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CONSOLIDATED CONSENT AGREEMENT/FEDERAL FACILITY COMPLIANCE AGREEMENT/FEDERAL FACILITY AGREEMENT FOR CONTROL AND ABATEMENT OF RADON-222 EMISSIONS MONTHLY PROGRESS REPORT PERIOD ENDING APRIL 30, 1993

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DOE-FN/EPA
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REPORT

CONSOLIDATED CONSENT AGREEMENT/FEDERAL FACILITY COMPLIANCE AGREEMENT/FEDERAL FACILITY AGREEMENT FOR CONTROL AND ABATEMENT OF RADON-222 EMISSIONS MONTHLY PROGRESS REPORT

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Introduction

The Consent Agreement (CA) As Amended under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sections 120 and 106(a), the Federal Facility Compliance Agreement (FFCA), and the Federal Facility Agreement for Control and Abatement of Radon-222 Emissions (FFA-CARE) between the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (U.S. EPA) signed September 20, 1991, July 18, 1986, and November 19, 1991, respectively, require that monthly reports be submitted to the U.S. EPA regarding progress made to meet the provisions of those agreements. This report fulfills those requirements by describing actions undertaken at the Fernald Environmental Management Project (FEMP) during the period April 1 through April 30, 1993, and planned actions for the period May 1 through May 31, 1993.

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WORK ASSIGNMENTS AND PROGRESS

Descriptions of work progress are presented in the following sections and/or enclosures to this report:

- o CA Section IX - Removal Actions.
- o CA Section X - Remedial Investigation/Feasibility Study.
- o Enclosure A - Wastewater Flows and Radionuclide Concentrations under CA Section XXIII.B.
- o Enclosure B - FFCA: Initial Remedial Measures and Other Open Actions.
- o Enclosure C - FFA: Control and Abatement of Radon-222 Emissions.
- o Enclosure D - Drilling/Boring Logs

CA Section IX. Removal Actions

This section provides an update of activities associated with the implementation of Removal Actions (RAs) at the FEMP during April 1993. Information is presented for each of the Removal Actions identified in the Consent Agreement As Amended.

Phase I Removal Actions

- o RA No. 1, Contaminated Water Under FEMP Buildings.
- o RA No. 2, Waste Pit Area Run-off Control.
- o RA No. 3, South Groundwater Contamination Plume.
- o RA No. 4, Silos 1 and 2.
- o RA No. 5, Decant Sump Tank.
- o RA No. 6, Waste Pit 6 Residues.
- o RA No. 7, Plant 1 Pad Continuing Release.

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Phase II Removal Actions

- RA No. 8, Inactive Flyash Pile Control.
- RA No. 9, Removal of Waste Inventories.
- RA No. 10, Active Flyash Pile Controls.
- RA No. 11, Pit 5 Experimental Treatment Facility.
- RA No. 12, Safe Shutdown.
- RA No. 13, Plant 1 Ore Silos.
- RA No. 14, Contaminated Soils Adjacent to Sewage Treatment Plant Incinerator.
- RA No. 15, Scrap Metal Piles.
- RA No. 16, Collect Uncontrolled Production Area Runoff--Northeast.
- RA No. 17, Improved Storage of Soil and Debris.
- RA No. 18, Control Exposed Material in Pit 5.

Phase III Removal Actions

- RA No. 19, Plant 7 Dismantling.
- RA No. 20, Stabilization of UNH Inventories.
- RA No. 21, Expedited Silo 3.
- RA No. 22, Waste Pit Area Containment Improvement.
- RA No. 23, Inactive Flyash Pile.
- RA No. 24, Pilot Plant Sump.

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CA Section IX. Removal Actions (continued)

- RA No. 25, Nitric Acid Tank Car and Area.
- RA No. 26, Asbestos Removals (Asbestos Program).
- RA No. 27, Management of Contaminated Structures at the FEMP.
- RA No. 28, Contamination at the Fire Training Facility
- RA No. 29, Temporary Nitrate Storage Tanks
- RA No. 30, Sewage Treatment Plant Incinerator

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REMOVAL ACTIONS

RA No. 1, Contaminated Water Under FEMP Buildings

Plant 6 - Through April 1993 approximately 59,778 gallons of Plant 6 perched groundwater have been extracted and transported for treatment to the Plant 8 Volatile Organic Compound (VOC) treatment system. In addition to the original Plant 6 extraction system, the motor bay sumps are being added to the Plant 6 system. Until the permanent system is installed, water collected from the four motor bay sumps is being pumped to drums and then transferred to the Plant 8 VOC Treatment System. Certified-for-Construction drawings were completed on April 13, 1993. Construction is anticipated to start July 1, 1993.

Plants 2/3 and Plant 8 - Through April 1993, approximately 147,413 gallons of perched water have been collected for treatment from Plant 2/3, and approximately 131,692 gallons of perched water have been collected for treatment from Plant 8.

Plant 9 - Approximately 26,213 gallons of Plant 9 perched water have been extracted and transported to Plant 8 through April 1993.

VOC Treatment System - Through April 1993, approximately 365,968 gallons of groundwater have been treated utilizing the Plant 8 treatment system. A reduced scope of sampling has been implemented so that increased pumping of Plant 2/3 can occur. This increased pumping is being coordinated with, and will occur when, the work to evaluate hydraulic pumping is implemented.

Pumping of perched water beneath the above-mentioned plants with subsequent treatment in the Interim Plant 8 VOC Treatment System, followed by uranium removal in the Plant 8 Wastewater Treatment System, will continue in accordance with the Work Plan provisions. Treatment will continue in this manner until the Advanced Waste Water Treatment (AWWT) Phases I and II are operational in 1994.

RA No. 2, Waste Pit Area Runoff Control

This removal action was completed on August 30, 1992.

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REMOVAL ACTIONS

RA No. 3, South Groundwater Contamination Plume

Part 1

The Work Plan for Part 1, Alternate Water Supply for two industrial users (Albright & Wilson Americas [AWA] and Delta Steel) was approved by the U.S. EPA on January 3, 1991. Subsequently, Delta Steel was deleted from the current scope of the project with approval of the U.S. EPA and the Ohio EPA. The Delta Steel hookup will be delayed until the planned public water supply can service the facility. A revised Work Plan (Revision 1) was prepared and issued to the EPAs to reflect this and other changes which have occurred. A summary of the most recent and ongoing activities for Part 1 are listed below:

Construction and initial operability testing was completed in December 1992. The 60-day initial testing period began on March 24, 1993. Water samples are being taken at the Albright and Wilson Americas (AWA) facility in accordance with criteria established in the Part 1 Work Plan. Preliminary analysis indicates all parameters are being met. The 60-day initial testing period will end May 24, 1993. At that time, the system will be turned over to AWA.

Part 2

This project was divided into five construction bid packages. These include: 2A - groundwater discharge pipeline (pressure flow) and outfall pipeline (gravity flow) from south of Willey Road to and including Manhole 183B; 2B1 - Manhole 183B to Great Miami River; 2B2 - Aeration Facility; 2C - recovery well field; and 2D - test well installation and pump test. The following is the status of the Part 2 activities:

Package 2A - Pipeline installation is progressing toward completion to accommodate the Package 2D (Test Well) pump test. The outfall line has been placed in service, and the existing line taken out of service. All wastewater discharged to the Great Miami River (GMR) is now discharged through the new outfall.

Package 2B1 - Complete.

Package 2B2 (Aeration Facility) - The delivery of aeration facility blowers has been delayed. The manufacturer is now quoting a mid-May delivery. The subcontractor has been directed to install a temporary blower for the pump test.

Package 2B3 (Parshall Flume) - The flume structure is in place to accommodate the pump test.

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REMOVAL ACTIONS

RA No. 3, South Groundwater Contamination Plume (continued)

Package 2C (Recovery Well Field) and Package 2D (Test Well) - Construction activities have increased with the advent of good weather. The archaeological survey for the Delta Steel property was submitted to the Ohio State Historical Preservation Office on April 26, 1993. Drilling of monitoring and piezometer wells continues in preparation for the May 12 pump test.

Part 3

The Work Plan for Parts 2 and 3 was prepared as one document. The plan entails the installation and operation of an Interim Advanced Wastewater Treatment (IAWWT) System to reduce uranium contaminant loading discharged to the Great Miami River to a level less than 1,700 pounds per year. Due to the relocation of the Part 2 well field to an area having a higher concentration of uranium, the IAWWT system capacity was expanded to maintain the 1,700 pound per year maximum level. The IAWWT system includes two treatment units. The IAWWT unit located at the Storm Water Retention Basin (IAWWT[SWRB]) consists of two trailer-mounted assemblies, each with a nominal 150 gpm capacity or a total nominal 300 gpm capacity. The unit located at the Biodenitrification Effluent Treatment System (IAWWT[BDN-ETS]) has a nominal capacity of 100 gpm. Current activities are described below.

<u>IAWWT(SWRB) Unit</u>

Training was completed for IAWWT(SWRB) resin sluicing addition and for the IAWWT resin drumming and dewatering. Sluicing of resin from the north IAWWT(SWRB) trailer was begun on April 29. This operation proceeded successfully as per the Standard Operating Procedure (SOP). However, sluicing of one IX vessel required more than one super sucker tank load, and therefore must be completed in several trips.

<u>IAWWT(BDN-ETS) Unit</u>

Quotations for the ion exchangers were received April 28. Quotes for the sand filtration system are due May 12. A draft construction schedule was developed which indicates a start date of June 1, and a completion date of June 30, 1993.

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REMOVAL ACTIONS

RA No. 3, South Groundwater Contamination Plume (continued)

Part 4

Part 4 of the South Groundwater Contamination Plume Removal Action Work Plan involves groundwater monitoring and institutional controls.

Private homeowner and existing RI/FS well sampling in the South Plume area continues. The two homeowner treatment systems installed south of the FEMP continue to operate successfully.

Part 5

Part 5 was added to the South Plume in order to address the relocation of the Part 2 well field. It includes groundwater modeling and geochemical investigation of the area south of the well field to determine if 20 ppb uranium concentration in groundwater is present downgradient of the Part 2 well field.

The South Plume Groundwater Modeling Report was revised to address the U.S. and Ohio EPA comments. The revised report is expected to be transmitted to the U.S. and Ohio EPA in early May.

The geochemical investigation is divided into four phases: Phase I - two traverse lines of hydropunch borings within the alluvium area and concurrent sampling of existing nearby wells; Phase II - two traverse lines of monitoring wells with corresponding hydropunch sampling north and south of the proposed recovery well field; Phase III - seven piezometers clustered near proposed extraction well R-4; and Phase IV - soil vapor sampling.

Phase I was completed on August 25, 1992. Only one hydropunch sample exceeded 20 ppb. uranium. The data summarizing Part 5 Phase I is undergoing review and is expected to be issued to U.S. EPA and Ohio EPA in early May.

Phase II, installation of the twelve wells, was started in late March. The 2000-series primary wells will be installed to support the Part 2D Pump Test. However, it is anticipated that several secondary wells will not be installed until after the pump test.

Phase III: The seven piezometer cluster located near proposed Recovery Well RW-4 will be installed in early May as part of Part 2D pump test construction package. These piezometers will also be used to determine the vertical extent of the uranium contamination within the aquifer and to test the proposed well field's vertical pumping influence as proposed in the Design, Monitoring, and Evaluation Program Plan.

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REMOVAL ACTIONS

RA No. 4, Silos 1 and 2

Installation of the bentonite in Silos 1 and 2 was completed on November 28, 1991.

The DOE submitted an evaluation detailing a revised method for determining the effectiveness of the bentonite in the silos to the U.S. EPA on December 17, 1992. A meeting between DOE and EPA was held on January 7, 1993. Disapproval with comments was received from the U.S. EPA on February 12, 1993. The U.S. EPA comments are currently being addressed. As discussed with U.S. EPA on April 13, 1993, information contained in the revised Bentonite Effectiveness Evaluation document will be incorporated into the Removal Action Final Report.

As defined in the Removal Action Work Plan and the FFA-CARE, data associated with monitoring the effectiveness of the bentonite installation are included in Enclosure C.

RA No. 5, K-65 Decant Sump Tank

Removal of the liquid from the K-65 Decant Sump Tank was completed on April 16, 1991, when the liquid was transferred to the holding tanks in Plant 2/3. Treatment of the decant liquid based on the Material Evaluation Form and available analytical results was completed on May 12, 1992.

The tank has been accumulating liquid since it was emptied in 1991. Upon reaching approximately 80% of its capacity, repumping was required. On January 22, 1993, a maintenance action was initiated to pump the contents of the tank. On February 2, 1993, the action was completed with the removal of approximately 8,000 gallons of liquid from the tank. The liquid is presently awaiting the results of laboratory analysis, which will allow treatment and disposal of the liquid. On February 8, 1993, a measurement of the K-65 Decant Sump Tank was conducted. The results indicate that approximately three feet of sludge and liquid remains in the tank; this is approximately 500 gallons of liquid. Ongoing activities include monitoring the liquid level and implementing maintenance actions as required. Per requirements of the Work Plan, Operable Unit 4 will advise DOE-FN when pumping operations are to resume.

RA No. 6, Waste Pit 6 Residues

This removal action was completed on December 19, 1990.

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REMOVAL ACTIONS

RA No. 7, Plant 1 Pad Continuing Release

This removal action consists of three phases. Phase I, which implements the run-on/off control measures, is complete. Phase II addresses the installation of 80,000 square feet of a newly covered and controlled concrete storage pad. Phase III involves activities to upgrade the remaining 375,000 square feet of the existing Plant 1 storage pad. Phase III upgrading activities include installation of a polymeric vapor barrier over the existing concrete and the installation of concrete above the barrier with an epoxy sealant. In addition, 22,000 square feet of the Phase III work area will be enclosed beneath a tension support structure.

Drum movements, which began in January 1993, continued and are due to be completed by June 14, 1993. The drum movements are required to clear areas for construction.

The specifications and drawings necessary for the bid package for Phase III activity are being revised due to an increase in the support capabilities of the pad. The revised Cost Estimate and drawings were completed on April 29. Approval is expected in May. The Invitation for Bid for Phase III activity is expected in late May.

KEY MILESTONES	STATUS	DUE DATE
Complete Phase III	Open, behind schedule	February 19, 1995

RA No. 8, Inactive Flyash Pile Control

The Inactive Flyash Pile Isolation Activity was completed ahead of schedule on December 23, 1991.

RA No. 9, Removal of Waste Inventories

During April 1993, 5,354 drum equivalents (DEs) of low-level waste (LLW) were dispositioned. Repackaging material has reduced volume shipped to the Nevada Test Site (NTS) by 5,241 DEs year-to-date. The FY1993 goal is to dispose of 67,000 DEs of LLW at NTS and 50,000 DEs of LLW through subcontractors.

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REMOVAL ACTIONS

RA No. 9, Removal of Waste Inventories (continued)

DOE-NV completed the review and approval of the SEG compaction process. The close-out surveillance was completed April 20, 1993. Approval to ship residues from SEG to NTS is contingent on DOE-NV approval of the FEMP Application Addendum and the FEMP Sampling and Analysis Program.

Disposition of residues to SEG and shipments of recoverable metal to SEG continued through April. The volume shipped to date is 420 DEs of residue and 1,934 DEs of non-ferrous metal.

Waste shipping activities for May include a DOE-NV visit to review and approve FEMP sample plans and analysis consistent with NVO-325 (Rev. 1) requirements. This meeting is expected to result in DOE-NV approval to ship residues to NTS. Two additional waste streams for thorium, one for asbestos containing material, and one for slag from SEG metal melt operations will be developed.

KEY MILESTONES	STATUS	DUE DATE
Submit Annual Work Procedures for 1993	Open, on schedule	June 30, 1993

RA No. 10, Active Flyash Pile Controls

This removal action was completed on June 29, 1992. Any required maintenance will be conducted on an ongoing basis.

RA No. 11, Pit 5 Experimental Treatment Facility

RA No. 11 was completed on March 20, 1992.

RA No. 12, Safe Shutdown

The Safe Shutdown Removal Action documents the ongoing shutdown activities that will remove uranium and other process/raw materials from equipment and pipe lines in areas of formerly used processing equipment and will properly disposition the removed materials off site.

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REMOVAL ACTIONS

RA No. 12, Safe Shutdown (continued)

KEY MILESTONES	STATUS	DUE DATE
Submit Annual Work Procedures for 1993	Open, on schedule	June 30, 1993

Equipment and Material Assessments (formerly Preliminary Assessments) are continuing. The title change was made to reflect that a thorough evaluation and field verification are being made of equipment in the plants. Field evaluations of Plants 1, 7, and 8 have been completed. The field evaluation of Plant 4 is in process.

The status of the capital and expense items in the equipment disposition program has not changed since last month, because efforts have been focused on developing a task order system to identify hold-up materials in equipment and track the removal of this material.

The following is the status of expense items: 2,878 expense items are currently in the data base; 1,411 have been field verified, 578 are on a "shopping list" to ascertain on-site use, 1,042 have been transferred to Maintenance, and 110 have been placed on AC-563 Forms to be excessed. These numbers are expected to fluctuate from month to month as field verification is conducted.

The following is the status of capital equipment: of an estimated 1,694 total number of items, 1,195 have been put on AC-563 Forms to be excessed, and 499 have been identified as "In Use/Future Use" items. The number of items on AC-563 Forms and the "In Use/Future Use" listing may vary due to change of status of equipment items.

The status of Maintenance work orders issued to-date to isolate and disconnect all utilities/energy sources from equipment not in use is 436, of which 134 have been completed. Field verification of the completed orders is ongoing. Completion of these work orders is a preliminary step for removal of hold-up material from the equipment in preparation for equipment removal and decontamination and decommissioning.

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REMOVAL ACTIONS

RA No. 12, Safe Shutdown (continued)

Negotiations continued during the month of April between the Army and NTS on the permit application for the of 4A Metal Removal Project, Phase II (shipment of rolled scrap to the NTS). While awaiting the finalization of the contract, consolidation and prepackaging of the material continued. To date, over 244 Nucfil vents have been installed and 96 white metal boxes have been filled. The white metal boxes have not been completely sealed to allow inspection of the contents, if needed, during NTS' audit of the process. The availability of white metal boxes will impede the progress of this task; they have been ordered, but delivery date is uncertain at this time.

Several meetings have been held with Nuclear Systems Safety since September 16, 1992, on requirements for the Safe Shutdown Program field activities. We reported last month that an approved safety assessment had been finalized; however, it required revisions based on comments received during the review cycle. When approved, this Safety Assessment will allow Safe Shutdown to gain entry and remove hold-up materials, and to remove radiological contamination. Exempt from the safety assessment are the Plant 1 storage area of enriched materials greater than 2% U^{235} and Plants 2/3. These areas will be addressed by separate safety assessments. Since the Safety Assessment comments are still being addressed, the Risk Assessment and Risk Management Plan are not expected to be approved until May.

As mentioned last month, it was agreed upon by all parties that an Environmental Assessment to allow removal of hold-up materials and high-level cleaning was not needed and that this work could be covered by a categorical exclusion for all plants. The categorical exclusion has been delayed, however, but should be completed and approved in May.

Progress on the Requests for Proposals (RFP) SD-417 for the sale of normal and enriched uranium, which has been stymied for two months, was resumed April 15, 1993, when DOE-Headquarters directed DOE-Richland (DOE-RL) to take over the normal and enriched sale after DOE-Oak Ridge resolved the potential conflict of interest issue. On April 19, 1993, DOE-RL tasked Westinghouse Hanford Company to manage the sale. A Hanford-based Source Evaluation Board has been selected, and they expect to make their recommendation in May. FERMCO will have no further involvement in the activities associated with RFP SD-417.

Bids on RFP for the sale of depleted uranium, SD-416, for depleted uranium, are due May 11; FERMCO will continue to manage this sale.

A "footprint" of the location of FEMP's nuclear inventory was issued, identifying storage by plant graphically. This is expected to be a dynamic document, accurately reflecting materials movement.

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REMOVAL ACTIONS

Planned activities for May include continuing packaging of the Army materials for off-site shipment as the availability of white metal boxes allows, evaluating the bids on RFP SD-416 for depleted uranium; continuing to issue work orders for utility isolation work; continuing reconciliation of the Safe Shutdown data base; pursuing completion of the Safety Assessment, Risk Assessment and Risk Management Plan; and commencing issuance of task orders to remove hold-up inventories from process equipment.

RA No. 13, Plant 1 Ore Silos

The Plant 1 Ore Silos Removal Action will include the dismantling of the 14 Plant 1 Ore silos and their support structure. This dismantling will eliminate the potential threat of additional material releases and the safety hazard due to structural deterioration of the silos and their support structure. The activities in this removal action will include characterization, removal, containerization, and disposal of the materials making up the above-ground portion of the facility.

April activities included removing miscellaneous equipment and structural assemblies from the perimeter of the concrete silo structure, removing all process equipment and structural steel located on top of the concrete silos, removing the concrete wall at the location of the size reduction facility, and removing the personnel platform and support beams.

May activities will include placing the concrete foundation for the UNH protective cover, installation of the UNH protective cover, and delivery and erection of the size reduction facility.

KEY MILESTONES	STATUS	DUE DATE
Complete Removal Action	Open, ahead of schedule.	December 19, 1994

RA No. 14, Contaminated Soils Adjacent to Sewage Treatment Plant Incinerator

This removal action will include the isolation or removal and disposition of contaminated soils in the vicinity of the Sewage Treatment Plant. This action will eliminate the potential threat of additional material releases to the environmental media through migration. The activities in this removal action will include characterization, removal, containerization, and storage/disposal of the materials.

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REMOVAL ACTIONS

RA No. 14, Contaminated Soils Adjacent to Sewage Treatment Plant Incinerator (continued)

The revised Work Plan Addendum and comment-responses were submitted to the EPAs on March 29. Removal of contaminated soil per the revised WPA began north of the sewage treatment plant on March 1. Survey maps showing sample locations have been revised to include additional information and to present data in a more readable format. The initial 187 white metal boxes from Phase II have been sampled.

May activities will include the submittal of the revised Work Plan Addendum and comment-resolutions to DOE-FN. After DOE-FN approval, the documents will be submitted to the EPAs. A new Lease Agreement with the property owner is planned to be completed by May 15, 1993. A revised Sampling Plan for the additional off-property area will be completed.

KEY MILESTONES	STATUS	DUE DATE
Phase III - Completion of off-property excavation	On hold, need new Lease Agreement	May 17, 1993
Phase IV - Submit Final Report	Open	To Be Determined

RA No. 15, Scrap Metal Piles

The Scrap Metal Piles Removal Action will detail the stabilization and disposition of LLW scrap metal currently stockpiled on site. This removal action will minimize material releases to the environment. Approximately 1,400 tons of scrap copper along with approximately 2,200 tons of recoverable scrap metals are the focus of this removal action.

Containerization of the Phase I scrap metal pile at B69 pad began in February. A total of 34,920 pounds of non-ferrous metal has been shipped to Quadrex and 311,130 pounds of ferrous metal has been shipped to SEG.

The pre-proposal meeting for the Phase IIB subcontract was held on March 18. The due date for bids is June 9, 1993.

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REMOVAL ACTIONS

RA No. 15, Scrap Metal Piles (continued)

KEY MILESTONES	STATUS	DUE DATE
Complete Phase I	Open, on schedule	March 30, 1994
Phase I - Submit Final Report	Open, on schedule	September 30, 1994
Phase IIB: Submittal of Subcontractor's Removal Action Plan	Behind Schedule Feb. 1, 1994 (F)	September 30, 1993
Phase IIB: Submittal of Final Report	Open, on schedule	March 30, 1995

RA No. 16, Collect Uncontrolled Production Area Runoff -- Northeast

The scope of this removal action is to collect the remaining stormwater runoff from the perimeter of the 136 acre former production area that currently discharges to Paddy's Run and divert it through the existing storm sewer system to the Storm Water Retention Basin. Construction is ongoing along the north perimeter fence; 1,486 linear feet of trench drain has been completed, and three tie-ins to the existing system have been made. Construction of catch basins #209 and #210 is complete. Construction has begun on catch Basin #211.

Future work on this removal action includes continuation of construction work.

KEY MILESTONES	STATUS	DUE DATE
Complete Removal Action	Open, on schedule	August 30, 1993

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REMOVAL ACTIONS

RA No. 17, Improved Storage of Soil and Debris

This removal action will include the management and appropriate storage of contaminated soil and debris on site. This will eliminate the potential threat of additional material releases to the environment due to wind, rain, or vehicular traffic. The activities in this Removal Action will include characterization, interim storage, and management of the contaminated soil and debris materials until the final remediation under Operable Unit 3.

The final Work Plan was submitted to DOE-FN on February 18 for transmittal to the EPAs. A draft letter addendum for the Work Plan was submitted to DOE-FN on March 31. This letter addendum will have DOE comments incorporated and was submitted to the EPAs on April 21.

The subcontractor will complete borings for the geotechnical survey by May 3, 1993. The final Safety Assessment is expected to be approved in early May. Approval of the Risk Management Plan and the Risk Assessment Report is also expected in May. FERMCO review of the 90% design package was completed and submitted to Parsons on April 21, 1993. Sampling of the Third Street Dirt Pile for RCRA characterization has begun and will be completed in May.

RA No. 18, Control Exposed Material in Pit 5

Dredging activities were completed in December 1992.

There was no field construction activity during April.

Planned activities for May include adjusting the berm elevation to meet the free board distance requirements.

RA No. 19, Plant 7 Dismantling

The Plant 7 Dismantling Removal Action will include dismantling and dispositioning of the Plant 7 structure. This dismantling will eliminate the potential threat of additional material releases and the safety hazard due to histoplasmosis. The activities in this removal action will include characterization, removal, dismantling, containerization, and disposition and potentially beneficial re-use of the materials making up the above ground portion of the facility.

The Removal Action Work Plan (RAWP) was submitted to the U.S. EPA on April 20.

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REMOVAL ACTIONS

RA No. 19, Plant 7 Dismantling (continued)

KEY MILESTONES	STATUS	DUE DATE
Submit Work Plan to the U.S. EPA	Complete, April 20, 1993	April 20, 1993

RA No. 20, Stabilization of UNH Inventories

The Stabilization of UNH Inventories Removal Action will remove and prepare for safe storage approximately 230,000 gallons of acidic UNH that is currently stored in 21 tanks in and around Plant 2/3. Existing processing equipment will be used to neutralize the solutions, filter the precipitate, and package the resulting filter cake in double containment for safe storage. This activity was previously part of RA No. 12, Safe Shutdown, but is being accelerated as a separate expedited response.

Processing resumed on April 13, but was stopped on April 20. This stoppage was to complete a commitment requiring an operational readiness review. Processing remains on hold pending a Class B investigation of an incident that occurred on April 27.

RA No. 21, Expedited Silo 3

On February 24, 1993, the Expedited Silo 3 Removal Action Final Report was submitted to the U.S. EPA.

RA No. 22, Waste Pit Area Containment Improvement

This project involves the stabilization of the south berm of Pit 4, the regrading of the drainage ditches along Pits 3, 4, 5, and 6, and the resurfacing of the road between Pits 3, 4, 5, and 6.

The final CFC package was received from Parsons. A detailed estimate and schedule were prepared. A construction kick-off meeting was held, and survey and layout work began April 7, 1993. During the month, equipment and materials were received. Erosion control measures were taken and excavation is in progress.

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REMOVAL ACTIONS

RA No. 22, Waste Pit Area Containment Improvement (continued)

Planned activities for May include the continuation of ditch and roadway improvements along with berm stabilization work. A June 30, 1993 completion date is targeted.

RA No. 23, Inactive Flyash Pile

A field investigation was conducted to determine if select locations within the Inactive Flyash Pile and South Field Disposal area boundary (RA No. 8) would require material to be removed. On June 24, contaminated debris from three of the regulated areas identified in the survey report were collected and placed in interim controlled storage. The contaminated items collected were a plastic bag (approximately 1 gallon) containing soil, a 1 foot x 2 feet section of transite and two small pieces of yellow material. Results of the survey were submitted on June 29, 1992. As a result of removal of the debris, DOE-FN determined that no additional action is required until remediation.

RA No. 24, Pilot Plant Sump

This sump is located on the southwest side of the Pilot Plant. The sump consists of a stainless steel cylinder approximately two feet in diameter and ten feet deep. This sump was built to remove liquids from the floor drains of the Pilot Plant and was actively used only during the renovation of the Pilot Plant in 1969. The sump is filled with a thick liquid and sludge. Analytical results of the sump contents show high concentrations of metals: lead, copper, chromium, nickel, as well as thorium and volatile organic compounds.

The seventh pump-out of the sump occurred on April 26, 1993, removing 135 gallons. To date, approximately 1,055 gallons have been removed. Preparations are underway to implement the removal, including the internal inspection of the sump drain line to assess its integrity. The final Removal Action Work Plan/Closure Plan Information and Data package was delivered to DOE-FN on April 6, 1993, for submittal to U.S. and Ohio EPA. Analytical reports for samples of the sump liquids taken thus far were submitted to DOE-FN on April 1, 1993.

A final schedule for implementing the removal action is expected in May.

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Period Ending April 30, 1993

REMOVAL ACTIONS

RA No. 25, Nitric Acid Tank Car and Area

The Nitric Acid Rail Car is located on the northern perimeter of the production area and east of Building 63. The FEMP RCRA Part A and Part B application identify this tank car and area surrounding it as a Hazardous Waste Management Unit.

This high-grade, stainless steel tank car has a capacity of approximately 100,000 gallons and measures approximately 10 feet wide x 40 feet long x 15 feet high. This unit operated from 1952 until about 1989. The tank car stored nitric acid used at the FEMP. Based on recent analysis, the tank car now contains 50-100 gallons of nitric acid. This removal action includes removal of residual contents from the tank car followed by decontamination and dispositioning of the tank car.

The final Work Plan was submitted to the EPAs on January 28, 1993. Ohio EPA conditional approval was received on March 1 and U.S. EPA approval was received on March 8, 1993. The subcontractor prepared responses to EPA comments and revised affected pages to incorporate those comment-responses. A revised Removal Action Work Plan/Closure Plan Information and Data was submitted to the U.S. EPA and the Ohio EPA on April 16, 1993.

A final schedule for implementation of the removal action is expected in May.

RA No. 26, Asbestos Removals (Asbestos Program)

This removal action documents ongoing asbestos abatement activity at the FEMP to mitigate the potential for contaminant release and migration. Abatements within the Asbestos Program to date include small-scale in-situ repairs, encasement, encapsulation, and removals.

The April 1993 Work Procedures submittal included Large-Scale Asbestos Practices which applies to all asbestos abatement on-site (both small- and large-scale). This submittal will also provide generalizations of all abatement activities to date as well as planned abatement activities for the next year, including several large-scale abatement projects.

April activities included the submittal of the draft Work Procedures to DOE-FN on April 5 and the receipt of DOE-FN's comments on April 20. The Compendium is presently being revised for DOE-HQ review. May activities will include DOE-HQ review and revision of the Work Procedures for submittal to the EPA in June. Field activities in asbestos material identification and abatement continue.

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REMOVAL ACTIONS

RA No. 26, Asbestos Removals (Asbestos Program) (continued)

KEY MILESTONES	STATUS	DUE DATE
Submit draft Work Procedures for 1993 to the U.S. EPA	Open, on schedule	June 30, 1993

RA No. 27, Management of Contaminated Structures at the FEMP

This removal action requires the submittal of the Engineering Evaluation/Cost Analysis (EE/CA) study to identify alternatives for managing contaminated structures; the documentation of the selection of a response(s) that will mitigate the potential threat to workers, the general public, and the environment associated with these structures; and addressing health and environmental impacts associated with the proposed action.

The Responsiveness Summary was completed and issued in March. This document included comments from the public received at the EE/CA Workshop held January 12, 1993, EPA comments, and responses to those comments.

The draft EE/CA was submitted to the EPAs on December 14, 1992. U.S. EPA conditional approval and comments were received January 19, 1993. Responses to EPA comments were submitted February 24. The final EE/CA will submitted upon resolution of Ohio EPA comments.

RA No. 28, Contamination at the Fire Training Facility

This removal action will address removal, decontamination and disposal, treatment or storage of all structures, tanks, equipment, the underground sump and oil/water separator, in addition to addressing "hot spots" soil staining, and any other surface soils from which a threat of migration of contamination exists.

The Removal Site Evaluation for this removal action was completed in July 1992. Soil vapor testing was completed March 12, 1993. During April the draft Removal Action Work Plan/Closure Plan Information and Data package was reviewed by FERMCO. A meeting was held with Ebasco to refine the removal strategy on April 14, 1993. The revised draft was submitted to DOE-FN on April 27, 1993 for review.

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REMOVAL ACTIONS

RA No. 28, Contamination at the Fire Training Facility (continued)

Activities for May will include providing DOE-FN comments on the draft to Ebasco for final revision of the draft to submit to EPA in June.

KEY MILESTONES	STATUS	DUE DATE
Submit draft Work Plan to EPA	Open, on schedule	June 30, 1993

RA No. 29, Temporary Nitrate Storage Tanks

This removal action involves the field actions to empty and thoroughly cleanse the interior of the tanks followed by disposition of the materials. The water will be characterized, transferred and treated through the exiting water treatment facilities. The sludges will be characterized, drummed, and dispositioned appropriately. The liners will be cleaned and decontaminated as required and free-released.

A draft Removal Site Evaluation was provided to the DOE-FN on March 15, 1993. Major revisions to the RSE have been made and sent to DOE on April 29, 1993.

KEY MILESTONES	STATUS	DUE DATE
Submit draft Work Plan to EPA	Open, on schedule	July 15, 1993

RA No. 30, Sewage Treatment Plant Incinerator

This removal action involves the field activities to decontaminate and dismantle the incinerator and associated equipment. This work includes characterization and disposition of the wastes, containerization of equipment for shipment to NTS, removal and packaging of the transite for on-site storage, dismantling and monitoring of steel for free release, decontamination of removable contamination from the remaining slab, and decontamination of the work area.

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REMOVAL ACTIONS

RA No. 30, Sewage Treatment Plant Incinerator (continued)

A draft Removal Site Evaluation was provided to DOE-FN on March 15, 1993. Major revisions to the RSE have been made and sent to DOE on April 29, 1993.

KEY MILESTONES	STATUS	DUE DATE
Submit draft Work Plan to EPA	Open, on schedule	July 30, 1993

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Period Ending April 30, 1993

REMEDIAL INVESTIGATIONS/FEASIBILITY STUDIES

1.0 Operable Unit 1

Operable Unit 1, as defined in the Amended Consent Agreement, includes Waste Pits 1 - 6, Clearwell, Burn Pit, berms, liners, and soil within the operable unit boundary.

1.1 Treatability Studies

Scope:

The Operable Unit 1 treatability studies will evaluate the two treatment process options identified in the Operable Unit 1 Initial Screening of Alternatives document: cement stabilization and vitrification. The technical feasibility of these technologies will be evaluated by conducting a series of experiments on both composite waste samples and individual strata samples. Performance criteria, including formulation ranges, compressive strength, leachability, bulking factor, and permeability, will be investigated. Cement stabilization binding agents, including portland cement, flyash, Blast Furnace Slag, and sodium silicate, are being evaluated. Clay (attapulgite and clinoptilolite) will be added to reduce the leachability of metals in the waste. Glass formers and modifiers considered for vitrification are flyash, soil, and sodium hydroxide.

The stabilization testing consists of two phases. The preliminary phase, now complete, consisted of reagent range-finding experiments on a pit-by-pit basis using composite samples from individual waste pits. The advanced phase consists of testing on strata samples where available. Each phase contains two stages permitting additional reagent testing as necessary. An optional phase to evaluate waste form durability is also being considered.

Status:

Validation of treatability study data is ongoing and should be complete by May 14, 1993. Work will begin on the Treatability Report as soon as data is received. A task order has been placed with University of Cincinnati to perform the wet/dry and freeze/thaw testing on the cement waste forms. Radon leach samples continue to be generated for testing. All other treatability work is complete.

Issues/Corrective Actions:

None to report.

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REMEDIAL INVESTIGATIONS/FEASIBILITY STUDIES

1.2 Remedial Investigation

Scope:

A RI Report will be prepared in accordance with the U.S. EPA Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA Directive 93553-01) and the approved Risk Assessment Work Plan Addendum.

Status:

Discipline leads are currently assembling their individual sections of the Draft Remedial Investigation Report for the planned technical review to follow.

A presentation on the status of the Operable Unit 1 Remedial Investigation Data and proposed Remedial Alternatives was presented to U.S. EPA on April 13, 1993. An explanation was given regarding the inability to obtain native soil samples from directly beneath the waste disposal pits and the difficulty in proposing in-situ site remediation methods.

Issues\Corrective Actions:

None to report.

OPERABLE UNIT 1 REMEDIAL INVESTIGATION REPORT **PRIMARY**

SCOPE	SUBMIT TO EPA	RECEIVE FROM EPA	SUBMIT TO EPA FINAL
Details the nature and extent of contaminants within the Operable Unit 1 study area. Estimates the volume of contaminated media and materials. Provides a baseline risk assessment and establishes remedial action objectives.	10/12/93 C	12/11/93 C	01/10/94 C

C = Consent Agreement Date

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REMEDIAL INVESTIGATIONS/FEASIBILITY STUDIES

1.3 Planned Activities for May 1993

- Validation of treatability data will be completed.
- Complete technical planning and format reviews of the Draft RI Report.
- Continue preparation of RI Report.

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REMEDIAL INVESTIGATIONS/FEASIBILITY STUDIES

2.0 Operable Unit 2

Operable Unit 2, as defined in the Amended Consent Agreement, includes the flyash piles, other South Field disposal areas, lime sludge ponds, solid waste landfill, berms, liners, and soil within the operable unit boundary.

2.1 Field Investigation

2.1.1 Work Plan Addendum - Installation of Monitoring Well 1433

Scope:

The Work Plan Addendum provides for installation of Monitoring Well 1433 in the northwest area of the South Field, near Boring 1401. This well is desirable to further characterize the fill/soil material by sampling any perched groundwater/leachate that may be present at that location that was not previously encountered.

Status:

Groundwater samples from Monitoring well 1433 were collected on November 18, 1992, for full Hazardous Substance Listing, full radiological, and general groundwater quality parameters. Results from the on-site FEMP laboratory analysis indicate Total Uranium concentrations at 4,200 ppb. The contract laboratory has completed the analysis of the soil samples retrieved during the installation of the well and the groundwater samples.

Data validation and database entry functions are continuing.

Issues/Corrective Actions:

Follow-on groundwater sampling of the well and further systematic investigation activities of the area encompassing Monitoring Well 1433 are planned under the RI field investigations as presented in the Sampling and Analysis Plan for the RI/FS Work Addendum for Operable Unit 2.

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REMEDIAL INVESTIGATIONS/FEASIBILITY STUDIES

2.1.2 RI/FS Work Plan Addendum for Operable Unit 2

Scope:

The Remedial Investigation (RI) Report for Operable Unit 2 was submitted to the U.S. EPA and the Ohio EPA in October 1992. Based on December 17, 1992, review comments from the EPAs on the RI Report, and responses to those comments submitted by the DOE-FN on February 7, 1993, a second phase of RI sampling and analysis is required for Operable Unit 2 in order to meet the objectives of the March 1988 Sitewide Remedial Investigation/Feasibility Study (RI/FS) Work Plan.

Status:

Sampling and Analysis Plan (SAP) for collection and analysis of additional environmental samples in Operable Unit 2 has been prepared in accordance with CERCLA Guidance for Conducting Remedial Investigations and Feasibility Studies.

The draft SAP for RI/FS Work Plan Addendum for Operable Unit 2 was submitted to the EPAs on March 8, 1993. Pursuant to the informal dispute resolution process with the U.S. EPA, field investigations were initiated on March 16, 1993. Work Plan approval with comments was received from the U.S. EPA and Ohio EPA on March 23, 1993. Preparation of a final SAP with response to comments is in progress.

South Field

The Work Plan calls for the installation of three 1000-Series and two 2000-Series monitoring wells. The status of which is as follows:

- 1941 Installation completed April 26, 1993, and a sample was sent to the on-site laboratory. The well was set at approximately 12 feet with a 7-foot screen. Well development was completed on April 29, 1993, and sampled on April 30, 1993.

- 1942 Installation completed April 16, 1993. The well was set at approximately 16 feet with a 10-foot screen. Well development was completed on April 30, 1993.

- 2943 Installation completed April 20, 1993. The well was set at approximately 66 feet with a 15-foot screen. Well development activities not started.

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REMEDIAL INVESTIGATIONS/FEASIBILITY STUDIES

2.1.2 RI/FS Work Plan Addendum for Operable Unit 2 (continued)

- 2944 Not started.
- 2945 Installation completed April 7, 1993. The well was set at approximately 65 feet with a 15-foot well screen. Well development and sampling were completed on April 28, 1993.

Hydropunch II operations

The Work Plan Addendum calls for the installation of ten Hydropunch II (HP) operations and subsequent groundwater sampling activities. An additional hydropunch was completed prior to the installation of Monitoring Well 1942.

HP 11014 and 11015 were completed in March 1993. HP 11009, 11010, 11011, 11012, 11013, 11016, 11017, and 11018 were completed in April 1993. Groundwater samples extracted were transported to the on-site FERMCO laboratory for Total Uranium analysis.

Surface Water and Sediment Sampling

Surface soil and sediment sampling was completed in the South Field during March 1993.

Near Surface and Surface Soil Hand Borings

The Operable Unit 2 Work Plan Addendum required 21 surface (0" to 6") and near surface (6" to 12") hand borings be completed at planned locations. The same locations were used to install the auger soil borings. The hand borings were completed in March 1993 and sent to the contract laboratory for full Hazardous Substance List (HSL), and full radiological analyses.

Soil Auger Borings

Borings 1964, 1965, 1966, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, and 1978 were completed in April 1993. The boring depths ranged from approximately 10 feet to 35 feet, based on the encountered thickness of the fill and glacial overburden. All samples were sent to the contract laboratory for full HSL, full radiological, geotechnical, and miscellaneous radiological parameter analyses.

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REMEDIAL INVESTIGATIONS/FEASIBILITY STUDIES

2.1.2 RI/FS Work Plan Addendum for Operable Unit 2 (continued)

Existing Monitoring Well Groundwater Sampling

Groundwater sampling and subsequent laboratory analysis is required for existing Monitoring Wells 2401, 1014, 2014, 1516, 1517, 1518, 1046, 2046, 1065, 2065, and 2085. This activity commenced on April 22, 1993.

Geophysical Survey/Trenching Activities

A geophysical survey is required by the Work Plan Addendum. Subsequent anomalies will be identified and investigated through trenching operations.

Solid Waste Landfill

The Work Plan Addendum requires the installation of three 1000-Series and four 2000-Series monitoring wells. The well installation status is as follows:

- 1947 Installation completed. The well was set at approximately 20 feet with a 10-foot screen. Well development activities not started.
- 1950 Installation has not begun.
- 1952 Installation started in April 1993.
- 2947 Installation completed. The well was set at approximately 80 feet with a 15-foot screen. Well development and first round of groundwater sampling completed April 21, 1993.
- 2949 Installation completed. The well was set at approximately 75 feet with a 15-foot screen. Well development and first round of groundwater sampling completed April 16, 1993.
- 2951 Installation completed. The well was set at approximately 72 feet with a 15-foot screen. Well development activities commenced April 27, 1993.

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REMEDIAL INVESTIGATIONS/FEASIBILITY STUDIES

2.1.2 RI/FS Work Plan Addendum for Operable Unit 2 (continued)

Surface Soil Sampling

The Work Plan calls for twelve surface soil samples to be collected at predetermined locations. Surface soil samples SWL-SS-01 through SWL-SS-12 were completed in April 1993. Samples were transported to the contract laboratory for full HSL, and full radiological analyses.

Surface Water and Sediment Sampling

Surface water and sediment sampling is required in 2 locations. Surface water and sediment sampling was completed in April 1993 at SWL-SW-01, SWL-SD-01, SWL-SW-02, and SWL-SD-02. The sediment samples were sent to the contract laboratory for full HSL and full radiological analyses. Surface water samples were sent to the contract laboratory for full HSL, full radiological, and general groundwater quality parameter analyses. Samples for Total Uranium were sent to the FERMCO on-site laboratory for analysis. Four additional sediments were collected from the drainage feature within landfill.

Soil Auger Borings

The Work Plan Addendum required 12 soil auger borings be completed. Soil boring 1985 was completed and boring 1986 commenced in April 1993. Samples for radiological and chemical parameters were sent to the contract laboratory for analysis.

Existing Monitoring Wells Groundwater Sampling

Groundwater sampling and subsequent laboratory analysis on existing Monitoring Wells 1719, 2027, 1035, 1037, 2037, 1038, and 2052 was initiated during April 1993.

Soil Gas Survey

Fifty soil gas survey points were completed in April 1993. A total of 14 VOCs were encountered during the survey. The average readings for the 14 VOCs was 25 ppm. Methane was encountered 29 times, with an average range detected of 1 ppm to 1000 ppm. Readings were achieved using a Foxboro OVA 128 (FID) meter with a methane probe.

Inactive Flyash Pile

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REMEDIAL INVESTIGATIONS/FEASIBILITY STUDIES

2.1.2 RI/FS Work Plan Addendum for Operable Unit 2 (continued)

The Work Plan Addendum requires the installation of one 1000-Series and one 2000-Series Monitoring Wells. The status of these monitoring wells is as follows:

- 1954 Installation has not started.
- 2955 Installation commenced April 22, 1993.

Soil Auger Borings

Soil auger borings in 5 predetermined locations are to be installed under the requirements of the Work Plan Addendum. Boring 1995 commenced April 30, 1993. Boring 1996 was completed on April 29, 1993. Subsequent samples were sent to the contract laboratory for full HSL, full radiological, and various geotechnical parameter analyses. Certain samples were also sent to the FERMCO on-site laboratory for Total Uranium and Gamma Spectrometry.

Surface Soil Sampling

Surface soil sampling is required at seven locations. IFP-SS-01 through IFP-SS-07 were completed in April 1993. Samples were sent to the contract laboratory for full HSL and full radiological analyses.

Surface Water and Sediment Samples

The Work Plan Addendum required the sampling of four surface water and four sediment media. Surface water and sediment samples were not taken at location IFP-SW-01 and IFP-SD-01, as no surface water was encountered. The samples were taken from locations IFP-SW-02, IFP-SD-02, IFP-SW-03, IFP-SD-03 IFP-SW-04, and IFP-SD-04 in April 1993. The sediment samples were transported to the contract laboratory for full HSL and full radiological analyses. The surface water samples were sent to the contract laboratory for full HSL, general groundwater quality, and full radiological analyses. In addition, a Total Uranium surface water sample was collected and sent to the FERMCO on-site laboratory for analysis.

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REMEDIAL INVESTIGATIONS/FEASIBILITY STUDIES

2.1.2 RI/FS Work Plan Addendum for Operable Unit 2 (continued)

Hydropunch II Operations

Hydropunch II (HP) sampling is required at 10 predetermined locations (1999 through 11008) in the Inactive Flyash Pile. HP 1999, 11000, 11001, 11003, 11004, 11005, 11006, and 11007 were completed in April 1993. Samples were sent to the FERMCO on-site laboratory for Total Uranium parameter analysis.

Existing Monitoring Wells Groundwater Sampling

Groundwater sampling is required by the Work Plan Addendum at existing Monitoring Wells 1016, 2016, 1433, 1711, 1047, 2047, and 2402. This activity was initiated in April 1993.

Active Flyash Pile

The Work Plan Addendum stipulates the installation of one 2000-Series Monitoring Well, 21033, which has not begun.

Soil Auger Borings

Three soil auger borings, 1979, 1980, and 1981, which are to be advanced in the Active Flyash Pile, have not begun.

Surface Soil Samples

Six surface soil samples are to be taken within the Active Flyash Pile. Operations have not begun.

Surface Water and Sediment Sampling

Two surface water samples and six sediment samples are required to be extracted from the Active Flyash Pile area. Operations have not begun.

Existing Monitoring Wells Groundwater Sampling

Five existing Monitoring Wells, 1045, 2045, 1048, 2048, and 2049, are to be sampled. This activity has not begun.

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REMEDIAL INVESTIGATIONS/FEASIBILITY STUDIES

2.1.2 RI/FS Work Plan Addendum for Operable Unit 2 (continued)

Lime Sludge Ponds

The Work Plan Addendum requires the installation of three 1000-Series and three 2000-Series Monitoring Wells the status of which follows:

- 1934 Installation not started.
- 1937 Installation commenced April 28, 1993, and was completed on April 30, 1993.
- 1940 Installation not started.
- 2935 Installation commenced April 28, 1993.
- 2936 Installation commenced April 27, 1993.
- 2939 Installation not started.

Soil Sampling

Fourteen soil samples are to be extracted from the Lime Sludge Ponds. This activity has not begun.

Soil Auger Borings

Currently, 15 soil auger borings are identified in the Work Plan Addendum. Soil auger operations have not begun.

Existing Monitoring Wells Groundwater Sampling

The Work Plan Addendum requires groundwater samples be taken from eight existing Monitoring Wells, 1210, 1229, 1134, 1039, 1041, 1042, 2042, and 1176. Groundwater sampling activities began during April 1993.

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REMEDIAL INVESTIGATIONS/FEASIBILITY STUDIES

2.1.2 RI/FS Work Plan Addendum for Operable Unit 2 (continued)

Issues/Corrective Actions:

None to report.

2.2 Treatability Studies

Scope:

This study is complete except for final revision to the Treatability Study Report. These results support the FS and subsequent remedy selection for Operable Unit 2. The study demonstrated that waste stabilization can achieve the desired level of material strength and provides quantitative leaching data for geochemical and computer modeling of groundwater contaminant transport.

Status:

On November 25, 1992, Ohio EPA approval was received on the Treatability Report Comment Response document which was submitted on October 21, 1992. In a letter received on October 21, 1992, the U.S. EPA conditionally approved the Treatability Study Report pending resolution of three outstanding comments followed by report revision. Responses to these comments were submitted to U.S. EPA on November 21, 1992. On December 29, 1992, the U.S. EPA approved the Treatability Study Report.

A final Treatability Study report will be issued in the near future.

Issues/Corrective Actions:

None to report.

2.3 Remedial Investigation

The RI provides a summary of the field investigations and supports the FS by defining the nature and extent of the contaminants in the Operable Unit 2 study area, estimating the volume of contaminated media and materials, and providing a Baseline Risk Assessment which establishes remedial action objectives.

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REMEDIAL INVESTIGATIONS/FEASIBILITY STUDIES

2.3 Remedial Investigation (continued)

Status:

The draft RI report was submitted to the EPAs on October 16, 1992. Comments were received from the U.S. EPA and the Ohio EPA on December 18, 1992. U.S. EPA disapproved the Draft RI report due to inadequate data on the nature and extent of contamination. Meetings were held with the U.S. EPA and Ohio EPA on February 17 and 23, 1993, to present a proposed data collection program and revised RI/FS schedule. The submittal date for the RI/FS, and Draft ROD have been revised.

Issues/Corrective Actions:

Additional field work is being done to obtain the required data.

OPERABLE UNIT 2 REMEDIAL INVESTIGATION REPORT **PRIMARY**

SCOPE	SUBMIT TO EPA	RECEIVE FROM EPA	SUBMIT TO EPA FINAL
Details the nature and extent of contaminants within the Operable Unit 2 study area. Estimates the volume of contaminated media and materials. Provides a baseline risk assessment and establishes remedial action objectives.	02/18/94 A	04/18/94 C	To be determined

C = Consent Agreement Date A = Actual Completion Date

2.4 Feasibility Study

The FS evaluates alternatives in detail with respect to the nine evaluation criteria developed by the U.S. EPA. The alternatives are analyzed individually against each criterion and then compared against one another to determine their respective strengths and weaknesses, and to identify the key tradeoffs that must be balanced for the operable unit.

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2.4 Feasibility Study (continued)

Status:

The revised schedule for the Operable Unit 2 RI/FS program, has been evaluated through the informal dispute resolution and is now finalized.

Issues:

Schedules have been revised due to the U.S. EPA's disapproval of the Remedial Investigation Report. Information will be reported as received. A schedule for the Operable Unit 2 RI/FS has been developed. The FS schedule continues to be very tight with little or no float available.

Corrective Actions:

The FS is being performed by FERMCO.

OPERABLE UNIT 2 FEASIBILITY STUDY REPORT **PRIMARY**

SCOPE	SUBMIT TO EPA	RECEIVE FROM EPA	SUBMIT TO EPA FINAL
Describes and analyzes potential remedial alternatives. A comparative analysis is performed for all alternatives.	04/29/94 C	06/24/94 C	07/25/94 C

C = Consent Agreement Date

2.5 Planned Activities for May 1993

- Expanding the fate and transport sensitivity studies with the addition of select inorganic and organic compounds.
- Continue development of chemical specific applicable or relevant and appropriate requirements.
- Start development of PRGs.
- Continue development of technologies for alternative analysis.

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2.5 Planned Activities for May 1993 (continued)

- The additional RI field activities are scheduled to be completed in each of the five subunits of Operable Unit 2 during May 1993. Drilling crews and sampling crews are scheduled to be mobilized into the Active Flyash Pile in early May 1993.

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3.0 Operable Unit 3

Operable Unit 3, as defined in the Amended Consent Agreement, includes the Production Area and production-associated facilities and equipment (including all above and below-grade improvements) including, but not limited to, all structures, equipment, utilities, drums, tanks, solid waste, waste, product, thorium, effluent lines, K-65 transfer lines, wastewater treatment facilities, fire training facilities, scrap metal piles, feed stocks, and coal pile.

3.1 RI/FS Work Plan

Scope:

The purpose of the RI/FS Work Plan is to detail the approaches and assumptions to be applied to the gathering of information and the presentation of results. Specifically, the Operable Unit 3 RI/FS Work Plan identifies the approach to be employed for baseline risk assessment and the specific sampling and sampling strategy to be performed during the field investigation program.

Status:

Comments and conditional approval of the RI/FS Work Plan Addendum (WPA) were received from the Ohio EPA on February 16, 1993. In an April 14, 1993, letter, the U.S. EPA approved the revised WPA, based on the comment-response package provided to the EPAs on March 19, 1993. The U.S. EPA approval stated, however, that the changed proposed in the comment-response package must be incorporated into the WPA and a final version of the WPA be submitted to the U.S. EPA by May 15, 1993. The revised WPA is being finalized and will be transmitted to the EPAs by May 14, 1993.

Issues/Corrective Actions:

None to report.

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3.1 RI/FS Work Plan (continued)

OPERABLE UNIT 3 WORK PLAN ADDENDUM

SCOPE	RECEIVE FROM EPA	SUBMIT TO EPA
The Work Plan Addendum includes an initial evaluation of OU3 (e.g., conceptual models and waste/contaminant quantities), a work plan rationale (e.g., data requirements and SAP approach) and specific OU3 RI/FS tasks.	08/04/92 A	12/18/92 C 12/17/92 A

C = Consent Agreement Date A = Actual

3.2 Field Investigation

Scope:

The purpose of the Operable Unit 3 field investigation program is to gather information necessary to perform a baseline risk assessment, further identify the nature of contaminants in the operable unit, refine estimates of volume of contaminated materials, and support initial screening of applicable alternatives.

Status:

Twenty-four Operable Unit 3 RI/FS Characterization procedures have been issued; three additional procedures are being issued. Lesson Plans for the Operable Unit 3 procedures have been developed. A Readiness Review to begin the RI/FS characterization is underway. An Independent Assessment program is being developed. A portion of Building 5E is being cleared in preparation for setting up a storage area for the Operable Unit 3 sampling equipment. Orders have been placed for a field portable X-ray fluorescence analyzer and a gas chromatograph.

Issues/Corrective Actions:

None to report.

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3.3 Treatability Studies

Scope:

The purpose of treatability studies is to gather information necessary to support remedy selection, engineering, and implementation. Specific studies will be structured to gather the information necessary for specific technologies identified through screening as part of leading alternatives.

Status:

Formal identification of treatability studies for Operable Unit 3 has not been undertaken; however, remedy screening treatability studies will be conducted in parallel with the Field Investigation and Alternatives development. Development of an outline for a Treatability Study Work Plan (TSWP) was initiated in January. The proposed revision of the RI/FS WPA identifies a delivery date for the TSWP of January 1994.

Issues/Corrective Actions:

None to report.

3.4 Remedial Investigation Report

Scope:

The purpose of the RI is to provide a summary of the field investigations and to support the FS by defining the nature and extent of the contaminants in Operable Unit 3, estimating the volume of contaminated media and materials, and providing a baseline risk assessment which establishes remedial action objectives.

Status:

With the exception of planning the report content and layout, formal development of the RI has not begun.

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3.5 Feasibility Study

Scope:

The purpose of the FS is to evaluate alternatives in detail with respect to the nine U.S. EPA evaluation criteria. The alternatives are analyzed individually and then compared to one another to determine respective strengths and weaknesses and to identify key tradeoffs.

Status:

Formal activities associated with the FS have not been initiated for Operable Unit 3, although alternatives research and document layout planning are underway. As a result of the development of a Proposed Plan for Interim Action, the Feasibility Study will not address initial decontamination or dismantlement (handled by the Proposed Plan). The FS will focus on treatment and disposition issues.

Issues/Corrective Actions:

None to report.

3.6 Planned Activities for May 1993

- Focus on technology research and initiate identification of remedy screening tier treatability studies for preparation of the Treatability Study Work Plan.
- Continue Proposed Plan document preparation to achieve an interim ROD for decontamination and decommissioning (D&D) of components for Operable Unit 3.
- Prepare Remedial Design Work Plan outline for Proposed Plan for Interim Action (D&D).
- The full-scale writing of Field Work Packages will continue.
- Train relevant personnel on Operable Unit 3's 27 sampling procedures.
- Complete set-up of equipment storage area.

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4.0 Operable Unit 4

Operable Unit 4, as defined in the Amended Consent Agreement, consists of Silos 1, 2, 3, and 4, the silo berms, the Decant Sump Tank System, and soil within the operable unit boundary.

4.1 Field Investigation

4.1.1 Sampling West of K-65 Silos 1 and 2

Scope:

The information obtained through this additional investigation will augment the current understanding and conclusions drawn from previous sampling and analytical results which have been used to characterize the extent of contamination in the vadose zone and groundwater in the glacial overburden immediately west of the K-65 Silos 1 and 2. Two 1000 series piezometers will be installed in the uppermost perched water interval in the K-65 Silos area. One well or lysimeter will target the perched water zone down gradient of the Decant Sump Tank. Three lysimeters will be installed in the east bank of Paddy's Run to verify that contamination from the vadose zone or perched water is not entering the stream.

Status:

The completed work plan addendum was processed as part of the Operable Unit 4 RI/FS baseline and was approved by the Level III, II, and I Change Control Boards on January 15, 1993, January 22, 1993, and January 27, 1993, respectively. Due to the schedule constraints associated with the completion of the investigative effort in time to include the additional data into the Operable Unit 4 Feasibility Study Report, the U.S. DOE has authorized FERMCO to proceed with the implementation of the work plan without the U.S. EPA formal approval of the addendum. This notice was given by the U.S. DOE with the confidence that previous U.S. EPA concerns about this project have been adequately addressed in the work plan and proposed field work.

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4.1 Field Investigation (continued)

Notice to Proceed was given to the subcontractor on February 1, 1993. Field work was initiated on February 9, 1993. Drilling activities were initiated on March 11, 1993. Monitoring Wells 1891, 1892, and 1893 were purged, developed, and sampled for the primary parameters as specified in the Work Plan. Hydropunch II samples are currently being analyzed by the FERMCO contract laboratory.

Lysimeters 1894, 1895, and 1896 were installed and sampled for primary parameters as specified in the Work Plan. The samples were transported to the FERMCO contract laboratory for analysis. Scanning results for the fluorescein dye have not been completed.

Groundwater sampling is still required at existing Monitoring Well 2032.

Comments and disapprovals on the Work Plan Addendum for Additional Characterization of the Perched Water West of the K-65 Silos from the Ohio EPA and the U.S. EPA were received on March 22, 1993. A meeting was conducted on April 1, 1993, with DOE-FN and the U.S. EPA to discuss the proposed resolution of the disapproval/comments of the Work Plan Addendum. A formal response to the Ohio EPA and U.S. EPA comments was submitted to DOE-FN on April 30, 1993. The responses are scheduled to be transmitted to Ohio EPA and U.S. EPA on May 24, 1993.

The primary concern expressed by the agencies was the ability of the project, as described in the Work Plan, to result in an adequate characterization of the nature and extent of the groundwater contamination in the K-65 Area. As a result, a piezometer will be installed adjacent to each of the lysimeters (borings 1894, 1895 and 1896) in order to determine if a perched water condition exists in the glacial overburden adjacent to Paddy's Run. In addition, the Work Plan needs to be revised to allow for the possibility of installing a piezometer southwest of boring 1891. The additional piezometer would be installed only if the total uranium sampling results from boring 1891 exceed 20 ug/l.

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4.1 Field Investigation (continued)

Issues/Corrective Actions:

The information obtained from this investigation program will be considered in the Operable Unit 4 Feasibility Study. Highest priority must be given to these field investigations to avoid schedule delays to the Operable Unit 4 Feasibility Study Report submittal. The results from this sampling effort will be integrated into the Operable Unit 5 Remedial Investigation Report. If the field investigation, perched groundwater analyses, and data validation is completed in a timely fashion, the information will be presented in the Final RI Report for Operable Unit 4.

4.2 Treatability Studies

Scope:

A Treatability Study Work Plan addresses the additional information that is required to support the FS and subsequent remedy selection for Operable Unit 4. There are two separate treatability studies to support the Operable Unit 4 FS. One study considers cement stabilization of Silos 1, 2, and 3 material and chemical extraction, leachate precipitation, and leachate stabilization of Silos 1 and 2 material. The second treatability study considers the vitrification of Silos 1, 2, and 3 material.

The Treatability Study Work Plan for cementation and chemical extraction will demonstrate whether stabilization achieves the desired level of material strength, provide information to help determine the effectiveness of chemical extraction, and provide data for use in fate and transport modeling. The study is composed of three preliminary phases, an advanced phase, and an optional phase. The preliminary phases determined the potential reagents and conditions for stabilization and/or extraction of composites of the silo material. The advanced phase evaluated the material variability by testing formulations and/or extraction on the top, middle, and bottom layers from each silo. The optional phase consists of testing stabilized waste for durability using American Society of Testing and Materials wet/dry and freeze/thaw test methods. In addition, radon emanation and radon leaching of cement stabilized waste and precipitate will be performed.

The Treatability Study Work Plan for the vitrification of residues from Silos 1, 2, and 3 considers vitrification of silo material, radon emanation rate from the vitrified waste, and the leachability of the vitrified waste.

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4.2 Treatability Studies (continued)

Status:

Cement Stabilization Preliminary and Advanced Phase Tests- Complete.
Chemical Extraction tests - Complete.

The draft Cement Stabilization/Chemical Extraction Treatability Study Report was submitted for internal review on March 31, 1993. Comments were consolidated and are currently being incorporated, but due to competing manpower resources with the Operable Unit 4 Feasibility Study Report, the submittal date of the revised Draft Cement Stabilization/Chemical Extraction Treatability Study Report to the U.S. DOE has been extended to June 11, 1993.

Cement Stabilization Optional Phase Treatability Testing - Complete.

The draft Cement Stabilization Optional Phase Treatability Study Report will be submitted for internal review in May 1993. The revised draft Cement Stabilization Optional Phase Treatability Study Report will be submitted to the U.S. EPA as Appendix H of the Operable Unit 4 Feasibility Study Report.

Vitrification Treatability Tests - Complete.

The draft Operable Unit 4 Treatability Study Report for the Vitrification of Residues from Silos 1, 2, and 3 was submitted for internal review on March 11, 1993. The U.S. DOE comments were received and are currently being incorporated.

Issues/Corrective Actions:

None.

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4.3 Remedial Investigation Report

Scope:

The RI provides a summary of the field investigations and supports the FS by defining the nature and extent of the contaminants in the Operable Unit 4 study area, estimating the volume of contaminated media and materials, and providing a baseline risk assessment which establishes remedial action objectives.

Status:

The revised draft Operable Unit 4 Remedial Investigation Report was submitted to the U.S. EPA on April 19, 1993, in accordance with the amended Consent Agreement schedules. Comments from the U.S. EPA are expected to be submitted to the U.S. DOE by June 18, 1993.

OPERABLE UNIT 4 REMEDIAL INVESTIGATION REPORT **PRIMARY**

SCOPE	SUBMIT TO EPA	RECEIVE FROM EPA	SUBMIT TO EPA FINAL
Details the nature and extent of contaminants in the Operable Unit 4 study area. Estimates the volume of contaminated media and materials. Provides a baseline risk assessment and establishes remedial action objectives.	04/19/93 C	06/18/93 C	07/18/93 C

C = Consent Agreement Date

4.4 Feasibility Study

Scope:

The FS evaluates remedial alternatives in detail with respect to the nine evaluation criteria developed by the U.S. EPA. The remedial alternatives are analyzed individually against each criterion and then compared against one another to determine their respective strengths and weaknesses, and to identify the key tradeoffs that must be balanced for the site.

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4.4 Feasibility Study (continued)

Status:

The revision of remedial alternatives, described in the U.S. EPA-approved ISA, is designed to provide separate alternatives for the different waste subunits. For example, alternatives for the disposition of Silos 1, 2, and 3 contents are being created; silo structures, berms, and subsoils are being grouped into a separate set of alternatives; and Silo 4 is being dispositioned in a separate set of alternatives. On-property disposal options were discussed during October 1992 and are being included as appropriate to the alternatives. Detailed alternative description revisions are ongoing. Cost estimates, alternative risk assessments and fate and transport modeling are also ongoing.

Issues/Corrective Actions:

The Operable Unit 4 Feasibility Study will contain the first site-wide integrated FS/EIS and also the first sitewide Comprehensive Response Action Risk Evaluation (CRARE). Presentation of the required technical information and integration with the RI/FS guidance for both documents are priority issues.

OPERABLE UNIT 4 FEASIBILITY STUDY **PRIMARY**

SCOPE	SUBMIT TO EPA	RECEIVE FROM EPA	SUBMIT TO EPA FINAL
Describes and analyzes potential remedial alternatives. A comparative analysis is performed for all alternatives.	09/10/93 C	11/10/93 C	12/09/93 C

C = Consent Agreement Date

4.5 Planned Activities for May 1993

- Complete draft Operable Unit 4 Feasibility Study Report for internal review.
- Complete the CRARE risk assessment activities and submit the draft CRARE for internal review.
- Complete the draft FEMP Sitewide Environmental Impact Statement for internal review.

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4.5 Planned Activities for May 1993 (continued)

- Complete the internal review of the draft Cement Stabilization Optional Phase Treatability Study Report.
- Prepare the Operable Unit 4 Remedial Investigation Report supporting documents for the inclusion in the Administrative Record.
- Prepare the outline for the ROD for internal review.
- Additional Characterization:
  - Complete the first round of groundwater sampling at existing Monitoring Well 2032.
  - Complete the laboratory analysis of the samples and subsequent data validation.
  - Revise the existing Work Plan to incorporate the comment resolutions of the regulatory agencies comments.

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5.0 Operable Unit 5

Operable Unit 5, as defined in the Amended Consent Agreement, includes: groundwater, surface water, soil not included in the definitions of Operable Units 1 - 4, sediments, flora, and fauna.

5.1 Field Investigation

5.1.1 Operable Unit 5 Work Plan Addenda

Scope:

Soil and perched groundwater sampling will be conducted in the following areas under this program: the Plant 1 Pad, the Southeast Quadrant of the Production Area, the Fire Training Area, the KC-2 Warehouse Area, Scrap Metal Area and Electrical Substation, and the K-65 Slurry Line and the Clearwell Line.

Status:

On November 30, 1992, conditional approval was received from the Ohio EPA to proceed with the field investigations. On December 2, 1992, the U.S. EPA also provided conditional approval of the Work Plan. Conditional approval from both agencies was based upon the necessity to respond to specific comments which appear minor. It was determined in January 1993 to initiate field investigations for the KC-2 Warehouse Area even though comments from the regulators indicated concerns and issues that require further resolution.

The responses to the additional comments from the Ohio EPA and U.S. EPA are pending completion of a FERMCO and DOE-FN internal review. After completion of the internal review, responses will be transmitted to the respective regulatory agency. The Work Plan Addenda will be revised once final comment resolutions have been obtained from the regulatory agencies, DOE-FN, and FERMCO.

Attempts to develop Monitoring Well 1842 continued in April 1993. However, due to extremely slow recharge rates, the first round of groundwater sampling has not occurred.

The nine new wells which were installed according to the Work Plan for this task and the status of each are as follows:

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5.1 Field Investigation (continued)

- 1836 Installation completed. Well development and first and second round of groundwater sampling completed.
- 1837 Installation completed. Well development and first and second round of groundwater sampling completed.
- 1838 Installation completed. Well development and first and second round of groundwater sampling completed.
- 1839 Installation completed. Well development and first and second round of groundwater sampling completed.
- 1840 Installation completed. Well development and first and second round of groundwater sampling completed.
- 1841 Boring complete. Well not installed because groundwater was not encountered at this location.
- 1842 Re-installation completed. The well was developed in March 1993; however, due to an extremely slow recharge rate, the first round of groundwater sampling has not occurred.
- 1843 Installation completed. Well development and first and second round of groundwater sampling completed.
- 1844 Installation completed. Well development and first and second round of groundwater sampling completed.

The Work Plan calls for only one round of groundwater sampling at existing Monitoring Wells 1173 and 1174 in the Southeast Quadrant. In February 1993, groundwater sampling of Monitoring Well 1173 was completed. Monitoring Well 1174 was found to be damaged and cannot be sampled under this program. It will be replaced and sampled as part of the upcoming Operable Unit 5 field program as outlined in the April 20 technical information exchange (TIE) meeting.

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5.1 Field Investigation (continued)

Attempts were made to once again to develop and sample Monitoring Well 1869; however, due to extremely slow recharge rates, the first round of groundwater sampling could not be completed.

The contract laboratory completed the radiological analysis for the first round of groundwater sampling of Monitoring Well 1887 located in the Fire Training Area.

Attempts to develop and sample Monitoring Well 1890 continue; however, due to extremely slow recharge rates, the sampling could not be performed.

Laboratory analysis was completed for the radiological parameters on the single hand auger sample taken in the sump of the Fire Training Area.

The samples collected during the field investigations for the KC-2 Warehouse Area, Scrap Metal Pile, and Electrical Substation are being analyzed at the contract laboratory for the radiological parameters.

Issues/Corrective Action:

Final resolution of the Ohio EPA and U.S. EPA comments that were received in December 1992 should be made with resolutions transmitted back to the respective regulatory agency for final review and approval.

Lack of comment resolution has caused an apparent negative variance in the Operable Unit 5 Consent Agreement Baseline Schedule. Conditional approval received from the regulatory agencies has provided some schedule recovery through acceleration of both field characterization effort and subsequent sample analysis at the contract laboratories.

5.1.2 Outfall Line Investigation

Scope:

This Work Plan Addendum defines the sampling and analysis required to investigate potential leakage from the Outfall Line as part of the Operable Unit 5 RI. The installation of Monitoring Well 2119 and subsequent sampling program were based upon possible failure of the pipeline between Manhole 179 and 180.

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5.1 Field Investigation (continued)

If groundwater contamination has occurred due to a failure in the pipeline between Manhole 179 and 180, then a previously unidentified occurrence of contamination in groundwater may exist beyond the FEMP eastern boundary.

Installation of Monitoring Well 2119 will determine if there is groundwater contamination associated with a pipeline failure between Manholes 179 and 180. If an off-FEMP plume is identified, then an additional investigation may be required to determine vertical and lateral extent of the plume.

Status:

Hydropunch II operations and subsequent installation of Monitoring Well 2119 was completed in January 1993. First round of groundwater sampling was completed January 27. Second round of groundwater sampling was completed in April. The contract laboratory has completed all analysis for the samples taken to-date from Monitoring Well 2119 and 2067. This field activity is now complete and will not be updated in future reports.

Responses to the December 1992 additional comments from the Ohio EPA and U.S. EPA are pending completion of an internal review. However, the evident lack of contamination in the monitoring well sample reduced the applicability of the comments. After completion of the internal review, responses will be transmitted to the respective regulatory agency. The Work Plan Addenda will be revised once final comment resolutions have been obtained from the regulatory agencies, DOE-FN, and FERMCO.

Issues/Corrective Actions:

Final comment resolution of the Ohio EPA and U.S. EPA comments received in December 1992 should be made with resolutions transmitted back to the respective regulatory agency for final review and approval.

5.1.3 Additional Operable Unit 5 Field Investigation Tasks

The scope and justification for the following site characterization programs was presented to DOE-FN, U.S. EPA, and Ohio EPA at TIE meetings on April 1 and April 20:

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5.1 Field Investigation (continued)

- Snapshot Monitoring Well Sampling and Surface Water/Sediment Sampling
- FEMP Glacial Overburden/Vadose Zone Hydraulic Investigation
- FEMP Trap Shooting Range Investigation
- Pilot Plant Drainage Ditch Seepage and Surface Water Background Investigation
- Great Miami Riverbank Characterization
- Surface and Subsurface Soil Sampling
- Monitoring Well/Piezometer Installation in the Great Miami Aquifer/Glacial Overburden

Draft project specific plans and internal reviews for these plans have been completed.

5.1.4 Removal Action For Abandonment and Plugging of KC-2 Warehouse Well No. 67

Scope:

In March 1993 a Removal Site Evaluation (RSE) for the KC-2 Warehouse/Well No. 67 was performed to assess the need for a Removal Action. The RSE was carried out to evaluate the impact of sediment-like material present in Well No. 67 on groundwater quality in the lower portion of the Great Miami Aquifer (GMR), pursuant to Section 104 (a)(1) of CERCLA, as amended. The DOE, as the lead agency, determined the need for a Removal Action (RA) pursuant to 40 CFR 300.415 Sections (b)(2)(ii) and (b)(2)(viii). The resulting Removal Action will be implemented as defined in 40 CFR 300.415. Since Well No. 67 is screened in the lower portion of the GMR, and this aquifer is a sole source aquifer, this RA will be performed as a Time Critical Removal Action.

The Removal Action Work Plan requires that the sediments in the well casing be removed prior to the abandonment of the well. This will mitigate the potential for release of contaminants from the sediment in the well to the aquifer.

No attempts to remove the existing well casing will be made because of the confined work area and the possibility that the casing could break at depth leaving a potential vertical migration pathway through the glacial overburden. Sediments and groundwater removed from the well will be sampled and drummed.

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5.1 Field Investigation (continued)

The analytical results will be used to develop a vertical profile of the sediment column and to perform a hazardous waste characterization to determine disposal options for these materials. An attempt will be made to re-develop the well and collect a groundwater sample. The casing will then be filled with Volclay grout to a level 30-inches below grade. The remaining 30-inches of casing will then be removed and a concrete cap will be placed over the hole. A monitoring well will be installed down-gradient of the former Well No. 67 location at an equivalent depth in the GMR aquifer. Details regarding the installation will be provided in a Project Specific Plan for additional monitoring wells.

5.2 Treatability Study

Scope:

The purpose of this study is to provide information to support the FS and subsequent remedy selection for Operable Unit 5. Specifically, the study will demonstrate the feasibility of soil washing as a remedial technology for cleaning soils in Operable Unit 5. The study incorporates a physical separation/chemical extraction process that initially involves the separation of a soil into different particle-size fractions. Reagent formulas in the washing solutions are used in the extraction of radionuclides and organic and inorganic compounds from these different-size fractions. The contaminants may be separated from the wash stream into a concentrated residue for further treatment. The study consists of two phases: (1) remedy screening Stages 1 and 2, involving laboratory and bench-scale tests; and (2) remedy selection using pilot-scale equipment. Soils from three different areas will be used in these investigations. These soils are from the following areas: incinerator area (ID-A), Plant 1 Pad Area (ID-B), and maintenance building area (OU 5-A).

5.2 Treatability Study (continued)

Status:

The final report for the remedy screening tests for the ID-A and ID-B soils was received from IT Corporation by FERMCO on April 12, 1993. Results from these bench-scale studies will be used to provide the initial operating conditions for startup of the remedy selection soil washing pilot plant. Initial operating conditions will include physical separation processes followed by chemical extraction with dilute inorganic acid at elevated temperatures. The test system is designed to include spent extractant treatment. The final report of the OU5-A soil is expected by the middle of May.

Installation of the skids, housing the soil washing pilot plant equipment, into Plant 8 was completed in April. Training of supervisors and technicians for the operation of the pilot plant was conducted. Documents completed in April in support of the startup of the soil washing pilot plant included the health and safety plan, environmental compliance plan and the risk management plan.

Design and programming of a database to accommodate Operable Unit 5 remedy screening and remedy selection data was initiated. The database is being designed to also accommodate soil washing treatability test data from Lockheed Environmental, Oak Ridge National Laboratory, and Westinghouse-Savanna River. These soil washing test programs have been conducted in parallel to the Operable Unit 5 study as part of separate programs such as the Integration Demonstration program and the Minimum Additive Waste Stabilization program.

A laboratory, to be used in support of any additional bench-scale testing, has been established. It is currently being supplied with soil washing bench-scale testing equipment and supplies.

5.3 Operable Unit 2 Dispute Resolution Supplemental Project (Uranium Reduction in FEMP Discharge)

Scope:

The supplemental project will provide for partial treatment of the South Plume discharge with the objective of reducing uranium discharges from the FEMP to the Great Miami River. The project consists of the following actions:

1. Procure and install one additional IAWWT trailer unit to treat 200 gpm South Plume flow and thereby reduce the uranium in the discharge by approximately 105 lbs/year. This new unit would go on line in approximately March 1994.

2. Utilize off peak capacity in Phase I AWWT for South Plume Treatment when no stormwater is available for treatment; estimated to be an average of 350 gpm. This should reduce the uranium in the discharge by approximately 184 pounds per year. This reduction will be realized in approximately January 1995 when Phase I of the AWWT becomes operational.

5.3 Operable Unit 2 Dispute Resolution Supplemental Project (Uranium Reduction in FEMP Discharge) (continued)

3. Eliminate low uranium streams, i.e., less than 20 ppb (Sewage Treatment Plant and clean side general sump) from Phase II AWWT and utilize this capacity to treat a portion of the South Plume; estimated to be approximately 200 gpm. This should reduce the uranium in the discharge by approximately 105 pounds per year. This reduction will be realized in approximately January 1995 when Phase II of the AWWT becomes operational.

4. Extend the planned operational life of the existing IAWWT SWRB unit and convert from treating stormwater to treating South Plume flow. Also, the capacity would be increased from 300 gpm to approximately 400 gpm thereby reducing the uranium in the discharge by approximately 211 pounds per year. This would be implemented in approximately March 1995.

Status:

Preliminary engineering was started the week of April 5. A Change Proposal for Actions 1 and 4 totaling $900,000 was presented to the Level 3 Review Board on April 22. Funding was approved. No further approvals are required. Detail scoping activities are ongoing. The project schedule is very aggressive with design expected to be complete by July 30, 1993.

5.4 Initial Screening of Alternatives (ISA)

Scope:

The ISA Report documents the initial activities of the Feasibility Studies (FS). These activities include: developing remedial action objectives; developing general response actions; identifying volumes or areas of media to which response actions might be applied; identifying and screening technologies; identifying and evaluating technology process options; assembling selected representative process options into alternatives; and performing an initial screening of alternatives.

Status:

A draft copy of the ISA Report was submitted to the Ohio EPA and U.S. EPA for review on November 13, 1992. Comments from both agencies were received in January 1993. A response to comments document was prepared and transmitted to both agencies on February 12, 1993. Approval of the responses (with one exception) has been received. The final ISA report has been prepared and was submitted to the Ohio EPA and U.S. EPA on March 26, 1993. This is more than three months ahead of the original Consent Agreement schedule date.

Issues/Corrective Actions:

None to report.

5.5 Remedial Investigation (RI)

Scope:

The RI serves as the mechanism for collecting data to characterize site conditions; determining the nature of the site's wastes; determining the nature and extent of contamination; and assessing baseline risk to human health and the environment.

Status:

RI data compilation and evaluation continues. All data sources to be included in the RI are being identified and evaluated. Chemical and radiological data collected as part of both the RI/FS and other site sampling programs are being posted on maps and evaluated. The geologic and hydrogeologic information contained in RI/FS and site files and documents is being compiled, evaluated, and updated. Existing maps and cross sections are being updated where additional information has become available. New maps and cross sections of the glacial overburden have been generated.

A significant data validation effort was initiated in January and became fully operational in February. A backlog of nearly 8,000 RI/FS samples requiring validation have been identified. Validation of all these samples is scheduled for completion in May 1993.

FERMCO internal review of Sections 1 and 2 of the RI is continuing. The draft version of Section 3 was completed in April and is also undergoing FERMCO review. Work on improving the current regional aquifer model continues. Two reports have been prepared: (1) a Groundwater Modeling Report documenting previous modeling activities; and (2) a Groundwater Model Improvement Plan. Both of these reports are in internal FERMCO review. Submittal to DOE-FN will take place in May, with subsequent transmittal to EPAs.

Work on evaluating groundwater and surface water background values continues. A report on results of this evaluation will be prepared in April. Work on preparing an ecological risk screening study based on U.S. EPA Region V guidelines continued. Completion of the screening study in May is expected.

A presentation on preliminary results of the RI data evaluation was given to U.S. EPA, Ohio EPA and DOE-FN staff on April 1. A general overview of the Operable Unit 5 RI/FS data was given. The data were presented by media sampled. The latter portion of the presentation focused on additional data needs identified during data evaluation. The scopes of work to fulfill the data needs were also outlined. The Agencies were given more than 30 maps/figures and several summary tables depicting portions of the Operable Unit 5 data set. Agency comments were requested on the data and the work scopes.

<u>Technical Information Exchange Meeting on April 20</u>

On April 20, Operable Unit met with U.S. EPA, Ohio EPA, DOE-FN and DOE-HQ staff. The main purposes of the meeting were to present a report on the "Characterization of Background Water Quality for Streams and Groundwater at the FEMP," and provide details of the upcoming Operable Unit 5 field program.

5.5 Remedial Investigation (RI) (continued)

The first four chapters of the background report were submitted. The entire report was discussed in detail, and a commitment was made to transmit a complete first draft of the report to the Agencies on May 4.

Details of the Operable Unit 5 field program were provided during discussion of the following Project Specific Plans:

- Snapshot Monitoring Well Sampling and Surface Water/Sediment Sampling
- Glacial Overburden/Vadose Zone Hydraulic Investigation
- Additional Monitoring Well and Piezometer Installations
- Pilot Plant West Drainage Ditch Seepage and Surface Water Background Investigation
- Great Miami River Bank Investigation

Overviews of the Surface/Subsurface Soil Sampling Plan and the Skeet Range Investigation were also furnished. More details of these plans will be provided to the agencies after the internal versions of the plans are finalized.

FERMCO also furnished the EPAs and DOE-HQ with copies of the report "Preliminary Presentation of Geology and Hydrogeology of the Glacial Overburden." This report was prepared by IT Corporation in support of Chapter 3 of the Operable Unit 5 RI report. As indicated by the title, the report is preliminary; and therefore, the contents of the report may be revised. Information in the report was requested by the EPAs at the April 1 TIE to enable them to further their understanding of the site.

Issues/Corrective Actions:

None to report.

5.6 Planned Activities for May 1993

- Submit Project Specific Plans to DOE-FN and the EPAs for the newly identified Operable Unit 5 RI/FS field investigation, and initiate field activities for all investigations.

- Complete validation of the Operable Unit 5 RI/FS data backlog.

- Initiate revisions of Sections 1, 2 and 3 into the RI Report.

- Submit the following reports to DOE-FN: 1) Groundwater Modeling Report; 2) Groundwater Model Transport Improvement Plan; and 3) Background Water Quality Study.

- Conducted a TIE with DOE, U.S. EPA and Ohio EPA on the subject of fate and transport modeling development/improvement/implementation.

- Complete the development and initial round of groundwater sampling of Monitoring Well 1842 for the K-65 Slurry and Clearwell Line subtask of the Operable Unit 5 Work Plan Addenda.

5.6 Planned Activities for May 1993 (continued)

- Complete the first round of groundwater sampling for new Monitoring Well 1869. Initiate the second round of groundwater sampling for Monitoring Well 1868. Complete the second round of groundwater sampling for Monitoring Well 1866. These wells are located in the S.E. Quadrant subtask of the Operable Unit 5 Work Plan Addenda.

- Attempt development and first round of groundwater sampling of Monitoring Well 1890 in the Fire Training Area subtask of the Operable Unit 5 Work Plan Addenda.

- Begin second round of groundwater sampling for Monitoring Wells 1338, 1339, 1343, and 1348, located in the Plant 1 Pad Area, for the Operable Unit 5 Work Plan Addenda.

- Revise the Operable Unit 5 Work Plan Addenda upon receiving final comment resolution of the Ohio EPA and U.S. EPA December 1992 comments.

- Revise the Operable Unit 5 Work Plan Addenda for the Outfall Line Investigation upon receiving final comment resolution of Ohio EPA and U.S. EPA December 1992 comments.

- Complete Parts 2A, 2C, and 2D of RA No. 3, South Groundwater Contamination Plume.

- Initiate Technical Information Exchange (TIE) on Groundwater Modeling with EPA (May 28, 1993).

- Submit Groundwater Modeling Report and Model Evaluation Plan to EPA.

6.0 On-Site Disposal Cell

The Engineered Waste Management Facility (EWMF) scope has been modified to evaluate the On-Site Disposal Cell (OSDC) alternatives along with the complete evaluation of off-site alternatives. All further reference to the EWMF will be entitled OSDC.

The technical approach for the evaluation will be based on a information previously developed for the EWMF. This information is being expanded to include the development of engineering assessment to evaluate the On-Site Disposal/Storage, Off-Site Disposal, and Transportation Risk Assessment for Off-Site Disposal. The information generated by these technical reports and the reports that will be generated from the information gathered for the EWMF Siting Report will serve as a basis for evaluating the disposal options and alternatives.

6.1 EWMF General Siting Report

Scope:

The EWMF Siting Report was scoped to evaluate the feasibility of locating an EWMF facility at the FEMP. The intent was to deliver all of the information necessary to meet the requirements in a singular document. In order to expedite the delivery of the technical information, the report has been subdivided into six stand-alone technical reports. The technical reports will be identified as follows with the appropriate scope:

- Geotechnical Engineering Analysis for an On-Site Disposal Cell - This report will contain the engineering analysis prepared for the EWMF structure. This will include an analysis of the barrier and cap design, drainage system, erosion analysis, slope stability analysis and an estimated cost of construction for an on-site tumulus. The report will be entitled, "Technical Report 5.1A, Engineering Evaluation Report for On-Site Disposal".

- Site Characterization Report - This report will include the investigation and evaluation of the site geology, radiation measurements, well installation diagrams, boring logs, and analytical data. This report will be entitled "Technical Report 5.1B, Site Characterization/Geological Report for On-Site Disposal".

- Material Source Survey - This report will discuss the availability and cost of materials in the local area required to construct the OSDC. This report will be entitled "Technical Report 5.1C, Material Source Survey for On-Site Disposal".

- ARARs Report - This report will identify and discuss the ARARs that will be applicable to the construction of an OSDC. This report will be entitled "Technical Report 5.4, ARARs for On-Site Disposal Cell Concept".

- Survey of Local Geology in the Alternate Siting Areas - This report will cover the investigation of two alternative sites for the OSDC adjacent or near the FEMP situated on bedrock highs. The two sites to be evaluated are the Girl Scout Camp and another located west of the FEMP. The report will be entitled, "Technical Report 5.3A, Geological Report for Off-Site Disposal".

6.1 EWMF General Siting Report (continued)

- Ecological Characterization - This report will discuss the ecological characterization of the two off-site locations. The two sites to be evaluated are the Girl Scout Camp and another located west of the FEMP. The report will be entitled, "Technical Report 5.3B, Ecological Characterization of the Off-Property Disposal Cell Study Area".

Status:

A contract has been placed for IT Corporation to complete the six above mentioned technical reports. All six technical reports have been received. The risk-based evaluation of an on-site disposal cell containing treated wastes has been delayed pending further review.

Issues/Corrective Actions:

None to report.

6.2 Planned Activities for May 1993

None to report.

7.0 Site-Wide Characterization Report

7.1 Risk Assessment Work Plan Addendum

Scope:

The Risk Assessment Work Plan Addendum provides a detailed scheme for development and completion of a baseline risk assessment for each operable unit, a preliminary site-wide baseline risk assessment, and a remedial action risk evaluation with each operable unit FS.

The Risk Assessment Work Plan Addendum presents the specific risk assessment methods to be followed in the RI/FS risk assessment tasks. It also establishes the scope of risk assessment work and documents the specific approach to determine whether estimated risks associated with selected remedial alternatives for the entire site are protective of human health and the environment. The addendum provides the methods, models, and parameters to develop the baseline risk assessment for each operable unit, the preliminary baseline risk assessment of the Site-Wide Characterization Report (SWCR), the remedial action risk evaluation, and the comprehensive response action risk evaluation for each operable unit FS.

Status:

The (Final) Risk Assessment Work Plan Addendum was transmitted to the U.S. EPA and Ohio EPA on June 19, 1992. Responses to comments received from the U.S. EPA on August 6, 1992, were submitted on September 24, 1992.

Issues/Corrective Actions:

None to report.

7.2 SWCR Report Preparation

Scope:

The SWCR is a one-time summary of all FEMP site data available as of December 1, 1991. It contains the preliminary baseline risk assessment which estimates human health and ecological risk of the FEMP from a site-wide perspective. The SWCR also provides the initial list of the leading remedial alternatives for each operable unit for input into the FS cumulative response action risk evaluation.

Status:

The revised SWCR, addressing the original (October 1992) and additional (January 1993) comments from the U.S. EPA and the Ohio EPA, was submitted to the EPAs on April 20, 1993. The report utilizes some risk assessment methodologies over which there is still lack of agreement with the EPAs; however, these issues will be addressed in the preparation of the Operable Unit-specific risk assessments.

7.2 SWCR Report Preparation (continued)

SITE-WIDE CHARACTERIZATION REPORT — SECONDARY

SCOPE	SUBMIT TO EPA	RECEIVE FROM EPA	SUBMIT TO EPA FINAL
Provides a one-time summary of site characterization data available as of 12/1/91, the Preliminary Baseline Risk Assessment, and a list of the leading remedial alternatives.	08/05/92 A	10/08/92 A	12/1/92 A

C = Consent Agreement Date A = Actual

8.0 Community Relations

Status

On April 3, 1993, thirteen members of the Fernald Residents for Environment, Safety and Health (FRESH) toured the FEMP. Areas visited included the analytical lab, Plant 9, the Emergency Operations Center, the *in-vivo* facility, the medical facility, and the rotary kiln. A new technology called Solid Block Modeling was demonstrated. A second demonstration showed 55-gallon drums being overpacked into 85-gallon drums.

A roundtable focusing on the start-up of the rotary kiln was held on April 6. The rotary kiln will be used to dry low-level radioactive waste residues in preparation for shipment off site. A video highlighting the safety components of the kiln was shown. Eight community residents attended.

Fernald is currently working with State and Federal regulators and members of the local community activist group, Fernald Residents for Environmental Safety and Health (FRESH), to establish a site specific advisory board. Candidates for the position of convener have been interviewed and stakeholders have agreed to the selection of a University of Cincinnati professor. A cooperative effort by DOE, U.S. EPA, Ohio EPA, and FRESH will immediately begin in order to establish a charter and select committee members. The concept and intention of the site specific advisory board will be discussed with the public at the next quarterly community meeting June 22, 1993.

DOE-FN representatives attended the monthly FRESH meeting, held April 22, 1993. Twenty-five members of the community attended the meeting. Topics included:

- presentation on the demolition of the Plant 1 Ore Silos;
- status on the progress of selecting the new advisory committee convener;
- update on the field sampling program; and
- announcement of a the public workshop to be held on May 18 to discuss the Initial Screening of Alternatives document for Operable Unit 5 recently submitted to the U.S. EPA

On April 28, U.S. EPA and Ohio EPA conducted a public meeting to discuss the dispute resolution settlement agreement between the U.S. EPA and the DOE. The agreement, signed April 9, resolves disputed matters relating to an extension of time for the DOE to submit documents for Operable Unit 2. The four terms agreed to in the settlement are:

1. Extension of the Operable Unit 2 milestones for the RI/FS Proposal Plan, and ROD by approximately one year. The schedule for this submittal of the ROD for OU1, OU3, and OU5 was accelerated by 30 days.

2. A $50,000 penalty to be paid by the DOE with assessment of an additional $25,000 penalty if DOE fails to meet the new scheduled dates;

3. A supplemental environmental project designed to reduce uranium discharge to the Great Miami River;

4. DOE commitment to conduct early data reviews with the U.S. EPA for all operable units.

8.0 Community Relations (continued)

Twenty community members attended the presentation by EPA, followed by a question and answer session. Time was made available for comments from the audience. Additionally, the U.S. EPA will accept written comments until May 11, 1993. All public comments will be considered by the U.S. EPA and the DOE, and the dispute regulation agreement may be revised based on comments received.

Issues/Corrective Action

None to report.

Planned Activities for May 1993

The public comment period on the Dispute Resolution Settlement Agreement will end May 11, 1993.

A public workshop to inform the public of the alternatives for Operable Unit 5, taken from the Initial Screening of Alternatives document, will be held May 18, 1993.

On May 19, 1993, 15 to 20 representatives of the Center for Disease Control will conduct community workshops to discuss a potential epidemiology study of the greater Cincinnati area. This is a follow up to the dose reconstruction study by CDC.
The public comment period on the Operable Unit 4 RI Report is scheduled to end on May 19, 1993.

The monthly FRESH meeting is scheduled for May 27.

CONSOLIDATED CONSENT AGREEMENT/FEDERAL FACILITY COMPLIANCE AGREEMENT/FEDERAL FACILITY AGREEMENT FOR CONTROL AND ABATEMENT OF RADON-222 EMISSIONS MONTHLY PROGRESS REPORT

Period Ending April 30, 1993

Introduction

The accompanying Effluent Radiation Reports provide, in accordance with the requirements of Section XXIII.B of the Consent Agreement As Amended under CERCLA Sections 120 and 106 (a), data on the daily wastewater flows, radionuclide concentrations, and loadings released to the Great Miami River and an estimate of runoff and radionuclide concentrations to Paddy's Run during April 1993.

Summary - April 1993

The total quantity of uranium discharged from the FEMP to the Great Miami River via Manhole 175 (Outfall 1I000004001) was 64.00 kilograms. The average uranium concentration for the previous 12 months was 0.61 mg/L. This is 68.5% of the Derived Concentration Guide (DOE Order 5400.5) for ingested water.

There was no discharge from the Stormwater Retention Basin (Outfall 1I000004002) to Paddy's Run via the Storm Sewer Outfall Ditch in April 1993. Based on 3.93 inches of rainfall in April 1993, the total quantity of uranium discharged to Paddy's Run from uncontrolled areas of the FEMP is estimated to be 11.16 kilograms.

CONSOLIDATED CONSENT AGREEMENT/FEDERAL FACILITY COMPLIANCE AGREEMENT/FEDERAL FACILITY AGREEMENT FOR CONTROL AND ABATEMENT OF RADON-222 EMISSIONS MONTHLY PROGRESS REPORT

PERIOD ENDING APRIL 30, 1993

ENCLOSURE A

WASTEWATER FLOWS AND RADIONUCLIDE CONCENTRATIONS UNDER CA SECTION XXIII.B

CONSOLIDATED CONSENT AGREEMENT/FEDERAL FACILITY COMPLIANCE AGREEMENT/FEDERAL FACILITY AGREEMENT FOR CONTROL AND ABATEMENT OF RADON-222 EMISSIONS MONTHLY PROGRESS REPORT

Period Ending April 30, 1993

Wastewater Flows and Radionuclide Concentrations

Facility: Fernald Environmental Management Project
U.S. Department of Energy
7400 Willey Road, P.O. Box 398705
Cincinnati, Ohio 45239-8705

Location: 11000004001 Month: April 1993
001 Total Discharge
Manhole 175 (Effluent to the Great Miami River)

Day	Flow (MGD)	Total Alpha (pCi/L)	Total Beta (pCi/L)	Total U (mg/L)	Total U (kgs)	Calculated Total U-238 (pCi/L) (1)
1	1.294	284	149	0.50	2.45	169
2	1.300	243	167	0.48	2.36	162
3	0.384	239	365	0.50	0.73	169
4	0.456	333	392	0.68	1.17	230
5	0.847	270	194	0.39	1.25	132
6	1.110	234	185	0.34	1.43	115
7	1.093	221	140	0.30	1.24	101
8	0.648	189	131	0.36	0.88	122
9	0.419	599	482	1.30	2.06	439
10	0.454	536	405	1.32	2.27	446
11	0.465	351	333	0.76	1.34	257
12	0.605	243	333	0.54	1.24	182
13	0.734	140	315	0.31	0.86	105
14	0.786	369	333	0.69	2.05	233
15	0.871	306	306	0.75	2.47	253
16	1.476	554	329	1.04	5.81	351
17	1.196	509	266	0.88	3.98	297
18	1.154	243	167	0.50	2.18	169
19	0.781	252	320	0.54	1.60	182
20	0.939	243	180	0.47	1.67	159
21	1.084	243	225	0.46	1.89	155
22	1.152	450	374	0.72	3.14	243
23	1.199	221	216	0.50	2.27	169
24	0.993	324	311	0.65	2.44	220
25	0.489	595	586	1.34	2.48	453
26	0.701	432	293	0.81	2.15	274
27	0.971	378	257	0.68	2.50	230
28	1.222	207	140	0.52	2.40	176
29	1.025	419	176	0.82	3.18	277
30	0.806	423	275	0.83	2.53	280
TOTAL	26.654				64.00	

CONSOLIDATED CONSENT AGREEMENT/FEDERAL FACILITY COMPLIANCE AGREEMENT/FEDERAL FACILITY AGREEMENT FOR CONTROL AND ABATEMENT OF RADON -222 EMISSIONS MONTHLY PROGRESS REPORT

Period Ending April 30, 1993

Wastewater Flows and Radionuclide Concentrations

Facility: Fernald Environmental Management Project

Location: 001 Total Discharge

Month April 1993

	Flow (MGD)	Total Alpha (pCi/L)(2)	Total Beta (pCi/L)(2)	Total U (mg/L)(2)	Total U (kgs)	Calculated Total U-238 (pCi/L)(1)(2)
Avg.	0.888	328	255	0.63	2.13	214
Max.	1.476	599	586	1.34	5.81	453
Min.	0.384	140	131	0.30	0.73	101

The average uranium concentration for the previous twelve months was 0.61 mg/L. This is 68.5% of the Derived Concentration Guide (DOE Order 5400.5) for ingested water.

Comments:

(1) The activity of this discharge has been and will continue to be reported as Uranium-238 (pCi/L) in accordance with the Ohio EPA format for reporting uranium. Since this does not account for the activity of the other uranium isotopes in the effluent, the total uranium data is also presented. The calculated total U-238 is based on a conversion factor of 337.84 pCi U-238/mg Total U applied to measure value of total uranium.

(2) Average values presented are flow-weighted.

CONSOLIDATED CONSENT AGREEMENT/FEDERAL FACILITY COMPLIANCE AGREEMENT/FEDERAL FACILITY AGREEMENT FOR CONTROL AND ABATEMENT OF RADON-222 EMISSIONS MONTHLY PROGRESS REPORT

Period Ending April 30, 1993

Wastewater Flows and Radionuclide Concentrations

Facility: Fernald Environmental Management Project
U.S. Department of Energy
7400 Willey Road, P.O. Box 398705
Cincinnati, Ohio 45239-8705

Location: 11000004002
002 Discharge (Overflow) to Storm Sewer Outfall Ditch
Stormwater Retention Basin Spillway (Effluent to Paddy's Run)

Month: April 1993

There was no discharge to Paddy's Run from the Stormwater Retention Basin.

Based on 3.93 inches of rainfall for the month, the uranium discharge to Paddy's Run from uncontrolled areas of the FEMP is estimated to be 11.16 kgs.

CONSOLIDATED CONSENT AGREEMENT/FEDERAL FACILITY COMPLIANCE AGREEMENT/FEDERAL FACILITY AGREEMENT FOR CONTROL AND ABATEMENT OF RADON-222 EMISSIONS MONTHLY PROGRESS REPORT

PERIOD ENDING APRIL 30, 1993

ENCLOSURE B

FFCA: INITIAL REMEDIAL MEASURES

AND OTHER OPEN ACTIONS

CONSOLIDATED CONSENT AGREEMENT/FEDERAL FACILITY COMPLIANCE AGREEMENT/FEDERAL FACILITY AGREEMENT FOR CONTROL AND ABATEMENT OF RADON-222 EMISSIONS MONTHLY PROGRESS REPORT

Period Ending April 30, 1993

INTRODUCTION

Enclosure B describes actions undertaken at the FEMP during the period April 1 through April 30, 1993, that are not covered by the reporting requirements of the Consent Agreement As Amended under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sections 120 and 106(a).

WORK ASSIGNMENTS AND PROGRESS

Descriptions of ongoing work progress are presented in the following sections of this report. The status of ongoing work in support of the Federal Facility Compliance Agreement (FFCA) is summarized in Table 1 of Enclosure B. Completed work previously reported upon has been eliminated for the sake of brevity. In this portion of the report and in Table 1, descriptions of actions are presented in a format consistent with that of the FFCA.

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA)

1. Initial Remedial Measures

   Section C

   K-65 Silo Project - Status information on the K-65 Silo project normally reported in this section is being provided under Operable Unit 4: Silos 1-4.

2. Remedial Investigation/Feasibility Study (RI/FS)

   Status information on the Remedial Investigation/Feasibility Study (RI/FS) normally reported in this section is being provided separately in accordance with the requirements of Section X of the Consent Agreement As Amended under CERCLA Sections 120 and 106(a).

CONSOLIDATED CONSENT AGREEMENT/FEDERAL FACILITY COMPLIANCE AGREEMENT/FEDERAL FACILITY AGREEMENT FOR CONTROL AND ABATEMENT OF RADON-222 EMISSIONS MONTHLY PROGRESS REPORT

Period Ending April 30, 1993

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA)

3. Reports and Record Keeping

Section B

The RI/FS Monthly Technical Progress Report for March 1993 was transmitted to the U.S. EPA on April 20, 1993, as an integral part of the Consolidated Consent Agreement/Federal Facility Compliance Agreement/Federal Facility Agreement for Control and Abatement of Radon-222 Emissions (CA/FFCA/FFA-CARE) Monthly Progress Report in accordance with the requirements of Section X of the Consent Agreement As Amended.

CLEAN AIR ACT (CAA)

Section E

The Quarterly Particulate Emissions Report will now be incorporated into the Annual NESHAP Compliance Report.

RADIATION DISCHARGE INFORMATION

Section A

This information will now be submitted on an annual basis as part of the FEMP Annual Site Environmental Report.

REPORTING REQUIREMENTS

Section B

The Federal Facility Compliance Agreement Monthly Progress Report for March 1993, was transmitted to the U.S. EPA on April 20, 1993, as Enclosure B of the Consolidated Consent Agreement/Federal Facility Compliance Agreement/Federal Facility Agreement for Control and Abatement of Radon-222 Emissions (CA/FFCA/FFA-CARE) Monthly Progress Report.

TABLE 1

STATUS OF ASSIGNMENTS FOR WORK REQUIRED ON FEDERAL FACILITY COMPLIANCE AGREEMENT ACTIONS

APRIL 30, 1993

ACTION	DESCRIPTION	COMPLETION TIME AFTER FFCA SIGNED	FY1992 STATUS
CERCLA			
1.	INITIAL REMEDIAL MEASURES		
1.C	Implement radon control plan approved by the U.S. EPA.	------	No longer applicable. Progress on actions to address radon emissions from the K-65 Silos are being reported separately under Section IX-Removal Actions of the Consent Agreement/FFCA Monthly Progress Report.
2.	REMEDIAL INVESTIGATION/FEASIBILITY STUDY		No action required.
2.A	RI/FS work is to be conducted in accordance with the U.S. EPA guidelines.	N/A	
2.B	--No Action Required--	------	Status information on the RI/FS is being reported in accordance with the requirements of Section X of the Consent Agreement As Amended under CERCLA Sections 120 and 106(a).
2.E	Amend and submit revised RI/FS Work Plan to U.S. EPA if deficiencies are found.		Status information on the RI/FS is being reported in accordance with the requirements of Section X of the Consent Agreement As Amended under CERCLA Sections 120 and 106(a).
2.F	Implement tasks described in the approved RI/FS Work Plan		Status information on the RI/FS is being reported in accordance with the requirements of Section X of the Consent Agreement As Amended under CERCLA sections 120 and 106(a).
3.	REPORTS AND RECORD KEEPING		
3.B	Submit monthly RI/FS progress reports.	monthly	The RI/FS Monthly Progress Report for March 1993 was transmitted to the U.S. EPA on April 20, 1993. (DOE-1740-93)
CLEAN AIR ACT			
B.4	Prepare annual progress report installation and replacement of emission control devices.	yearly	The Fifth Annual Progress Report on the installation and replacement of emission control devices was transmitted to the U.S. EPA on March 9, 1993 (DOE-1305-93).

TABLE 1

STATUS OF ASSIGNMENTS FOR WORK REQUIRED ON FEDERAL FACILITY COMPLIANCE AGREEMENT ACTIONS

4395

APRIL 30, 1993

C.	Provide annual reports to the U.S. EPA per 40 CFR 61.94(c).	yearly	The Annual NESHAP Compliance Report for CY1990 was transmitted to the U.S. EPA on June 25, 1992 (DOE-1912-92).
D.1	Provide U.S. EPA with yearly stack-testing schedule.	yearly	The 1989 stack testing schedule was transmitted to the U.S. EPA on June 16, 1989. A letter (DOE-1615-89) was transmitted to the U.S. EPA on September 15, 1989, indicating that, due to the uncertainty concerning resumption of production at the FEMP, the 1989 FFCA Stack Testing Program was being deferred. In August 1991, the DOE confirmed that no further production would take place at the facility, and renamed the facility the FEMP. Stacks in areas such as the Laboratory are currently being identified for potential testing during FY1993.
D.2	Provide U.S. EPA with stack-test results for stacks tested that year.	45 days	Because the FEMP has been out of production since mid-1989, there was no opportunity to perform stack testing. The DOE, in August 1991, confirmed that no future production will take place at the FEMP. Stacks in areas such as the Laboratory are currently being identified for potential testing during FY1993.
E.1	Maintain records of monthly particulate matter emissions.	------	Ongoing.
E.2	Provide quarterly reports to U.S. EPA on these emissions.	------	The Quarterly Particulate Emissions Report will now be incorporated into the Annual NESHAP Compliance Report.
RCRA			
A.1	Conduct a hazardous waste determination on all waste streams.	30 days	Complete. Pursuant to the Proposed Amended Consent Decree, a RCRA waste evaluation was be conducted on all identified waste streams pertaining to the PACD.
A.2	Commence a hazardous waste analysis program for materials in the landfill and going to the incinerator.	30 days	Complete. Operation of these units was discontinued and data on the waste which had gone to them was provided in a 30-day FFCA deliverable on August 17, 1986.

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TABLE 1

STATUS OF ASSIGNMENTS FOR WORK REQUIRED ON FEDERAL FACILITY COMPLIANCE AGREEMENT ACTIONS

APRIL 30, 1993

A.5	Update the facility closure plan to reflect the year the facility expects to begin closure.	30 days	The Facility closure date is dependent upon closure schedules for individual TSD units as presented most recently in Section I of the RCRA Part B Permit Application transmitted to the Ohio EPA and the U.S. EPA on March 26, 1993 (DOE-1471-93). Facility closure will be completed on a date the last TSD unit is closed.
RADIATION DISCHARGE INFORMATION			
A.3	Report to U.S. EPA, Ohio EPA and Ohio Department of Health the results of the continuous liquid discharge samples.	yearly	The twenty-first Quarterly Discharge Report for the period October through December 1991 was transmitted to the U.S. EPA on February 20, 1992 (DOE-941-92). This information will now be reported on an annual basis.
REPORTING REQUIREMENTS			
B.	Issue monthly progress report of actions taken to ensure compliance with FFCA requirements.	monthly	March's FFCA Monthly Progress Report was transmitted to the U.S. EPA on April 20, 1993. (DOE-1740-93).

CONSOLIDATED CONSENT AGREEMENT/FEDERAL FACILITY COMPLIANCE AGREEMENT/FEDERAL FACILITY AGREEMENT FOR CONTROL AND ABATEMENT OF RADON-222 EMISSIONS MONTHLY PROGRESS REPORT

PERIOD ENDING APRIL 30, 1993

ENCLOSURE C

FEDERAL FACILITY AGREEMENT:
CONTROL AND ABATEMENT OF RADON-222 EMISSIONS

CONSOLIDATED CONSENT AGREEMENT/FEDERAL FACILITY COMPLIANCE AGREEMENT/FEDERAL FACILITY AGREEMENT FOR CONTROL AND ABATEMENT OF RADON-222 EMISSIONS MONTHLY PROGRESS REPORT

Period Ending April 30, 1993

Introduction

The Federal Facility Agreement for Control and Abatement of Radon-222 Emissions (FFA-CARE) between the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (U.S. EPA), signed November 19, 1991, requires that a monthly report be submitted to the U.S. EPA regarding all steps undertaken in the preceding month to implement Part V of the agreement and that all data generated as a result of those actions be submitted.

Enclosure C fulfills those requirements by describing steps taken at the FEMP during the period April 1 through April 30, 1993, to implement Part V, Radon-222 Control and Abatement Plan, paragraphs 19-33 of the FFA-CARE.

After four months of data collection for the applicable parameters, preparation is now underway to evaluate the data for use in the Transport Release Models.

Work Assignments and Progress

In this section of Enclosure C, action descriptions and work progress are presented in a format consistent with that of the FFA-CARE. Immediately following this section are the K-65 Silos Report and the Selected Radon Data Report. Reporting this data is also a requirement included in the U.S. EPA approved Silos 1 and 2 Removal Action Work Plan (Removal Action No. 4).

CONSOLIDATED CONSENT AGREEMENT/FEDERAL FACILITY COMPLIANCE AGREEMENT/FEDERAL FACILITY AGREEMENT FOR CONTROL AND ABATEMENT OF RADON-222 EMISSIONS MONTHLY PROGRESS REPORT

Period Ending April 30, 1993

FFA Part, Paragraph(s)	Description of Commitment	FFA Due Date	Status of Commitment
Part V, 19 & 21	Implement the K-65 Silos 1 and 2 Removal Action in accordance with the approved Silos 1 and 2 Removal Action Work Plan.	12/1/91	Completed. Installation of the bentonite completed 11/28/91.
Part V, 20	Reduce radon-222 to a level As-Low-As Reasonably-Achievable (ALARA) with the goal as specified in the Silos 1 and 2 Removal Action Work Plan.	5/22/92	Completed. Concentrations offsite remain well below performance goal of removal action.
Part V, 22	Submit proposed methodology for estimating radon-222 concentration reductions resulting from completion of the Silos 1 and 2 Removal Action.	Within 60 days of completing removal action; 1/27/92.	The Bentonite Effectiveness Environmental Monitoring Plan was resubmitted to the U.S. EPA for comment and approval on 3/13/92. EPA approval was received on 4/24/92. DOE has prepared a revision to the methodology. Comment responses to the U.S. EPA's disapproval of the revised methodology is under way.
Part V, 23	Evaluate performance of the removal action and determine whether or not additional actions are needed prior to final remediation.	None specified.	Methodology for estimating radon-222 concentration reduction submitted to U.S. EPA per paragraph 20 of Part V. The first Bentonite Effectiveness Environmental Monitoring Report was issued to the U.S. EPA on 5/22/92. DOE submitted a revision to the methodology to the U.S. EPA on 12/17/92. Comment responses to the U.S. EPA's disapproval of the revised methodology is under way.

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FFA Part, Paragraph(s)	Description of Commitment	FFA Due Date	Status of Commitment
Part V, 24, 25, and 33	Demonstrate compliance with NESHAP Subpart Q at the completion of final remediation using a methodology approved by the U.S. EPA. Applicable to: Silos 1, 2, and 3; Waste Pits 1, 2, 3, 4, and 5 and the Clearwell; and any newly discovered radon-222 emission sources.	None specified.	No information to report for April 1993.
Part V, 26	Directly measure radon-222 flux from Waste Pits 1, 2, 3, 4, and 5 and the Clearwell in the RI/FS under the CERCLA Consent Agreement.	None specified.	Radon sampling is complete for Pits 1, 2, and 3. All measurements were below the criteria set by the U.S. EPA. A final report was issued to the U.S. EPA on 6/25/92. A letter was received from the U.S. EPA on 10/16/92 giving approval of the proposed method for measuring the radon flux from Pit 4. The letter also stated that since the Clearwell is water covered, and Pit 5 is nearly 100% water covered, the flux from Pit 5 and the Clearwell may be assumed to be zero.
Part V, 26	Include direct measurement data from Waste Pits 1, 2, 3, 4, and 5 and the Clearwell in the RI/FS under the CERCLA Consent Agreement.	None specified.	See above.
Part V, 27	Estimate radon-222 emissions from Silo 3 based upon characterization data; include the estimated radon-222 emission data from Silo 3 in the RI/FS that includes Silo 3 under the CERCLA Consent Agreement.	None specified.	Completed. An estimate of radon flux from the K-65 Silo 3 was submitted to the U.S. EPA on 12/17/91. Radon flux for the silo was estimated to be above 20 pCi/m^2-s.
Part V, 28	Submit documentation or estimates of current radon-222 emissions from existing but newly discovered sources that contain radium-226 in sufficient concentrations to emit radon-222 in excess of NESHAP Subpart Q prior to final remediation.	Within 30 days of discovery.	No new sources identified.

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FFA Part, Paragraph(s)	Description of Commitment	FFA Due Date	Status of Commitment
Part V, 30	Submit methodology for direct measurement or other appropriate means of characterization of the relevant emissions pursuant to paragraph 29 of the FFA.	Within 45 days of the U.S. EPA response pursuant to paragraph 29.	None required.
Part V, 31	Submit results of measurements pursuant to paragraph 30.	Within 30 days of U.S. EPA approval of characterization method.	None required.
Part VI, 31	Submit monthly report on steps undertaken to implement Part V of the FFA-CARE and the data obtained in the preceding month.	20th day of succeeding month.	The progress report being submitted herewith as an integral part of the CERCLA Consent Agreement Monthly Progress Report.

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CONSOLIDATED CONSENT AGREEMENT/FEDERAL FACILITY COMPLIANCE AGREEMENT/FEDERAL FACILITY AGREEMENT FOR CONTROL AND ABATEMENT OF RADON-222 EMISSIONS MONTHLY PROGRESS REPORT

Period Ending April 30, 1993

Data Reporting Requirements: RA No. 4: Silos 1 and 2

As defined in the Silos 1 and 2 Removal Action Work Plan and the Federal Facility Agreement, data associated with monitoring the effectiveness of the bentonite installation are included in the following tables: the K-65 Silos Report and the Selected Radon Data Report.

The K-65 Silos Report includes data on the following parameters:

- Ambient temperature and pressure near the silos.
- Silos 1 and 2 headspace temperature.
- Silos 1 and 2 differential pressure.
- Silos 1 and 2 radon headspace concentration.
- Silos 1 and 2 headspace humidity

The Selected Radon Data Report includes radon data from the following locations:

- Air monitoring station number 5 (AMS-5)
- Air monitoring station number 6 (AMS-6)
- Pilot Plant
- Background data
- K-65 Monitoring Data (K-65 NW, K-65 SW, K-65 NE, K-65 SE).

The radon data submitted in Enclosure C: Radon Data for the K-65 Removal Action and in all previous consent agreement status updates is considered to be draft. The radon data, although collected by qualified technicians using detailed procedures, was not obtained in a manner which would withstand a rigorous validation process. The various field and laboratory procedures are currently being reviewed and modified to be in accordance with the conditionally approved Site-Wide CERCLA Quality Assurance Project Plan (SCQ). Once the sampling and analysis procedures have been modified and approved, along with specific validation protocols, suspect radon data will either be qualified or rejected.

CONSOLIDATED CONSENT AGREEMENT/FEDERAL FACILITY COMPLIANCE AGREEMENT/
FEDERAL FACILITY AGREEMENT MONTHLY PROGRESS REPORT

FACILITY: Fernald Environmental Management Project
U.S. Department of Energy
7400 Willey Road, P.O. Box 398704
Cincinnati, Ohio 45239 Hamilton

K-65 SILO REPORT

LOCATION: Silo # 1 DATE: April 1993

Day	Ambient Temp Deg. F	Ambient Pres In. Hg.	Temperature Head Space Deg. F	Inter. Hum. %	Diff. Pres In. HG	Head Space Radon (pCi/l)
*1	46.1	28.94	43.2	N/A	0.079	7923
*2	32.0	29.31	42.4	N/A	0.113	4705
*3	37.7	29.59	41.8	N/A	0.004	20118
4	38.5	29.60	41.9	N/A	-0.007	15338
5	36.7	29.43	41.9	N/A	-0.008	10288
*6	46.1	29.48	41.9	N/A	-0.006	81025
7	52.2	29.51	42.6	N/A	-0.004	323688
8	57.2	29.34	43.4	N/A	-0.004	319532
9	51.3	29.10	43.9	N/A	-0.008	373884
*10	48.6	29.21	44.0	N/A	0.048	65894
11	53.5	29.19	44.2	N/A	-0.005	162478
*12	46.2	29.41	44.8	N/A	-0.007	121373
13	49.9	29.44	44.7	N/A	-0.005	349763
*14	48.9	29.22	44.8	N/A	-0.006	448580
*15	62.1	28.96	45.0	N/A	-0.005	880110
*16	41.0	29.15	45.2	N/A	0.045	171244
*17	42.6	29.39	44.8	N/A	0.046	100993
18	50.8	29.42	44.8	N/A	-0.005	366386
*19	58.2	29.21	45.4	N/A	-0.012	677631
*20	62.2	29.14	46.2	N/A	0.027	161324
21	39.0	29.40	46.0	N/A	0.051	83909
22	44.3	29.43	45.2	N/A	-0.007	143489
23	54.7	29.38	45.5	N/A	-0.004	457900
*24	59.0	29.25	46.5	N/A	-0.014	346003
25	58.6	29.29	47.0	N/A	0.017	197987
*26	48.9	29.55	47.0	N/A	0.023	48581
27	49.2	29.71	46.8	N/A	-0.005	314181
28	56.3	29.62	47.0	N/A	-0.003	145104
29	57.0	29.51	47.7	N/A	-0.003	99745
*30	60.8	29.48	48.1	N/A	-0.009	123720
ARITHMETIC MEAN	48.9	29.35	43.8	N/A	0.523	220763
MAXIMUM	62.2	29.71	48.1	N/A	15.361	880110
MINIMUM	32.0	28.94	14.9	N/A	-0.014	4705
MEDIAN	49.1	29.4	44.8	N/A	-0.004	153214

Notes: * – Limited number of samples in daily average, i.e readings were not recorded, due to system malfunctions, maintenance, or because readings were outside of range restrictions.
N/A – Humidity sensor data not available
Report generated from previously edited data files.

CONSOLIDATED CONSENT AGREEMENT/FEDERAL FACILITY COMPLIANCE AGREEMENT/
FEDERAL FACILITY AGREEMENT MONTHLY PROGRESS REPORT

FACILITY: Fernald Environmental Management Project
U.S. Department of Energy
7400 Willey Road, P.O. Box 398704
Cincinnati, Ohio 45239 Hamilton

K-65 SILO REPORT

LOCATION: Silo # 2 DATE: April 1993

Day	Ambient Temp Deg. F	Ambient Pres In. Hg.	Temperature Head Space Deg. F	Inter. Hum. %	Diff. Pres In. HG	Head Space Radon (pCi/l)
*1	46.1	28.94	43.5	N/A	0.100	112015
*2	32.0	29.31	42.7	N/A	0.116	38719
*3	37.7	29.59	42.1	N/A	0.020	147179
4	38.5	29.60	42.3	N/A	-0.007	82727
5	36.7	29.43	42.3	N/A	-0.007	213812
*6	46.1	29.48	42.2	N/A	-0.007	882361
7	52.2	29.51	42.8	N/A	-0.006	2071122
8	57.2	29.34	43.6	N/A	-0.007	2153295
9	51.3	29.10	44.1	N/A	-0.005	2178960
*10	48.6	29.21	44.2	N/A	0.026	2082325
11	53.5	29.19	44.4	N/A	-0.007	1948499
*12	46.2	29.41	45.0	N/A	-0.007	1708577
13	49.9	29.44	44.9	N/A	-0.007	1401349
*14	48.9	29.22	44.9	N/A	-0.029	1550742
*15	62.1	28.96	45.2	N/A	0.006	1669171
*16	41.0	29.15	45.4	N/A	-0.007	1242664
*17	42.6	29.39	44.9	N/A	-0.006	1343568
18	50.8	29.42	45.0	N/A	-0.007	1556766
*19	58.2	29.21	45.5	N/A	-0.007	1762973
*20	62.2	29.14	46.3	N/A	0.030	907275
21	39.0	29.40	46.1	N/A	0.051	1263621
22	44.3	29.43	45.3	N/A	-0.006	1668553
23	54.7	29.38	45.7	N/A	-0.007	1685070
*24	59.0	29.25	46.5	N/A	-0.036	1203886
25	58.6	29.29	47.1	N/A	0.014	1052500
*26	48.9	29.55	47.1	N/A	0.022	641517
27	49.2	29.71	46.9	N/A	-0.007	1547369
28	56.3	29.62	47.1	N/A	-0.007	1593769
29	57.0	29.51	47.8	N/A	-0.007	1622198
*30	60.8	29.48	48.2	N/A	-0.007	1792302
ARITHMETIC MEAN	48.9	29.35	44.0	N/A	0.512	1304163
MAXIMUM	62.2	29.71	48.2	N/A	15.173	2178960
MINIMUM	32.0	28.94	15.4	N/A	-0.036	38719
MEDIAN	49.1	29.40	44.9	N/A	-0.007	1549055

Notes: * – Limited number of samples in daily average, i.e readings were not recorded, due to system malfunctions, maintenance, or because readings were outside of range restrictions.
N/A – Humidity sensor data not available
Report generated from previously edited data files.

CONSOLIDATED CONSENT AGREEMENT/FEDERAL FACILITIES COMPLIANCE AGREEMENT/
FEDERAL FACILITY AGREEMENT MONTHLY PROGRESS REPORT

FACILITY: Fernald Environmental Management Report
U.S. Department of Energy
7400 Willey Road, P.O. Box 398704
Cincinnati, Ohio 45239 Hamilton

SELECTED RADON DATA REPORT

MONTH: APRIL, 1993

Monthly Summary of Selected Sampling Locations

Daily Averages

Date	K-65, NW (pCi/L)	K-65, SW (pCi/L)	K-65, NE (pCi/L)	K-65, SE (pCi/L)
04/01/93	0.9	0.6	0.5	0.6
04/02/93	0.6	0.6	0.8	0.9
04/03/93	0.8	0.6	0.9	1.0
04/04/93	0.8	1.4	0.3	4.8
04/05/93	0.8	2.1	0.3	0.8
04/06/93	0.8	1.3	0.3	1.6
04/07/93	2.6	2.3	2.1	3.6
04/08/93	2.5	1.8	2.8	2.2
04/09/93	2.5	2.0	1.5	2.0
04/10/93	0.8	0.9	0.8	1.3
04/11/93	1.2	1.5	2.3	5.1
04/12/93	0.7	0.8	0.5	0.9
04/13/93	1.2	2.0	0.7	0.9
04/14/93	1.4	1.9	0.4	0.7
04/15/93	1.6	0.9	0.6	0.8
04/16/93	0.6	0.6	0.4	0.6
04/17/93	0.7	0.7	1.1	1.4
04/18/93	1.0	0.9	2.1	1.7
04/19/93	1.2	1.3	2.0	1.9
04/20/93	0.6	0.6	0.4	0.7
04/21/93	0.6	0.6	0.5	0.9
04/22/93	0.8	0.9	0.9	1.6
04/23/93	1.3	1.1	1.0	1.1
04/24/93	0.8	0.6	0.3	0.8
04/25/93	0.6	0.6	0.3	1.6
04/26/93	0.6	0.6	0.2	1.4
04/27/93	1.2	1.2	0.9	2.0
04/28/93	1.9	1.8	4.9	3.4
04/29/93	1.4	1.8	3.9	3.3
04/30/93	1.4	1.2	1.3	1.9

Summary of Daily Averages

	K-65, NW (pCi/L)	K-65, SW (pCi/L)	K-65, NE (pCi/L)	K-65, SE (pCi/L)
AVERAGE	1.1	1.2	1.2	1.6
MAXIMUM	2.6	2.3	4.9	5.1
MINIMUM	0.6	0.6	0.2	0.6
MEDIAN	0.8	0.9	0.8	1.4
Std. Dev	0.6	0.6	1.1	1.2

CONSOLIDATED CONSENT AGREEMENT/FEDERAL FACILITIES COMPLIANCE AGI
FEDERAL FACILITY AGREEMENT MONTHLY PROGRESS REPORT

FACILITY: Fernald Environmental Management Report
U.S. Department of Energy
7400 Willey Road, P.O. Box 398704
Cincinnati, Ohio 45239 Hamilton

SELECTED RADON DATA REPORT

MONTH: APRIL, 1993

Monthly Summary of Selected Sampling Locations

Daily Averages

Date	AMS 5 (pCi/L)	AMS 6 (pCi/L)	PILOT PLANT (pCi/L)	BKGRD (pCi/L)
04/01/93	0.4	0.3	0.3	N/A
04/02/93	0.4	0.2	0.3	N/A
04/03/93	0.4	0.3	0.3	N/A
04/04/93	0.4	0.3	0.3	N/A
04/05/93	0.5	0.3	0.4	N/A
04/06/93	0.5	0.3	0.4	N/A
04/07/93	0.7	0.6	0.5	N/A
04/08/93	1.4	0.6	0.7	N/A
04/09/93	0.8	0.6	0.5	N/A
04/10/93	0.4	0.3	0.3	N/A
04/11/93	0.6	0.4	0.5	N/A
04/12/93	0.5	0.3	0.4	N/A
04/13/93	0.6	0.4	0.3	N/A
04/14/93	0.5	0.4	0.3	N/A
04/15/93	0.5	0.3	0.3	N/A
04/16/93	0.4	0.2	0.3	N/A
04/17/93	0.4	0.2	0.3	N/A
04/18/93	0.7	0.5	0.5	N/A
04/19/93	0.6	0.4	0.4	N/A
04/20/93	0.4	0.2	0.3	N/A
04/21/93	0.4	0.2	0.3	N/A
04/22/93	0.5	0.3	0.4	N/A
04/23/93	0.7	0.4	0.4	N/A
04/24/93	0.4	0.3	0.3	N/A
04/25/93	0.4	0.3	0.3	N/A
04/26/93	0.4	0.2	0.2	N/A
04/27/93	0.5	0.3	0.3	N/A
04/28/93	0.9	0.6	0.7	N/A
04/29/93	0.9	0.7	0.3	N/A
04/30/93	0.6	0.4	0.4	N/A

Summary of Daily Averages

	AMS 5 (pCi/L)	AMS 6 (pCi/L)	PILOT PLANT (pCi/L)	BKGRD (pCi/L)
AVERAGE	0.6	0.4	0.4	N/A
MAXIMUM	1.4	0.7	0.7	N/A
MINIMUM	0.4	0.2	0.2	N/A
MEDIAN	0.5	0.3	0.3	N/A
Std. Dev	0.2	0.1	0.1	N/A

CHOOSE THE YEAR FOR THE REPORT

FEDERAL FACILITY AGREEMENT MONTHLY PROGRESS REPORT

FACILITY: Fernald Environmental Management Project
U.S. Department of Energy
7400 Willey Road, P.O. Box 398704
Cincinnati, Ohio 45239 Hamilton

K-65 SILO REPORT
RADON CONCENTRATIONS

MONTH: APRIL, 1993 REPORT GENERATED: 05/18/93

Daily Summary of Recorded Headspace Concentrations
(recorded at 5 minute intervals)

	SILO 1				SILO 2			
Date	Average	Maximum	Minimum	Std. Dev.	Average	Maximum	Minimum	Std. Dev.
04/01/93	7923 M	68330	2930	10232	112015	529530	13600	67088
04/02/93	4705	49760	2930	4304	38719	110690	14750	19182
04/03/93	20118	108310	3600	20334	147179	240080	67990	39319
04/04/93	15338	102460	3600	16451	82727	196070	22340	44213
04/05/93	10288	89740	2430	9592	213812	616900	2550	172771
04/06/93	81025 M	439520	4430	87185	882361 M	1870010	164750	564964
04/07/93	323688	536740	33010	148848	2071122	2296331	1721366	143534
04/08/93	319532	570680	39460	137715	2153295	2262602	1903347	62537
04/09/93	373884	544370	30290	160018	2178960	2253189	2085327	32148
04/10/93	65894	430660	5010	80248	2082325	2176318	1874716	65644
04/11/93	162478	515520	3650	144843	1948499	2176318	1443688	159817
04/12/93	121373 M	572220	4840	143095	1708577 M	1961000	1051096	292917
04/13/93	349763	912257	83931	247468	1401349	1670269	936936	152402
04/14/93	448580	931475	83931	231815	1550742	1802100	687387	233189
04/15/93	880110 L	1290730	232182	265077	1669171 L	1926725	577477	285922
04/16/93	171244 L	715765	83931	124488	1242664 L	1651950	621621	229276
04/17/93	100993	294542	64713	34295	1343568	1721620	786486	231897
04/18/93	366386	926769	83931	215170	1556766	1787386	900299	204344
04/19/93	677631 L	974617	294542	215948	1762973 L	1824022	1604203	54901
04/20/93	161324 L	564386	79053	82991	907275 L	1560059	361261	328316
04/21/93	83909	242666	64894	25391	1263621	1732431	588588	309433
04/22/93	143489	516403	64894	58612	1668553	1780178	75075	112588
04/23/93	457900	780307	103438	197876	1685070	1816815	1277776	97955
04/24/93	346003	1030053	84166	228573	1203886	1813211	306306	477774
04/25/93	197987	549833	103438	78333	1052500	1717716	408708	429210
04/26/93	48581	160860	1650	37965	641517	1662761	14960	523919
04/27/93	314181	626527	84166	200950	1547369	1732431	911110	163093
04/28/93	145104	530562	60175	101592	1593769	1787386	1065164	159343
04/29/93	99745	156140	60175	26839	1622198	1824022	852552	224792
04/30/93	123720	295368	60175	30952	1792302	1860959	1585884	48986

Grab Samples of Headspace

Date	SILO 1 Concentration	SILO 2 Concentration
04/07/93	581264	2258984
04/16/93	20541	586784
04/21/93	104	641542
04/23/93	220764	1294540
04/28/93	10383	1114929
04/29/93	355323	Not Taken

Notes:
1. All values reported in pCi/L.
2. "M" denotes system down for maintenance.
3. "P" denotes partial data due to system malfunction.
4. "L" denotes partial data obtained due to system malfunction impacted by nearby lightning strike
5. Grab Samples and DLS readings are all below 4,000,000 pCi/l per Silo, i.e. does not exceed 0.015 pCi/l above background, at nearest residence, (performance goal of Removal Action).

SUBJECT: FFA DATA DISKS

Three disks contain the following data:

Summary Files:

FFARPT.WK1 FFARPT.FMT	Monthly Summary of Physical Parameters and Daily Radon Headspace Concentrations.
APRIL3.WK1 APRIL3.FMT	Monthly Summary of Daily Radon Headspace Concentrations from 5 Minute Data.
APR93REP.WK1 APR93REP.FMT	Monthly Summary of Daily Radon Concentrations from Selected Sampling Locations.

Data Files:

05APR01.WK1 05APR15.WK1	Data Logger System File - Radon Headspace Concentrations Recorded at 5 Minute Intervals. (April, 1993).
TREND04.WK1	Data Logger System File - K-65 Silos Physical Parameters Recorded at 15 Minute Intervals.
RNAPR#R.WK1 #= 1 - 5	Hourly Radon Concentration Data Files for K-65 Perimeter Locations and Other Selected Locations.

All of the data files are raw data or censored as indicated. Data is downloaded directly from the Honeywell Data Logger System with the exception of the K-65 Perimeter Locations and Other Selected Locations. The data depicted in the reports are reductions of the raw data to show trends.

CONSOLIDATED CONSENT AGREEMENT/FEDERAL FACILITY COMPLIANCE AGREEMENT/FEDERAL FACILITY AGREEMENT FOR CONTROL AND ABATEMENT OF RADON-222 EMISSIONS MONTHLY PROGRESS REPORT

PERIOD ENDING APRIL 30, 1993

ENCLOSURE D

DRILLING/BORING LOGS

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: ~~LWB~~ 04.33	PROJECT NAME: Fernald OU5 - 12 well		
BORING NUMBER: MW-2880	COORDINATES:	DATE: 4-7-93	
ELEVATION: ~ 581	GWL: Depth 63.5 Date/Time 4/12/93	DATE STARTED: 4-7-93	
ENGINEER/GEOLOGIST: Kaseirin / Smith	Depth Date/Time	DATE COMPLETED: 4-13-93	
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
5.0'	109251 14:15 4-7-93	42 50/3"	6	(10YR 6/3) pale brown, ~~silty~~ fine to coarse sand with some pebbles, moist	sp	NA	βγ: 0.0 cpm ~ ~~HNU~~: 0.0 ppm Microtip
5.5' 2.5	109252 14:25 4-7-93	50/5	3	(10YR 6/3) pale brown, fine to coarse sand with some pebbles moist	sp	NA	βγ: 0.0 cpm ~ ~~HNU~~: 0.0 ppm Microtip
	109253 14:35 4-7-93	26 40 50/5"	10	(10YR 5/2) grayish brown, gravelly sand, moist	sp	NA	βγ: 0.0 cpm ~ ~~HNU~~: 0.0 ppm Microtip
6.1' 5.0	109254 16:35 4-7-93	50/5	1.5	(10YR 5/2) grayish brown, sandy gravel with broken pebbles moist.	gm	NA	βγ: 0.0 cpm ~ ~~HNU~~: 0.0 ppm Microtip
	109255 16:55 4-7-93	50/5	0	No recovery ~~N/A~~	NA	NA	βγ: — ~~0.0 cpm~~ NA ~~HNU~~: — NA Microtip * NA
▽ 6.3.5 7.5	109256 0930 4-8-93	29 50/5	4	(10YR 5/4) brown, sandy gravel loose, subangular to subrounded pebbles wet.	gm	NA	βγ: 0.0 cpm ~ ~~HNU~~: Microtip NA
6.6' 10.0	109257 0945 4-8-93	37 50/4	7	(10YR 5/4) yellowish brown, coarse sandy gravel, pebbles, wet. Boulders broken in shoe.	gm	NA	βγ: 0.0 cpm ~ ~~HNU~~: Microtip NA
	109258 1010 4-8-93	46 50... 50/3	3	(10YR 4/2) dark grayish-brown, fine to coarse sandy gravel; subrounded rounded pebbles, loose, wet.	gm	NA	βγ: 0.0 cpm ~ ~~HNU~~: Microtip NA
6.8.5' 12.5	109259 1025 4-8-93	48		(10YR 4/2) dark grayish-brown, gravelly SAND, 80% fine to coarse sand, wet.	sp	NA	βγ: 0.0 cpm ~ ~~HNU~~: Microtip NA
7.1'	109260 1045 4-8-93	19 24 32		(10YR 4/4) dark yellowish-brown, fine to coarse SAND T.D. 73 (2 feet sump)	sp	NA	βγ: 0.0 cpm ~ ~~HNU~~: Microtip NA

NOTES: 109261 / 1045 / 4-8-93 Composite

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

SAA = Same As Above
N/A = Not Applicable

Background = βγ = 0.0 cpm, Microtip = 0.0 ppm

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

~ 4/9/93 Rad background 40 cpm

* J. Patrick asked for microtip. Hnu needed on rig (Andy L. Clester) in OU 2.

FERNALD
RI/FS

-4395

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald OU-5 12 Well
FIELD ENG./GEO. PAT SMITH DATE 4/12/93
PROJECT NO. 04.33 Fernco
CHECKED BY _____ DATE _____
BORING NO. MW-2880
PIEZOMETER NO. MW-2880
DATE OF INSTALLATION 4/12/93

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
TYPE OF BIT hammer
DRILLING FLUID (S) USED:
FLUID Potable FROM 0.0 ft. TO 73.0 ft.
FLUID — FROM — TO —
CASING SIZE (S) USED
SIZE 4 inch FROM 0.0 ft TO 73.0 ft
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE stainless steel
DIAMETER OF PERFORATED SECTION 4.0 ID
PERFORATION TYPE:
SLOTS ☑ HOLES ☐ SCREEN ☑
AVERAGE SIZE OF PERFORATIONS .020
TOTAL PERFORATED AREA 15 feet
RISER PIPE MATERIAL stainless steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in. I.D. 4.0 in.
LENGTH OF PIPE SECTIONS 5-10 FT, 1-5 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

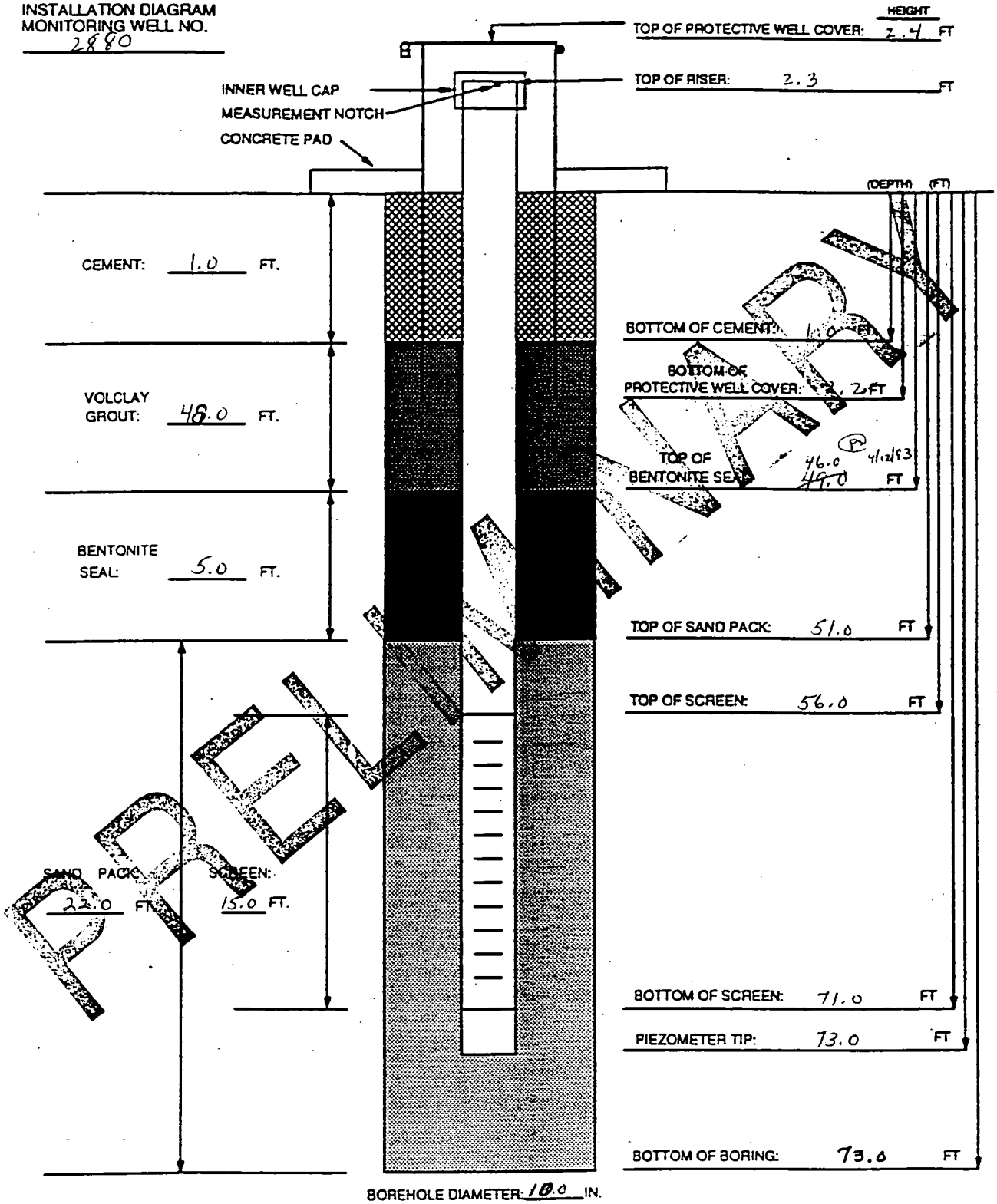
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.3			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.7			
BOREHOLE FILL MATERIALS: Volclay Cement GROUT / ~~SLURRY~~ PS 4/15/93	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE -	TOP ~~46.0~~ 49.0 ~~2.0~~ 4/15/93	BOTTOM 51.0 ~~7.0~~ 4/15/93	TOP	BOTTOM
SAND - 10/20	TOP 51.0	BOTTOM 73.0	TOP	BOTTOM
GRAVEL - None used	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION 316 S.S.	TOP 56.0	BOTTOM 71.0	TOP	BOTTOM
PIEZOMETER TIP	73.0 - 71.0			
BOTTOM OF BOREHOLE	73.0			
GWL AFTER INSTALLATION	61.2			

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

4395

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 2880

INSTALLATION DATE: 4/12/93



PRELIMINARY

MATERIALS USED

SAND TYPE AND QUANTITY: Best 4/30 Silica
BENTONITE PELLETS (5-GALLON BUCKETS): 5 buckets
BAGS OF VOLCLAY GROUT: 700 lbs. (7 bags)
AMOUNT OF CEMENT: 1 bag
AMOUNT OF WATER USED: 400 gallons
OTHER: N/A
TASK: N/A

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 0.20 IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE 61.2 FT/ 4/12
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: PAT SMITH

ASI FORM 0157 REV. (0)

95 3

FERNALD
RI/FS

Attachment 2

FIELD ACTIVITY DAILY LOG

DAILY LOG			
DATE	4	13	93
NO.			
SHEET	/ OF		

PROJECT NAME: OU-5 12 Well

PROJECT NO.: 04.33 Fernald 4305

FIELD ACTIVITY SUBJECT: Install 2880 monitoring well

0700 Arrive at Base Trailer. Prepare for field.
0730 OU-2 meeting held in Trailer one by Dick on briefing of Sampling for Active Fly Ash Sub-Unit.
0800 Arrive at 2880 site. Mike Schley stayed at trailer to do memorandum
0830 Still waiting on driller.
0840 Driller and helper arrive. Hold tailgate safety meeting.
0855 Crew begins work. Mechanical problems on hydraulic lift. Brian Yearley's driller is summoned for help. Problem resolved. M. Schley arrives.
1010 Control announces drill. Accountability for crews on-site only according to M. Schley.
1130 Lunch
1230 Return to base trailer. Message from John Hall relayed by Tony Delucca that Per diem will increase.
1300 Arrive at drill site. Driller and helper are in truck. Call from Yearley to Pat. Schley answers. Will bring grout pump over.
1340 Health and safety arrives (Tom Ernestes). Tom reviews NE 5 [illegible] 68m and signs off. We are topping off sand pack.
1355 Tom leaves. Top of sand measures 54.0 feet. Pull casing / Sand is 6 feet inside casing. Pulled 5 foot sections of casing.
1400 Sand is at 59 feet minus 4 foot stick-up. 59 feet - top of sand. Driller makes sand and grout run.
1500 Driller returns with Volclay and sand. TOS 54 feet. 23 bags.
1640 Bentonite top at 47.6 feet. Add water, check in morning. Police Area
1800 Leave site for day

METER CALIBRATION

Hnu Calibration Gas #
Hnu S/N (eV) Span Cal. to ppm

By meter S/N passed cal. check using
L meter S/N passed cal. check using

VISITORS ON SITE:
Health & Safety - Tom Ernostes
DoE - Tommy Anderson

CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:
N/A

WEATHER CONDITIONS:
Cool 45°F, Overcast, windy.
29.43 Barometric Pressure
49°F @ 10:24

IMPORTANT TELEPHONE CALLS:
N/A

PERSONNEL ON SITE: P. Smith (IT), Driller - Chris Coutter, Helper - David Holmes, M. Schley (Fernald)

SUPERVISOR: Pat Smith DATE: 4/13/93

ASI FORM 0155A Rev. (0)

FERNALD
RI/FS

Attachment 2

FIELD ACTIVITY DAILY LOG

DAILY LOG | DATE 4 6 93 | NO. — | SHEET 1 OF 1

PROJECT NAME: OU 5 12 Well Program | PROJECT NO. 04.33 - 4305

FIELD ACTIVITY SUBJECT: Drill MW 2880 at 12 Well Site

0700 Arrive at main Trailer. M. Schley picks up stencils and sample numbers.
0730 Prepared to leave for drill site. J. Patrick stops me and asks that we delay drilling until he talks to Bruce Myers about final clearance on utilities.
0745 Arrive at drill site. Write up T.S.M. sheet.
0800 Waiting on driller and clearance of utilities.
0830 Casing arrives. J. Patrick arrives. Bruce Myers o.k.'s drilling to begin. Patrick (H&S) gives me H&S Well/Boring Site Pre-Work Check List.
0900 Cannot stencil drums. Paint is too cold and will not spray. Will spray later.
0935 Begin drilling.
1107 Stopped drilling. Down 8'. Casing 10' deep.
1130 Lunch
1230 Return. Set casing (10 inch ~~stainless~~ carbon steel) / Tack-weld sections.
1300 Begin drilling. Label contaminated trash bag and clean trash bag.
1700 Hammered 4th casing down for a total of 40 feet of casing. Driller is having difficulty in drilling. Boulders, cobbles or some very hard material slowing down drilling.
1730 Arrive at Trailer. Chris reports total depth as 30 feet.
1735 Met with J. Patrick reported gas line 100 feet or less south of M.W. 2899 stake. We checked map and saw easement of pipeline.

PREVIEW

METER CALIBRATION

Hnu Calibration Gas #
Hnu S/N (eV) Span Cal. to ppm

By meter S/N passed cal. check using
& meter S/N passed cal. check using

VISITORS ON SITE: NA

CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS: NA

WEATHER CONDITIONS: overcast, warmer

IMPORTANT TELEPHONE CALLS: NA

PERSONNEL ON SITE: M. Schley, P. Smith, M. Kesebir

SUPERVISOR: Patricia Smith DATE: 4/6/93

ASI FORM 0155A Rev. (0)

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FERNALD
RI/FS

Attachment 2

FIELD ACTIVITY DAILY LOG

DAILY LOG	DATE	04	05	93
	NO.			
	SHEET	1	OF	1

PROJECT NAME: OU5 Twelve Well Program | PROJECT NO. 20 | -4305

FIELD ACTIVITY SUBJECT: ~~INITIATIN~~ Initiating Well 2880

0700: STAFF MEETING Held by Bruce in Driller's shack.
0730: Prep for field. D. Smith signs out tools for geologist. M. Schley will assist me in field.
0830: Arrive on site. Wait on Driller and helpers. Driller - Chris Coulter is decontaminating equipment casing.
1130: Driller still at decon. Leave for lunch
1230: Return to site
1245: Trees are pruned to make room for tower on rig.
1400: Cable tool rig moves in to site. Difficult to set up close to line and Trees. Tree trimmer stands by while crew raises tower.
1510: Ready for pre drill inspection of rig by J. Patrick. Schley calls Patrick.
1600: Inspection complete. Tree trimmer returns to prune branches around rig tower.
1630: Driller makes second run for drums.
1710: Shut down for day. Leave drill site and return to trailer.
1720: Arrive at trailer. Round up supplies, charger etc.
1800: Leave site for day.

PRELIMINARY

METER CALIBRATION

Hnu Calibration Gas # 101692
Hnu S/N A70209 (10.2 eV) Span 1.55 Cal. to 55 ppm

By meter S/N 50754 passed cal. check using 50498
& meter S/N passed cal. check using

VISITORS ON SITE: Ray Schwitzer - Tree Trimmer

CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS: —

WEATHER CONDITIONS: overcast, misting. 40°F

IMPORTANT TELEPHONE CALLS: —

PERSONNEL ON SITE: M. Schley, P. Smith

SUPERVISOR: Pat Smith DATE: 4/5/93

ASI FORM 0155A Rev. (0)

FERNALD
RI/FS

Attachment 2

FIELD ACTIVITY DAILY LOG

DAILY LOG			
DATE	4	23	93
NO.			
SHEET	1	OF	1

PROJECT NAME: 12 Well South Field / Knollmen Farm
PROJECT NO. 0433 Well #3880 - 4395

FIELD ACTIVITY SUBJECT: Drilling Monitoring well #3880

0700 Arrived at base trailer (Pat Smith, Mike Schley, Thea Layne) Mike prepared supplies for day, Thea dressed out, Pat organized paperwork.

0730 Mike and Thea took vehicle to Penn Drill for washing and then to Plant for gasoline fill up. Pat attended Rad Con Instruction at Base trailer.

0840 Mike + Thea arrived back at base trailer, picked up Pat and proceeded to UNO/DOS trailers for Pat to drop off time sheets.

0900 Pat, Thea + Mike arrive at site. Mike Contacted Contact + Dave Mason for stakes and Mike Called Penn Drill to Contact Driller and Helper. Pat + Thea worked on preparing paperwork.

0935 Pat, Thea + Mike return to base trailer - Contact [illegible] Drillers confirmed that fitting for propane fuel has not arrived, rig is down to .1 fuel - Fitting was ordered on Wednesday. Rig is down because of need to refuel which is not possible without fitting.

0950 Pat and Thea to Dos trailer to see Jen Hoe + dump fit/paperwork (IT) Uno

1050 Pat + Thea return to base trailer. Mike took monitoring equipment to turn in for calibration. [illegible] 4-23-93

1200 lunch break

1300 Return for organizing + preparing paperwork at base trailer

1600 Left site for day.

N/A No Drilling Activity today

METER CALIBRATION

Hnu Calibration Gas #
Hnu S/N (eV) Span Cal. to ppm

By meter S/N passed cal. check using
& meter S/N passed cal. check using

VISITORS ON SITE: N/A

Temperature 50
29.94 Barometric Pressure
Wind Speed —

CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:

N/A

WEATHER CONDITIONS:

IMPORTANT TELEPHONE CALLS:

N/A

PERSONNEL ON SITE: Pat Smith, Thea Layne, Mike Schley

SUPERVISOR: Pat Smith DATE: 4-23-93

ASI FORM 0155A Rev. (0)

RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2		DATE 4/22/93
BORING NUMBER: 11006	COORDINATES:		DATE STARTED: 4/22/93
ELEVATION:	GWL: Depth	Date/Time	DATE COMPLETED: 4/27/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth	Date/Time	PAGE 1 OF 12
DRILLING METHODS: HOLLOW STEM AUGER			

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	0945 111940 4/22/93	3	5	M. Dense. Black flyash, dry	NA	NA	HNU = 0 ppm BS = 40cpm
		6	0	No Recovery	NA	NA	HNU = NA BS = NA
1		6	0	No Recovery	NA	NA	HNU = NA BS = NA
	0880 111941 4/22/93	6	6	M. Dense, black flyash w/ organics, dry	NA	NA	HNU = 0ppm BS = 60 cpm
2	0885 111942 4/22/93	8	6	SAA	NA	NA	HNU = 0ppm BS = 60cpm
		8	0	No Recovery	NA	NA	HNU = NA BS = NA

SAA - same as above
NA - not applicable

NOTES:

Drilling Contractor: PENNSYLVANIA DRILLING CO.

Drilling Equipment: ACKER SENTRY

Driller: Jeff Bentley / Sonny Arthur

Samples collected per ASTM standard penetration test

colors identified using Munsell Color Chart

Key: HNU = 0ppm BS = 80cpm

PRELIMINARY

402-11

RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 110016	COORDINATES:	DATE 4/22/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/22/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/27/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 2 OF 12

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	0855 111943 4/22/93	6	6	M. Dense Black flyash with organics, dry	NA	NA	HNU = 0 ppm BS = 60cpm
		7	0	No Recovery	NA	NA	HNU = NA BS = NA
4		8	0	No Recovery	NA	NA	HNU = NA BS = NA
	0905 111944 4/22/93	2	6	Loose Black flyash with organics, dry	NA	NA	HNU = 0ppm BS = 60cpm
5	0905 111945 4/22/93	2	6	SAA	NA	NA	HNU = 0ppm BS = 60cpm
	0905 111946 4/22/93	3	6	SAA	NA	NA	HNU = 0ppm BS = 60cpm

PRELIMINARY

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Jeff Bentley
Bobby Arthur

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

Key: HNU = ppm BS = BS cpm

402-11

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RI/FS

VISUAL CLASSIFICATION OF SOILS

-4005

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2		
BORING NUMBER: 110016	COORDINATES:	DATE 4/22/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/22/93	
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/27/93	
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 3 OF 12	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	0930 111947 4/22/93	13	6	M Brown black flyash, dry	NA	NA	HNU = 0ppm BS = 60cpm
	0930 111948 4/22/93	8	6	SAA	NA	NA	HNU = 0ppm BS = 60cpm
7	0930 111949 4/22/93	8	6	SAA	NA	NA	HNU = 0ppm BS = 60cpm
	0945 11950 4/22/93	6	6	SAA	NA	NA	HNU = 0ppm BS = 40cpm
8	0945 111951 4/22/93	6	5	SAA	NA	NA	HNU = 0ppm BS = 40cpm
		6	0	No Recovery	NA	NA	HNU = NA BS = NA

PRELIMINARY

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Jeff Bentley
Donny Arthur

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = 0ppm BS = 60cpm

402-11-6

RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	DATE 4/22/93
BORING NUMBER: 110016	COORDINATES:	DATE STARTED: 4/22/93
ELEVATION:	GWL: Depth Date/Time	DATE COMPLETED: 4/27/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	PAGE 4 OF 12
DRILLING METHODS: HOLLOW STEM AUGER		

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	0930 111952 4/22/93	3	6	Loose block flyash w/ gravel dry	NA	NA	HNU = 0ppm BS = 60cpm
		4	0	No Recovery	NA	NA	HNU = NA BS = NA
10		3	0	No Recovery	NA	NA	HNU = NA BS = NA
	1005 111953 4/22/93	4	[illegible]	Brown block flyash with cinder block debris, dry	NA	NA	HNU = .3ppm BS = 50cpm
11		8	0	No Recovery	NA	NA	HNU = NA BS = NA
		7	0	No Recovery	NA	NA	HNU = NA BS = NA

SA - same as above
NA - not applicable

NOTES:

Drilling Contractor: PENNSYLVANIA DRILLING CO.

Drilling Equipment: ACKER SENTRY

Driller: Jeff Bentley, Sonny Arthur

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = ppm BS = cpm

PRELIMINARY

RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 PHASE 2	
BORING NUMBER: 110016	COORDINATES:	DATE 4/22/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/22/93
ENGINEER/GEOLOGIST: D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/27/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 13 OF 12

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1013 111984 4/22/93	3	3	Loose, black silty sand w/cinder blocks & wood, moist Soft. 2.5Y(3/2) Grayish brown gravelly clay, moist	NA CL	NA .25	HNU = .1 ppm BG = 50 cpm
		4	0	No Recovery	NA	NA	HNU = NA BG = NA
13		3	0	No Recovery	NA	NA	HNU = NA BG = NA
	1030 111984 4/22/93	3	4	Loose 2.5Y(3/2) Grayish brown sand with gravel & concrete wet	SP	NA	HNU = 0 ppm BG = 60 cpm
14		7	0	No Recovery	NA	NA	HNU = NA BG = NA
		3	0	No Recovery	NA	NA	HNU = NA BG = NA

PRELIMINARY

NOTES:

SA - same as above
NA - not applicable

Drilling Contractor: PENNSYLVANIA DRILLING CO.

Drilling Equipment: ACKER SENTRY

Driller: Jim Bentley
Dorthy Arthur

Samples collected per ASTM standard penetration test

colors identified using Munsell Color Chart

Key: HNU = ppm BG = cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 PHASE 2	
BORING NUMBER: 110316	COORDINATES:	DATE 4/22/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/22/93
ENGINEER/GEOLOGIST: D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/27/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 6 OF 12

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1045 1109 4/22/93	5	6	M. Dense. 2.5Y (5/2) Grayish brown sand with depressed fibrous material, moist rotting, wet	SP	NA	HNU = .5 ppm BG = 10cpm
		8	0	No Recovery	NA	NA	HNU = NA BG = NA
16		8	0	No Recovery	NA	NA	HNU = NA BG = NA
	1100	3	0	No Recovery	NA	NA	HNU = NA BG = NA
17			0	No Recovery	NA	NA	HNU = NA BG = NA
			0	No Recovery	NA	NA	HNU = NA BG = NA

NOTES:

SA - same as above
NA - not applicable

Drilling Contractor: PENNSYLVANIA DRILLING CO.

Drilling Equipment: ACKER SENTRY

Driller: Jeff Bentley
Jeffrey Arthur

Samples collected per ASTM standard penetration test

colors identified using Munsell Color Chart

Key: HNU = ppm BG = cpm

402-1

RI/FS

VISUAL CLASSIFICATION OF SOILS : -4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2		
BORING NUMBER: 1100H	COORDINATES:	DATE 4/22/93	
ELEVATION: [redacted]	GWL: Depth Date/Time	DATE STARTED: 4/22/93	
ENGINEER/GEOLOGIST. D. [redacted]	Depth Date/Time	DATE COMPLETED: 4/27/93	
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 7 OF 12	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1325 111957 4/22/93	8	6	M. Dense, black coarse sand mixed w/ flyash, brick, rocks, poorly graded, wet	SP	NA	HNU = 0 ppm BS 60 cpm
	1328 111958 4/22/93	8	4	SAA	SP	NA	HNU = 0 ppm BS 60 cpm
19		7	0	No Recovery	NA	NA	HNU = NA BS = NA
	1330 111959 4/22/93	20	5	Soft. 2.5Y(5/2) Grayish brown clay w/ flyash, brick, copper wire, low plasticity, wet	CL	.5	HNU = 0 ppm BS = 1100 cpm
20		20	0	No Recovery	NA	NA	HNU = NA BS = NA
		20	0	No Recovery	NA	NA	HNU = NA BS = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: [redacted]

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = ppm BS = cpm

402-11-86

RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2		
BORING NUMBER: 11001b	COORDINATES:	DATE 4/26/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/22/93	
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/27/93	
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 8 OF 12	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1355 111960 4/26/93	17	6	M. Dense. 10YR(4/6) Dk yellowish brown silt & fine sand moist	SM	NA	HNU = 0ppm BS = 100cpm
	1355 111961 4/26/93	7	5	SAA	SM	NA	HNU = 0ppm BS = 100cpm
22		7	0	No Recovery	NA	NA	HNU = NA BS = NA
	1430 111962 4/26/93	5	6	V. Loose 2.5Y(5/1) Gray clayey sludge with gravel & rocks, wet	NA	NA	HNU = 0ppm BS = 900cpm
23	1430 111962 4/26/93	5	4	SAA	NA	NA	HNU = 0ppm BS = 900cpm
		4	0	No Recovery	NA	NA	HNU = NA BS = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Jeff Beatty, David Holmes

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = ppm BS = cpm

402-11-86

RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2		
BORING NUMBER: 110014	COORDINATES:	DATE 4/21/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/22/93	
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/27/9	
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 9 OF 12	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1443 111962 4/26/93	3 4 4	6	Loose 2.5Y(5/1) Gray clayey sludge w/gravel, wet	NA	NA	HNU = 0ppm BG = 1100 cpm
25	1445 111963 4/26/93	4	6	Loose 10YR(5/6) yellowish brown med to coarse sand poorly graded dry	SP	NA	HNU = 0ppm BG = 60cpm
		4	0	No Recovery	NA	NA	HNU = NA BG = NA
26	1500 111964 4/26/93	3	6	Loose. 10YR(5/6) yellowish brown med to coarse sand poorly graded, dry	SP	NA	HNU = 0ppm BG = 60cpm
		4	0	No Recovery	NA	NA	HNU = NA BG = NA
		4	0	No Recovery	NA	NA	HNU = NA BG = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Jeff Bentley
David Holmes

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = ppm BG = cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 110016	COORDINATES:	DATE 4/26/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/22/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/27/93
DRILLING METHODS: Hollow Stem Auger		PAGE 10 OF 12

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	BO 110417 4/26/93	4	6	M. Dense 10YR(5/6) Yellowish brown, med to coarse sand poorly graded, dry	SP	NA	HNU 0 ppm BS = 60cpm
	BO 110418 4/26/93	8	6	SAA	SP	NA	HNU = 0 ppm BS = 60cpm
28	BO 110419 4/26/93	9	6	SAA	SP	NA	HNU = 0 ppm BS = 60cpm
				Boring terminated at 28.8 ft			HNU = BS =
29							HNU = BS =
							HNU = BS =

SAA = same as above
NA = not applicable

NOTES:

Drilling Contractor Pennsylvania Drilling Co.

Drilling Equipment Acker Sentry

Driller: Jeff Bartley, David Holmes

Samples collected per ASTM standard practice D2488

Colors identified using Munsell Color Chart

Log: HNU = 0 ppm BS = 60 cpm

PRELIMINARY

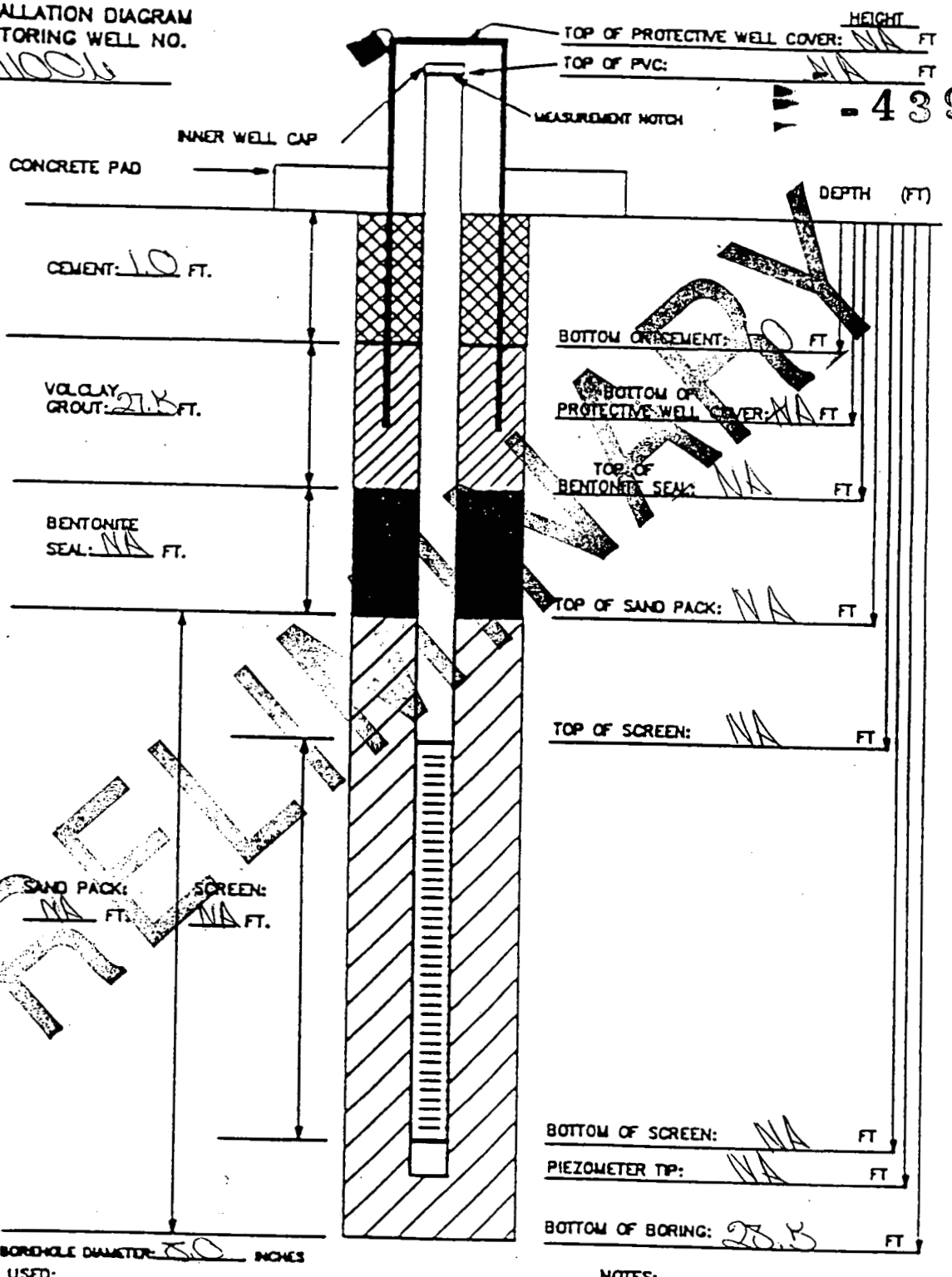
110912

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 110016

INSTALLATION DATE: 4/27/93

-4395



PRELIMINARY

MATERIALS USED:
SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 2 bag
AMOUNT OF CEMENT: 1 bag
AMOUNT OF WATER USED: 20 gal
OTHER:

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH ID, SCHEDULE 40 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: NA

Soil, Water TASK: 20.03.03 GEOLOGIST/ENGINEER: D.O. Brun

110

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FERNALD
RI/FS

120412

PIEZOMETER INSTALLATION SHEET - 4395

PROJECT NAME OU2 phase 2 FIELD ENG./GEO. D O'Brien DATE 4/27/93
PROJECT NO. 20.03.05 CHECKED BY _____ DATE _____
BORING NO. HP01
PIEZOMETER NO. _____ DATE OF INSTALLATION 4/27/93

BOREHOLE DRILLING

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

PIEZOMETER DESCRIPTION

TYPE Hydropunch Boring	RISER PIPE MATERIAL NA
DIAMETER OF PERFORATED SECTION NA	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. NA I.D. NA
SLOTS ☐ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS NA
AVERAGE SIZE OF PERFORATIONS NA	JOINING METHOD NA
TOTAL PERFORATED AREA NA	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA	OTHER PROTECTION NA
PROTECTIVE PIPE O.D. NA	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 28.5	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	28.5			
GWL AFTER INSTALLATION 4/27/93	0. NA			

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

409-11-8

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FERRALD
RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER 20.03.05	PROJECT NAME. Southfield OU2	
BORING NUMBER 1974	COORDINATES.	DATE 04-13-93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 04-13-93
ENGINEER/GEOLOGIST J. Boyer/J. Reagan	Depth Date/Time	DATE COMPLETED. 04-13-93
DRILLING METHODS Hollowstem 8½" auger		PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	112518 1010			Pushed shelby tube ↓ pushed shelby tube			
2	112519 1030	5	6	soft (2.5Y4/3) olive brown, silty fine sand, low plasticity, moist. Black fragments present	ml	0.5	β γ = 50cpm
		6	6	medium stiff (2.5Y4/3) olive brown, silty clay low plasticity, moist. some gravel	cl	1.0	HNu = <1ppm
3		12	6	very stiff (2.5Y 4/3) olive brown, silty clay low plasticity, moist. some gravel	cl	3.0	
	112519 1030	13	0	No recovery			
4	112520 1035	5	6	very stiff (2.5Y 5/4) light olive brown, silty clay, low plasticity, moist. gravels present	cl	3.0	β γ = 200cpm
		8	6	soft (2.5Y4/3) olive brown, silty fine sand, low plasticity, moist. gravels present	ml	0.5	HNu = <1ppm
5		10	4	very stiff (2.5Y 5/4) light olive brown, silty clay, slightly plastic, moist. gravels	cl	3.0	
	112520 1035	11	0	No recovery			
6	112521 1045	7	6	very stiff (2.5Y 5/4) light olive brown, silty clay, slightly plastic, moist	cl	3.0	β γ = 150cpm
	112522 1045	14	6	SAA	cl	3.0	HNu = <1ppm
7	112523 1045	18	6	very stiff (10YR 5/4) yellowish brown, silty clay, slightly plastic, moist, black concretions present	cl	3.0	

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment CME-45
Driller Joe RAAB
Roger Davis

SAA - Same as above
NA - Not Applicable

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

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER 20	PROJECT NAME. Southfield OU 2		
BORING NUMBER. 1974	COORDINATES.		DATE 4-13-93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED 4-13-93
ENGINEER/GEOLOGIST J. Boyer/J. Reagan	Depth	Date/Time	DATE COMPLETED 4-13-93
DRILLING METHODS Hollow stem auger 8½"			PAGE 2 OF 4

DES 050393

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	112524 1315	9	6	Stiff (10YR 4/6) dark yellowish brown, silty clay, slightly plastic, moist.	CL	2.0	βγ = 150cpm
	112525 1315	11	4	Soft (10YR 5/4) yellowish brown, silty clay, low plasticity, moist	CL	1.0	HNu = <1ppm
		11	0	No recovery			
9	112526 1330	10	6	very stiff (2.5Y 5/4) light olive brown, silty clay, slightly plastic, moist	CL	3.0	βγ ~ 50cpm
	↓	15	6	SAA	CL	3.0	HNu = <1ppm
10	112526 1330	25	6	Stiff (2.5Y 5/4) light olive brown, silty clay, low plasticity, moist.	CL	2.0	
11	112527 1330	31	6	very stiff (2.5Y 5/4) light olive brown silty clay, slightly plastic, moist	CL	3.0	
				Bottom of boring 11 ft.			

NOTES

Drilling Contractor Pennsylvania Drilling

Drilling Equipment

Driller

SAA - Same as above
NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

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050393 3 of 4 ~~2 of 2~~

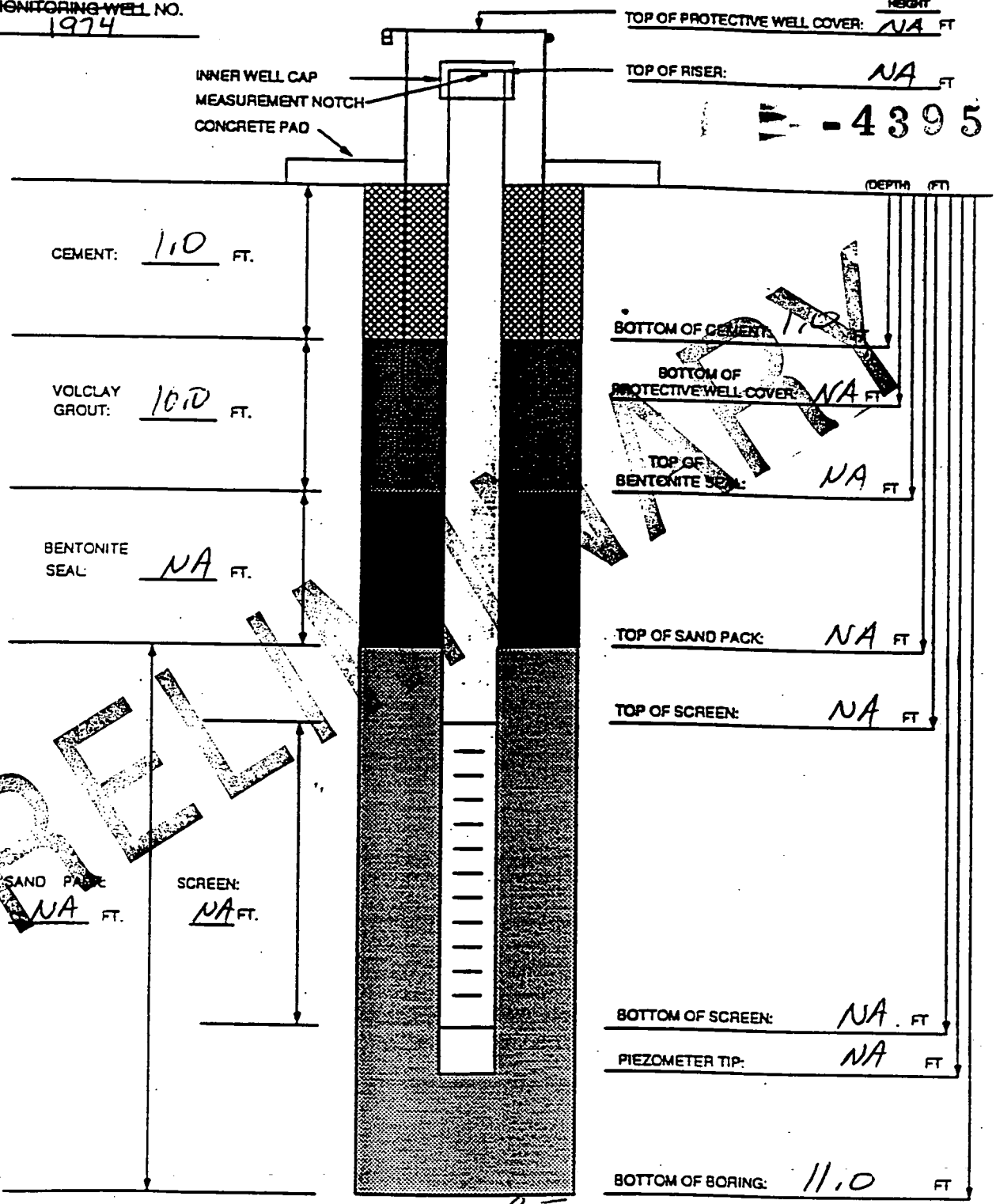
FERNALD RI/FS
INSTALLATION DIAGRAM
~~MONITORING WELL~~ NO. 1974

INSTALLATION DATE: 041393

TOP OF PROTECTIVE WELL COVER: HEIGHT NA FT

TOP OF RISER: NA FT

-4395



BOREHOLE DIAMETER: 8.5 IN.

PRELIMINARY

MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 2
AMOUNT OF CEMENT: 1 BAG
AMOUNT OF WATER USED: ~5-8 gallons
OTHER: 1 SOIL, 1 WATER DRUM
TASK: 20.03.05

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BEL GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: J. Boyer

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Seb 050393
~~1 of 2~~ 4 of 4

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET - 4395

PROJECT NAME OU-2 Southfield FIELD ENG./GEO. J. Boyer DATE 04/13/
PROJECT NO. 20.03.05 CHECKED BY _____ DATE _____
BORING NO. 1974
PIEZOMETER NO. NA DATE OF INSTALLATION 04/13/93

BOREHOLE DRILLING

DRILLING METHOD Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT ~~Hollow Stem~~ Auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (NA)	
TOP OF RISER PIPE	NA		NA	
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	NA		NA	
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~ CEMENT	TOP 0.0	BOTTOM 1.0	TOP NA	BOTTOM
~~BENTONITE~~ VOLCLAY	TOP 1.0	BOTTOM 11.0	TOP NA	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP NA	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP NA	BOTTOM
PIEZOMETER TIP	NA		NA	
BOTTOM OF BOREHOLE	11.0		NA	
GWL AFTER INSTALLATION	NA		NA	

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

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: FERNALD RI/FS		ob 050393
BORING NUMBER: 1976 (SFB-13)	COORDINATES:		DATE: 4/2/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 4/2/93
ENGINEER/GEOLOGIST: J. Boyer	Depth	Date/Time	DATE COMPLETED: 4/2/93
DRILLING METHODS: AUGER (HOLLOW STEM) 8 1/4			PAGE 1 OF 2

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	110537 0930	5	6	HARD, (7.5YR 5/4/3), BROWN, SILTY CLAY, LOW PLASTICITY, MOIST	CL	>4	HNU: 0 α: NT Bδ: 40
	110538 0930	18	6	SAME AS ABOVE	CL	>4	
1	110539 0930	9	6	SAME AS ABOVE	CL	>4	
	110540 1000	13	6	MED STIFF (10YR, 5/4) YELLOWISH BROWN, SILTY CLAY W/ GRAVEL, MOTTLING, LOW PLASTICITY, SLIGHTLY MOIST.	CL	1.5	HNU: 0 α: NT Bδ: 55
2	110541 1000	24	6	VERY STIFF (10YR, 5/3), BROWN, SILTY CLAY W/ GRAVEL, MOTTLED, LOW PLASTICITY, SLI. MOIST.	CL	3.5	
	110542 1000	26	6	SAME AS ABOVE	CL	3.0	
3	110543 1015	17	3	VERY STIFF, (10YR, 5/2), GRAYISH BROWN, SILTY CLAY, MOTTLED, SLIGHTLY MOIST, LOW PLASTICITY	CL	3.5	HNU: 0 α: NT Bδ: 40
	110544 1015	24	6	VERY STIFF (10YR, 5/6) YELLOWISH BROWN, SILTY CLAY, SLIGHTLY MOIST, LOW PLASTICITY	CL	3.5	
4	110545 1015	24	6	HARD (10YR 5/3), BROWN, SILTY CLAY, TRACE GRAVEL, LOW PLASTICITY, SLIGHTLY MOIST	CL	>4	
	110546 1030	19	0	HARD, (10YR, 6/2) LIGHT BROWNISH GRAY, SILTY CLAY W/ GRAVEL, LOW PLASTICITY, SLI. MOIST.	CL	>4	HNU: 0 α: NT Bδ: 40
5	110547 1030	18	6	HARD (10Y, 5/4) YELLOWISH BROWN, SILTY CLAY, TRACE GRAVEL, LOW PLASTICITY SLIGHTLY MOIST	CL	>4	
	110547 1030	17	6	SAME AS ABOVE	CL	>4	
6	110548 1100	5	3	VERY STIFF, (10YR, 5/3), BROWN SILTY CLAY, TRACE GRAVEL, LOW PLASTICITY SLIGHTLY MOIST	CL	3.0	HNU: 0 α: NT Bδ: 40
	110549 1100	4	6	VERY STIFF, (10YR 5/3) BROWN, SILTY CLAY, LOW PLASTICITY, SLIGHTLY MOIST	CL	3.5	
7	110550 1100	8	6	VERY STIFF, (10YR 5/3) BROWN, SILTY CLAY, LOW PLASTICITY, SLIGHTLY MOIST	CL	2.5	

NOTES: CONTRACTOR: PENNDRILL
RIG: MOBILE
DRILLER: DAN JAMISON
ASSISTANT: ROGER DAVIS
NT = NOT TAKEN
4 1/2 - 6 INTERVAL SAMPLED TWICE

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TE
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 100 PPM
α = CPM
Bδ = 40-60 CPM
~~HELIUM~~ LEL: ~~PPM~~ LCB
~~O2~~ %

142132

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FERNALD RI/FS

= -4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1976 (SF-SB-13)	COORDINATES:	DATE: 4/2/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/2/93
ENGINEER/GEOLOGIST: John Boyer	Depth Date/Time	DATE COMPLETED: 4/2/93
DRILLING METHODS: AUGER (HOLLOW STEM) 8 1/4		PAGE 2 OF 2

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	110557 1115	19	6	very stiff, (5Y, 5/3) olive, silty clay low plasticity, slightly moist	cl	2.5	HNU = 0
	110552 1115	21	6	very stiff, (5Y, 5/3) olive, silty clay low plasticity, trace organics, slightly moist	cl	3.0	α = NT
	110553 1115	32	6	very stiff, (2.5Y, 6/4) light yellowish brown, low plasticity, slightly moist	3.0	3.5	Bγ = 40
9	110554 1330	11	6	very stiff, (2.5Y, 5/4) light olive brown, silty clay, med plasticity, slight moist	cl	2.5	HNU = 0
	110555 1330	18	6	very stiff, cl, same as above	cl	3.5	α = NT
10	110556 1380	19	6	~~very stiff~~ dense, (2.5Y, 6/3) light yellowish brown, clayey silt, no plasticity wet	ml	2.5	Bγ = 45
							perched water zone
11	110556 1330	16	6	very stiff, (2.5Y, 5/4) light olive brown ~~clayey silt~~ silty clay, low plasticity wet	cl/ml	1.0	HNU = 0 110557[3] 1400'
	110558 1400	21	6	very dense same as above.	cl	1.0	α = NT 110558
	110559 1400	24	6	~~stiff~~, (2.5Y, 5/6), light olive brown, clayey silt, slight plasticity, wet to moist	ml		Bγ = 40 110559[2]
12							110560[4] 1400'
				Bottom of Boring			HNU =
				12 feet			α =
13							Bγ =
14							HNU =
							α =
							Bγ =

NOTES:

1 Sample 110557, -558, -559, -560 were taken at 1400

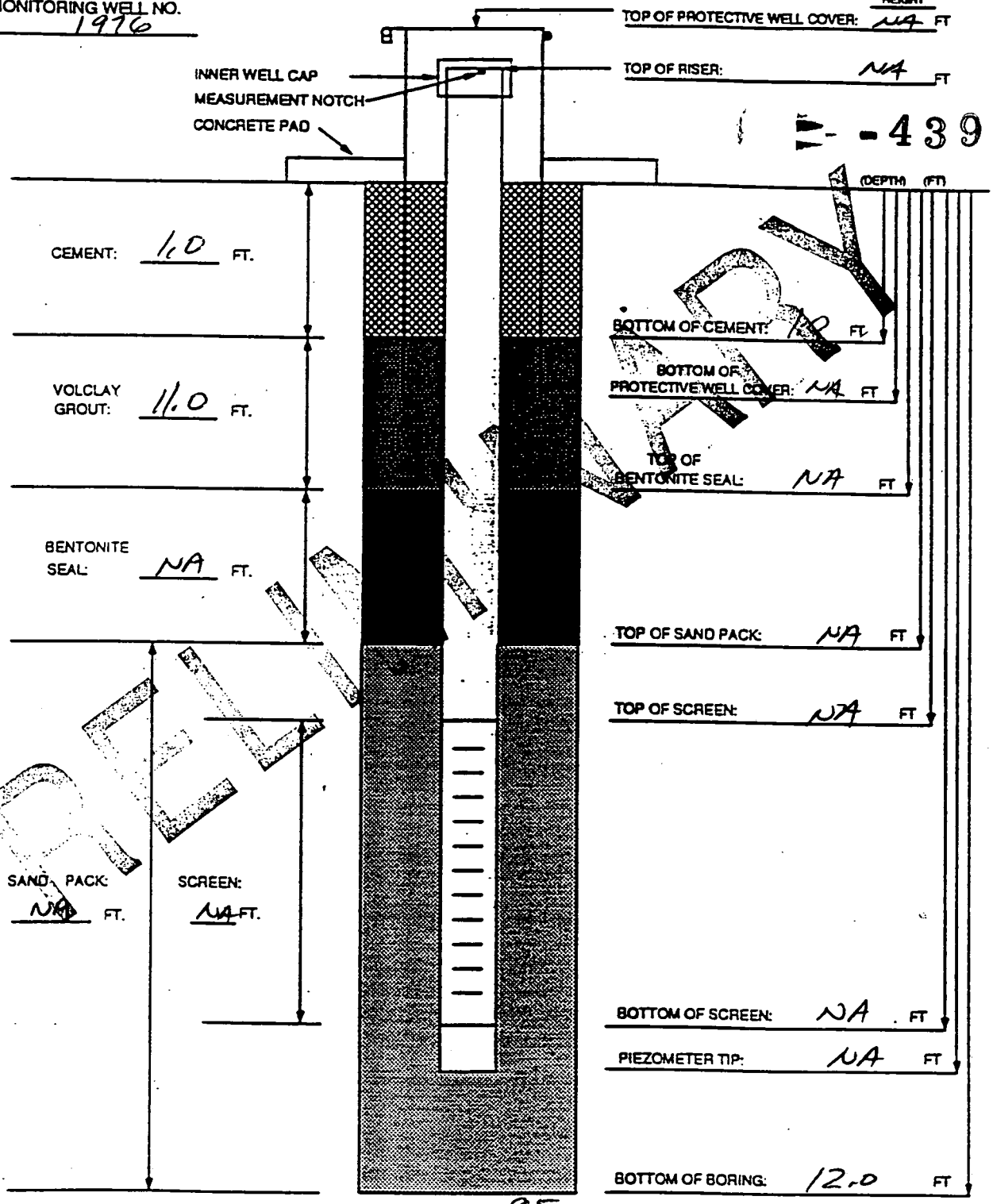
2 Sample 110559 was collected for total uranium

3 110557 taken from 10 1/2 - 11

4 110560 " " 11 1/2 - 12

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 1976

INSTALLATION DATE: 040293



E-4395

PRELIMINARY

MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 1 1/2 BAGS
AMOUNT OF CEMENT: 1 BAG
AMOUNT OF WATER USED: ~5-7 GALLONS
OTHER: 1 SOIL, 1 WATER + ALCONOX
TASK: 20.03.05.02

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BEL GROUND LEVEL
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: J. Boyce

ASI FORM 0157 REV. (0)

FERNALD RI/FS

-4395

PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU-2 Southfield FIELD ENG./GEO. J. Boyer DATE 04/
PROJECT NO. 20.03.05 CHECKED BY _____ DATE _____
BORING NO. 1977
PIEZOMETER NO. NA DATE OF INSTALLATION 040793

BOREHOLE DRILLING

DRILLING METHOD Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT Hollow Stem Auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION _____
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (NA)	
TOP OF RISER PIPE	NA		NA	
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE			NA	
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~ CEMENT	TOP 0.0	BOTTOM 1.0	TOP NA	BOTTOM N
~~BENTONITE~~ VOLCLAY	TOP 1.0	BOTTOM 12.0	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP ↓	BOTTOM ↓	TOP ↓	BOTTOM ↓
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP NA	BOTTOM N
PIEZOMETER TIP	NA		NA	
BOTTOM OF BOREHOLE	12.0		↓	
GWL AFTER INSTALLATION	NA		NA	

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

REMARKS _____

FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1977 / (SF-SB-14)	COORDINATES:	DATE: 4/6/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/6/93
ENGINEER/GEOLOGIST: J Boyer	Depth Date/Time	DATE COMPLETED: 4/7/93
DRILLING METHODS: AUGER (HOLLOW STEM) 8 1/2		PAGE 3 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
	110578 1345		NA	Shelby tube sampling sample was not.			HNU = <1 ppm α = Bδ = 65
	↓		NA				
16	110578 1345		NA				
	110579 1410	23	6	Stiff, (2.5y 5/1) gray, silty clay, w/ gravel to trace, low plasticity, moist.	cl	1.0	HNU = <1 ppm α = Bδ = 65
17	110579 1410	35	6	SAA		1.5	
	110579 1410	57	6	SAA		2.0	
18	110579 1410	78	6	Very dense, (2.5y 3/6) light olive brown, clayey silt, slight plasticity, dry.	ml		HNU = α = Bδ =
				18 1/2 Bottom of			
19				the Boring			
							HNU = α = Bδ =
20							

NOTES:

I NOTE TWO SAMPLES COLLECTED HERE:
110579 full HSL, FULL RAP
110580 TOTAL URANIUM (1410) 18-18 1/2
eb ~~18 1/2~~

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER 20.03.05	PROJECT NAME. RI/FS FERNALD		
BORING NUMBER SF-SB-14/1977	COORDINATES.		DATE 4/6/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED 4/6/93
ENGINEER/GEOLOGIST J. BOYER	Depth	Date/Time	DATE COMPLETED. 4/7/93
DRILLING METHODS Hollow Stem AUGER 8 1/2			PAGE 1 OF 35

DEPTH ft	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY 12"	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
	110563 0845	3	4	STIFF, (2.5y, 4/3), olive brown, silty clay w/ gravel, low plasticity, moist	cl	2.0	HNU = 70 ppm
	110564 0845	7	5	SAA	cl	2.0	Bγ = 40
1		12	0	Light	cl		
	1440 110565	20	6	MEDIUM DENSE (2.5y, 5/4), olive brown, clayey silt, low plasticity, slightly moist w/ gravel	ML	90	Bγ = 40 HNU = <1
2	1440 110566	20	6	SAA	ML	25	BACKGROUND 40-60 cpm
	1440 110567	30	4	VERY STIFF, (2.5y 5/6) light olive brown, silty clay, low plasticity, slightly moist	cl	3.5	1430
3	110568 1515		12	Sampled by Shelby tube			HNU = <1 Bγ = 40
				SAA			~1' recovery inside tube, from 3'-5
4		NA		SAA			
	110568 1515			SAA			HNU = 0 Bγ = 40
5	110569 1545	4	6	MEDIUM STIFF (2.5y, 5/4) light olive brown, silty clay, med plasticity, moist.	cl	1.0	
	1545 110569	4	6	SAA	cl	1.0	
6	110569 1545	4	0	SAA	cl	1.0	HNU = 0 Bγ = 40
	110569 1545	7	6	STIFF (2.5y, 5/4), ~~light olive brown~~, silty clay, med. plasticity, mottling, moist	cl	1.5	
7	110569 1545	6	6	SAA	cl		

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment MOBILE
Driller Joe Ring
HELPER: RODGER DAVIS

SAA - Same as above
NA - Not Applicable

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

FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1977 (SF-SB-14)	COORDINATES:	DATE: 040693
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 040693
ENGINEER/GEOLOGIST: J. BOYER	Depth Date/Time	DATE COMPLETED: 040693
DRILLING METHODS: AUGER (HOLLOW STEM) 8½		PAGE 2 OF 35

050393 JHB

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	110569 1540	10	6	VERY STIFF, (2.5Y, 5/6) light olive brown, silty clay, med plasticity, slight moist.	cl	2.5	HNU = 0
	110570 1600	13	6	VERY STIFF (10YR, 5/6) yellowish brown, silty clay, low plasticity, slightly moist.	cl	3.0	α: BG = 40
9	110571 1625	8	6	VERY STIFF (2.5Y, 5/4) light olive brown, low plasticity, silty clay, slightly moist	cl	2.0	
	110571 1625	10	6	SAA	cl	2.0	HNU = 0
10	110571 1625	15	6	VERY DENSE, (2.5Y, 6/6) olive yellow, clayey silt, slight plasticity, slightly moist	ml		α: BG = 40
	110572 1645	8	6	VERY STIFF, (2.5Y, 5/4) light olive brown, silty clay, nothing, slight-low plasticity, slightly moist	cl	2.0	
11	110573 1645	16	6	MEDIUM DENSE, (2.5Y 5/6) light olive brown, SAA, silty sand, trace gravel, moist, poorly graded	sm	2.5	HNU = 0
	110574 1645	21	6	SAA			α: BG = 40
12	110575 0955	16	6	DENSE, (2.5Y, 5/6) light olive brown, poorly graded silty sand, wet	sm		
	110575 0955	30	6	SAA			HNU = <1 ppm
13	110575 0955	29	6	VERY DENSE, (2.5Y, 6/1), gray, clayey silt, slight plasticity, moist, few sand	ml		α: BG = 70
	110575 0955	47	6	SAA			BACKGROUND 4/7/93 60-80 cpm
14	110576 1335	12	6	STIFF, (2.5Y, 5/6), light olive brown, silty clay, high plasticity, moist	cl	1.5	HNU = <1 ppm
	110577 1335	19	6	SAA		2.0	α: BG = 75 cpm
	110578 1335	NR	2ft	Shelby tube sampling			

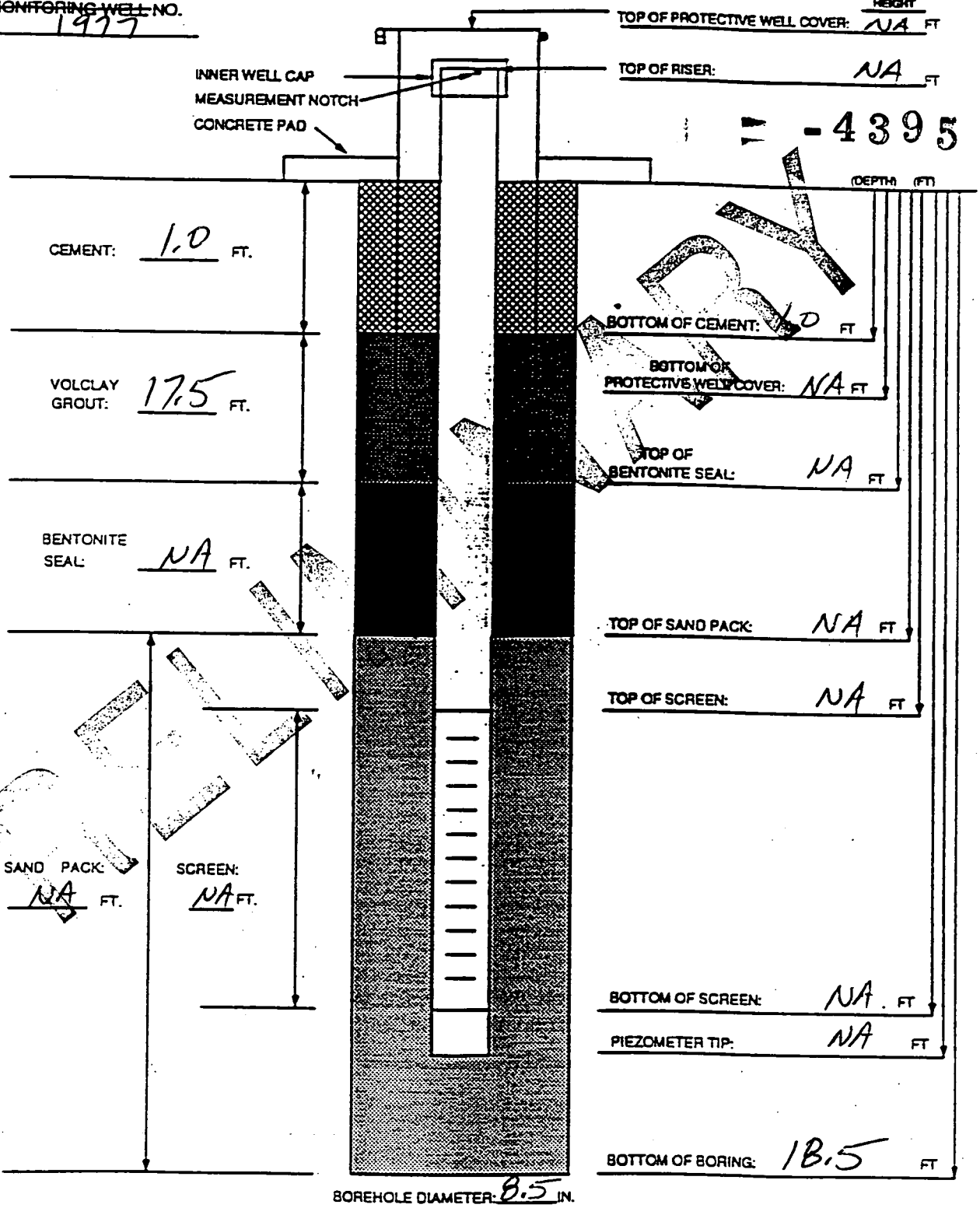
NOTES: 031 1345

SAMPLE 4/8/93

OWS 050393 ~~2 of 2~~ 4 of 5

FERNALD RI/FS
INSTALLATION DIAGRAM
~~MONITORING WELL~~ NO. 1977

INSTALLATION DATE: 040793



MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 3 1/2
AMOUNT OF CEMENT: 1 Bag
AMOUNT OF WATER USED: 10 gallons
OTHER: 1 soil, 1 water & Alconox Drum
TASK: 7.0.03.05

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/ N
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: J. Boyer

123

ASI FORM 0157 REV (0)

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FERNALD RI/FS

~~1 of 2~~ 50FS RAB 0503

PIEZOMETER INSTALLATION SHEET - 4395

PROJECT NAME OU-2 Southfield FIELD ENG./GEO. J. Boyer DATE 0407
PROJECT NO. 20.03.05 CHECKED BY _____ DATE _____
BORING NO. 1977
PIEZOMETER NO. NA DATE OF INSTALLATION 040793

BOREHOLE DRILLING

DRILLING METHOD Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT Hollow Stem Auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (NA)	
TOP OF RISER PIPE	NA		NA	
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	NA		NA	
BOREHOLE FILL MATERIALS: ~~GROUT/SLURRY~~ CEMENT	TOP 0.0	BOTTOM 1.0	TOP NA	BOTTOM
~~BENTONITE~~ VOLCLAY	TOP 1.0	BOTTOM 18.5	TOP NA	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP NA	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP NA	BOTTOM
PIEZOMETER TIP	NA		NA	
BOTTOM OF BOREHOLE	18.5		NA	
GWL AFTER INSTALLATION	NA		NA	

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

REMARKS _____

FEMALS
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. OU2 - Southfield		
BORING NUMBER 11018	COORDINATES.		DATE 4/16/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED 04/6/93
ENGINEER/GEOLOGIST J. Regan / J. Bryan	Depth	Date/Time	DATE COMPLETED 04/7/93
DRILLING METHODS hollow stem auger			PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS βγ background - 50cpm HNu - <1ppm
1	112595 1015	2	6	Soft, (10YR2/1) Black, silty fine sand, low plasticity, wet	ML	0.5	βγ - 50 cpm
	112596 1015	7	6	Soft, 2.5Y 4/4 olive brown, silty fine sand, wet, low plasticity	ML	0.5	HNu = <1ppm
	112597 1015	10	6	Stiff, 2.5Y4/4 olive brown silty clay, wet, slightly plastic, gravels	CL	2.0	
2	112598 1025	7	6	SAA	CL		βγ = 50cpm
	112599 1025	12	4	SAA	CL		HNu = <1ppm
		24	0	No recovery			
3	112600 1345	2	6	Stiff, 2.5Y4/4 olive brown, silty clay, wet, slightly plastic	CL	2.0	βγ = 45cpm
	112601 1345	11	6	loose, 10YR6/3, pale brown, silty gravel, dry. cemented	GM		HNu = <1ppm
4	112602 1345	10	2	loose, 10YR 4/4, dark yellowish brown moist	SP		
5	112603 1410	1	6	SAA			βγ = 55cpm
	112604 1410	10	6	SAA			HNu = <1ppm
		17	0	No recovery			
6	112605 1430	22	6	Dense, SAA			βγ = 50cpm
	112606 1430	26	6	Dense, SAA			HNu = <1ppm
7	112607 1430	31	4	Dense, 10YR 4/4, dark yellowish brown, gravelly sand, moist	GP		

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment CME 45
Driller Joe Reab
Roger Davis

SAA - Same as above
NA - Not Applicable

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

FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. OU2 - Southfield	
BORING NUMBER 11018	COORDINATES.	DATE 4/16/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 4/16/93
ENGINEER/GEOLOGIST J. Regan/J. Boyer	Depth Date/Time	DATE COMPLETED. 041793
DRILLING METHODS Hollow stem auger		PAGE 2 OF ~~8~~ 6

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (ISF)	REMARKS
8	112608 1445	17	6	medium dense, 10YR 4/4, dark yellowish brown, poorly graded sand, moist	SP		
	112609 1445	24	6	medium dense, 10YR 5/3, brown, poorly graded sand, moist	SP	NA	βγ = 45 cpm
9	NA	32	0	~~dense~~ No recovery	NA		HNu = <1 ppm
	112610 1500	7	6	Loose, 10YR 4/4 dark yellowish brown poorly grading sand, moist	SP		βγ = 40 cpm
	112611 1500	22	6	medium dense, 10YR 4/4 dark yellowish brown poorly graded sand, moist	SP	NA	HNu = <1 ppm
10	112612 1500	35	2	dense, 10YR 4/4 dark yellowish brown, poorly graded sand, moist	SP		
11	112613 1530	25	6	dense, 10YR 4/4 dark yellowish brown, poorly graded sand, moist	SP		βγ = 50 cpm
	112614 1530	32	6	dense, 10YR 4/4 dark yellowish brown poorly graded sand, moist	SP	NA	HNu = <1 ppm
12	112615 1530	57	6	very dense, 10YR 4/4 dark yellowish brown poorly graded sand, moist	SP		
	112616 0930	8	6	VERY DENSE, (10YR, 4/4) DARK YELLOWISH BROWN, POORLY GRADED SAND W/ GRAVEL, MOIST	SP		βγ = 45 cpm
13	112617 0930	21	6	SAA	SP	NA	MT = 1.2 ppm
	112618 0930	35	4	SAA	SP		
	112619 0945	20	6	VERY DENSE, (10YR 4/6) DARK YELLOWISH BROWN, POORLY GRADED SAND W/ GRAVEL, MOIST	SP		βγ = 50
14	112620 0945	28	6	SAA	SP	NA	MT = 1.0 ppm
	112621 0945	30	6	SAA	SP		

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment CME-45
Driller Joe Raab
Roger Davis

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

FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. SOUTHFIELD OU-2	
BORING NUMBER 11018	COORDINATES.	DATE 041793
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 041693
ENGINEER/GEOLOGIST J. BOYER	Depth Date/Time	DATE COMPLETED. 041793
DRILLING METHODS HOLLOW STEM AUGER		PAGE 3 OF 6

ecb 050493

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15	112622 1000	12	6	VERY DENSE, (10YR 4/6) DARK YELLOWISH BROWN, POORLY GRADED SAND W GRAVEL, TRACE SILT, MOIST	SP		Bγ = 25 cpm
16	112623 1000	47	6	SAA	SP	NA	MT = 1.5 ppm
	112624 1000	28	4	SAA	SP		
17	112625 1010	22	6	VERY DENSE, (10YR 4/6), DARK YELLOWISH BROWN, POORLY GRADED GRAVEL W SAND; MOIST	GP		Bγ = 50 cpm
	112626 1010	38	6	SAA	GP	NA	MT = 1.2 ppm
18	112627 1010	51	3	SAA	GP		
	112628 1025	8	6	MEDIUM DENSE, (10YR 4/6) DARK YELLOWISH BROWN, POORLY GRADED SAND W GRAVEL, MOIST TO WET.	SP		Bγ = 40 cpm
19	112629 1025	11	6	SAA	SP	NA	MT = 1.3 ppm
		15	0	~~SAA~~ ecb	NA		
20	112630 1040	9	6	DENSE, (10YR 4/6) DARK YELLOWISH BROWN, POORLY GRADED SAND W GRAVEL, WET	SP		Bγ = 50 cpm
	112631 1040	18	6	SAA	SP	NA	MT = 2.7 ppm
	NA	18	0	~~SAA~~ ecb			
21	112632 1450	Heb		HYDROPUNCH DESTRUCTIVE DRILLING	NA		GW SAMPLE 21-24 ft
		NA	NA		NA	NA	
22	112633 1450	H.ecb			NA		

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment CME-45
Driller JOE RAAB
ROGER DAVIS

SAA - Same as above
NA - Not Applicable
MT = MICROTIP
Samples collected per ASTM standard penetration tes
Colors identified using Munsell Color Char

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER 20.03.05	PROJECT NAME. Southfield OU-2		
BORING NUMBER 1101B	COORDINATES.	DATE 041793	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 041693	
ENGINEER/GEOLOGIST J. Boyer	Depth Date/Time	DATE COMPLETED 041793	
DRILLING METHODS Hollow Stem Auger		PAGE 4 OF ~~4~~ 6	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (ASF)	REMARKS
23	112634 1450 OP	8	OP	HYDRO PUNCH / DESTRUCTIVE DRILLING	NA		low sample collected from 21-24ft
		13	OP		NA	NA	
24	112637	17	OP		NA		
	112635 1500	8	6 OP	MEDIUM DENSE, (10YR, 4/4) DARK YELLOWISH BROWN, POORLY GRADED SAND, WET	SP		βγ = 50cpm
	112636 1500	13	6	SAA	SP		MT = 0.9ppm
25	NA	17	0	NA			
				BOTTOM OF BORING 25.5 ft			
26							
27							
28							
29							
30							

OVB 050493

041793

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment CME-45
Driller JOE RAAB
RODGER DAVIS

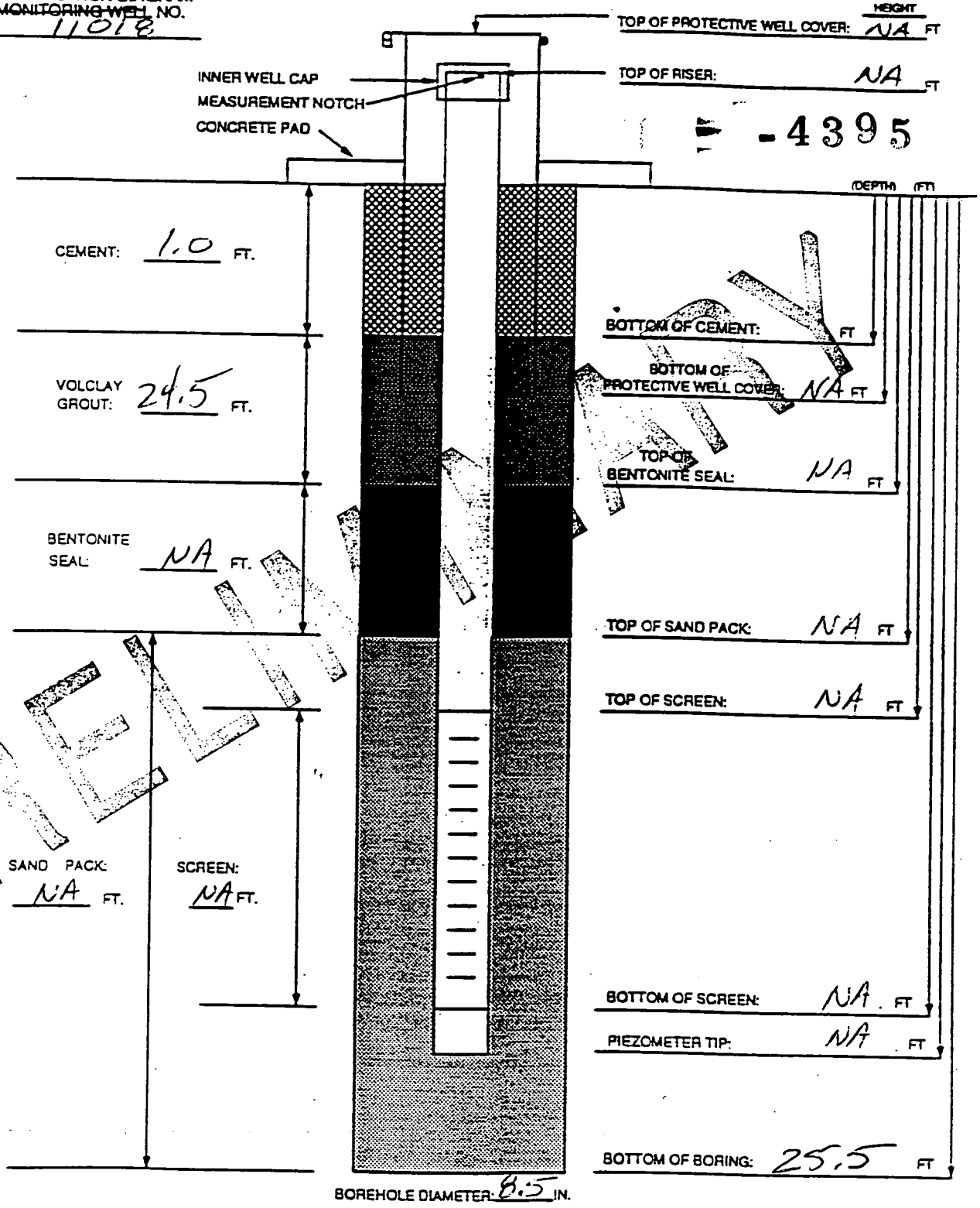
SAA - Same as above
NA - Not Applicable
MT = MICROTIP
Samples collected per ASTM standard penetration test
Colors identified using Munsell Color Chart

5/317

5 OF 6 ~~2 OF 2~~ 9KB050393

FERNALD RI/FS
INSTALLATION DIAGRAM
~~MONITORING WELL~~ NO. 11018

INSTALLATION DATE: 041293



MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 3 Bags
AMOUNT OF CEMENT: 1 BAG
AMOUNT OF WATER USED: 15 gallons
OTHER: 1 Soil, 1 WATER Drum
TASK: 20.03.05

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT.
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BEL GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: J. Royer

PRELIMINARY

FERNALD RI/FS

~~1 of 2~~ OU3050393 6 of 6

PIEZOMETER INSTALLATION SHEET 4395

PROJECT NAME OU-2 Southfield FIELD ENG./GEO. J. Boyer DATE 041
PROJECT NO. 20.03.05 CHECKED BY _____ DATE _____
BORING NO. 11018
PIEZOMETER NO. NA DATE OF INSTALLATION 041793

BOREHOLE DRILLING

DRILLING METHOD Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT Hollow Stem Auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (NA)	
TOP OF RISER PIPE	NA		NA	
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	NA		NA	
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~ CEMENT	TOP 0.0	BOTTOM 1.0	TOP NA	BOTTOM
~~BENTONITE~~ VOLCLAY	TOP 1.0	BOTTOM 25.5	TOP NA	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP NA	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP NA	BOTTOM
PIEZOMETER TIP	NA		NA	
BOTTOM OF BOREHOLE	25.5		NA	
GWL AFTER INSTALLATION	NA		NA	

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

REMARKS _____

FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. Southfield OU-2	
BORING NUMBER 1971	COORDINATES.	DATE 4/15/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 4/15/93
ENGINEER/GEOLOGIST J. Boyer/J. Reagan	Depth Date/Time	DATE COMPLETED.
DRILLING METHODS 8 1/2" Hollow stem auger		PAGE 1 OF 4

OLB 05039

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (")	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS: βγ background 50cpm; HNu = 0ppm
1	112530 830	3	6	medium stiff, (2.5Y5/3) light olive brown silty fine sand, low plasticity, moist	ml	1.0	
	112531 830	3	6	very stiff, (2.5Y4/3) olive brown, silty clay, low plasticity, moist	cl	3.5	βγ = 50cpm
	112532 830	5	6	stiff (2.5Y4/3) olive brown, silty clay, low plasticity, moist	cl	1.25	HNu = <1ppm
2	~~112533~~ 845	7	0	No recovery			
	~~112534~~ 845	7	0	No recovery			
	~~112534~~ 845	7	0	No recovery			
3	~~112535~~ 112533 900	7	6	soft (2.5Y 4/3) olive brown, silty fine sand, low plasticity, moist	ml	0.75	βγ = 40cpm
	112534 900	9	6	stiff, (2.5Y4/3) olive brown, silty clay, low plasticity, moist	cl	1.75	HNu = <1ppm
4	112535 900	15	4	medium stiff, (2.5Y5/3) light olive brown, silty fine sand, moist	ml	0.50	
	112536 905	3	6	stiff, (10YR 4/4) dark yellowish brown, silty clay, slightly plastic, moist	cl	1.0	βγ = 50cpm
5	112536 905	7	6	stiff (10YR 4/4) dark yellowish brown silty fine sand, low plasticity, moist	ml	1.75	HNu = <1ppm
	112536 905	15	6	stiff (10YR 4/6) dark yellowish brown silty clay, low plasticity, moist	cl	1	
6	112536 905	19	6	very stiff (2.5Y5/4) light olive brown silty fine sand, low plasticity, moist	ml	2.75	
	112537 915	25	6	very stiff (2.5Y5/4) light olive brown silty clay, slightly plastic, moist	cl	3.5	βγ = 50cpm
7	112538 915	30	6	SAA	cl	3.75	HNu = <1ppm

Drilling Contractor Pennsylvania Drilling
Drilling Equipment CME-45
Driller Joe Raab
Roger Davis

SAA - Same as above
NA - Not Applicable

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

FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. Southfield OU-2	
BORING NUMBER 1971	COORDINATES.	DATE 4/15/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 4/15/93
ENGINEER/GEOLOGIST J. Reagan / J. Boyer	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS		PAGE 2 OF 4

Sub 050343

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (")	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	112539 915	42	3	SAA	cl	3.5	
	112540 935	6	6	SAA	cl	3.5	βγ = 50cpm
9	112541 935	15	6	SAA	cl	3.5	HNu = <1ppm
	112592 935	25	3	SAA	cl	3.25	
10	112593 1000	5		very stiff (10YR 5/4) yellowish brown, silty clay, slightly plastic, moist	cl	3.5	βγ = 50cpm
		24		very stiff (10YR 5/4) yellowish brown, (2.5Y 7/1) light gray mottles, silty clay slightly plastic, moist	cl	4.0	HNu = <1ppm
		37		very stiff (10YR 5/4) yellowish brown, (2.5YR 4/6) strong brown mottles, (2.5Y 7.1) light gray mottles, silty clay, slightly plastic, moist	cl	4.0	
11	112593 1000	33		very stiff (2.5Y 5/6) light olive brown, (2.5Y 7/1) light gray mottles, silty clay, slightly plastic, moist	cl	3.0	
				Bottom of boring 11.5 Ft			

NOTES

Drilling Contractor Pennsylvania Drilling

Drilling Equipment _____

Driller _____

SAA - Same as above

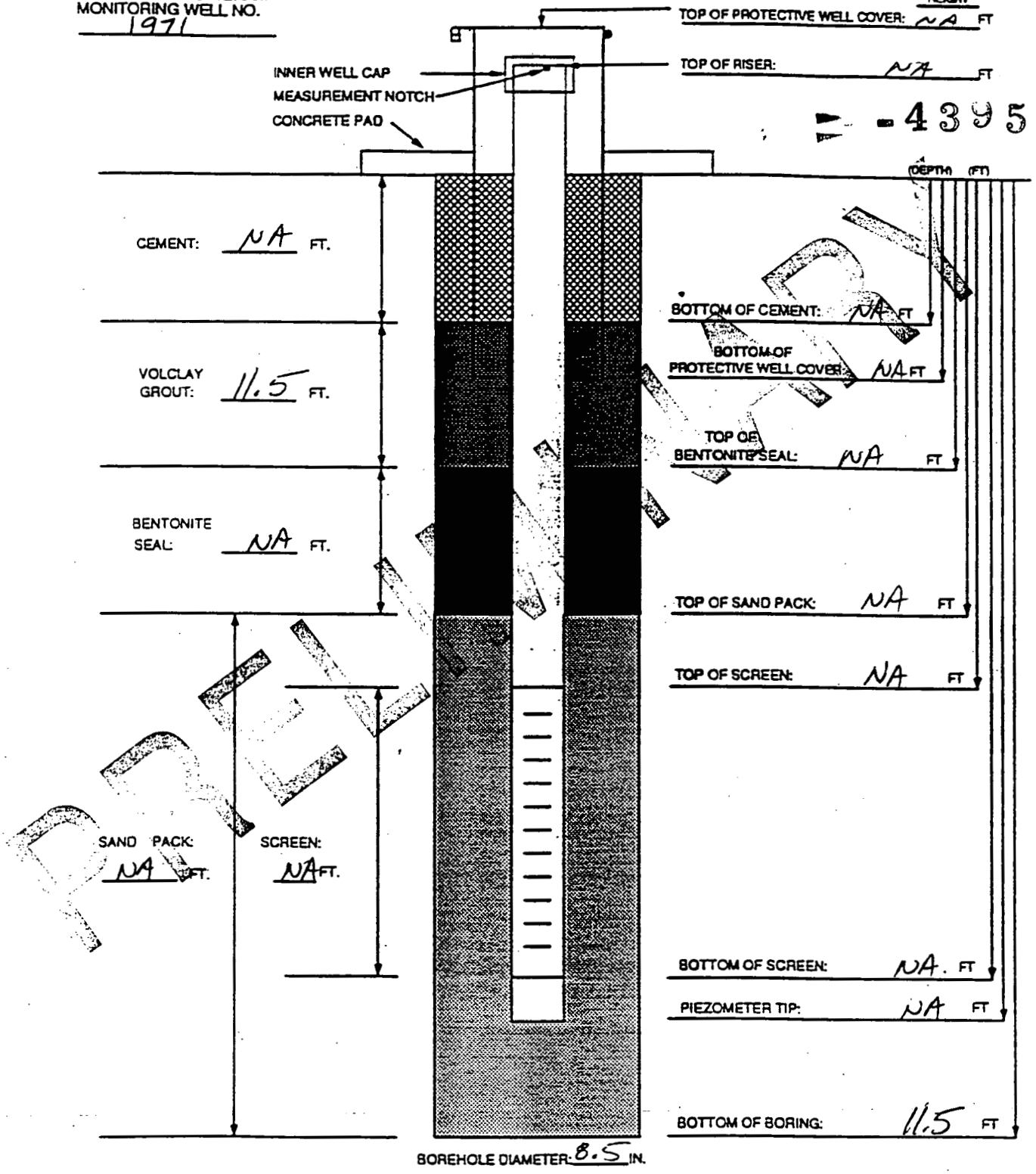
NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 1971

INSTALLATION DATE: 041593



PRELIMINARY

MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 1.5
AMOUNT OF CEMENT: NA
AMOUNT OF WATER USED: 8 gallons
OTHER: 1 DRUM SOIL, 1 WATER + ALCONOX
TASK: 20.03.05

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/ __
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: J. REAGAN

ASI FORM 0157 REV. (0)

4 OF 4

FERNALD RI/FS

- -4305

PIEZOMETER INSTALLATION SHEET

PROJECT NAME South field OU-2 FIELD ENG./GEO. J. REAGAN DATE 04/15
PROJECT NO. 20.03.05 CHECKED BY J. BOYER DATE 04/15
BORING NO. 1971
PIEZOMETER NO. NA DATE OF INSTALLATION 041593

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT AUGER
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA
NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 11.5	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	11.5			
GWL AFTER INSTALLATION	NA			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☐
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☐
REMARKS Borehole was abandoned using bolclay ~~cem~~ from the bottom to ground surface

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FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. Southfield OU-2	
BORING NUMBER 1972/SF-SB-04	COORDINATES.	DATE 040893
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 040893
ENGINEER/GEOLOGIST J. Boyer	Depth Date/Time	DATE COMPLETED. 040895
DRILLING METHODS Hollow Stem		PAGE 1 OF ~~8~~ 4

DEPTH	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	110583 1015	5	6	MEDIUM DENSE (2.5Y, 5/3) Light olive Brown, CLAYEY SILT, w/SAND & GRAVEL, slight plasticity, SCI, moist	ml		HNU = <3
	110583 1015	15	6	SAA			Bγ = 500cpm
1	110583 1015	13	0				
	110583 1015	10	6	VERY STIFF, (2.5Y, 5/6) light olive Brown, SILTY CLAY WITH GRAVEL, low plasticity, slightly moist	cl	3.0	Bγ = 100cpm HNU = <3
2 1015	110583	10	6	SAA		3.5	
	110584 1045	22	4	VERY STIFF (2.5Y, 5/6) light olive Brown, SILTY CLAY, low plasticity, slightly moist.	cl	3.5	
3	110584 1045	13	6	HARD, (10YR, 5/6) yellowish Brown, SILTY CLAY, low plasticity, slightly moist, iron stained.	cl	4.5	HNU = <3ppm Bγ = 80-100cpm
	110584 1045	17	6	SAA		4.0	
4	110584 1045	28	4	SAA			
	110586 1315	7		LOOSE (2.5Y, 5/4) light olive Brown, CLAYEY SILT, TRACE GRAVEL, DRY, low PLASTICITY.	ml		HNU = <3ppm Bγ = 100-120
5	112492 1315	12	6	VERY STIFF (10YR, 5/6) yellowish Brown, SILTY CLAY, low plasticity, dry-moist	cl	3.5	
	112493 1315	14	4	VERY STIFF (10YR, 5/8) yellowish Brown, low-med plasticity, moist SILTY CLAY	cl	3.0	
6		8		NO RECOVERY			HNU = Bγ =
		13					NO RECOVERY AND DRILLER HAD ALREADY NEXT ADVANCED TO INTERVAL
7		22					

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment CME-45
Driller JOE RAAB
RODGER DAVIS

SAA - Same as above
NA - Not Applicable

Samples collected per ASTM standard penetration te
Colors identified using Munsell Color Char-

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FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1972/SF-SB-04	COORDINATES:	DATE: 040893	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 040893	
ENGINEER/GEOLOGIST: J. Boyer	Depth Date/Time	DATE COMPLETED: 040893	
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 2	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	112494 1345	5		LOOSE, (2.5Y, 5/6) light olive brown, clayey sandy silt, fine sand, moist	SC		Hnu = <3ppm α = Bδ = 80
	112494 1345	8		LOOSE, (2.5Y, 6/6) olive yellow, clayey silt, w/ fine sand, moist, slight plasticity	ML		
	112494 1345	11		SAA			
9	112495 1400	7		LOOSE, (2.5Y, 5/6) light olive brown, clayey silt w/ fine sand, slight plasticity, moist	ML		Hnu = <3ppm α = Bδ = 80
	112496 1400	12		VERY STIFF (2.5Y, 5/6) light olive brown, silty clay, med plasticity, moist	CL	3.0	
10	112497 1400	20		VERY STIFF, (2.5Y, 6/4) light yellowish brown, low plasticity, moist, silty clay	CL	3.5	
11				10'/2 Bottom of Boring			Hnu = α = Bδ =
12							
13							Hnu = α = Bδ =
14							Hnu = α = Bδ =

NOTES:

Anthro cs

Concentrations of <3ppm were considered Background according Jack Patrick (IH)

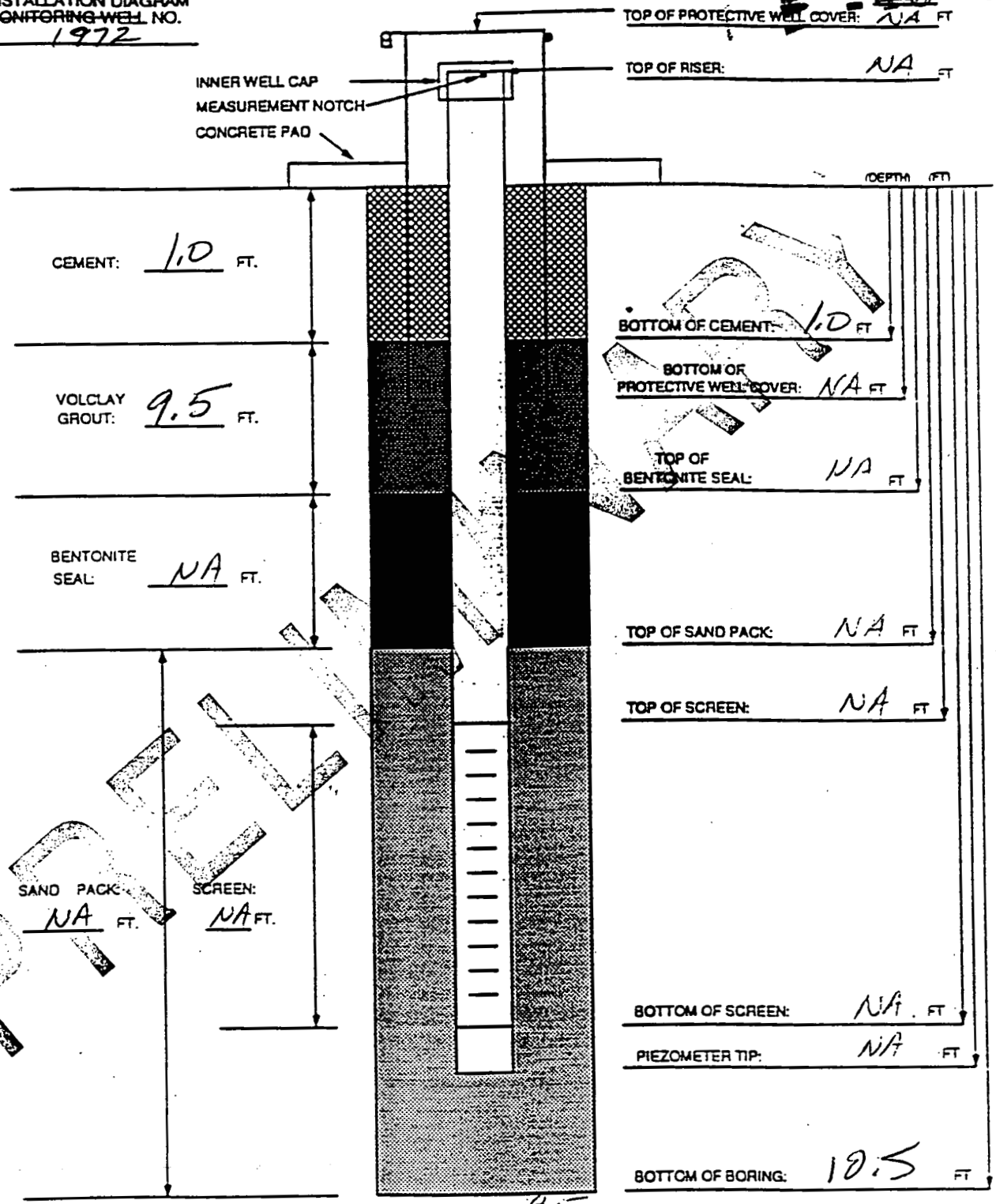
2 of 2 3 of 4

FERNALD RI/FS
INSTALLATION DIAGRAM
~~MONITORING WELL~~ NO. 1972

INSTALLATION DATE: 040893

TOP OF PROTECTIVE WELL COVER: NA FT

TOP OF RISER: NA FT



BOREHOLE DIAMETER: 8.5 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 2
AMOUNT OF CEMENT: 1 BAG
AMOUNT OF WATER USED: 5 gallons
OTHER: 1 soil drum, 1 water drum
TASK: 20.03.05

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA
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: J. Royer

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ASI FORM 0157 REV (0)

FERNALD RI/FS

~~1 of 2~~ 4 of 4
OU 05035

PIEZOMETER INSTALLATION SHEET -4395

PROJECT NAME OU-2 Southfield FIELD ENG./GEO. J. Boyer DATE 4/08
PROJECT NO. 20.03.05 CHECKED BY _____ DATE _____
BORING NO. 1972
PIEZOMETER NO. NA DATE OF INSTALLATION 040893

BOREHOLE DRILLING

DRILLING METHOD Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT Hollow Stem Auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (NA)	
TOP OF RISER PIPE	NA		NA	
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	NA		NA	
BOREHOLE FILL MATERIALS: ~~GROUT/SLURRY~~ CEMENT	TOP 0.0	BOTTOM 1.0	TOP NA	BOTTOM
~~BENTONITE~~ VOLCLAY	TOP 1.0	BOTTOM 10.5	TOP NA	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP NA	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP NA	BOTTOM
PIEZOMETER TIP	NA		NA	
BOTTOM OF BOREHOLE	10.5		NA	
GWL AFTER INSTALLATION	NA		NA	

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

REMARKS

FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. OU-2 Southfield		
BORING NUMBER 1973 (SF-58-10)	COORDINATES.		DATE 041295
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED 041293
ENGINEER/GEOLOGIST J Boyer	Depth	Date/Time	DATE COMPLETED 041293
DRILLING METHODS Hollow Stem Auger 8 1/2			PAGE 1 OF 2

OLD 050393 4

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	112500 1030	6	6	DENSE, (2.5y, 4/4) olive brown, clayey silt, moist, slightly plastic	ml		HNU = <1 ppm
	112501 1030	10	6	SAA			Bγ = 80 cpm
1	112502 1030	25	2	Dense, (2.5y, 5/6) light olive brown, clayey silt with gravel, cobble size to to coarse sand, moist	ml		
	112503 1045	28	6	Dense (2.5y, 5/4) light olive brown, silty gravel, cobbles to coarse sand, moist, odor (methane) stained blue green	GM		Bγ = 80 cpm HNU = 5 ppm
2		9	0	cl ~~SAA~~ 9cb			large cobble stained (5B 4/4) dark bluish gray. methane odor
		21	0	~~SAA~~ 9cb			
3	112504 1055	10	6	Medium loose (2.5y, 4/3) olive brown clayey silt w gravel, pebbles to coarse, slight plasticity, moist.	ml		HNU = <1 Bγ = 60 cpm
	112505 1055	11	6	Stiff, (2.5y 5/6), light olive brown, silty clay, medium plasticity, moist.	cl	2.0	
4	112506 1055	15	6	SAA		2.0	
	112507 1415	5	6	Medium dense, (2.5y 5/4) light olive brown silty sand with clay, low plasticity, moist.	ml	1.5	HNU = <1 Bγ = 60 cpm
5	112507 1415	3	6	SAA		0	
	112507 1415	5	6	SAA		1.0	
6	112507 1415	8	5	SAA		0.5	HNU = <1 Bγ = 60 cpm
	112508 1430	8	6	Medium dense (2.5y, 5/6) light olive brown, silty sand with clay, low plasticity moist.	ml		
7	112509 1430	10	6	Stiff (2.5y, 5/6) light olive brown, silty clay, medium plasticity, wet	ml cl	2.0	

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment SKID RIG CME 45
Driller JOE RAAB
RODGER DAVIS

SAA - Same as above
NA - Not Applicable

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

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FERNALD
RI/FS.

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1973 (SFSB-10)	COORDINATES:	DATE: 041293
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 041293
ENGINEER/GEOLOGIST: J Boyer	Depth Date/Time	DATE COMPLETED: 041293
DRILLING METHODS: AUGER (HOLLOW STEM) 8 1/2		PAGE 2 OF 2

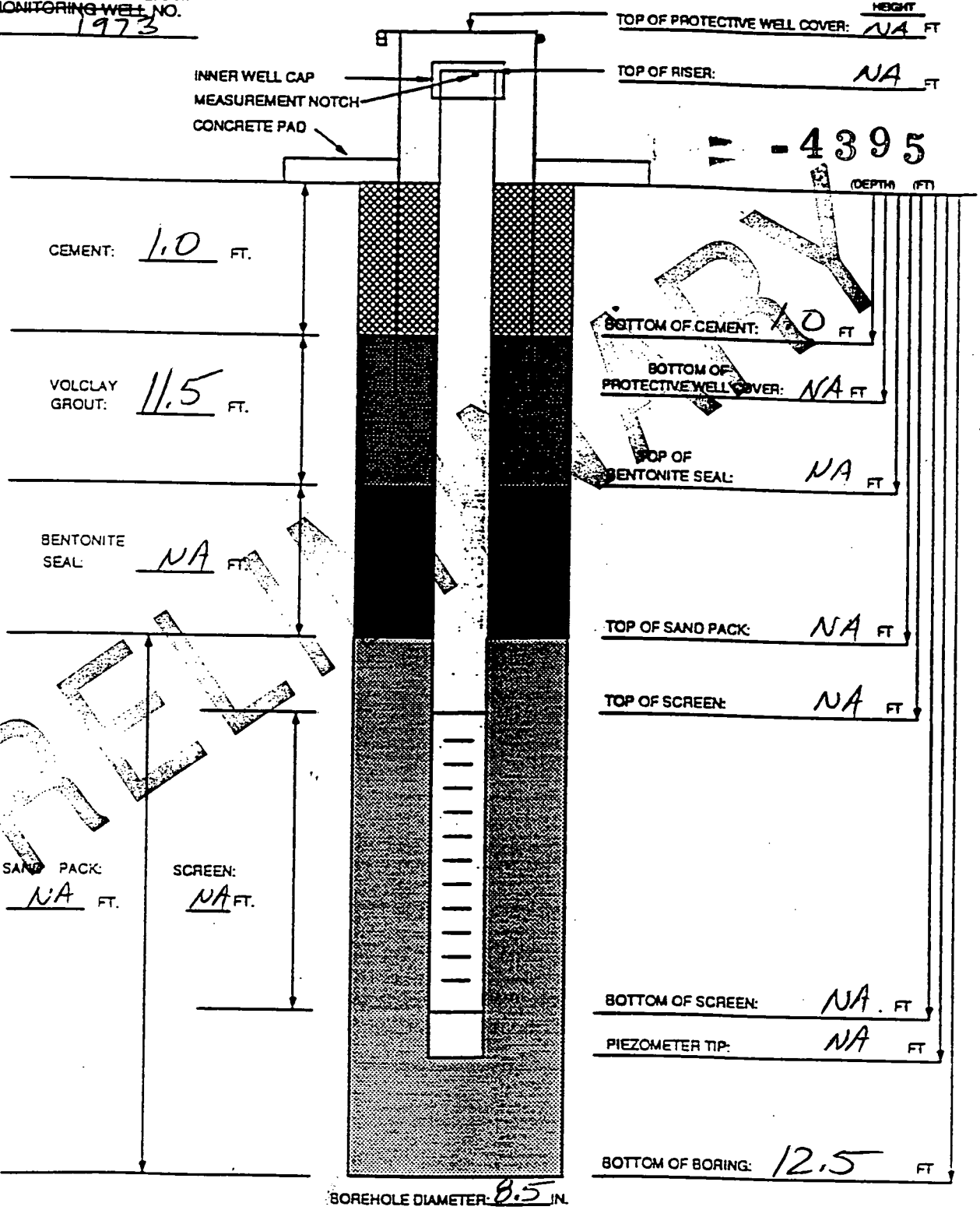
DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	112510 1430	14	6	SAA		2.0	HNU = <1
8	112511 1445	5	6	Very stiff, (2.5y, 5/4) light olive brown, silty clay, low plasticity, moist.	cl	3.5	α = Bq = 60cpm
	112512 1445	8	6	SAA		3.0	
9	112513 1445	16	6	Very stiff (2.5y, 5/6) light olive brown, silty clay, low plasticity, slightly moist.	cl	3.0	HNU = <1
	112514 1500	3	6	Medium dense, (2.5y 5/6) light olive brown, clayey silty gravel, moist.	ml		α = Bq = 60cpm
10	112514 1500	5	6	Medium dense (2.5y 5/6), light olive brown, silty sand with gravel, moist	SM		
	112514 1500	7	6	SAA			HNU = <1
11	112514 1500	8	6	" SAA			α = Bq = 60cpm
	112515 1520	9	6	SAA			
12	112516 1520	18	6	Medium dense (2.5y 5/6), light olive brown, silty sand w/ gravel, wet	SM		HNU = <1
				Bottom of Boring			α = Bq = 60cpm
13				12.5 ft.			
14							HNU = α = Bq =

NOTES:

3 of 4 ~~2 of 2~~ 298 0503

FERNALD RI/FS
INSTALLATION DIAGRAM
~~MONITORING WELL~~ NO. 1973

INSTALLATION DATE: 041293



MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 2
AMOUNT OF CEMENT: 1 Bag
AMOUNT OF WATER USED: 1 SOIL, 1 WATER DRUMS
OTHER: 5 gallons
TASK: 7.0.03.05

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/
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: J. Boyer

~~1 of 2~~ 9W 050393

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET 4395

PROJECT NAME OU-2 Southfield FIELD ENG./GEO. J. Boyer DATE 04/12
PROJECT NO. 20.03.05 CHECKED BY _____ DATE _____
BORING NO. 1973
PIEZOMETER NO. NA DATE OF INSTALLATION 04/12/93

BOREHOLE DRILLING

DRILLING METHOD Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT Hollow Stem Auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (NA)	
TOP OF RISER PIPE	NA		NA	
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	NA		NA	
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~ CEMENT	TOP 0.0	BOTTOM 1.0	TOP NA	BOTTOM
~~BENTONITE~~ VOLCLAY	TOP 1.0	BOTTOM 12.5	TOP NA	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP NA	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP NA	BOTTOM
PIEZOMETER TIP	NA		NA	
BOTTOM OF BOREHOLE	12.5		NA	
GWL AFTER INSTALLATION	NA		NA	

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

REMARKS

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RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. South Field OU-2		DATE 042093
BORING NUMBER 1965	COORDINATES.		DATE STARTED 042093
ELEVATION:	GWL: Depth	Date/Time	DATE COMPLETED 042193
ENGINEER/GEOLOGIST J. Boyer	Depth	Date/Time	PAGE 1 OF 6
DRILLING METHODS Hollow Stem Auger			

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	112735 0920	4 4 5 8	6 6 6 5	Medium Dense (2.5y 5/6), light olive brown, clayey silt, low plasticity, organic material.	ML	NA	Bγ = 60cpm MT = 0.6ppm
				SAA	ML	NA	
				Medium Dense, (2.5y 6/6), olive yellow, silty sand, moist-wet.	OH MT SM	NA	
				SAA	ML	NA	
2	112736 0930	NA	9B offset AA 18	Shelby Tube	NA	NA	NA
3				Very Dense, (2.5y 5/6) light olive brown, clayey silt with gravel, slight plasticity, dry	ML/CL	NA	Bγ = 60cpm MT = 0.3ppm
4	112737 1010	12 11 31 24	6 6 6 2	SAA	ML/CL	NA	
				SAA	ML/CL	NA	
5				SAA 9B	ML/CL	NA	
6	112738 1035	8	6	Medium Dense, (5y 4/4) olive, clayey silt with sand and gravel, low-med-plasticity, dry	ML	NA	Bγ = 60cpm MT = 0.4ppm
				SAA	ML	NA	
	112739 1035	12 15	6 0	No Recovery SAA 9B OSU 3-3	ML	NA	
7							

SAA - Same as above
NA - Not Applicable
MT = MICROTYP

NOTES
Drilling Contractor Pennsylvania Drilling
Drilling Equipment CME-45
Driller Joe Davis / Roger Davis

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

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RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. SOUTH HELD OU-2		
BORING NUMBER 1965	COORDINATES.		DATE 04/20/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED 04/20/93
ENGINEER/GEOLOGIST J. BOYER	Depth	Date/Time	DATE COMPLETED 04/21/93
DRILLING METHODS HOLLOW STEM AUGER			PAGE 2 OF 6

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	112740 1050	5 4 8	6	MEDIUM DENSE, (5GY 5/1) GREENISH GRAY, CLAYEY SILT TRACE SAND GRAVEL, MOIST.	ML	NA	BZ = 80cpm MT = 0.8ppm
	NA		0	NA	NA	NA	
	NA		0	NA	NA	NA	
9	112741 1100	3 3 4	6	MEDIUM STIFF, (5Y, 5/4) OLIVE, SILTY CLAY, WITH GRAVEL & SAND, MOIST-WET, BLACK CLAY NODULES.	CL	1.0	BZ = 60cpm MT = 0.5ppm
10	112742 1100		4	SAA	CL	0.5	
	NA		0	NA	NA	NA	
11	112743 1300	6 7 8	6	MEDIUM STIFF, (5GY 4/1) DARK GREENISH GRAY, SILTY CLAY, TRACE GRAVEL MED-HIGH PLASTICITY, BLACK CLAY NODULES, MOIST	CL	.75	BZ = 120cpm MT = 0.6ppm
	112744 1300		6	SAA	CL	.75	
			0	NA	NA	NA	
12	112745 1310	6 8 8	6	MEDIUM STIFF (5Y, 5/2) OLIVE GRAY, SILTY CLAY, TRACE GRAVEL, MED PLASTICITY, MOIST.	CL	.5	BZ = 60cpm MT = 0.0ppm
	112746 1312		6	SAA	CL	.75	
13	112747 1310		6	MEDIUM STIFF (5Y 3/2) DARK OLIVE GRAY, SILTY CLAY, MED PLASTICITY, MOIST	CL	.5	
14	112748 1320	5 7 8	6	SAA		.5	BZ = 60cpm MT = 0.0ppm
	112749 1320		6	SAA		.7	
15	112750 1320		2	SAA		.5	

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment CME-45
Driller JOE RAAB
RODGER DAVIS

SAA - Same as above.
NA - Not Applicable
MT - MICROTIP
Samples collected per ASTM standard penetration tes
Colors identified using Munsell Color Char

RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. Southfield OU-2		
BORING NUMBER 1965	COORDINATES.		DATE 042093
ELEVATION: 496 ft	GWL: Depth	Date/Time	DATE STARTED 042093
ENGINEER/GEOLOGIST J. Boyer	Depth	Date/Time	DATE COMPLETED 042193
DRILLING METHODS HOLLOW STEM AUGER			PAGE 3 OF 6

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15	112751 1330	2 3	6	VERY SOFT, (5Y, 3/2) DARK OLIVE GRAY, SILTY CLAY, TRACE GRAVEL MEDIUM PLASTIC, MOIST	CL	.25	BZ = 60cpm
16	112752 1330	3	6	SAA	CL	.25	MT = 0.0ppm
	NA		0	NA	NA	NA	
17	112753 1330	6	6	VERY SOFT (5Y 3/2) DARK OLIVE GRAY, SILTY CLAY, TRACE GRAVEL, MEDIUM PLASTICITY, MOIST	CL	.25	BZ = 60cpm
	NA	>50	0	SPLIT SPOON REFUSAL, HIT DOLOMITE, COBBLE (APPEARS TO BE CONCRETE OR CEMENTED GRAVEL)	NA	NA	MT = 0.0ppm
18	NA		0		NA	NA	
	112754 1430	12	6	VERY SOFT (5Y 4/4) OLIVE, SILTY CLAY, MED PLASTICITY, MOIST. ALSO CONCRETE, WOOD CHIPS, BOTTLE FRAGMENT	CL	0.25	BZ = 60cpm MT = 1.2ppm
19	NA	12	0	NA	NA	NA	
	NA	12	0	NA	NA	NA	
20	112755 1440	6 7	6	STIFF, (2.5Y 5/4) light OLIVE BROWN, SILTY CLAY, TRACE GRAVEL, LOW PLASTICITY, DRY	CL	1.5	BZ = 75cpm
	112756 1440	10	6	SAA	CL	1.75	MT = 1.0ppm
	NA		0	NA	NA	NA	
21	112758 0930	7	6	VERY SOFT, (5Y 4/3) OLIVE, SILTY CLAY, TRACE GRAVEL, SLIGHT PLASTICITY MOIST	CL	.25	BZ = 60
22	112759 0930	9 21	6	STIFF (10YR 4/6) DARK YELLOWISH BROWN, SILTY CLAY, TRACE GRAVEL, LOW PLASTICITY	CL	1.5	MT = 1.7ppm
	112760 0930		6	SAA	CL	2.0	

NOTES

Drilling Contractor Pennsylvania Drilling

Drilling Equipment CME-45

Driller JOE RAAB, RODGER DAVIS

SAA - Same as above

NA - Not Applicable

MT = microTIP

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

RI/FS

VISUAL CLASSIFICATION OF SOILS

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PROJECT NUMBER 20.03.05	PROJECT NAME. SOUTHFIELD OU-2		
BORING NUMBER. 1965	COORDINATES.		DATE 04/21/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED 04/20/93
ENGINEER/GEOLOGIST J. Bayer	Depth	Date/Time	DATE COMPLETED. 04/21/93
DRILLING METHODS HOLLOW STEM AUGER			PAGE 4 OF 6

DEPTH ft	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY IN	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS 2.0 ppm = BACKGROUND
23	112761 1000	4 7 16 32	6	STIFF, (10YR 4/6) DARK YELLOWISH BROWN, SILTY CLAY WITH GRAVEL, SLIGHT PLASTICITY, dry.	CL ML	1.5	BZ = 60cpm
			6	DENSE (10YR 5/4) YELLOWISH BROWN, CLAYEY SILT WITH GRAVEL, NO TO SLIGHT PLASTICITY, dry	ML	NA	MT = 2.0ppm
24			6	SAA	ML	NA	
	112761 1000		6	SAA	ML	NA	
25	112762 1020.	NA	NA	SHELBY TUBE	NA	NA	NA
26	112762 1020						
27	112763 1100	7 10 12 23	6	DENSE, (10YR 5/6) YELLOWISH BROWN, POORLY GRADED SAND, WITH GRAVEL, dry	SP	NA	BZ = 40cpm
			6	SAA	SP	NA	MT = 0.0ppm
28	112763 1100		6	SAA	SP	NA	
	112764 1100		6	SAA	SP	NA	
				BOTTOM OF BORING 28 1/2 FEET			

NOTES

Drilling Contractor Pennsylvania Drilling

Drilling Equipment CME-45

Driller JOE RAAB

RODGER DAVIS

SAA - Same as above

NA - Not Applicable

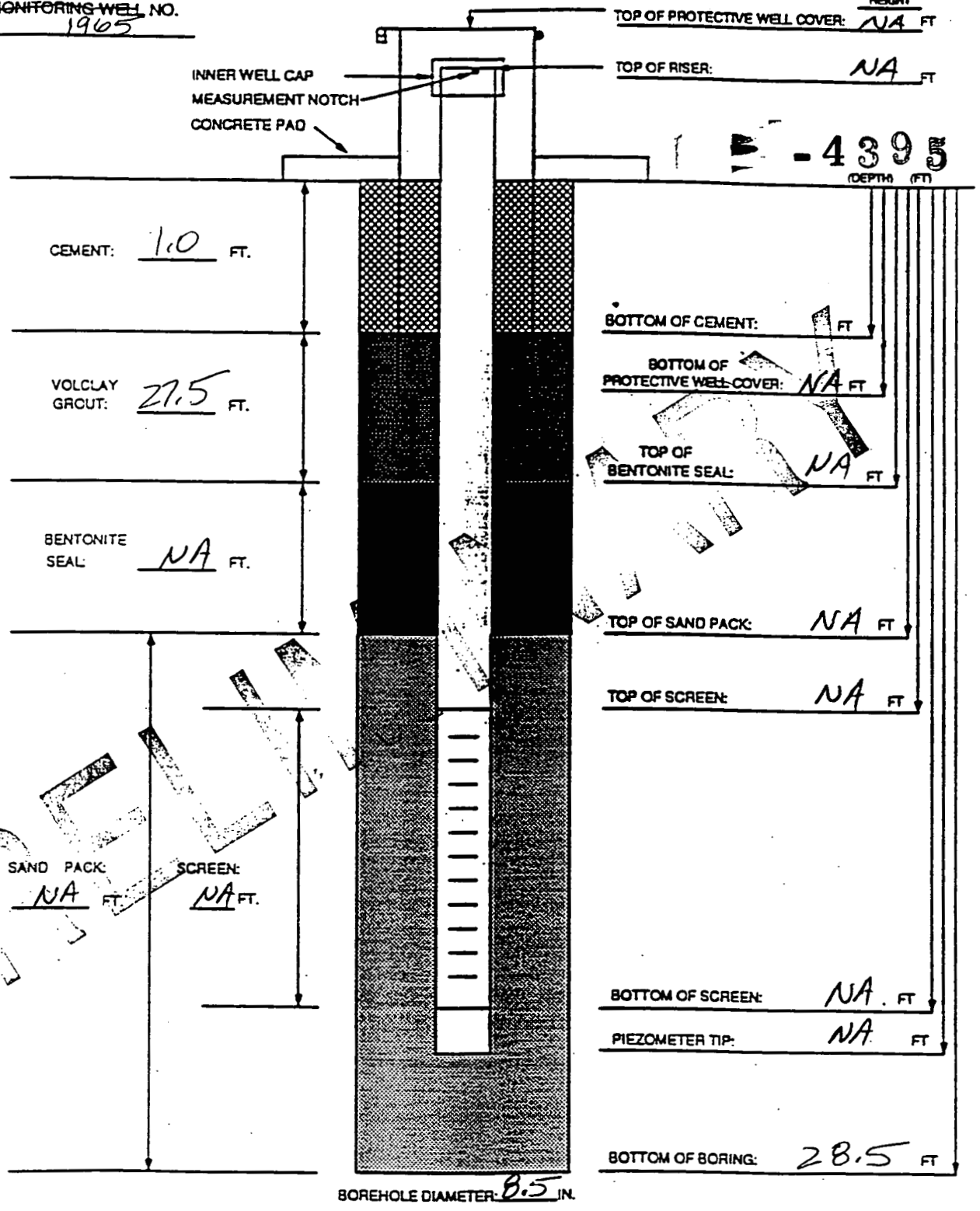
MT = MICROTIP

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

FERNALD RI/FS
INSTALLATION DIAGRAM
~~MONITORING WELL~~ NO. 1965

INSTALLATION DATE: 042193



TOP OF PROTECTIVE WELL COVER: HEIGHT NA FT
TOP OF RISER: NA FT
BOTTOM OF CEMENT: FT
BOTTOM OF PROTECTIVE WELL COVER: NA FT
TOP OF BENTONITE SEAL: NA FT
TOP OF SAND PACK: NA FT
TOP OF SCREEN: NA FT
BOTTOM OF SCREEN: NA FT
PIEZOMETER TIP: NA FT
BOTTOM OF BORING: 28.5 FT

MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 3 1/2
AMOUNT OF CEMENT: 1 Bag
AMOUNT OF WATER USED: 10 gallons
OTHER: 2 Soil Drums, 1 water Drum
TASK: 20.03.05

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/ A
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BELO GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: J. Boyer

ASI FORM 0157 REV (0)

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FERNALD RI/FS

E-4395

PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU-2 Southfield FIELD ENG./GEO. J. Boyer DATE 04/21
PROJECT NO. 20.03.05 CHECKED BY _____ DATE _____
BORING NO. 1965
PIEZOMETER NO. NA DATE OF INSTALLATION 04/21/93

BOREHOLE DRILLING

DRILLING METHOD Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT Hollow Stem Auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (NA)	
TOP OF RISER PIPE	NA		NA	
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	NA		NA	
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~ CEMENT	TOP 0.0	BOTTOM 1.0	TOP NA	BOTTOM
~~BENTONITE~~ VOLCLAY	TOP 1.0	BOTTOM 28.5	TOP NA	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP NA	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP NA	BOTTOM
PIEZOMETER TIP	NA		NA	
BOTTOM OF BOREHOLE			NA	
GWL AFTER INSTALLATION	NA		NA	

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

REMARKS _____

FERNALD
RI/FS

E--4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. Southfield OU-2		
BORING NUMBER 1967	COORDINATES.	DATE 041893	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 041893	
ENGINEER/GEOLOGIST J. Boyer	Depth Date/Time	DATE COMPLETED 041993	
DRILLING METHODS Hollow Stem Auger		PAGE 7 OF 7	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS Background 50-70cpm
1	112638 1310	9	6	MEDIUM DENSE, (2.5y, 5/4) light olive brown, clayey silt, slight moist, low plasticity	ml	NA	Bγ = 75cpm
	112639 1310	7	6	SAA	NA	NA	MT = 0.0ppm
	112640 1310	10	6	SAA	NA	NA	
2	112641 1320	11	6	MEDIUM DENSE, (2.5y 4/4) olive brown, clayey silt, slight plasticity, slightly moist. trace gravel	ml	NA	Bγ = 60cpm
	112642 1320	10	6	SAA	NA	NA	MT = 0.0ppm
	112643 1320	12	6	SAA	NA	NA	
3	112644 1335	4	6	MEDIUM DENSE (2.5y 4/4) olive brown, clayey silt, trace gravel, slight plasticity, sli. moist	ml	NA	Bγ = 75cpm
	112645 1335	12	8	SAA	NA	NA	MT = 0.2ppm
4	NA	15	0	NA	NA	NA	
5	112646 1345	11	6	very stiff, (2.5y 5/4) light olive brown, silty clay, trace gravel, low plasticity, sli. moist.	2.5	cl NA	Bγ = 100cpm
	1345 112646	14	6	stiff, (2.5y 5/4) light olive brown, silty clay, trace gravel, low plasticity sli. moist	1.5	cl NA	MT = 1.2ppm
6	NA	17	9 ob 07	push rock low recovery	NA	NA	
	NA	28	0	NA	NA	NA	
7	112646 1345	7	6	very dense, (2.5y, 5/4) light olive brown, clayey silt with gravel, low plasticity, slightly moist	ml	NA	Bγ = 75cpm
	112646 1345	18	6	SAA	NA	NA	MT = 1.1ppm

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment CME-45
Driller Joe Raab
Rodger Davis

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

FERNALD
RI/FS

E-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. Southfield OU-2		
BORING NUMBER 1967	COORDINATES.	DATE 041893	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 041893	
ENGINEER/GEOLOGIST J. Boyer	Depth Date/Time	DATE COMPLETED 041993	
DRILLING METHODS ~~Hollow~~ Hollow Stem Auger		PAGE 2 OF 7	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (")	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	112697 1350	27	6	VERY DENSE, (2.5Y 5/4) light olive brown CLAYEY SILT w/ gravel, low plasticity, slightly moist	ML	NA	Bq = 75cpm
	112698 1350	24	4	SAA	ML	NA	MT = 1.1ppm
9	112699 1405	4	6	MEDIUM DENSE, (2.5Y 5/4) light olive brown, CLAYEY SILT, TRACE GRAVEL, low plasticity, slightly moist	ML	NA	Bq = 70cpm
	112700 1405	5 6	6	SAA	ML	NA	MT = 1.2ppm
	NA		0	SAA	ML	NA	
10	112701 1425	3	6	SAA	ML	NA	Bq = 80-90cpm
11	112702 1425	7	6	MEDIUM DENSE, (5Y, 5/3) OLIVE, CLAYEY SILT, TRACE GRAVEL + organics, low plasticity, slightly moist	ML	NA	MT = 2.5ppm
	112703 1425	9	4	SAA	ML	NA	
12	NA	10	NA	NO RECOVERY	NA	NA	NA
	NA	10 15	NA	↓	NA	NA	
	NA		NA	NO RECOVERY	NA	NA	
13	112704 1445	7	6	MEDIUM DENSE, (5Y, 4/4) OLIVE, CLAYEY SILT, SLIGHT PLASTICITY, slightly moist	ML	NA	Bq = 75cpm
14	NA	16	0	NA	NA	NA	MT = 3.0ppm
	NA	21	0	NA	NA	NA	
	112705 1510	3	6	MEDIUM DENSE, (5Y, 5/3) OLIVE, CLAYEY SILT, LOW PLASTICITY, MOIST	ML	NA	
15							

Drilling Contractor Pennsylvania Drilling
Drilling Equipment CME-45
Driller JOE RAAB
RODGER DAVIS

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

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FERNALD
RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. Southfield OU-2		
BORING NUMBER 1967	COORDINATES.	DATE. 041893	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 041893	
ENGINEER/GEOLOGIST J. Boyer	Depth Date/Time	DATE COMPLETED. 041993	
DRILLING METHODS Hollow Stem Auger		PAGE 3 OF 7	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15	112706 1510	6	6	MEDIUM DENSE (5Y, 5/3) OLIVE, CLAYEY SILT, TRACE ORGANICS, LOW PLASTICITY, MOIST	ML	NA	BZ = 50cpm
	112707 1510	9	3	SAA	ML	NA	MT = 3.2ppm
16	112708 1520	9	6	DENSE, (5Y, 5/3) OLIVE, CLAYEY SILT TRACE ORGANICS, TRACE GRAVEL, LOW PLASTICITY, MOIST	ML	NA	BZ = 100cpm
	112709 1520	14	6	SAA	ML	NA	MT = 3.5ppm
17	112710 1520	17	4	DENSE, (5Y, 5/3) OLIVE, CLAYEY SILT, TRACE ORGANICS, LOW-MED. PLASTICITY, MOIST ORGANIC ODOR	ML	NA	ODOR - ~~PETROLEUM~~
	112711 0845	4	6	SOFT, (5Y, 4/4); OLIVE SILTY CLAY W SAND, TR. GRAVEL, MED PLASTIC. MOIST ORGANIC ODOR	CL OH	0.5	BZ = 60cpm
18	NA	5	0	NO RECOVERY PUSHED ROCK	NA	NA	MT = 1.5ppm
	NA	8	0		NA	NA	
19	112712 0900	8	6	SOFT (5Y, 4/4) OLIVE, SILTY CLAY WITH SAND, TRACE GRAVEL, MED PLASTICITY, MOIST, ORGANIC ODOR	CL	.5	BZ = 60cpm
	112713 0900	4	6	SOFT (5Y, 4/4) OLIVE, SILTY CLAY WITH GRAVEL, TRACE SAND, MED PLASTICITY, MOIST.	CL	.25	MT = 0.9ppm
20		7	0	NA			
	112714 0910	7	6	SOFT (5Y, 4/4) OLIVE, SILTY CLAY WITH SAND + GRAVEL, MED-HIGH PLASTICITY MOIST.	CL	.5	BZ = 60cpm
21	112715 0910	13	6	SAA	NA	NA	MT = 1.5ppm
	NA	15	0	NA	NA	NA	
22	112716 0925	9	6	SOFT (5Y 4/4) OLIVE, SILTY CLAY WITH GRAVEL MED PLASTICITY. MOIST	CL	.5	NEXT PAGE

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment CME-45
Driller JOE RAAB
RODGER DAVIS

SAA - Same as above
NA - Not Applicable
MT = MICROTIP
Samples collected per ASTM standard penetration tes
Colors identified using Munsell Color Char-

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FERNALD
RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. South Field OU-2		
BORING NUMBER 1967	COORDINATES.		DATE 041993
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED 041893
ENGINEER/GEOLOGIST J. Boyer	Depth	Date/Time	DATE COMPLETED. 041993
DRILLING METHODS Hollow Stem Auger			PAGE 4 OF 7

DEPTH FT	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY IN	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
23	112717 0925	13	6	MEDIUM STIFF, (5Y 4/4) OLIVE, SILTY CLAY W GRAVEL, LOW PLASTICITY MOIST, ORGANIC ODOR	cl	.75	BG = 65cpm MT = 1.0ppm
	112718 0925	17	4	SAA	NA	NA	
24	112719 0945	5	6	MEDIUM STIFF, (5Y 4/4) OLIVE, SILTY CLAY, TRACE GRAVEL + ORGANICS MOIST	cl	1.0	BG = 75cpm MT = 0.6ppm
	112720 0945	8	6	SAA	NA	NA	
25	112721 0945	10	6	SAA	NA	NA	
	112722 1055	9	6	STIFF, (5Y 4/4) OLIVE, SILTY CLAY, TRACE GRAVEL AND ORGANICS, MOIST	cl	1.5	BG = 60cpm MT = 1.0ppm
26	112723 1055	4	6	~~SASA~~ SAA	cl	2.0	
	112724 1055	6	5	SAA	cl	1.75	
27	112725 1110	15	6	STIFF (5Y 5/4) OLIVE, SILTY CLAY, LOW PLASTICITY, TRACE GRAVEL, MOIST	cl	2.0	BG = 60cpm MT = 0.0ppm
	112726 1110	11	6	SAA	cl	1.5	
28	112727 1110	16	6	SAA	cl	1.0	
	112728 1315	2	6	STIFF, (2.5Y 5/4) light olive BROWN, SILTY CLAY W SAND TRACE GRAVEL, MOIST	cl	1.0	BG = 60cpm MT = 1.0ppm
29	112729 1315	6	6	SAA	cl	1.0	
	112730 1315	9	4	SAA	cl	2.0	
30	112731 1370	8	6	DENSE, (10YR 4/6) DARK yellowish BROWN, SILT, TRACE COARSE SAND, DRY	ml	NA	

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment CME-45
Driller JOE RAAB
RODLER DAVIS

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

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FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. Southfield OU-2		
BORING NUMBER 1962	COORDINATES.		DATE 041893
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED 041893
ENGINEER/GEOLOGIST J. Boyer	Depth	Date/Time	DATE COMPLETED 041993
DRILLING METHODS Hollow Stem Auger			PAGE 5 OF 7

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30	112731 1330	11	6	DENSE, (10YR, 4/6), DARK YELLOWISH BROWN, SILT, TRACE COARSE SAND, DRY	ML	NA	BZ = 600 ppm
	112731 1330	15	6	SAA	ML	NA	MT = 1.2 ppm
31	112732 1330	21	6	SAA	ML	NA	
32				Bottom Boring 31.5 feet			
33							
34							

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment CME-45
Driller JOE RAAB
RUDOLPH DAVIS

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

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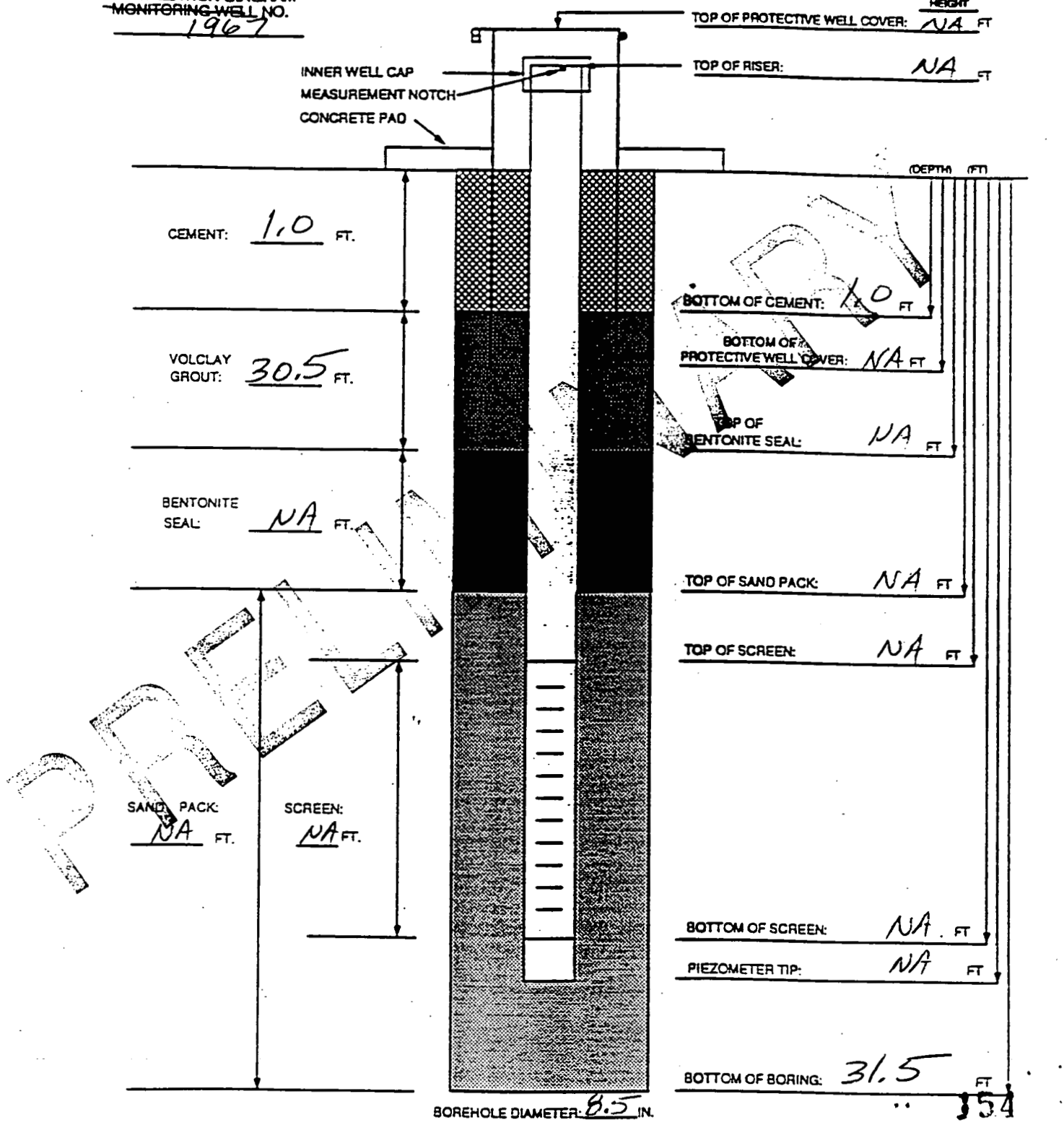
FERNALD RI/FS
INSTALLATION DIAGRAM
~~MONITORING WELL~~ NO. 1967

INSTALLATION DATE: 4/7/93



PRELIMINARY

MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 4
AMOUNT OF CEMENT: 1 BAG
AMOUNT OF WATER USED: 12 GALLONS
OTHER: 1 SOIL, 1 WATER DRUM
TASK: 20.03.05

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT.
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: J. Royer

FERNALD RI/FS

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PIEZOMETER INSTALLATION SHEET 4395

PROJECT NAME OU-2 Southfield FIELD ENG./GEO. J. Boyer DATE 04
PROJECT NO. 20.03.05 CHECKED BY _____ DATE _____
BORING NO. 1967
PIEZOMETER NO. NA DATE OF INSTALLATION 04/1993

BOREHOLE DRILLING

DRILLING METHOD Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT Hollow Stem Auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☒ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (NA)	
TOP OF RISER PIPE	NA		NA	
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	NA		NA	
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~ CEMENT	TOP 0.0	BOTTOM 1.0	TOP NA	BOTTOM
~~BENTONITE~~ VOLCLAY	TOP 1.0	BOTTOM 31.5	TOP NA	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP NA	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP NA	BOTTOM
PIEZOMETER TIP	NA		NA	
BOTTOM OF BOREHOLE	31.5		NA	
GWL AFTER INSTALLATION	NA		NA	

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

REMARKS

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FERNALD
RI/FS.

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. IEP OU-2		
BORING NUMBER. 1996	COORDINATES.		DATE 04/29/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED 04/29/93
ENGINEER/GEOLOGIST J. Boyer	Depth	Date/Time	DATE COMPLETED 04/29/93
DRILLING METHODS Hollow Stem Auger			PAGE 1 OF 5

TIME	DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1055	1	112070 1055	9 9 14	6 6 6	MEDIUM DENSE, (10YR, 4/6), SANDY SILT W/GRAVEL, MOIST TO DRY	ML/SM		BG = 80cpm MT = 0.0ppm
					(10YR, 2/1), FLY ASH, BLACK	NA	NA	
1055	2	112071 112072	27	6	MEDIUM DENSE, (10YR, 4/6) DARK YELLOWISH BROWN CLAYEY SILT W/GRAVEL, SLIGHTLY PLASTIC, MOIST.	ML		
	3	112073 1115	10 14 44 22	6 6 0 0	(10YR, 2/1) BLACK, FLY ASH, WET			BG = 80cpm MT = 0.0ppm
					SAA	NA	NA	
					NO RECOVERY			HARD drilling (through gravel or concrete).
1320	4	112074	8 8 6	6 0 0	(10YR, 2/1) BLACK, FLY ASH, with silty clay + gravel.	NA	NA	BG = 60cpm MT = 0.0ppm
					NO RECOVERY	NA	NA	
1320	6	~~112075~~ ~~112076~~	~~8~~ 8	0				
1325	7	112075 112076	6	6	(10YR, 2/1) BLACK, FLY ASH, DRY	NA	NA	BG = 60cpm MT = 0.0ppm
		1325	6	6	SAA			
		NA	8	0	NO RECOVERY			

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment CME-45
Driller JOE ZAAB
ROGER DAVIS

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

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FERNALD
RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. IFP - OU - 2		
BORING NUMBER 1996	COORDINATES.		DATE 042993
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED 042993
ENGINEER/GEOLOGIST J. Boyer	Depth	Date/Time	DATE COMPLETED 042993
DRILLING METHODS HOLLOW STEM AUGER			PAGE 2 OF 5

TIME	DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
			12	0	NO RECOVERY	NA	NA	page 1
1340	8	112077	4	6	(10YR, 2/1) BLACK, fly ash, dry			Bq = 80cpm
			2	6	SAA	NA	NA	MT = 0.0 ppm
	9		1	6	SAA			
		112077	2					
1340		112078 112079		3	SAA			
	10							
1350	11	112080 1350	NA	NA	Shelby tube	NA	NA	NA
	12							
1400		112081 1400	1	6	(10YR, 2/1) BLACK, fly ash, dry			Bq = 80cpm
			1	6	SAA	NA	NA	MT = 0.0 ppm
1400	13	112082 112083	1	6	SAA			
		NA	1	0	NO RECOVERY			
	14	112084 1430	4	6	(10YR, 2/1) BLACK, fly ash, dry	NA	NA	Bq = 80cpm
			3					MT = 0.0 ppm
			8	6	SAA			

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment CME-45
Driller JOE RAAB
ROGER DAVIS

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

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FERNALD
RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. IFP OU-2		
BORING NUMBER 1996	COORDINATES.		DATE 042993
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED 042993
ENGINEER/GEOLOGIST J. Boyer	Depth	Date/Time	DATE COMPLETED: 42993
DRILLING METHODS Hollow Stem Auger			PAGE 3 OF 5

TIME	DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	15							
1430		112085 112086	11	6	(10YR, 2/1) Black, fly ash, dry, plywood fragment			BZ = 80cpm MT = 0.0ppm
		NA		0	NO RECOVERY	NA	NA	plywood at 15 1/2
	16							
		112087 1445	7	6	(10YR, 2/1) Black, fly ash, moist, with wood, odor			BZ = 80cpm
			21			NA	NA	MT =
		NA	18	6	QCB 042993			MAX 2073 ppm MIN = 15.1 pp
WT	17	112088 1445	12	3	medium dense (2.5y, 4/4) light yellowish brown, poorly graded sand, slightly moist	SP	NA	BZ = 80cpm MT = 13.1ppm
QB		NA		0	NO RECOVERY	NA	NA	
	18							
112090		112089 1520	11	6	medium dense (2.5y, 5/6) light olive brown, poorly graded sand, slightly moist	SP		BZ = 80cpm
		116064 1520	14	6	SAA	SP		MT = 14.1ppm
	19	112089 1520	10	2	SAA	SP	NA	
			9	0	~~SAA~~ QCB NO RECOVERY	S		
	20							
1540		116070 1540	21	6	SAA			BZ = 80cpm
			12	6	SAA	SP	NA	MT = 5.1ppm
	21	116070 1540	14	6	SAA			
1540		116011 116012	11	4	SAA			
	22							
					BOTTOM BORING 22 feet			

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment CME-45
Driller JOE RAAB
ROGER DAVIS

SAA - Same as above
NA - Not Applicable
MT = MICROTIP

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

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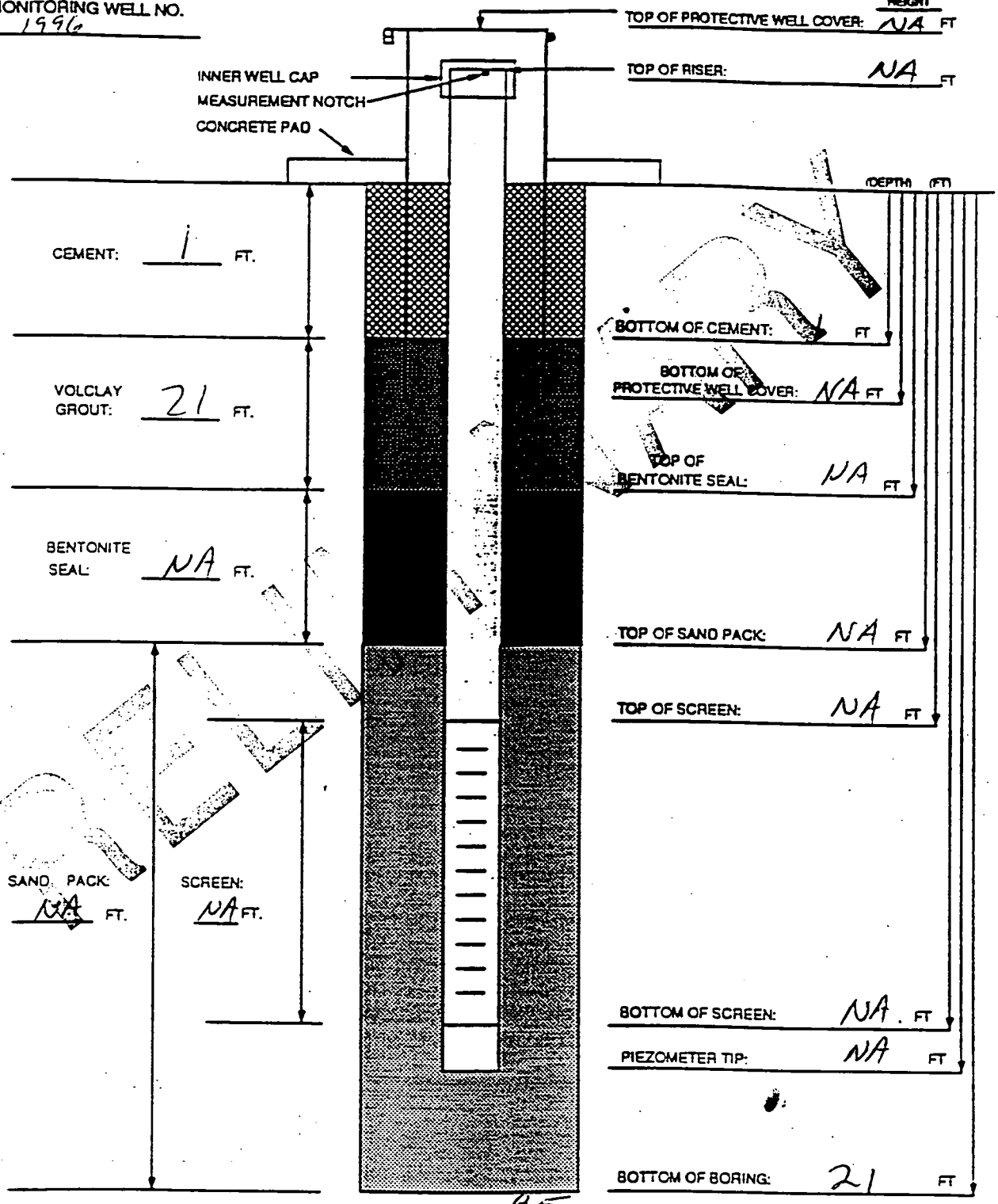
FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 1996

INSTALLATION DATE: 4/29/93



BOREHOLE DIAMETER: 8.5 IN.

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MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 3
AMOUNT OF CEMENT: 1/2
AMOUNT OF WATER USED: 15 gal
OTHER:
TASK: 20.03.05

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/ A
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BELO GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: J. Boyer

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FERNALD
RI/FS

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PIEZOMETER INSTALLATION SHEET

PROJECT NAME IFP OU-2 FIELD ENG./GEO. J. Boyer DATE 4/29
PROJECT NO. 20.03.05 CHECKED BY J Reagan DATE 5/3
BORING NO. 1996
PIEZOMETER NO. NA DATE OF INSTALLATION 4/29/93

BOREHOLE DRILLING

DRILLING METHOD Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT Hollow Stem Auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (NA)	
TOP OF RISER PIPE	NA		NA	
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	NA		NA	
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~ CEMENT	TOP 0.0	BOTTOM 1.0	TOP NA	BOTTOM
~~BENTONITE~~ VOLCLAY	TOP 1.0	BOTTOM 22.0'	TOP NA	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP NA	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP NA	BOTTOM
PIEZOMETER TIP	NA		NA	
BOTTOM OF BOREHOLE	22'		NA	
GWL AFTER INSTALLATION	NA		NA	

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

RI/FS

VISUAL CLASSIFICATION OF SOILS -4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: ~~1037~~ 1039	COORDINATES:	DATE 4/6/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/6/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/7/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 1 OF 7

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1005 110527 4/6/93	14	3	V. Stiff 2.5Y(4/3) Olive Brown gravelly clay w/organics, no plasticity, dry	CL	2.25	HNU = 0 ppm BG = 300 cpm
		25	0	No Recovery	NA	NA	HNU = NA BG = NA
1		16	0	No Recovery	NA	NA	HNU = NA BG = NA
	1015 110528 4/6/93	2	2	V. Stiff. 2.5Y (4/3) Olive Brown gravelly clay, no plasticity dry	CL	2.0	HNU = 0 ppm BG = 300 cpm
2		4	0	No Recovery	NA	NA	HNU = ~~0~~ NA BG = NA
		3	0	No Recovery	NA	NA	HNU = NA BG = NA

NOTES:

SA - same as above
NA - not applicable

Drilling Contractor: PENNSYLVANIA DRILLING CO.

Drilling Equipment: ACKER SENTRY

Driller: Kevin Miles, Donny Arthur

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = ppm BG = cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS 4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: ~~HS-2~~ 1009	COORDINATES:	DATE 4/6/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/6/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/7/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 2 OF 8

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1025 1105:29 4/6/93	18	6	V. STIFF. 2.5Y(4/3) Olive Brown clay gravelly mixed w/fines & coarse, no plasticity dry	CL	3.5	HNU = 0 ppm BS = 200 cpm
	1025 1105:30 4/6/93	47	3	SAA	CL	3.75	HNU = 0 ppm BS = 900 cpm
4	1035 DSS 4/6/93	45	0	No Recovery	NA	NA	HNU = 0 NA BS = NA
	1035 1105:31 4/6/93	18	6	V. STIFF. 2.5Y(5/1) gray gravelly clay, no plasticity dry	CL	3.0	HNU = 0 ppm BS = 200 cpm
5	1035 1105:32 4/6/93	24	5	SAA	CL	2.75	HNU = 0 ppm BS = 200 cpm
		13	0	No Recovery	NA	NA	HNU = NA BS = NA

SAA - same as above
NA - not applicable

NOTES:

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: KEVIN MYERS, JOHNNY ARTHUR

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = ppm BS = cpm

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RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 11009	COORDINATES:	DATE 4/16/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/16/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/16/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 3 OF 7

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1045 110533 4/16/93	5	5	V. STIFF 2.5Y(5/4) Light olive brown gravelly sandy clay, no plasticity, dry	cl	2.5	HNU = 0ppm BG = 120 cpm
		8	0	No Recovery	NA	NA	HNU = NA BG = NA
7		18	0	No Recovery	NA	NA	HNU = NA BG = NA
	1100 110534 4/16/93	14	6	~~V. STIFF~~ 2.5Y(5/1) gray silt w/gravel, moist	ml	NA	HNU = 0ppm BG = 80 cpm
8	1100 110535 4/16/93	14	6	V. STIFF 2.5Y(5/6) Light olive brown sandy gravelly clay, no plasticity, wet	cl	2.5	HNU = 0ppm BG = 80cpm
	1100 110536 4/16/93	18	6	SAA	cl	2.5	HNU = 0ppm BG = 80cpm

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Kevin Myers
Donny Arthur

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

Key: HNU = 0ppm BG = 80 cpm

RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 110009	COORDINATES:	DATE 4/6/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/6/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/7/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 4 OF 8

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1315 110587 4/6/93	X	6	Med. Dark. 2.5Y(5/1) Gray gravelly silt, wet.	ML	NA	HNU = 0ppm BG = 100cpm
	1315 110588 4/6/93	13	6	SAA	ML	NA	HNU = 0ppm BG = 100cpm
10		14	0	No Recovery	NA	NA	HNU = NA BG = NA
	1330 110589 4/6/93	4	6	V. Stiff. 2.5Y(5/1) gray gravelly silty clay, no plasticity wet	CL	2.5	HNU = 0ppm BG = 120cpm
11	1330 110590 4/6/93	15	4	M. Dense. 2.5Y(5/1) gray sandy gravelly silt, wet	ML	NA	HNU = 0ppm BG = 120cpm
		18	0	No Recovery	NA	NA	HNU = NA BG = NA

SAA - same as above
NA - not applicable

NOTES:

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Kevin Myers, Sonny Arthur

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Bkgd: HNU = 0ppm BG = 80cpm

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RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 11009	COORDINATES:	DATE 4/6/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/6/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/7/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 3 OF 8

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (1/2 FT)	RECOVERY (IN)	DESCRIPTION (M. Dense DSO 4/6/93)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1340 110591 4/6/93	4	6	~~V.~~ Stiff. 2.5Y(5/1) Gray gravelly clayey silt, wet	DSO 4/6/93 M	NA	HNU = 0ppm BG = 100cpm
	1340 110592 4/6/93	5	8	M. Dense. 2.5Y(5/1) Gray clayey sand w/gravel, wet	SC	NA	HNU = 0ppm BG = 100cpm
13		18	0	No Recovery	NA	NA	HNU = NA BG = NA
	1405 110593 4/6/93	18	6	V. Dense. 2.5Y(5/1) gray clayey sand w/gravel, moist	SC	NA	HNU = 0ppm BG = 100 cpm
14	1405 110594 4/6/93	49.	3	Hard. 2.5Y(5/1) Gray gravelly clay, no plasticity, dry	CL	4.5	HNU = 0ppm BG = 100 cpm
		50	0	No Recovery	NA	NA	HNU = NA BG = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: RYAN MYERS
JOHNNY [illegible]

Samples collected per ASTM standard practice on site
Colors identified using Munsell Color Chart

Key: HNU = 0ppm BG = 100cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 11009	COORDINATES:	DATE 4/7/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/7/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/7/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 10 OF 8

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	0930 110595 4/7/93	18	10	Hard. 2.5Y (5/1) Gray gravelly clay, no plasticity, dry	CL	4.0	HNU = 0 ppm BS = 80 cpm
	0930 110596 4/7/93	36	4	Hard. 10YR (4/6) dk. yellowish brown gravelly clay, no plasticity dry	CL	>4.5	HNU = 0 ppm BS = 80 cpm
16		50	0	No Recovery	NA	NA	HNU = NA BS = NA
				Boring terminated at 16.8 ft			HNU = BS =
17							HNU = BS =
							HNU = BS =

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: KEVIN MYERS
DONNY ARTHUR

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

Key: HNU = ppm BS = cpm

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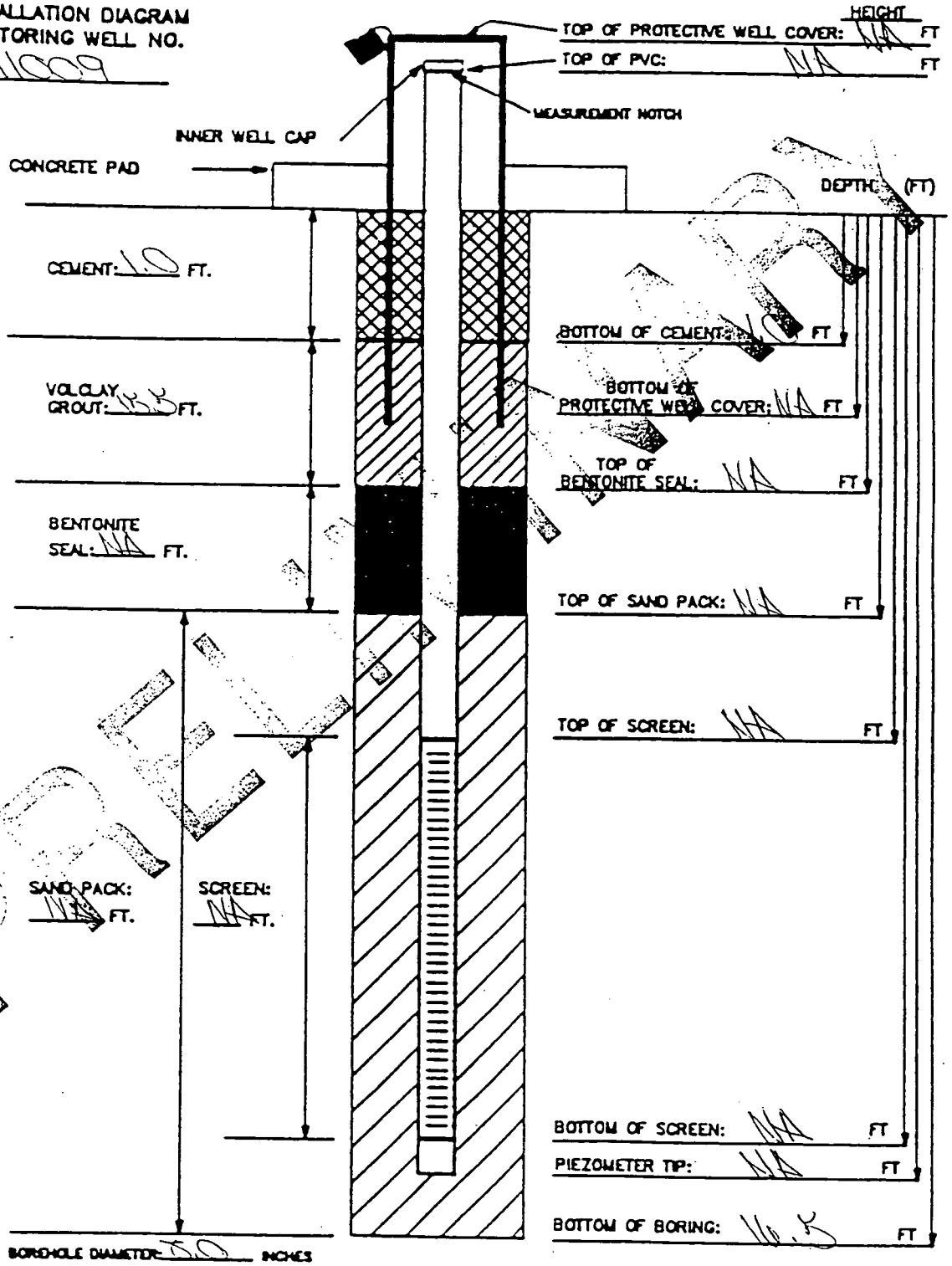
FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 11009

INSTALLATION DATE: 4/7/93



MATERIALS USED:

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 112 bag
AMOUNT OF CEMENT: 1 bag
AMOUNT OF WATER USED: 200 gal
OTHER:

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 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:

1 soil drum

TASK: 20.03.05

GEOLOGIST/ENGINEER: D. O'Brien

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU-2 Phase 2 FIELD ENG./GEO. [illegible] DATE
PROJECT NO. 20.03.03 CHECKED BY DATE
BORING NO. 1009
PIEZOMETER NO. DATE OF INSTALLATION 4/7/93

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger	TYPE OF BIT Auger
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID NA FROM NA TO NA	SIZE NA FROM NA TO NA
FLUID — FROM — TO —	SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Hydropunch Boring	RISER PIPE MATERIAL NA
DIAMETER OF PERFORATED SECTION NA	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. NA I.D. NA
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS NA
AVERAGE SIZE OF PERFORATIONS NA	JOINING METHOD NA
TOTAL PERFORATED AREA NA	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA	OTHER PROTECTION NA
PROTECTIVE PIPE O.D. NA	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE				
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE				
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 1.0	TOP 1.0	BOTTOM 16.3
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	16.5			
GWL AFTER INSTALLATION	5.5			

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

REMARKS

409-11

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER. WBS 20.03.05	PROJECT NAME. RI/FS South Field	
BORING NUMBER. 1998	COORDINATES:	DATE 4/27/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 4/27/93
ENGINEER/GEOLOGIST Dobes/Boyer	Depth Date/Time	DATE COMPLETED: 4/27/93
DRILLING METHODS Hollow stem auger		PAGE 1 OF 1

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	112040 1605 4/27/93	7	6	Black, (2.5 Y, 2.5/1), silty sand, low plasticity, dry	SM	NA	Microtip (MT) = 0.0 ppm
	112040 1605 4/27/93	9	6	Black (2.5 Y, 2.5/1) fly ash	NA	NA	β γ = 120 cpm
1.0	112040 1605 4/27/93	14	6	SAA	NA	NA	
	112040 1605 4/27/93	25	6	SAA	NA	NA	
2.0	112041 1630 4/27/93	NA	6	Shelby tube	NA	NA	Microtip (MT) = NA
	112041 1630 4/27/93	NA	6		NA	NA	β γ = NA
3.0	112041 1630 4/27/93	NA	6		NA	NA	
	112041 1630 4/27/93	NA	6	Shelby tube	NA	NA	
4.0							

NOTES

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: CME - 45

Driller: Joe Raab

Helper: Roger Davis

Background 4/27/93

β γ = 60 cpm

MT = 0.0 ppm

Samples collected per ASTM standard penetration test.

Colors identified using Munsell Color Chart.

402-11-86

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FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER. WBS 20.03.05	PROJECT NAME. RI/FS Southfield	
BORING NUMBER. 1998	COORDINATES:	DATE 4/28/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 4/28/93
ENGINEER/GEOLOGIST. Debes/Boyer	Depth Date/Time	DATE COMPLETED: 4/28/93
DRILLING METHODS: Hollow Stem Auger		PAGE 1 OF 6

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.0 – 0.5	112042 0840 4/28/93	8	6	Black (2.5 Y, 2.5/1), Silty sand, low plasticity, dry	sm	NA	Microtip = 0.3 ppm; βγ = 60 cpm
0.5 – 1.0	112042 0840 4/28/93	7	6	Black (2.5 Y, 2.5/1), fly ash	NA	NA	
1.0 – 1.5	112042 0840 4/28/93	14	6	SAA	NA	NA	
1.5 – 2.0	112043 112044 0840 4/28/93	18	6	SAA	NA	NA	
2.0 – 2.5	112045 0905 4/28/93	5	6	SAA	NA	NA	Microtip = 0.5 ppm; βγ = 80 cpm
2.5 – 3.0	112045 0905 4/28/93	5	6	SAA	NA	NA	
3.0 – 3.5	112045 0905 4/28/93	5	6	SAA	NA	NA	
3.5 – 4.0	112046 112047 0905 4/28/93	5	6	Very stiff, Yellowish brown (10YR, 5/4) Silty clay, low plasticity, dry	cl	2.5	
4.0 – 4.5	112048 0930 4/28/93	3	6	Black (2.5 Y, 2.5/1), Silty sand, low plasticity, dry	sm NA NO 4/40	NA	Microtip = 0.6 ppm; βγ = 80 cpm
4.5 – 5.0	112048 0930 4/28/93	3	6	Black (2.5Y, 2.5/1), Fly ash.	NA	NA	

NOTES

Pennsylvania Drilling
CME - 45
Driller: Joe Raab
Helper: Roger Davis

SAA = Same As Above
NA = Not Applicable

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

FERNALD RI/FS

-4355

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. WBS 20.03.05	PROJECT NAME. RI/FS Southfield	
BORING NUMBER. 1998	COORDINATES:	DATE 4/28/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/28/93
ENGINEER/GEOLOGIST. Debes/Boyer	Depth Date/Time	DATE COMPLETED: 4/28/93
DRILLING METHODS: Hollow Stem Auger		PAGE 2 OF 6

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
5.0	112048 0930 4/28/93	6	6	Stiff, Yellowish brown (10YR, 5/4), Silty clay with roots and wood fragments, low plasticity, dry	cl	1.75	MT = 0.6 ppm βγ = 80 cpm
5.5	112049 112050 0930 4/28/93	14	6	SAA	cl	1.75	
6.0	112051 0950 4/28/93	5	6	Black (2.5Y, 2.5/1), Fly ash, wet.	NA	NA	MT = 0.6 ppm βγ = 80 cpm
6.5	112051 0950 4/28/93	17	6	Hard, Light yellowish brown (10YR, 6/4) and gray (10YR, 7/2), Silty clay, med. plasticity, sl. moist	cl	3.5	
7.0	112051 0950 4/28/93	22	6	SAA	cl	3.5	
7.5	112052 112053 0950 4/28/93	28	6	SAA	cl	3.5	
8.0	112054 1055 4/28/93	8	6	Black (2.5Y, 2.5/1), Fly ash, moist.	NA	NA	MT = 0.5 ppm βγ = 60 cpm
8.5	112054 1055 4/28/93	6	6	Very stiff, Light yellowish brown (10YR, 6/4), Silty clay, low plasticity, dry.	cl	2.5	
9.0	112054 1055 4/28/93	8	6	Black (2.5Y, 2.5/1), Fly ash, wet.	NA	NA	
9.5	112055 112056 1055 4/28/93	14	6	Very stiff, Gray (10YR, 6/1), Silty clay with iron stringers and gravel, low plasticity, dry	cl	3.0	
10.0							

NOTES:

Pennsylvania Drilling

CME - 45

Driller: Joe Raab

Helper: Roger Davis

MT = Microtip Photoionization

SAA = Same as Above

NA = Not Applicable

Samples collected per ASTM Standard Penetration Test.

Colors identified using Munsell Color Chart.

402-11-6

FERNALD RI/FS

- -4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. WBS 20.03.05	PROJECT NAME. RI/FS Southfield	
BORING NUMBER. 1998	COORDINATES:	DATE 4/28/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/28/93
ENGINEER/GEOLOGIST Debes/Boyer	Depth Date/Time	DATE COMPLETED: 4/28/93
DRILLING METHODS: Hollow Stem Auger		PAGE 3 OF 6

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
10.0	112057 1330 4/28/93	3	6	Medium stiff, Light brownish gray (10YR, 6/2), Silty clay, med. plasticity, dry	cl	1.5	MT = 0.3 ppm βγ = 60 cpm
10.5	112057 1330 4/28/93	6	6	SAA	cl	1.5	
11.0	112057 1330 4/28/93	12	6	Light olive brown (2.5Y, 5/4) Gravelley sand, wet.	sw	NA	
11.5	112058 112059 1330 4/28/93	17	6	Hard, Light olive brown (2.5Y, 5/4), Silty clay with pea gravel, low plasticity, dry.	cl	3.5	
12.0	112060 1355 4/28/93	4	6	Light olive brown (2.5Y, 5/4), Poorly graded gravelley sand, wet.	sp	NA	MT = 0.5 ppm βγ = 60 cpm
12.5	112060 1355 4/28/93	10	6	Stiff, gray (2.5Y, 5/1), Silty clay with pea gravel, dry.	cl	3.5	
13.0	112060 1355 4/28/93	17	6	SAA	cl	3.5	
13.5	112061 112062 1355 4/28/93	20	6	SAA	cl	3.5	
14.0	112063 1410 4/28/93	3	6	Stiff, Gray (2.5, 5/1), Silty clay with pea gravel, med. plasticity, sl. moist.	cl	3.0	MT = 0.5 ppm βγ = 60 cpm
14.5	112063 1410 4/28/93	5	6	SAA	cl	3.0	
15.0							

NOTES:
Pennsylvania Drilling
CME-45
Driller: Joe Raab
Helper: Roger Davis

MT = Microtip Photoionization
SAA = Same As Above
NA = Not Applicable
Samples collected per ASTM Standard Penetration Test.
Colors identified using Munsell Color Chart.

FERNALD RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. WBS 20.03.05	PROJECT NAME. RI/FS Southfield	
BORING NUMBER. 1998	COORDINATES:	DATE 4/28/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 4/28/93
ENGINEER/GEOLOGIST Debes/Boyer	Depth Date/Time	DATE COMPLETED: 4/28/93
DRILLING METHODS Hollow Stem Auger		PAGE 4 OF 6

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0	112063 1410 4/28/93	12	6	Stiff, Gray (2.5Y, 5/1), silty clay with pea gravel, med. plasticity, sl. moist.	cl	3.0	MT = 0.5 ppm BS = 60 cpm
15.5	112063 1410 4/28/93	14	3	Gray (2.5Y, 5/1), Poorly graded sand, moist.	sp	NA	
16.0	112064 1430 4/28/93	NA	6	Shelby Tube	NA	NA	The shelby tube could only be pushed 1-foot in this material.
16.5	112064 1430 4/28/93	NA	6	Shelby Tube	NA	NA	
17.0	112065 1524 4/28/93	>50/6	6	Hard, Gray (2.5Y, 5/1), Silty clay with pea gravel, low plasticity, dry. (Hard Pan)	cl	4.0	MT = 0.5 ppm BS = 60 cpm
17.5	112065 1524 4/28/93	>50/6	6	SAA	cl	4.0	
18.0	112065 1524 4/28/93	>50/6	6	SAA	cl	4.0	
18.5	112066 112067 1524 4/28/93	>50/6	6	SAA	cl	4.0	
19.0				Bottom of boring 19.0 feet			

NOTES

Pennsylvania Drilling

CME-45

Driller: Joe Raab

Helper: Roger Davis

MT = Microtip Photoionization

SAA = Same As Above

NA = Not Applicable

Samples collected per ASTM Standard Penetration Test.

Colors identified using Munsell Color Chart.

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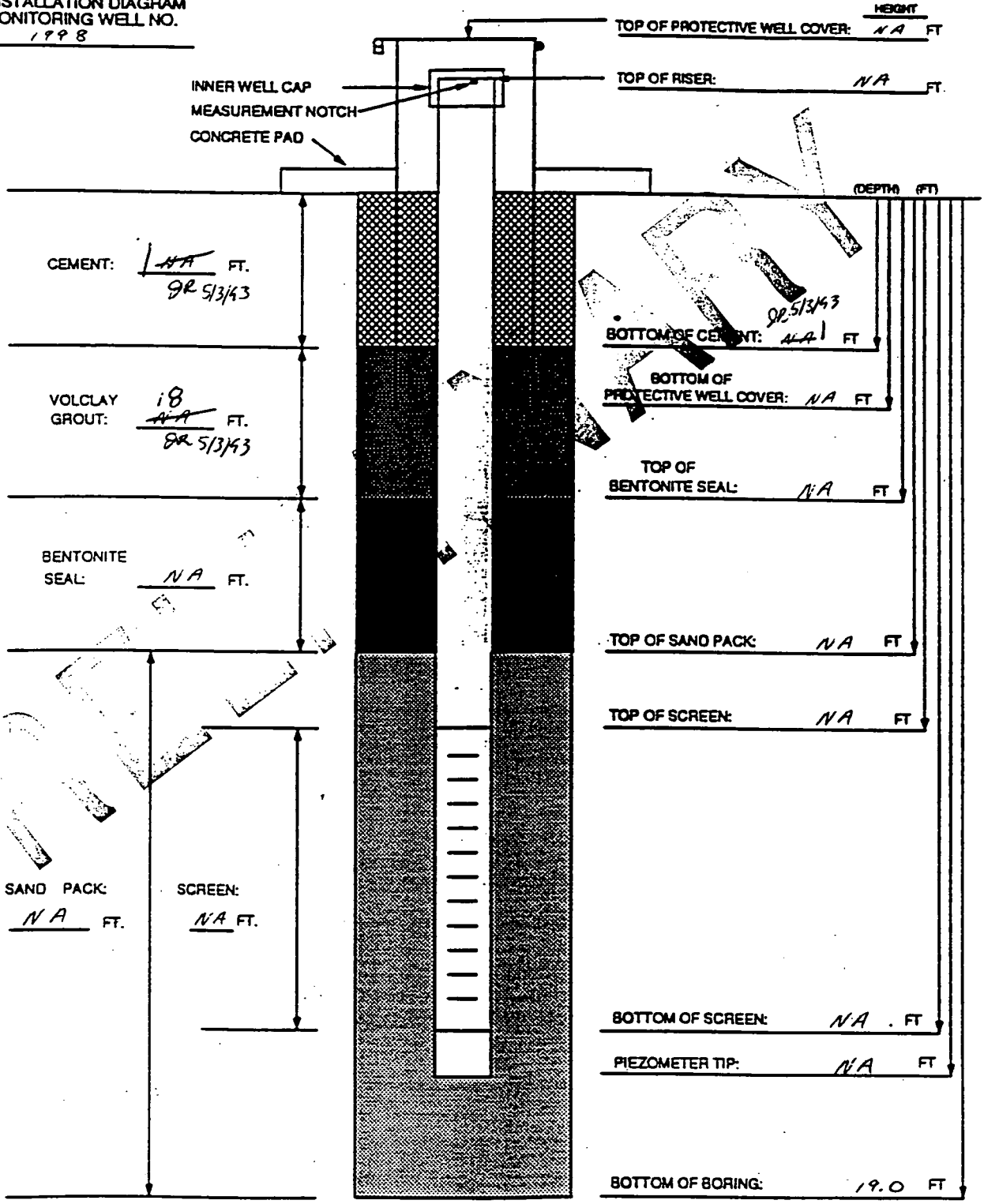
FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 1998

INSTALLATION DATE: 4/28/93



MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: ~~NA~~ 3 JR 5/3/93
AMOUNT OF CEMENT: ~~NA~~ 1 JR 5/3/93
AMOUNT OF WATER USED: ~~NA~~ 15 gal JR 5/3/93
OTHER: NA
TASK: Sample collection

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/ A
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: Debes/Boyer

ASI FORM 0157 REV. (0)

FERNALD RI/FS

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-4395

PIEZOMETER INSTALLATION SHEET

PROJECT NAME RI/FS Southfield
FIELD ENG./GEO. Debes/Boyer DATE 4/28/
PROJECT NO. WBS 20.03.05
CHECKED BY J. Reagan DATE 5/31
BORING NO. 1998
PIEZOMETER NO. NA
DATE OF INSTALLATION ~~NA~~ ~~4/3~~ 5/3/93 JR 5/3/93

BOREHOLE DRILLING

DRILLING METHOD Hollow stem auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT Auger
CASING SIZE (S) USED:
SIZE 8.0 FROM 0.0 - ft TO 19.0 - ft
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE: NA
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 1 ~~NA~~ JR 5/3/93	BOTTOM 19 ~~NA~~ JR 5/3/93	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	19.0			
GWL AFTER INSTALLATION	NA			

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

REMARKS

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: 1FP-HP-03/11001	COORDINATES:	DATE: 04/12/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/12/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 04/13/93	
DRILLING METHODS: Hollow Stem Auger		PAGE 1 OF 5	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	1530 111691 04/12	3	6	Hard (2.5Y 4/4) olive brown silty clay, some black ash, small gravel, low plasticity, dry	CL	3.5	HNU = 0 ppm Bγ = 50-60 cpm
	1530 111692 04/12	7	4	SAA	CL	4.0	HNU = 0 ppm Bγ = 50-60 cpm
	NA	12	0	No Recovery	NA	NA	HNU = NA Bγ = NA
2	1535 111693 04/12	8	6	Hard (2.5Y 5/4) light olive brown silty clay, some black ash, small gravel, low plasticity, dry	CL	3.5	HNU = 0 ppm Bγ = 90-100 cpm
	1535 111694 04/12	9	6	SAA	CL	2.0	HNU = 0 ppm Bγ = 90-100 cpm
3	NA	12	0	No Recovery	NA	NA	HNU = NA Bγ = NA
	1540 111695 04/12	3	6	Firm (2.5Y 5/4) light olive brown silty clay with black ash, small gravel, low plasticity, dry	CL	1.0	HNU = 0 ppm Bγ = 40-50 cpm
4	1540 111696 04/12	6	6	Black ash, dry	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
	1540 111697 04/12	5	2	Black ash, dry	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
5	1545 111698 04/12	7	6	Hard (2.5Y 4/4) olive brown silty clay, ~~medium~~ ae 4/14/93 same small gravel, same black ash, medium plasticity, dry	CL	2.5	HNU = 0 ppm Bγ = 40-50 cpm

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller D. Smith
Assistant S. Smith

Background: HNU = 0 ppm
Bγ = 50 cpm

SAA - Same As Above
NA - Not Applicable
3" Split Spoons driven by ASTM Standard

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FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: IFP-HP-03/11001	COORDINATES:		DATE: 04/12/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 04/12/93
ENGINEER/GEOLOGIST: A. Como	Depth	Date/Time	DATE COMPLETED: 04/13/93
DRILLING METHODS: Hollow Stem Auger			PAGE 2 OF 5

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
5	1545 111699 04/12	8	6	Black ash, dry	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
	NA	9	0	No Recovery	NA	NA	HNU = NA Bγ = NA
6	1610 111700 04/12	2	6	Black Ash, dry	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
	1610 111701 04/12	4	6	Black Ash, dry	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
7	1610 111702 04/12	12	6	Hard (2.5Y 5/2) grayish brown silty clay, some gravel, some black ash, low plasticity, dry	CL	3.25	HNU = 0 ppm Bγ = 40-50 cpm
	1615 111703 04/12	2	6	SAA Firm,	CL	1.0	HNU = 0 ppm Bγ = 50-60 cpm
8	1615 111704 04/12	4	6	Black ash, dry	NA	NA	HNU = 0 ppm Bγ = 50-60 cpm
	1615 111705 04/12	12	6	Hard (2.5Y 6/8) olive yellow, silty clay, some black ash, low plasticity, dry	CL	2.75	HNU = 0 ppm Bγ = 50-60 cpm
9	1620 111706 04/12	7	6	Hard (2.5Y 6/6) olive yellow, silty clay, black ash, low plasticity, dry	CL	2.5	HNU = 0 ppm Bγ = 40-50 cpm
	1620 111707 04/12	9	6	Hard (2.5Y 5/4) light olive brown, silty clay, medium plasticity, moist	CL	2.5	HNU = 0 ppm Bγ = 40-50 cpm
10							

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller D. Smith
Assistant S. Smith

Background: HNU = 0 ppm
Bγ = 50 cpm

SAA - Same As Above
NA - Not Applicable
3" Split Spoon driven by ASTM Standard

FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: IFP-HP-03/11001	COORDINATES:	DATE: 04/12/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/12/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 04/13/93	
DRILLING METHODS: Hollow Stem Auger		PAGE 3 OF 5	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
10	1620 111708 04/12	9	6	Hard (2.5Y 5/4) light olive brown, silty clay, medium plasticity, moist	CL	2.5	HNU = 0 ppm Bγ = 40-50 cpm
	1625 111709 04/12	7	6	SAA light olive brown	CL	2.0	HNU = 0 ppm Bγ = 40-50 cpm
11	1625 111710 04/12	12	6	Hard (2.5Y 5/4) silty clay, low plasticity, moist gray	CL	2.0	HNU = 0 ppm Bγ = 40-50 cpm
	1625 111711 04/12	15	6	Firm (2.5Y 6/0) silty clay, medium plasticity, moist	CL ~~NA~~ ac 04/12/93	1.0	HNU = 0 ppm Bγ = 40-50 cpm
12	1635 111712 04/12	4	6	Firm, SAA	CL ~~NA~~ 04/12/93	1.25	HNU = 0 ppm Bγ = 50-60 cpm
	1635 111713 04/12	4	6	Very loose (2.5Y 6/0) gray sandy silt, some clay, low plasticity, wet	ML ~~NA~~ ac 04/12/93	NA ~~0.75~~ ac 04/12/93	HNU = 0 ppm Bγ = 50-60 cpm
13	1635 111714 04/12	5	6	SAA	ML ~~NA~~ ac 04/12/93	NA	HNU = 0 ppm Bγ = 50-60 cpm
	0830 111715 04/13	6	6	FIRM (2.5Y 5/4) light olive brown, silty clay, some sand, some black ash, medium plasticity, moist	CL	1.25	HNU = 0 ppm Bγ = 10-20 cpm
14	0830 111716 04/13	8	6	SAA	CL	1.75	HNU = 0 ppm Bγ = 10-20 cpm
	0830 111717 04/13	12	6	Medium Dense (2.5Y 6/4) light yellowish brown, sandy silt, some clay, low plasticity, moist	ML ~~NA~~ ac 04/13/93	ac 04/13/93 ~~2.0~~	HNU = 0 ppm Bγ = 10-20 cpm
15							

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller D. Smith
Assistant S. Smith

Background: HNU = 0 ppm
Bγ = 50 cpm

SAA - Same As Above
NA - Not Applicable
3" split spoon driven by ASTM standard

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: IFP-HP-03/11001	COORDINATES:	DATE: 04/13/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/12/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 04/13/93	
DRILLING METHODS: Hollow Stem Auger		PAGE 4 OF 5	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15	0835 111718 04/13	4	6	Firm (2.5Y 6/6) olive yellow, clay, some black ash, high plasticity, moist	CL	1.0	HNU = 0 ppm Bγ = 10-20cpm
	0835 111719 04/13	6	6	Firm, SAA	CL	1.5	HNU = 0 ppm Bγ = 10-20cpm
16	0835 111720 04/13	12	4	Medium dense (2.5Y 6/8) olive yellow sandy silt, some gravel, low plasticity, wet	ML	NA	HNU = 0 ppm Bγ = 10-20 cpm
	0840 111721 04/13	12	6	Medium dense (2.5Y 5/6) light olive brown, small gravel, moist	ML	NA	HNU = 0 ppm Bγ = 10-20 cpm
17	0840 111722 04/13	13	6	Medium dense (5Y 5/1) gray sandy silt, some gravel, dry	ML	NA	HNU = 0 ppm Bγ = 10-20 cpm
	0840 111723 04/13	13	6	SAA	ML	NA	HNU = 0 ppm Bγ = 10-20cpm
18	0850 111724 04/13	6	6	Loose (2.5Y 6/4) light yellowish brown, sandy silt, some clay, low plasticity, wet	ML	NA	HNU = 0 ppm Bγ = 10-20 cpm
	0850 111725 04/13	8	6	Loose (5Y 6/1) gray silt, some gravel, no plasticity, moist	ML	NA	HNU = 0 ppm Bγ = 10-20 cpm
19	0850 111726 04/13	12	6	SAA, dry	ML	NA	HNU = 0 ppm Bγ = 10-20 cpm
	0910 111727 04/13	13	6	SAA, wet	ML	NA	HNU = 0 ppm Bγ = 10-20 cpm
20							

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller D. Smith
Assistant S. Smith

Background: HNU = 0 ppm
Bγ = 10-20 cpm

SAA - Same As Above
NA - Not Applicable
3" Split spoons driven by ASTM stand

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: FP-HP-03/11001	COORDINATES:		DATE: 04/12/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 04/12/93
ENGINEER/GEOLOGIST: A. Como	Depth	Date/Time	DATE COMPLETED: 04/13/93
DRILLING METHODS: Hollow Stem Auger			PAGE 5 OF 5

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
20	0910 111728 04/13	12	6	(20.0'-20.3') SAA Medium dense (5Y4/1) dark gray, sand, silt, wet according	ML	NA	HNV = 0ppm Bγ = 10-20cpm
	0910 111729 04/13	15	6	Medium dense (5Y4/1) dark gray, silt, dry	ML	NA	HNV = 0ppm Bγ = 10-20cpm
21	1005 111730 04/13	12	6	SAA	ML	NA	HNV = 0ppm Bγ = 10-20cpm
	1005 111731 04/13	12	6	SAA	ML	NA	HNV = 0ppm Bγ = 10-20cpm
22	NA	10	0	No Recovery	NA	NA	HNV = NA Bγ = NA
							HNV = Bγ =
							HNV = Bγ =
							HNV = Bγ =
							HNV = Bγ =
							HNV = Bγ =

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller D. Smith
Assistant S. Smith

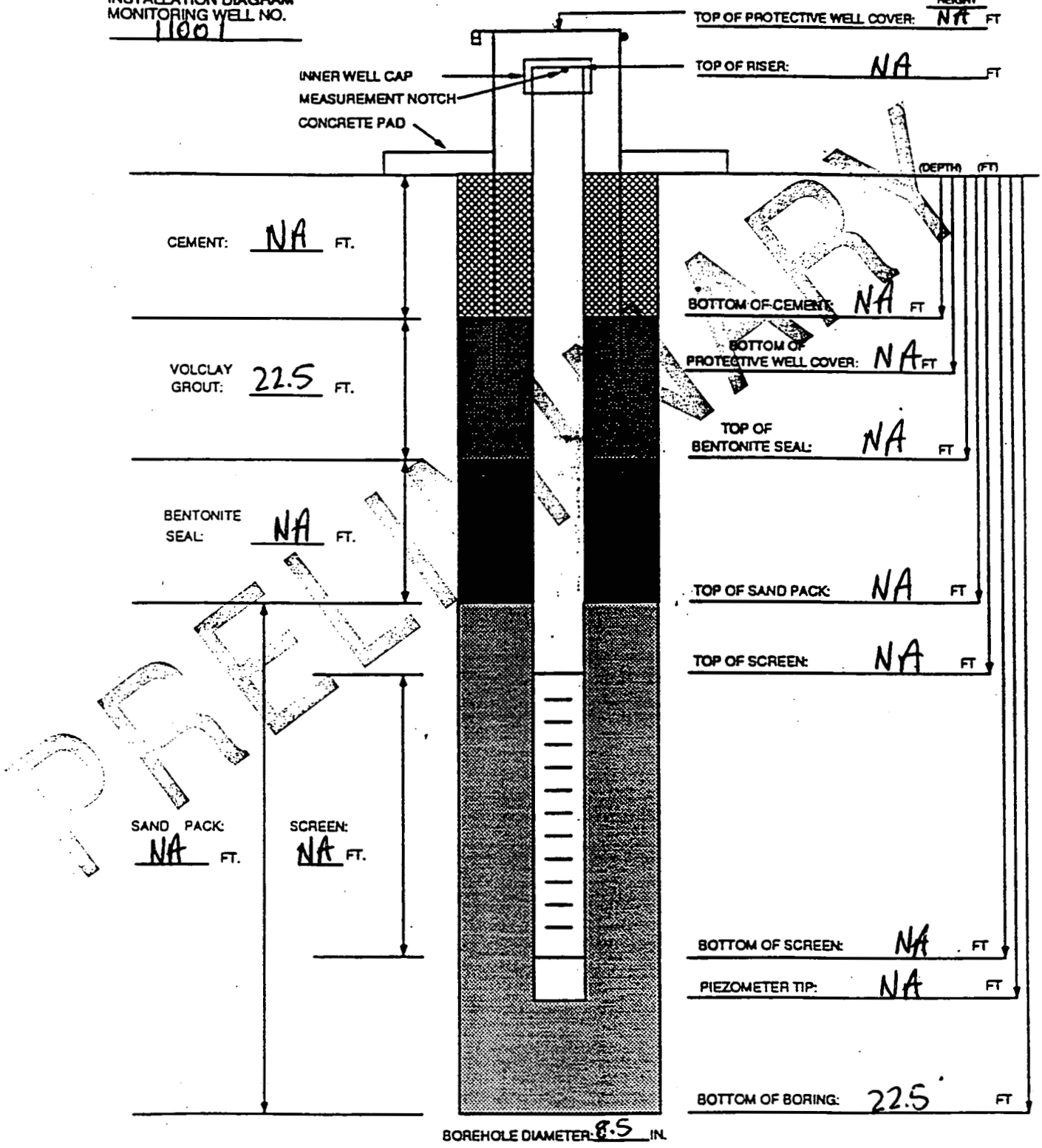
Background: HNV = 0ppm
Bγ = 10-20cpm

SAA - Same As Above
NA - Not Applicable
3" Split Spoons driven by ASTM standa

PRELIMINARY

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 11001

INSTALLATION DATE: 04/13/93



MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 4
AMOUNT OF CEMENT: NA
AMOUNT OF WATER USED: 1 gallon
OTHER: NA
TASK: Hydropunch Boring

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BELO GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: A. Como

PRELIMINARY

FERNALD RI/FS

-4395

PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU2 Phase II
PROJECT NO. 20.03.05
BORING NO. 11001
PIEZOMETER NO. NA

FIELD ENG./GEO. A. Como DATE 04/14
CHECKED BY _____ DATE _____
DATE OF INSTALLATION 04/13/93

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT 4 1/4" Auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Hydropunch Boring
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 22.5	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	22.5			
GWL AFTER INSTALLATION	NA			

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

REMARKS _____

RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2		
BORING NUMBER: 11017	COORDINATES:		DATE 4/1/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 4/1/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth	Date/Time	DATE COMPLETED: 4/1/93
DRILLING METHODS: HOLLOW STEM AUGER			PAGE 1 OF 8

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	0945 110488 4/1/93	3	6	V.Stiff. 2.5Y (5/4) Light olive brown, gravelly clay, low plasticity, moist.	CL	3.5	HNU = 0 ppm BG = 100 cpm
		6	0	No Recovery	NA	NA	HNU = NA BG = NA
1		13	0	No Recovery.	NA	NA	HNU = NA BG = NA
	0950 110489 4/1/93	13	6	Hard. 2.5Y (5/4) Light olive brown, gravelly clay, no plasticity, dry.	CL	4.5	HNU = 0 ppm BG = 80 cpm
2	0950 110490 4/1/93	24	4	SAA, V.Stiff	CL	2.5	HNU = 0 ppm BG = 80 cpm
		24	0	No Recovery	NA	NA	HNU = NA BG = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Kevin Myers
Donny Arthur

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = ppm BG = 80 cpm

402-11-86

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 11017	COORDINATES:	DATE 4/1/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/1/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/1/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 2 OF 8

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1010 110491 4/1/93	20	6	Hard. 2.5Y(5/6) Light olive brown, gravelly clay, no plasticity, dry.	cl	4.0	HNU = 0 ppm BS = 80 cpm
	1010 110492 4/1/93	30	4	SAA	cl	4.0	HNU = 0 ppm BS = 80 cpm
4		31	0	No Recovery.	NA	NA	HNU = NA BS = NA
	1040 110493 4/1/93	4	6	V. Stiff. 2.5Y(5/6) Light olive brown, gravelly clay, some organics, no plasticity, dry.	cl	2.5	HNU = 0 ppm BS = 80 cpm
5	1040 110494 4/1/93	6	3	SAA	cl	2.75	HNU = 0 ppm BS = 80 cpm
		12	0	No Recovery	NA	NA	HNU = NA BS = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.
Drilling Equipment ACKER SENTRY
Driller: Kevin Myers
Donny Arthur

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

Key: HNU = 0 ppm BS = 80 cpm

402-11-86

FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2		
BORING NUMBER: 11017	COORDINATES:		DATE 3/4/1/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 4/1/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth	Date/Time	DATE COMPLETED: 4/1/93
DRILLING METHODS: HOLLOW STEM AUGER			PAGE 3 OF 8

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1055 110495 4/1/93	12	6	V. Stiff. 2.5Y(4/8) Olive yellow gravelly clay w/organics, no plasticity, dry.	cl	3.0	HNU = 0 ppm BS = 80 cpm
	1055 110496 4/1/93	32	6	SAA	cl	3.5	HNU = 0 ppm BS = 80 cpm
7	1055 110497 4/1/93	45	6	SAA, hard.	cl	4.0	HNU = 0 ppm BS = 80 cpm
	1110 110498 4/1/93	9	6	SAA	cl	4.0	HNU = 0 ppm BS = 80 cpm
8	1110 110499 4/1/93	12	6	SAA	cl	4.0	HNU = 0 ppm BS = 80 cpm
		19	0	No Recovery.	NA	NA	HNU = 0 ppm BS = 80 cpm

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.
Drilling Equipment ACKER SENTRY
Driller: Kevin Myers
Donny Arthur

Samples collected per ASTM standard penetration test
colors identified using Munsell color chart

Key: HNU = 0 ppm BS = 80 cpm

402-11-66

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VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 11017	COORDINATES:	DATE 4/1/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/1/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/1/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 4 OF 8

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1315 110500 4/1/93	6	6	V. Stiff. 2.5Y(6/8) Olive yellow mottled w/gray silty clay, no plasticity, dry	cl	3.25	HNU = 0ppm BS = 60cpm
	1315 110501 4/1/93	12	5	SAA	cl	2.5	HNU = 0ppm BS = 60cpm
10		34	0	No Recovery	NA	NA	HNU = NA BS = NA
	1330 110502 4/1/93	14	6	V. Stiff. 2.5Y(6/8) Olive yellow silty clay, no plasticity, dry.	cl	2.5	HNU = 0ppm BS = 60cpm
11	1330 110503 4/1/93	21	6	SAA	cl	2.75	HNU = 0ppm BS = 60cpm
	1330 110504 4/1/93	32	6	V. Dense. 2.5Y(6/8) Olive yellow clayey silt, slightly moist.	ml	NA	HNU = 0ppm BS = 60cpm

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Kevin Myers
Donny Arthur

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = 0ppm BS = 60cpm

402-11-86

FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 11017	COORDINATES:	DATE 4/1/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/1/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/1/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 5 OF 8

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1/2 (FT)	RECOVERY (FT)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1350 110505 4/1/93	15	6	Dense. 2.5Y(6/8) Olive yellow silt, wet	ml	NA	HNU = 0 ppm BG = 40cpm
		18	0	No Recovery	NA	NA	HNU = NA BG = NA
13		24	0	No Recovery	NA	NA	HNU = NA BG = NA
	1410 110506 4/1/93	12	6	M. Dense. 2.5Y(6/8) Olive yellow silt, wet.	ml	NA	HNU = 0 ppm BG = 40cpm
14	1410 110507 4/1/93	8	4	SAA	ml ~~M~~ 4/1/93	NA	HNU = 0 ppm BG = 40cpm
		18	0	No Recovery.	NA	NA	HNU = NA BG = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.
Drilling Equipment ACKER SENTRY
Driller: Kevin Myers
Donny Arthur

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

Bkgd: HNU = 0ppm BG = 80cpm

402-11-86

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2		
BORING NUMBER: 11017	COORDINATES:		DATE 4/1/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 4/1/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth	Date/Time	DATE COMPLETED: 4/1/93
DRILLING METHODS: HOLLOW STEM AUGER			PAGE 6 OF 8

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1420 110508 4/1/93	23	6	Dense. 2.5Y(6/8) Olive yellow silt, ~~[illegible]~~ moist. DO 4/1/93	ML	NA	HNU = 0ppm BG = 40cpm
	1420 110509 4/1/93	24	5	V. Stiff. 2.5Y(5/1) Gray gravelly clay, no plasticity dry.	CL	3.5	HNU = 0ppm BG = 40cpm
16		25	0	No Recovery	NA	NA	HNU = NA BG = NA
	1515 110510 4/1/93	13	5	Hard. 2.5Y(5/1) Gray gravelly clay, no plasticity dry.	CL	4.0	HNU = 0ppm BG = 60cpm
17		24	0	No Recovery.	NA	NA	HNU = NA BG = NA
		35	0	No Recovery	NA	NA	HNU = NA BG = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.
Drilling Equipment ACKER SENTRY
Driller: Kevin Myers
Donny Arthur

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

Key: HNU = 0ppm BG = 80cpm

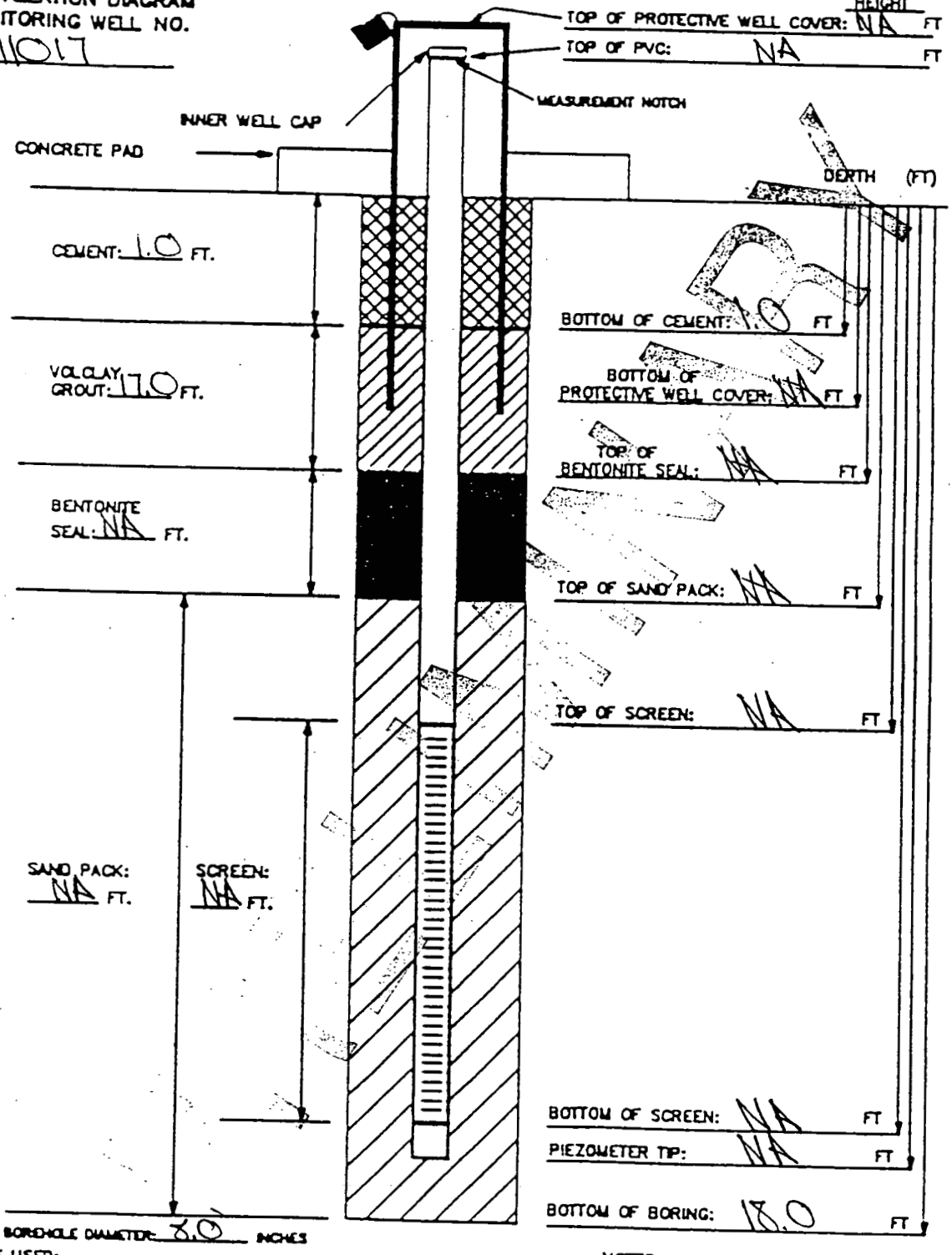
402-11-86

E-4395 7018

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 11017

INSTALLATION DATE: 4/1/93



MATERIALS USED:

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 2
AMOUNT OF CEMENT: 1 bag
AMOUNT OF WATER USED: 25 gallons
OTHER:

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 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:

150 l drum

TASK: 20.03.05

GEOLOGIST/ENGINEER: D. O'Brien

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FERNALD RI/FS

E-4395 8018

PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU-2 phase 2 FIELD ENG./GEO. D. O'Brien DATE 4/1/93
PROJECT NO. 20.03.03 CHECKED BY _____ DATE _____
BORING NO. 11017
PIEZOMETER NO. _____ DATE OF INSTALLATION 4/1/93

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID _____ FROM _____ TO _____

TYPE OF BIT Auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Hydropunch Boring
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 18.0	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	18.0			
GWL AFTER INSTALLATION	NA			

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

REMARKS _____

FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. OU2 Southfield		
BORING NUMBER 1013	COORDINATES.		DATE 4/17/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED 4/17/93
ENGINEER/GEOLOGIST S. Reagan	Depth	Date/Time	DATE COMPLETED.
DRILLING METHODS hollow stem auger			PAGE 1 OF 2

DEPTH	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
							βγ background = 60cpm NAU = 0ppm
	JR ~~110596~~ 112792 1010	5	6	10YR 3/3, dark yellowish brown, silty fine sand, low plasticity, moist	ml	0.5	HNU = 1ppm βγ = 80cpm
1	JR ~~110599~~ 112793 1010	12	6	2.5Y 5/4, light olive brown, silty clay slightly plastic, moist	Cl	3.0	
		14	0	No recovery		-	
2	JR ~~110600~~ 112794 1020	14	6	2.5Y 5/4, light olive brown, silty clay, slightly plastic, moist	Cl	3.0	βγ = 100cpm HNU = <1ppm
	JR ~~110601~~ 112795 1020	17	6	10YR 5/6, yellowish brown, 10YR 7/2 light gray mottled, silty clay, slightly plastic, moist	Cl	3.5	
	JR ~~110602~~ 112796 1020	23	2	10YR 5/6, yellowish brown, 10YR 7/2 light gray mottled, silty clay, slightly plastic, moist	Cl	4.0	
3	JR ~~110603~~ 112797 1030	27	6	SAA			HNU = 1ppm βγ = 100cpm
4	JR ~~110604~~ 112798 1030	26	6	SAA			
	JR ~~110605~~ 112799 1030	28	2	SAA			
5	JR ~~110606~~ 112800 1045	5	6	10YR 5/8, yellowish brown, silty clay, slightly plastic, moist	Cl	2.0	HNU = <1ppm βγ = 60cpm
	JR ~~110607~~ 112801 1045	9	6	SAA	Cl	1.5	
	JR ~~110608~~ 112802 1045	23	6	10YR 5/8, yellowish brown, silty fine sand, low plasticity, wet	ml	0	
6	JR ~~110609~~ 112803 1055	6	6	SAA	ml	0	HNU = <1ppm βγ = 80cpm
	JR ~~110610~~ 112804 1055	9	6	SAA	ml	0	
7	JR ~~110611~~ 112805 1055	17	2	SAA	ml	0	7' water

NOTES

Drilling Contractor Pennsylvania Drilling

Drilling Equipment

Driller Kevin Myers

George Bylli #

SAA - Same as above

NA - Not Applicable

Samples collected per ASTM standard penetration

Colors identified using Munsell Color Chart

FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 11013	COORDINATES:	DATE: 4/17/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/17/93
ENGINEER/GEOLOGIST: J. Reagan	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 2

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	SR ~~110612~~ 112806 1110	6	6	SAA			HNU = <1 ppm α = Bγ = 60cpm
	SR ~~110613~~ 112807 1110	9	6	SAA			
9	SR ~~110614~~ 112808 1110	11	6	10YR 6/6, brownish yellow, 10YR 6/1 gray mottles, silty clay, moist, slightly plastic	CL	3.25	
	SR ~~110616~~ 112810 1340	10	6	2.5Y 5/4, light olive brown, 10YR 6/1 gray mottles, silty clay, slightly plastic, moist	CL	2.0	HNU = <1 ppm α = Bγ = 60cpm
10	SR ~~110617~~ 112815 1340	16	6	2.5Y 5/4, light olive brown 2.5Y 6/1 gray mottles, silty clay, slightly plastic moist.	CL	2.5	
		17	0	No recovery			
11				Bottom of boring 10.0'			HNU = α = Bγ =
12							HNU = α = Bγ =
13							
14							HNU = α = Bγ =

NOTES:

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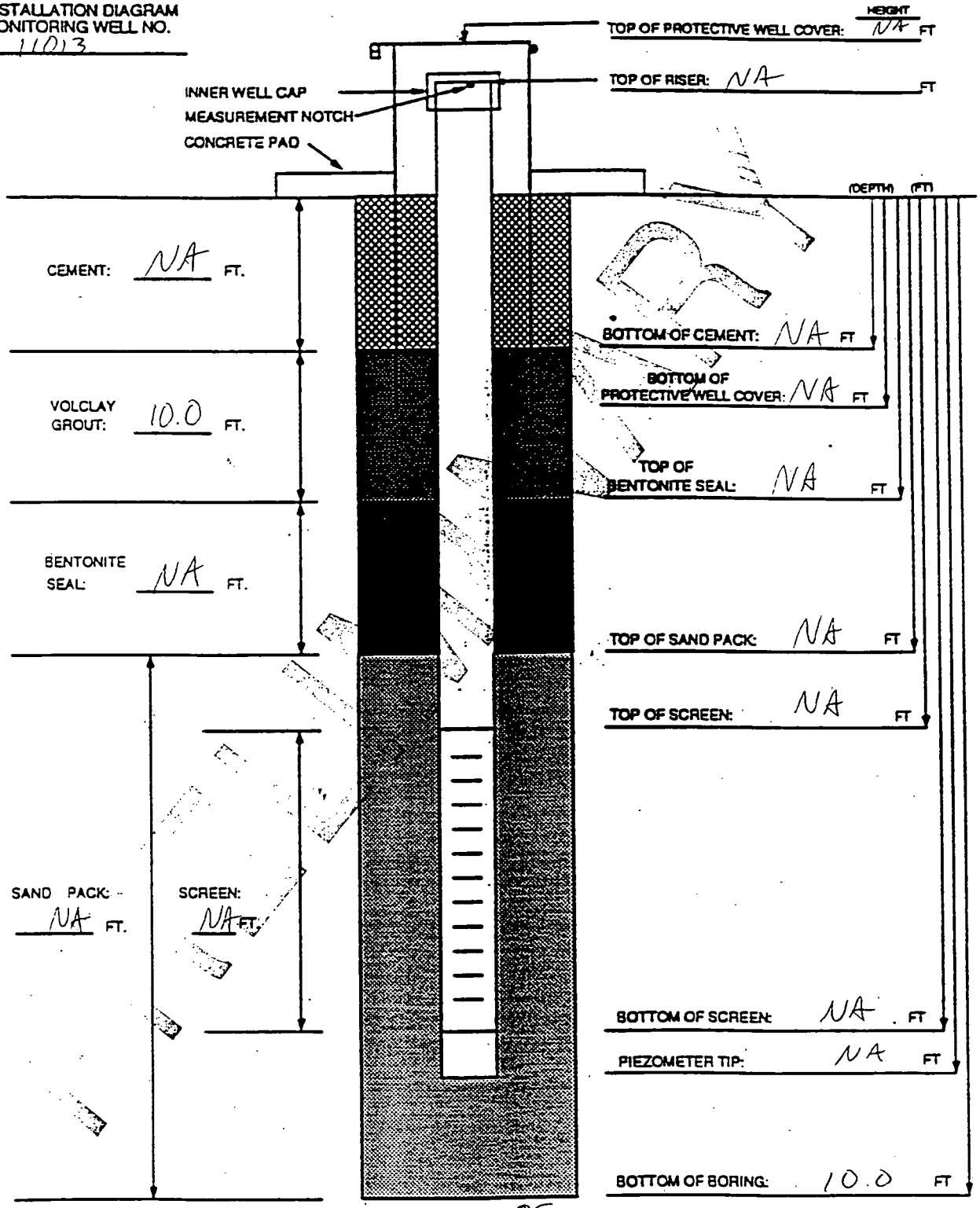
FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 11013

INSTALLATION DATE: 4/13/93



MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 1
AMOUNT OF CEMENT: 1
AMOUNT OF WATER USED: 5 gal
OTHER: —
TASK: RO 03.05

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/_
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BEL GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: J. Reagan

ASI FORM 0157 REV. (0)

FERNALD
RI/FS

-4395

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Southfield OU2 FIELD ENG./GEO. J. Reagan DATE 4/17/
PROJECT NO. 20.03.05 CHECKED BY _____ DATE _____
BORING NO. 11013
PIEZOMETER NO. NA DATE OF INSTALLATION 4/17/93

BOREHOLE DRILLING

DRILLING METHOD Hollowstem auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 10.0	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	10.0			
GWL AFTER INSTALLATION	NA			

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

194

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RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: DU2 PHASE 2		
BORING NUMBER: 11007	COORDINATES:		DATE 4/19/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 4/19/93
ENGINEER/GEOLOGIST: D. O'BRIEN	Depth	Date/Time	DATE COMPLETED: 4/21/93
DRILLING METHODS: HOLLOW STEM AUGER			PAGE 1 OF 10

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
050 4/20/93	1630 050 10046 4/19/93	7	6	V. stiff. 2.5Y (5/6) light olive brown, sandy clay, no plasticity slightly moist	CL	1.0	HNU = 0ppm BS = 40cpm
	1630 10047 4/19/93	11	3	Black flyash, dry	NA	NA	HNU = 0ppm BS = 100cpm
1	050 4/19/93	12	0	No Recovery	NA	NA	HNU = NA BS = NA
	1645 10048 4/19/93	8	6	Loose, black flyash w/ organics, dry	NA	NA	HNU = 0ppm BS = 50cpm
2	1645 10049 4/19/93	5	3	SAA	NA	NA	HNU = 0ppm BS = 50cpm
		5	0	No Recovery	NA	NA	HNU = NA BS = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor: PENNSYLVANIA DRILLING CO.

Drilling Equipment: ACKER SENTRY

Driller: [illegible]

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = 0ppm BS = 50cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 PHASE 2	
BORING NUMBER: 1107	COORDINATES:	DATE 4/19/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/19/93
ENGINEER/GEOLOGIST: D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/21/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 2 OF 10

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1055 110652 4/19/93	2	6	V. Loose, black sugsh dry	NA	NA	HNU = 0 ppm BS = 100 cpm
	1055 110651 4/19/93	3	4	SAA	NA	NA	HNU = 0 ppm BS = 100 cpm
4		2	0	No Recovery	NA	NA	HNU = NA BS = NA
	1700 110652 4/19/93	4	4	V. Loose, black, sugsh dry	NA	NA	HNU = 0 ppm BS = 100 cpm
5	1700 110653 4/19/93	4	6	SAA	NA	NA	HNU = 0 ppm BS = 100 cpm
		5	0	No Recovery	NA	NA	HNU = NA BS = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Jeff Bentley
Dan Samison

Samples collected per ASTM standard penetration test

colors identified using Munsell Color Chart

Key: HNU = ppm BS = cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 PHASE 2		
BORING NUMBER: 11007	COORDINATES:		DATE 20APR93
ELEVATION: BEM 20APR97	GWL: Depth	Date/Time	DATE STARTED: 4/19/93
ENGINEER/GEOLOGIST: B.E. MILLER D. BOLEN	Depth	Date/Time	DATE COMPLETED: 4/21/93
DRILLING METHODS: HOLLOW STEM AUGER			PAGE 3 OF 10

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	BCKGRND BS - 50-60CP REMARKS MICROTP - Ø
	0850 110654 20APR93	3	6	LOOSE BLACK FLY ASH, SOME SLAG, DRY	NA	000 4/21/93 Ø NA	HNU = 0 ppm BS = 50 cpm
	0850 110655 20APR93	4	6	SAA	NA	NA	HNU = 0 ppm BS = 50 cpm
7	0850 110656 20APR93	3	3	SAA	NA	NA	HNU = 0 ppm BS = 50 cpm
	0905 110657 20APR93	2	6	SAA	NA	NA	HNU = 0 ppm BS = 60 cmpm
8	0905 110658 20APR93	3	6	SAA	NA	NA	HNU = 0 ppm BS = 50 cpm
	0905 20APR93	3	Ø	NO RECOVERY	NA	NA	HNU = NA BS = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: [illegible]

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Bkgd: HNU = 0ppm BS = 50cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 1007	COORDINATES:	DATE 20 APR 93
ELEVATION: BP 20APR93	GWL: Depth Date/Time	DATE STARTED: 4/19/93
ENGINEER/GEOLOGIST. B.E. MULLER D.O. BRIEN	Depth Date/Time	DATE COMPLETED: 4/21/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 4 OF 10

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	0518 110659 20APR93	3	6	BLACK FLY ASH MED-CRS SAND SOME GRAVEL SIZED SLAG	NA	NA	HNU = 0 ppm BS = 60 cpm
	0518 110660 20APR93	4	3	SAA	NA	NA	HNU = 0 ppm BS = 60 cpm
10	0518 20APR93	4	0	NO RECOVERY	NA	NA	HNU = NA BS = NA
	0533 110661 20APR93	3	6	BLACK FLY ASH, MED-CRSE SND, SOME GRAVEL SLAG	NA	NA	HNU = 0 ppm BS = 70 cpm
11	0533 110662 20APR93	3	6	SAA	NA	NA	HNU = 0 ppm BS = 70 cpm
	0533 20APR93	3	0	NO RECOVERY	NA	NA	HNU = NA BS = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: ~~Jeff Bentley~~ ~~Bobby Arthur~~

Samples collected per ASTM standard practice on test

Colors identified using Munsell Color Chart

Key: HNU = ppm BS = cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS - 4305

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 PHASE 2	
BORING NUMBER: 11007	COORDINATES:	DATE 20 APR 93
ELEVATION: BEM 20 APR 93	GWL: Depth Date/Time	DATE STARTED: 4/19/93
ENGINEER/GEOLOGIST: BJE, MULLER, D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/21/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 5 OF 10

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	0943 110663 20APR93	2	6	BLACK FLY ASH, MED-CRSE SND TRACE CRUC SLAG, DRY	NA	NA	HNU = ~~NA~~ 0 ppm BEM 21APR93 BS = 80cpm
	0943 110664 20APR93	1	6	SAA	NA	NA	HNU = ~~NA~~ 0 ppm BEM 21APR93 BS = 80cpm
13	0943 20APR93	2	0	NO RECOVERY	NA	NA	HNU = NA BS = NA
	0956 110665 20APR93	3	6	BLACK FLY ASH, MED-CRSE SND TRCE FN CRUC SLAG, DRY	NA	NA	HNU = 0 ppm BS = 70cpm
14	0956 20APR93	3	0	NO RECOVERY	NA	NA	HNU = NA BS = NA
	0956 20APR93	4	0	NO RECOVERY	NA	NA	HNU = NA BS = NA

SAA - same as above
NA - not applicable

NOTES:

Drilling Contractor: PENNSYLVANIA DRILLING CO.

Drilling Equipment: ACKER SENTRY

Driller: ~~Jay Bentley~~ ~~Denny Arthur~~

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = ppm BS = cpm

402-11-86

RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 PHASE 2	
BORING NUMBER: 11007	COORDINATES:	DATE 20APR93
ELEVATION: DATE 20APR93	GWL: Depth Date/Time	DATE STARTED: 4/19/93
ENGINEER/GEOLOGIST: J.R. MULLER ~~D. BRIEN~~	Depth Date/Time	DATE COMPLETED: 4/21/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 10 OF 10

DEPTH	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1006 110666 20APR93	12	6	0-4 FLY ASH 2-6 YELLOW-SANDY-SLTY CLY ∇. ORANGE MOTTLES MOIST	CL	NA	HNU = 0 ppm BS = 60cpm
	1006 110667 20APR93	24	6	SAA - SOME HORIZONS HAVE INCREASED SILT CONTENT WHICH ARE WET	CL/ML	1.3	HNU = 0 ppm BS = 60 cpm
16	1006 110668 20APR93	26	6	SAA - INCREASED FN SND CONTENT AT SOME HORIZONS	CL/ML	1.5	HNU = 0 ppm BS = 60cpm
	1010 110669 20APR93	30	6	YELLOW CLY SANDY ~~SLTY~~ ~~SND~~ SLT DRY MOIST ∇. RNDED GRVL(FN) ∇. CRS SND POCKET MED SND (WET	ML	4.2	HNU = 0 ppm BS = 60cpm
17	1010 110670 20APR93	50/6"	6	YELLOW CLY SANDY SLT DRY ∇. RNDED FN GRVL ∇. CRS SND	ML	>4.5	HNU = 0 ppm BS = 60 cpm
			0	No Recovery	NA	NA	HNU = ~~0 ppm~~ DIEM BS = ~~60~~ DIEM

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Jeff Bentley
Anthony Arthur

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

Key: HNU = 0ppm BS = 60cpm

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RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 11007	COORDINATES:	DATE 4/20/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 4/19/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/21/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 7 OF 10

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1320 4/20/93 2 110674 4/20/93	18 22	6	V. Dense. 10YR(4/6) Dk yellowish brown fine sand, poorly graded wet	SP	NA	HNU = 0ppm BS = 90 cpm
	1320 4/20/93 3 110672 4/20/93	23	6	V. Stiff. 10YR(4/6) Dk yellowish brown sandy clay w/ gravel no plasticity, dry	CL	3.5	HNU = 0ppm BS = 90cpm
19	1320 4/20/93 4 110673 4/20/93	34	6	SAA, hard	CL	4.0	HNU = 0ppm BS = 90cpm
	1345 110675 4/20/93	18	6	V. Dense. 2.5Y(5/6) Light olive brown, clayey sand, wet.	SC	NA	HNU = 0ppm BS = 60 cpm
20	1345 110676 4/20/93	24	6	Hard 2.5Y(5/1) Gray sandy clay, no plasticity, dry	CL	4.5	HNU = 0ppm BS = 60cpm
		29	0	No Recovery	NA	NA	HNU = ~~NA 0ppm~~ DK 4/22 BS = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Jeff Bentley
Dorthy Arthur

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

Key: HNU = 0ppm BS = 90 cpm

RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 PHASE 2	
BORING NUMBER: 11007	COORDINATES:	DATE 4/20/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/19/93
ENGINEER/GEOLOGIST: D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/21/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 8 OF 10

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1425 110677 4/20/93	30	5	Hard. 2.5Y(5/1) Gray gravelly clay, no plasticity, dry	CL	4.5	HNU = 0ppm BG = 60cpm
		50/5	0	No Recovery	NA	NA	HNU = NA BG = NA
22			0	No Recovery	NA	NA	HNU = NA BG = NA
	0920 110678 4/21/93	8	5	V. Stiff. 2.5Y(5/1) Gray gravelly clay, no plasticity slightly moist	CL	3.0	HNU = 0ppm BG = 60cpm
23		12	0	No Recovery	NA	NA	HNU = NA BG = NA
		14	0	No Recovery	NA	NA	HNU = NA BG = NA

NOTES:

NA - sample should
NA - not applicable

Drilling Contractor: PENNSYLVANIA DRILLING CO.

Drilling Equipment: ACKER SENTRY

Driller: Jeff Bentley, Johnny Arthur

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

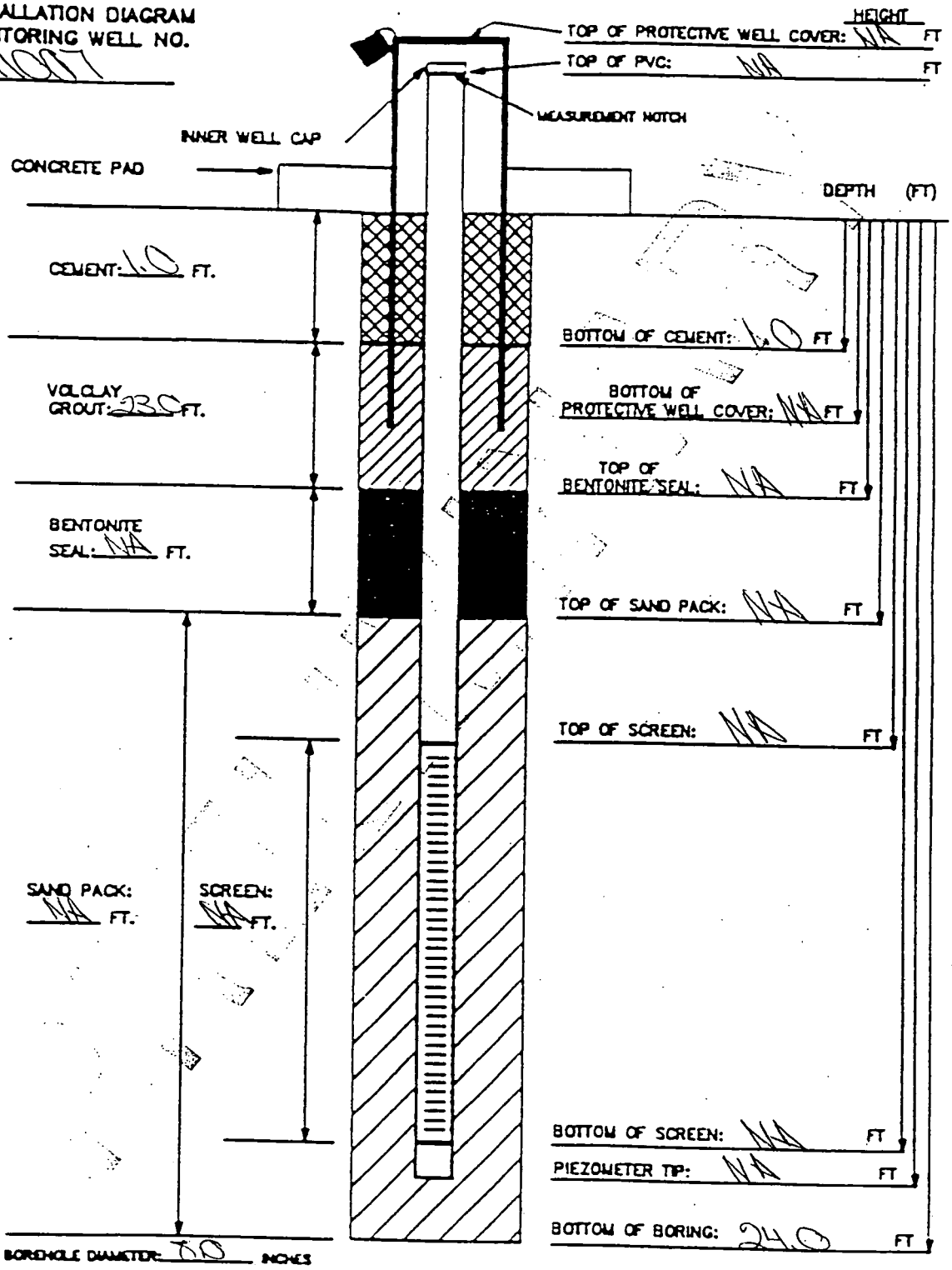
Key: HNU = ppm BG = cpm

-4395 90 IC

INSTALLATION DATE: 4/21/93

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1007



MATERIALS USED:
SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 2
AMOUNT OF CEMENT: 1 bag
AMOUNT OF WATER USED: 20 gal
OTHER:

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH-ID, SCHEDULE 40 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: 21.04 4/21/93

D50 4/21/93

1 50 gal drum

TASK: 20.03.05

GEOLOGIST/ENGINEER: D. O'Brien

FERNALD
RI/FS

-4395 D01C

PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU2 phase 2 FIELD ENG./GEO. D.O'Brien DATE 4/21
PROJECT NO. 20.03.05 CHECKED BY _____ DATE _____
BORING NO. 1007
PIEZOMETER NO. ——— DATE OF INSTALLATION 4/21/93

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Augs	TYPE OF BIT Augs
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID NA FROM NA TO NA	SIZE NA FROM NA TO NA
FLUID ——— FROM ——— TO ———	SIZE ——— FROM ——— TO ———

PIEZOMETER DESCRIPTION

TYPE Hydropunch Bailer	RISER PIPE MATERIAL NA
DIAMETER OF PERFORATED SECTION NA	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. NA I.D. NA
SLOTS ☐ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS NA
AVERAGE SIZE OF PERFORATIONS NA	JOINING METHOD NA
TOTAL PERFORATED AREA NA	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA	OTHER PROTECTION NA
PROTECTIVE PIPE O.D. NA	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (Cement)	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 24.0	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	24.0			
GWL AFTER INSTALLATION	21.0			

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

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-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: 11012	COORDINATES:	DATE: 4/7/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/7/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 4/8/93	
DRILLING METHODS: Hollow Stem Auger		PAGE 1 OF 3	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	1435 110687 4/7/93	3	6	Hard (2.5Y 5/4) light olive brown, silty clay with some small pieces of gravel, low plasticity, moist	CL	4.0	HNU = 0 ppm Bγ = 60-80 cpm
	1435 110688 4/7/93	5	6	SAA	CL	4.0	HNU = 0 ppm Bγ = 60-80 cpm
	1435 110689 4/7/93	9	1	SAA	CL	4.0	HNU = 0 ppm Bγ = 60-80 cpm
2	1438 110690 4/7/93	10	6	Very Hard (2.5Y 6/6) olive yellow, silty clay, some small gravel, no plasticity, dry	CL	4.5	HNU = 0 ppm Bγ = 60-80 cpm
	1438 110691 4/7/93	12	6	SAA	CL	4.5	HNU = 0 ppm Bγ = 60-80 cpm
3	1438 ~~110692~~ 4/7/93	4/8/93 12	0	No Recovery	NA	NA	HNU = NA Bγ = NA
	1445 110692 4/7/93	5	6	Hard (2.5Y 5/4) light olive brown, silty clay, low plasticity, dry	CL	2.0	HNU = 0 ppm Bγ = 60-80 cpm
4	1445 110693 4/7/93	6	6	SAA	CL	3.5	HNU = 0 ppm Bγ = 60-80 cpm
	1445 110694 4/7/93	6	2	SAA	CL	2.5	HNU = 0 ppm Bγ = 60-80 cpm
5	1447 110695 4/7/93	7	6	Hard (2.5Y 5/6) light olive brown, silty clay, some gravel, low plasticity, dry	CL	2.5	HNU = 0 ppm Bγ = 60-80 cpm

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller Don Smith
Assistant Sam Smith

Background: HNU = 0 ppm
Bγ = 80 cpm

SAA - Same as Above
NA - Not applicable
Split Spoons driven by ASTM STANDARD

402-11-86

FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: 11012	COORDINATES:	DATE: 4/7/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/7/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 4/8/93	
DRILLING METHODS: Hollow Stem Auger		PAGE 2 OF 3	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
5	1447 110696 4/7/93	8	6	SAA	CL	2.0	HNU = 0 ppm Bγ = 60-80 cpm
	1447 4/7/93	7	0	No Recovery	NA	NA	HNU = 0 ppm Bγ = 60-80 cpm
6	1455 110697 4/7/93	8	6	Hard (2.5Y 6/6) olive yellow silty clay with (2.5Y 8/0) white clay interbedded, low plasticity, some gravel, dry	CL	2.5	HNU = 0 ppm Bγ = 60-80 cpm
	1455 110698 4/7/93	10	6	SAA	CL	3.0	HNU = 0 ppm Bγ = 60-80 cpm
7	1455 110699 4/7/93	13	4	SAA	CL	3.0	HNU = 0 ppm Bγ = 60-80 cpm
	1505 110700 4/7/93	14	6	SAA	CL	2.0	HNU = 0 ppm Bγ = 80-100 cpm
8	1505 110701 4/7/93	18	6	Hard (2.5Y 7/0) light gray silty clay, some gravel, low plasticity, dry	CL	3.5	HNU = 0 ppm Bγ = 80-100 cpm
	1505 110702 4/7/93	24	6	SAA	CL	1.5	HNU = 0 ppm Bγ = 80-100 cpm
9	1520 110703 4/7/93	21	6	SAA	CL	1.0	HNU = 0 ppm Bγ = 60-80 cpm
	1520 110704 4/7/93	23	6	Firm (2.5Y 7/0) light gray silty clay, some gravel, ~~low~~ ac medium plasticity, wet	CL	1.5	HNU = 0 ppm Bγ = 60-80 cpm
10							

NOTES:

Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller Don Smith
Assistant Sam Smith

Background: HNU = 0 ppm
Bγ = 80 cpm

SAA - Same As Above
NA - Not Applicable
Split Spoons driven by ASTM standards

402-11-86

FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: 11012	COORDINATES:	DATE: 4/7/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/7/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 4/8/93	
DRILLING METHODS: Hollow Stem Auger		PAGE 3 OF 3	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
10	1520 110705 4/7	28	6	Medium dense (2.5Y 5/3) light olive brown silty sand, no plasticity, wet	ML	NA	HNU = 0 ppm Bq = 60-80 cpm
	1535 110706 4/7	4	6	Hard (2.5Y 6/4) silty clay, medium plasticity wet	CL	2.5	HNU = 0 ppm Bq = 40-60 cpm
11	1535 110707 4/7	6	6	SAA	CL	2.5	HNU = 0 ppm Bq = 40-60 cpm
	1535 110708 4/7	5	3	Medium dense (2.5Y 5/3) light olive brown silty sand, no plasticity, wet	ML	NA	HNU = 0 ppm Bq = 40-60 cpm
12	1540 110709	15	6	SAA	ML	NA	HNU = 0 ppm Bq = 60-80 cpm
	1540 110710	10	6	SAA	ML	NA	HNU = 0 ppm Bq = 60-80 cpm
13	1540 110711	15	6	Hard (2.5Y 5/0) gray silty clay, some gravel, low plasticity, dry	CL	2.5	HNU = 0 ppm Bq = 60-80 cpm
	1005 110712 4/8	12	6	Medium dense (2.5Y 5/4) dark gray silty sand, some gravel, no plasticity, moist	ML	NA	HNU = 0 ppm Bq = 40-60 cpm
14	1005 110713 4/8	12	6	Hard (2.5Y 5/0) gray silty clay, some small gravel, medium plasticity, dry	CL	2.0	HNU = 0 ppm Bq = 40-60 cpm
	1005 NA 4/8	17	0	No recovery			HNU = NA Bq = NA
15							

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller Don Smith
Assistant Sam Smith

Background: HNU = 0 ppm
Bq = 80 cpm

SAA - Same As Above
NA - Not Applicable
Split Spoons driven by ASTM standard

402-

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FERNALD
RI/FS

E-4395

PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU2 Phase II. FIELD ENG./GEO. A. Como DATE 04/08/
PROJECT NO. 20.03.05 CHECKED BY _____ DATE _____
BORING NO. 11012
PIEZOMETER NO. NA DATE OF INSTALLATION 4-8-93

BOREHOLE DRILLING

DRILLING METHOD Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT Hollow Stem Auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0'	BOTTOM 15.0'	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	15.0'			
GWL AFTER INSTALLATION	NA			

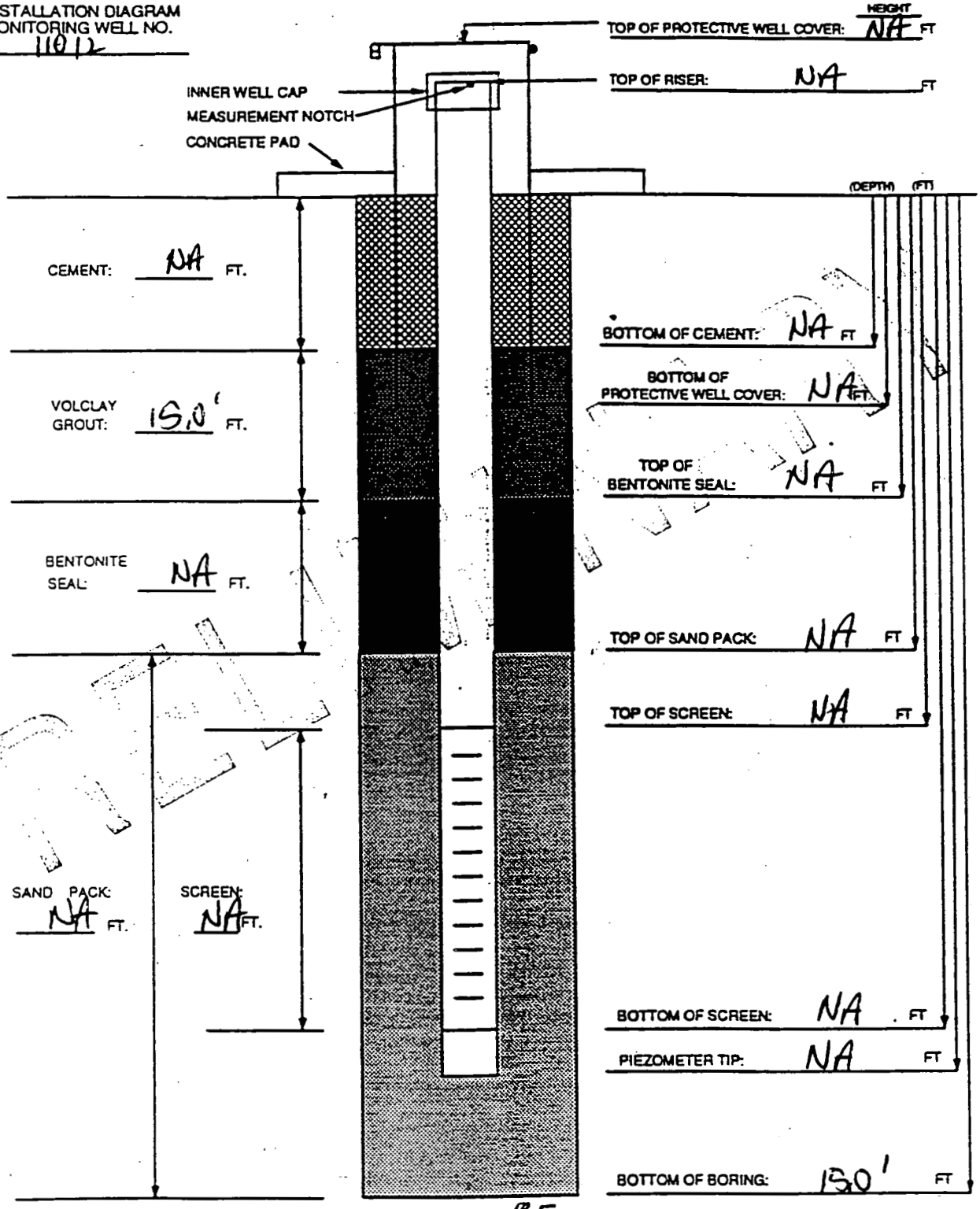
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Hydropunch Boring

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 1012

INSTALLATION DATE: 04/08/93

TOP OF PROTECTIVE WELL COVER: HEIGHT NA FT

TOP OF RISER: NA FT



BOREHOLE DIAMETER: 8.5 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 3
AMOUNT OF CEMENT: NA
AMOUNT OF WATER USED: 1 gallon
OTHER: NA
TASK: NA

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/_
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BEL GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: A. Como

ASI FORM 0157 REV. (0)

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: IFP-HP-01/1999	COORDINATES:	DATE: 04/19/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/19/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 04/19/93	
DRILLING METHODS: Hollow Stem Auger		PAGE 1 OF 3	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	0630 111897 04/19	7	6	Loose (2.5YR5/0) black gritty, silt-like material (Black Ash), dry	NA	NA	MT = 0.6 ppm Bγ = 30-40cpm
	0630 111898 04/19	8	6	SAA	NA	NA	MT = 0.6ppm Bγ = 30-40cpm
1	0630 111899 04/19	7	3	SAA	NA	NA	MT = 0.6 ppm Bγ = 30-40 cpm
	0635 111900 04/19	7	6	SAA	NA	NA	MT = 0.6 ppm Bγ = 20-30
2	0635 111901 04/19	9	6	SAA	NA	NA	MT = 0.6 ppm Bγ = 20-30 cpm
	0635 111902 04/19	9	6	SAA	NA	NA	MT = 0.6 ppm Bγ = 20-30 cpm
3	0640 111903 04/19	7	6	SAA	NA	NA	MT = 0.6 ppm Bγ = 20-30 cpm
	0640 111904 04/19	12	6	SAA Very hard (2.5Y 5/6) light olive brown silty clay, low plasticity, dry	NA CL	NA 45	MT = 0.6 ppm Bγ = 20-30 cpm
4	0640 111905 04/19	22	6	SAA	NA	NA	MT = 0.6ppm Bγ = 20-30 cpm
	0645 111906 04/19	7	6	SAA	NA	NA	MT = 0.6ppm Bγ = 20-30 cpm
5							

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller D. Smith
Assistant S. Smith

Background: MT = 0.6 ppm
Bγ = 20-40cpm

MT - Microtip
SAA - Same As Above
NA - Not Applicable
3" split spoons driven by ASTM standards

RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: IFP-HP-01/1999	COORDINATES:	DATE: 04/19/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/19/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 04/19/93	
DRILLING METHODS: Hollow Stem Auger		PAGE 2 OF 3	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
5	0845 04/19	12	6	Hard (2.5Y 5/6) light olive brown, silty clay, low plasticity, dry	CL	2.5	MT = 0.6 ppm Bγ = 20-30 cpm
6	0845 04/19	8	6	SAA	CL	3.25	MT = 0.6 ppm Bγ = 20-30 cpm
	0850 04/19	8	6	SAA	CL	3.25	MT = 0.6 ppm Bγ = 20-30 cpm
	0850 04/19	10	6	SAA, moist	CL	3.00	MT = 0.6 ppm Bγ = 20-30 cpm
7	0850 NA 04/19	12	0	No Recovery	NA	NA	MT = NA Bγ = NA
8	0855 04/19	8	6	Firm (10YR 4/4) dark yellowish brown, clayey silt, some black ash, low plasticity, wet	ML	1.5	MT = 0.6 ppm Bγ = 20-30 cpm
	0855 04/19	12	6	SAA, with some sand, well graded, wet	ML	NA ~~4.5~~ ac 04/19/93	MT = 0.6 ppm Bγ = 20-30 cpm
	0855 04/19	10	6	SAA	ML	NA ~~4.5~~ ac 04/19/93	MT = 0.6 ppm Bγ = 20-30 cpm
9	0900 04/19	12	6	SAA	ML	NA ~~4.0~~ ac 04/19/93	MT = 0.6 ppm Bγ = 10-20 cpm
	0900 04/19	16	6	very Hard (2.5Y 5/4) light olive brown, silty clay, low plasticity, moist	CL	4.75	MT = 0.6 ppm Bγ = 10-20 cpm
10							

NOTES:

Drilling Co. Pennsylvania Drilling

Drilling Equipment Mobile B-80

Driller D. Smith

Assistant S. Smith

Background: MT = 0.6 ppm
Bγ = 20-40 cpm

MT - Microtip

SAA - Same As Above

NA - Not Applicable

3" Split Spoons driven by ASTM standar

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RI/FS

VISUAL CLASSIFICATION OF SOILS

- 4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: 1FP-HP-01	COORDINATES:	DATE: 04/19/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/19/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 04/19/93	
DRILLING METHODS: Hollow Stem Auger		PAGE 3 OF 3	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
10	0900 111916 04/19	15	6	Very Hard (2.5Y 5/4) light olive brown, silty clay, some gravel, low plasticity, moist	CL	4.5	MT = 0.6 ppm Bγ = 10-20 cpm
	0905 111917 04/19	18	6	SAA	CL	3.25	MT = 0.6 ppm Bγ = 20-30 cpm
11	0905 111918 04/19	12	6	Hard (2.5Y 5/6) light olive brown silty clay, some gravel, low plasticity, dry	CL	3.5	MT = 0.6 ppm Bγ = 20-30 cpm
	0905 111919 04/19	18	6	Very Hard (2.5Y 5/3) light olive brown silty clay with some (5Y 6/1) gray silty clay, gravel, low plasticity, dry	CL	4.25	MT = 0.6 ppm Bγ = 20-30 cpm
12	1550 111920 04/19	12	6	SAA	CL	1.0	MT = 0.6 ppm Bγ = 30-40 cpm
	1550 111921 04/19	9	6	SAA	CL	1.0	MT = 0.6 ppm Bγ = 30-40 cpm
13	NA	13	0	No Recovery	NA	NA	MT = NA Bγ = NA
							MT = Bγ =
14							MT = Bγ =
							MT = Bγ =

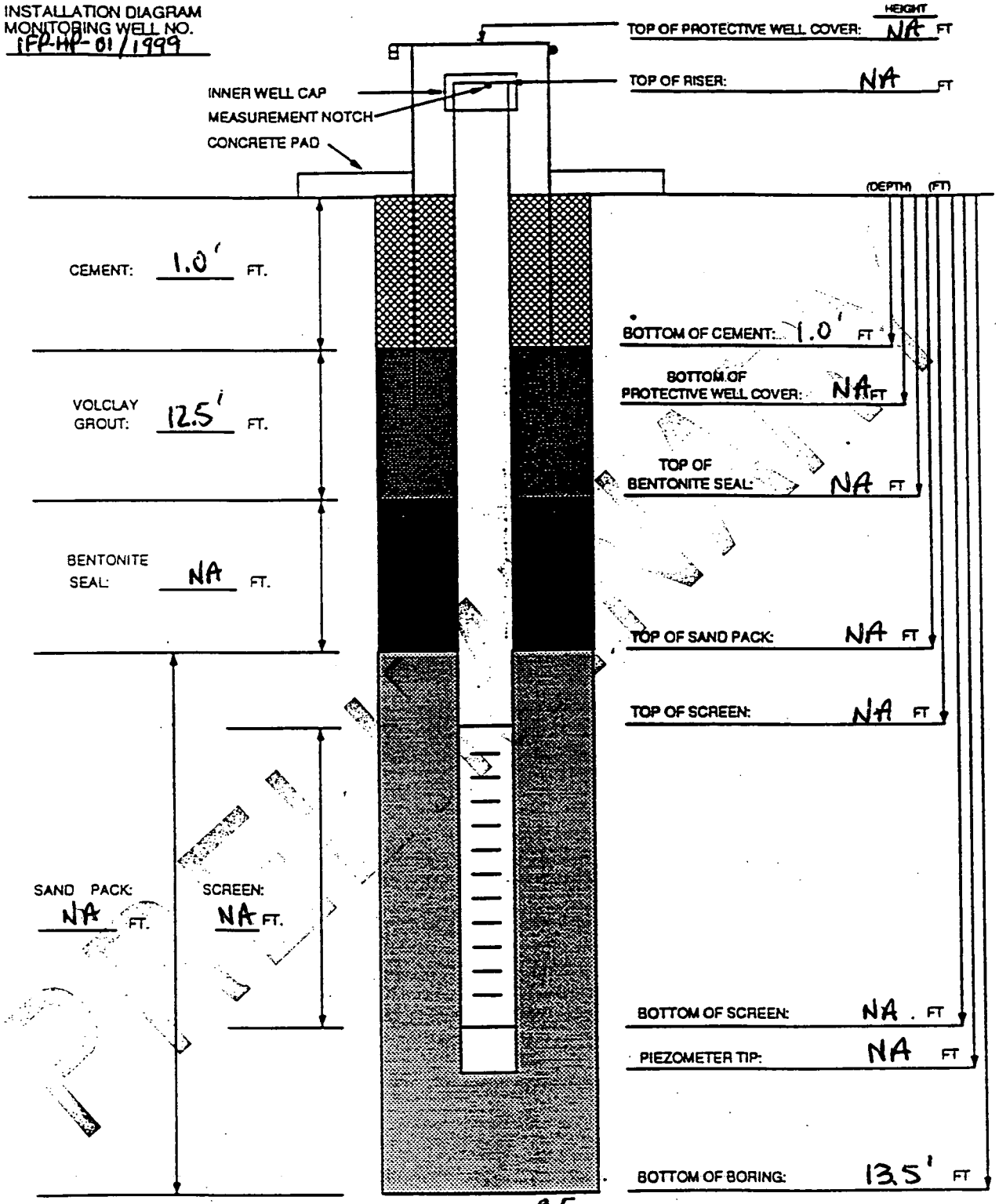
NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller D. Smith
Assistant S. Smith

Background: MT = 0.6 ppm
Bγ = 20-40 cpm

MT – Microtip
SAA – Same As Above
NA – Not Applicable
3" split spoons driven by ASTM standards

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. IFP-HP-01/1999

INSTALLATION DATE: _____



MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 2
AMOUNT OF CEMENT: 1 Bag
AMOUNT OF WATER USED: 5 gallons
OTHER: NA
TASK: Hydropunch borehole

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BEL GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: A. Como

ASI FORM 0157 REV. (0)

FERNALD
RI/FS

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PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU2 Phase II FIELD ENG./GEO. A. Como DATE 04/19/
PROJECT NO. 20.03.05 CHECKED BY _____ DATE _____
BORING NO. 1FP-HP-01/1999
PIEZOMETER NO. NA DATE OF INSTALLATION 04/19/93

BOREHOLE DRILLING

DRILLING METHOD Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT Hollow Stem Auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION (NA)	
TOP OF RISER PIPE	NA		NA	
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	ac 04/19/93		NA	
BOREHOLE FILL MATERIALS:	0.0	13 1.0'		
Cement GROUT/SLURRY	TOP 1.0'	BOTTOM 13.5'	TOP NA	BOTTOM NA
BENTONITE	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
SAND	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PIEZOMETER TIP	NA		NA	
BOTTOM OF BOREHOLE	13.5'		NA	
GWL AFTER INSTALLATION	NA		NA	

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

FEMALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: IFP-HP-02/11000	COORDINATES:	DATE: 04/13/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/13/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 04/15/93	
DRILLING METHODS: Hollow Stem Auger		PAGE 1 OF 4	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	1530 111732 04/13	6	6	Hard (2.5Y 5/4) light olive brown silty clay, some small gravel, some black ash, low plasticity, dry	CL	2.5	HNU = 0 ppm Bγ = 40-50 cpm
	1530 111733 04/13	6	6	SAA	CL	3.0	HNU = 0 ppm Bγ = 40-50 cpm
	NA	8	0	No Recovery	NA	NA	HNU = NA Bγ = NA
2	1535 111734 04/13	9	6	Black Ash, dry	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
	1535 111735 04/13	12	6	SAA	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
3	NA	13	0	No Recovery	NA	NA	HNU = NA Bγ = NA
	1540 111736 04/13	15	6	Black Ash, dry	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
4	1540 111737 04/13	18	6	SAA	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
	1540 111738 04/13	21	6	SAA	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
5	1545 111739 04/13	6	6	SAA	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-60
Driller Don Smith
Assistant Sam Smith

Background: HNU = 0 ppm
Bγ = 40-50 cpm

SAA - Same As Above
NA - Not Applicable
3" split spoons driven by ASTM std

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FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: 1FP-HP-02/11000	COORDINATES:	DATE: 04/13/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/13/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 04/15/9	
DRILLING METHODS: Hollow Stem Auger		PAGE 2 OF 4	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
5	1545 111740 04/13	6	6	Black Ash, dry	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
	1545 111741 04/13	8	6	SAA	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
6	1550 111742 04/13	7	6	SAA	NA	NA	HNU = 0 ppm Bγ = 90-100 cp
	1550 111743 04/13	10	6	Hard (2.5Y 5/6) light olive brown silty clay, some gravel, low plasticity, dry	CL	2.25	HNU = 0 ppm Bγ = 90-100 cp
7	NA	11	0	No Recovery	NA	NA	HNU = NA Bγ = NA
	1555 111744 04/13	10	6	Black Ash, dry	NA	NA	HNU = 0 ppm Bγ = 40-50 cp
8	1555 111745 04/13	12	6	Hard. (2.5Y 6/8) olive yellow silty clay, low plasticity, dry	CL	3.0	HNU = 0 ppm Bγ = 40-50 cp
	1555 111746 04/13	16	6	SAA	CL	3.0	HNU = 0 ppm Bγ = 40-50 cp
9	1600 111747 04/13	8	6	Black Ash, some gravel, moist	NA	NA	HNU = 0 ppm Bγ = 90-100 cp
	1600 111748 04/13	8	6	Hard (2.5Y 6/8) olive yellow and (5Y 6/1) gray silty clay interbedded, low plasticity, dry	CL	3.0	HNU = 0 ppm Bγ = 90-100 c
10							

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller D. Smith
Assistant S. Smith

Background: HNU = 0 ppm
Bγ = 40-50 c

SAA - Same As Above
NA - Not Applicable
3" Split Spoons driven by ASTM standa

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: 1FP-HP-02/11000	COORDINATES:	DATE: 04/13/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/13/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 04/15/93	
DRILLING METHODS: Hollow Stem Auger		PAGE 3 OF 4	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
10	1600 111749 04/13	12	6	Hard (2.5Y 6/8) olive yellow and (5Y 6/1) gray silty clay interbedded, low plasticity, dry	CL	3.0	HNU = 0 ppm Bγ = 90-100 cpm
	1610 111750 04/13	6	6	Hard (2.5Y 5/6) silty clay, some sand, low plasticity, dry	CL	3.75	HNU = 0 ppm Bγ = 90-100 cpm
11	1610 111751 04/13	8	6	SAA	CL	1.5	HNU = 0 ppm Bγ = 90-100 cpm
	1610 111752 04/13	7	6	Firm (2.5Y 6/4) light yellowish brown (5Y 6/1) clayey silt, low plasticity, moist	ML ~~CL~~ acc 4/13/93	~~1.0~~ ge	HNU = 0 ppm Bγ = 90-100 cpm
12	1615 111753 04/13	2	6	Very Loose (2.5Y 4/0) dark gray clayey silt, some gravel, trace black ash, low plasticity, wet	ML	NA	HNU = 0 ppm Bγ = 40-50 cpm
	1615 111754 04/13	4	6	Very Loose (2.5Y 6/6) olive yellow silty sand, no plasticity, wet	ML	NA	HNU = 0 ppm Bγ = 40-50 cpm
13	1615 111755 04/13	9	6	SAA	ML	NA	HNU = 0 ppm Bγ = 40-50 cpm
	1635 111756 04/13	6	6	Firm (2.5Y 5/6) light olive brown silty clay, some gravel, low plasticity, wet	CL	1.0	HNU = 0 ppm Bγ = 40-50 cpm
14	1635 111757 04/13	5	6	Loose (2.5Y 6/8) olive yellow silty sand, no plasticity, wet	ML	NA	HNU = 0 ppm Bγ = 40-50 cpm
	1635 111758 04/13	8	6	Loose (10YR 6/1) gray clayey silt, some gravel, low plasticity, dry	ML	NA	HNU = 0 ppm Bγ = 40-50 cpm
15							

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller D. Smith
Assistant S. Smith

Background: HNU = 0 ppm
Bγ = 40-50 cpm

SAA - Same As Above
NA - Not Applicable
3" Split Spoons driven by ASTM Standard

FERNALD
RI/FS

E-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 30.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: 1FP-HP-02/11000	COORDINATES:	DATE: 04/15/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/13/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 04/15/93	
DRILLING METHODS: Hollow Stem Auger		PAGE 4 OF 4	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15	0915 111760 4/15	6	6	(2.5Y 6/8) olive yellow silty clay low plasticity, dry, some gravel	CL	2.5	HNU = 0 ppm Bγ = 50-60 cpm
	0915 111761 4/15	7	6	SAA	CL	2.75	HNU = 0 ppm Bγ = 50-60 cpm
16	0915 NA 4/15	8	0	No Recovery	NA	NA	HNU = NA Bγ = NA
	0940 111762 4/15	17	6	5Y 5/1 gray clayey silt, some sand, low plasticity, dry	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
17	0940 111763 4/15	12 ~~18~~ 4/15	6	SAA, no plasticity	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
	0940 111764 4/15	18	0	SAA, no plasticity	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
18							HNU = Bγ =
							HNU = Bγ =
19							HNU = Bγ =
							HNU = Bγ =
20							

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller K. Myers
Assistant S. Smith

Background: HNU = 0 ppm
Bγ = 50-60 cpm

SAA - Same As Above
NA - Not Applicable
3" split spoons driven by ASTM stand

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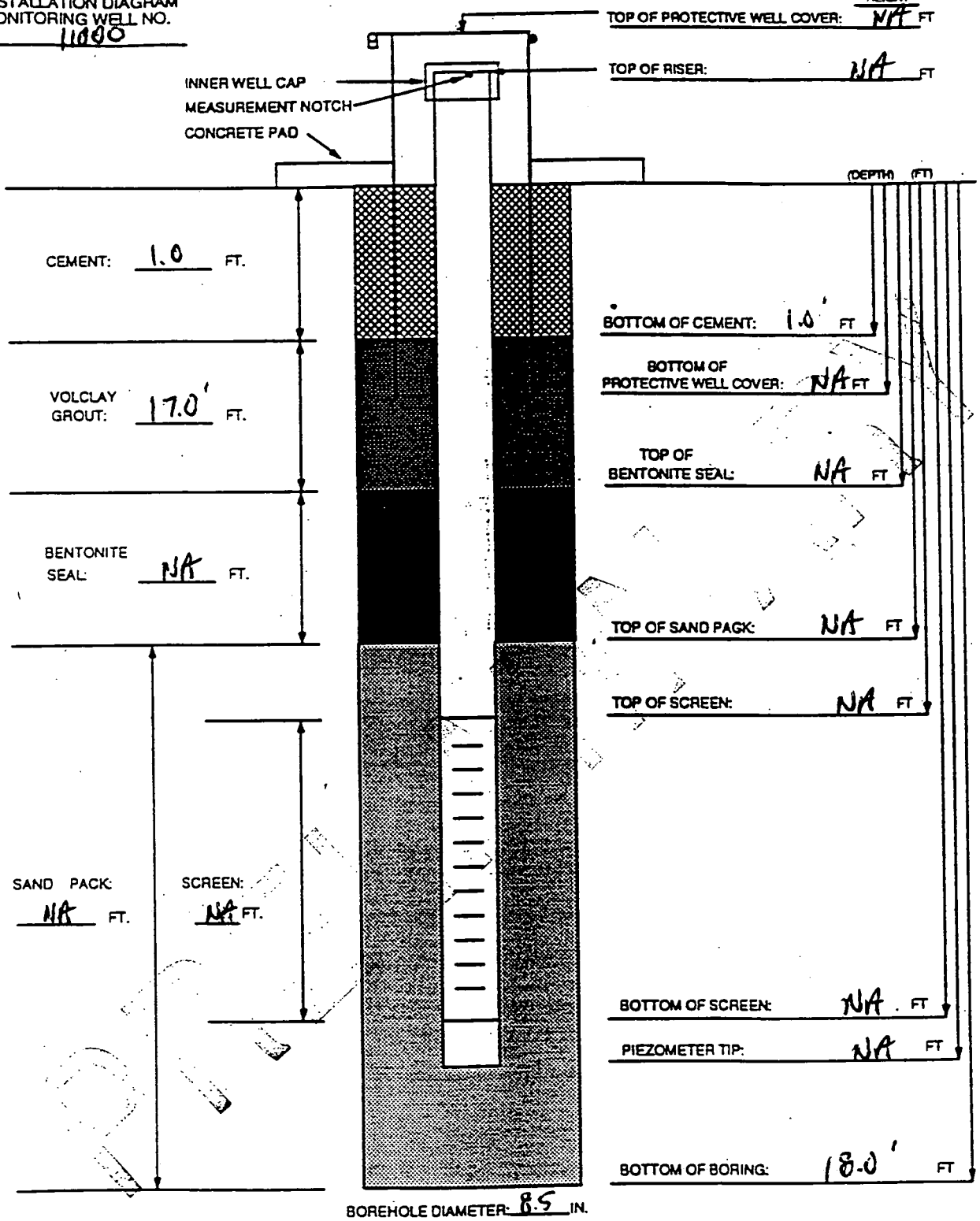
FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 11000

INSTALLATION DATE: 09/14/2395



	HEIGHT	(DEPTH) (FT)
TOP OF PROTECTIVE WELL COVER:	NA FT	
TOP OF RISER:	NA FT	
BOTTOM OF CEMENT:		1.0' FT
BOTTOM OF PROTECTIVE WELL COVER:		NA FT
TOP OF BENTONITE SEAL:		NA FT
TOP OF SAND PACK:		NA FT
TOP OF SCREEN:		NA FT
BOTTOM OF SCREEN:		NA FT
PIEZOMETER TIP:		NA FT
BOTTOM OF BORING:		18.0' FT

MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 2
AMOUNT OF CEMENT: 1 Bag
AMOUNT OF WATER USED: 5 gals
OTHER: NA
TASK: Hydropunch Boring

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BELO GROUND LEVEL
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: A. Como

FERNALD
RI/FS

E-4395

PIEZOMETER INSTALLATION SHEET

PROJECT NAME: OU2 Phase II
FIELD ENG./GEO.: A. Como
DATE: 09/15
PROJECT NO.: 20.03.05
CHECKED BY:
DATE:
BORING NO.: 11000
PIEZOMETER NO.: NA
DATE OF INSTALLATION: 09/15/93

BOREHOLE DRILLING

DRILLING METHOD: Auger
TYPE OF BIT: Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE: NA
DIAMETER OF PERFORATED SECTION: NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS: NA
TOTAL PERFORATED AREA: NA
RISER PIPE MATERIAL: NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS: NA
JOINING METHOD: NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH: NA
PROTECTIVE PIPE O.D.: NA
OTHER PROTECTION: NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS:	0.0'	1.0'		
Cement GROUT/SLURRY	TOP 1.0'	BOTTOM 18.0'	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	18.0'			
GWL AFTER INSTALLATION	NA			

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

REMARKS

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FERNALD
RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. OU2-Southfield		
BORING NUMBER 11016	COORDINATES. NA		DATE 4/18/93
ELEVATION: NA	GWL: Depth	Date/Time	DATE STARTED 4/18/93
ENGINEER/GEOLOGIST J. Reagan	Depth	Date/Time	DATE COMPLETED. 4/18/93
DRILLING METHODS Hollow stem auger			PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
							Bγ background = 60cpm HNU = 0ppm
1	112812 1000	2	6	Soft, 10YR 3/2, very dark grayish brown, silty fine sand, low plasticity, moist	ml	0.5	HNU = 0 ppm
	112813 1000	7	6	Stiff, 2.5Y 5/4, light olive brown, silty clay, low plasticity, moist	cl	2.0	Bγ = 40 cpm
	NA	8	0	NO recovery	NA	NA	
2	112814 1010	18	6	Stiff, 2.5Y 5/4, light olive brown, silty clay, low plasticity, moist	cl	2.0	Bγ = 60 cpm HNU = 0 ppm
	112815 1010.	26	6	very stiff 2.5Y 5/4, light olive brown, 2.5Y 6/1 gray mottles, silty clay, low plasticity, moist	cl	2.5	
	112816 1010	32	2	SAA	cl	2.5	
3	112817 1030	21	6	2.5Y 5/4, light olive brown, 2.5Y 7/1 light gray mottles, silty clay, low plasticity, moist	cl	3.5 JR 4/18	HNU = 0 ppm Bγ = 40 cpm
4	112818 1030	26	6	SAA	cl	2.0	
	112819 1030	24	2	SAA	cl	2.5	
5	112820 1045	3	6	2.5Y 5/4, light olive brown, silty clay, low plasticity, moist	cl	1.0	HNU = 0 ppm Bγ = 40 cpm
	112821 1045	7	6	SAA	cl	1.5	
	112822 1045	11	4	Stiff, 2.5Y 5/6, light olive brown, 2.5Y 6/1 gray mottles, silty fine sand, low plasticity, moist	ml	1.0	
6	112823 1100	3	6	Stiff 2.5Y 5/6, light olive brown, silty fine sand, low plasticity, moist	ml	1.0	HNU = 0 ppm Bγ = 40 cpm
	112824 1100	14	6	very stiff, 2.5Y 5/6, light olive brown, 2.5Y 6/1 gray mottles, silty clay, low plasticity, moist	cl	3.0	
7	112825 1100	12	4	very soft 2.5Y 5/6, light olive brown, 2.5Y 6/1 gray mottles, silty fine sand, low plasticity, very moist	ml	0.0	

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment Acker Soil Sentry
Driller Kevin Myers
George Bullitt

SAA - Same as above
NA - Not Applicable

Samples collected per ASTM standard penetration
Colors identified using Munsell 220 Char-

FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 11916	COORDINATES: NA		DATE: 4/18/93
ELEVATION: NA	GWL: Depth	Date/Time	DATE STARTED: 4/18/93
ENGINEER/GEOLOGIST: J. Reagan	Depth	Date/Time	DATE COMPLETED: 4/18/93
DRILLING METHODS: AUGER (HOLLOW STEM)			PAGE 2 OF 2

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	112826 1110	5	6	very stiff 2.5Y 5/6, light olive brown, 2.5Y 6/1 gray mottles, silty fine sand, low plastic wet	ml	0	HNU = 0 ppm α = Bγ = 60 cpm
	112827 1110	7	6	SAA	ml	0.5	
9	112828 1110	13	6	very stiff 2.5Y 5/6, light olive brown, 2.5Y 6/1 gray mottles, silty clay, slightly plastic, moist	cl	3.0	
	112830 1340	18	6	stiff 2.5Y 5/4 light olive brown, 2.5Y 5/1 gray mottles, silty clay, slightly plastic, moist	cl	2.0	HNU = 0 ppm α = Bγ = 60 cpm
10	112831 1340	20	6	SAA	cl	2.5	
	112832 1340	23	6	very stiff 2.5Y 5/4, light olive brown, 2.5Y 5/1 gray and 2.5Y 5/6 light olive brown mottles silty clay, slightly plastic, moist	cl	3.0	
11				Bottom of Boring 10.5'			HNU = α = Bγ =
12							HNU = α = Bγ =
13							
14							HNU = α = Bγ =

NOTES:

Water at 7'. Set hydropunch at 5.5'–9.5' Sample # 112829
13:25

FERNALD
RI/FS

4395

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Southfield OU2 FIELD ENG./GEO. J. Reagan DATE 4/18/9
PROJECT NO. 20.03.05 CHECKED BY NA DATE NA
BORING NO. 11016
PIEZOMETER NO. NA DATE OF INSTALLATION 4/18/93

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

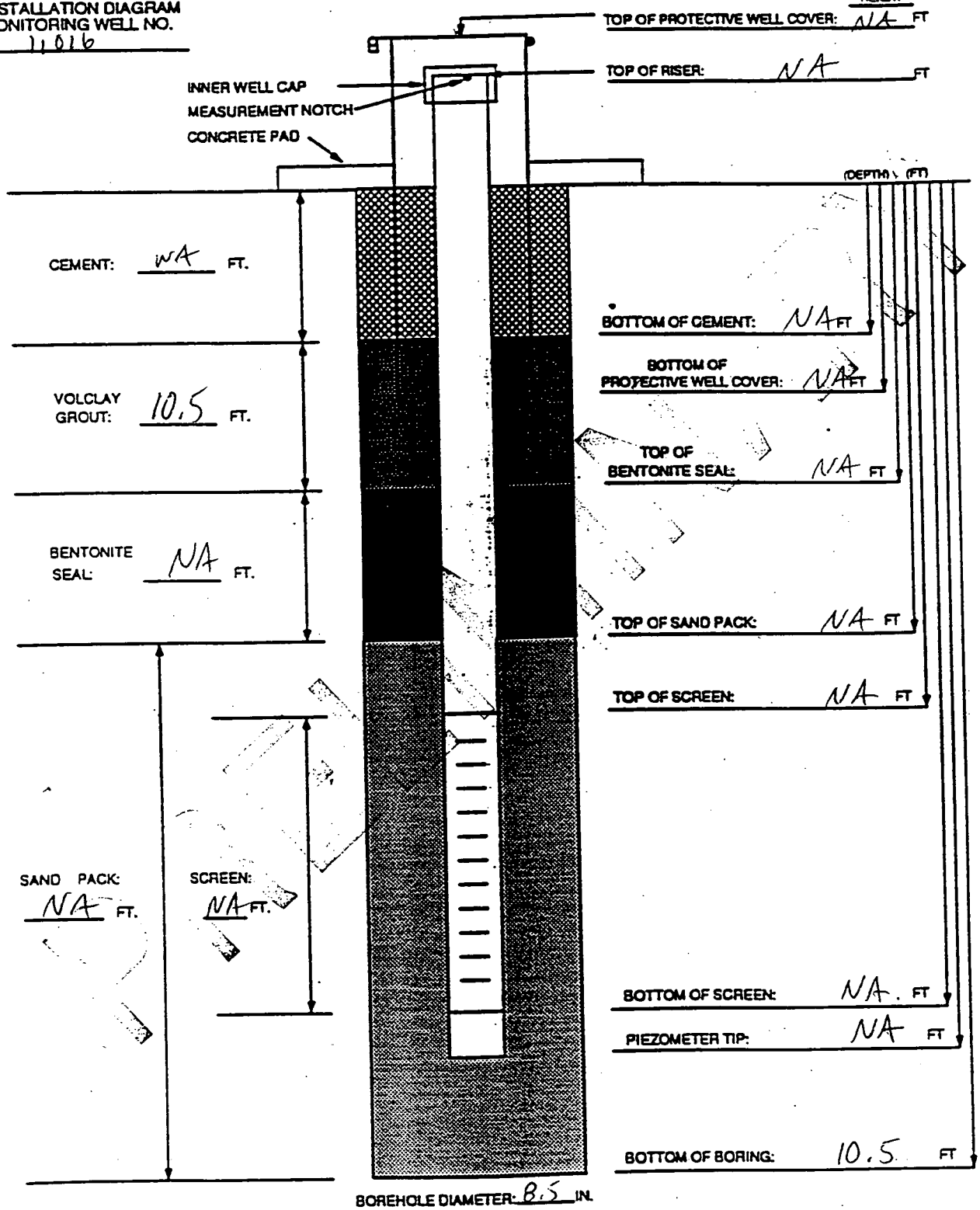
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 10.5	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	10.5			
GWL AFTER INSTALLATION	NA			

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. 11016

INSTALLATION DATE: 4/18/93



MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 1
AMOUNT OF CEMENT: 1
AMOUNT OF WATER USED: 5gal
OTHER: —
TASK: 20.03.05

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA 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: J. Reagan

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: 1FP-HP-05/11003	COORDINATES:		DATE: 04/16/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 04/16/93
ENGINEER/GEOLOGIST: A. Como	Depth	Date/Time	DATE COMPLETED: 04/17/93
DRILLING METHODS: Hollow Stem Auger			PAGE 1 OF 6

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	0820 111765 04/16	5	6	Firm (2.5Y 5/4) light olive brown silty clay, low plasticity, moist	CL	2.0	HNU = 0 ppm Bγ = 40-50 cpm
	0820 111766 04/16	10	6	Loose (2.5YR 2.5/0) black gritty, silt-like material (Black Ash), dry	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
	NA	9	0	No Recovery	NA	NA	HNU = NA Bγ = NA
2	0825 111767 04/16	5	6	Loose (2.5YR 2.5/0) black gritty, silt-like material (Black Ash), dry	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
	0825 111768 04/16	6	6	SAA	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
3	0825 111769 04/16	8	6	SAA	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
	0830 111770 04/16	12	6	SAA	NA	NA	HNU = 0 ppm Bγ = 80-90 cpm
4	0830 111771 04/16	11	6	SAA	NA	NA	HNU = 0 ppm Bγ = 80-90 cpm
	NA	7	0	No Recovery	NA	NA	HNU = NA Bγ = NA
5	0835 111772 04/16	12	6	Medium Dense (2.5YR 2.5/0) black gritty, silt-like material (Black Ash), dry	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller D. Smith
Assistant S. Smith

Background: HNU = 0 ppm
Bγ = 40-50 cpm

SAA- Same As Above
NA- Not Applicable
3" Split Spoon driven by ASTM standa

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS -4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: 1PP-HP-05/11003	COORDINATES:	DATE: 04/16/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/16/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 04/17/93	
DRILLING METHODS: Hollow Stem Auger		PAGE 2 OF 6	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
5	0835 11773 04/16	11	6	Medium Dense (2.5YR 2.5/0) black gritty silt-like material (Black Ash), dry	NA	NA	HNU = 0ppm Bγ = 40-50cpm
	0835 11774 04/16	12	3	SAA	NA	NA	HNU = 0ppm Bγ = 40-50 cpm
6	0840 11775 04/16	7	6	SAA	NA	NA	HNU = 0ppm Bγ = 40-50cpm
	0840 11776 04/16	12	6	SAA	NA	NA	HNU = 0ppm Bγ = 40-50cpm
7	0840 NA	10	0	No Recovery	NA	NA	HNU = NA Bγ = NA
	0845 11777 04/16	6	6	Loose (2.5YR 2.5/0) black gritty silt-like material (Black Ash), dry	NA	NA	HNU = 0ppm Bγ = 40-50cpm
8	0845 11778 04/16	6	6	SAA	NA	NA	HNU = 0ppm Bγ = 40-50cpm
	0845 11779 04/16	7	6	SAA	NA	NA	HNU = 0ppm Bγ = 40-50cpm
9	0850 11780 04/16	8	6	SAA	NA	NA	HNU = 0ppm Bγ = 40-50cpm
	0850 11781 04/16	7	6	SAA	NA	NA	HNU = 0ppm Bγ = 40-50cpm
10							

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller D. Smith
Assistant S. Smith

Background: HNU = 0ppm
Bγ = 40-50cpm

SAA - Same As Above
NA - Not Applicable
3" split spoons driven by ASTM standard

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: IFP-HP-05/11003	COORDINATES:	DATE: 04/16/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/16/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 04/17/93	
DRILLING METHODS: Hollow Stem Auger		PAGE 3 OF 6	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
10	0850 111782 04/16	9	6	Loose (2.5YR 2.5/0) black gritty, silt-like material (Black Ash), dry	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
	0855 111783 04/16	2	6	SAA	NA	NA	HNU = 0 ppm Bγ = 50-60 cpm
11	0855 111784 04/16	4	6	SAA	NA	NA	HNU = 0 ppm Bγ = 50-60 cp
	0855 111785 04/16	8	6	SAA	NA	NA	HNU = 0 ppm Bγ = 50-60 cpm
12	0925 111786 04/16	12	6	SAA, moist	NA	NA	HNU = 0 ppm Bγ = 50-60 cp
	0925 111787 04/16	16	6	SAA with some 2.5Y5/6 light olive brown silty clay	NA	NA	HNU = 0 ppm Bγ = 50-60 cp
13	0925 111788 04/16	4	3	Loose (2.5YR 2.5/0) black gritty, silt-like material (Black Ash), moist	NA	NA	HNU = 0 ppm Bγ = 50-60 cp
	0930 111789 04/16	7	6	SAA	NA	NA	HNU = 0 ppm Bγ = 50-60 cp
14	0930 111841 04/16	12	6	Hard (5Y 4/2) olive gray silty clay, medium plasticity, some black ash, moist	CL	2.0	HNU = 0 ppm Bγ = 50-60 cp
	NA	16	0	No Recovery	NA	NA	HNU = NA Bγ = NA
15							

NOTES:

Drilling Co. Pennsylvania Drilling

Drilling Equipment Mobile B-80

Driller D. Smith

Assistant S. Smith

Background: HNU = 0 ppm
Bγ = 40-50 cp

SAA-Same As Above
NA- Not Applicable

3" split spoons driven by ASTM standard

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU 2 Phase 2		
BORING NUMBER: IFP-HP-05/11003	COORDINATES:	DATE: 04/16/93	
ELEVATION:	GWL: Depth / Date/Time	DATE STARTED: 04/16/93	
ENGINEER/GEOLOGIST: A. Como	Depth / Date/Time	DATE COMPLETED: 04/17/93	
DRILLING METHODS: Hollow Stem Auger		PAGE 4 OF 6	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15	0940 111842 04/16	14	6	Medium Dense (2.5YR 2.5/0) black gritty, silt-like material (Black Ash), moist	NA	NA	HNU = 0 ppm Bγ = 80-90 cpm
	0940 111843 04/16	15	6	Firm (5Y 4/2) olive gray, silty clay low plasticity, moist	CL	1.75	HNU = 0 ppm Bγ = 90-100 cpm
16	0940 111844 04/16	14	6	SAA	CL	1.75	HNU = 0 ppm Bγ = 80-90 cpm
	0955 111845 04/16	12	6	SAA, some Flyash	CL	1.75	HNU = 0 ppm Bγ = 1500 cpm
17	NA	22	0	No Recovery	NA	NA	HNU = NA Bγ = NA
	NA	27	0	No Recovery	NA	NA	HNU = NA Bγ = NA
18	1350 111846 04/16	7	6	Soft (5Y 4/1) dark gray, silty clay, high plasticity, moist	CL	0.75	HNU = 0 ppm Bγ = 600 cpm
	1350 NA	8	0	No Recovery	NA	NA	HNU = NA Bγ = NA
19	NA	9	0	No Recovery	NA	NA	HNU = NA Bγ = NA
	1400 111847 04/16	8	6	Soft (5Y 4/1) dark gray, silty clay, high plasticity, wet	CL	0.50	HNU = 0 ppm Bγ = 350 cpm
20							

NOTES:

Drilling Co. Pennsylvania Drilling

Drilling Equipment Mobile B-80

Driller D. Smith

Assistant S. Smith

Background: HNU = 0 ppm
Bγ = 40-50 cpm

SAA- Same As Above
NA- Not Applicable

3" Split Spoons driven by ASTM sta

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: IFP-HP-05/11003	COORDINATES:	DATE: 04/16/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/16/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 04/17/93	
DRILLING METHODS: Hollow Stem Auger		PAGE 5 OF 6	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
20				Firm ac 4/16/93			
	1400 111848 04/16	7	6	Soft (5Y 4/1) dark gray, silty clay, high plasticity, wet	CL	0.75	HNU = 0 ppm Bγ = 350-360 cpm
	NA	7	0	No Recovery	NA	NA	HNU = NA Bγ = NA
21	1420 111849 04/16	10	6	Soft (5Y 4/1) dark gray, silty clay, high plasticity, wet	CL	0.5	HNU = 0 ppm Bγ = 390-400 cpm
	NA	7	0	No Recovery	NA	NA	HNU = NA Bγ = NA
22	NA	8	0	No Recovery	NA	NA	HNU = NA Bγ = NA
	1430 111850 04/16	12	6	Firm (5Y 4/1) dark gray silty clay, high plasticity, wet	CL	1.0	HNU = 0 ppm Bγ = 350-360 cpm
23	1430 111851 04/16	17	6	Medium Dense (5Y 4/1) dark gray, sandy silt, low plasticity, dry	ML	NA	HNU = 0 ppm Bγ = 90-100 cpm
	NA	24	0	No Recovery	NA	NA	HNU = NA Bγ = NA
24	1435 111852 04/16	37	6	Hard (5Y 4/1) dark gray, silty clay, some gravel with some (2.5Y 5/6) light olive brown, sandy silt, dry	CL	3.75	HNU = 0 ppm Bγ = 90-100 cpm
	1435 111853 04/16	49	6	Dense (2.5Y 4/3) olive brown sand, some silt, well sorted, moist some iron staining	ML	NA	HNU = 0 ppm Bγ = 40-50 cpm
25							

NOTES:

Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller D. Smith
Assistant S. Smith

Background: HNU = 0 ppm
Bγ = 40-50 cpm

SAA - Same As Above
NA - Not Applicable
3" split spoons driven by ASTM standard

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU 2 Phase 2		
BORING NUMBER: IFP-HP-05/11003	COORDINATES:	DATE: 04/16/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/16/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 04/17/93	
DRILLING METHODS: Hollow Stem Auger		PAGE 6 OF 6	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
25	1435 NA	50	0	No Recovery	NA	NA	HNU = NA Bq = NA
26	0905 04/17	12	6	Medium Dense (5YR 5/4) silty sand, well graded, dry	ML	NA	Microtip ac 4/17/93 ~~HNU~~ = 0 ppm Bq = 40-50 cpm
	0905 NA	24	0	No Recovery	NA	NA	HNU = NA Bq = NA
27	0905 NA	32	0	No Recovery	NA	NA	HNU = NA Bq = NA
							HNU = Bq =
							HNU = Bq =
							HNU = Bq =
							HNU = Bq =
							HNU = Bq =
							HNU = Bq =

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller D. Smith
Assistant S. Smith

Background: Microtip ac 4/17/93 ~~HNU~~ = 0 ppm
Bq = 40-50 cpm

NA- Not Applicable

3" split spoons driven by ASTM standard

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FERNALD
RI/FS

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PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU2 Phase II
PROJECT NO. 20.03.05
BORING NO. 11003
PIEZOMETER NO. NA

FIELD ENG./GEO. A. Lomo DATE 04/17/
CHECKED BY _____ DATE _____
DATE OF INSTALLATION NA

BOREHOLE DRILLING

DRILLING METHOD Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT Hollow stem auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION _____
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (NA)	
TOP OF RISER PIPE	NA		NA	
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	NA		NA	
BOREHOLE FILL MATERIALS:	0.0'	1.0'		
Cement GROUT/SLURRY	TOP 1.0'	BOTTOM 27.0'	TOP NA	BOTTOM NA
BENTONITE	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
SAND	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PIEZOMETER TIP	NA		NA	
BOTTOM OF BOREHOLE	27.0'		NA	
GWL AFTER INSTALLATION	NA		NA	

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

REMARKS _____

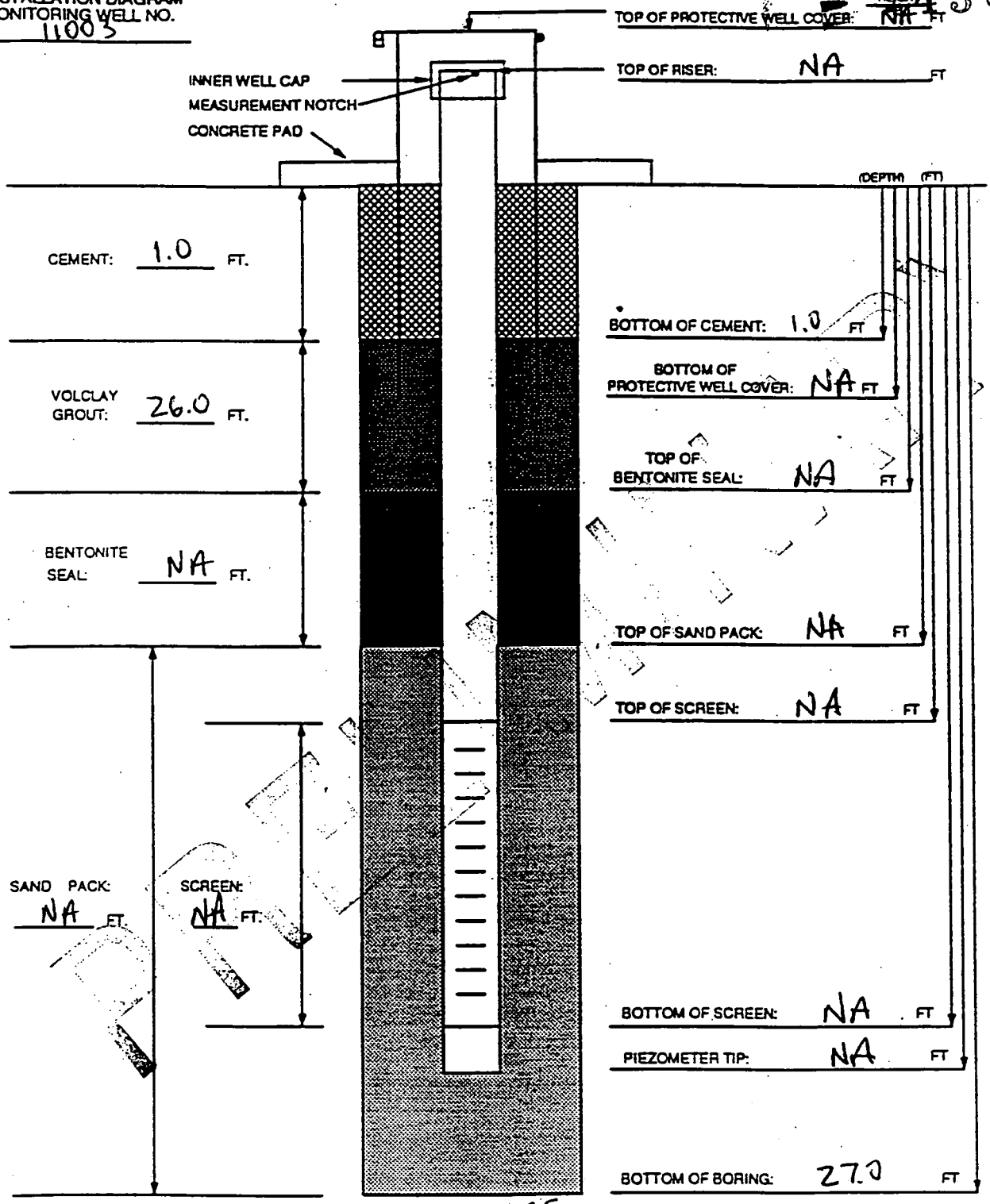
FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 11003

INSTALLATION DATE: 04/17/93

4395

TOP OF PROTECTIVE WELL COVER: NA FT

TOP OF RISER: NA FT



BOREHOLE DIAMETER: 8.5 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 5
AMOUNT OF CEMENT: 1 bag
AMOUNT OF WATER USED: 5.0 gallons
OTHER: NA
TASK: Hydropunch Boring

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/_
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BEL GROUND LEVEL
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: A. Lowe

ASI FORM 0157 REV. (0)

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RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 1100B	COORDINATES:	DATE 4/28/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 4/28/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/29/9
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 1 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1445 111970 4/28/93	2	6	Loose, black flyash w/organics dry	NA	NA	HNU = 0ppm BS = 40cpm
	1448 111971 4/28/93	2	3	SAA	NA	NA	HNU = NA BS = NA
1		2	0	No Recovery	NA	NA	HNU = NA BS = NA
	1450 11972 4/28/93	4	5	Loose, black flyash w/organics dry	NA	NA	HNU = 0ppm BS = 60cpm
2		4	0	No Recovery	NA	NA	HNU = NA BS = NA
		4	0	No Recovery	NA	NA	HNU = NA BS = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Jeff Bentley, Bill Sybert

Samples collected per 15.in standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = ppm BS = cpm

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VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 11055	COORDINATES:	DATE 4/28/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 4/28/92
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/29/
DRILLING METHODS: Hollow Stem Auger		PAGE 2 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1455 9 11/6/73 4/28/93	4	6	M. Dense. Black Flyash with organics, Dry	NA	NA	HNU = 0ppm BS = 60cpm
	1455 9 11/6/74 4/28/93	6	6	SAA	NA	NA	HNU = 0ppm BS = 60cpm
4	1455 9 11/6/75 4/28/93	8	6	SAA	NA	NA	HNU = 0ppm BS = 60cpm
	1500 9 11/6/76 4/28/93	4	6	SAA	NA	NA	HNU = 0ppm BS = 60cpm
5	1500 9 11/6/77 4/28/93	4	6	SAA	NA	NA	HNU = 0ppm BS = 60cpm
		7	0	No Recovery	NA	NA	HNU = NA BS = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor Pennsylvania Drilling Co.

Drilling Equipment Acker Sentry

Driller: Jeff Bentley
Bill Sabin

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = 0ppm BS = 60cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2		
BORING NUMBER: 110MK	COORDINATES:	DATE 4/29/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 4/28/93	
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/29/93	
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 3 OF 9	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
DSO 4/30/93	0905 9 111678	4	6	M. Dense, black flyash w/ organics, dry	NA	NA	HNU = 0 ppm BS = 60cpm
DSO 4/30/93	0905 9 111679	5	5	SAA	NA	NA	HNU = 0 ppm BS = 60cpm
7		6	0	No Recovery	NA	NA	HNU = NA BS = NA
DSO 4/30/93	0915 9 111680	2	6	Loose black flyash, dry	NA	NA	HNU = 0 ppm BS = 60cpm
8 DSO 4/30/93	9 111681	4	6	SAA	NA	NA	HNU = 0 ppm BS = 60cpm
DSO 4/30/93	9 111682	6	6	~~Loose~~ Soft. 2.5Y(3/4) Light olive brown gravelly clay, no plasticity, moist	CL	.5	HNU = 0 ppm BS = 60cpm

SAA - same as above
NA - not applicable

NOTES:

Drilling Contractor Pennsylvania Drilling Co.

Drilling Equipment Acker Sentry

Driller: Jeff Bentley, David Holmes

Samples collected per ASTM standard penetration test

colors identified using Munsell Color Chart

Key: HNU = 0 ppm BS = 60 cpm

402-11

RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	4995
BORING NUMBER: 11005	COORDINATES:	DATE 4/29/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/28/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/29/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 4 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	0920 SB0 9 11683 4/29/93	7	8	M. Dense. 2.5Y(5/3) Lt. olive brown sand with concrete debris, dry	SP	NA	HNU = 0ppm BG = 60cpm
		9	0	No Recovery	NA	NA	HNU = NA BG = NA
10		9	0	No Recovery	NA	NA	HNU = NA BG = NA
	0940 SB0 9 11684 4/29/93	6	6	Soft. 2.5Y(5/4) Lt olive brown clay w/ concrete, sand, & organics, no plasticity moist	CL	8	HNU = 0ppm BG = 480cpm
11		4	0	No Recovery			HNU = NA BG = NA
		4	0	No Recovery			HNU = NA BG = NA

NOTES:

NA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Todd Bentley
Daniel Holmes

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = 0ppm BG = 60cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	4395
BORING NUMBER: 1003	COORDINATES:	DATE 4/29/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 4/28/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/29/9
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 5 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
880 4/30/93	0945 9 1116788 4/29/93	5	6	STIFF 2.5Y (4/4) Olive brown clay w/gravel & sand, low plasticity, moist	CL	1.0	HNU = 0ppm BG = 280cpm
880 4/30/93	0945 9 1116786 4/29/93	6	6	SAA	CL	1.75	HNU = 0ppm BG = 80cpm
13		8	0	No Recovery	NA	NA	HNU = NA BG = NA
880 4/30/93	1000 9 1116787 4/29/93	9	6	Hard 2.5Y (3/4) Lt. olive brown clay with gravel, no plasticity dry	CL	4.0	HNU = 0ppm BG = 60cpm
14 880 4/30/93	1000 9 1116788 4/29/93	11	6	SAA	CL	4.5	HNU = 0ppm BG = 60cpm
		16	0	No Recovery			HNU = BG =

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: JEFF BENTLEY
DAVID HOLMES

Samples collected per ASTM standard penetration test

colors identified using Munsell Color Chart

Key: HNU = 0ppm BG = 80cpm

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 1100B	COORDINATES:	DATE 4/29/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/28/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/29/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 6 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1010 D50 4/29/93 ~~1163A~~	12	0	No Recovery	NA	NA	HNU = NA BS = NA
		10	0	No Recovery	NA	NA	HNU = NA BS = NA
16		6	0	No Recovery	NA	NA	HNU = NA BS = NA
	1020 D50 4/29/93 ~~1116B9~~	7	6	Hard: 2.5Y(6/6) Olive yellow gravelly clay, no plasticity dry			HNU = 0 ppm BS = 60cpm
17	1000 ~~1116B~~ 116119 4/29/93	22	6	V.St.Aff. 2.5Y(6/6) Olive yellow gravelly clay, low plasticity slightly moist			HNU = 0 ppm BS = 60cpm
	1020 116120 4/29/93	23	6	Hard 2.5Y(6/6) Olive yellow gravelly clay, no plasticity dry			HNU = 0 ppm BS = 60cpm

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Jeff Bentley
David Holmes

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

Key: HNU = ppm BS = BS cpm

402-11-86

RI/FS

B-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2		
BORING NUMBER: 11005	COORDINATES:		DATE 4/29/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 4/28/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth	Date/Time	DATE COMPLETED: 4/29/93
DRILLING METHODS: Hollow Stem Auger			PAGE 7 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1035 116121 4/29/93	50/4	4	Hard, 2.5Y(6/6) Olive yellow gravelly clay, no plasticity dry	CL	>4.5	HNU = 0ppm BS = >60cpm
			0	No Recovery	NA	NA	HNU = NA BS = NA
19			0	No Recovery	NA	NA	HNU = NA BS = NA
	1330 116122 4/29/93	50	6	V. Dense 2.5Y(5/4) Lt olive brown med to coarse sand, poorly graded, slightly moist.	SP	NA	HNU = 0ppm BS = 60cpm
20		50/2	0	No Recovery	NA	NA	HNU = NA BS = NA
			0	No Recovery Boring terminated at 21.0 ft	NA	NA	HNU = NA BS = NA

NOTES:

SA - same as above
NA - not applicable

Drilling Contractor Pennsylvania Drilling Co.

Drilling Equipment Acker Sentry

Driller: Jeff Bordley
Dallas Holmes

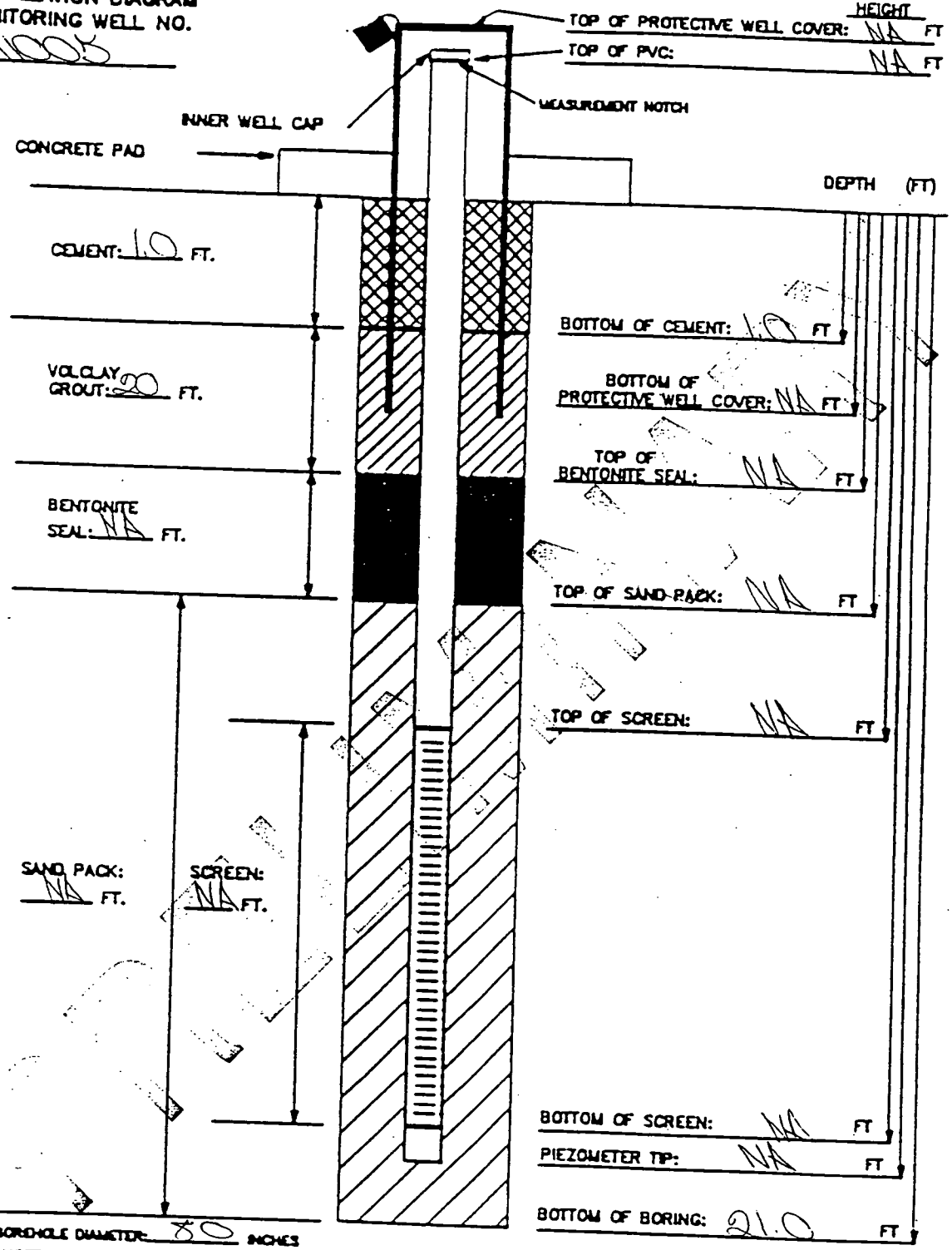
Samples collected per ASTM standard penetration test
Colors identified using Munsell Color Chart

Key: HNU = 0ppm BS = 60cpm

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1005

INSTALLATION DATE: 4/29/93



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 3
AMOUNT OF CEMENT: 1 bag
AMOUNT OF WATER USED: 25 gal
OTHER:

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 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: NA

DJO 4/30/93

Soil & Water drum

TASK: 20.03.03

GEOLOGIST/ENGINEER: D. O'Brien

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FERNALD
RI/FS

9019

-4395

PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU2 phase 2 FIELD ENG./GEO. D. O'Brien DATE 4/30
PROJECT NO. 20.03.05 CHECKED BY _____ DATE _____
BORING NO. 11003
PIEZOMETER NO. ——— DATE OF INSTALLATION 4/29/93

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Augs
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID ——— FROM ——— TO ———

TYPE OF BIT Augs
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE ——— FROM ——— TO ———

PIEZOMETER DESCRIPTION

TYPE Hydropunch Boring
DIAMETER OF PERFORATED SECTION
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0 / 1.0	BOTTOM 1.0 / 21.0	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA	NA		
BOTTOM OF BOREHOLE	21.0			
GWL AFTER INSTALLATION	NA			

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

REMARKS _____

409-11-8

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RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 PHASE 2	
BORING NUMBER: 11005	COORDINATES:	DATE 4/28/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/28/93
ENGINEER/GEOLOGIST: D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/29/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 1 OF 9

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1445 111970 4/28/93	2	6	Loose, black flyash w/organics dry	NA	NA	HNU = 0ppm BS = 40cpm
1	1448 111971 4/28/93	2	3	SAA	NA	NA	HNU = NA BS = NA
		2	0	No Recovery	NA	NA	HNU = NA BS = NA
2	1450 111972 4/28/93	4	5	Loose, black flyash w/organics dry	NA	NA	HNU = 0ppm BS = 60cpm
		4	0	No Recovery	NA	NA	HNU = NA BS = NA
		4	0	No Recovery	NA	NA	HNU = NA BS = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor: PENNSYLVANIA DRILLING CO.
Drilling Equipment: ACKER SENTRY
Driller: Jeff Bentley, Bill Sibert

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

Key: HNU = ppm BS = cpm

FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER	20.03.05	PROJECT NAME.	OU2 - Southfield		
BORING NUMBER.	1966	COORDINATES.	NA	DATE	4/21/93
ELEVATION:	NA	GWL: Depth	Date/Time	DATE STARTED	4/21/93
ENGINEER/GEOLOGIST	J. Reagan	Depth	Date/Time	DATE COMPLETED.	4/22/9
DRILLING METHODS	Hollow stem auger			PAGE 1	OF 4

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	112854 950	2	6	soft, 2.5Y 3/1 very dark gray silty fine sand, low plasticity, moist	ML	0.5	HNU = 0.5 ppm Bγ = 60 cpm
	~~112855~~ 950		6	Sample taken by IH personnel		0.5	HNU = 16.1 ppm Bγ = 300 cpm
1	112855 950	8	2	st-66, 2.5Y 5/4 light olive brown, 2.5Y 3/1 very dark gray mottles, silty clay, slightly plastic, moist	cl	1.0	HNU = 16.1 in ho. 200 cpm in at 4 in sec
	112856 1000	6	6	very st-82, 2.5Y 5/4 light olive brown, 2.5Y 3/1 very dark gray mottles, silty clay, slightly plastic, moist	cl	2.5	Bγ = 60 cpm HNU = <1 ppm
2	112857 1000	12	6	st-66, 2.5Y 5/4 light olive brown, 2.5Y 3/1 very dark gray mottles, silty clay, slightly plastic, moist	cl	1.75	
	112858 1035	4	6	SAA	cl	2.0	
3	↓	6	6	SAA	cl	2.0	HNU = 0 ppm Bγ = 60 cpm
	↓	8	6	SAA	cl	2.0	
4	112858 1035	8	6	SAA	cl	2.0	
	112859 1050	4	6	st-66, 2.5Y 5/4 light olive brown, silty clay, slightly plastic, moist	cl	1.25	HNU = 0 ppm Bγ = 50 cpm
5	↓	4		SAA	cl	1.0	
	↓	5	6	SAA	cl	0.5	
6	112859 1050	5	6	SAA	cl	1.5	HNU = 0 ppm Bγ = 50 cpm
	112860 1330	NA	NA	Shelby tube	NA	NA	
7	112860 1330		NA	Shelby tube	NA	NA	

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment Acker Soil Sentry
Driller Marty Watral
Bob Deiley

SAA - Same as above
NA - Not Applicable

Samples collected per ASTM standard penetration
Colors identified using Munsell Color Char-

FERNALD
RI/FS

E-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1966	COORDINATES: NA		DATE: 4/21/93
ELEVATION: NA	GWL: Depth	Date/Time	DATE STARTED: 4/21/93
ENGINEER/GEOLOGIST: J. Reagan	Depth	Date/Time	DATE COMPLETED: 4/22/93
DRILLING METHODS: AUGER (HOLLOW STEM)			PAGE 2 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	112860 1330	NA	NA	Shelby tube	NA	NA	HNU = α = Bq =
	112860 1330		NA	Shelby tube	NA	NA	
9	112861 1345	2	6	stiff 2.5Y 4/3 olive brown silty clay low plasticity moist	CL	1.25	
	112862 1345	2	6	stiff 2.5Y 4/2 dark grayish brown silty clay, low plasticity, moist	cl	1.0	HNU = 0 ppm α = Bq = 50 cpm
10	112863 1345	4	4	SAA	cl	1.25	
	112864 1400	3	6	stiff 2.5Y 4/2 dark grayish brown, 2.5Y 5/1 gray mottles, silty clay, low plasticity moist, gravels	cl	1.0	
11	112865 1400	3	6	SAA	cl	1.0	HNU = 0 ppm α = Bq = 50 cpm
	112866 1400	3	6	SAA	cl	1.0	
12	112867 1405	7	6	stiff 2.5Y 4/4, olive brown, silty clay, low plasticity, moist	cl	1.25	
	↓	8	6	stiff 2.5Y 4/4, olive brown, 2.5Y 5/6 light olive brown mottles, silty clay, slightly plastic moist, gravels	cl	1.25	~~HNU~~ ~~α~~ ~~Bq~~
13	112867 1405	10	6	SAA	cl	1.5	
	112868 1430		NA	Shelby tube	NA	NA	
14	112868 1430	NA	↓	↓	↓	↓	HNU = 0 ppm α = Bq = 50 cpm
	112868 1430		↓	↓	↓	↓	
	112868 1430		NA	Shelby tube	NA	NA	

NOTES:

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1966	COORDINATES: NA		DATE: 4/21/93
ELEVATION: NA	GWL: Depth	Date/Time	DATE STARTED: 4/21/93
ENGINEER/GEOLOGIST: J. Reagan	Depth	Date/Time	DATE COMPLETED: 4/22/9
DRILLING METHODS: AUGER (HOLLOW STEM)			PAGE 3 OF 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	112869 1450	3	6	stiff 2.5Y 4/4, olive brown, silty clay, low plasticity, moist, gravels	cl	1.0	HNU = 1.8 ppm α = Bγ = 60 cpm
16	112870 1450	5	6	SAA	cl	2.0	
	112871 1450	12	6	stiff, 5GY 4/1 dark greenish gray, silty clay, low plasticity, moist, gravels	cl	1.5	
17	112872 1500	3	6	SAA	cl	1.5	HNU = 1.7 ppm α = Bγ = 50 cpm
	112873 1500	10	6	SAA	cl	1.5	
18	NA	14	0	NO Recovery	NA	NA	
	NA	20	NA	NO Recovery	NA	NA	HNU = α = Bγ = NA
19	NA	25	NA	NO Recovery	NA	NA	
	NA	25	NA	No Recovery	NA	NA	
20	112874 1540	12	6	very stiff, 10YR 3/1, very dark gray, silty clay, low plasticity, moist	cl	3.0	
	112875 1540	20	6	very stiff 2.5Y 4/4, olive brown, silty clay, low plasticity, moist	cl	4.0	HNU = 0 ppm Bγ = 50 cpm
21	112876 1540	24	6	SAA	cl	4.5	
	112878 920	6	6	stiff, 2.5Y 4/4 olive brown, silty clay, low plasticity, moist	cl	1.5	HNU = 0 ppm Bγ = 50 cpm
22	112879 920	6	6	very stiff, 2.5Y 4/4 olive brown, silty clay, slightly plastic, moist	cl	2.5	
	NA	12	0	No recovery	NA	NA	

NOTES:

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. OU2 - Southfield		
BORING NUMBER 1966	COORDINATES. NA		DATE 4/22/93
ELEVATION: NA	GWL: Depth	Date/Time	DATE STARTED 4/21/93
ENGINEER/GEOLOGIST J. Reagan	Depth	Date/Time	DATE COMPLETED. 4/22/93
DRILLING METHODS Hollow stem auger			PAGE 4 OF 4

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
23	112880 940	8	6	very stiff 66, 2.5Y 3/2, very dark grayish brown, silty clay, slightly plastic, moist	Cl	3.5	NNu = 0 ppm
	112881 940	8	6	St. 66, 10YR 4/3, brown, silty clay low plasticity, moist, some sand	Cl	1.5	βγ = 50 cpm
24	112882 940	12	6	SAA	Cl	1.5	
	112883 955	8	6	SAA	Cl	1.5	NNu = 0 ppm
25	112883 955	10	6	SAA	Cl	1.5	βγ = 50 cpm
	112884 955	17	6	Medium dense 10YR 4/3, brown, sand-silt-gravel mixture, low plasticity, moist	GM	NA	
26				Bottom of sampling 25.5 FT			
27							

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment Acker Soil Sentry
Driller Marty Watral
Bob Deiley

SAA - Same as above
NA - Not Applicable

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

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU2 - Southfield
PROJECT NO. 20.03.05
BORING NO. 1966
PIEZOMETER NO. NA
FIELD ENG./GEO. S. Reagan DATE 4/2
CHECKED BY NA DATE N
DATE OF INSTALLATION 4/21 - 4/22/93

BOREHOLE DRILLING

DRILLING METHOD hollow stem auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

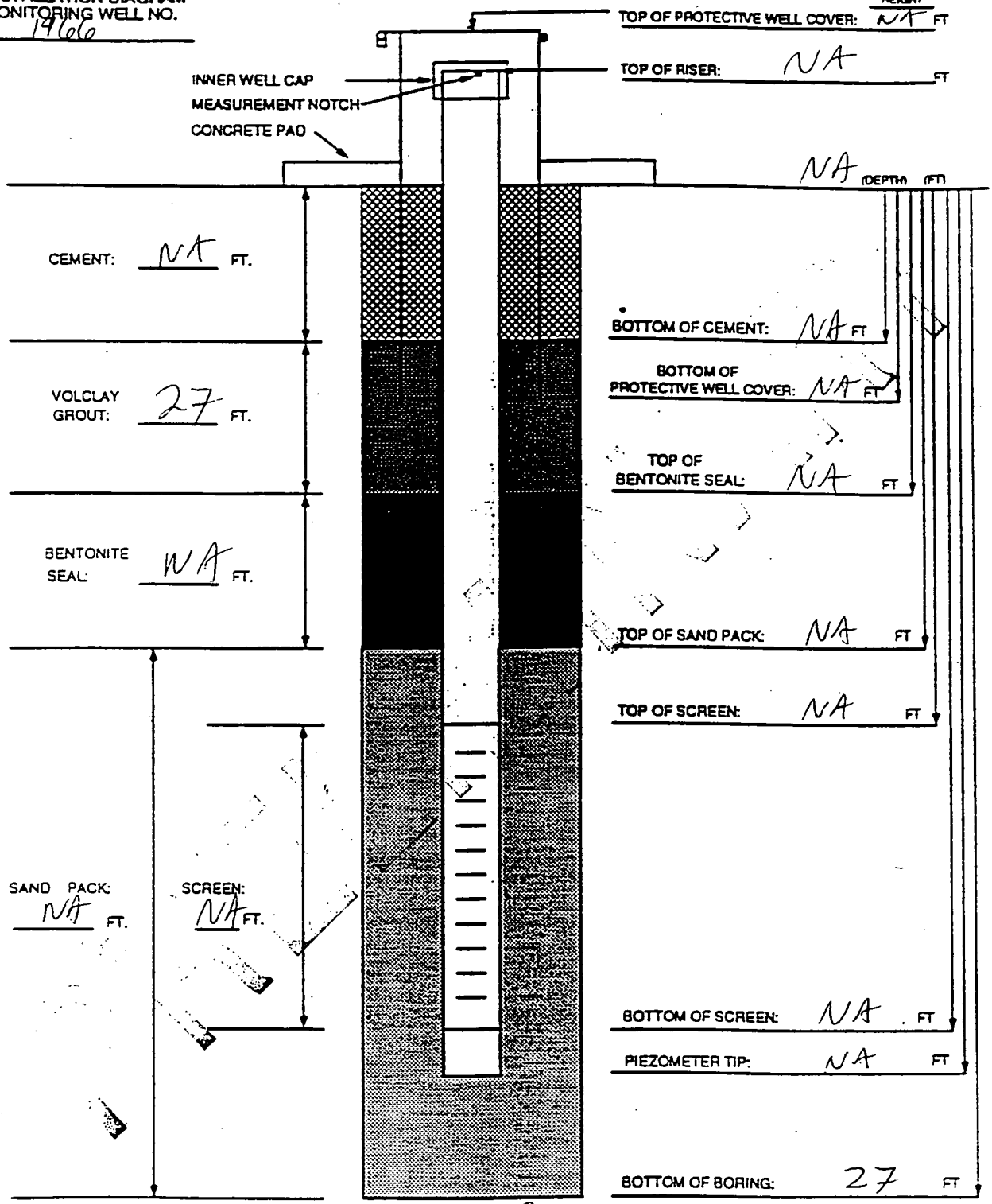
OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION ( )	
TOP OF RISER PIPE	NA		NA	
GROUND SURFACE	0.0		↓	
BOTTOM OF PROTECTIVE PIPE	NA		NA	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 27.0	TOP NA	BOTTOM N
BENTONITE	TOP NA	BOTTOM NA	TOP ↓	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP ↓	BOTTOM ↓
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP NA	BOTTOM N
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	27.0			
GWL AFTER INSTALLATION	NA			

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

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 1966

INSTALLATION DATE: 4/22/93



TOP OF PROTECTIVE WELL COVER: HEIGHT NA FT

TOP OF RISER: NA FT

NA (DEPTH) (FT)

BOTTOM OF CEMENT: NA FT

BOTTOM OF PROTECTIVE WELL COVER: NA FT

TOP OF BENTONITE SEAL: NA FT

TOP OF SAND PACK: NA FT

TOP OF SCREEN: NA FT

BOTTOM OF SCREEN: NA FT

PIEZOMETER TIP: NA FT

BOTTOM OF BORING: 27 FT

BOREHOLE DIAMETER: 8.5 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 2
AMOUNT OF CEMENT: 1
AMOUNT OF WATER USED: 20 gal
OTHER: NA
TASK: 20.03.05 Boring 1966

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA-T/A
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: J. Reagan

FERNALD
RI/FS

4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase II		
BORING NUMBER: 1984	COORDINATES:	DATE: 05/01/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 05/01/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 05/01/93	
DRILLING METHODS: Hollow stem Auger w/ CME sampler		PAGE 1 OF 2	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (NA)	RECOVERY (ft)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1100 05/01	NA	2.5	Hard (2.5Y 4/4) and 2.5Y 5/2 silty clay, slight plasticity, some small gravel, dry	CL	2.25	MT = 1.5 ppm Bq = 100-110 cpm 111463 - D (TAL) 111464 - TOCD 111465 - Archive
2.5	1100 05/01	NA	2.5	(2.5'-3.0') obstruction (5Y 5/1) silty sand, well graded with (2.5Y 4/4) silty clay, some small gravel, dry	ML	NA	At 2.5' hit obstruction. Drilled through with augers. MT = 1.6 ppm Bq = 100-110 cpm 111466 - TAL C
5.0	1400 05/01	NA	2.5	(5Y 5/1) silty sand, well graded, some small gravel, some (5Y 4/4) silty clay, low plasticity, dry	ML	NA	MT = 1.1 ppm Bq = 100-110 cpm 111469 - Archive
7.5							

NOTES:

Drilling Co: Pennsylvania Drilling Co.
Driller: Chris Coulter
Assistant: Bob Johnson

Background MT = 1.1 ppm
Bq = 100-110 cpm

NA - Not Applicable
MT - Microtip

FERNALD
RI/FS

E-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase II		
BORING NUMBER: 1984	COORDINATES:	DATE: 05/01/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 05/01/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 05/01/93	
DRILLING METHODS: Hollow stem Auger w/ CME sampler		PAGE 1 OF 2	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (NA)	RECOVERY (ft)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
7.5	1400			SAA			MT = 1.1 ppm Bγ = 100-110 cpm
		NA	2.5	9.0 Hard (5Y 3/1) silty clay, low plasticity, some (5Y 4/1) silty clay, dry	CL	2.25	111467 - TAL D 111471 - TOC D 111472 - Archive (5Y 4/1) silty clay increased as sample advances
10.0	05/01 1430						
		NA	2.5	Hard (2.5Y 5/6) and (2.5Y 5/0) silty clay, slight plasticity, dry	CL	2.5	MT = 1.1 ppm Bγ = 100-110 cpm 111470 - Archive
12.5	05/01 1430						
		NA	2.5	Hard (2.5Y 5/6) silty clay, some (2.5Y 6/0) silty clay, slight plasticity, dry	CL	2.75	MT = 1.1 ppm Bγ = 100-110 cpm 111408 - Archive
15.0	05/01						

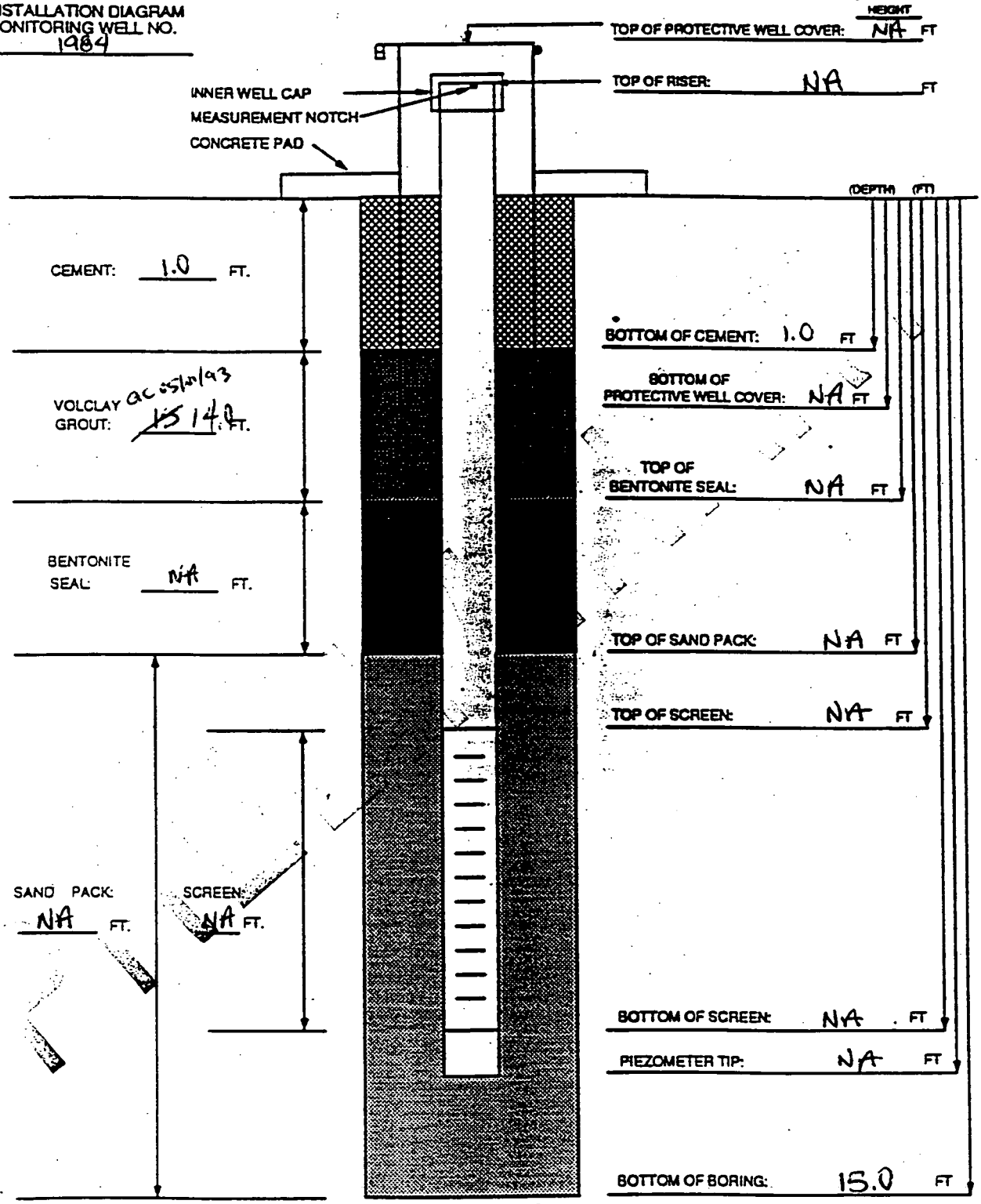
NOTES:
Drilling Co.: Pennsylvania Drilling Co.
Driller: Chris Coulter
Assisstant: Bob Johnson

Background: MT = 1.1 ppm
Bγ = 100-110 cpm

NA - Not Applicable
SAA - Same As Above
MT - Microtip

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 1984

INSTALLATION DATE: 05/04/93



	HEIGHT	
TOP OF PROTECTIVE WELL COVER:	NA	FT
TOP OF RISER:	NA	FT

	(DEPTH) (FT)	
BOTTOM OF CEMENT:	1.0	FT
BOTTOM OF PROTECTIVE WELL COVER:	NA	FT
TOP OF BENTONITE SEAL:	NA	FT
TOP OF SAND PACK:	NA	FT
TOP OF SCREEN:	NA	FT
BOTTOM OF SCREEN:	NA	FT
PIEZOMETER TIP:	NA	FT
BOTTOM OF BORING:	15.0	FT

MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 9 bags
AMOUNT OF CEMENT: 1 Bag
AMOUNT OF WATER USED: 5 gallons
OTHER: NA
TASK: Hollow stem Auger w/ CME sampler

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/_
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BEL GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: A. Lomo

ASI FORM 0157 REV. (0)

250 159

FERNALD
RI/FS

B-4395

PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU2 Phase II
PROJECT NO. 20.03.05
BORING NO. 1984
PIEZOMETER NO. NA

FIELD ENG./GEO. A. Lomo DATE 05/01/
CHECKED BY _____ DATE _____
DATE OF INSTALLATION NA

BOREHOLE DRILLING

DRILLING METHOD Hollow stem Auger w/CME sampler
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT Hollow stem Auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (A)		ELEVATION (NA)	
TOP OF RISER PIPE	NA		NA	
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	NA		NA	
BOREHOLE FILL MATERIALS:	0.0'	1.0'		
Cement GROUT/SLURRY	TOP 1.0'	BOTTOM 15.0'	TOP NA	BOTTOM NA
BENTONITE	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
SAND	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PIEZOMETER TIP	NA		NA	
BOTTOM OF BOREHOLE	15.0'		NA	
GWL AFTER INSTALLATION	NA		NA	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Soil boring using hollow stem auger w/ CME sampler.

FERNALD
RI/FS

E-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase II		
BORING NUMBER: 1984	COORDINATES:	DATE: 05/01/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 05/01/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 05/01/93	
DRILLING METHODS: Hollow stem Auger w/ CME sampler		PAGE 1 OF 2	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (NA)	RECOVERY (ft)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1100 05/01	NA	2.5	Hard (2.5Y 4/4) and 2.5Y 5/2 silty clay, slight plasticity, some small gravel, dry	CL	2.25	MT = 1.5 ppm Bσ = 100-110 cpm 111463 - D (TAL) 111464 - TOCD 111465 - Archive
2.5	1100 05/01	NA	2.5	(2.5'-3.0') obstruction (5Y 5/1) silty sand, well graded with (2.5Y 4/4) silty clay, some small gravel, dry	ML	NA	At 2.5' hit obstruction. Drilled through with augers. MT = 1.6 ppm Bσ = 100-110 cpm 111466 - TAL C
5.0	1400 05/01	NA	2.5	(5Y 5/1) silty sand, well graded, some small gravel, some (5Y 4/4) silty clay, low plasticity, dry	ML	NA	MT = 1.1 ppm Bσ = 100-110 cpm 111469 - Archive
7.5							

NOTES:

Drilling Co: Pennsylvania Drilling Co.
Driller: Chris Coulter
Assisstant: Bob Johnson

Background MT = 1.1 ppm
Bσ = 100-110 cpm

NA - Not Applicable
MT - Microtip

FERNALD
RI/FS

B-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase II		
BORING NUMBER: 1986	COORDINATES:	DATE: 04/28/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/28/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 4/30/93	
DRILLING METHODS: Hollow stem Auger w/ CME Sampler		PAGE 1 OF 2	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1430			Hard (2.5Y 4/3) silty clay, low to medium plasticity, dry, some (5Y 4/2) olive gray silty clay			MT = 0.9 ppm Bd = 100-120 cpm
	111451	NA	18		CL	2.75	Found some pieces of glass in the sample
2.5	04/28						
	1430			Hard (2.5Y 4/3) silty clay, low plasticity, gravel, dry			MT = 0.9 Bd = 150-170
	111452	NA	18		CL	4.0	
	111454	TCLP					
	111450	Hot Sample		Hard (2.5Y 4/0) dark gray to (2.5Y 2/0) black silty clay, no plasticity, dry			MT = 0.9 Bd = 10,000 cpm This sample was at the very tip of the sample from 4½" to 5.0'
5.0	04/28						
	1515			Hard (5Y 4/2) silty clay, low plasticity, some gravel, small areas of black material, some (2.5Y 5/4) silty clay w/ some (2.5Y 5/1) silty clay, dry			Note: Hot sample MT = 1.0 ppm Bd = 150 cpm collected from first 2 inches. Also found green sandy material within this sample.
	111457	NA	30		CL	3.0	MT = 1.0 ppm Bd = 150-170 cpm Found some brittle, thin material in sample
7.5	04/29						

NOTES:
Drilling Co: Pennsylvania Drilling Co.
Driller: Don Smith
Assistant: Sam Smith

MT = 0.9 ppm
Bd = 150-170 cpm

MT - Microtip
NA - Not Applicable

402-11-86

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase II		
BORING NUMBER: 1986	COORDINATES:	DATE: 04/28/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/28/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 04/30/93	
DRILLING METHODS: Hollow stem Auger w/ CME Sampler		PAGE 2 OF 2	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
7.5	1515			Hard (5Y 4/2) silty clay, some subangular to rounded gravel, low plasticity, dry			MT = 1.0 ppm Bγ = 150-170 cpm
	111456	NA	24	9.0 (5Y 4/2) sand lense Hard (7.5YR 2/0) black silty clay, low plasticity, dry	CL	2.75	small pieces of glass in sample (8.0'-9.0') some greenish silty clay
10.0	04/29 0930			Hard (5Y 5/1) clay with (2.5Y 5/6) silty clay, low plasticity, dry 11.0			MT = 0.6 ppm Bγ = 80-90 cpm
	111457	NA	30	Hard (2.5Y 6/0) and (2.5Y 5/6) silty clay, with some (2.5Y 2/0) clay, low plasticity, dry	CL	3.0	
12.5	04/30 0930			Hard (2.5Y 5/6) silty clay, low plasticity, dry			MT = 0.6 ppm Bγ = 80-90 cpm
	111458	TAL		(13.0'-13.5') (2.5Y 5/6) clayey sand, well graded, some gravel, moist			
	111459	NA	30		CL	2.75	Shelby tube (sample # 111461) pushed from 15.0'-17.0'
15.0	04/30						

NOTES
Drilling Co.: Pennsylvania Drilling Co.
Driller: Don Smith
Assisstant: Sam Smith

Background: MT = 1.0 ppm, Bγ = 150-170 cpm } 04/28 + 04/29
MT - Microtip
NA - Not Applicable
MT = 0.6 ppm, Bγ = 80-90 cpm } 04/30

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FERNALD
RI/FS

-4395

PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU2 Phase II' FIELD ENG./GEO. A. Como DATE 04/30/
PROJECT NO. 20.03.05 CHECKED BY _____ DATE _____
BORING NO. 1980
PIEZOMETER NO. NA DATE OF INSTALLATION NA

BOREHOLE DRILLING

DRILLING METHOD Hollow stem auger w/CME Sampler
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT Hollow stem auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (NA)	
TOP OF RISER PIPE	NA		NA	
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	NA		NA	
BOREHOLE FILL MATERIALS:	0.0	1.0		
Cement GROUT/SLURRY	TOP 1.0	BOTTOM 15.0	TOP NA	BOTTOM NA
BENTONITE	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
SAND	TOP NA	BOTTOM NA	TOP NA	BOTTOM N
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM N
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP NA	BOTTOM N
PIEZOMETER TIP	NA		NA	
BOTTOM OF BOREHOLE	15.0'		NA	
GWL AFTER INSTALLATION	NA		NA	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Soil Boring using Hollow stem Auger w/ CME sampler. Pushed shelby tube from 15.0' to 17.0'.

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: IFP-HP06/11004	COORDINATES:	DATE: 04/17/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/17/93	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 04/18/9	
DRILLING METHODS: Hollow Stem Auger		PAGE 1 OF 6	

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	1545 111856 04/17	4	6	Firm (2.5Y 4/3) silty clay, organic material, some gravel, low plasticity dry	CL	1.0	HNU = 0 ppm Bγ = 40-50cpm
	1545 111857 04/17	7	6	Black ash, dry (2.5YR 2.5/0)	NA	NA	HNU = 0 ppm Bγ = 40-50cpm
	1545 NA	6	0	No Recovery	NA	NA	HNU = NA Bγ = NA
2	1550 111858 04/17	4	6	Black ash, dry	NA	NA	HNU = 0 ppm Bγ = 40-50cpm
	1550 111859 04/17	8	6	SAA	NA	NA	HNU = 0 ppm Bγ = 40-50cpm
3	1550 111860 04/17	12	6	SAA	NA	NA	HNU = 0 ppm Bγ = 40-50 cp
	1555 111861 04/17	12	6	SAA	NA	NA	HNU = 0 ppm Bγ = 30-40 cp
4	1555 111862 04/17	4	6	SAA	NA	NA	HNU = 0 ppm Bγ = 30-40 cpm
	1555 NA	9	0	No Recovery	NA	NA	HNU = NA Bγ = NA
5	1600 111863 04/17	4	6	Black ash, dry	NA	NA	HNU = 0 ppm Bγ = 20-30 cp

NOTES:

Drilling Co. Pennsylvania Drilling

Drilling Equipment Mobile B-80

Driller Don Smith

Assistant Sam Smith

Background: HNU = 0 ppm
Bγ = 40-50cp

SAA- Same As Above
NA- Not Applicable

B--4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: 1FP-HP-06/11004	COORDINATES:		DATE: 04/17/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 04/17/93
ENGINEER/GEOLOGIST: A. Como	Depth	Date/Time	DATE COMPLETED: 04/18/93
DRILLING METHODS: Hollow Stem Auger			PAGE 2 OF 6

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
5	1600 111864 4/17	8	6	Black Ash, dry (2.5YR 2.5/0)	NA	NA	HNU = 0 ppm Bγ = 20-30 cpm
	1600 NA	5	0	No Recovery	NA	NA	HNU = NA Bγ = ~~20-3~~ NA ac 04/18/93
6	1605 111865	4	6	Black Ash, dry	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
	1605 111866	3	6	SAA	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
7	1605 111867 4/17	2	3	SAA	NA	NA	HNU = 0 ppm Bγ = 40-50 cpm
	1610 111868	3	6	SAA	NA	NA	HNU = 0 ppm Bγ = 20-30 cpm
8	1610 111869	3	6	SAA	NA	NA	HNU = 0 ppm Bγ = 20-30 cpm
	1610 111870	3	2	SAA	NA	NA	HNU = 0 ppm Bγ = 20-30 cpm
9	1615 111871	2	6	SAA	NA	NA	HNU = 0 ppm Bγ = 10-20 cpm
	1615 111872 4/17	3	6	SAA	NA	NA	HNU = 0 ppm Bγ = 10-20 cpm
10							

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller D. Smith
Assistant S. Smith

Background: HNU = 0 ppm
Bγ = 40-50 cpm

SAA- Same As Above
NA- Not Applicable

VISUAL CLASSIFICATION OF SOILS - 439

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: FP-HP-06/11004	COORDINATES:		DATE: 04/17/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 04/17/93
ENGINEER/GEOLOGIST: A. Como	Depth	Date/Time	DATE COMPLETED: 04/18/9
DRILLING METHODS: Hollow Stem Auger			PAGE 3 OF 6

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
10	1615 NA 4/17	2	0	No Recovery	NA	NA	HNU = NA Bγ = NA
	1620 111873	5	6	Black Ash, dry	NA	NA	HNU = 0 ppm Bγ = 10-20 cpm
11	1620 111874	3	6	SAA	NA	NA	HNU = 0 ppm Bγ = 10-20 cpm
	1620 111875 4/17	2	2	SAA	NA	NA	HNU = 0 ppm Bγ = 10-20 cpm
12	0830 111876 4/18	3	6	SAA	NA	NA	HNU = 0 ppm Bγ = 30-40 cp
	0830 111877	4	6	SAA	NA	NA	HNU = 0 ppm Bγ = 30-40 cpm
13	0830 NA 4/18	4	0	No Recovery	NA	NA	HNU = NA Bγ = NA
	0835 111878	3	6	Black Ash, dry	NA	NA	HNU = 0 ppm Bγ = 30-40 cpm
14	0835 111879	3	6	SAA	NA	NA	HNU = 0 ppm Bγ = 30-40 cp
	0835 111880 04/18	6	6	SAA, with some 2.5Y 6/6 ~~silty~~ clay/silt, low plasticity, dry at 04/18/93	NA	NA	HNU = 0 ppm Bγ = 30-40 cp
15							

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller D. Smith
Assistant S. Smith

Background: HNU = 0 ppm
Bγ = 40-50 cpm

NA - Not Applicable
SAA - Same As Above

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: 1FP-HP06/11004	COORDINATES:		DATE: 04/17/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 04/17/93
ENGINEER/GEOLOGIST: A. Como	Depth	Date/Time	DATE COMPLETED: 04/18/93
DRILLING METHODS: Hollow Stem Auger			PAGE 4 OF 6

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15	0840 111881 4/18	3	6	Black Ash, dry	NA	NA	HNU = 0 ppm Bγ = 30-40 cpm
16	0840 111882 04/18	7	6	Hard (10YR 5/6) ~~silty~~ clay/silt low plasticity, dry, some small gravel	ML	3.25	HNU = 0 ppm Bγ = 30-40 cpm
	0840 NA	10	0	No Recovery	NA	NA	HNU = NA Bγ = NA
17	0845 111883 04/18	7	6	Hard 10YR 5/6 clayey silt, some small gravel, low plasticity, dry	ML	3.5	HNU = 0 ppm Bγ = 30-40 cpm
	0845 111884 04/18	9	6	SAA	ML	3.5	HNU = 0 ppm Bγ = 30-40 cpm
18	0845 NA	2	0	No Recovery	NA	NA	HNU = NA Bγ = NA
	0850 111885 04/18	7	6	Hard 10YR 5/6 clayey silt, some small gravel, low plasticity, dry	ML	3.25	HNU = 0 ppm Bγ = 30-40 cpm
19	0850 111886 04/18	7	6	SAA with 10YR 5/6 silty sand, well graded, dry	ML	~~3.25~~ ac calibrations	HNU = 0 ppm Bγ = 30-40 cpm
	0850 NA	9	0	No Recovery Medium Dense	NA	NA	HNU = ~~0~~ ac calibrations NA Bγ = NA
20	0855 111887 04/18	12	6	(10YR 5/6) silty sand, well graded, small gravel, dry	ML	NA	HNU = 0 ppm Bγ = 30-40 cpm

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller D. Smith
Assistant S. Smith

Background: HNU = 0 ppm
Bγ = 40-50 cpm

NA - Not Applicable
SAA - Same As Above

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: IFP-HP-06/11004	COORDINATES:	DATE: 04/17/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/17/9	
ENGINEER/GEOLOGIST: A. Como	Depth Date/Time	DATE COMPLETED: 04/18/	
DRILLING METHODS: Hollow Stem Auger		PAGE 5 OF 6	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
20	0855 111888 4/18	24	6	Medium Dense (10YR 5/6) silty sand, well graded, small gravel, dry	ML	NA	HNU = 0 ppm Bγ = 30-40 cpm
	0855 111889 4/18	24	3	SAA	ML	NA	HNU = 0 ppm Bγ = 30-40 cpm
21	0925 111890 4/18	10	6	SAA, dry	ML	NA	HNU = ~~0~~ 0 ppm Bγ = 30-40 cpm
	0925 111891 4/18	18	6	SAA, moist	ML	NA	HNU = 0 ppm Bγ = 30-40 cpm
22	0925 NA 4/18	16	0	NO Recovery	NA	NA	HNU = NA Bγ = NA
	0930 111892	12	6	Medium Dense (10YR 5/3) silty sand, well graded, small gravel wet	ML	NA	HNU = 0 ppm Bγ = 30-40 cpm
23	0930 111893	28	6	Very Hard (5Y 5/1) silty clay, ~~no~~ low plasticity, gravel, dry	CL	5.0	HNU = 0 ppm Bγ = 30-40 cpm
	0930 111894 4/18	40	6	SAA	CL	5.0	HNU = 0 ppm Bγ = 30-40 cpm
24	1255 111895 4/18	12	6	Hard (5Y 5/1) silty clay medium plasticity, some gravel, dry	CL	3.25	HNU = 0 ppm Bγ = 20-30 cpm
	1255 111896 4/18	20	6	SAA, dry	CL	3.5	HNU = 0 ppm Bγ = 20-30 cpm
25							

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller D. Smith
Assistant S. Smith

Background: HNU = 0 ppm
Bγ = ~~30~~-40-50 cpm

NA- Not Applicable
SAA- Same As Above

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER: EO-0305	PROJECT NAME: OU2 Phase 2		
BORING NUMBER: IFP-HP-06/11004	COORDINATES:		DATE: 04/17/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 04/17/93
ENGINEER/GEOLOGIST: A. Como	Depth	Date/Time	DATE COMPLETED: 04/18/93
DRILLING METHODS: Hollow Stem Auger			PAGE 6 OF 6

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
25	1256 ~~NA~~ 11087 4/18	25	0	NO Recovery	NA	NA	HNU = NA Bγ = NA
				END OF BORING			HNU = Bγ =
26							HNU = Bγ =
							HNU = Bγ =
27							HNU = Bγ =
							HNU = Bγ =
28							HNU = Bγ =
							HNU = Bγ =
29							HNU = Bγ =
							HNU = Bγ =
30							HNU = Bγ =

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Mobile B-80
Driller D. Smith
Assistant S. Smith

Background: HNU = 0 ppm
Bγ = 40-50 cpm

NA - Not Applicable
SAA - Same As Above

FERNALD RI/FS

E-4395

PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU2 Phase II FIELD ENG./GEO. A. Como DATE 04/18/93
PROJECT NO. 20.03.05 CHECKED BY _____ DATE _____
BORING NO. IFP-HP-06/11004
PIEZOMETER NO. NA DATE OF INSTALLATION 04/18/93

BOREHOLE DRILLING

DRILLING METHOD Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT Hollow Stem Auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

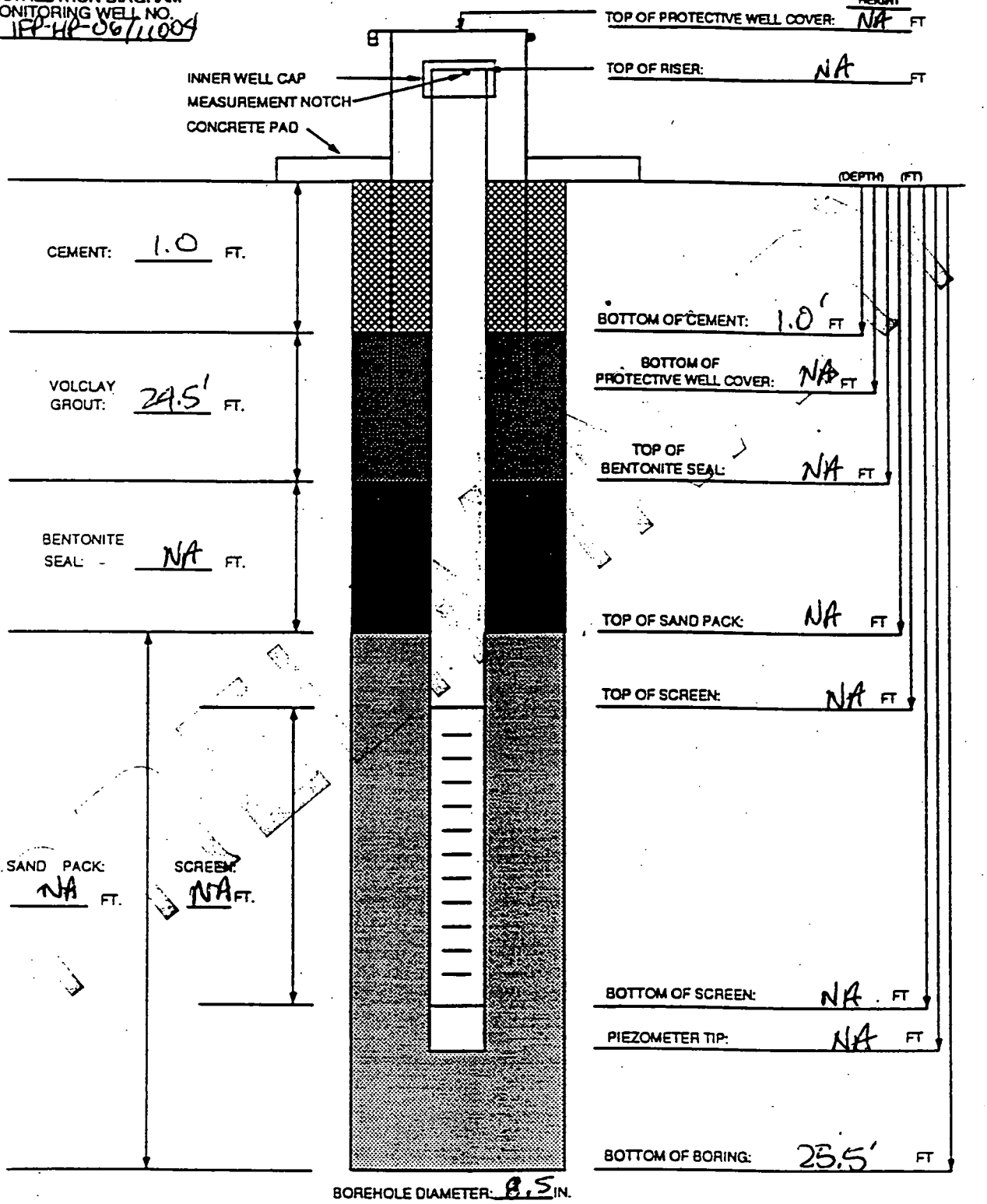
OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (NA)	
TOP OF RISER PIPE	NA		NA	
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	NA		NA	
BOREHOLE FILL MATERIALS:	0.0	1.0'		
Cement GROUT/SLURRY	TOP 1.0'	BOTTOM 25.5'	TOP NA	BOTTOM NA
BENTONITE	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
SAND	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	25.5'			
GWL AFTER INSTALLATION	NA			

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

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. IP-HP-06/11004

INSTALLATION DATE: 04/18/93



BOREHOLE DIAMETER: 8.5 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 6
AMOUNT OF CEMENT: 1
AMOUNT OF WATER USED: 3.0 gal.
OTHER: NA
TASK: Hydropunch boring

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/ N
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BELO GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: A. Como

HI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2		05/2/93
BORING NUMBER: 11008	COORDINATES:		DATE 5/2/0
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 5/2/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth	Date/Time	DATE COMPLETED: 5/3/0
DRILLING METHODS: HOLLOW STEM AUGER			PAGE 1 OF 1

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1015 116123 5/2/93	2	6	Y. Loose black flyash w/ organics dry	NA	NA	HNU = 0ppm BS = 40cpm
		2	0	No Recovery			HNU = 0.NA BS = NA
1		2	0	No Recovery			HNU = BS =
	1017 116124 5/2/93	2	6	Loose black flyash w/ organics dry			HNU = BS = 60
2	1017 116125 5/2/93	3	5	SAA			HNU = BS = 60
		3	0	No Recovery	NA	NA	HNU = BS =

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Marty Hibbert
Bill Hibbert

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

Log: HNU = 0ppm BS = 60cpm

402-11-6

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 116005	COORDINATES:	DATE 5/2/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 5/2/9
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 5/3/
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 2 OF 1

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1025 116126 5/2/93	3	6	Loose black flyash/gravel & organics dry	NA	NA	HNU = 0 ppm BS = 60 cpm
	1000 116127 5/2/93	4	4	SAA			HNU = 0 ppm BS = 60 cpm
4		4	0	No Recovery			HNU = NA BS = NA
	1035 116128 5/2/93	2	6	V. Loose black flyash dry			HNU = 0 ppm BS = 60 cpm
5	1030 116129 5/2/93	2	6	SAA			HNU = 0 ppm BS = 60 cpm
	1035 116130 5/2/93	2	4	SAA	NA	NA	HNU = 0 ppm BS = 60 cpm

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Martin Wishart
Bill Wishart

Samples collected per ASTM standard practice and colors identified using Munsell color chart

Key: HNU = ppm BS = cpm

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 1008	COORDINATES:	DATE 5/2/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 5/2/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 5/3/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 3 OF 10

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1040 116131 5/2/93	1	6	V Loose black flyash w/ organics dry	NA	NA	HNU = 0ppm BS = 60 cpm
	1040 116132 5/2/93	2	6	SAA			HNU = 0ppm BS = 100cpm
7		2	0	No Recovery			HNU = NA BS = NA
	1043 116133 5/2/93	2	6	V Loose black flyash w/ organics dry			HNU = 0ppm BS = 80 cpm
8	1043 116134 5/2/93	2	6	SAA			HNU = 0ppm BS = 80cpm
		2	0	No Recovery	NA	NA	HNU = NA BS = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor: Pennsylvania Drilling Co.

Drilling Equipment: Acker Sentry

Driller: Marty Wright, Bill Sibert

Samples collected per ASTM standard practice D-2488

Colors identified using Munsell Color Chart

Key: HNU = 0ppm BS = 80 cpm

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 11108	COORDINATES:	DATE 5/2/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 5/2/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 5/3/
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 4 OF 1

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1050 116135 5/2/93	1	6	V. Loose black flyash, dry	NA	NA	HNU = 0ppm BS = 100cpm
	1050 116136 5/2/93	2	4	SAA			HNU = 0ppm BS = 100cpm
10		2	0	No Recovery			HNU = NA BS = NA
	1055 116137 5/2/93	1	6	V. Loose black flyash, dry			HNU = 0ppm BS = 60 cpm
11	1055 116138 5/2/93	2	6	SAA			HNU = 0ppm BS = 60cpm
		2	0	No Recovery	NA	NA	HNU = NA BS = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: [illegible]

[illegible]

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = 0ppm BS = 60cpm

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 11008	COORDINATES:	DATE 5/2/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 5/2/0
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 5/2/
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 5 OF

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1105 116139 5/2/93	1	6	V. Loose black silty sand, dry	NA	NA	HNU = 0ppm BS = 40cp
	1105 116140 5/2/93	2	6	SAA			HNU = 0ppm BS = 40cpm
13	1105 116141 5/2/93	2	6	SAA			HNU = 0ppm BS = 40cpm
	1315 116142 5/2/93	1	6	SAA			HNU = 0ppm BS = 40cpm
14	1315 116143 5/2/93	1	6	SAA			HNU = 0ppm BS = 40cpm
		1	0	NO RECOVERY	NA	NA	HNU = NA BS = NA

NOTES:

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: [illegible]

SAA - same as above
NA - not applicable

Samples collected per ASTM standard practice D2488

Colors identified using Munsell Color Chart

Key: HNU = ppm BS = cpm

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2		
BORING NUMBER: 11008	COORDINATES:		DATE 5/2/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 5/2/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth	Date/Time	DATE COMPLETED: 5/2/93
DRILLING METHODS: HOLLOW STEM AUGER			PAGE 6 OF 7

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1320 116144 5/2/93	1	6	V. loose black, fine sand, dry	NA	NA	HNU = 0 ppm BS = 40 cpm
	1320 116145 5/2/93	1	6	SAA			HNU = 0 ppm BS = 40 cpm
16	1320 116146 5/2/93	2	3	SAA			HNU = 0 ppm BS = 40 cpm
	1325 116147 5/2/93	1	6	SAA			HNU = 0 ppm BS = 60 cpm
17	1325 116148 5/2/93	2	6	SAA			HNU = 0 ppm BS = 60 cpm
	1325 116149 5/2/93	3	6	SAA Hard 2.54 (5 in) light olive brown gravelly clay, no plasticity dry	NA CL	NA 4.0	HNU = 0 ppm BS = 60 cpm

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Marty Watson
Bill Sibbald

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

Key: HNU = ppm BS = cpm

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VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2		
BORING NUMBER: 1008	COORDINATES:	DATE 5/2/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 5/2/93	
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 5/2/93	
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 7 OF 17	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1340 116/50 5/2/93	10	6	V. Stiff 2.5Y(4/4) Olive brown gravelly clay, no plasticity slightly moist	CL	2.5	HNU = 0 ppm BS = 40 cpm
	1340 116/51 5/2/93	12	5	Hard 2.5Y(5/6) Lt. Olive brown clay w/ fine sand & gravel no plasticity dry	CL	>4.5	HNU = 0 ppm BS = 40 cpm
19		15	0	No Recovery	NA	NA	HNU = NA BS = NA
	1350 116/52 5/2/93	7	6	V. Stiff 2.5Y(6/6) Olive yellow silty clay w/ fine sand, no plasticity, dry	CL	2.0	HNU = 0 ppm BS = 40 cpm
20	1356 116/53 5/2/93	9	5	V. Stiff 2.5Y(5/3) Lt olive brown silty clay w/ gravel no plasticity, grading moist to dry	CL	3.0	HNU = 0 ppm BS = 40 cpm
		17	0	No Recovery	NA	NA	HNU = BS =

NOTES:

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Marty Wetzel / Bill Shoot

SA - same as above
NA - not applicable

Samples collected per ASTM standard practice D420

Colors identified using Munsell Color Chart

Note: HNU = 0 ppm BS = 40 cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2		
BORING NUMBER: 11008	COORDINATES:		DATE 5/2/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 5/2/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth	Date/Time	DATE COMPLETED: 5/3/93
DRILLING METHODS: HOLLOW STEM AUGER			PAGE 8 OF 12

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1400 1161154 5/2/93	3	6	VSLY 2.5Y (5/3) Lt olive brown gravelly clay w/sand no plasticity, dry	CL	3.0	HNU = 0 ppm BS = 60 cpm
	1400 1161155 5/2/93	10	6	M. Dense 2.5Y (5/6) Lt olive brown med to coarse grained sand poorly graded, dry	SP	NA	HNU = 0 ppm BS = 100 cpm
22		11	0	No Recovery	NA	NA	HNU = NA BS = NA
				Boring terminated at 22.5 ft			HNU = BS =
23							HNU = BS =
							HNU = BS =

NOTES:

SA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: [illegible]

Samples collected per ASTM standard practice on site

Colors identified using Munsell Color Chart

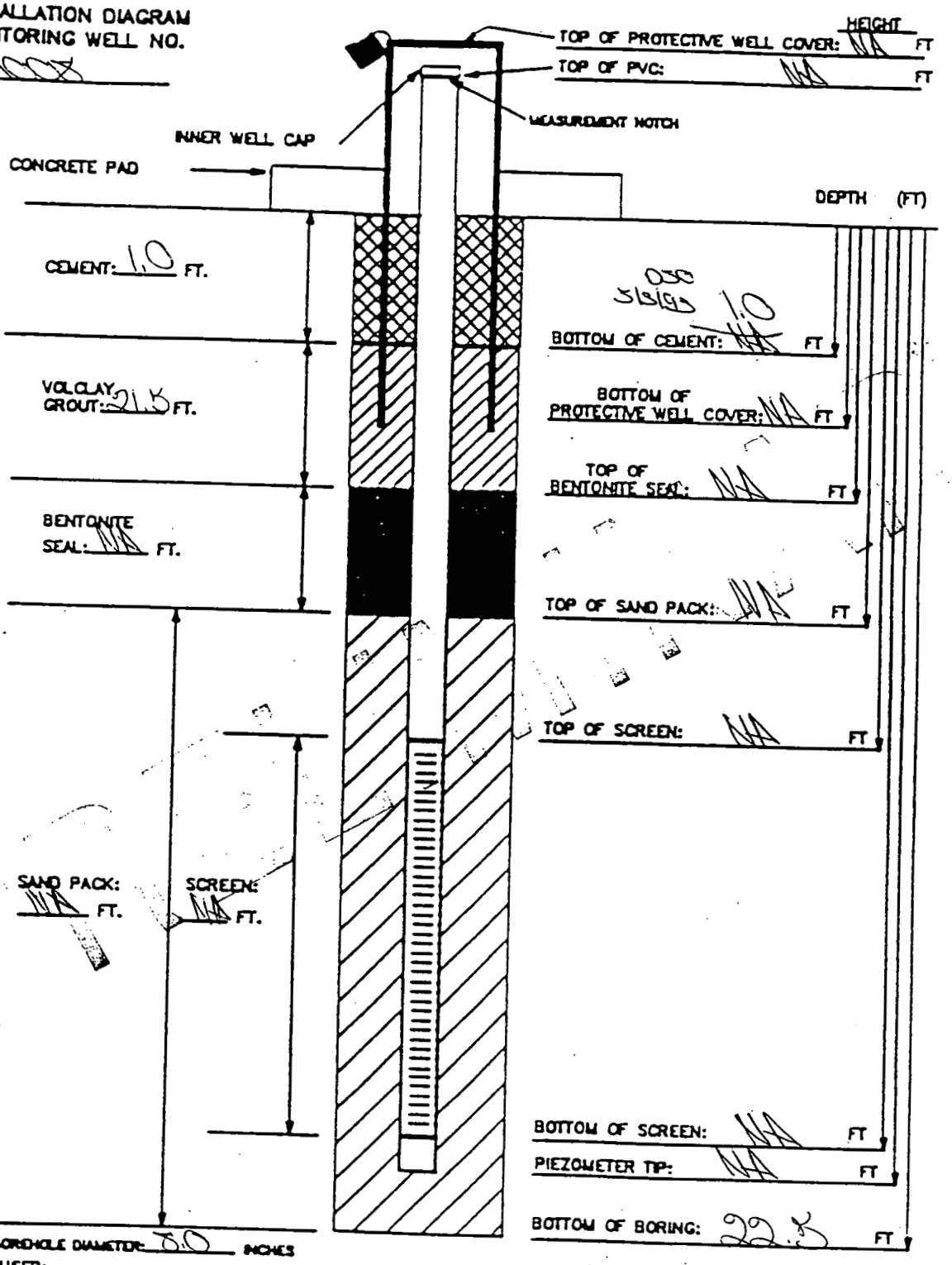
Key: HNU = ppm BS = cpm

E-4395 9010

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1003

INSTALLATION DATE: 5/3/93



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 2
AMOUNT OF CEMENT: 1 bag
AMOUNT OF WATER USED: 25 gal
OTHER:

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 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: NA

DSO 5/3/93

1500 Water drum

TASK: 20.03.05

GEOLOGIST/ENGINEER: D. O'Brien

272 181

-4395 N 04/C

PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU2 phase 2 FIELD ENG./GEO. D. O'Brien DATE 5/3/9
PROJECT NO. 20.08.05 CHECKED BY _____ DATE _____
BORING NO. 1008
PIEZOMETER NO. _____ DATE OF INSTALLATION 5/3/93

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID _____ FROM _____ TO _____

TYPE OF BIT Auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Hydropunch Boring
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS: Cement				
GROUT/SLURRY	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 22.3	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	22.3			
GWL AFTER INSTALLATION	NA			

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

REMARKS _____

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER 20.03.05	PROJECT NAME IEP-OU-2		
BORING NUMBER 1995	COORDINATES		DATE 04 05 93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED 05 02 93
ENGINEER/GEOLOGIST J. Bayer	Depth	Date/Time	DATE COMPLETED 05 02 93
DRILLING METHODS Hollow Stem Auger			PAGE 1 OF 7

5/01/93 TIME	DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS MT
0915	1	116077	4 9 12 14	6	MEDIUM DENSE, (2.5y, 5/4) light olive brown, clayey silt with gravel, trace flyash	ML	NA	Bγ = 40-100 cpm MT = 1.9 ppm
				6	SAA			
		116077		6	SAA			
		116078			SAA	ML		
	2	116079		6	(10yR, 2/1), black, flyash, sl. moist	NA		
0930	3	116080	9 9 11 15	6	(10yR, 2/1) black, flyash sli moist, trace silty clay	NA	NA	Bγ = 180 cpm
				6	Stiff (2.5y, 5/4) light olive brown, silty clay with gravel trace flyash.	CL	1.5	Bγ = 120 cpm
		116080		6	SAA	CL	NA	
		116081		6	(10yR, 2/1) black			Bγ = 120 cpm
	4	116082	20		flyash, sli moist, trace clay	NA	NA	MT = 1.5 ppm
1000	5	116083	82 73 42 4	6	Loose, (2.5y, 5/6) light olive brown, clayey silt with gravel, trace flyash.	ML	NA	Bγ = 80 cpm MT = 0.0 ppm
				6	SAA	ML		
		116083		6	(10yR, 2/1) black, flyash, slightly moist.	NA		
		116084 116085		6	Loose, (2.5y, 5/6) light olive brown, clayey silt with gravel, trace flyash	ML		
1045	6	116086	3	6	Stiff, (2.5y 5/6) light olive brown, silty clay with gravel and flyash.	CL	1.0	Bγ = 80 cpm MT = 0.1 ppm
		116087	4	6				
	7		4	3	SAA	CL	1.0	
		116088			SAA	CL	1.0	Some cement at 1.5 ft.

NOTES

Drillers:
Joe Raab
Roger Davis
Rig: CME-45

Had auger refusal at 8 feet. Moved hole east. Took a Shelby tube at 3-5 ft (11660 89, 1300) at new hole and then drilled to 8 feet.

MT = microtip
MT = Background ~1.3 ppm
SAA = Same as above

402-11-66

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FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER 20.03.05	PROJECT NAME IFP-OU-2		
BORING NUMBER 1995	COORDINATES	DATE 050193	
ELEVATION	GWL: Depth Date/Time	DATE STARTED 05/93	
ENGINEER/GEOLOGIST J. Boyer	Depth Date/Time	DATE COMPLETED 050293	
DRILLING METHODS Hollow Stem Auger		PAGE 2 OF 7	

Time	DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
			49	0	No Recovery	NA	NA	
	8	116090	1	6	(10YR, 2/1) Black, flyash, slightly moist,	NA		Bz = 60cpm
1315	9	116090	1	6	SAA	NA	NA	MT = 0.0 ppm
		116091 116092	1	6	SAA	NA		
		NA	1	0	SAA, NA	NA		
	10	116093	1	6	(10YR, 2/1) Black, Flyash sli. moist. SAA	NA		Bz = 60cpm
	11	116093	2	6	SAA	NA	NA	MT = 0.0ppm
		116094 116095	2 1	6 0	SAA	NA		
	12	NA			NA	NA	NA	
1400	13	116096	2	6	(10YR, 2/1), Black, Flyash sli moist	NA	NA	Bz = 90cpm
		116096	2	6	SAA	NA		MT = 0.0ppm
		116097 116098	2	6	SAA	NA		
	14	116099	1	6	SAA	NA		Bz = 80cpm
1415	15	116099	1	6	SAA	NA		MT = 0.0ppm

MT = MICROTIP
Bz
SAA = SAME AS ABOVE

402-11-86

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: IFP OU-2		
BORING NUMBER: 1995	COORDINATES:	DATE 04 050193	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 050193	
ENGINEER/GEOLOGIST: J. Boyer	Depth Date/Time	DATE COMPLETED: 050293	
DRILLING METHODS: HOLLOW STEM AGER		PAGE 3 OF 7	

TIME	DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1415		116100 116101	1	6	(10YR, 2/1) BLACK, FLYASH, slightly moist.	NA	NA	BG = 80cpm MT = 0.0ppm
		NA		0	NA	NA		
1430	16	116102	2	6	(10YR, 2/1) BLACK, flyash, slightly moist	NA	NA	BG = 60cpm MT = 0.0ppm
	18	116102	3 3	6	SAA	NA	NA	
		116103 116104	4	3	SAA	NA	NA	
		NA		0	NO RECOVERY	NA	NA	
1450	18	116105	5	6	(10YR, 2/1) BLACK, flyash, slightly moist	NA	NA	BG = 60cpm MT = 0.0 ppm
	19	116105	3 2 6	6	SAA	NA	NA	
		116106 116107		6	SAA			
1530	20	116108	1	6	SAA	NA	NA	BG = 60cpm MT = 0.3ppm
	21	116108	2 1	6	SAA			
		116109 116110	1	6	SAA			
1540	22	116111	2	6	SAA	NA	NA	

NOTES

MT = MICROTIP
SAA = SAME AS ABOVE

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FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: IFP OU-2		
BORING NUMBER: 1995	COORDINATES:		DATE 050193
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 050193
ENGINEER/GEOLOGIST: J. Boyer	Depth	Date/Time	DATE COMPLETED: 050293
DRILLING METHODS: HOLLOW STEM AUGER			PAGE 4 OF 7

TIME	DEPTH ft	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1540	23	116111	2	6	(10YR, 2/1) BLACK, flyash, slight/ly moist.	NA	NA	Bq = 40cpm MT = 0.3ppm
		116111	4 7	6	SAA			
		116112 116113		6	SAA			
1555	24	116114	2	6	SAA	NA	NA	Bq = 40cpm MT = 0.1ppm
	25		3	6	SAA			
		116114	4	6	SAA			
		116115 116116	1	6	SAA			
1610	26	116117	3	6	MEDIUM DENSE, (10YR, 3/2) ~~SAA~~ very dark grayish brown, SILT, moist, Mg nodules	ml	1.5	gs Bq = 60cpm MT = 0.0ppm
	27		7	6	SAA	ml	2.0	
		116117	4	6	SAA	ml	3.0	Mg nodules may indicate original soil horizon
		116118 116119	14	6	gs SAA	ml	3.0	
1630	28	116120	15	6	~~VERY STIFF~~, MEDIUM DENSE, (10YR, 4/3) BROWN, CLAYEY SILT, NO PLASTICITY, SLI. MOIST	ml	2.5	Bq = 60cpm MT = 0.3ppm
			21	6	SAA	ml	3.5	
	29		27	6	SAA	ml	3.5	
			28	4	SAA	ml	3.0	
	30	116120						

NOTES - At 26-26.5 ft magnesium nodules were found in the silt this may indicate an original soil horizon.

MT = MICROTIP
SAA = SAME AS ABOVE

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FERNALD
RI/FS

-4355

VISUAL CLASSIFICATION OF SOILS

OJECT NUMBER: 20.03.05	PROJECT NAME: IFP OU-2		
BORING NUMBER: 1995	COORDINATES:	DATE ~~04~~ 050193	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 050193	
ENGINEER/GEOLOGIST: J. Boyer	Depth Date/Time	DATE COMPLETED: 050293	
DRILLING METHODS: Hollow Stem Auger		PAGE 5 OF 7	

TIME 050293

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
	116172	34 13 16 22	6	MEDIUM DENSE, (10YR, 4/4) DARK YELLOWISH BROWN, CLAYEY SILT TRACE GRAVEL, MOIST LOW PLASTICITY	ML	NA	BZ = 80cpm MT = 0.9ppm
			6	SAA	ML		
31			6	MEDIUM DENSE, (10YR, 5/4) YELLOWISH BROWN, SILTY GRAVEL WITH COARSE SAND, POORLY GRADED MOIST.	GM		
	116173 116174		4	SAA	GM		
32							
				BOTTOM BORING 32 FEET			

0930

NOTES

SAA = SAME AS ABOVE
MT = MICROTIP

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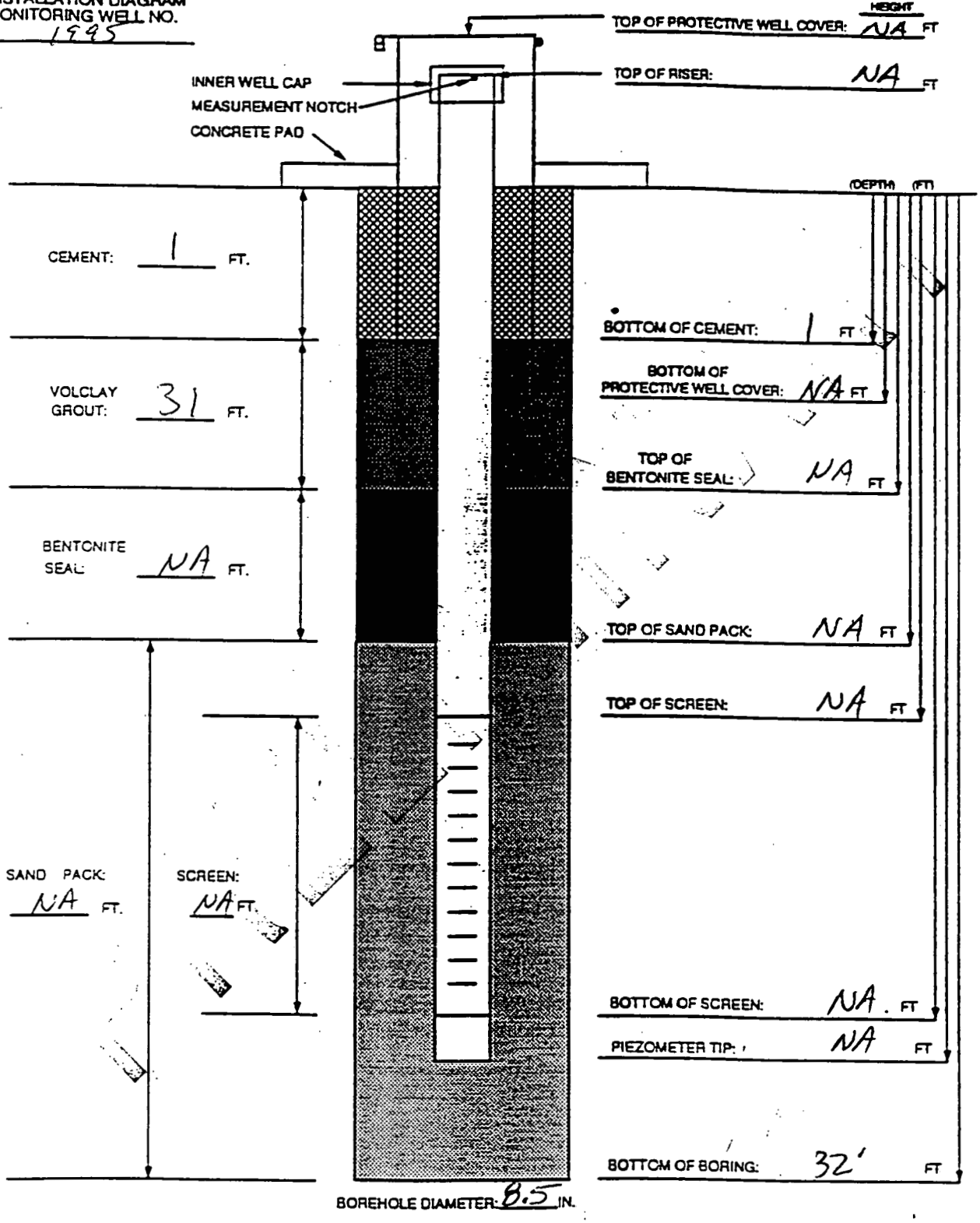
FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 1995

INSTALLATION DATE: 5/2/93



MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 4 bags
AMOUNT OF CEMENT: ½ bag
AMOUNT OF WATER USED: 20 gal
OTHER:
TASK: 20.03.05

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT; A
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BELO GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: J. Boyer

FERNALD RI/FS

- -4395

PIEZOMETER INSTALLATION SHEET

PROJECT NAME IFP OU-2 FIELD ENG./GEO. J. Boyer DATE 5/2/
PROJECT NO. 20.03.05 CHECKED BY J. Reagan DATE 5/3
BORING NO. 1995
PIEZOMETER NO. NA DATE OF INSTALLATION 5/1-5/2/93

BOREHOLE DRILLING

DRILLING METHOD Auger TYPE OF BIT Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (NA)	
TOP OF RISER PIPE	NA		NA	
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	NA		NA	
BOREHOLE FILL MATERIALS: ~~GROUT/SLURRY~~ CEMENT	TOP 1'	BOTTOM	TOP NA	BOTTOM N
~~BENTONITE~~ VOLCLAY	TOP 31'	BOTTOM	TOP NA	BOTTOM /
SAND	TOP NA	BOTTOM NA	TOP NA	BOTTOM A
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM /
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP NA	BOTTOM /
PIEZOMETER TIP	NA		NA	
BOTTOM OF BOREHOLE	32'		NA	
GWL AFTER INSTALLATION	NA		NA	

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

REMARKS

RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 409197.20.03.05	PROJECT NAME. RI/FS Southfield	
BORING NUMBER 1941	COORDINATES.	DATE 4/26/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 4/26/93
ENGINEER/GEOLOGIST Debes/Boyer	Depth Date/Time	DATE COMPLETED. 4/27/93
DRILLING METHODS Hollow Stem Auger		PAGE 1 OF 5

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.0	112765 0955 4/26/93	4	6	Stiff, Light olive brown (2.5 YR, 5/4), silty clay with some pebbles and rock fragments, low plasticity, dry	cl	1.25	MT = 1.5 ppm; BG = 80 cpm
0.5	112766 0955 4/26/93	6	6	SAA	cl	1.25	
1.0	112767 0955 4/26/93	9	2	SAA	cl	1.25	
1.5	112768 1000 4/26/93	7	6	Very stiff, Olive brown (2.5 YR, 4/4) silty clay with gravel and roots, med. plasticity, dry	cl	2.5	MT = 0.5 ppm; BG = 60 cpm
2.0	112769 1000 4/26/93	11	6	SAA	cl	2.5	
2.5	112770 1000 4/26/93	14	3	SAA	cl	2.5	
3.0	112771 1005 4/26/93	16	6	Very stiff, Yellowish brown (10 YR, 5/4) silty clay with trace of organics, med. plasticity, dry	cl	3.5	MT = 0.4 ppm; BG = 60 cpm
3.5	112772 1005 4/26/93	23	6	SAA	cl	3.5	
4.0	112773 1005 4/26/93	21	6	SAA	cl	3.5	
4.5	112774 1015 4/26/93	19	6	Very stiff, Yellowish brown (10YR, 5/4) silty clay with gravel, med. plasticity, dry.	cl	2.5	MT = 0.5 ppm; BG = 60 cpm
5.0							

NOTES

Drilling Contractor Pennsylvania Drilling

Drilling Equipment CME-45

Driller Joe Raab

Roger Davis

MT - Microtip Photoionization

SAA - Same as above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 409197.20.03.05	PROJECT NAME. RI/FS South field	
BORING NUMBER. 1941	COORDINATES.	DATE 4/26/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 4/26/93
ENGINEER/GEOLOGIST Debes/Boyer	Depth Date/Time	DATE COMPLETED. 4/27/93
DRILLING METHODS Hollow Stem Auger		PAGE 2 OF 5

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
5.0	NA	14	0	No Recovery	NA	NA	NA
5.5	NA	10	0	No Recovery	NA	NA	
6.0	112775 1022 4/26/93	12	6	Very stiff, Light olive brown (2.5 YR, 5/4) silty clay with iron stains, med. plasticity, sl. moist.	cl	2.5	MT = 0.5 ppm βγ = 60 cpm
6.5	NA	15	0	No Recovery	NA	NA	
7.0	NA	18	0	No Recovery	NA	NA	
7.5	112776 1030 4/26/93	3	6	Hard, Yellowish brown (10YR, 5/6) silty clay, med. plasticity, sl. moist	cl	4.0	MT = 0.5 ppm βγ = 60 cpm
8.0	112777 1030 4/26/93	5	3	SAA	cl	4.0	
8.5	NA	9	0	No Recovery	NA	NA	
9.0	112778 1038 4/26/93	4	6	Hard, Light yellowish brown (10YR, 6/4) silty clay, med. plasticity, sl. moist	cl	4.0	MT = 0.5 ppm βγ = 60 cpm
9.5	112779 1038 4/26/93	6	6	SAA	cl	4.0	
10.0							

NOTES

Drilling Contractor Pennsylvania Drilling

Drilling Equipment CME-45

Driller Joe Raab

Roger Davis

MT = Microtip Photoionization

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

-4395

PROJECT NUMBER 20.03.05	PROJECT NAME. RI/FS Southfield	
BORING NUMBER 1941	COORDINATES.	DATE 4/26/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 4/26/93
ENGINEER/GEOLOGIST Debes/Boyer	Depth Date/Time	DATE COMPLETED. 4/27/93
DRILLING METHODS Hollow Stem Auger		PAGE 3 OF 5

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
10.0	112780 1038 4/26/93	7	6	Hard, Light yellowish brown (10YR, 6/4) silty clay, med. plasticity, moist	cl	4.0	MT = 0.5 ppm βγ = 60 cpm
10.5	112781 1055 4/26/93	14	6	Olive brown (2.5YR, 6/6) clayey sand, moist.	SC	NA	MT = 0.5 ppm βγ = 60 cpm
11.0	112781 1055 4/26/93	19	6	SAA	SC	NA	
11.5	NA	27	0	No Recovery	NA	NA	
12.0	112782 1110 4/26/93	10	6	Olive brown (2.5YR, 6/6) clayey sand, moist.	SC	NA	MT = 0.5 ppm βγ = 60 cpm
12.5	112783 1110 4/26/93	12	6	Very stiff, Gray (2.5YR, 6/1) silty clay, med. plasticity, sl. moist.	cl	2.5	
13.0	112784 1110 4/26/93	13	6	SAA	cl	2.5	
13.5				Split spoon sampled to 13.5'. Bottom of boring is 13.5'.			Composite sieve is sample #112781.

NOTES

Drilling Contractor Pennsylvania Drilling

Drilling Equipment CME-45

Driller Joe Raab

Roger Davis

MT - Microtip Photoionization

SAA - Same as above

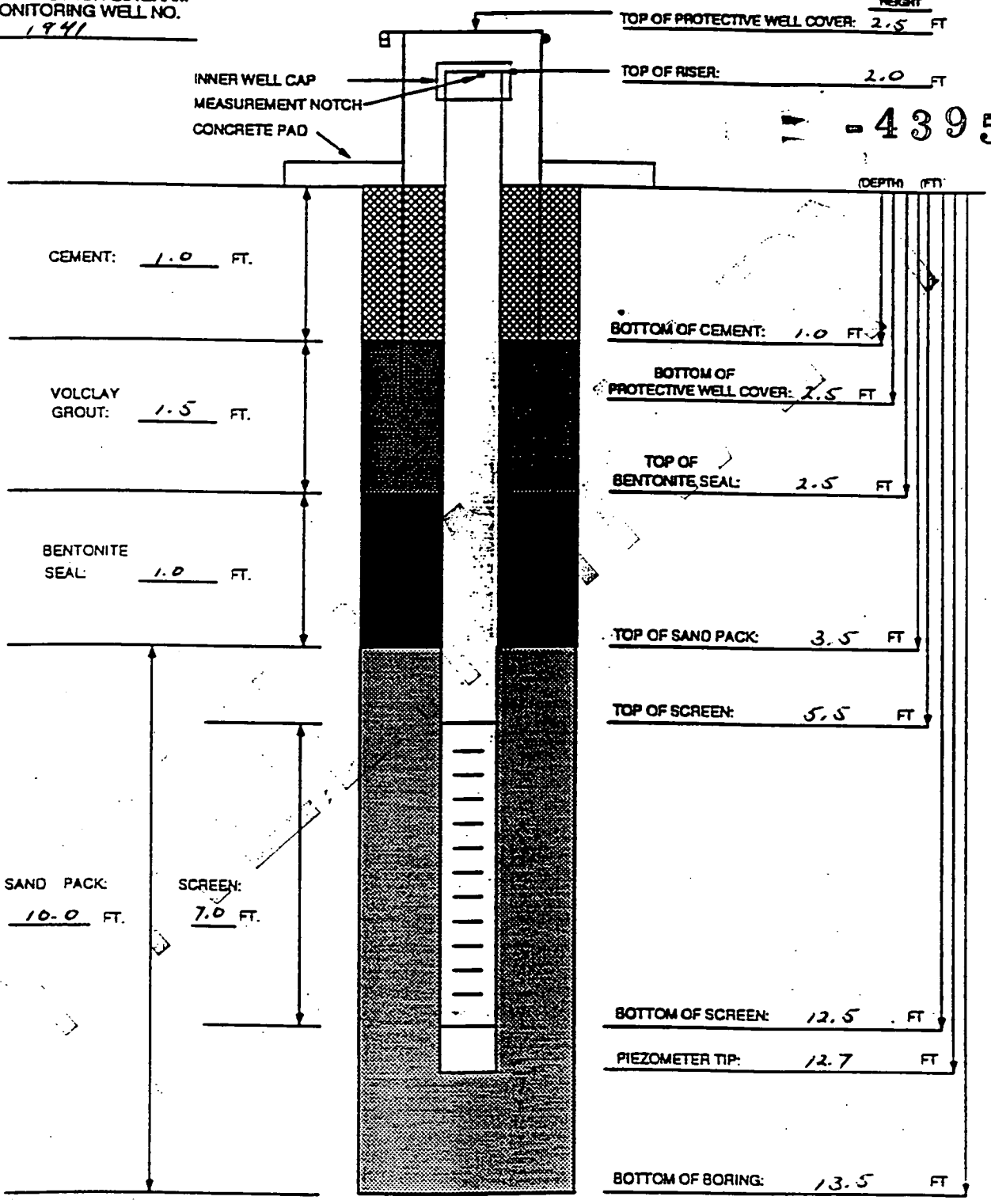
NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 1941

INSTALLATION DATE: 4/26/93



	HEIGHT	
TOP OF PROTECTIVE WELL COVER:	2.5	FT
TOP OF RISER:	2.0	FT

-4395

	(DEPTH) (FT)	
BOTTOM OF CEMENT:	1.0	FT
BOTTOM OF PROTECTIVE WELL COVER:	2.5	FT
TOP OF BENTONITE SEAL:	2.5	FT
TOP OF SAND PACK:	3.5	FT
TOP OF SCREEN:	5.5	FT
BOTTOM OF SCREEN:	12.5	FT
PIEZOMETER TIP:	12.7	FT
BOTTOM OF BORING:	13.5	FT

MATERIALS USED

SAND TYPE AND QUANTITY: 10/20, 6 1/2 - 50lb bags
BENTONITE PELLETS (5-GALLON BUCKETS): 1-bucket
BAGS OF VOLCLAY GROUT: 1/2 - 50 lb bag
AMOUNT OF CEMENT: 1 - 94 lb bag
AMOUNT OF WATER USED: 7.0 gals
OTHER: 1-7' screen, 1-Sump cap, 1-7 1/2' section
TASK: WBS 20.03.05 ; 1000-series well

NOTES:

1) RISER PIPE IS 2.0 IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2.0 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 2.4 FT/ 4/
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: Rebes / Boyer

FERNALD RI/FS

-4395

MONITORING WELL ~~PIEZOMETER~~ INSTALLATION SHEET

MO, 4/27/93

PROJECT NAME RI/FS Southfield
FIELD ENG./GEO. Debes/Boyer DATE 4/20/
PROJECT NO. WBS 20.03.05
CHECKED BY _____ DATE _____
BORING NO. 1941
PIEZOMETER NO. NA
DATE OF INSTALLATION 4/26/93

BOREHOLE DRILLING

DRILLING METHOD Hollow stem auger
TYPE OF BIT Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA
CASING SIZE (S) USED:
SIZE 8.0" FROM 0.0-ft TO 13.5-ft
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Monitoring well
DIAMETER OF PERFORATED SECTION 2.0" ID
PERFORATION TYPE:
SLOTS ☑ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.010"
TOTAL PERFORATED AREA 7.0-ft
RISER PIPE MATERIAL 316 stainless stee
RISER PIPE DIAMETERS:
O.D. 2 3/8" I.D. 2.0" ID
LENGTH OF PIPE SECTIONS 1 - 7½-ft sect
JOINING METHOD Screw type - flush joint threaded.

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0-ft
PROTECTIVE PIPE O.D. ~4.0"
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		NA	
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:	TOP 0.0	BOTTOM 1.0		
Concrete GROUT/SLURRY	TOP 1.0	BOTTOM 2.5	TOP	BOTTOM
BENTONITE	TOP 2.5	BOTTOM 3.5	TOP	BOTTOM
SAND	TOP 3.5	BOTTOM 13.5	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 5.5	BOTTOM 12.5	TOP	BOTTOM
PIEZOMETER TIP	12.7			
BOTTOM OF BOREHOLE	13.5			
GWL AFTER INSTALLATION	2.4 4/27/93			

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

REMARKS

RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 1942	COORDINATES:	DATE 4/13/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/13/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/16/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 1 OF 8

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0910	0910 10619 4/13/93	7	5	V. Stiff, 2.5Y(5/6) Lt. olive brown clay w/ gravel, organics, cement no plasticity, dry	CL	2.75	HNU = 0ppm BS = 40cpm
		9	0	No Recovery	NA	NA	HNU = NA BS = NA
1		9	0	No Recovery	NA	NA	HNU = NA BS = NA
	0920 110620 4/13/93	12	6	Hard, 2.5Y(5/6) Lt olive brown gravelly clay, no plasticity dry	CL	4.5	HNU = 0ppm BS = 60cpm
2	0920 110621 4/13/93	27	6	SAA, v stiff	CL	3.75	HNU = 0ppm BS = 60cpm
		29	0	No Recovery	NA	NA	HNU = NA BS = NA

SAA - same as above
NA - not applicable

NOTES:

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Kevin Myers
Donny Arthur

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = 0ppm BS = 80cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 1942	COORDINATES:	DATE 4/13/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/13/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/16/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 2 OF 8

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	0928 110622 4/13/93	24	6	Hard. 2.5Y (4/6) Olive yellow gravelly clay, no plasticity dry	CL	4.0	HNU = 0ppm BS = 60 cpm
	0928 110623 4/13/93	30	6	SAA, V. Stiff	CL	3.5	HNU = 0ppm BS = 60cpm
4	0928 110624 4/13/93	28	5	Stiff. 2.5Y (6/6) Olive yellow gravelly clay, low plasticity slightly moist.	CL	1.25	HNU = 0ppm BS = 60 cpm
	0943 110625 4/13/93	4	6	V. Stiff. 2.5Y (6/6) Olive yellow gravelly clay w/ coarse no plasticity, slightly moist.	CL	3.0	HNU = 0ppm BS = 60cpm
5		8	0	No Recovery	NA	NA	HNU = NA BS = NA
		6	0	No Recovery	NA	NA	HNU = NA BS = NA

SAA - same as above
NA - not applicable

NOTES:

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Kevin Myers
Donny Arthur

Samples collected per ASTM standard penetration test

colors identified using Munsell Color Chart

Key: HNU = ppm BS = cpm

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RI/FS

VISUAL CLASSIFICATION OF SOILS -4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2		
BORING NUMBER: 1942	COORDINATES:		DATE 4/13/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 4/13/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth	Date/Time	DATE COMPLETED: 4/16/93
DRILLING METHODS: HOLLOW STEM AUGER			PAGE 3 OF 8

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1325 110620 4/13/93	12	6	Hard. 2.5Y(4/4) Lt. yellowish brown, clay. no plasticity slightly moist.	CI	1.25	HNU = 0ppm BS = 60cpm
	1325 110627 4/13/93	12	3	SAA	CI	1.0	HNU = 0ppm BS = 60cpm
7		18	0	No Recovery	NA	NA	HNU = NA BS = NA
	1345 110628 4/13/93	18	2	Mod Stiff. 2.5Y(4/4) Lt yellowish brown, clay, low plasticity wet.	CI	.75	HNU = 0ppm BS = 40cpm
8		30	0	No Recovery	NA	NA	HNU = NA BS = NA
		27	0	No Recovery	NA	NA	HNU = NA BS = NA

SAA - same as above
NA - not applicable

NOTES:

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Kevin [illegible] / Donny Arthur

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = 0ppm BS = 60cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 1942	COORDINATES:	DATE 4/13/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/13/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/16/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 4 OF 8

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1355 110629 4/13/93	8	6	Stiff 2.5Y(6/4) Lt yellowish brown mottled w/gray clay, low plasticity slightly moist	Cl	1.5	HNU = 0 ppm BG = 60 cpm
	1355 110630 4/13/93	18	6	SAA, hard	Cl	4.25	HNU = 0 ppm BG = 60 cpm
10	1355 110631 4/13/93	30	6	SAA, v. stiff	Cl	3.25	HNU = 0 ppm BG = 60 cpm
	1415 110632 4/13/93	1	6	Stiff. 2.5Y(6/4) Lt yellowish brown, mottled w/gray clay, low plasticity, moist	Cl	1.0	HNU = 0 ppm BG = 60 cpm
11	1415 110633 4/13/93	1	6	SAA, 2.5Y(5/1) Gray	Cl	1.0	HNU = 0 ppm BG = 60 cpm
	1415 110634 4/13/93	21	6	SAA Bottom 2" gray silt	Cl ml	1.0 NA	HNU = 0 ppm BG = 60 cpm

SAA - same as above
NA - not applicable

NOTES:

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Kevin Myers
Donny Smith

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

Key: HNU = 0 ppm BG = 60 cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 PHASE 2	
BORING NUMBER: 1942	COORDINATES:	DATE 4/13/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/13/93
ENGINEER/GEOLOGIST: D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/14/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 5 OF 8

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1425 110635 4/13/93	7	6	Dense 2.5Y(4/6) Olive yellow silt w/ an inch sand layer in between, fine wet.	DSO 4/13/93 ~~MT~~ SM	NA	HNU = 0ppm BS = 60cpm
	1425 110636 4/13/93	18	3	SAA	DSO 4/13/93 ~~MT~~ SM	NA	HNU = 0ppm BS = 60cpm
13		21	0	No Recovery	NA	NA	HNU = NA BS = NA
	1445 110637 4/13/93	8	6	Med Dense 2.5Y(6/6) Olive yellow silt and sand mixture, wet	SM	NA	HNU = 0ppm BS = 60cpm
14	1445 110638 4/13/93	8	6	SAA. 2.5Y(8/1) Grey clay w/ gravel sand & silt, no plasticity moist.	CL	1.25	HNU = 0ppm BS = 60cpm
	1445 110639 4/13/93	8	6	SAA, less sand	CL	1.25	HNU = 0 ppm BS = 60 cpm

SAA - same as above
NA - not applicable

NOTES:

Drilling Contractor: PENNSYLVANIA DRILLING CO.

Drilling Equipment: ACKER SENTRY

Driller: KEVIN MYERS, DONNY ARTHUR

Samples collected per ASTM standard practice for colors identified using Munsell Color Chart

Key: HNU = 0ppm BS = 60cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS - -4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2		
BORING NUMBER: 1942	COORDINATES:	DATE 4/13/93	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/13/9	
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/16/	
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 6 OF 8	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1455 110640 4/13/93	5	6	V. stiff. 2.5Y(5/1) Gray gravelly sandy clay, no plasticity dry	CL	3.0	HNU = 0 ppm BS = 60 cpm
	1455 110641 4/13/93	5	4	SAA	CL	3.0	HNU = 0 ppm BS = 60 cpm
16		14	0	No Recovery	NA	NA	HNU = NA BS = NA
	0855 110642 4/13/93	4	6	V. stiff 2.5Y(5/1) Gray gravelly clay, low plasticity dry	CL	3.0	HNU = 0 ppm BS = 50 cpm
17	0855 110643 4/13/93	4	6	SAA	CL	3.5	HNU = 0 ppm BS = 50 cpm
	0855 110644 4/13/93	14	3	SAA	CL	3.5	HNU = 0 ppm BS = 50 cpm

SAA - same as above
NA - not applicable

NOTES:

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: KEVIN MYERS
DONNY ARTHUR

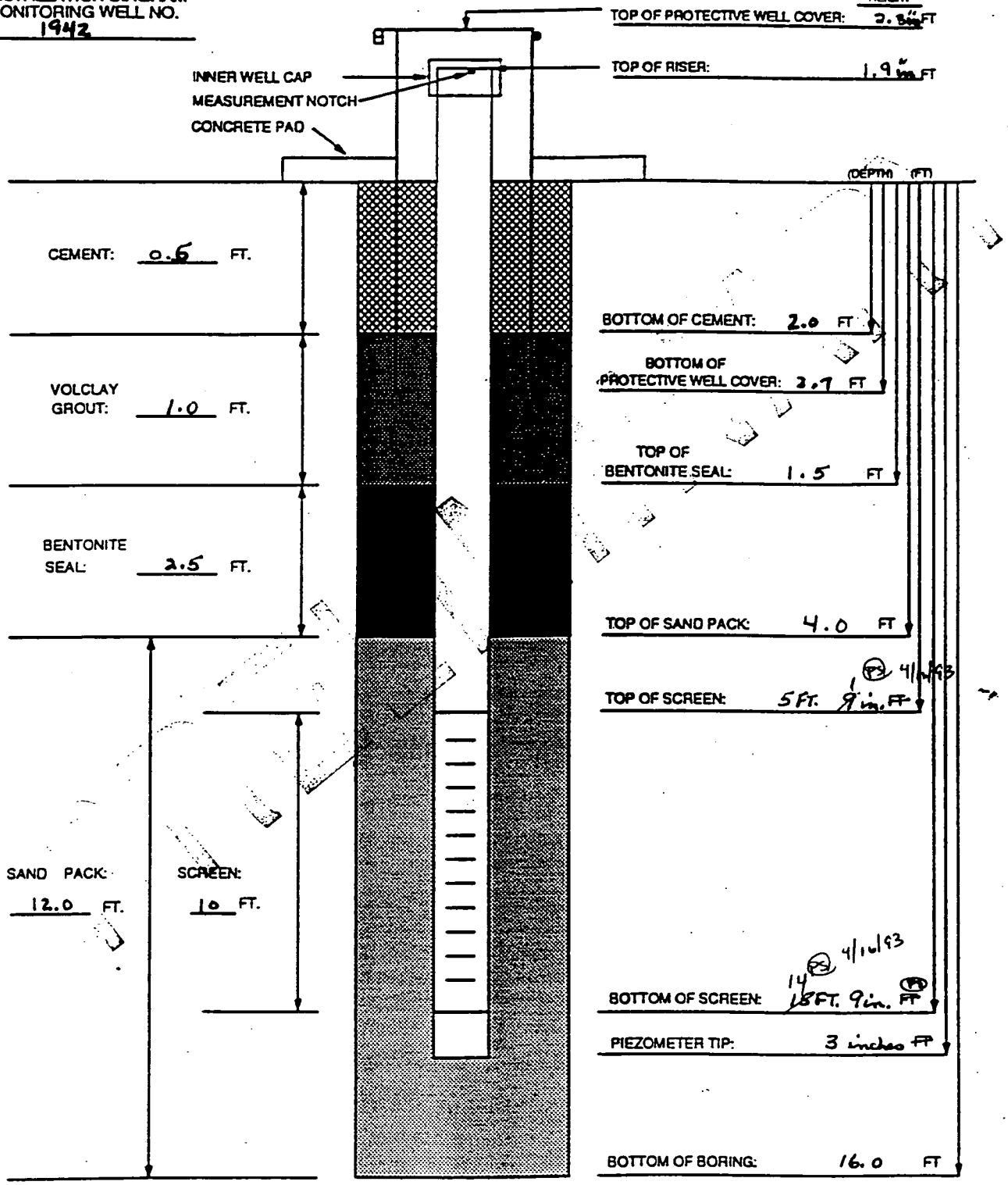
Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = 0 ppm BS = 50 cpm

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 1942

INSTALLATION DATE: 4/16/93



BOREHOLE DIAMETER: 10 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: 10/20 silica
BENTONITE PELLETS (5-GALLON BUCKETS): 1
BAGS OF VOLCLAY GROUT: 1 BAG
AMOUNT OF CEMENT: 1 BAG
AMOUNT OF WATER USED: 5 gallons
OTHER: N/A
TASK: N/A

NOTES:

1) RISER PIPE IS 2 IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2 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 6.2 FT/4/16
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: P. Smith

FERNALD RI/FS

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PIEZOMETER INSTALLATION SHEET

PROJECT NAME CRU 2 South Field
PROJECT NO. RD C11 20.03.05
BORING NO. 1942
PIEZOMETER NO. 1942

FIELD ENG./GEO. Smith DATE 4/16/93
CHECKED BY _____ DATE _____
DATE OF INSTALLATION 4/16/93

BOREHOLE DRILLING

DRILLING METHOD Auger (Hollow Stem)
DRILLING FLUID (S) USED:
FLUID N/A FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT hollow stem Auger
CASING SIZE (S) USED:
SIZE N/A FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE ~~NA~~ 316 SS (4/16/93)
DIAMETER OF PERFORATED SECTION 2 in ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS 0.010
TOTAL PERFORATED AREA 10.0 FT.

RISER PIPE MATERIAL ~~NA~~ 316 SS (4/16/93)
RISER PIPE DIAMETERS:
O.D. 2 5/16 in. I.D. 2.0 in
LENGTH OF PIPE SECTIONS 1 (5 ft.), 1 (3 ft)
JOINING METHOD Screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft
PROTECTIVE PIPE O.D. 4 3/8 in

OTHER PROTECTION hinged protective cover with installed 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 1.5	TOP	BOTTOM
BENTONITE	TOP 1.5	BOTTOM 4.0	TOP	BOTTOM
SAND	TOP 4.0	BOTTOM 16.0	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 5 ft. 1 in.	BOTTOM 15 ft. 9 in	TOP	BOTTOM
PIEZOMETER TIP	16.0			
BOTTOM OF BOREHOLE	16.0			
GWL AFTER INSTALLATION	N/A			

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

FERNALD RI/FS

E-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER WBS 2003.05	PROJECT NAME. RI/FS South field	
BORING NUMBER. 2943	COORDINATES:	DATE 4-12-93
ELEVATION:	GWL: Depth 54 ft Date/Time 4/16/93 1255	DATE STARTED 4-12-93
ENGINEER/GEOLOGIST Ken Geiger	Depth 51.6 ft Date/Time 4/21/93 800	DATE COMPLETED: 4-20-93
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
0.0 – 1.5	110737 1420 4/12/93	1 2 1	11	Stiff, Dark Yellowish Brown (10YR 4/4) Silty Clay with some pebbles and Rock Fragments, med plasticity, slightly moist	CL	1.25	HNu = 0ppm Bγ = 90cpm α = 0cpm
1.5 – 3.0	110738 1425 4/12/93	4 7 12	10	Very Stiff Yellowish Brown (10YR 5/4) Silty Sandy clay with Rock fragments, medium plasticity, slightly moist	CL	2.5	HNu = 0ppm Bγ = 60cpm α = 0cpm
3.0 – 4.5	110739 1430 4/12/93	13 18 18	11	Hard, Light Olive Brown (2.5Y 5/4) silty sandy clay with rock fragments & pebbles, low plasticity, slightly moist	CL	4.5	HNu = 5ppm Bγ = 80cpm α = 0cpm
4.5 – 6.0	110740 1435 4/12/93	17 19 15	6	Very stiff, Yellowish Brown (10YR 5/4) silty sandy clay with rock fragments, low plasticity, slightly moist	CL	4.0	HNu = 2ppm Bγ = 90cpm α = 0cpm
6.0 – 7.5	110741 1440 4/12/93	10 8 7	13	Med. Stiff, Grayish Brown (2.5Y 5/2) silty sandy clay with rock fragments, low plasticity, moist	CL	1.0	HNu = 2ppm Bγ = 60cpm α = 0cpm
7.5 – 9.0	110742 1445 4/12/93	6 6 9	10	Soft, Dark Grayish Brown (2.5Y 4/2) silty sandy clay with rock fragments, med. plasticity, moist	CL	0.5	HNu = 2ppm Bγ = 90cpm α = 0cpm
9.0 – 10.5	110743 1450 4/12/93	10 16 17	13	Very soft, Dark Grayish Brown (2.5Y 4/2) silty sandy clay with rock fragments, med. plasticity, moist	CL	0.25	HNu = 2ppm Bγ = 100cpm α = 0cpm
10.5 – 12.0	110744 1605 4/12/93	10 12 14	7	Medium Stiff Olive Brown (2.5Y 4/3) silty clay with a trace of gravel, high plasticity, moist	CH	1.0	HNu = 0ppm Bγ = 80cpm α = 0cpm
12.0 – 13.5	110745 0845 4/13/93	15 17 17	16	Soft, light olive brown (2.5Y, 5/4) Silty sandy clay, high plasticity, moist	CH	0.5	HNu = 0ppm Bγ = 60cpm α = 0cpm
13.5 – 15.0	110746 0900 4/13/93	12 15 17	12	Soft, light olive brown (2.5Y, 5/4) silty, sandy clay, medium plasticity, moist	CL	0.5	HNu = 0ppm Bγ = 70cpm α = 0cpm

NOTES

Drilling Company: Pennsylvania Drilling

Driller: Dave Newman

Assistant: Jeff Bentley

Samples collected per ASTM Standard Penetration Test.

Colors: Munsell Soil Color Chart

4/12/93 Background Levels: HNu = 0ppm α = 0ppm Bγ = 40-60cpm

4/13/93 Background Levels: HNu = 0ppm α = 0cpm Bγ = 40-60cpm

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FERNALD RI/FS

B-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. W13S20.03.05	PROJECT NAME. RI/FS South field	
BORING NUMBER. 2943	COORDINATES:	DATE 4-13-93
ELEVATION:	GWL: Depth 54' Date/Time 4/14/93, 1253	DATE STARTED 4-12-93
ENGINEER/GEOLOGIST. Ken Geiger	Depth 51.6' Date/Time 4/21/93, 800	DATE COMPLETED: 4-20-93
DRILLING METHODS Cable Tool		PAGE 2 OF 3

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0	110747	9		Stiff, olive brown (2.5Y, 4/4),			HNU = 0 ppm
	0907	13	13	silty, sandy, gravelly clay, medium	CL	2.0	β γ = 70 cpm
16.5	4-13-93	21		plasticity, moist			α = 0 cpm
	110748	9		Very Stiff, grayish brown (2.5Y,			HNU = 0 ppm
	0915	14	12	5/2) silty, sandy, clay, medium	CL	3.0	β γ = 60 cpm
18.0	4-13-93	14		plasticity, moist			α = 0 cpm
	110749	9		Hard, dark gray, (2.5Y, 4/1)			HNU = 0 ppm
	0930	16	13	silty clay with some gravel, low	CL	4.5	β γ = 90 cpm
19.5	4-13-93	19		plasticity, moist			α = 0 cpm
	110750	12		Very Dense, brown (10YR, 5/3)			HNU = 2 ppm
	1045	14	12	poorly graded sand with some	SP	NA	β γ = 60 cpm
21.0	4-13-93	49		gravel, dry.			α = 0 cpm
25.0				No samples taken. Samples to be taken every 5' starting at 25.0'			
	110751	17		Very Dense, brown (10YR, 5/3)			HNU = 0 ppm
	1435	43	10	poorly graded sand with some	SP	NA	β γ = 40 cpm
26.5	4-13-93	50		gravel, dry.			α = 0 cpm
30.0							

NOTES: See page 1

4/13/93 Background levels
HNU = 0 ppm
β γ = 60 cpm
α = 0 cpm

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FERNALD RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WI5520.03.05	PROJECT NAME: RI/FS Southfield	
BORING NUMBER: 2943	COORDINATES:	DATE 4-13-93
ELEVATION:	GWL: Depth 54' Date/Time 4/16/93, 1255	DATE STARTED 4-12-93
ENGINEER/GEOLOGIST: Ken Geiger	Depth 51.6' Date/Time 4/21/93, 800	DATE COMPLETED:
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
30.0							
31.5	110752 1455 4-13-93	17 32 50	9	Very Dense, light olive brown (2.5Y, 5/6) well graded sand with few pebbles, dry	SW	NA	HNU = 0ppm $\beta\gamma$ = 60cpm α = 0cpm
35.0							
36.5	110753 1530 4/13/93	17 23 28	11	Very Dense, dark yellowish brown (10YR, 4/4) well graded sand with few pebbles, dry	SW	NA	HNU = 0ppm $\beta\gamma$ = 70cpm α = 0cpm
40.0							
41.5	110754 1605 4/13/93	14 22 29	9	Very Dense, dark yellowish brown (10YR, 4/4) poorly graded sand with pebbles, dry	SP	NA	HNU = 0ppm $\beta\gamma$ = 60cpm α = 0cpm
45.0							

NOTES: See page 1

4/13/93 Background levels.
HNU = 0 ppm
$\beta\gamma$ = 60cpm
α = 0cpm

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FERNALD RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER WBS20.03.05	PROJECT NAME. RI/FS South field	
BORING NUMBER. 2943	COORDINATES:	DATE 4/15/93
ELEVATION:	GWL: Depth 54' Date/Time 4/16/93, 1255	DATE STARTED 4-12-93
ENGINEER/GEOLOGIST Ken Geiger	Depth 57.6' Date/Time 4/21/93, 500	DATE COMPLETED: 4-20-93
DRILLING METHODS Cable tool		PAGE 4 OF 4

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45.0							
46.5	110755 0932 4/15/93	15 50/4	10	Very dense, Pale brown (10YR, 6/3), Poorly-graded sand with much pea gravel, moist	SP	NA	HNU = 1 ppm; Bγ = 50 cpm; α = 0 cpm
50.0							
51.5	110756 1015 4/15/93	29 36 50/4	16	Very dense, Pale brown (10YR, 6/3), Poorly-graded sand with pea gravel, moist	SP	NA	HNU = 1 ppm; Bγ = 70 cpm; α = 0 cpm
53.0	110757 1340 4/15/93	38 50/2	8	Very dense, Yellowish brown (10YR, 5/4), Poorly-graded sand with pea gravel, moist	SP	NA	HNU = 1 ppm; Bγ = 60 cpm; α = 0 cpm; Moisture could be due to drilling f
WATER TABLE 54' ▽ 54.5	110758 1400 4/15/93	12 28 23	14	Very dense, Dark yellowish brown (10 YR, 4/4) Poorly-graded sand with pea gravel, moist	SP	NA	HNU = 4 ppm; Bγ = 80 cpm; α = 0 cpm; Moisture could be due to drilling fl
56.0	110759 1445 4/15/93	13 25 25	12	Very dense, Dark yellowish brown (10YR, 4/4) Poorly-graded sand with pea gravel, moist	SP	NA	HNU = 2 ppm; Bγ = 80 cpm; α = 0 cpm; Moisture could be due to drilling fluid!
57.5	110760 0855 4/16/93	6 14 18	11	Dense, Dark yellowish brown (10YR, 4/4) Poorly-graded sand with pea gravel, w.t.	SP	NA	HNU = 0 ppm; Bγ = 80 cpm; α = 0 cpm
59.0	110761 0915 4/16/93	9 23 27	15	Very Dense, Olive brown (2.5Y, 4/3), Well-graded sand with pea gravel, moist.	SW	NA	HNU = 0 ppm; Bγ = 80 cpm; α = 0 cpm; no 4/16/93

NOTES: See page 1.

Background Levels 4/16/93
HNU = 0 ppm
Bγ = 60 cpm
α = 0 cpm

or 4/14/93 ~~4/14~~ 4/15/93 Background levels.
HNU = 0 ppm
Bγ = 60 cpm
α = 0 cpm

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FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS -4395

PROJECT NUMBER. WBS 20.03.05	PROJECT NAME. South field		
BORING NUMBER. 2943	COORDINATES:	DATE 4/16/93	
ELEVATION:	GWL: Depth 54' Date/Time 4/16/93 1255	DATE STARTED 4/12/93	
ENGINEER/GEOLOGIST Ken Geiger	Depth 51.6' Date/Time 4/21/93 800	DATE COMPLETED: 4/20/93	
DRILLING METHODS Cable Tool		PAGE 5 OF 5	

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 inches	RECOVERY (inches)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
59.0							
60.5	H0762 0950 4/16/93	7 9 18	13	Medium dense, Olive brown (2.5Y 4/3), well-graded sand with pea gravel, moist	SW	NA	HNμ = 0 ppm Bγ = 60 cpm α = 0 cpm
62.0	110763 1005 4/16/93	5 6 17	12	Medium dense, Dark olive brown (2.5 Y, 3/3), poorly-graded sand with pea gravel, moist	SP	NA	HNμ = 0 ppm Bγ = 60 cpm α = 0 cpm
63.5	110764 1025 4/16/93	6 14 20	18	Dense, Light olive brown (2.5Y, 5/4), poorly-graded sand with pea gravel moist	SP	NA	HNμ = 0 ppm Bγ = 60 cpm α = 0 cpm
65.0	110765 1330 4/16/93	8 15 24	18	Dense, Light olive brown (2.5Y, 5/4), well-graded sand with pea gravel, moist	SW	NA	HNμ = 0 ppm Bγ = 60 cpm α = 0 cpm
				Split spoon sampled to 65.0', Bottom of boring at 70.0'			Composite Sieve Sample # 110766.

NOTES: See page 1.

Background levels, 4/16/93

HNμ = 0 ppm, Span = 3.18

Bγ = 60 cpm

α = 0 cpm

402-11-86

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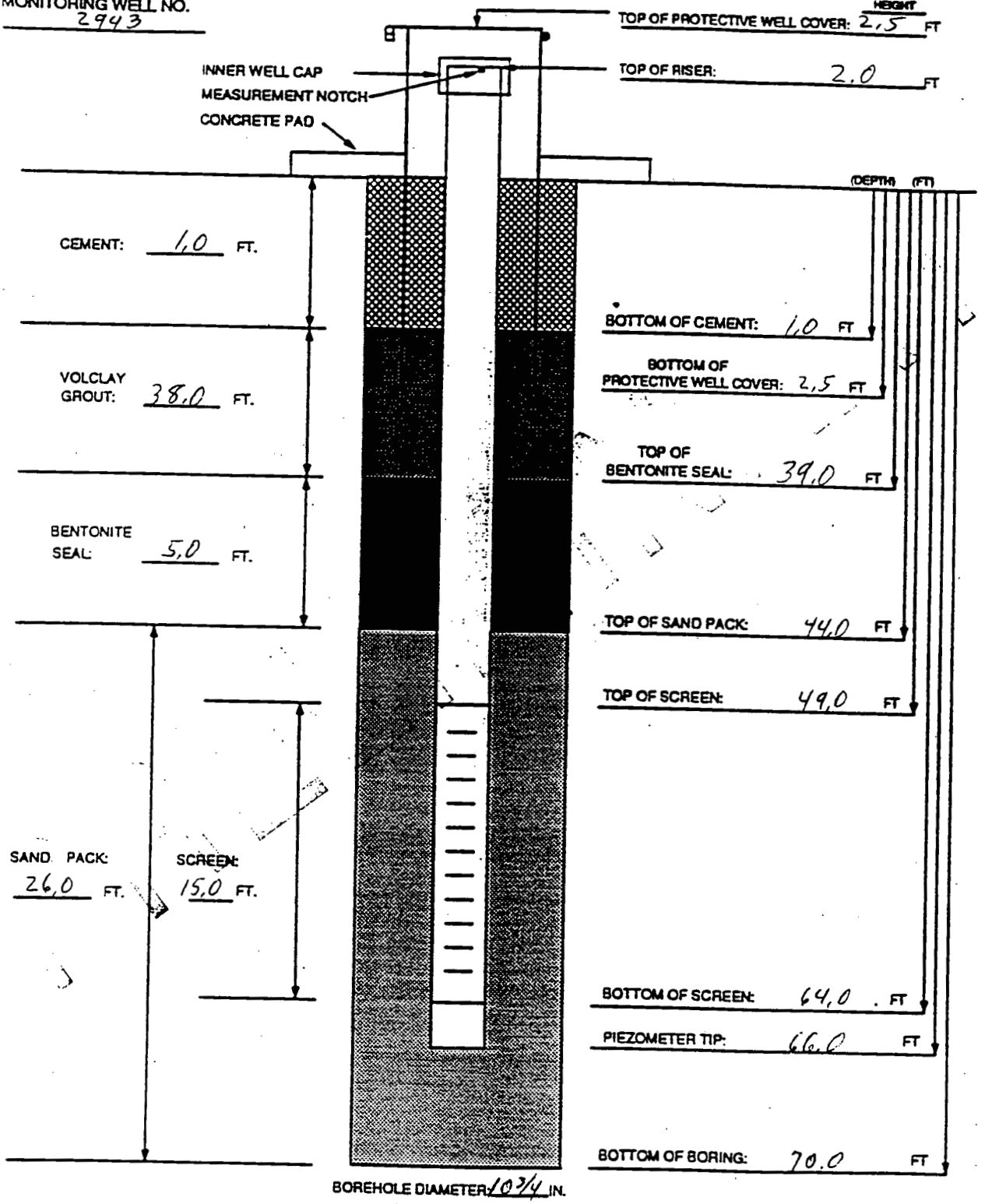
FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 2943

INSTALLATION DATE: 4/20/93



BOREHOLE DIAMETER: 10 3/4 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: 10/20, 24-50lb bags
BENTONITE PELLETS (5-GALLON BUCKETS): 5 Buckets
BAGS OF VOLCLAY GROUT: 7 - 50lb Bags
AMOUNT OF CEMENT: 1 Bag
AMOUNT OF WATER USED: 500 gallons
OTHER: Riser Pipe Sections 1-15' screen with 2' sump, 5-10', 1-1'
TASK: WBS 20 03 05 RDC-11

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 54.0 FT/ 4/16
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: Ken Geiger

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FERNALD RI/FS

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PIEZOMETER INSTALLATION SHEET

PROJECT NAME RI/FS Southfield FIELD ENG./GEO. Ken Geiger DATE 4/21/9
PROJECT NO. WBS 200305 RD<11 CHECKED BY _____ DATE _____
BORING NO. 2943 R6 4/21/93
~~PIEZOMETER NO.~~ 2943 Mon Toring well DATE OF INSTALLATION 4/20/93

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0.0 ft TO 54.0 ft
FLUID N/A FROM N/A TO N/A

TYPE OF BIT Hammer Percussion Bit
CASING SIZE (S) USED:
SIZE 10" FROM 0.0 ft TO 70.0 ft
SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE Monitoring well
DIAMETER OF PERFORATED SECTION 4.0 ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS .010
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 1-15' Screen with 2' Sump 5-10' & 1-1' Risers
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 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: CONCRETE	TOP 0.0	BOTTOM 1.0		
GROUT/SLURRY	TOP 1.0	BOTTOM 39.0	TOP	BOTTOM
BENTONITE	TOP 39.0	BOTTOM 44.0	TOP	BOTTOM
SAND	TOP 44.0	BOTTOM 70.0	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 49.0	BOTTOM 64.0	TOP	BOTTOM
PIEZOMETER TIP	66.0			
BOTTOM OF BOREHOLE	70.0			
GWL AFTER INSTALLATION	51.6			

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

FERNALD
RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. OU2 -		
BORING NUMBER 1947	COORDINATES.		DATE 4/26/93
ELEVATION: NA	GWL: Depth	Date/Time	DATE STARTED 4/26/93
ENGINEER/GEOLOGIST J. Reagan	Depth	Date/Time	DATE COMPLETED. 4/28/93
DRILLING METHODS Hollow Stem auger			PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
							BG = 50cpm HNu = 0 ppm
1 2 3 4 5				Brown, silty clay moist			Refer to Boring log for MW2947 for detailed soil descriptions
6 7	111639 1420			Shelby tube			BG = 50cpm HNu = 0ppm
8 9	111640 1440	8 10 13 13	6 6 6 6	stiff, 10YR 5/6 yellowish brown silty clay, low plasticity moist	Cl	2.5	BG = 50cpm HNu = 0ppm
10 11	111641 1625	4 8 8	6 6 6	very stiff, 10YR 5/4, silty clay, mottled, some fine sand, low plasticity moist	cl	3.0	BG = 80cpm HNu = 0ppm
12	111642 1630	7 8 8	6 6 0	SAA	cl	3.0	BG = 60cpm HNu = 0 ppm
13 14	111643 1640	3 10 13	6 6 4	Stiff, 10YR 5/4 silty clay mottled, low plasticity, moist	cl	1.5	BG = 60cpm HNu = 0ppm

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment Acker Soil Sentry
Driller Marty Watral
Bob Reiley

SAA - Same as above
NA - Not Applicable

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

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS -4395

PROJECT NUMBER 20.03.05	PROJECT NAME. OU2	
BORING NUMBER 1947	COORDINATES. NA	DATE 4/26/93
ELEVATION: NA	GWL: Depth Date/Time	DATE STARTED 4/26/93
ENGINEER/GEOLOGIST J. Reagan	Depth Date/Time	DATE COMPLETED. 4/28/93
DRILLING METHODS Hollow Stem auger		PAGE 2 OF 2

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (FT)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
14.5							
15	111644	6	6	Stiff, 10YR5/4, silty clay,			BZ=80cpm
	1650	10	6	mottled, low plasticity, moist	cl	1.5	NNv = 0ppm
		13	4				
16	111645	8	6				
17	1655	10	6	SAA	cl	1.5	Bγ = 60cpm
		14	0				NNv = 0ppm
18	111646	8	6				
	1705	17	6	SAA	cl	1.5	Bγ = 80cpm
19		24	6				NNv = 0ppm
	111647	4	6				
20	1715	8	6	SAA	cl	1.5	Bγ = 80cpm
		12	6				NNv = 0ppm

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment Acker Soil Sentry
Driller Marty Watral
Bob Dexley

SAA - Same as above
NA - Not Applicable

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

FERNALD RI/FS

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PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU2 FIELD ENG./GEO. J. Reagan DATE 4/2
PROJECT NO. 20.03.05 CHECKED BY NA DATE NA
BORING NO. 1947
PIEZOMETER NO. NA DATE OF INSTALLATION 4/28/93

BOREHOLE DRILLING

DRILLING METHOD Hollowstem auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Stainless.
DIAMETER OF PERFORATED SECTION 2 in
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.01 in
TOTAL PERFORATED AREA 10 Ft

RISER PIPE MATERIAL Stainless
RISER PIPE DIAMETERS:
O.D. _____ I.D. 2 in
LENGTH OF PIPE SECTIONS 10', 2'
JOINING METHOD Flush thread

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

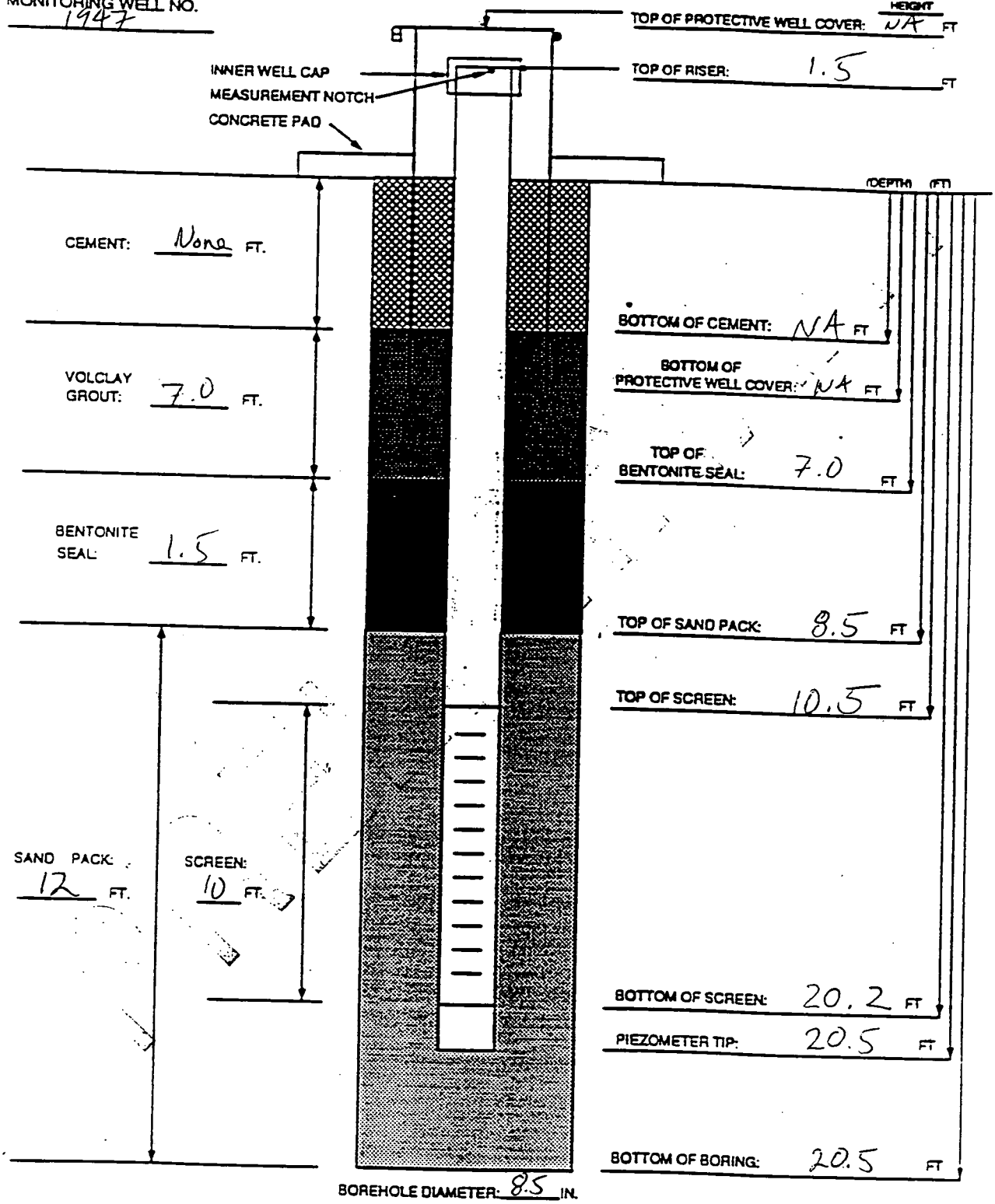
OTHER PROTECTION Drum over riser pipe

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	1.5		NA	
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	NA		NA	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 7.0	TOP NA	BOTTOM N
BENTONITE	TOP 7.0	BOTTOM 8.5	TOP NA	BOTTOM N
SAND	TOP 8.5	BOTTOM 20.5	TOP NA	BOTTOM N
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM N
PERFORATED SECTION	TOP 10.5'	BOTTOM 20.2	TOP NA	BOTTOM N
PIEZOMETER TIP	20.5'		NA	
BOTTOM OF BOREHOLE	20.5'		NA	
GWL AFTER INSTALLATION	None		NA	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Temporary well set as per instructions from John Whitehead. See attached drawing with FADL by 4/27/93

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 1947

INSTALLATION DATE: 4/28/93



MATERIALS USED

SAND TYPE AND QUANTITY: 10x20, 5 bags
BENTONITE PELLETS (5-GALLON BUCKETS): 1/2
BAGS OF VOLCLAY GROUT: 1
AMOUNT OF CEMENT: None
AMOUNT OF WATER USED: 15 gal
OTHER: NA
TASK: NA

NOTES:

1) RISER PIPE IS 2 IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2 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 N/ FT/
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: J. Reagan

FERNALD
RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. OU2 - Southfield		
BORING NUMBER 1968	COORDINATES.		DATE 4/19/93
ELEVATION: NA	GWL: Depth	Date/Time	DATE STARTED 4/19/93
ENGINEER/GEOLOGIST J. Reagan	Depth	Date/Time	DATE COMPLETED. 4/20/
DRILLING METHODS Hollow stem auger			PAGE 1 OF 3

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
							Bγ background 60-6 HNU = 0 ppm
1	NA	50/3	0	No recovery			HNU = NA
	NA	Refusal 6"	0	No recovery			Bγ = NA
	112833 820		NA	Shelby tube sample	NA	NA	
2	↓	NA	NA	↓	↓	↓	Bγ = NA HNU = NA
			NA				
	112833 820		NA	Shelby tube sample	NA	NA	
3	112834 835	13	6	2.5Y 2.5/1 black, coal pieces	NA	NA	HNU = 0 ppm Bγ = 60cpm
	↓	17	6	st. 6b 2.5Y 5/4 light olive brown, silty fine sand, low plasticity, dry	ml	1.5	
4	112834 835	18	6	st. 6b 2.5Y 4/1, dark gray, silty fine sand, low plasticity, dry	ml	1.5	
5	112835 850	6	6	st. 6b 2.5Y 4/4, olive brown, silty clay, low plasticity, moist	cl	1.5	HNU = 0 ppm Bγ = 60cpm
	↓	12	6	very stiff 2.5Y 4/2, dark grayish brown silty clay, slightly plastic, moist	cl	2.5	
	↓	18	6	SAA	cl	2.5	
6	112835 850	10	6	SAA	cl	2.0	HNU = 0 ppm Bγ = 60cpm
7	112836 905	10	6	SAA	cl	2.0	
	112837 905	7	6	SAA	cl	2.0	

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment Acker Soil Sentry
Driller Marty Watral
Doc Detley

SAA - Same as above
NA - Not Applicable

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

FERNALD
RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1968	COORDINATES: NA		DATE: 4/20/93
ELEVATION: NA	GWL: Depth	Date/Time	DATE STARTED: 4/19/93
ENGINEER/GEOLOGIST: J. Reagan	Depth	Date/Time	DATE COMPLETED: 4/20/9
DRILLING METHODS: AUGER (HOLLOW STEM)			PAGE 2 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	112838 905	8	6	very stiff, dark grayish brown, silty clay, slightly plastic, moist	cl	2.5	Hnu = 0 α = Bq = 60cpm
	112839 915	4	6	stiff, 2.5Y 4/1, dark gray, silty clay, low plasticity, moist	cl	1.5	
9	NA	4	0	No recovery	NA	NA	
	NA	4	0	No recovery	NA	NA	Hnu = 0 ppm α = Bq = 80cpm
10	112840 920	3	6	stiff, 2.5Y 4/1, dark gray, silty clay, low plasticity, moist	cl	2.0	
	112841 920	3	6	stiff 2.5Y 4/1 dark gray, 2.5Y 3/1 very dark gray mottles, silty clay, slightly plastic, moist	cl	1.25	
11	NA	4	0	No recovery	NA	NA	Hnu = 0 ppm α = Bq = 40 cpm
	112842 930	15	6	stiff, 2.5Y 4/1 dark gray, 2.5Y 3/1 very dark gray mottles, silty clay, slightly plastic, wet	cl	3.0	SR 4/20/93
12	112843 930	17	6	very stiff, 2.5Y 4/2 dark grayish brown, 2.5Y 3/1 very dark grayish brown mottles, silty clay, slightly plastic, moist	cl	3.0	
	112844 930	23	6	very stiff, 2.5Y 4/2 dark grayish brown, silty clay, slightly plastic, moist	cl	2.5	Hnu = 0 ppm α = Bq = 60cpm
13	112845 945	7	6	SAA	cl	2.5	
	112846 945	10	6	SAA	cl	2.75	
14	NA	12	0	No recovery	NA	NA	Hnu = 0ppm α = Bq = 60cpm
	112847 1005	5	6	very stiff, 2.5Y 5/4 light olive brown, silty clay, low plasticity, moist	cl	2.5	
	112848 1005	12	6	SAA	cl	2.5	

NOTES:

FERNALD
RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1968	COORDINATES: NA	DATE: 4/20/93
ELEVATION: NA	GWL: Depth Date/Time	DATE STARTED: 4/19/9
ENGINEER/GEOLOGIST: J. Reagan	Depth Date/Time	DATE COMPLETED: 4/20/
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 3 OF

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	NA	20	0	NO recovery	NA	NA	HNU = 0 ppm α = Bγ = 60 cpm
16	112849 1030	10	6	stiff, 2.5Y 5/4, light olive brown, silty clay, dry, low plasticity	cl	2.0	
	112849 1030	24	6	SAA	cl	2.0	
	112850 1030	50/5	4	SAA	cl	3.0	HNU = 0 ppm α = Bγ = 50 cpm
17	112851 1330	10	6	Loose, 2.5Y 4/3 olive brown, poorly graded sand, moist	SP	NA	
	112852 1330	10	4	SAA			
18	NA	11	0	NO recovery			HNU = α = Bγ =
19							
20							HNU = α = Bγ =

NOTES:

FERNALD RI/FS

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PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU2 - Southfield
FIELD ENG./GEO. J. Reagan DATE 4/2
PROJECT NO. 70.03.05
CHECKED BY NA DATE N
BORING NO. 1968
PIEZOMETER NO. NA
DATE OF INSTALLATION 4/20/93

BOREHOLE DRILLING

DRILLING METHOD Hollow stem auger
TYPE OF BIT Auger
DRILLING FLUID (S) USED:
FLUID WA FROM NA TO NA
FLUID NA FROM NA TO NA
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA
RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA
OTHER PROTECTION NA

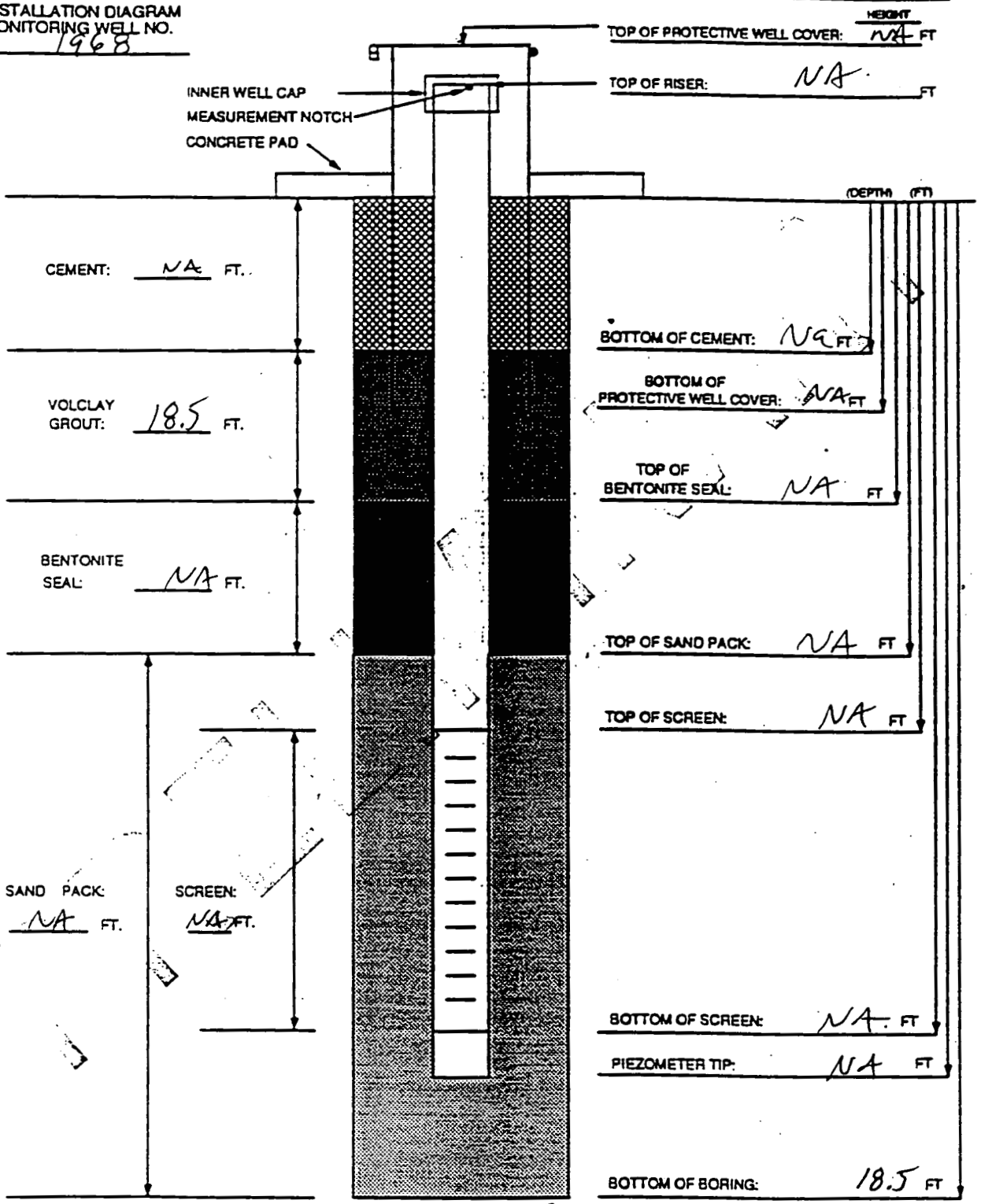
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	NA		NA	
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	NA		NA	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 18.5	TOP NA	BOTTOM NA
BENTONITE	TOP NA	BOTTOM NA	TOP NA	BOTTOM N
SAND	TOP NA	BOTTOM NA	TOP NA	BOTTOM N
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM N.
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP NA	BOTTOM N
PIEZOMETER TIP	NA		NA	
BOTTOM OF BOREHOLE	18.5		NA	
GWL AFTER INSTALLATION	NA.		NA	

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. 1968

INSTALLATION DATE: 4/20/93



BOREHOLE DIAMETER: 8.5 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 1
AMOUNT OF CEMENT: 1
AMOUNT OF WATER USED: 5 gal
OTHER: NA
TASK: NA

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BEL GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: J. Reagan

ASI FORM 0157 REV. (0)

FERNALD RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER WBS 2003.05	PROJECT NAME. RI/FS	
BORING NUMBER. 2945	COORDINATES:	DATE 3/19/93
ELEVATION:	GWL: Depth 43.5' Date/Time 4/2/93/830	DATE STARTED 3/19/93
ENGINEER/GEOLOGIST Ken Geiger	Depth 43.6' Date/Time 4/7/93/830	DATE COMPLETED: 4/7/93
DRILLING METHODS: Cable Tool		PAGE 1 OF 6

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.0	110237	2		Soft, Brown (10YR, 4/3) Silty Sandy			HNU = 0ppm Some Roots
	950	8	8	clay with light Yellowish Brown (2.5Y, 6/4)	CL	.5	BY = 60cpm
1.5	3/19/93	10		mottling, Some Gravel + Concrete Fragments. medium Plasticity, Slightly moist.			α = 0cpm Fill
	110238	9		Soft Brown (10YR, 4/3) Silty Clay			HNU = 0ppm
	1000	10	7	with Some Concrete Fragments and		.5	BY = 60cpm
3.0	3/19/93	9		Gravel, medium Plasticity, Slightly moist			α = 0cpm Fill
	110239	4		Stiff Brown (10YR, 4/3) Silty Sandy Clay			HNU = 0ppm
	1005	7	5	with Some Concrete Fragments and	CL	1.5	BY = 60-80cpm
4.5	3/19/93	7		Gravel, medium Plasticity, Slightly moist.			α = 0cpm Fill
	110240	45		Stiff Brown (10YR, 4/3) Silty Sandy clay			HNU = 0ppm
	1015	40	4	with Concrete Fragments and Gravel,	CL	1.5	BY = 60-80cpm
6.0	3/19/93	16		medium Plasticity, Slightly moist.			α = 0cpm Fill
	110241	32		Stiff, Brown (10YR, 4/3), Sandy clay			HNU = 0ppm
	1025	30	4	with Concrete Fragments and Some	CL	1.0	BY = 80cpm
7.5	3/19/93	28		Gravel, medium Plasticity, Slightly moist.			α = 0cpm Fill
	110242	31					HNU = 0ppm
	1030	28	5	Same As Above	CL	1.5	BY = 80cpm
9.0	3/19/93	16					α = 0cpm Fill
	110243	16		Stiff Dark Grayish Brown (10YR, 4/2)			HNU = 0ppm
	1035	21	18	Silty Clay with a Trace of Gravel,	CL	1.5	BY = 60-80cpm
10.5	3/19/93	20		Low Plasticity, Slightly moist.			α = 0ppm
	110245	8		Stiff Dark Brown (10YR, 3/3) Silty			HNU = 1-2ppm
	1645	9	13	Clay with a Trace of Gravel, Low	CL	1.5	BY = 60-80cpm
12.0	3/24/93	10		plasticity, Slightly moist			α = 0 cpm
	110246	9		Stiff, Dark Brown (10YR, 3/3) Silty			HNU = 0ppm
	900	13	14	Clay with a Trace of Gravel,	CL	1.75	BY = 80-100cpm
13.5	3/25/93	17		medium Plasticity, Slightly moist			α = 0 cpm
	110247	34		Very Stiff Dark Brown (10YR, 3/3			HNU = 0ppm
	925	17	13	Silty clay with a Trace of Gravel	CL	3.0	BY = 80-100cpm
15.0	3/25/93	10		and Sand, medium Plasticity, Slightly moist			α = 0cpm

NOTES:

Drilling Company: Pennsylvania Drilling
Driller: Dave Newman
Assistant: Jeff Bentley

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

Background Levels 3/24/93
HNU = 0ppm α = 0cpm
BY = 40-80cpm

Background Levels 3/25/93
HNU = 1ppm α = 0cpm
BY = 40-80cpm

Background Levels 3/19/93
HNU = 0ppm α = 0cpm
BY = 40-80cpm

402-11-86

FERNALD RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER WBS 20.03.05	PROJECT NAME RI/FS	
BORING NUMBER 2445	COORDINATES:	DATE 3/25/93
ELEVATION:	GWL: Depth 43.5' Date/Time 4/2/93/830	DATE STARTED 3/19/93
ENGINEER/GEOLOGIST Ken Geiger	Depth 43.6' Date/Time 4/7/93/830	DATE COMPLETED 4/7/93
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
15.0	110248	17		Stiff, Brown (10YR, 4/3) Silty Clay with some Gravel and Sand, medium plasticity, slightly moist	CL	1.5	Hnu = 0ppm Bγ = 80-100cpm α = 0cpm
16.5	1005	33	13				
	3/25/93	50/5					
	110249	9		Stiff, Brown (10YR, 5/3) Silty Sandy Clay with some Gravel, medium plasticity, slightly moist	CL	1.5	Hnu = 0ppm Bγ = 60-80cpm α = 0cpm
	1040	13	12				
18.0	3/25/93	17					
	110250	17		Stiff, Brown (10YR, 5/3) Silty Sandy Clay with some Gravel, medium plasticity, moist	CL	1.0	Hnu = 0ppm Bγ = 60-80cpm α = 0cpm
	1405	4	12				
19.5	3/25/93	3					
	110251	3		Loose, Dark Yellowish Brown (10YR, 4/4) Poorly Graded Sand with some Clay, slightly moist	SP	N/A	Hnu = 0ppm Bγ = 60-80cpm α = 0cpm
	1420	4	10				
21.0	3/25/93	3					
				No Sample Taken. Samples to be Taken Every 5ft Starting at 25.0ft			
25.0	110252	48		Very Dense, Dark Yellowish Brown (10YR, 4/4) Well Graded Sand with some Gravel, Dry	SW	N/A	Hnu = 0ppm Bγ = 60cpm α = 0cpm used 3" Spoon to collect GeoTech Sample. Drive 2ft.
	1430	49	12				
	3/29/93	50/3					
27.0							
30.0							

NOTES:

See Page 1

Background Levels 3/25/93
Hnu = 1ppm
Bγ = 40-80cpm
α = 0cpm

Background Levels 3/29/93
Hnu = 1ppm
Bγ = 40-80cpm
α = 0cpm

402-11-86

FERNALD RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: W35 20.03.05	PROJECT NAME: RI/FS	
BORING NUMBER: 2945	COORDINATES:	DATE: 3/29/93
ELEVATION:	GWL: Depth 43.5' Date/Time 4/2/93/830	DATE STARTED: 3/19/93
ENGINEER/GEOLOGIST: Ken Grigger	Depth 43.6' Date/Time 4/7/93/830	DATE COMPLETED: 4/7/93
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
30.0	110254	9		Dense, Dark Yellowish Brown (10YR, 4/4) Poorly Graded Gravelly Sand with Rock Fragments, Dry	SP	N/A	HNU = 0ppm
	1615	14	10				Bγ = 40-60 cpm
31.5	3/29/93	21					α = 0 cpm
35.0							
	110255	41		Very Dense; Dark Yellowish Brown (10YR, 4/4) Poorly Graded Sand with Some Gravel, Slightly moist	SP	N/A	HNU = 0ppm moisture
	1040	50/4	7				Bγ = 40-60 cpm Appears to
36.5	3/30/93						α = 0 cpm be from Drilling fluid
40.0							
	110256	25		Very Dense, Brown (10YR, 5/3) Poorly Graded Gravelly Sand, Dry	SP	N/A	HNU = 0ppm
	1405	41	12				Bγ = 40-60 cpm
41.5	3/30/93	50/3					α = 0 cpm
	110257			Very Dense, Brown (10YR, 5/3) Poorly Graded Gravelly Sand, Slightly moist	SP	N/A	HNU = 0ppm moisture
	1525	50/4	4				Bγ = 40-60 cpm Appears to
43.0	3/30/93						α = 0 cpm be from Drilling fluid
W.T. 43.5' ▽	110258	32		Very Dense, Brown (10YR, 5/3) well Graded Sand with Some Gravel, wet	SW	N/A	HNU = 0ppm
	1550	40	13				Bγ = 40-60 cpm
44.5	3/30/93	50/4					α = 0 cpm

NOTES:

See Page 1

Background Levels 3/29/93
HNU = 1 ppm
Bγ = 40-60 cpm
α = 0 cpm

Background Levels 3/30/93
HNU = 1 ppm
Bγ = 40-60 cpm
α = 0 cpm

FERNALD RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBS 2003.05	PROJECT NAME: RI/FS		
BORING NUMBER: 2945	COORDINATES:	DATE: 3/29/93	
ELEVATION:	GWL: Depth 43.5 Date/Time 4/2/93/ 530	DATE STARTED: 3/19/93	
ENGINEER/GEOLOGIST: Ken Geiger	Depth 43.6 Date/Time 4/7/93/ 530	DATE COMPLETED: 4/7/93	
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
44.5	110259 1640 3/30/93	10 13 31	16	Dense, Brown (10YR, 5/3) Poorly Graded Sand with Some Gravel, wet	SP	N/A	HNU = 0ppm BY = 40-60cpm α = 0cpm
46.0	110260 1655 3/30/93	12 14 17	12	Dense, Brown (10YR, 4/3) Poorly Graded Sand with Some Gravel, wet	SP	N/A	HNU = 0ppm BY = 40-60cpm α = 0cpm
47.5	110261 0845 3/31/93	7 14 21	13	Dense, Brown (10YR, 4/3) Poorly Graded Sand with Some Gravel, wet	SP	N/A	HNU = 0ppm BY = 60cpm α = 0cpm
49.0	110262 0900 3/31/93	4 13 14	12	Medium Dense, Brown (10YR, 4/3) Poorly Graded Sand with Some Gravel wet	SP	N/A	HNU = 0ppm BY = 60cpm α = 0cpm
50.5	110263 0930 3/31/93	8 14 12	12	Medium Dense, Brown (10YR, 4/3) Poorly Graded Sand with Some Gravel, wet	SP	N/A	HNU = 0ppm BY = 60cpm α = 0cpm
52.0	110264 0945 3/31/93	6 9 8	14	Medium Dense, Brown (10YR, 4/3) Poorly Graded Sand with Some Gravel, wet	SP	N/A	HNU = 0ppm BY = 60cpm α = 0cpm
53.5	110265 1000 3/31/93	11 14 10	18	Medium Dense, Brown (10YR, 4/3) Poorly Graded Sand with Some Gravel, wet	SP	N/A	HNU = 0ppm BY = 40cpm α = 0cpm
55.0				Split Spoon Sampled To 55.0' Bottom of Boring at 60.0'			Composite Sieve Sample #110266

NOTES:

See Page 1

Background Levels 3/30/93
HNU = 1ppm
BY = 40-60 cpm
α = 0 cpm

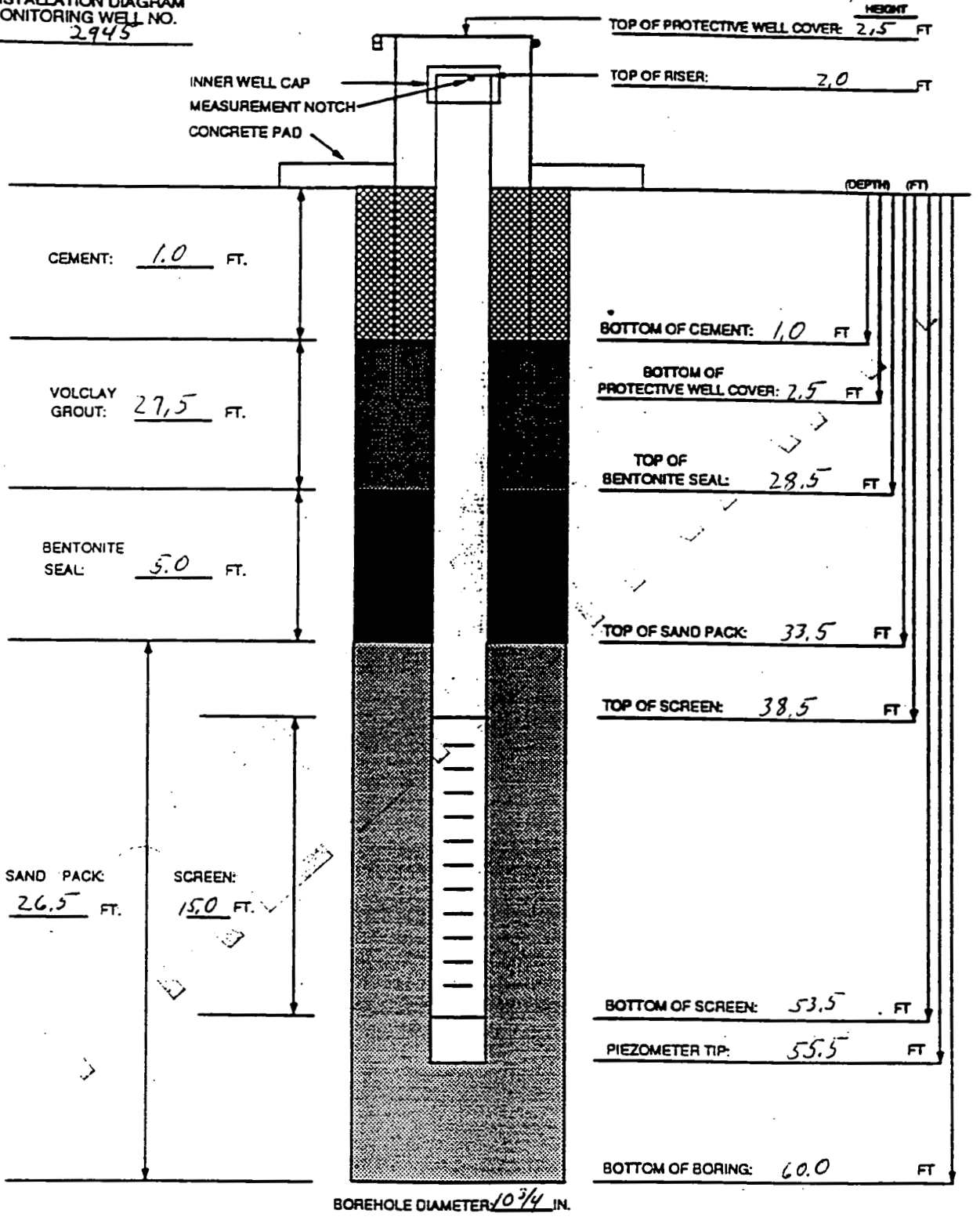
Background Levels 3/31/93
HNU = 1ppm
BY = 40-60 cpm
α = 0 cpm

402-11-66

4395

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 2945

INSTALLATION DATE: 4/7/93



	HEIGHT	(DEPTH) (FT)
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:		28.5 FT
TOP OF SAND PACK:		33.5 FT
TOP OF SCREEN:		38.5 FT
BOTTOM OF SCREEN:		53.5 FT
PIEZOMETER TIP:		55.5 FT
BOTTOM OF BORING:		60.0 FT

MATERIALS USED

SAND TYPE AND QUANTITY: 430/20-50 lb bags
BENTONITE PELLETS (5-GALLON BUCKETS): 7 Buckets
BAGS OF VOLCLAY GROUT: 6 1/2 - 50 lb bags
AMOUNT OF CEMENT: 1 Bag
AMOUNT OF WATER USED: 500 gallons
OTHER: Riser Pipe Sections 1-15' Screen w/ 1-2' Sump, 4-10', 1-5'
TASK: WBS 20.03.05 ROC 11

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 43.5 FT/ 4/
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: KEN GEIGER

ASI FORM 0157 REV. (0)

PIEZOMETER INSTALLATION SHEET

PROJECT NAME RI/FS Southfield
FIELD ENG./GEO. KEN GEIGER DATE 4/7/93
PROJECT NO. WBS 20.03.05 RDC11
CHECKED BY _____ DATE _____
BORING NO. 2945
KL 4/7/93
~~PIEZOMETER~~ monitoring well NO. 2945
DATE OF INSTALLATION 4/7/93

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0.0 ft TO 44.0 ft
FLUID N/A FROM N/A TO N/A

TYPE OF BIT Hammer Percussion Bit
CASING SIZE (S) USED:
SIZE 16" FROM 0.0 ft TO 20.0 ft
SIZE 12" FROM 0.0 ft TO 20.0 ft
SIZE 10" FROM 20.0 ft TO 60.0 ft

PIEZOMETER DESCRIPTION

TYPE Monitoring well
DIAMETER OF PERFORATED SECTION 4.0 I.D.
PERFORATION TYPE:
SLOTS ☑ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS .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 _____
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 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: CONCRETE	TOP 0.0	BOTTOM 1.0		
GROUT/SLURRY	TOP 1.0	BOTTOM 28.5	TOP	BOTTOM
BENTONITE	TOP 28.5	BOTTOM 33.5	TOP	BOTTOM
SAND	TOP 33.5	BOTTOM 60.0	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 38.5	BOTTOM 53.5	TOP	BOTTOM
PIEZOMETER TIP	55.5			
BOTTOM OF BOREHOLE	60.0			
GWL AFTER INSTALLATION	43.6			

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

well # 2945 Sieve Analysis 7/2/93 4395

Ken Geiger Sample # 110266

Retained Values

40% .053

50% .037

60% .006

$\frac{.053}{.006} = 8.8$ 8.8 > 3 use a factor of 4

4 x .037 = .148

.148 most closely fits the coarse grain sand and the .020 screen size.

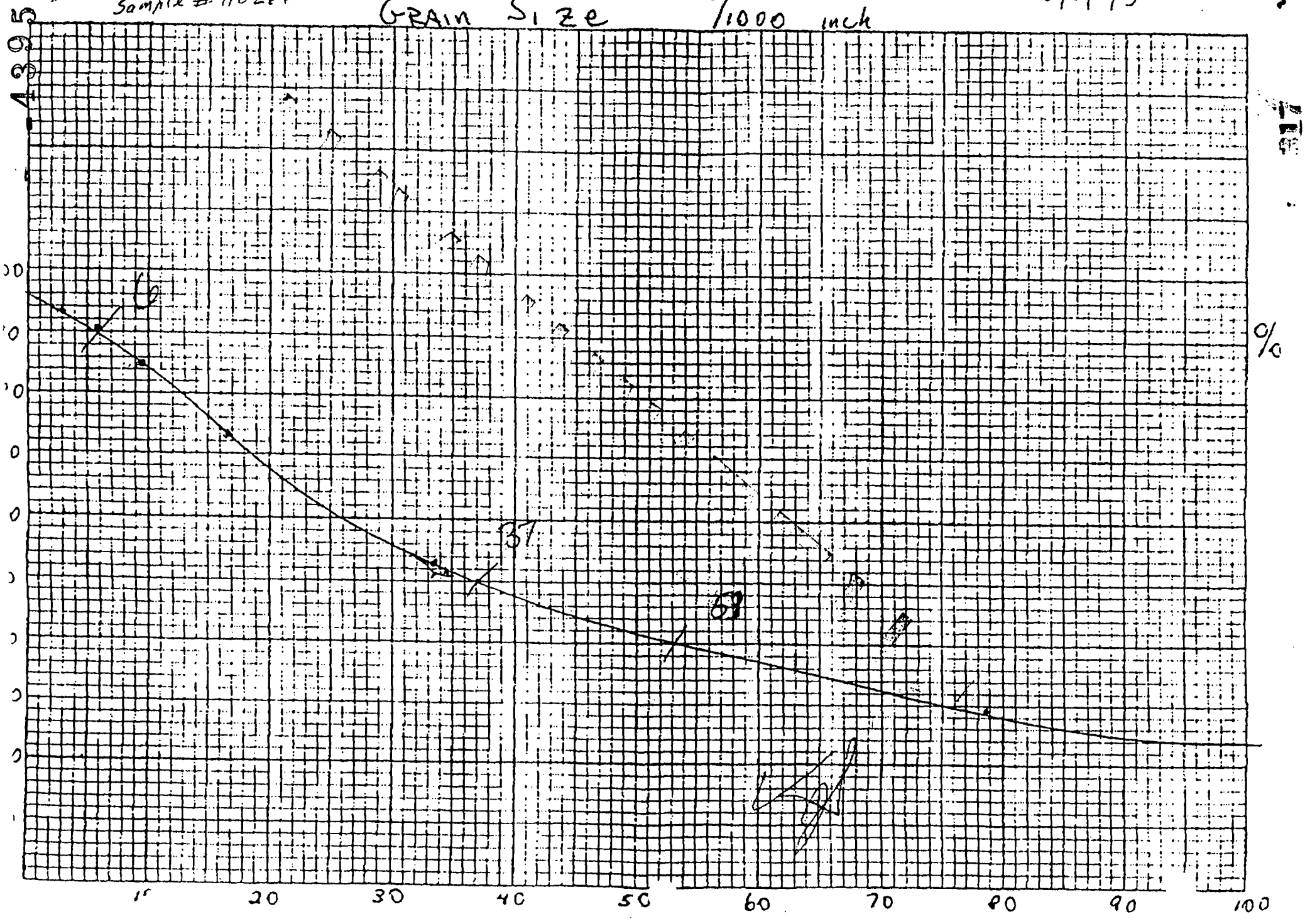
MADE IN U. S. A.

Sample #110266

Grain Size 1/1000 inch

430531-055

4-1-93



well 2945
Sample #110266

24 Hours

CHAIN OF CUSTODY

Analis ID: 930331-055 Project No.: 0010-0001 Change: RCRA
Customer No.: 10266 Customer Name: FERMCO
Matl. Descr.: OU-2 PHASE II Deadline: 1 Apr
Sample Matrix: SOIL Date Sampled: 31-MAR
Comments: SEND RESULTS TO MIKE FRANK, FERMCO FAX 738-0145
AND TO CATE BRIER (IMMEDIATE) FAX 738-9222
Sample Logged By: MJ ROLFES Modified By: MJ ROLFES
Sampled From: 6 2945.40-55 Date Modified: 31-MAR-1993 14:40

ENVIRONMENTAL & PROCESS MATERIALS LABORATORY

Analysis	Units	Activ.	Prep	Prep No	Analys	Pro
SIEVE ANALYSIS, 40% RETAINED	.001 INCH	9158	53		9158	
SIEVE ANALYSIS, [illegible]% RETAINED	.001 INCH	9158	37		9158	
SIEVE ANALYSIS, [illegible]% RETAINED	.001 INCH	9158	6		9158	

Crosschecked by: [illegible]
Entered on Computer by:
Approved and Printed by:

Placed in at ____ hrs on ____
(date) by ____

RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU 2 PHASE 2	
BORING NUMBER: 11011	COORDINATES:	DATE 4/8/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/8/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/12/
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 1 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1350 110599 4/8/93	3	5	V. Stiff. 2.5Y (3/3) Dk olive brown gravelly clay w/organics no plasticity, dry	CL	2.5	HNU = 0ppm BS = 100cpm
	DSG 4/8/93	4	0	No Recovery	NA	NA	HNU = NA BS = NA
1	1352	8	0	No Recovery	NA	NA	HNU = NA BS = NA
	1352 110599 4/8/93	8	6	Stiff. 10YR (4/4) Dk yellowish brown clay w/gravel, low plasticity slightly moist	CL	1.75	HNU = 0ppm BS = 150cpm
2	1352 DSG 4/8/93 1400 110600 4/8/93	12	4	SAA	CL	1.75	HNU = 0ppm BS = 150cpm
		14	0	No Recovery	NA	NA	HNU = NA BS = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Kevin Myers
Donny Arthur

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Note: HNU = 0ppm BS = 150cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS

4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2		
BORING NUMBER: 1011	COORDINATES:		DATE 4/8/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 4/8/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth	Date/Time	DATE COMPLETED: 4/12/93
DRILLING METHODS: HOLLOW STEM AUGER			PAGE 2 OF 9

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	1355 DSO 4/8/93 1103 601 4/8/93	18	6	V. Stiff. 2.5Y(5/6) Light olive brown gravelly clay w/concrete fragments, low plasticity, slightly moist	CL	2.5	HNU = 0 ppm BS = 100 cpm
2	1355 DSO 4/8/93 1103 602 4/8/93	47	6	SAA	CL	3.75	HNU = 0 ppm BS = 100 cpm
4		26	0	No Recovery	NA	NA	HNU = NA BS = NA
5	1410 DSO 4/8/93 1103 603 4/8/93	6	4	Stiff. 2.5Y(5/6) Light olive brown DSO 4/8/93 gravelly clay w/ organics, ~~no~~ plasticity, dry	CL	1.25	HNU = 0 ppm BS = 150 cpm
		7	0	No Recovery	NA	NA	HNU = NA BS = NA
		9	0	No Recovery	NA	NA	HNU = NA BS = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Kevin Myers
Danny Arthur

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

Log: HNU = 0 ppm BS = 100 cpm

402-1-1-6

229

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RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 1011	COORDINATES:	DATE 4/8/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 4/8/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/12/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 3 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
000 4/8/93	1420 604 1004 Hsp	4	3	Pb Shelby 2.3x(44) Ht olive brown gravelly clay, low plasticity moist	CL	.75	HNU = 0ppm BS = 100cpm
		6	0	No Recovery	NA	NA	HNU = NA BS = NA
7		6	0	No Recovery	NA	NA	HNU = NA BS = NA
		1	0	No Recovery	NA	NA	HNU = NA BS = NA Tried twice
8		3	0	No Recovery	NA	NA	HNU = NA BS = NA
		4	0	No Recovery	NA	NA	HNU = NA BS = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Kevin Myers
Donny Arbout

Samples collected per ASTM standard penetration test

colors identified using Munsell Color Chart

Bkgd: HNU = 0ppm BS = 80cpm

RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 110111	COORDINATES:	DATE 4/8/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/8/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/12/
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 4 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
DSO 4/8/93	1445 604 110~~[illegible]~~ 4/8/93	6	6	Stiff. 2.5Y(4/3) Olive brown gravelly clay w/ flyash ~~[illegible]~~, low plasticity moist	CL	1.0	HNU = 0ppm BS = 300cpm
DSO 4/8/93	1445 606 110~~[illegible]~~ 4/8/93	6	3	SAA	CL	1.0	HNU = 0ppm BS = 300cpm
10		12	0	No Recovery	NA	NA	HNU = NA BS = NA
DSO 4/8/93	1455 607 110~~[illegible]~~	8	4	Stiff. 2.5Y(4/3) Olive brown gravelly clay w/ flyash, no plasticity, moist.	CL	1.0	HNU = 0 ppm BS = 100cpm
11		25	0	No Recovery	NA	NA	~~DSO 4/8/93~~ HNU = ~~0ppm~~ NA BS = NA
		24	0	No Recovery	NA	NA	HNU = NA BS = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Kevin Myers, Sonny Kohut

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = ppm BS = cpm

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RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 11011	COORDINATES:	DATE 4/8/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/8/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/12/
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 3 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1/2 (FT)	RECOVERY (FT)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
DSO 4/8/93	1505 609 4/8/93	8	6	DSO 4/8/93 ~~2.5Y~~ 10YR (4/6) Dk yellowish brown gravelly clay w/ trace low plasticity moist.	CL	1.0	HNU = 0ppm BS = 100cpm
DSO 4/8/93	1505 609	13	6	Sm. 10YR (4/6) Dk yellowish brown gravelly sandy clay w/ copper wire, low plasticity moist.	CL	1.0	HNU = 0 ppm BS = 100cpm
13 DSO 4/8/93	1505 610	14	4	SAA	CL	1.0	HNU = 0 ppm BS = 100 cpm
DSO 4/8/93	1515 611	14	6	DSO 4/8/93 10YR Sm. ~~2.5Y~~ (2/2) V. Dark Brown sandy clay w/ gravel, no plasticity moist	CL	1.2K	HNU = 0ppm BS = 100 cpm
14 DSO 4/8/93	1515 612	22	6	SAA	CL	DSO 4/8/93 ~~>4.5~~ 1.25	HNU = 0 ppm BS = 100 cpm
DSO 4/8/93	1515 613	28	6	Hard. 2.5Y (4/4) Olive brown clay w/ gravel, no plasticity dry.	CL	>4.5	HNU = 0ppm BS = 100cpm

SAA - same as above
N/A - not applicable

NOTES:

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Kevin Myers / Donny Lesher

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = 0ppm BS = 100cpm

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RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2		
BORING NUMBER: 11011	COORDINATES:		DATE 4/15/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 4/15/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth	Date/Time	DATE COMPLETED: 4/12
DRILLING METHODS: HOLLOW STEM AUGER			PAGE 6 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1330 DSO 4/15/93 614 ~~110574~~ 4/15/93	24	6	Hard. ~~2.34~~ (3/6) Dk yellowish brown gravelly clay, no plasticity dry 10YR	CI	14.8	HNU = 0ppm BG = 100cpm
	1330 DSO 4/16/93 615 ~~110575~~ 4/16/93	24	3	SAA	CI	14.8	HNU = 0ppm BG = 100cpm
16		28	0	No Recovery	NA	NA	HNU = NA BG = NA
	1345 DSO 4/15/93 616 ~~110576~~	4	6	Stiff 2.34 (4/4) Olive brown gravelly clay w/concrete chunks, no plasticity, dry	CI	1.28	HNU = 0ppm BG = 100cpm
17	1345 DSO 4/15/93 617 ~~110577~~	12	6	SAA	CI	1.28	HNU = 0ppm BG = 100cp
		16	0	No Recovery	NA	NA	HNU = NA BG = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Kevin Murphy, Sonny Arthur

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = ppm BG = cpm

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RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 1011	COORDINATES:	DATE 4/8/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/8/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/12/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 7 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 FT	RECOVERY (FT)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
4/8/93	1613 1615	3	6	Stiff ~~2.5YR~~ 2.5Y (4/4) olive brown sandy clay w/gravel no plasticity dry	CL	1.75	HNU = 0ppm BS = ~~100~~ 50 cpm 4/8/93
		4	0	No Recovery	NA	NA	HNU = NA BS = NA
19		5	0	No Recovery	NA	NA	HNU = NA BS = NA
				Boring terminated @ 19.5ft			HNU = BS =
20							HNU = BS =
							HNU = BS =

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: [illegible]

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = ppm BS = cpm

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RI/FS

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 11010	COORDINATES:	DATE 4/2/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 4/2/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/3/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 1 OF 7

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1/2 (1)	RECOVERY (1/2)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1520 110511 4/2/93	4	6	Soft. 2.5Y(6/3) Light yellowish brown clay w/organics, low plasticity, moist. Black flyash bottom 3".	cl	.25	HNU = 0 ppm BS = 100cpm ~~DSO 4/6/93~~
		5	0	No Recovery	NA	NA	HNU = ~~0 ppm~~ NA BS = NA
1		8	0	No Recovery	NA	NA	HNU = NA BS = NA
	1525 110512 4/2/93	10	6	Black flyash top 4" V. stiff. 10YR(6/6) Brownish yellow sandy clay, no plasticity, dry	NA cl	NA 2.75	HNU = 0 ppm BS = 80cpm
2	1528 110513 4/2/93	14	3	SAA	cl	2.5	HNU = 0 ppm BS = 80cpm
		12	0	No Recovery	NA	NA	HNU = NA BS = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.
Drilling Equipment ACKER SENTRY
Driller: Kevin Myers
Danny Lewis

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

Key: HNU = 0 ppm BS = 80 cpm

402-11-86

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-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 110 10	COORDINATES:	DATE 4/2/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/2/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/5/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 2 OF 7

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1830 110514 4/2/93	20	3	V. Stiff. 10YR(6/6) Brownish yellow gravelly clay, trace flyash, low plasticity, dry	CL	2.0	HNU = 0 ppm BS = 60 cpm
		22	0	No Recovery	NA	NA	HNU = NA BS = NA
4		25	0	No Recovery	NA	NA	HNU = NA BS = NA
	1545 110515 4/2/93	3	6	Loose. 10YR(6/6) Brownish yellow, silty clayey sand, fine, moist.	SC	NA	HNU = 0 ppm BS = 60 cpm
5	1545 110516 4/2/93	4	3	SAA	SC	NA	HNU = 0 ppm BS = 60 cpm
		3	0	No Recovery	NA	NA	HNU = NA BS = NA

NOTES:

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Kevin Myers

Tommy Arbour

Kogi: HNU = 0 ppm BS = 60 cpm

SAA - same as above
NA - not applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

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VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 11010	COORDINATES:	DATE 4/2/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/2/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/5/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 3 OF 7

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1600 11031 4/2/93	16	6	Top 2" Dense 2.5Y(5/6) Light olive brown, coarse sand w/gravel well graded, wet. V. stiff. 2.5Y(5/6) Light olive brown, gravelly clay w/silt, no plasticity, dry	CL	NA 2.5	HNU = 0 ppm BG = 60 cpm
	1600 11033 4/2/93	22	6	SAA	CL	2.5	HNU = 0 ppm BG = 60 cpm
7		25	0	No Recovery	NA	NA	HNU = NA BG = NA
	1610 11039 4/2/93	3	6	Dense. 2.5Y(5/1) Gray silt wet	ML	NA	HNU = 0 ppm BG = 60 cpm
8		22	0	No Recovery	NA	NA	HNU = NA BG = NA
		24	0	No Recovery	NA	NA	HNU = NA BG = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.
Drilling Equipment ACKER SENTRY
Driller: Kevin Mus
Tommy Jackson

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

Key: HNU = 0 ppm BG = 60 cpm

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RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2	
BORING NUMBER: 11010	COORDINATES:	DATE 4/2/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/2/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth Date/Time	DATE COMPLETED: 4/3/93
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 4 OF 7

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1625 110500 4/2/93	8	6	Dense. 2.5Y (5/1) Gray gravelly sandy silt, wet	ml	NA	HNU = 0ppm BS = 40cpm
	1625 110501 4/2/93	12	3	SAA	ml	NA	HNU = 0ppm BS = 40cpm
10		20	0	No Recovery	NA	NA	HNU = NA BS = NA
	1635 110502 4/2/93	7	5	M. Dense 2.5Y (5/1) gray gravelly silt, wet	ml	NA	HNU = 0ppm BS = 40cpm
11		8	0	No Recovery	NA	NA	HNU = NA BS = NA
		7	0	No Recovery	NA	NA	HNU = NA BS = NA

NOTES:

SAA - same as above
NA - not applicable

Drilling Contractor PENNSYLVANIA DRILLING CO.

Drilling Equipment ACKER SENTRY

Driller: Kevin Myers
Sonny Arthur

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Key: HNU = 0ppm BS = 80cpm

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VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER. 20.03.05	PROJECT NAME. OU2 PHASE 2		
BORING NUMBER: 1010	COORDINATES:		DATE 4/15/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 4/12/93
ENGINEER/GEOLOGIST. D. O'BRIEN	Depth	Date/Time	DATE COMPLETED: 4/15/93
DRILLING METHODS: HOLLOW STEM AUGER			PAGE 3 OF 7

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1/2 (FT)	RECOVERY (FT)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	0930 110523 4/15/93	4	6	Stiff. 2.5Y(5/1) Gray gravelly clay, low plasticity, wet to moist	CL	1.75	HNU = 0ppm BG = 60cpm
	0930 110524 4/15/93	8	5	V. Stiff. 2.5Y(5/1) Gray gravelly clay, no plasticity, slightly moist.	CL	2.25	HNU = NA BG = NA
13		17	0	No Recovery	NA	NA	HNU = NA BG = NA
	1310 110525 4/15/93	4	5	V. Stiff. 2.5Y(5/1) Gray gravelly clay, no plasticity, slightly moist	CL	2.0	HNU = 0ppm BG = 60cpm
14		5	0	No Recovery	NA	NA	HNU = NA BG = NA
		22	0	No Recovery	NA	NA	HNU = NA BG = NA

NOTES:

SA - same as above
NA - not applicable

Drilling Contractor: PENNSYLVANIA DRILLING CO.
Drilling Equipment: ACKER SENTRY
Driller: KEVIN MYERS
DONNY ARTHUR

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

Kegj: HNU = 0ppm BG = 60cpm

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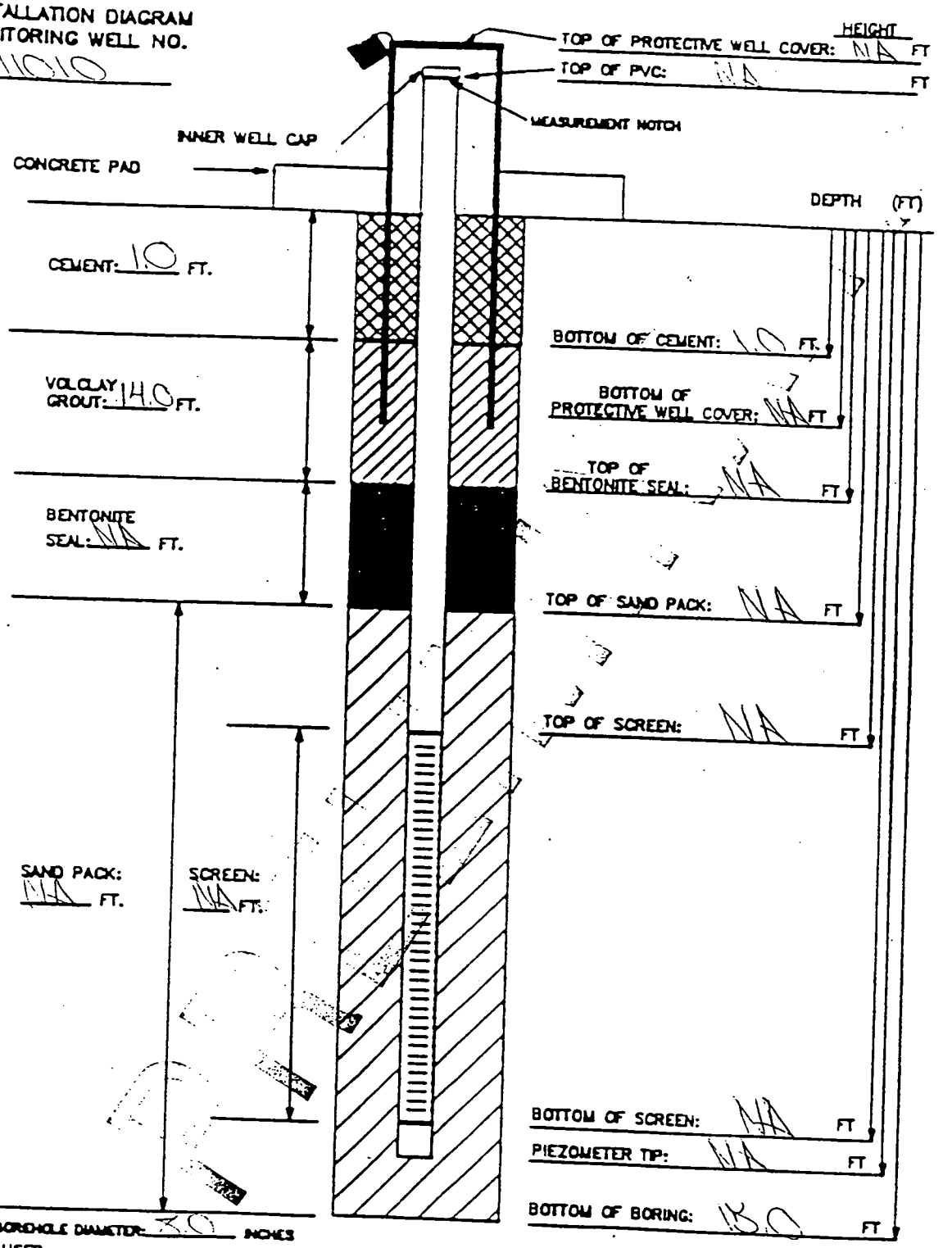
INSTALLATION DIAGRAM
MONITORING WELL NO. 1010

INSTALLATION DATE: 4/15/93



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 1 bag
AMOUNT OF CEMENT: 1 bag
AMOUNT OF WATER USED: 20 gal
OTHER:

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 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: 9.2 4/15/93

1 gal/drum

TASK: 20.03.05

GEOLOGIST/ENGINEER: D. O'Brien

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PIEZOMETER INSTALLATION SHEET -4395

PROJECT NAME OU-2 phase 2 FIELD ENG./GEO. D.O'Brien DATE 4/13/0
PROJECT NO. 2003.05 CHECKED BY _____ DATE _____
BORING NO. 1010
PIEZOMETER NO. NA DATE OF INSTALLATION 4/13/93

BOREHOLE DRILLING

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

PIEZOMETER DESCRIPTION

TYPE Soil Boring	RISER PIPE MATERIAL NA
DIAMETER OF PERFORATED SECTION NA	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. NA I.D. NA
SLOTS ☐ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS NA
AVERAGE SIZE OF PERFORATIONS NA	JOINING METHOD NA
TOTAL PERFORATED AREA NA	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA	OTHER PROTECTION NA
PROTECTIVE PIPE O.D. _____	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (~~FT~~)		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 1.0	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	15.0			
GWL AFTER INSTALLATION	9.2			

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

REMARKS _____

409-11-86

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VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER 20.03.05 RDC 11	PROJECT NAME. CRU 2 Phase II	
BORING NUMBER. 2949	COORDINATES.	DATE 3-26-93
ELEVATION:	GWL: Depth 64.2 FT Date/Time 4-7-93/1100	DATE STARTED 3-25-93
ENGINEER/GEOLOGIST K. Payne	Depth Date/Time	DATE COMPLETED. 4-7-9
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	111189 0840 3-26-93	1 2 4	18	Very Stiff (10YR, 6/4) light yellowish brown, silty clay, low plasticity, moist, mottling	CL	2.5	HNU = 0 ppm βγ = 40-60 cpm 2 IN Spoon
2 3	111190 0845 3-26-93	2 3 5	5	SAA	CL	2.5	HNU = 0 ppm βγ = 40-60 cpm 2 IN Spoon
4	111191 0850 3-26-93	6 8	12	Stiff (10YR, 6/2) light brownish gray, low plasticity, moist	CL	1.5	HNU = 0 ppm βγ = 60-80 cpm 2 IN Spoon
5 6	111192 0930 3-26-93	6 15 20 25	24	Very Stiff (10YR, 6/8) Brownish Yellow, Silty Clay, non-plastic, slightly moist	CL	3.0	HNU = 0 ppm βγ = 80-100 cpm 3 IN Spoon
7	111200 1030 3-26-93	8 10 13	16	Dense (10YR, 6/4) Light Yellowish Brown Clayey Silt, non-plastic, slightly moist	ML	N/A	HNU = 0 ppm βγ = 60-80 cpm 2 IN Spoon
8 9	111201 1040 3-26-93	6 12 14	15	Dense (10YR, 6/4) light yellowish Brown Clayey Silt with trace gravel, non-plastic, slightly moist	ML	N/A	HNU = 0 ppm βγ = 60-80 cpm 2 IN Spoon
10	111202 1530 3-26-93	7 11 17	14	Medium Dense (10YR, 5/3) Brown, Clayey Silt with trace gravel, non-plastic, slightly moist	ML	N/A	HNU = 0 ppm βγ = 60-80 cpm 2 IN Spoon
11 12	111203 1545 3-26-93	3 6 9	12	Medium Dense (2.5Y, N6/) Gray, Clayey Silt with trace Gravel, slightly plastic, slightly moist	ML	N/A	HNU = 0 ppm βγ = 60-80 cpm 2 IN Spoon
13	111204 1600 3-26-93	2 3 6	11	Loose (2.5Y, N6/) Gray, Clayey Silt, Low Plasticity, Moist, ~~slightly plastic, slightly moist~~ KP 4-7-93	ML	N/A	HNU = 0 ppm βγ = 60-80 cpm 2 IN Spoon
14	1616 3-26-93	3	N/A	No Recovery	N/A	N/A	N/A
15	111205 1620 3-26-93	3 5 7 13	22	Medium Dense (2.5Y, N6/) Gray, Clayey Silt, Low Plasticity, Moist	ML	N/A	HNU = 0 ppm βγ = 60-80 cpm 3 IN Spoon

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment Cyclone 42
Driller Bob Johnson
Lonnie McGloklin

SAA - Same as above
NA - Not Applicable

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

Background Readings
3-26-93 { HNU = 0 ppm
βγ = 40-60 cpm

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VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER 20.03.05	PROJECT NAME. CRU 2 Phase II	
BORING NUMBER 2949	COORDINATES.	DATE 3-29-93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 3-25-93
ENGINEER/GEOLOGIST K. Payne	Depth Date/Time	DATE COMPLETED 4-7-93
DRILLING METHODS Cable Tool		PAGE 2 OF 11

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				see p. 1			
16							
17	111215 09-15 3-29-93	5 3 4	12	Loose (5Y, 5/3) Olive Clayey Silt, trace gravel slightly plastic, moist	ML	N/A	HNU = 0 ppm Bγ = 60-80 cpm
18	111216 0905 3-29-93	2 5 8	15	Medium Dense (5Y, 4/3) Olive clayey silt, trace gravel slightly plastic, moist	ML	N/A	HNU = 0 ppm Bγ = 40-60 cpm
19							
20	111217 0935 3-29-93	2 4 6	10	Loose (5Y, 5/1) Gray, ~~Silt~~ Clayey Silt, slightly plastic, moist	ML	N/A	HNU = 0 ppm Bγ = 60-80 cpm
21	111218 0955 3-29-93	2 4 6	12	Loose (5Y, 5/2) Olive Gray Clayey Silt, slightly plastic, moist	ML	N/A	HNU = 0 ppm Bγ = 60-80 cpm
22							
23	111219 1015 3-29-93	6 6 4	16	Loose (5Y, 5/2) Olive Gray Clayey Silt, slightly plastic, moist	ML	N/A	HNU = 0 ppm Bγ = 60-80 cpm
24	111220 1025 3-29-93	25 24 26	5	Very Stiff (5Y, 4/1) Dark Gray Silty Clay, medium Plasticity Moist	CL	~~N/A~~ 2.0	HNU = 0 ppm Bγ = 60-80 cpm
25							
26	111221 1040 3-29-93	18 22 25	6	Dense (5Y, 4/1) Dark Gray Clayey Silt, Slight Plasticity moist	ML	N/A	HNU = 0 ppm Bγ = 60-80 cpm
27	111222 1100 3-29-93	18 19 26	N/A	No Recovery	N/A	N/A	HNU = N/A ppm Bγ = N/A cpm 2 Spoons No Recovery
28							
29	111222 1120 3-29-93	16 19 22	14	Dense (5Y, 4/1) Dark Gray Clayey Silt with Trace Gravel Slight Plasticity, Moist	ML	N/A	HNU = 0 ppm Bγ = 60-80 cpm
30				see p. 3			

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment Cyclone 42
Driller Bob Johnson
Lonnie McGloklin

SAA - Same as above
NA - Not Applicable

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

Background Readings
3-29-93 { HNU = 0 ppm
BY = 40-60 cpm

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VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER 20.03.05 RDC11	PROJECT NAME. CRU 2 Phase II	
BORING NUMBER. 2949	COORDINATES.	DATE 3-29-93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 3-25-9
ENGINEER/GEOLOGIST K. Payne	Depth Date/Time	DATE COMPLETED. 4-7-93
DRILLING METHODS Cable Tool		PAGE 3 OF 11

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	111223 1340 3-29-93	6 12 18	13	Medium Dense (5Y, 5/1) Gray, Clayey Silt Trace Gravel, Slightly Plastic Moist	ML	N/A	HNU = 0 ppm BZ = 40-60 cpm 2" spoon
32	111224 1355 3-29-93	4 10 13	11	Medium Dense (5Y, 5/1) Gray, Clayey Silt Trace Gravel, Slightly Plastic, Moist	ML	N/A	HNU = 0 ppm BZ = 60-80 cpm 2" spoon
33 34	111225 1405 3-29-93	8 12 16	14	Medium Dense (5Y, 5/1) Gray Clayey Silt Trace Gravel, Slightly Plastic, Moist	ML	N/A	HNU = 0 ppm BZ = 40-60 cpm 2" spoon
35	111226 1415 3-29-93	5 10 21	15	Dense (5Y, 5/1) Gray, Clayey Silt, Slightly Plastic Moist	ML	N/A	HNU = 0 ppm BZ = 80-100 cpm 2" spoon
36 37	111227 1430 3-29-93	9 9 13	7	Medium Dense (5Y, 5/1) Gray, Clayey Silt, Slightly Plastic Moist	ML	N/A	HNU = 0 ppm BZ = 60-80 cpm 2" spoon
38	111228 1450 3-29-93	8 10 12	12	Medium Dense (5Y, 5/1) Gray, Clayey Silt, Slightly Plastic Moist	ML	N/A	HNU = 0 ppm BZ = 40-60 cpm 2" spoon
39 40	111229 1500 3-29-93	8 9 18	10	Medium Dense (2.5Y, 5/4) light olive brown, Poorly Graded Fine Sand, Dry	SP	N/A	HNU = 0 ppm BZ = 80-100 cpm 2" spoon
41	111230 1550 3-29-93	6 8 9	12	Medium Dense (2.5Y, 5/6) light olive brown, Poorly Graded Fine Sand, Dry	SP	N/A	HNU = 0 ppm BZ = 60-80 cpm 2" spoon
42 43	111231 1610 3-29-93	8 16 15	16	Dense (2.5Y, 5/6) light olive brown, Sandy Silt, Non-plastic moist. with 6" (2.5Y, N5/) Gray Clayey Silt, slightly plastic, moist	ML	N/A	HNU = 0 ppm BZ = 60-80 cpm 2" spoon
44	111232 1620 3-29-93	3 3 19	10	Medium Dense (2.5Y, N5/) Gray Silt, non-plastic, moist	ML	N/A	HNU = 0 ppm BZ = 60-80 cpm 2" spoon
45				See P. 4			

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment Cyclone 42
Driller Bob Johnson
Lonnie McGloklin

SAA - Same as above
NA - Not Applicable

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

Background Readings
3-29-93 HNU = 0 ppm
BZ = 40-60 cpm

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-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05 RDC 11	PROJECT NAME. CRU 2 Phase II	
BORING NUMBER 2949	COORDINATES.	DATE 3-29-93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 3-25-93
ENGINEER/GEOLOGIST K. Payne	Depth Date/Time	DATE COMPLETED. 4-7-93
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
46	111233 1635 3-29-93	20 33 45	8	Very Dense (2.5Y, 6/4) light yellowish brown poorly graded fine sand with trace gravel; Dry	SP	N/A	HNU = 0 ppm BX = 80-100 cpm 2 IN Spoon
47				* begin 50 FT sampling			
48							
49							
50	111234 1705 3-29-93	14 17 32	7	Very Dense (2.5Y, 6/4) light yellowish brown, poorly graded fine sand; Dry	SP	N/A	HNU = 0 ppm BX = 60-80 cpm 2 IN spoon
51							
52							
53							
54							
55	111235 0840 3-30-93	35 45 50/.3	7	Very Dense (2.5Y, 5/6) light olive brown, poorly graded fine Sand, Dry	SP	N/A	HNU = 0 ppm BX = 40-60 cpm 2 IN Spoon
56							
57							
58							
59							
60				* begin continuous sampling 60.0 to 75.0 FT			

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment Cyclone 42
Driller Bob Johnson
Lonnie McGlothlin

SAA - Same as above
NA - Not Applicable

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

Background Readings
3-29-93 { HNU = 0 ppm, BX = 40-60 cpm
3-30-93 { HNU = 0 ppm, BX = 40-60 cpm

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

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PROJECT NUMBER 20.03.05 RDC 11	PROJECT NAME. CRU 2 Phase II	
BORING NUMBER. 2949	COORDINATES.	DATE 3-30-93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 3-25-93
ENGINEER/GEOLOGIST K. Payne	Depth Date/Time	DATE COMPLETED: 4-7-93
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 (ISF)	REMARKS
61	111236 1000 3-30-93	25 37 50/.5	9	Very Dense (10YR, 5/2) Grayish Brown, Poorly Graded Fine Sand with trace gravel, Dry	SP	N/A	HNU = 0 ppm BG = 60-80 cpm 2 IN SPOON
62 63	111237 1020 3-30-93	20 30 34	8	Very Dense (2.5YR, 5/3) Light Olive Brown, Well Graded Sand with trace Gravel, Dry	SW	N/A	HNU = 0 ppm BG = 60-80 cpm 2IN SPOON
64	111238 1345 3-30-93	30 24 33	16	Very Dense (2.5YR, 4/2) Dark Grayish Brown, Poorly Graded Fine Sand, wet	SP	N/A	HNU = 0 ppm BG = 80-100 cpm 2 IN SPOON
65 66	111239 1400 3-30-93	9 16 16	15	Dense (2.5Y, 5/2) Grayish Brown, Well Graded Sand, Wet	SW	N/A	HNU = 0 ppm BG = 60-80 cpm 2 IN SPOON
67	111240 1440 3-30-93	19 39 50	17	Very Dense (2.5Y, 4/2) Dark Grayish Brown, Poorly Graded Fine Sand, Wet	SP	N/A	HNU = 0 ppm BG = 80-100 cpm 2 IN SPOON
68 69	111241 1500 3-30-93	36 50 36	16	Very Dense (2.5Y, 4/2) Dark Grayish Brown, Poorly Graded Fine Sand with Trace Gravel, wet	SP	N/A	HNU = 0 ppm BG = 60-80 cpm 2 IN SPOON
70	111242 1520 3-30-93	10 18 26	18	Dense (2.5Y, 4/2) Dark Grayish Brown, Poorly Graded Fine Sand, wet	SP	N/A	HNU = 0 ppm BG = 60-80 cpm 2 IN SPOON
71 72	111243 1550 3-30-93	10 16 18	16	Dense (2.5Y, 4/2) Dark Grayish Brown, Poorly Graded Fine Sand, wet	SP	N/A	HNU = 0 ppm BG = 60-80 cpm 2 IN SPOON
73	111244 1615 3-30-93	65 83	10	Very Dense (5Y, 4/3) Olive, Well Graded Sand, wet	SW	N/A	HNU = 0 ppm BG = 80-100 cpm 2 IN SPOON
74 75	111245 1640 3-30-93	18 24 26	17	Very Dense (5Y, 4/3) Olive, Poorly Graded Fine Sand, wet	SP	N/A	HNU = 0 ppm BG = 80-100 cpm 2 IN SPOON

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment Cyclone 42
Driller Bob Johnson
Lonnie McGloklin

SAA - Same as above
NA - Not Applicable

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

Background Readings 3-30-93 { HNU = 0 ppm, BG = 60-80 cpm

FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05 RDC 11	PROJECT NAME. CRU 2 Phase II	
BORING NUMBER. 2949	COORDINATES.	DATE 3-30-93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 3-25-93
ENGINEER/GEOLOGIST K. Payne	Depth Date/Time	DATE COMPLETED. 4-7-93
DRILLING METHODS Cable Tool		PAGE 6 OF 11

DEPTH	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (ISF)	REMARKS
76							
77							
78							
79				Bottom of Boring 79.0 FT			
				Bottom of Casing 80.6 FT			
80							

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment Cyclone 42
Driller Bob Johnson
Lonnie McGloklin

SAA - Same as above
NA - Not Applicable

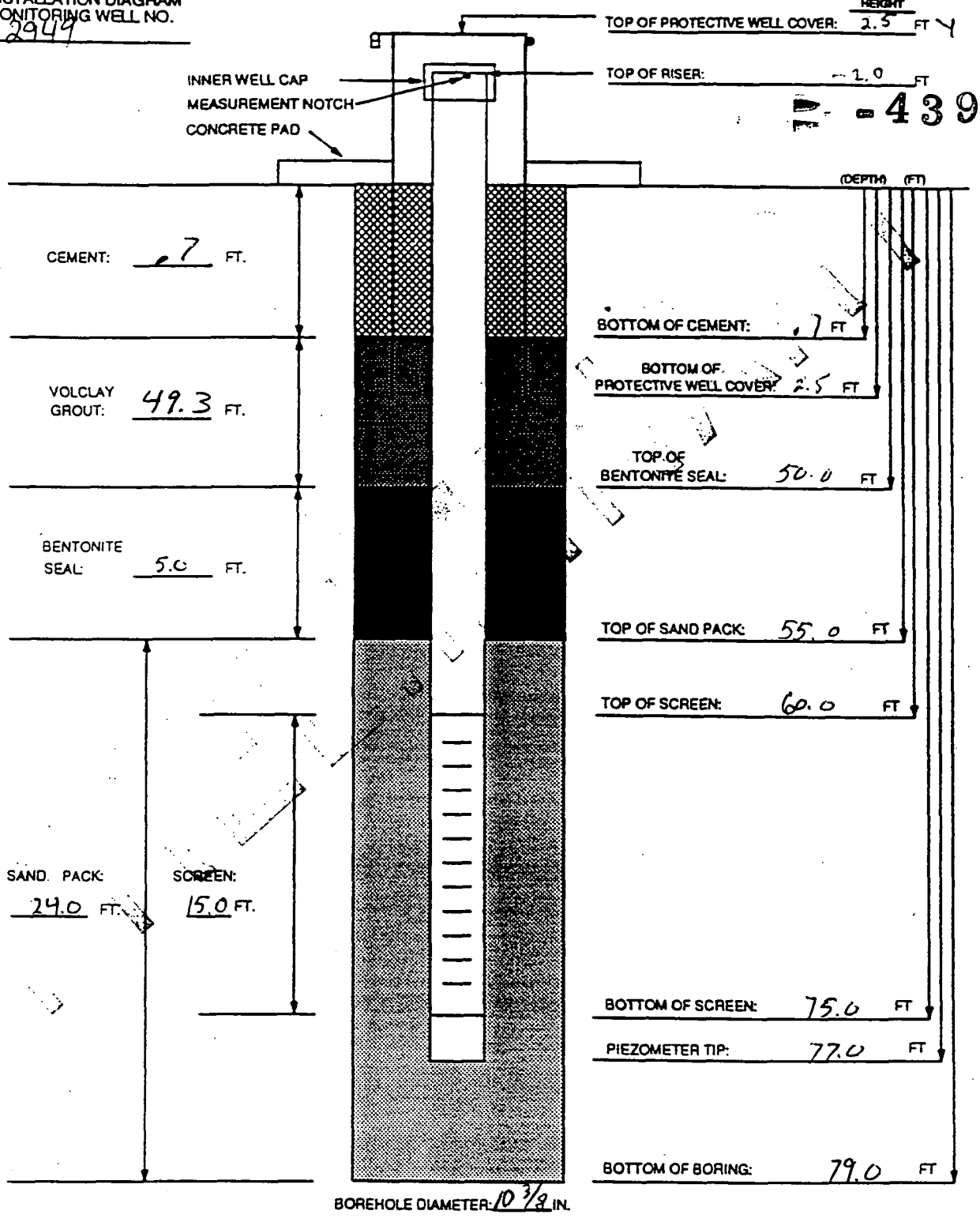
Samples collected per ASTM standard penetration tes
Colors identified using Munsell Color Chart

Background Readings 3-30-93 { HNU = 0 ppm
BV = 40-60 ppm

338 247

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 2949

INSTALLATION DATE: 4-7-93



MATERIALS USED

SAND TYPE AND QUANTITY: 25 50lb bags 4/30
BENTONITE PELLETS (5-GALLON BUCKETS): 5 buckets
BAGS OF VOLCLAY GROUT: 12 50lb bags
AMOUNT OF CEMENT: 1 bag at 90 lb
AMOUNT OF WATER USED: 1050 gallons
OTHER: 15 Drums Soil; 1 Drum Akonar/water
TASK: 20.03.05 RDC 11

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 64.2 FT/ 4-7-93
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

ASI FORM 0157 REV. (0)

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FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME CRU 2 Phase II
PROJECT NO. 20.03.05 ROC 11
BORING NO. 2949
PIEZOMETER NO. 2949

FIELD ENG./GEO. K. Payne DATE 4-7-9
CHECKED BY _____ DATE _____
DATE OF INSTALLATION 4-7-93

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0.0 FT TO 60.0 FT
FLUID N/A FROM N/A TO N/A

TYPE OF BIT Hammer Percussion Bit
CASING SIZE (S) USED:
SIZE 10.0 in ID FROM 0.0 FT TO 80.0 FT
SIZE N/A FROM N/A TO N/A

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 _____
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 ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.5 FT			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 FT			
BOREHOLE FILL MATERIALS:	TOP 0.0 FT	BOTTOM .7 FT		
GROUT / SLURRY	TOP .7 FT	BOTTOM ~~49.3~~ 50.0 FT RP 4-7-93	TOP	BOTTOM
BENTONITE	TOP 50.0 FT	BOTTOM 55.0 FT	TOP	BOTTOM
SAND	TOP 55.0 FT	BOTTOM 79.0 FT	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 60.0 FT	BOTTOM 75.0 FT	TOP	BOTTOM
PIEZOMETER TIP	77.0 FT			
BOTTOM OF BOREHOLE	79.0 FT			
GWL AFTER INSTALLATION	64.2 FT			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Cement was placed from 0.0 to .7 FT to hold the protective cover in place

B-2949 04/01/93 14:03 WMCO SAMPLE RECEIVING LAB 4395 002

C

****** 24 HOUR SAMPLE ******

****** CHAIN OF CUSTODY ******

Analis No: 930330-079 Project No.: 1405-0001 Charge: RDC11
Customer No.: 111246 Customer Name: OU2 PHASE II
Matl. Descr.: OU2 PHASE II Deadline: 31-MAR
Sample Matrix: LIQUID Date Received: 30-MAR
Comments: SEND RESULTS TO MIKE FRANK FAX # 738-0145

Sample Logged By: 9222

ENVIRONMENTAL & PROCESS MATERIALS LABORATORY

Analysis	Units	Activ.	Prep Proc No	Analys Proc
SIEVE ANALYSIS, 40% RETAINED	.001 INCH	9158	23	9158
SIEVE ANALYSIS, 50% RETAINED	.001 INCH	9158	20	9158
SIEVE ANALYSIS, 90% RETAINED	.001 INCH	9158	9	9158

Crosschecked by: [signature]
Entered on Computer by:
Approved and Printed by:

Phoned in at ____ hrs on ____
Ideal by ____

341

Grain Size 1/1000 inch

3-31-93

-4395

242

Well # 2949

Retained Values

90% = .009

50% = .020

40% = .023

$\frac{.023}{.009} = 2.56$ 2.56 < 3 therefore use factor of 5

$5 \times .020 = .10$

-4395
-4395

RI/FS

VISUAL CLASSIFICATION OF SOILS -4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 - Southfield	
BORING NUMBER: 1970 (SF-SB-07)	COORDINATES: NA	DATE: 4-18-93
ELEVATION: NA	GWL: Depth Date/Time	DATE STARTED: 4-18-93
ENGINEER/GEOLOGIST: Musa Keskar	Depth Date/Time	DATE COMPLETED: 4-18-93
DRILLING METHODS: Hollow Stem Auger (HSA)		PAGE 1 OF 5

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS MTIP ↓ mmk 4-18-93
0	112688 4/18 0920	NA	6	Shelby	NA	NA	~~HNU~~ = NA Bγ = 40 cpm mmk 4-18-93
	112688 4/18 0920		6				~~HNU~~ = Bγ = SAA
1	112688 4/18 0920		~3				~~HNU~~ = Bγ = SAA
	112688 4/18 0920		0				~~HNU~~ = Bγ = SAA
2	112689 4/18 0930		6	Shelby			~~HNU~~ = Bγ = SAA
	112689 4/18 0930		6				~~HNU~~ = Bγ = SAA
3	112689 4/18 0930		6				~~HNU~~ = Bγ = SAA
	112689 4/18 0930		6				~~HNU~~ = Bγ = SAA
4	112690 4/18 1000	4	6	Stiff (10 YR 4/3) Brown, silty clay med to high plasticity, moist	CL	2	~~HNU~~ = 0 ppm Bγ = 40 cpm
5	112690 4/18 1000	10	6	SAA	CL	2.5	~~HNU~~ = Bγ = SAA

NOTES:

Drilling Co. Pennsylvania Drilling

Drilling Equipment Acker #393

Driller Marty Wattral

Assistant Dennis Arthur

Background: MTIP ~~HNU~~ = 0.0 ppm
Bγ = 40 cpm

Samples taken by using 3" OD SSS sampler driven 1.5' or 2' using 140 lbs. hammer falling freely through 30"

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 - Southfield	
BORING NUMBER: 1970 (SF-SB-07)	COORDINATES: NA	DATE: 4-18-93
ELEVATION: NA	GWL: Depth Date/Time	DATE STARTED: 4-18-9
ENGINEER/GEOLOGIST: Alusa Kesebow	Depth Date/Time	DATE COMPLETED: 4-18-
DRILLING METHODS: HSA		PAGE 2 OF 5

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
							MTIP ↓ mmk 4-18-93
5	112690 4/18 1020	12	6	very stiff (10 YR 4/3) brown, silty clay w/broken cobbles, med to high plasticity, moist	CL	2.5	~~HNU~~ = 0 ppm Bγ = 40 cpm
	112691 4/18 1020	4	6	stiff (10 YR 4/3) brown, silty clay med to high plasticity, moist	CL	2	~~HNU~~ = Bγ = SAA
6	112691 4/18 1020	4	6	SAA	CL	2	~~HNU~~ = Bγ = SAA
	112691 4/18 1020	7	6	stiff (10 YR 4/3) brown, silty clay w/broken cobbles, med to high plasticity, moist	CL	2	~~HNU~~ = Bγ = SAA
7	112892 4/18 1050	NA	6	Shelby	NA	NA	~~HNU~~ = Bγ = NA 40 cpm
	112892 4/18 1050	NA	6	↓	↓	↓	~~HNU~~ = Bγ = ↓
8	112892 4/18 1050	NA	6	↓	↓	↓	~~HNU~~ = Bγ = ↓
	112892 4/18 1050	NA	0	↓	↓	↓	~~HNU~~ = Bγ = ↓
9	112893 4/18 1310	3	6	medium stiff (10 YR 4/3) brown, silty clay high plasticity, moist	CL	1	~~HNU~~ = 0 ppm Bγ = 40 cpm
10	112893 4/18 1310	2	6	medium stiff (5 GY 5/1) greenish gray, silty clay, high plasticity, moist	CL	1	~~HNU~~ = Bγ = SAA

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Acker #393
Driller Marty Wintral
Assistant Dennis Arthur

Background: MTIP ~~HNU~~ = 0 ppm
Bγ = 40 cpm

RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU 2 - South field	
BORING NUMBER: 1970	COORDINATES: NA	DATE: 4-18-93
ELEVATION: ~~[illegible]~~ NA	GWL: Depth Date/Time	DATE STARTED: 4-18-93
ENGINEER/GEOLOGIST: Musa Kesebir	Depth Date/Time	DATE COMPLETED: 4-18-9
DRILLING METHODS: HSA		PAGE 3 OF 5

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (MT IP ↓ mark 4-18-93)
10	112B93 4/18 1310	3	6	SAA	CL	1	~~HNU~~ = BZ = SAA
	112B94 4/18 1310	4	4	SAA	CL	1	~~HNU~~ = BZ = SAA
11				10.8' feet total depth			HNU = BZ =
							HNU = BZ =
							HNU = BZ =
							HNU = BZ =
							HNU = BZ =
							HNU = BZ =
							HNU = BZ =
							HNU = BZ =

NOTES:

Drilling Co. Pennsylvania Drilling

Drilling Equipment Acker #373

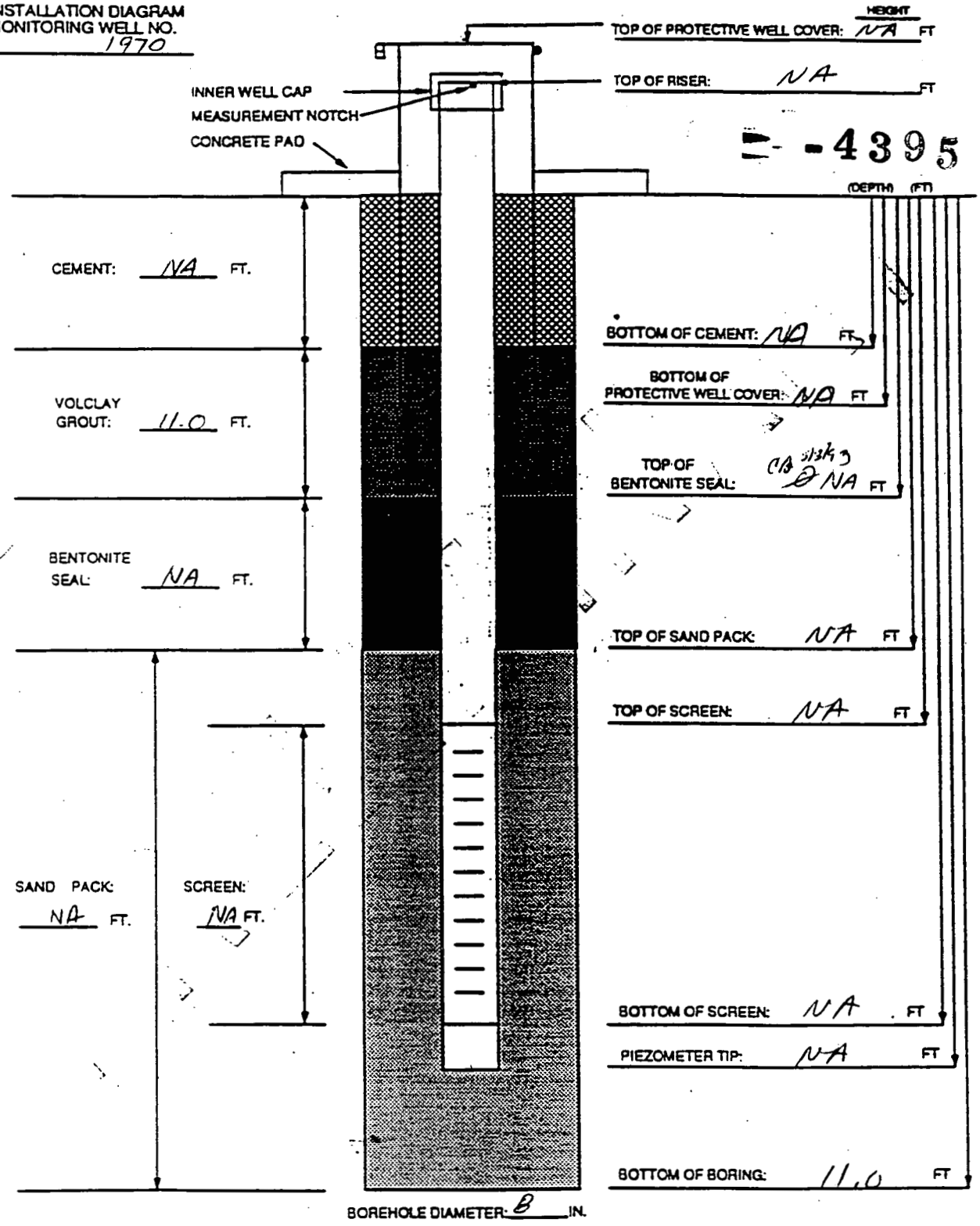
Driller Marty Wallace

Assistant Dennis Arthur

Background: HNU = 0 ppm
BZ = 40 ppm

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 1970

INSTALLATION DATE: 4-18-93



TOP OF PROTECTIVE WELL COVER: NA (HEIGHT) FT

TOP OF RISER: NA FT

CEMENT: NA FT.

VOLCLAY GROUT: 11.0 FT.

BENTONITE SEAL: NA FT.

SAND PACK: NA FT.

SCREEN: NA FT.

BOTTOM OF CEMENT: NA FT

BOTTOM OF PROTECTIVE WELL COVER: NA FT

TOP OF BENTONITE SEAL: CA 5/13/93 NA FT

TOP OF SAND PACK: NA FT

TOP OF SCREEN: NA FT

BOTTOM OF SCREEN: NA FT

PIEZOMETER TIP: NA FT

BOTTOM OF BORING: 11.0 FT

BOREHOLE DIAMETER: 8 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 1
AMOUNT OF CEMENT: 1/2 bag of 94 lbs
AMOUNT OF WATER USED: NB gal
OTHER: 1 drum for soil cutting / 1 drum for alconox water
TASK: 20.03.05

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/_
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BEL GROUND LEVEL
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: M. Kessler

PIEZOMETER INSTALLATION SHEET

-4395

PROJECT NAME OU2 - Southfield
PROJECT NO. 20.03.05
BORING NO. 1970
PIEZOMETER NO. NA

FIELD ENG./GEO. Musa Keseler DATE 4-18-
CHECKED BY _____ DATE _____
DATE OF INSTALLATION NA

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT Auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM //	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	NA			
GWL AFTER INSTALLATION	NA			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑
REMARKS 1 drum for drill cuttings, 1 drum for decon-water were generated

VISUAL CLASSIFICATION OF SOILS -4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 - South Field		
BORING NUMBER: 1969 (SF-SB-06)	COORDINATES: NA		DATE: 4-15-93
ELEVATION: NA	GWL: Depth	Date/Time	DATE STARTED: 4-15-93
ENGINEER/GEOLOGIST: Musa M. Keselbir	Depth	Date/Time	DATE COMPLETED: 4-15-9
DRILLING METHODS: Hollow STEM Auger			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	112554 4/15 0850	1	6	medium stiff (10YR 5/3) Brown, silty clay w/ plant roots, high plasticity moist	OL	1	HNU = 0.0 ppm Bγ = 80 cpm
	112555 4/15 0850	4	6	SAA	OL	1.5	HNU = 0.0 ppm Bγ = 80 cpm
1	112556 4/15 0850	3	6	SAA	OL	1.5	HNU = 0.0 ppm Bγ = 80 cpm
	NA	3	0	No Recovery	NA	NA	HNU = NA Bγ = NA
2	112557 4/15 9:10	3	6	stiff (10YR 5/2) grayish brown, silty clay w/decomposed roots, med- to high plasticity, moist	OH	2	HNU = 0.0 ppm Bγ = 40 cpm
	112557 4/15 9:10	5	6	SAA	OH	2	HNU = 0.0 ppm Bγ = 40 cpm
3	112557 4/15 9:10	10	6	SAA	OH	2	HNU = 0.0 ppm Bγ = 40 cpm
	112557 4/15 9:10	13	6	SAA	OH	2	HNU = 0.0 ppm Bγ = 40 cpm
4	112558 4/15 9:35	15	6	stiff (10YR 5/2) grayish brown, silty clay w/ lamination, medium to high plasticity, moist,	OH	1.5	HNU = 2 ppm Bγ = 60 cpm
	112559 4/15 9:35	15	6	SAA	OH	2	HNU = 2 ppm Bγ = 60 cpm
5							

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Acker
Driller Marty Watral
Assistant Doe Deiley

Background: HNU = 0.0 ppm
Bγ = 40-80 cpm

Samples taken by using 3.0" OD SSS sampler driven 2' using 140 lbs hammer falling freely through 30".

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 - Southfield		
BORING NUMBER: 1969	COORDINATES: NA		DATE: 4-15-93
ELEVATION: NA	GWL: Depth	Date/Time	DATE STARTED: 4-15-93
ENGINEER/GEOLOGIST: Musa M Kesebir	Depth	Date/Time	DATE COMPLETED: 4-15-93
DRILLING METHODS: HSA			PAGE 2 OF 5

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
5	112559 4/15 9:35	15	6	SAA	OH	2	HNU = 2 ppm Bγ = 60 cpm
	112559 4/15 9:35	15	6	SAA	OH	2	HNU = 2 ppm Bγ = 60 cpm
6	112560 4/15 1000	5	6	very stiff (10YR 5/2) grayish brown, laminated clay, med to high plasticity, moist	CL	3	HNU = 1.5 ppm Bγ = 60 cpm
	112561 4/15 1000	14	6	SAA	CL	3	HNU = 1.5 ppm Bγ = 60 cpm
7	112562 4/15 1010	9	6	SAA	CL	3	HNU = 2.0 ppm Bγ = 60 cpm
	112562 4/15 1010	20	6	SAA	CL	3	HNU = 2.0 ppm Bγ = 60 cpm
8	112562 4/15 1010	25	6	SAA	CL	3	HNU = 2.0 ppm Bγ = 60 cpm
	112562 4/15 1010	30	6	SAA	CL	3	HNU = 2.0 ppm Bγ = 60 cpm
9	112563 4/15 1020	5	6	very stiff (10YR 5/2) grayish brown, clay w/ 2" (10YR 5/1) gray clay, high plasticity, moist	CL	3	HNU = 1 ppm Bγ = 100 cpm
	112563 4/15 10:20	9	6	SAA	CL	3	HNU = 1 ppm Bγ = 100 cpm
10							

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Acker
Driller Marty Watral
Assistant Joe Deiley

Background: HNU = 0.0 ppm
Bγ = 40-80 cpm

VISUAL CLASSIFICATION OF SOILS - 4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 - South Field.	
BORING NUMBER: 1969 (SF-SB-06)	COORDINATES: NA	DATE: 4-15-93
ELEVATION: NA	GWL: Depth Date/Time	DATE STARTED: 4-15-93
ENGINEER/GEOLOGIST: Musa Kesebir	Depth Date/Time	DATE COMPLETED: 4-15-93
DRILLING METHODS: HSA		PAGE 3 OF 5

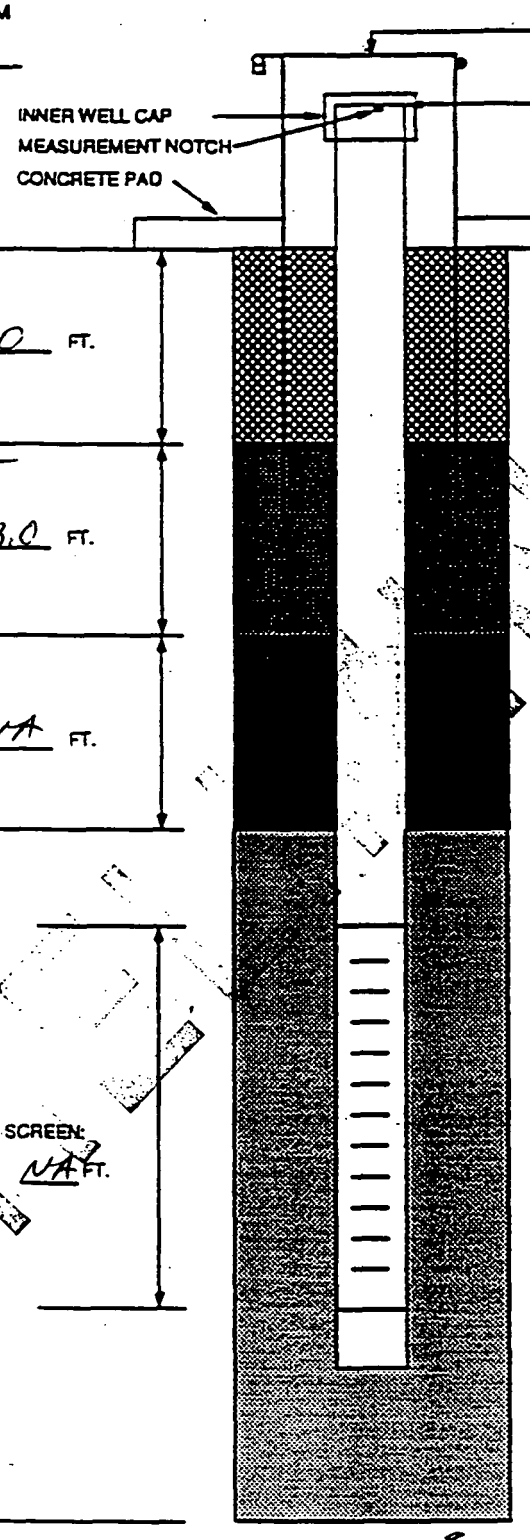
DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
10	112563 4/15 10:20	15	6	medium stiff (10YR 5/3) brown, clayey silt, low plasticity, moist to wet	OL	1	HNU = 1 ppm Bγ = 100 cpm
	112564 4/15 1045	5	6	(10YR 5/3) brown, fine sand, wet, loose	SM	-	HNU = 1 ppm Bγ = 60 cpm
11	112564 4/15 1045	7	6	stiff (10YR 5/3) brown, clayey silt low plasticity, moist	OL	1.5	HNU = 1 ppm Bγ = 60 cpm
	112564 4/15 1045	14	6	(10YR 5/1) gray, fine sand moist to wet, loose	SM	-	HNU = 1 ppm Bγ = 60 cpm
12	112565 4/15 1105	NA		Sheeting	NA	NA	HNU = Bγ =
	112565 4/15 1105	NA			NA	NA	HNU = Bγ =
13	112565 4/15 1105	NA			NA	NA	HNU = 1 ppm. Bγ = 60 cpm
	112566 4/15 1115	6	5	very stiff (10YR 5/1) gray - fine sandy silt ~~[illegible]~~ medium dense, moist	MH	3	HNU = 1 ppm Bγ = 60 cpm
14				TO 14 Ft			HNU = Bγ =
							HNU = Bγ =
15							

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Acker
Driller Marty Walral
Assistant Joe Dertey

Background: HNU = 0.0 ppm
Bγ = 40-80 cp

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 1969

INSTALLATION DATE: NA



HEIGHT
TOP OF PROTECTIVE WELL COVER: NA FT
TOP OF RISER: NA FT

(DEPTH) (FT)

1 CEMENT: 1.0 FT.

mixture

2 VOLCLAY GROUT: 13.0 FT.

BENTONITE SEAL: NA FT.

SAND PACK: NA FT.

SCREEN: NA FT.

BOTTOM OF CEMENT: NA FT
BOTTOM OF PROTECTIVE WELL COVER: NA FT
TOP OF BENTONITE SEAL: NA FT
TOP OF SAND PACK: NA FT
TOP OF SCREEN: NA FT
BOTTOM OF SCREEN: NA FT
PIEZOMETER TIP: NA FT
BOTTOM OF BORING: 14.0 FT

BOREHOLE DIAMETER: 8 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 2 bags 50 lbs
AMOUNT OF CEMENT: 1/2 bag 94 lbs
AMOUNT OF WATER USED: 38 gal
OTHER: 1 drum Soil cuttings, 1 drum Alcohol Water
TASK: 20.03.05

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BELO GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: Musa M. Keseler

ASI FORM 0157 REV. (0)

FERNALD RI/FS

5 of 5

E-4395

PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU2 - Southfield FIELD ENG./GEO. Musa M. Kesebir DATE 4-15
PROJECT NO. 20.03.05 CHECKED BY _____ DATE _____
BORING NO. 1969
PIEZOMETER NO. NA DATE OF INSTALLATION NA

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT Auger Bit (4 1/4" I.
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS: NA
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS: CEMENT GROUT / SLURRY	TOP 0.0 TOP 0.0	BOTTOM 1.0 BOTTOM 14.0	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	14.0			
GWL AFTER INSTALLATION	NA			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS 2 x 50 lbs volclay & 1/2 x 94 lbs cement were used to grou

RI/FS

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: South Field	
BORING NUMBER: #1975 (SF-SB-12)	COORDINATES: NA	DATE: 4-13-93
ELEVATION: NA	GWL: Depth Date/Time	DATE STARTED: 4-13-93
ENGINEER/GEOLOGIST: Musa M. Kesebir	Depth Date/Time	DATE COMPLETED: 4-13-93
DRILLING METHODS: Hollow Stem Auger		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	112542 4/13 10:30	5	6	very stiff (10YR 4/2) dark grayish brown, silty clay, some pebbles, moist, medium plasticity	CL	2.5	Microtip 4-13-93 ~~HNU~~ = 0.0 ppm Bγ = 80 cpm
0.5	112543 4/13 10:30	6	6	SAA	CL	2.5	MTIP ~~HNU~~ = 0.0 ppm Bγ = 80 cpm
1	NA	6	0	No Recovery	NA	NA	MTIP ~~HNU~~ = Bγ = NA
1.5	NA	5	0	No Recovery	NA	NA	MTIP ~~HNU~~ = Bγ = NA
2	112544 4/13 10:45	3	6	medium stiff (10YR 5/3) brown, silty clay moist to wet, med. plasticity	CL	1	MTIP ~~HNU~~ = 0.0 ppm Bγ = 60 cpm
11:15 2.5	112544 4/13 10:45	3	6	SAA	CL	1	MTIP ~~HNU~~ = 0.0 ppm Bγ = 60 cpm
3	112544 4/13 10:45	3	6	SAA	CL	1	MTIP ~~HNU~~ = 0.0 ppm Bγ = 60 cpm
3.5	NA	~~4~~ 4	0	No Recovery	NA	NA	MTIP ~~HNU~~ = NA Bγ = NA
4	112545 4/13 11:00	8	6	very stiff (10YR 5/3) Brown, clay, high plasticity moist	CH	3.0	Microtip ~~HNU~~ = 0.0 ppm Bγ = 60 cpm
4.5	112545 4/13 11:00	5	6	SAA	CH	3.0	Microtip ~~HNU~~ = 0.0 ppm Bγ = 60 cpm
5							

NOTES:

Drilling Co. Pennsylvania Drilling

Drilling Equipment Acker #393

Driller Marty Watral

Assistant Doc Dailey

Background: MTIP ~~HNU~~ = 0.0 ppm
Bγ = 40-80 cpm

Samples taken by using 3" OD SSS sample driven 20" using 140 lbs hammer falling freely through 30".

VISUAL CLASSIFICATION OF SOILS

-4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: South Field	
BORING NUMBER: #1975 (SF-SB-12)	COORDINATES: NA	DATE: 4-13-93
ELEVATION: NA	GWL: Depth Date/Time	DATE STARTED: 4-13-93
ENGINEER/GEOLOGIST: Musa Al. Kesseir	Depth Date/Time	DATE COMPLETED: 4-13-9
DRILLING METHODS: HSA		PAGE 2 OF 5

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (4/13/93 MMA)
5	112546 4/13 1340 MMA	NA		pushed shelby tube	NA	NA	MTIP ~~HNU~~ = Bq =
6							MTIP ~~HNU~~ = Bq =
							MTIP ~~HNU~~ = Bq =
7							MTIP ~~HNU~~ = 0.0 ppm Bq = 60 cpm
	MMA 112547 4/13 14:10	10	6	STIFF (10 YR 5/3) Brown, silty clay med plasticity, moist	CL	2	MTIP ~~HNU~~ = 0.0 ppm Bq = 60 cpm
8	112548 4/13 14:10	9	6	STIFF (10 YR 5/3) Brown, clayey silt low plasticity, moist	ML	1.5	MTIP ~~HNU~~ = 0.0 ppm Bq = 60 pp
	112549 4/13 1410	11	6	SAA	ML	1.5	MTIP ~~HNU~~ = 0.0 ppm Bq = 60 cpm
8.5	112550 4/13 1425	10	6	very stiff (10 YR 5/3) Brown, laminated clay, high plasticity, moist	CH	3	MTIP ~~HNU~~ = 0.0 ppm Bq = 60 cpm
9	112550 4/13 14:25	11	6	SAA	CH	3	MTIP ~~HNU~~ = 0.0 ppm Bq = 60 cpm
10	112550 4/13 14:25	13	6	SAA	CH	3	MTIP ~~HNU~~ = 0.0 ppm Bq = 60 cpm

NOTES:

Drilling Co. Pennsylvania Drilling

Drilling Equipment Acker #393

Driller Marty Watral

Assistant Doc Deiley

Background: MTIP ~~HNU~~ = 0 ppm
Bq = 40-80 cpm

Stockpile

4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: South Field	
BORING NUMBER: #1975 (SF-SB-12)	COORDINATES: NA	DATE: 4-13-93
ELEVATION: NA	GWL: Depth Date/Time	DATE STARTED: 4-13-9
ENGINEER/GEOLOGIST: Musa M. Kesebir	Depth Date/Time	DATE COMPLETED: 4-13
DRILLING METHODS: HSA		PAGE 3 OF 3

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS MTIP 4/13/93 MMK
10	112551 1425	15	6	SAA	CH	8	~~HNU~~ = 0.0 ppm Bγ = 60 cpm
10.5				TD 10.5'			HNU= Bγ =
11							HNU = Bγ =
							HNU = Bγ =
12							HNU = Bγ =
							HNU = Bγ =
13							HNU = Bγ =
							HNU = Bγ =
14							HNU = Bγ =
							HNU = Bγ =
15							

NOTES:

Drilling Co. Pennsylvania Drilling

Drilling Equipment Acker / #393

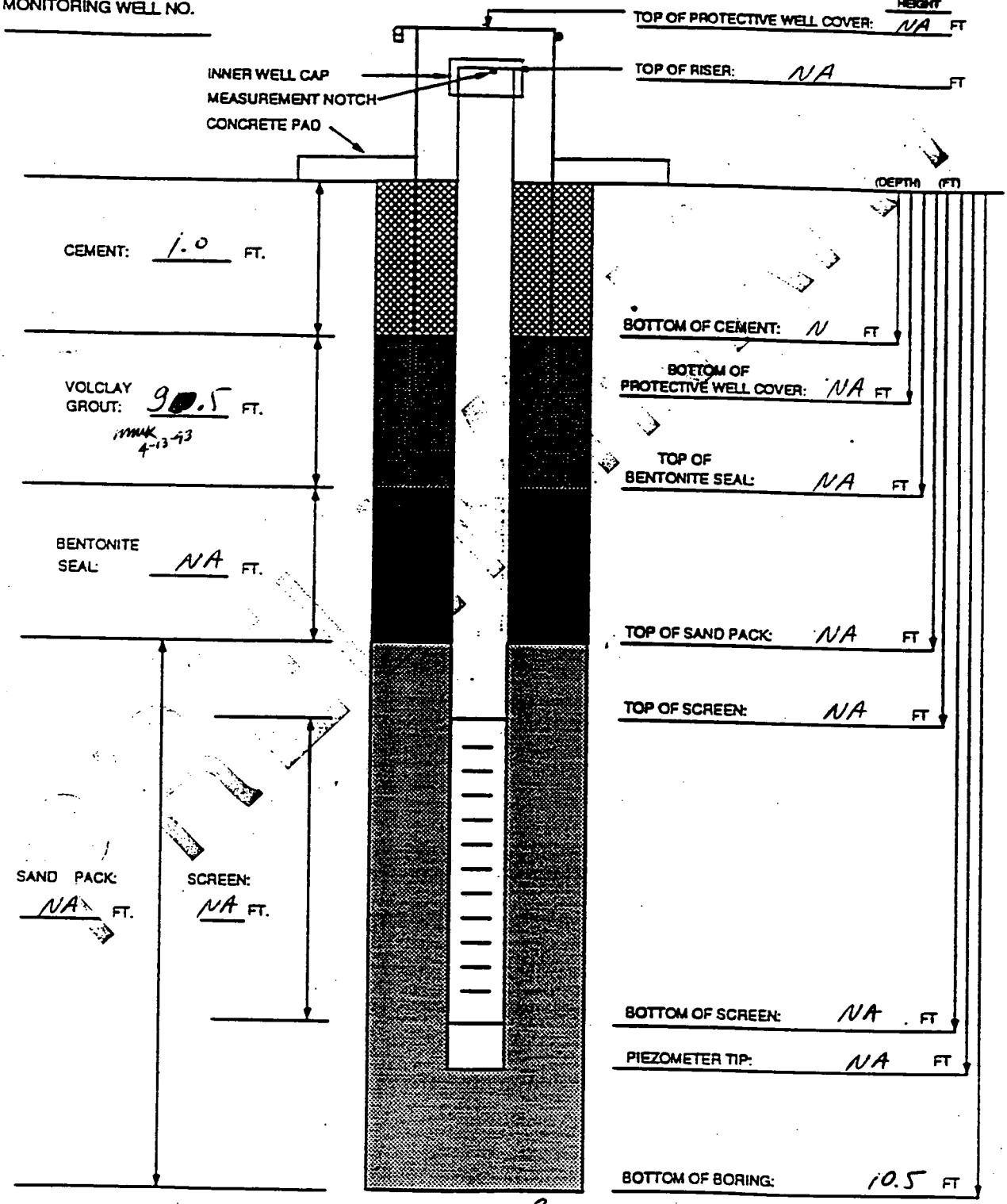
Driller Marty Watral

Assistant Doc Deiley

Background: MTIP ~~HNU~~ = 0 ppm
Bγ = 40-80 cp

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO.

INSTALLATION DATE: 4-13-93



BOREHOLE DIAMETER: 8 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 2 x 50 lbs
AMOUNT OF CEMENT: 1 x 50 lbs
AMOUNT OF WATER USED: 8 gal
OTHER: 1 drum soil cuttings / 1 drum decon. water
TASK: 20.03.05

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/__
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BELC GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: Musa M. Keschir

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU2 - Southfield
PROJECT NO. 20.03.05
BORING NO. 1975
PIEZOMETER NO. NA

FIELD ENG./GEO. Musa M. Keskbir DATE 9-1
CHECKED BY _____ DATE ____
DATE OF INSTALLATION NA

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT Auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 10.5	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP NA	BOTTOM N
SAND	TOP NA	BOTTOM NA	TOP NA	BOTTOM N
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM N
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP NA	BOTTOM N
PIEZOMETER TIP	NA		NA	
BOTTOM OF BOREHOLE	10.5'		NA	
GWL AFTER INSTALLATION	NA		NA	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☐ NA
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☐ NA
REMARKS Soil boring was grouted up using volclay-cement mix. A piezometer was not installed.

FERNALD
RI/FS

4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 - Southfield	
BORING NUMBER: 1978 (SF-SB-15)	COORDINATES: NA	DATE: 4-16-93
ELEVATION: NA	GWL: Depth Date/Time	DATE STARTED: 4-16-93
ENGINEER/GEOLOGIST: Musa M. Keschia	Depth Date/Time	DATE COMPLETED: 4-16-93
DRILLING METHODS: Hollow Stem Auger		PAGE 1 OF 6

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0	112568 4/16 8:50	2	6	very stiff (10YR 3/2) very dark grayish brown, peat with high organic content, moist	PT	2	HNU = 8 ppm Bq = 50 cpm
	112569 4/16 0850	5	6	very stiff (10YR 4/3) brown, silty clay med-high plasticity, with some pebbles, moist	CH	3	HNU = Bq = SAA
1	112570 4/16 0850	10	6	SAA	CH	3	HNU = Bq = SAA
	112571 4/16 0850	15	6	SAA	CH	3	HNU = Bq = SAA
2	112572 4/16 0910	12	6	very stiff (10YR 5/3) brown, silty clay med to high plasticity, few pebbles, moist	CH	3	HNU = 8 ppm Bq = 50 cpm
	112573 4/16 0910	14	6	SAA	CH	3	HNU = Bq = SAA
3	112574 4/16 0910	14	6	SAA	CH	3	HNU = Bq = SAA
	NA	15	0	No recovery	NA	NA	HNU = Bq = —
4	112575 4/16 9:50	5	6	very stiff (10YR 5/3) brown, silty clay, med-high plasticity, some large gravel and pebble, moist	CH	3	HNU = 8 ppm Bq = 60 cpm
	112576 4/16 9:50	8	6	SAA	CH	3	HNU = Bq = SAA
5							

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Acker
Driller Marty Walter
Assistant Doc Deitey

Background: HNU = 8 ppm
Bq = 40-80 cpm

NOTE:
Samples taken by using 3" OD SSS sampler, driven 2' using 140 lbs hammer falling freely through 30".

E-4305

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU 2 - South Field	
BORING NUMBER: 1978	COORDINATES: NA	DATE: 4-16-93
ELEVATION: NA	GWL: Depth Date/Time	DATE STARTED: 4-16-93
ENGINEER/GEOLOGIST: Musa Keseber	Depth Date/Time	DATE COMPLETED: 4-16-93
DRILLING METHODS: HSA		PAGE 2 OF 6

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
5	112577 4/16 9:30	9	6	SAA	CH	3	HNU = Bγ = SAA
	112578 4/16 9:30	13	6	SHBB (10YR 3/2) very dark grayish brown, silty clay (fill), med plasticity, moist, some pebbles	CH	2	HNU = Bγ = SAA
6	112579 4/16 9:45	9	6	SHBB (10YR 4/3) brown, silty clay, med to high plasticity, w/ some pebbles, moist	CH	1.5	HNU = 8 ppm Bγ = 50 cpm
	112590 4/16 9:45	10	6	SAA	CH	1.5	HNU = Bγ = SAA
7	112591 4/16 9:45	9	6	SHBB (10YR 2/2) very dark brown, silty clay, med-to-high plasticity, moist	CH	2	HNU = Bγ = SAA
	112580 4/16 9:45	10	6	SAA	CH	2	HNU = Bγ = SAA
8	112581 4/16 10:00	3	6	SHBB (10YR 5/3) brown, silty clay high plasticity, moist	CH	1.5	HNU = 8 ppm Bγ = 40 cpm
	112582 4/16 10:00	5	6	SAA	CH	1.5	HNU = Bγ = SAA
9	112583 4/16 10:00	6	6	SAA	CH	1.5	HNU = Bγ = SAA
	112584 4/16 1015	3	6	SAA	CH	2	HNU = 8 ppm Bγ = 50 cpm
10							

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Acker
Driller Marty Walter
Assistant Doc Deiley

Background: HNU = 8 ppm
Bγ = 40 cpm

FERNALD
RI/FS

-4355

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 - Southfield	
BORING NUMBER: 1978	COORDINATES: NA	DATE: 4-16-93
ELEVATION: NA	GWL: Depth Date/Time	DATE STARTED: 4-16-93
ENGINEER/GEOLOGIST: Laura Kezeber	Depth Date/Time	DATE COMPLETED: 4-16-93
DRILLING METHODS: HSA		PAGE 3 OF 6

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
10	112584 4/16 1015	5	6	medium stiff (5GY 6/1) SAA	CH	3	HNU = BG = SAA
	112584 4/16 1015	6	6	(~~10YR 5/1~~) greenish gray, silty clay high plasticity, moist to wet	CH	1	HNU = BG = SAA
11	NA	6	0	No recovery	NA	NA	HNU = BG = —
11.5	112585 4/16 1030	5	6	very stiff (5GY 4/1) dark greenish gray silty clay, med to high plasticity, moist	CH	3	HNU = 8 ppm BG = 40 cpm
12	112586 4/16 1030	10	6	SAA	CH	3	HNU = BG = SAA
	112587 4/16 1030	15	6	stiff (10YR 5/3) brown, silty clay, high plasticity, moist	CH	2	HNU = BG = SAA
13	NA	18	0	No recovery ~~SAA~~ mmk @ 4-16-93	NA	NA	HNU = ~~8 ppm~~ mmk BG = ~~50~~ 4-16-93
	112588 4/16 1055	5	6	SAA	CH	1	HNU = 8 ppm ~~SAA~~ mmk BG = 50 cpm
14	112588 4/16 1055	20	6	SAA	CH	2	HNU = BG = SAA
15	112588 4/16 1055	35	6	SAA	CH	3	HNU = BG = SAA

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Acker
Driller Marty Walter
Assistant Doc Deilego

Background: HNU = 8 ppm
BG = 40 cpm

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 - South Field		
BORING NUMBER: 197B	COORDINATES: NA		DATE: 4-16-93
ELEVATION: NA	GWL: Depth	Date/Time	DATE STARTED: 4-16-9
ENGINEER/GEOLOGIST: Nina M. Keseborn	Depth	Date/Time	DATE COMPLETED: 4-16-9
DRILLING METHODS: HSA			PAGE 4 OF 6

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15	112589 4/16 1055	50/4	4	hard (10YR 5/1) gray, silty clay w/ some pebbles, med plasticity dry to moist	CH	5	HNU = 8 ppm Bγ = 50 cpm
15.5				Total Depth 15.5'			HNU= Bγ =
							HNU = Bγ =
							HNU = Bγ =
							HNU = Bγ =
							HNU = Bγ =
							HNU = Bγ =
							HNU = Bγ =
							HNU = Bγ =

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Acker
Driller Marty Walter
Assistant Doc Desley

Background: HNU = 8 ppm
Bγ = 40 cpm

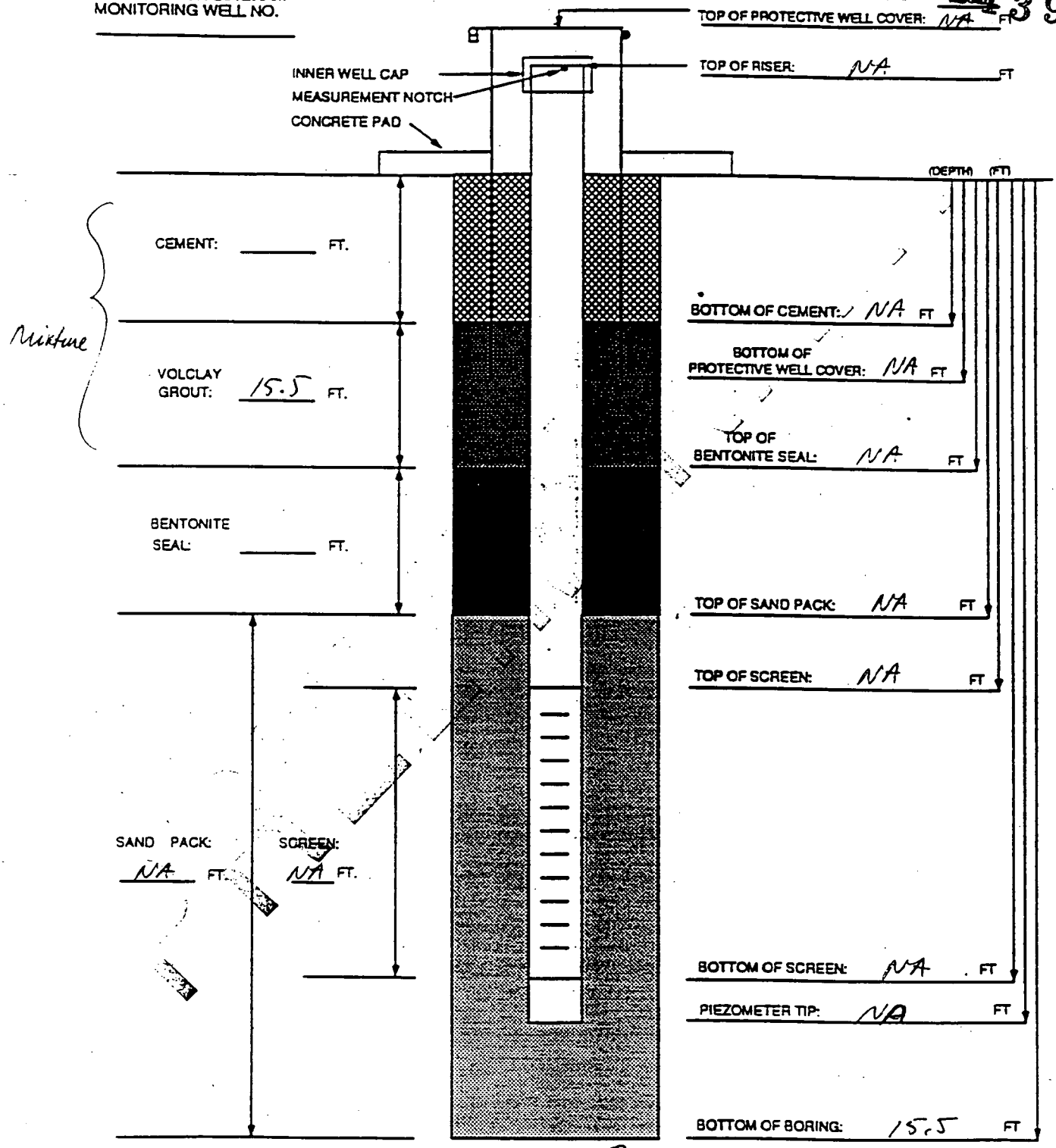
FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. _____

INSTALLATION DATE: _____

TOP OF PROTECTIVE WELL COVER: NA FT

4395

TOP OF RISER: NA FT



BOREHOLE DIAMETER: 8 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 1
AMOUNT OF CEMENT: 1/2 bag of 94 lbs
AMOUNT OF WATER USED: ~8 gal
OTHER: 1 drum for soil cuttings / 1 drum for alcohol non-water
TASK: 20.03.05

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE ____FT/__
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BELC GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: NA

FERNALD
RI/FS

- -4395 of 6

PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU2 - South field
PROJECT NO. 20.03.05
BORING NO. 1978
PIEZOMETER NO. NA
FIELD ENG./GEO Musa Kesebir DATE 4-16
CHECKED BY _____ DATE _____
DATE OF INSTALLATION NA

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT Auger Bit
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. _____ I.D. _____
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	NA		NA	
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	NA		NA	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (Volclay)	TOP 0	BOTTOM 15.5'	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	NA			
GWL AFTER INSTALLATION	NA			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☐
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☐
REMARKS 1 bag 50 lbs volclay and 1/2 bag 94 lbs cement were used to grout

4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 - Southfield		
BORING NUMBER: 1964(SF-SB-01)	COORDINATES: NA		DATE: 4-17-93
ELEVATION: NA	GWL: Depth	Date/Time	DATE STARTED: 4-17-93
ENGINEER/GEOLOGIST: Musa M. Kesabri	Depth	Date/Time	DATE COMPLETED: 4-17-93
DRILLING METHODS: Hollow Stem Auger (HSA)			PAGE 1 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0	112643 4-17 9:00	4	6	medium stiff (10YR 4/1) dark gray, peat with high organic content, moist	PT	1	MTIP ~~HNU~~ = 5.2 ppm; Bγ = 40 cpm
1	112644 4-17 9:00	4	6	SHFF (10YR 5/3) brown, silty clay w/pebbles, med to high plasticity moist	CH	2	MTIP ~~HNU~~ = ; Bγ = SAA
	NA	12	0	No Recovery	NA	NA	MTIP ~~HNU~~ = ~~[illegible]~~ ppm; Bγ = ~~[illegible]~~ cpm MMK 4
2	112645 4-17 0910	8	6	SAA	CH	2	MTIP ~~HNU~~ = 6.2 ppm; Bγ = 40 cpm
	112646 4-17 0910	9	6	SAA	CH	2	MTIP ~~HNU~~ = ; Bγ = SAA
	NA	14	0	No Recovery	NA	NA	MTIP ~~HNU~~ = NA; Bγ = NA
3	112647 4-17 0920	8	6	VSHFF (10YR 4/2) dark grayish brown, silty clay w/some pebbles. med to high plasticity, moist	CH	1.5	MTIP ~~HNU~~ = 4.2 ppm; Bγ = 40 cpm
	112647 4-17 0920	9	6	SAA	CH	1.5	MTIP ~~HNU~~ = ; Bγ = SAA
4	112647 4-17 0920	12	6	VERY SHFF (10YR 4/1) dark gray, gravelly silty clay w/some pebbles. low plasticity - dry to moist	CL ~~AH~~ CB 4/4/93	4	MTIP ~~HNU~~ = ; Bγ = SAA
5	112647 4-17 0920	22	6	SAA	CL ~~AH~~ CB 4/4/93	4	MTIP ~~HNU~~ = ; Bγ = SAA

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Acker
Driller Marty Wateral
Assistant Donnie Arthur

Background: MTIP ~~HNU~~ = 4.2 ppm
Bγ = 40 cpm

Samples taken by using 3" OD SSS sample driven 1.5' or 2' using 140 lb hammer falling freely through 30".

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 - Southfield	
BORING NUMBER: 1964 (SF-SB-01)	COORDINATES: NA	DATE: 4-17-93
ELEVATION: NA	GWL: Depth Date/Time	DATE STARTED: 4-17-93
ENGINEER/GEOLOGIST: Musa Kesebir	Depth Date/Time	DATE COMPLETED: 4-17-9
DRILLING METHODS: HSA		PAGE 2 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS MTIP ↓ 4/17/93 MMK
5	112648 4-17 930	8	6	stiff (10 YR 4/3) brown, silty clay med to high plasticity, some pebbles moist	CH	2	~~HNU~~ = 4.2 ppm Bγ = 50 cpm
	112648 4-17 930	9	6	SAA	CH	3.5	MTIP ~~HNU~~ = Bγ = SAA
6	112648 4-17 930	12	6	very stiff (10 YR 4/2) dark grayish brown, silty clay w/ some pebbles, med plasticity moist	CL ~~CH~~ CBS 5/3/93	4	MTIP ~~HNU~~ = Bγ = SAA
	112649 4-17 945	12	6	stiff (5 YR 4/2) olive gray, sandy silty clay, w/ some pebbles, low to med plasticity, moist	CL ~~CH~~ CBS 5/3/93	2	MTIP ~~HNU~~ = 3.6 ppm Bγ = 50 cpm
7	112650 4-17 945	20	6	SAA	CL ~~CH~~ CBS 5/3/93	2	MTIP ~~HNU~~ = Bγ = SAA
	112651 4-17 945	28	6	stiff (5 YR 4/2) olive gray, silty clay w/ pebbles, med to high plasticity moist (some cobbles)	CH	2	MTIP ~~HNU~~ = Bγ = SAA
8	112652 4-17 1000	6	8	stiff (5 YR 4/2) olive gray, silty clay w/ cobbles, med to high plasticity moist	CH	2	MTIP ~~HNU~~ = 3.5 ppm Bγ = 40 cpm
	112653 4-17 1000	6	8	SAA	CH	2	MTIP ~~HNU~~ = Bγ = SAA
9	NA	0	9	No Recovery	NA	NA	MTIP ~~HNU~~ = NA Bγ = NA
10	NA	0	15	No Recovery	NA	NA	MTIP ~~HNU~~ = NA Bγ = NA

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Acker
Driller Marty Watral
Assistant Donnie Arthur

Background: MTIP ~~HNU~~ = 3.2-4.2 ppm
Bγ = 40-60 cpm

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 - South Field		
BORING NUMBER: 1964 (SF-SB-01)	COORDINATES: NA		DATE: 4-17-93
ELEVATION: NA	GWL: Depth	Date/Time	DATE STARTED: 4-17-93
ENGINEER/GEOLOGIST: Musa Keskor	Depth	Date/Time	DATE COMPLETED: 4-17-93
DRILLING METHODS: HSA			PAGE 3 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
10	112654 4-17 1010	6	6	very stiff (5 YR 4/2) olive gray, silty clay, few pebbles, med-to-high plasticity, moist	CH	3	MTIP ↓ 4/17/93 ~~HNU~~ = 3.5 ppm Bγ = 40 cpm
11	112655 4-17 1010	8	6	very stiff (10 YR 5/3) brown, clayey silt w/ some pebbles, low plasticity moist	ML ~~OL~~ CB 5/24/93	3	~~HNU~~ = Bγ = SAA
	NA	6	0	No Recovery	NA	NA	~~HNU~~ = NA Bγ = NA
12	NA	12	0	No Recovery	NA	NA	~~HNU~~ = NA Bγ = NA
	112656 4-17 1020	9	6	very stiff (10 YR 5/3) brown, sandy clayey silt, w/ some pebbles, low plasticity moist	OL	3	~~HNU~~ = 5.3 ppm Bγ = 40
13	112657 4-17 1020	15	6	very stiff (10 YR 5/3) brown, clayey silt low plasticity, moist	OL	3.5	~~HNU~~ = Bγ = SAA
	112658 4-17 1020	22	6	very stiff (10 YR 5/3) brown, silty clay, med to high plasticity, moist	CL ~~CH~~ CB 5/24/93	3.5	~~HNU~~ = Bγ = SAA
14	NA	35	0	No Recovery	NA	NA	~~HNU~~ = NA Bγ = NA
	112659 4-17 1045	13	6	(10 YR 5/2) grayish brown, silty sand, loose, w/ some pebbles moist	SM	NA	~~HNU~~ = 3.5 ppm Bγ = 40 cpm
15	112660 4-17 1045	13	6	very stiff (10 YR 5/3) brown, silty clay med plasticity, moist	CL ~~CH~~ CB 5/24/93	3	~~HNU~~ = Bγ = SAA

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Acker
Driller Marty Wetrak
Assistant Dannie Arthur

Background: MTIP ~~HNU~~ = 3-4 ppm
Bγ = 40 cpm

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU 2 Southfield	
BORING NUMBER: 1964 (SF-SB-01)	COORDINATES: NA	DATE: 4-17-93
ELEVATION: NA	GWL: Depth Date/Time	DATE STARTED: 4-17-93
ENGINEER/GEOLOGIST Musa Kejebar	Depth Date/Time	DATE COMPLETED: 4-17-93
DRILLING METHODS:		PAGE 4 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15	112661 4-17 1045	21	6	soft (10 YR 5/3) brown, clayey silt low plasticity, wet	CH	0.5	RETIP ↓ 4/17/93 MMK ~~HNU~~ = Bγ = SAA
16	112662 4-17 1045	24	6	SAA	CH	0.5	~~HNU~~ = Bγ = SAA
	112663 4-17 1055	7	6	SAA	CH	0.5	~~HNU~~ = 3.2 ppm Bγ = 40 cpm
17	112664 4-17 1055	10	6	medium stiff (10 YR 5/3) brown, clayey silt med plasticity, wet to moist	CH	1.0	~~HNU~~ = Bγ = SAA
	112665 4-17 1055	21	6	very stiff (10 YR 5/3) brown, silty clay med. to high plasticity, moist	CH	4.0	~~HNU~~ = Bγ = SAA
18	112666 4-17 1055	26	6	SAA	CH	4.5	~~HNU~~ = Bγ = SAA
	112667 4-17 1330	8	6	Hard (10 YR 5/3) brown, clayey silt w/ some angular pebbles, med plasticity, moist	CH	5	~~HNU~~ = 0 ppm Bγ = 40 cpm
19	112668 4-17 1330	17	6	SAA		5	~~HNU~~ = Bγ = SAA
	112669 4-17 1330	27	6	SAA		5	~~HNU~~ = Bγ = SAA
20	112670 4-17 1330	28	6	SAA		5	~~HNU~~ = Bγ = SAA

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Acker
Driller Marty Watral
Assistant Dennie Arthur

Background: RETIP ~~HNU~~ = 0.8 – 2.6 ppm
Bγ = 40 cpm

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2 - Southfield		
BORING NUMBER: 1964	COORDINATES: NA		DATE: 4-17-93
ELEVATION: NA	GWL: Depth	Date/Time	DATE STARTED: 4-17-93
ENGINEER/GEOLOGIST: Musa Kesebir	Depth	Date/Time	DATE COMPLETED: 4-17-
DRILLING METHODS: HSA			PAGE 5 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS MTIP ↓ 4-17-93 MMK
20	112671 4-17 1350	5	6	hard (10 YR 5/3) brown, clayey silt w/ cobbles, med to high plasticity moist	CH	4.5	~~HNU~~ = 0.0 ppm Bγ = 40 cpm
	112672 4-17 1350	16	6	(10 YR 5/1) gray, loose poorly graded gravelly sand, w/ some pebbles moist	SP	NA	~~HNU~~ = Bγ = SAA
21	112671 4-17 1350	21	6	SAA	SP	NA	~~HNU~~ = Bγ = SAA
	112671 4-17 1350	22	6	SAA	SP	NA	~~HNU~~ = Bγ = SAA
22	112672 4-17 1405	35	6	SAA	SP	NA	~~HNU~~ = 0 Bγ = SAA
	112673 4-17 1405	15	6	SAA	SP	NA	~~HNU~~ = Bγ = SAA
23	112674 4-17 1405	21	6	SAA	SP	NA	~~HNU~~ = Bγ = SAA
	112675 4-17 1405	33	6	SAA	SP	NA	~~HNU~~ = Bγ = SAA
24	112676 4-17 1420	21	6	SAA	SP	NA	~~HNU~~ = 0 ppm Bγ = 40 cpm
25	112677 4-17 1420	31	6	hard (10 YR 5/3) brown, sandy clayey silt, w/ some pebbles, low plasticity moist	ML ~~CH~~ (CB 5/3/93)	4.5	~~HNU~~ = Bγ = SAA

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Acker
Driller Marty Watlar
Assistant Donnie Arthur

Background: HNU = 0 ppm
Bγ = 40 cpm

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU2- Southfield		
BORING NUMBER: 1964 (SF-SB-01)	COORDINATES: NA		DATE: 4-17-93
ELEVATION: NA	GWL: Depth	Date/Time	DATE STARTED: 4-17-93
ENGINEER/GEOLOGIST: Musa Kesebir	Depth	Date/Time	DATE COMPLETED: 4-17-9
DRILLING METHODS: HSA			PAGE 6 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS MTIP ↓ 4/17/93 mmk
25	112678 4-17 1420	30	6	(10 YR 5/1) gray, loose poorly graded sand w/ some pebbles moist	SP	NA	~~HNU~~ = Bq = SAA
	NA	32	0	No Recovery	NA	NA	~~HNU~~ = NA Bq = NA
26	112679 4-17 1440	9	6	SAA (25.0 to 25.5 FT)	SP	NA	~~HNU~~ = Bq = SAA
	112680 4-17 1440	17	6	SAA	SP	NA	~~HNU~~ = Bq = SAA
27	112681 4-17 1440	11	6	SAA	SP	NA	~~HNU~~ = Bq = SAA
	112682 4-17 1450	21	6	SAA	SP	NA	~~HNU~~ = Bq = SAA
28	112683 4-17 1450	21	6	SAA	SP	NA	~~HNU~~ = Bq = SAA
	112684 4-17 1450	21	6	SAA	SP	NA	~~HNU~~ = Bq = SAA
29	112685 4-17 1510	20	6	SAA	SP	NA	~~HNU~~ = Bq = SAA
	112685 4-17 1510	28	6	SAA	SP	NA	~~HNU~~ = Bq = SAA
30							

NOTES:

Drilling Co. Pennsylvania Drilling

Drilling Equipment Acker

Driller Marty Natral

Assistant Donnie Arthur

Background: ~~HNU~~ = 0 ppm
Bq = 40 cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS -4395

PROJECT NUMBER: 20.03.05	PROJECT NAME: OU-2 Southfield		
BORING NUMBER: 1964 (SF-SB-01)	COORDINATES: NA		DATE: 4-17-93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 4-17-93
ENGINEER/GEOLOGIST: Musa Keseler	Depth	Date/Time	DATE COMPLETED: 4-17-93
DRILLING METHODS: HSA			PAGE 7 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (NTIP 4/17/93 MMK)
30	112685 4-17 1510	23	6	SAA	SP	NA	~~HNU~~ = BZ = SAA
31	112686 4-17 1510	28	6	(10 YR 5/1) gray, loose poorly ~~[illegible]~~ graded medium sand moist	SP	NA	~~HNU~~ = BZ = SAA
				Total Depth 31'			HNU = BZ =
							HNU = BZ =
							HNU = BZ =
							HNU = BZ =
							HNU = BZ =
							HNU = BZ =
							HNU = BZ =
							HNU = BZ =

NOTES:
Drilling Co. Pennsylvania Drilling
Drilling Equipment Acker
Driller Marty Wattar
Assistant Donnie Arthur

Background: HNU = 0 ppm
BZ = 40 ppm

FERNALD RI/FS

8 of 9

PIEZOMETER INSTALLATION SHEET -4395

PROJECT NAME OU2 - Southfield FIELD ENG./GEO. Musa Kesebir DATE 4-17
PROJECT NO. 20.03.05 CHECKED BY _____ DATE _____
BORING NO. 1964
PIEZOMETER NO. NA DATE OF INSTALLATION NA

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT Auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE NA
DIAMETER OF PERFORATED SECTION NA
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS NA
TOTAL PERFORATED AREA NA

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS: CEMENT GROUT/SLURRY	TOP 0.0 TOP ~~0.0~~ 1.0	BOTTOM 1.0 BOTTOM 31.0 ft	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	NA			
GWL AFTER INSTALLATION	NA			

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

REMARKS 2 drums for soil cuttings
1 drum for alconox-water
2 bags of 50 lbs volclay
1/2 bag of 94 lbs cement

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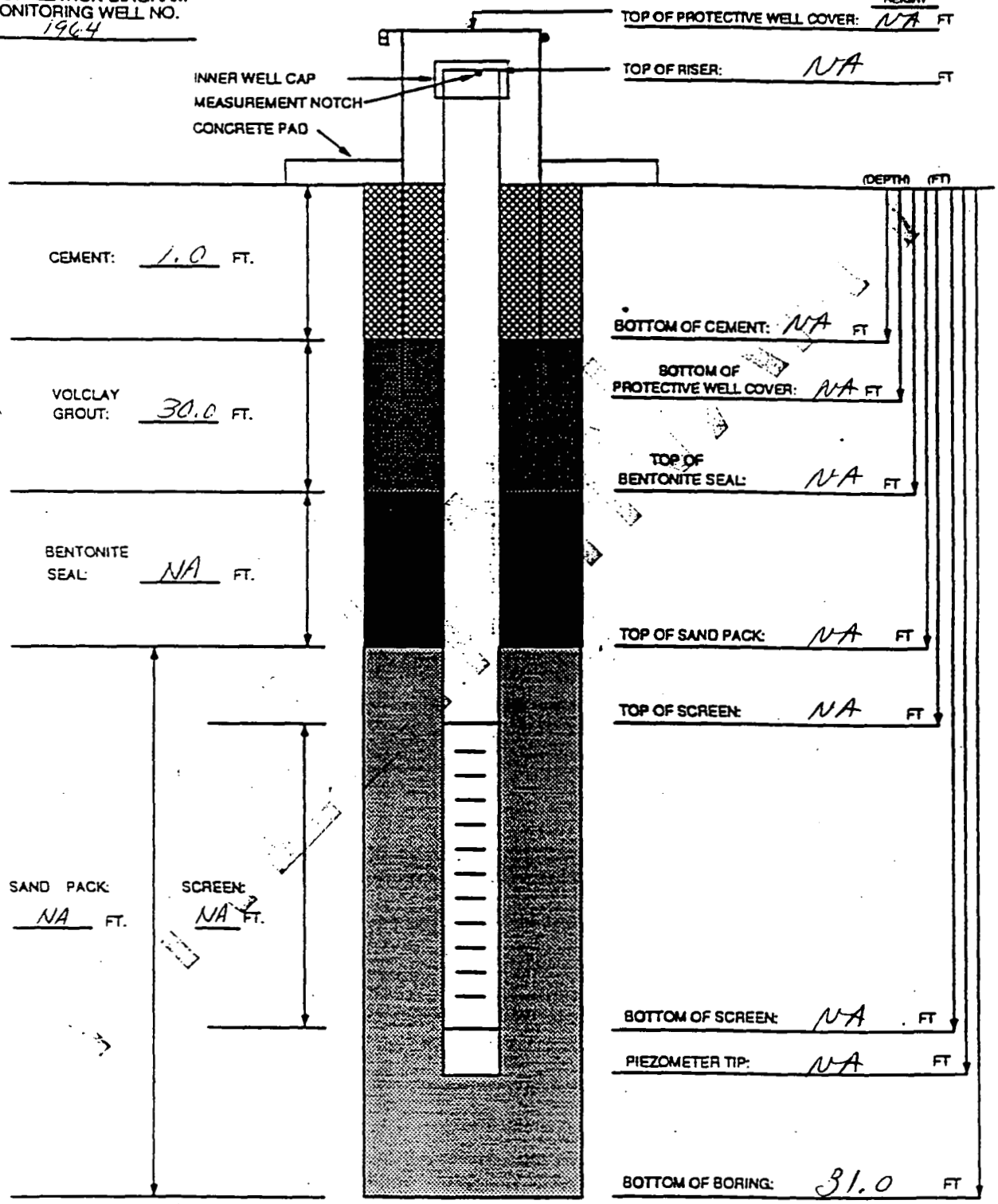
FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 196.4

INSTALLATION DATE: 4-17-93



BOREHOLE DIAMETER: 8.0 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 2
AMOUNT OF CEMENT: 1/2 bag 94 lbs
AMOUNT OF WATER USED: ~8 gal
OTHER: 1 drum for alconox-water / 1 drum for drill cuttings
TASK: 20.03.05

NOTES:

1) RISER PIPE IS NA IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS NA IN. ID. 316 STAINLESS STEEL PIPE WITH 0. NA IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE NA FT/ NA
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: M. Kesbiri

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBS 0433	PROJECT NAME: South Plume 12 Well		
BORING NUMBER: MW 2897	COORDINATES:	DATE: 3-30-93	
ELEVATION:	GWL: Depth 66.5 Date/Time 4-2-93 0845	DATE STARTED: 3-30-93	
ENGINEER/GEOLOGIST: B. Yearsley	Depth 66.3 Date/Time 4-7-93 0900	DATE COMPLETED: 4-6-93	
DRILLING METHODS: Cable Tool		PAGE OF	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.0				See description for MW 3897			βγ: HNU:
							βγ: HNU:
							βγ: HNU:
							βγ: HNU:
							βγ: HNU:
							βγ: HNU:
							βγ: HNU:
							βγ: HNU:
							βγ: HNU:
58							βγ: HNU:

NOTES:

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment: 38 Cyclone
Driller: Jim Zubini
Helper: Jeff Chechan

SAA = Same As Above
N/A = Not Applicable
Background = 20cpm

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

402-11-66

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBS 0433	PROJECT NAME: South Plume 2 Well		
BORING NUMBER: MW 2897	COORDINATES:		DATE: 4-1-93
ELEVATION:	GWL: Depth 66.5 Date/Time 4-2-93		DATE STARTED: 4-1-93
ENGINEER/GEOLOGIST: B. Yearglen	Depth	Date/Time 0815	DATE COMPLETED: 4-6-93
DRILLING METHODS: Cable Tool	66.3	4-7-93 0800	PAGE 1 OF

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
58 59	1330 4-1-93	22 47 33	10	V. Dense 2.5Y(6/6) Brownish yellow fine to coarse sand w/gravel, dry, well graded	SW	NA	βγ: 20cpm HNU: 0 ppm
60 61	1345 4-1-93	20 35 30	8	V. Dense 2.5Y(6/6) Brownish yellow fine to coarse sand w/ gravel, well graded, dry	SW		βγ: 20cpm HNU: 0 ppm
62	1445 4-1-93	7 15 25	16	Dense 2.5Y(6/6) Brownish yellow med. to coarse sand w/ gravel and some clay, dry, well graded (Oxidation Stains)	SW		βγ: 20 cpm HNU: 0 ppm
63 64	1530 4-1-93	13 37 54	14	V. Dense 2.5Y(6/3) Pale Brown gravel w/ sand, dry, well graded V. Dense, 2.5Y(6/3) Pale Brown fine sand w/ gravel, poorly graded, moist	GW SP		βγ: 20 cpm HNU: 0 ppm
65	1600 4-1-93	17 25 51	16	V. Dense, 2.5Y(6/3) Pale Brown coarse sand w/ gravel, well graded, dry V. Dense, 2.5Y(6/3) Pale Brown fine sand w/ gravel, poorly graded dry	GW SP		βγ: 20cpm HNU: 0 ppm
66 67	1630 4-1-93	25 37 48	17	V. Dense, 2.5Y(6/3) Pale Brown med. grained sand w/ gravel, poorly graded, dry up to ~66 ft. then wet.	SP		βγ: 20 cpm HNU: 0 ppm
68	1700 4-1-93	7 10 14	17	M. Dense, 2.5Y(5/2) Grayish brown gravel, well graded, wet Dense 2.5Y(5/2) Grayish brown, med. grain sand w/ gravel, poorly graded, wet	GW SP		βγ: 20 cpm HNU: 0 ppm
69 70	1715 4-1-93	8 12 13	18	M. Dense, 2.5Y(5/2) Grayish brown goes from fine sand, poorly graded to a gravel, well graded back to a fine sand, wet	SP/GW		βγ: 20cpm HNU: 0ppm
71	1725 4-1-93	8 11 15	18	M. Dense 2.5Y (5/2) Grayish brown, med. grain sand w/ gravel, poorly graded, wet	SP	↓	βγ: 20 cpm HNU: 0ppm
72 73	0830 4-2-93	4 6 9	18	M. Dense, 2.5Y (5/2) Grayish brown, fine to coarse sand w/ gravel, poorly graded, wet (oxidation stains and 3" gravel zone)	SW/GP	NA	βγ: 20cpm HNU: 0 ppm

NOTES:

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment: 38 Cyclone
Driller: Jim Zubini
Helper: Jeff Cherchan

SAA = Same As Above
N/A = Not Applicable

Background = 4-1-93 = 20cpm
4-2-93 = 20 cpm

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

402-11-46

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBS 0433	PROJECT NAME: 12 Well South Plume		
BORING NUMBER: MW 2897	COORDINATES:	DATE: 4-2-93	
ELEVATION:	GWL: Depth 66.5 Date/Time 4-2-93 0815	DATE STARTED: 4-1-93	
ENGINEER/GEOLOGIST: B. Yearsley	Depth 66.3 Date/Time 4-7-93 0900	DATE COMPLETED: 4-6-93	
DRILLING METHODS: Cable Tool		PAGE 2 OF	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (ISF)	REMARKS
73 74	0900 4-2-93	6 18 16	18	Dense 2.5Y(5/2) Grayish brown, fine to coarse sand w/ gravel and a 2" gravel zone well graded, wet	SW/GP	NA	βγ: 20cpm HNU: 0 ppm
75 76	0930 4-2-93	3 4 3	18	Loose, 2.5Y(5/2) Grayish brown, 6" of fine to coarse gravel, well graded, wet Loose; 2.5Y(5/2) Grayish brown, fine to coarse sand w/ gravel, well graded, wet	GW SW	NA	βγ: 20cpm HNU: 0ppm
77							βγ: HNU:
78							βγ: HNU:
79 80				Well drilled out to 810ft, (Set at 790 ft.)			βγ: HNU:
81							βγ: HNU:
							βγ: HNU:
							βγ: HNU:
							βγ: HNU:
							βγ: HNU:

NOTES:

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment: 38 Cyclone
Driller: Jim Zuchio
Helper: Jeff Cherdue

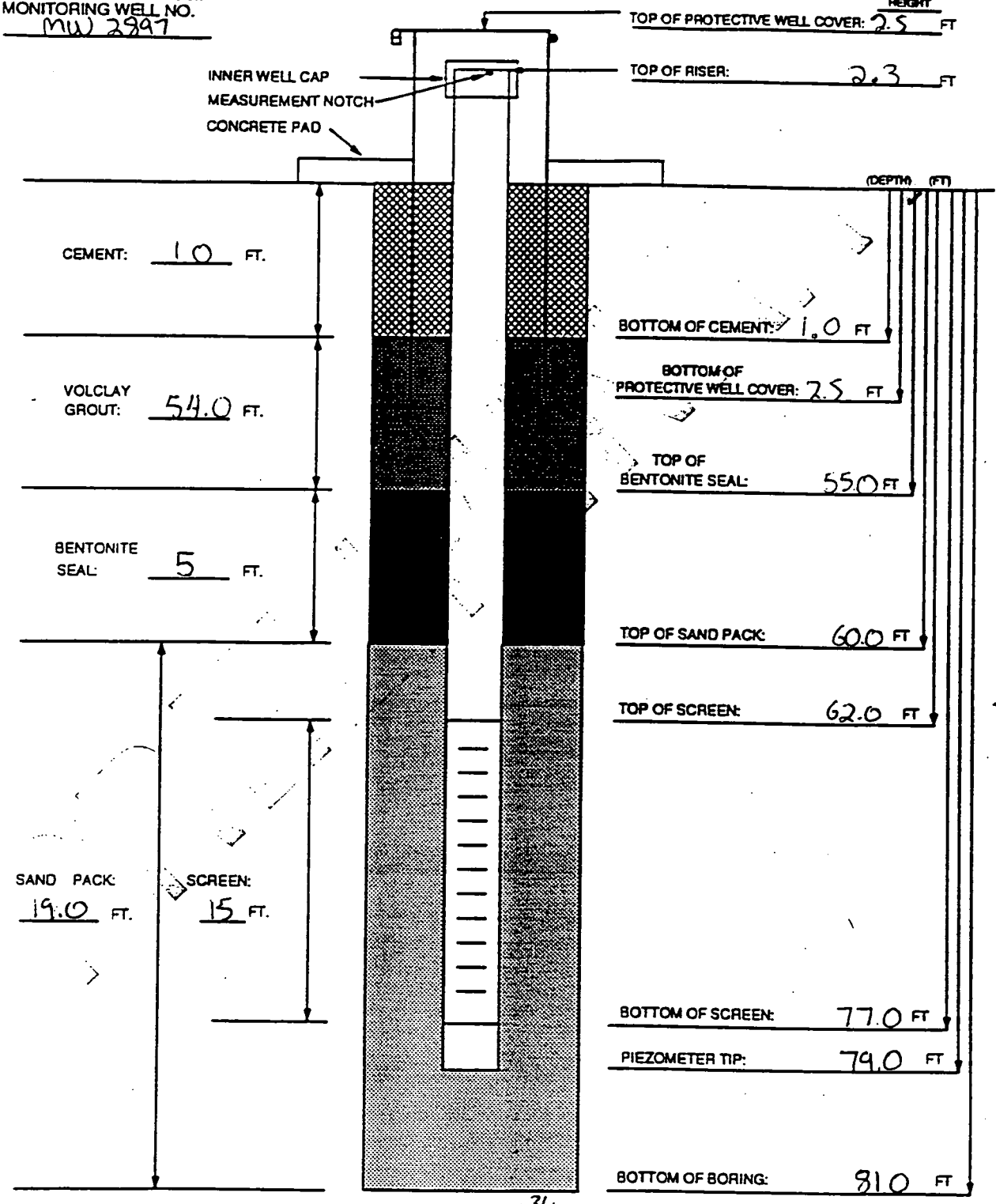
SAA = Same As Above
N/A = Not Applicable
Background = 20 cpm

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

402-11-88

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. MW 2997

INSTALLATION DATE: 3-30-93 - 4-6-93



BOREHOLE DIAMETER: 10 3/4 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: 20 bags 10/20
BENTONITE PELLETS (5-GALLON BUCKETS): 5
BAGS OF VOLCLAY GROUT: 14 bags
AMOUNT OF CEMENT: 2 bags
AMOUNT OF WATER USED: 750 gallons
OTHER: 12 Drums Soil, 0 Drums H_2O
TASK: WBS - 04.33

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 66.3 FT/ 4/7/9
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. Yocoolley

ASI FORM 0157 REV. (0)

FERNALD RI/FS

-4395

PIEZOMETER INSTALLATION SHEET

PROJECT NAME 12 Well South Plume FIELD ENG./GEO. B Yeardley DATE 4-13-9
PROJECT NO. WBS 0433 CHECKED BY _____ DATE _____
BORING NO. MW 2897
PIEZOMETER NO. MW 2897 DATE OF INSTALLATION 3/30/93 - 4/6/93

BOREHOLE DRILLING

DRILLING METHOD Cable tool
DRILLING FLUID (S) USED:
FLUID water FROM 0.0 TO 66.5
FLUID NA FROM NA TO NA

TYPE OF BIT Hammer Percussion
CASING SIZE (S) USED:
SIZE 10 in ID FROM 0.0 ft TO 80.0 ft
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Monitor Well
DIAMETER OF PERFORATED SECTION 4.0 in ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.01
TOTAL PERFORATED AREA 15.0 ft

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 I.D. 4.0
LENGTH OF PIPE SECTIONS 6-10ft, 1-5ft
JOINING METHOD Screw Type - Flush Joint

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	2.3			
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 55.0	TOP	BOTTOM
BENTONITE	TOP 55.0	BOTTOM 60.0	TOP	BOTTOM
SAND	TOP 60.0	BOTTOM 80.0	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 62.0	BOTTOM 77.0	TOP	BOTTOM
PIEZOMETER TIP	79.0			
BOTTOM OF BOREHOLE	91.0			
GWL AFTER INSTALLATION	66.3 @ ground level			

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

REMARKS _____

378 287

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBS 04.33	PROJECT NAME: 12 Well - South Plume		
BORING NUMBER: MW 3897	COORDINATES:	DATE: 4-7-93	
ELEVATION:	GWL: Depth 66.5 Date/Time 4-13-93 1000	DATE STARTED: 4-7-93	
ENGINEER/GEOLOGIST: B. Yeardley	Depth 66.0 Date/Time 4-28-93 0940	DATE COMPLETED: 4-28-93	
DRILLING METHODS: Cable Tool		PAGE 1 OF	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	1500 109237 4-7-93	3 2 3	7	Stiff, 10YR(4/3) Brown silty clay w/ organics, roots, med. plasticity 10YR(4/6) silty clay w/ sand lens, minor gravel	CL	1.5	βγ: 20-40 cpm HNU: 0 ppm
2 3	1505 109238 4-7-93	4 9 10	4	Stiff 10YR (4/6) Dk. Yellow brown silty clay w/ gravel, med. plasticity, moist	CL	1.5	βγ: 20-40 cpm HNU: 0 ppm
4	1510 109239 4-7-93	3 7 3	8	Loose 2.5Y(4/4) Olive brown, silty Sand w/ gravel, poorly graded	SM	2.75	βγ: 20-40 cpm HNU: 0 ppm
				V. Stiff silty clay w/ gravel, med. plasticity, moist	CL		
5 6	1515 109240 4-7-93	8 9 9	10	V. Stiff 2.5(5/4) lt. olive brown, silty clay w/ little gravel, med. plasticity, moist, last 3" clayey silt, wet	CL ML	2.25	βγ: 20-40 cpm HNU: 0 ppm
7	1520 109241 4-7-93	14 14 20	10	Dense wet 2.5Y (5/4) lt. ol. Brown clayey silt	SM	NA	βγ: 20-40 cpm HNU: 0 ppm
				V. Stiff 2.5Y (5/4) lt. ol. Brown, silty clay w/ some gravel, med. plast. moist	CL	2.5	
8 9	1540 109242 4-7-93	7 11 51	12	V. Stiff 2.5 (5/4) lt. olive brown, silty clay w/ gravel, med. plasticity, moist	CL	3.5	βγ: 20-40 cpm HNU: 0 ppm
10	1545 109243 4-7-93	38 42 51	10	V. Stiff 2.5 (5/4) lt. olive brown, silty clay w/ gravel, med. plasticity, moist	CL	2.5	βγ: 20-40 cpm HNU: 0 ppm
11 12	1555 109244 4-7-93	21 23 28	8	Hard 5B (4/1) Dk. bluish gray Lmst. gravel to a 10YR (5/6) Yell Brown sand poorly graded, wet to a 5Y(4/1) silty clay w/ gravel	G? SP CL	NA NA >4	βγ: 20-40 cpm HNU: 0 ppm
13	1610 109245 4-7-93	20 35 20	4	Hard 5B (4/1) Dk. Bluish gray Lmst gravel -Pushing cobble ahead of spoon-	G	NA	βγ: 20-40 cpm HNU: 0 ppm
14 15	1620 109246 4-7-93	6 8 15	6	V. Stiff 5Y (4/1) Dk. Gray silty clay w/ gravel, med. plasticity, moist	CL	2.75	βγ: 20-40 cpm HNU: 0 ppm

NOTES:

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment: 38 Cyclone
Driller: Jim Saccani
Helper: Jeff Cherbas

SAA = Same As Above
N/A = Not Applicable
Background = 20-40 cpm

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

FERNALD RI/FS

- -4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBS 04.33	PROJECT NAME: 17 Well South Plume		
BORING NUMBER: MW 3897	COORDINATES:	DATE: 4-12-93	
ELEVATION:	GWL: Depth 66.5 Date/Time 4-13-93 1000	DATE STARTED: 4-7-93	
ENGINEER/GEOLOGIST: B. Yearsley	Depth 66.0 Date/Time 4-28-93 0800	DATE COMPLETED: 4-28-93	
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 (TSF)	REMARKS
15 16	1635 4-7-93	7 9 9	0	No Sample	NA	NA	βγ: HNU: NA
17 18	0955 109247 4-12-93	3 8 17	12	Stiff 5Y(4/1) Dk. Gray, silty, gravelly clay, med. plasticity moist	CL	1.75	βγ: 40-60cpm HNU: 0 ppm
19	1000 109248 4-12-93	22 37 33	18	V. Dense 5Y(4/1) Dk. Gray gravelly sand, fine to medium, poorly graded, wet	SP	NA	βγ: 40-60cpm HNU: 0ppm
20 21	1010 109249 4-12-93	12 16 17	8	Dense 5Y(4/1) Dk Gray, clayey sand w/ gravel, poorly graded, wet	SP	NA	βγ: 40-60cpm HNU: 0ppm
22	1020 109250 4-12-93	8 8 8	14	Med. Dense 5Y(4/1) Dk. Gray fine sand w/ minor gravel, poorly graded, wet - last 3" silty clay	SP	NA	βγ: 40-60cpm HNU: 0ppm
23 24	1030 109287 4-12-93	4 6 20	12	V. Stiff 5Y(4/1) Dk Gray, silty clay w/ minor gravel, med. plasticity, moist with sand lens, wet	CL	2.25	βγ: 40-60cpm HNU: 0ppm
25	1040 109288 4-12-93	6 11 18	14	Med. Dense 5Y(4/1) Dk. Gray fine sand w/ minor gravel, poorly graded, wet	SP	NA	βγ: 40-60cpm HNU: 0 ppm
26 27	1050 109289 4-12-93	4 6 10	7	Stiff 5Y(4/2) Olive gray, silty clay w/ some gravel, med plasticity, moist	CL	1.75	βγ: 40-60cpm HNU: 0ppm
28	1345 109290 4-12-93	3 4 6	8	Stiff 5Y(4/1) Dk. Gray silty gravelly clay, med plasticity moist	CL	1.75	βγ: 40-60cpm HNU: 0 ppm
29 30	1355 109291 4-12-93	12 8 6	14	SAA	CL	1.75	βγ: 40-60cpm HNU: 0 ppm

NOTES:

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment: 38 Cyclone
Driller: Jim Sechen
Helper: Jeff Chechan

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

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBS-0433	PROJECT NAME: South Plume 12 Well		
BORING NUMBER: MW-3897	COORDINATES:	DATE: 4-12-93	
ELEVATION:	GWL: Depth 66.5 Date/Time 4-13-93 1000	DATE STARTED: 4-7-93	
ENGINEER/GEOLOGIST: B. Yearsley	Depth 66.0 Date/Time 4-29-93 0900	DATE COMPLETED: 4-28-93	
DRILLING METHODS: Cable Tool		PAGE 3 OF	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30 31	1410 109292 4-12-93	11 14 16	18	Stiff 5Y(4/1) Dk Gray silty, gravelly clay, med plasticity, moist	CL	1.75	βγ: 40-60cpm HNU: 0ppm
32 33	1420 109293 4-12-93	3 7 14	14	Stiff 5Y(4/1) Dk Gray to 10YR(5/6) yellow brown silty, gravelly clay, med. plasticity, moist	CL	1.75	βγ: 40-60cpm HNU: 0ppm
34	1440 109294 4-12-93	40 46 50	12	V. Dense 10YR(5/6) yellowish brown gravelly silt, low plasticity, moist V. Dense 2.5Y(5/4) lt. olive brown fine sand w/ gravel, poorly graded, dry	ML SP	NA NA	βγ: 40-60cpm HNU: 0ppm (Limestone gravel in sand)
35							βγ: HNU:
36 37							βγ: HNU:
38							βγ: HNU:
39 40							βγ: HNU:
41							βγ: HNU:
42 43							βγ: HNU:
44 45							βγ: HNU:

NOTES:

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment: 38 Cyclone
Driller: Joe Saccani
Helper: Jeff Uhrlich

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

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBS-04.33	PROJECT NAME: 12 Well South Plume		
BORING NUMBER: MW 3897	COORDINATES:	DATE: 4-13-93, 4-12-93	
ELEVATION:	GWL: Depth 66.5 Date/Time 4-13-93 1000	DATE STARTED: 4-7-93	
ENGINEER/GEOLOGIST: B. Yeardley	Depth 66.0 Date/Time 4-29-93 0800	DATE COMPLETED: 4-28-93	
DRILLING METHODS: Cable Tool		PAGE 4 OF	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
40	1605 109285 4-12-93	20 31 36	14	V. St. tf 2.5Y(5/4) lt. olive brown sand w/ gravel, well graded, dry	SW	NA	Bq = 40-60 cpm HNU = 0 ppm
41.5							
45.0							
	1715 109296 4-12-93	50/3 50/3 50/4	10	SAA	SW	NA	Bq = 40-60 cpm HNU = 0 ppm
46.5							
50.0							
	0845 109297 4-13-93	12 37 46	18	V. Dense, 2.5Y(5/4) lt. ol brown, crse sand and gravel well graded, moist V. Dense, 2.5Y(5/4) lt. olive brown sand w/ minor gravel, poorly graded, dry	SW SP	NA	Bq = 60-80 HNU = 0 ppm
51.5							

NOTES:

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment: Cable Tool
Driller: Jim Saccani
Helper: Jeff Cherchan

SAA = Same As Above
N/A = Not Applicable

Background = 40-60 4-12-93
40-60 4-13-93 cpm

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

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FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBS 04.33	PROJECT NAME: 12 Well South Plume		
BORING NUMBER: MW 3897	COORDINATES:	DATE: 4-13-93	
ELEVATION:	GWL: Depth 66.5 Date/Time 4-13-93 1000	DATE STARTED: 4-7-93	
ENGINEER/GEOLOGIST: B Yeardley	Depth 66.0 Date/Time 4-28-93 0800	DATE COMPLETED: 4-28-93	
DRILLING METHODS: Cable Tool		PAGE 5 OF	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
55.0	1000	26		Vy. dense 2.5Y(5/4) lt. olive brown crse.			βγ = 40-60 cpm
	109298	50/3	12	sand w/ some gravel to fine sand w/	SP	NA	HNU → 0 ppm
56.5	4-13-93	50/3		crse gravel, poorly graded, dry			
60.0							
	1015	77		Dense 2.5Y(5/4) lt olive brown			βγ = 40-60 cpm
	109299	37	12	fine to coarse sand w/ gravel, well	SW	NA	HNU = 0 ppm
61.5	4-13-93	32		graded, dry - oxidation stains 7.5YR			
				(5/8) strong brown			
65.0							
	1400	100/.4		V. Dense 2.5Y(5/4) lt. olive brown fine			βγ = 40-60 cpm
	109300		3	sand w/ gravel, poorly graded, dry	SP	NA	HNU = 0 ppm
66.5	4-13-93						

NOTES:

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment : Cable Tool
Driller : Jim Sabani
Helper : Jeff Cherkan

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.

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FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBS 0433	PROJECT NAME: R Well - South Plume		
BORING NUMBER: MW 3897	COORDINATES:	DATE: 4-13-93	
ELEVATION:	GWL: Depth 66.5 Date/Time 4-13-93 1600	DATE STARTED: 4-7-93	
ENGINEER/GEOLOGIST: B. Yearsley	Depth 66.0 Date/Time 4-28-93 0800	DATE COMPLETED: 4-28-93	
DRILLING METHODS: Cable Tool		PAGE 6 OF	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
70.0	1445 109301 4-13-93	10 14 12	17	Med. Dense 2.5Y(5/4) lt. olive brown, med. to coarse sand w/ gravel, well graded, wet	SW	NA	Bγ = 40-60 cpm HNU = 0 ppm
71.5							
75.0	1600 109302 4-13-93	20 20 25	18	Dense 2.5Y(5/4) lt. olive brown, gravel, well graded, wet Dense 2.5Y(5/4) lt. olive brown, fine to coarse sand w/ gravel, well gr, wet	GW SW	NA	Bγ = 40-60 cpm HNU = 0 ppm
76.5							
80.0	1615 109303 4-13-93	16 23 22	14	Dense, 2.5Y(5/4) lt. ol. brown, med. sand poorly graded, wet Dense, 2.5Y(5/4) lt. ol. brown, gravel w/ sand, well graded, wet	SP GW	NA	Bγ = 40-60 cpm HNU = 0 ppm
81.5				Hydropunch set and sample taken at 82-86.0 ft.			

NOTES:

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment : Cable Tool
Driller : Jim Saccuni
Helper : Jeff Cherkas

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.

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FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBS 0433	PROJECT NAME: 12 Well - South Plume		
BORING NUMBER: MW 3897	COORDINATES:	DATE: 4-16-93	
ELEVATION:	GWL: Depth 66.5 Date/Time 4-13-93 1000	DATE STARTED: 4-7-93	
ENGINEER/GEOLOGIST: B. Yeardley	Depth 66.0 Date/Time 4-25-93 0900	DATE COMPLETED: 4-28-93	
DRILLING METHODS: Cable Tool		PAGE 7 OF	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
85 86.5	0930 109307 4-16-93	10 27 16	6	Dense 2.5Y (5/4) lt. olive brown, sandy gravel, well graded, wet	GW	NA	β γ = 40-60 cpm HNU = 0 ppm
90 91.5	0945 109308 4-16-93	6 9 15	14	M. Dense 2.5Y (5/4) lt. olive brown, fine-coarse sand w/ gravel, well graded, wet	SW	NA	Bγ = 40-60 cpm HNU = 0 ppm
95.0 96.5	1050 109309 4-16-93	20 30 32	18	V. Dense 2.5Y (5/4) lt. olive brown gravel, well graded to a gravelly sand, poorly graded, wet	~~GW~~ SP	NA	Bγ = 40-60 cpm HNU = 0 ppm

NOTES:

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment : Cable Tool
Driller : Tim Saber
Helper : Jeff Chechan

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.

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FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBS 0433	PROJECT NAME: 12 Well South Plume	
BORING NUMBER: MW 3897	COORDINATES:	DATE: 4-16-93
ELEVATION:	GWL: Depth 66.5 Date/Time 4-13-93 1006	DATE STARTED: 4-[illegible]-93
ENGINEER/GEOLOGIST: B. Yeardley	Depth 66.0 Date/Time 4-29-93 0900	DATE COMPLETED: 4-28-93
DRILLING METHODS: Cable Tool		PAGE 8 OF

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (ft)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
100.0	1145 109310 4-16-93	6 8 13	18	M. Dense 2.5Y(5/4) lt. olive brown, sandy gravel, well graded, wet	GW	NA	BG = 40-60 cpm HNU = 0 ppm
105	1500 109311 4-16-93	50/4 50/4 12/4	12	Vy. Dense 2.5Y(5/4) lt. olive brown sand and gravel, well graded, wet	SW	NA	BG = 40-60 cpm HNU = 0 ppm
110.0	0950 109315 4-17-93	18 83	10	V. Dense, 2.5Y(5/4) lt. olive brown, fine gravel, poorly graded, wet 2.5Y(5/4) lt. olive brown, sand with gravel some clay, poorly graded, wet	GP SP	NA	BG = 40-60 cpm Micro = 0 ppm
111.5				Hydropunch Sample taken @ 109.0 - 113.0 Sample # 109312 1700 109313 109314			

NOTES:

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment : Cable Tool
Driller : Jim Sauhan
Helper : Jeff Checkai

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: WBS 0433	PROJECT NAME: DWell - South Plume	
BORING NUMBER: MW 3897	COORDINATES:	DATE: 4-17-93
ELEVATION:	GWL: Depth 66.5 Date/Time 4-13-93 1000	DATE STARTED: 4-7-93
ENGINEER/GEOLOGIST: B. Yearsley	Depth 66.0 Date/Time 4-29-93 0900	DATE COMPLETED: 4-28-93
DRILLING METHODS: Cable Tool		PAGE 9 OF

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
115.0	1045 109316 4-17-93	12 16 20	16	Dense 2.5Y(5/4) lt. olive brown fine to crse sand w/ some gravel, well graded wet. Last 2 in clayey sand	SW SC	NA	BZ = 40-60 cpm Micro = 0 ppm
116.5							
120	1130 109317 4-17-93	11 16 21	18	Dense 2.5Y(5/4) lt. olive brown fine to crse sand w/ gravel, well graded, wet	SW	NA	BZ = 40-60 cpm Micro = 0 ppm
121.5							
125	1500 109318 4-17-93	70 43 61	18	V. Dense 2.5Y(5/4) lt. olive Brown, fine to coarse sand w/ gravel, well graded wet	SW	NA	BZ = 40-60 cpm Micro = 0 ppm
126.5				Hydropunch taken at Sample 109319, 20, 21			

NOTES:

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment : Cable Tool
Driller : Jim Sargent
Helper : Jeff Cherkas

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

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WB 0433	PROJECT NAME: 12 Well - South Plume		
BORING NUMBER: MW 3897	COORDINATES:	DATE: 4-18-93	
ELEVATION:	GWL: Depth 66.5 Date/Time 4-13-93 1000	DATE STARTED: 4-7-93	
ENGINEER/GEOLOGIST: B. Yearsley	Depth 66.0 Date/Time 4-29-93 0900	DATE COMPLETED: 4-28-93	
DRILLING METHODS: Cable Tool		PAGE 10 OF	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
130 By 4-22-93 131	0900 ~~106322~~ 4-18-93	8 12 14	6	M. Dense, 2.5Y(5/4) Lt. Olive Br, medium to coarse sand w/gravel, well graded, wet	SW	A	βγ = 40-60cpm HNU = 0ppm
132	0915 NA 4-18-93	9 15 20	12	SAA	SW	NA	βγ = 40-60cpm HNU = 0ppm
133 134	0930 NA 4-18-93	7 13 20	14	SAA	SW	NA	βγ = 40-60cpm HNU = 0ppm
135 136	1430 NA ~~4-21-93~~	12 24 31	18	V. Dense 2.5Y(5/4) Lt. Olive Brown, fine to coarse sand w/gravel, well graded, wet	SW	NA	βγ = 40-60cpm HNU = 0ppm
By 4-28-93 137	0850 ~~12~~ 4-22-93	8 12 22	10	Dense, 2.5Y(5/4) Lt. Olive brown, med to coarse gravelly sand, well graded, wet	SW	NA	βγ = 40-60cpm HNU = 0ppm
138	0945 NA 4-22-93	20 18 20	8	Dense 2.5Y(5/4) Lt. Olive brown fine to med sand w/ gravel,	SW	NA	βγ = 40-60cpm HNU = 0ppm
139 140	1045 NA 4-22-93	18 18 21	12	SAA	SW	NA	βγ = 40-60cpm HNU = 0ppm
							βγ = HNU =
							βγ = HNU =
							βγ = HNU =

NOTES:

Drilling Contractor: By 4-22-93 Pennsylvania Drilling
Drilling Equipment : ~~30 Cyclone~~ Cable Tool
Driller : Jim Scott
Helper : Don Jamison, Jeff Uecker

SAA = Same As Above
N/A = Not Applicable

Background = 40-60 cpm 12/20
= 40-60 cpm 12/21
= 40-60 cpm 12/22

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

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FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WB 04.33	PROJECT NAME: 12 Well - South Plume		
BORING NUMBER: MW 3897	COORDINATES:	DATE: 4-22-93	
ELEVATION:	GWL: Depth 66.5 Date/Time 4-13-93 1000	DATE STARTED: 4-7-93	
ENGINEER/GEOLOGIST: B Yeardley	Depth 66.0 Date/Time 4-29-93 0900	DATE COMPLETED: 4-28-93	
DRILLING METHODS: Cable Tool		PAGE 11 OF	

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
140.0 140.5	1410 109323 4-22-93	4 20 22	12	Dense, 2.5YR(5/4) lt olive brown, med. gr. med. sand w/ gravel, poorly graded, wet	SP	NA	βγ = 40-60 cpm Micro: 0 ppm
150 151.8	1510 109324 4-22-93	48 50 40	11	V.D. 2.5Y(5/4) lt. olive brown, fine to med. sand w/ gravel, well graded, wet. 2.5Y(5/4) lt olive brown, silty sand w/ gravel & some clay, wet	SW SC	NA	βγ = 40-60 cpm Micro: 0 ppm
				hydropunch, taken at 149.0-153.0 ft 109325, 109326			

NOTES:

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

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

184

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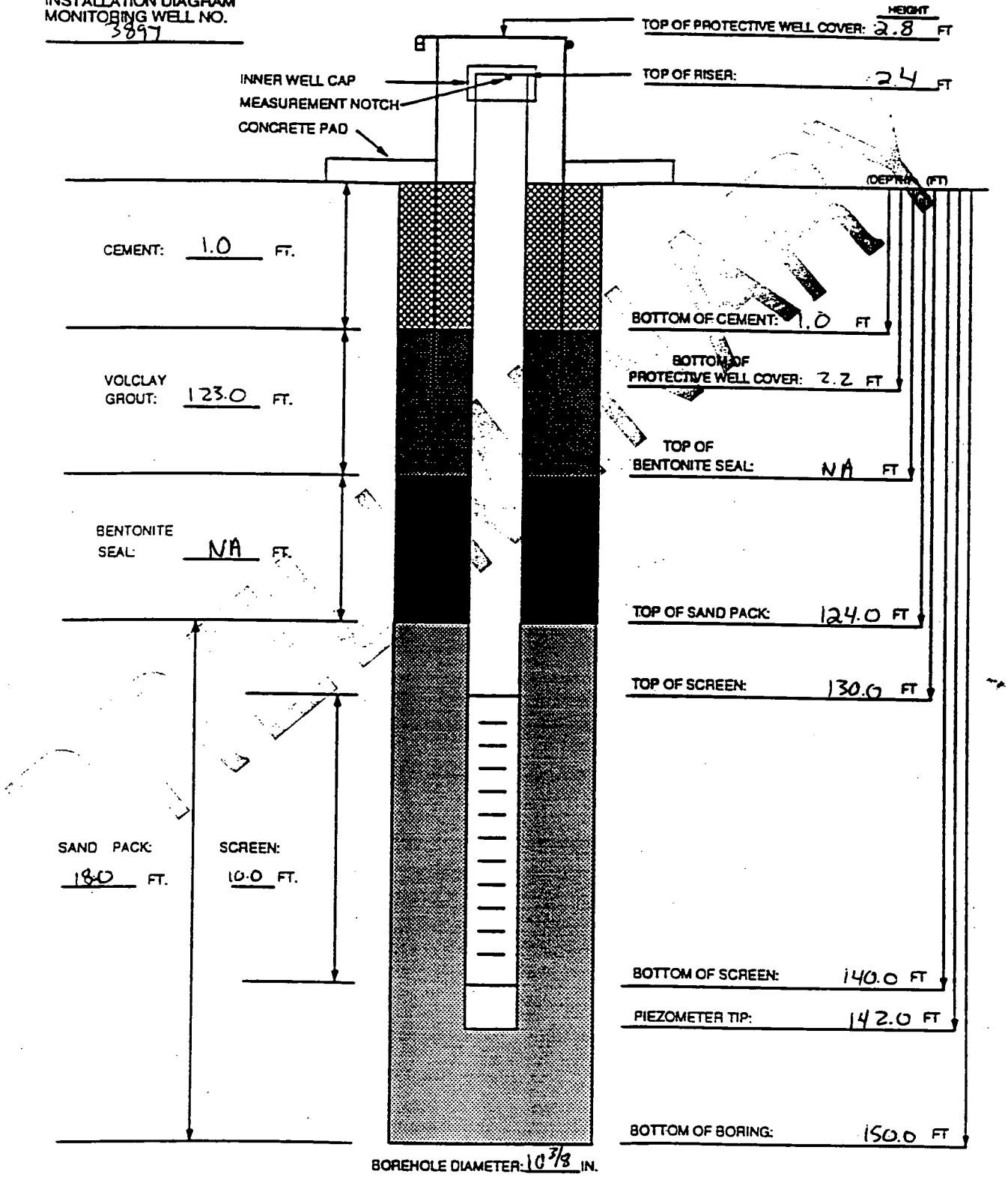
FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 3897

INSTALLATION DATE: 4-7-93 to 4-28-93



MATERIALS USED

SAND TYPE AND QUANTITY: 29 bags 10/20
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 32 bags (50lb)
AMOUNT OF CEMENT: 2 bags
AMOUNT OF WATER USED: 1300
OTHER: 23 drums Soil, 1 Water/Alcox
TASK: WBS 04.33

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 66.0 FT/4-
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 Yearsley

30.0

ASI FORM 0157 REV. (0)

FERNALD RI/FS

- -4395

PIEZOMETER INSTALLATION SHEET

PROJECT NAME 12 Well South Plume FIELD ENG./GEO. B. Yeardley DATE 5-3-93
PROJECT NO. WBS 0433 CHECKED BY _____ DATE _____
BORING NO. 3897
PIEZOMETER NO. 3897 DATE OF INSTALLATION 4-7-93 to 4-28-93

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID H_2O FROM 0.0 TO 66.0
FLUID _____ FROM — TO —

TYPE OF BIT Hammer Percussion Bit
CASING SIZE (S) USED:
SIZE 10.0 in FROM 0.0 TO 150.0
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 0.01 in
TOTAL PERFORATED AREA 10.0 ft

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 I.D. 4.0 in
LENGTH OF PIPE SECTIONS 14-10ft, 2-2ft BJS
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	2.8			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.2			
BOREHOLE FILL MATERIALS:	TOP 0.0	BOTTOM 1.0		
CEMENT GROUT / ~~SLURRY~~ By 5/3/93	TOP 1.0	BOTTOM 124.0	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND 16/20	TOP 124.0	BOTTOM 142.0	TOP	BOTTOM
GRAVEL - none used	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 130.0	BOTTOM 140.0	TOP	BOTTOM
PIEZOMETER TIP	142.0			
BOTTOM OF BOREHOLE	156.0			
GWL AFTER INSTALLATION	66.0 (@ ground level)			

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

REMARKS _____

-4395

7 DAY PRIORITY

C

***** CHAIN OF CUSTODY *****

Sample ID: 930426-078 Project No.: 0020-0001 Charge: RJN01
Customer No.: 109322 Customer Name: FERMCO
Stl. Descr.: 13 WELL SOUTH PLUME Deadline: 3-MAY-199
Sample Matrix: SOIL Date Sampled: 22-APR-199
Comments: SEND RESULTS TO MIKE FRANK FAX 738-8274

Sample Logged By: MJ ROLFES Modified By: MJ ROLFES
Sampled From: MW 3697(130-14 Date Modified: 26-APR-1993 09:36

ENVIRONMENTAL & PROCESS MATERIALS LABORATORY

Analysis	Units	Activ.	Prep Proc No	Analys Proc No
SIEVE ANALYSIS, 40% RETAINED	.001 INCH	9158		9158
SIEVE ANALYSIS, 50% RETAINED	.001 INCH	9158		9158
SIEVE ANALYSIS, 90% RETAINED	.001 INCH	9158		9158

Faxed
Phoned in at _____ hrs on _____
(date) by _____

Crosschecked By: Tom McCullough 4-
Entered on computer By: _____
Approved & Printed By _____

3897 South Plume

B. Yeardly
Lanie P.

10 X 10 PER INCH

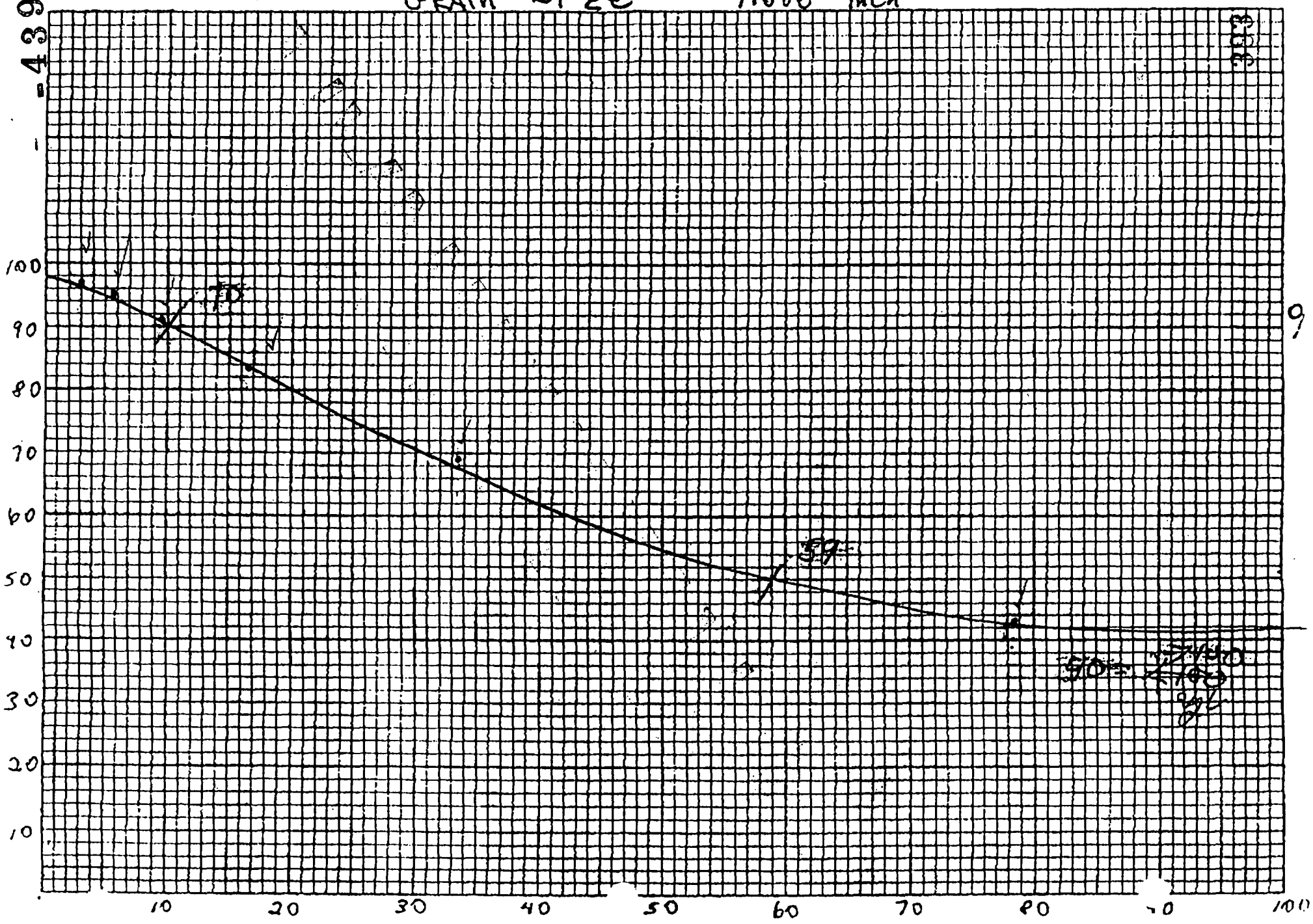
EUGENE DIETZGEN CO.
MADE IN U. S. A.

Hylak
4-26-93

P. 84

-4395

GRAIN SIZE 1/1000 inch



Customer Number: 109322

MATERIAL: Soil

SAMPLE NUMBER: 930426-078

DETERMINATION: Particle Size

METHOD: C92151 Sieve Analysis

Sample weight: 193.02

Sieve Number	Weight Retained, g	% Retained	Cumulative % Retained	Grain Size, 1/1000 inch
10	84.55	43.80	43.80	78.7
20	48.01	24.87	68.67	33.5
40	29.39	15.23	83.90	16.7
60	14.96	7.75	91.65	9.8
100	7.00	3.63	95.28	5.9
200	4.13	2.14	97.42	3.0
Pan	4.43	2.30	99.72	

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

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

Analyzed by: [signature]

Checked by: Tom McCullough 4-27-93

Date analyzed: 4-26-93

GRAIN SIZE RETAINED	40 %	>100
	50 %	59
	90 %	10

[signature] 4-26-93

-4395

FERNALD
RI/FS

WATER QUALITY
FIELD COLLECTION REPORT

Date: 4-22-93
Time: 1600
Page: 1 of 1

FADL REF # 4-22-93

PROJECT NAME	12 Wells South Plume	SAMPLE LOCATION	MW 3897
PROJECT NUMBER	WBS-04 33	SAMPLE ID NUMBER	109325, 26, ~~27~~ By 4-22-93
DATE COLLECTED	4-22-93	RFA NUMBER	
TIME COLLECTED	1630	C/C NUMBER	72001.003
COLLECTED BY	B.Y., L.P.	SAMPLE TYPE	Water Hydropunch

SAMPLING INFORMATION

BAROMETRIC PRESSURE	23.1 in Hg
AIR TEMPERATURE	52°F
DO SATURATION IN AIR	N/A
WATER TEMPERATURE	12.5°C
DEPTH OF SAMPLE	149.0-153.0
WATER LEVEL	66.5

FIELD READINGS

	BEGINNING READ 1	MIDDLE READ 2	END READ 3
pH	7.56	NA	NA
SPEC. COND. uMHOS/cm	490	NA	NA
D.O. MG/L	NA	NA	NA

	BACKGROUND	BREATHING ZONE	DOWNHOLE READING
HNU	0ppm	0ppm	0ppm

METER CALIBRATION

BY 4-22-93

pH Temp.	pH Std.	pH Std.	D.O. Temp.	D.O. Zero	D.O. Full Sc.	D.O. Calib. O_2	Spec. Cond. Temp.	Spec. Cond. Low	Spec. Cond. High	~~HNU~~ Micro Stand	HNU Lot #	HNU Span	HNU Reading
21°C	4	7				N/A	21°C	1413	12900	Isobutylene	?	NA	100ppm
OK	✓	✓	OK			N/A	OK	1325	11000				

WEATHER CONDITIONS: 55°F

ADDITIONAL REMARKS:

TEST EQUIPMENT LIST

EQUIPMENT NUMBER	EQUIPMENT NAME
004033	ORION 250A PH METER
92E039154	YSI MODEL 33 SCT METER
857985	Hydropunch
889422	Masterflex

EQUIP.	NUMBER
BAILER	N/A
HOSE/S	N/A
PUMP	N/A
FILTER KIT	GEOTECH DISPOSABLE
N/A	N/A

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304

(T.D. NA) - (W.L. NA) = NA Ht. of Water Column

NA Ht. of Water Column x NA = NA (3 Volumes)

NA Ht. of Water Column x NA = NA (5 Volumes)

FORM 0155D Rev. (1) 9/0

Field Form
Page 1 of 3

Subsurface Soil Sample Collection Log

FEMP RI/FS

Well / Boring ID No. 3847

Field Check by _____ Date _____

Computer Entry	Date	Int.
1st Key		
2nd Key		
ManVer		

Unique Sample Number	Collector's Initials	Collection Date (MM DD YY)	Collection Time (HH MM)	Sample Depth Interval	Preservative	Sequence	Blank	Spike	Duplicate	Duplicate of Sample Number	Split	Split of Sample Number	General Comments
109237	BY LP	4 7 93	15 00	0.0-1.5	N	1	NA	NA	NA	NA	NA	NA	Archives
109238			15 05	1.5-3.0		2							
109239			15 10	3.0-4.5		3							
109240			15 15	4.5-6.0		4							
109241			15 20	6.0-7.5		5							
109242			15 40	7.5-9.0		6							
109243			15 45	9.0-10.5		7							
109244			15 55	10.5-12.0		8							
109245			16 10	12.0-13.5		9							
109246		4 7 93	16 20	13.5-15.0		10							
109247		4 12 93	09 55	16.5-18.0		11							
109248			10 00	18.0-19.5		12							
109249			10 ~~10~~ 10	19.5-21.0		13							
109250			10 20	21.0-22.5		14							
109287	BY LP	4 12 93	10 30	22.5-24.0	N	15	NA	NA	NA	NA	NA	NA	Archives

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Field Form
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Subsurface Soil Sample Collection Log

FEMP RI/FS

Well / Boring ID No. 3897

Field Check by _____ Date _____

Computer Entry	Date	Int.
1st Key		
2nd Key		
ManVer		

Unique Sample Number	Collector's Initials	Collection Date (MM DD YY)	Collection Time (HH MM)	Sample Depth Interval	Preservative	Sequence	Blank	Spike	Duplicate	Duplicate of Sample Number	Split	Split of Sample Number	General Comments
109288	BY, LP	4 12 93	10 40	24.0-25.5	N	16	NA	NA	NA	NA	NA	NA	Archive
109289			10 50	25.5-27.0		17							
109290			13 45	27.0-28.5		18							
109291			13 55	28.5-30.0		19							
10 LP 04.13.93 ~~09~~ 292			14 10	30.0-31.5		20							
109293			14 20	31.5-33.0		21							
109294			14 40	33.0-34.5		22							
109295			16 05	40.0-41.5		23							
109296		4 12 93	17 15	45.0-46.5		24							
109297		4 13 93	08 45	50.0-51.5		25							
109298			10 00	55.0-56.5		26							
109299			10 15	60.0-61.5		27							
109300			14 00	65.0-66.5		28							
109301			14 45	70.0-71.5		29							
109302	BY, LP	4 13 93	16 00	75.0-76.5	N	30	NA	NA	NA	NA	NA	NA	Archive

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Field Form
Page 3 of 3

Subsurface Soil Sample Collection Log

FEMP RI/FS

Well / Boring ID No. 3897

Field Check by _____ Date _____

Computer Entry	Date	Int.
1st Key		
2nd Key		
ManVer		

Unique Sample Number	Collector's Initials	Collection Date (MM DD YY)	Collection Time (HH MM)	Sample Depth Interval	Preservative	Sequence	Blank	Spike	Duplicate	Duplicate of Sample Number	Split	Split of Sample Number	General Comments
109303	BY, L.P	4 13 93	16 15	80.0-81.5	N	31	NA	NA	NA	NA	NA	NA	Archives
109307		4 16 93	09 30	85.0-86.5		32							
109308			09 45	90.0-91.5		33							
109309			10 50	95.0-96.5		34							
109310			11 45	100.0-101.5		35							
109311		4 16 93	15 00	105.0-106.5		36							
109315		4 17 93	09 50	110.0-111.5		37							
109316			10 45	115-116.5		38							
109317			11 30	120.0-121.5		39							
109318		4 17 93	15 00	125.0-126.5		40							Archive
109322		4 22 93	11 00	130.0-140.0	BY 4-23-93 N	41							Sieve
		~~4 14 93~~	~~09 00~~	~~130.0-131.5~~									
109323		4 22 93	14 10	145.0-146.5	N	42							Archive
109324	BY, LD	4 22 93	15 10	150.0-151.5	N	43	NA	NA	NA	NA	NA	NA	Archive

ASL FORM 0155E Rev. (1) 9/01/92

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Field Form
Page 1 of 1
mw 3897

Sample Collection Log

Ground Water Task 04.33

Field Check by _____ Date _____

Computer Entry	Date	Int.
1st Key		
2nd Key		
ManVer		

Unique Sample Number	Well / Boring ID No.	Collectors Initials	Collection Date MM	DD	YY	Collection Time HH	MM	Sample Depth Interval	Preservative	Sequence	Blank	Spike	Duplicate	Duplicate of Sample Number	Split	General Comments
109305	3897	BY, LP	4	15	93	10	00	82-86.0	Y	1	NA	NA	NA	NA	WB	04.33A Hydropunch - water
109304			4	15	93	10	00	NA	N	2	Y					Trip Blank
109306			4	15	93	10	00	82-86.0	Y	3						Tot U - Fermco
109312			4	16	93	17	00	1090-1130	Y	4						Hydropunch - water 04.33A
109313			4	16	93	17	00	109.0-113.0	Y	5						Tot U - Fermco
109314			4	16	93	17	00	NA	N	6	Y					Trip Blank
109319			4	17	93	17	30	1290-1330	Y	7						Hydropunch - 04.33A
109320			4	17	93	17	30	1290-133.0	Y	8						Tot U - Fermco
109321			4	17	93	17	30	NA	N	9	Y					Trip Blank
109325			4	22	93	16	00	149.0-153.0	Y	10	N					Hydropunch - 04.33
109326	3897	BY, LP	4	22	93	16	00	149.0-153.0	Y	11	NA	NA	NA	NA	NA	Tot U - Fermco

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RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER WBS 20.03.05	PROJECT NAME LIME SLUDGE POND INVESTIGATION	
BORING NUMBER MW 1937	COORDINATES:	DATE 28APR93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 28APR93
ENGINEER/GEOLOGIST B.R. MULLER	Depth Date/Time	DATE COMPLETED: 30APR93
DRILLING METHODS HOLLOW STEM AUGER		PAGE 1 of 2

08 MAY 93 BEM

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	111138 28APR 1130	1	6	VERY SOFT (10YR, 3/3) DARK BROWN CLAY WITH TRACE COARSE SAND, MOIST	CL	0.25	BV = 60 CPM α = 0 CPM MT = 0 PPM
	111139 28APR 1130	4	6	HARD (10 YR, 6/4) LIGHT YELLOWISH BROWN SILTY CLAY WITH TRACE MED.-COARSE SAND, MOIST	CL	4.25	
	111140 28APR 1130	13	2	SAA	CL	>4.50	
2	NA 28APR 1130	13	0	NA	NA	NA	
	111141 111142 111143 1140	11	6	VERY STIFF (2.0 Y, 6/4) LIGHT OLIVE BROWN SILTY CLAY, WITH TRACE MED-COARSE SAND MOIST	CL	3.0	BV = 80 CPM α = 0 CPM MT = 0 PPM TAL - 0 111141 T.U. 111142 T.O.C. 111143
3	111141 111142 111143 1140	14	6	VERY STIFF (10 YR, 6/6) BROWNISH YELLOW SILTY CLAY, TRACE MEDIUM-FINE SAND, MOIST	CL	3.0	
	111141 111142 111143 1140	21	6	HARD, SAA INCREASED SILT AND TRACE ORANGE MOTTLES	CL	>4.5	
4	111141 111142 111143 1140	32	0	NA	NA	NA	
	111144 28APR 1330	3	6	VERY STIFF (2.5Y, 5/2) GRAYISH BROWN SILTY CLAY, MOIST	CL	2.5	BV = 70 CPM α = 0 CPM MT = 0 PPM
5	111145 28APR 1330	5	5	SAA	CL	2.75	
	NA 1330	7	0	NA	NA	NA	
6	111146 28APR 1335	10	6	VERY STIFF (5Y, 5/6) OLIVE, SILTY CLAY, MOIST	CL	3.5	BV = 70 CPM α = 0 PPM MT = 0 PPM
	111147 28APR 1335	14	6	SAA	CL	3.5	
7	111148 28APR 1335	14	3	SAA	CL	3.0	
	111149 28APR 1340	5	6	STIFF (2.5, 5/4) LIGHT OLIVE BROWN SILTY CLAY, MOIST	CL	2.0	

NOTES
DRILLING CONTRACTOR: PENN DRILL
DRILLING RIG: MOBIL B80
DRILLER: DAN JAMISON
ASSISTANT: DON ARTHUR

DESCRIPTION BASED ON MUNSELL

BACKGROUND READINGS
MICROTIP : 0 PPM
BV : 50-70 CPM
α : 0 CPM

NO RETURN = (NR)
SAME AS ABOVE = (SAA)

FERNALD
RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER WBS 20.03.05	PROJECT NAME. LIME SLUDGE POND INVESTIGATION	
BORING NUMBER. MW 1937	COORDINATES:	DATE 28 APR 93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 28 APR 93
ENGINEER/GEOLOGIST B.E. MULLER	Depth Date/Time	DATE COMPLETED: 30 APR 93
DRILLING METHODS		PAGE 2 OF 52

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (02MAY93 BEM)
8	111150 28APR 1340	7	6	VERY STIFF SAA (2.5, 5/4) LIGHT OLIVE BROWN, SILTY CLAY MOIST	CL	2.75	BY = 60 cpm α = 0 cpm MT = 0 ppm
	111151 28APR 1340	8	6	STIFF SAA	CL	1.75	TIME = 1340
9	111152 28APR 1350	5	6	STIFF (2.5 Y, 5/3) LIGHT OLIVE BROWN, SILTY CLAY, MOIST	CL	1.5	BY = 60 cpm α = 0 cpm MT = 0 ppm
	111153 28APR 1350	4	6	SAA + 1" SILTY LAYER, WET	CL	1.75	
10	111154 28APR 1350	5	2	VERY SOFT (2.5Y, 6/2) LIGHT BROWNISH GREY, SILTY CLAY, WET	CL	<0.25	TIME = 1350
	111155 28APR 1400	4	6	STIFF (2.5Y, 5/4) LIGHT OLIVE BROWN, SILTY CLAY, WET	CL	1.5	BY = 60 cpm α = 0 cpm MT = 0 ppm
11	111156 28APR 1400	5	6	VERY SOFT SAA	CL	<0.25	
	111157 28APR 1400	3	2	VERY SOFT (2.5Y, N5/) GRAY SILTY CLAY, WET	CL	<0.25	TIME = 1400
12	111158 28APR 1410	4	6	VERY SOFT (2.5Y, N4/) DARK GRAY SILTY CLAY, WET	CL	<0.25	BY = 70 cpm α = 0 cpm MT = 0 ppm
	111159 28APR 1410	4	6	SAA	CL	<0.25	
13	111160 28APR 1410	6	6	MEDIUM DENSE (2.5Y, N4/) DARK GRAY, WELL SORTED, FINE SAND AND SILT, WET	SM	NA	TIME = 1410
	111161 28APR 1415	5	6	LOOSE (2.5Y N4/) DARK GRAY, WELL SORTED, FINE SAND AND SILT, WET	SM	NA	BY = 60 cpm α = 0 cpm MT = 0 ppm
14	111162 28APR 1415	8	6	SAA	SM	NA	
	111163 28APR 1415	8	2	SAA	SM	NA	TIME = 1415
	111164 30APR 0905	8	6	MEDIUM DENSE (2.5Y, 6/2) LIGHT BROWNISH GREY, SILTY FINE SAND, WET	SM	NA	

NOTES
DRILLING CONTRACTOR: PENN DRILL
DRILLING RIG: B80
DRILLER: DAN JAMISON
ASSISTANT: DON ARTHUR

DESCRIPTION BASED ON MUNSELL

BACKGROUND READINGS:
MICROTIP: 0 PPM
BY: 50-70 CPM
α: 0 CPM

NO RETURN = (NR)
SAME AS ABOVE = (SAA)

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FERNALD
RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 20.03.05	PROJECT NAME. LIME SLUDGE POND INVESTIGATION	
BORING NUMBER. MW 1537	COORDINATES:	DATE 30APR93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 28APR93
ENGINEER/GEOLOGIST B.E. MULLER	Depth Date/Time	DATE COMPLETED: 30APR93
DRILLING METHODS HOLLOW STEM AUGER - CONTINUOUS SAMPLE		PAGE 3 OF 35

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	111165 30APR93 0705	9	6	MEDIUM DENSE (2.5Y 6/2) LIGHT BROWNISH GREY, SILTY FINE SAND WET	SM	NA	BY = 70 CPM α = 0 CPM MT = 1.0 PPM
16	111166 30APR93 0705	15	6	SAA	SM	NA	TIME: 0705
	111167 30APR93 0520	7	6	VERY DENSE (2.5Y, 5/4) LIGHT OLIVE BROWN SILT SANDY SAND WET SMALL SATURATED CLAY LAYER	SM	NA	BY = 80 CPM α = 0 CPM MT = 1.0 PPM
	111168 30APR93 0520	46	2	VERY DENSE (2.5Y 6/2) LIGHT BROWNISH GRAY, SILTY FINE SAND, WET	SM	NA	
17	~~111169~~ 30APR93 0520	13EM 50/5	30APR93 0	NA	NA	NA	TIME: 0520
111169 18	111170 30APR93 0527	13EM 17	30APR93 6	DENSE SAA	SM	NA	BY = 70 CPM α = 0 CPM MT = 0.0 PPM
	111170 30APR93 0527	15	6	SAA	SM	NA	
111171 19	111172 30APR93 0527	13EM 19	30APR93 6	DENSE (5Y, 5/4) OLIVE CLAYEY SANDY SILT VERY MOIST TRACE FINE GRAVEL	MH	2.6	TIME: 0527
111172	111173 30APR93 0534	13EM 3	30APR93 6	MEDIUM DENSE OLIVE CLAYEY SANDY SILT (5Y, 5/4) WET, TRACE GRAVEL	MH	NA	BY = 70 CPM α = 0 CPM MT = 0.6 PPM
111173	~~111174~~ 30APR93 0534	13EM 7	30APR93 6	SAA	MH	NA	
20 111174	111175 30APR93 0534	13EM 17	30APR93 6	MEDIUM DENSE (5Y, 5/4) OLIVE CLAYEY SANDY SILT TRACE FINE GRAVEL, VERY MOIST	MH	NA	TIME: 0534
				Bottom of Boring 20.5 FT			BY = α = MT =
				13EM 03MAY93			
							TIME:

NOTES
DRILLING CONTRACTOR: PENN DRILL
DRILLING RIG: MOBIL B 80
DRILLER: DAN JAMISON
ASSISTANT: MARK REBOLO

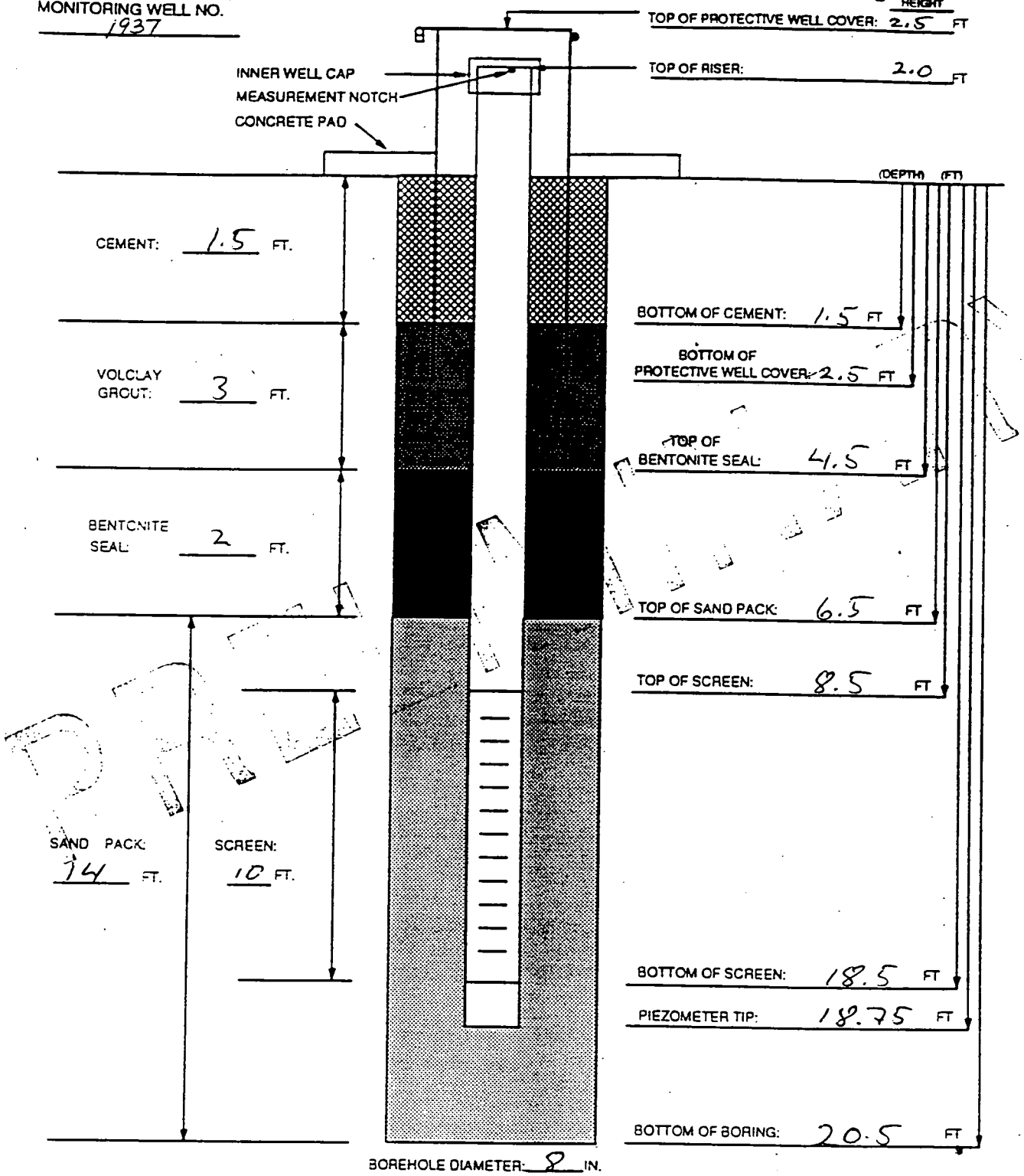
DESCRIPTION BASED ON MUNSELL

BACKGROUND READINGS:
MICROTIP: 1.6-1.1 PPM
BY: 40-50 CPM
α: 0 CPM

NO RETURN = (NR)
SAME AS ABOVE = (SAA)

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 1937

INSTALLATION DATE: May 1, 1993



BOREHOLE DIAMETER: 8 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: 10/20 7x50#
BENTONITE PELLETS (5-GALLON BUCKETS): 1
BAGS OF VOLCLAY GROUT: 1/2 BAG 50#
AMOUNT OF CEMENT: 1/2 BAG 94#
AMOUNT OF WATER USED: 8 GALLONS
OTHER: NA
TASK: NA

NOTES:

1) RISER PIPE IS 2 IN. ID. 316 STAINLESS STEEL PIPE. FLUSH-THREADED JOINTS.
2) SCREEN IS 2 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 1.82 FT. 01/05/93
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: D. E. MULLER

ASI FORM 0157 REV. (0)

FERNALD
RI/FS

- 4395

5 of 5

PIEZOMETER INSTALLATION SHEET

PROJECT NAME CRU2 PHASE II
PROJECT NO. 20.03.05
BORING NO. 1937
PIEZOMETER NO. 1937

FIELD ENG./GEO. B.E. MULLER DATE 01 MAY
CHECKED BY _____ DATE _____
DATE OF INSTALLATION 01 MAY 93

BOREHOLE DRILLING

DRILLING METHOD HOLLOW STEM AUGER
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT AUGER
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 2.0 IN I.D.
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.010 IN
TOTAL PERFORATED AREA 13 FT

RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. _____ I.D. 2.0 IN I.D.
LENGTH OF PIPE SECTIONS 10, 6 IN
JOINING METHOD FLUSH JOINT - SCREWS

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT
PROTECTIVE PIPE O.D. 4 3/8 IN

OTHER PROTECTION HINGED PROTECTIVE COVER WITH INSTALLED 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 1.5 BEM 03MAY93	TOP	BOTTOM
BENTONITE	TOP 1.5	BOTTOM ~~6.5~~ 6.5	TOP	BOTTOM
SAND 03MAY93 BEM	TOP ~~6.5~~ 6.5	BOTTOM 18.5	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 8.5	BOTTOM 18.5	TOP	BOTTOM
PIEZOMETER TIP	18.75 FT			
BOTTOM OF BOREHOLE	20.50			
GWL AFTER INSTALLATION	1.82			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS THE TOP 6 IN SECTION OF RISER IS BENT AND NEEDS TO BE REPLACED

464

409-11

313

FERNALD
RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20-03.05 RDC 11	PROJECT NAME. CRU 2 Phase II	
BORING NUMBER. 2951	COORDINATES.	DATE 4-13-93
ELEVATION:	GWL: Depth 61.7 Date/Time 4/27/93 1030	DATE STARTED 4-12-93
ENGINEER/GEOLOGIST K. Payne	Depth Date/Time	DATE COMPLETED: 4-23-93
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
1	111389 0930 4-13-93	1 4 6	12	Stiff (2.5Y, 4/3) Olive Brown Silty Clay with mottling non-plastic, slightly moist	CL	1.5	HNU = 0 ppm βγ = 100 cpm α = 0 cpm
2 3	111390 0933 4-13-93	6 10 2	12	Very Stiff (2.5Y, 5/6) light olive brown Silty Clay with trace gravel, non-plastic, slightly moist	CL	4.0	HNU = 0 ppm βγ = 100 cpm α = 0 cpm
4	111391 0940 4-13-93	6 21 25	14	Hard (2.5Y, 5/6) light olive brown, Silty Clay with trace gravel, non-plastic, slightly moist	CL	4.5	HNU = 0 ppm βγ = 60 cpm α = 0 cpm
5 6	111392 0945 4-13-93	30 33 30	15	Very Dense (2.5Y, 6/2) light brownish gray, clayey Silt with trace gravel, non-plastic, slightly moist	ML	N/A	HNU = 0 ppm βγ = 100 cpm α = 0 cpm
7	111393 0955 4-13-93	21 27 31	16	Very Dense (2.5Y, 5/3) light olive brown, clayey Silt with trace gravel, slightly plastic, moist	ML	N/A	HNU = 0 ppm βγ = 100 cpm α = 0 cpm
8 9	111394 1005 4-13-93	34 37 30	17	Very Dense (2.5Y, 5/3) light olive brown clayey Silt with trace gravel, non-plastic, slightly moist	ML	N/A	HNU = 0 ppm βγ = 70 cpm α = 0 cpm
10	111395 1500 4-13-93	9 18 23	6	Dense (10YR, 6/6) Brownish Yellow, clayey Silt, mottling, non-plastic, slightly moist	ML	N/A	HNU = 0 ppm βγ = 80 cpm α = 0 cpm
11 12	111396 1520 4-13-93	10 15 15	14	Medium Dense (2.5Y, 6/3) light yellowish Brown, Clayey Silt, non-plastic, slightly moist	ML	N/A	HNU = 0 ppm βγ = 80 cpm α = 0 cpm
13	111397 1535 4-13-93	4 5 8	7	Medium Dense (2.5Y, 4/2) dark grayish Brown, Clayey Silt, slight plasticity, moist	ML	N/A	HNU = 0 ppm βγ = 60 cpm α = 0 cpm
14 15	111398 1550 4-13-93	1 4 7	6	Medium Dense (2.5Y, N4/) dark gray, Clayey Silt, low plasticity, moist	ML	N/A	HNU = 0 ppm βγ = 80 cpm α = 0 cpm

NOTES
Drilling Contractor Pennsylvania Drilling
Drilling Equipment Cyclone 42
Driller Bob Johnson
Lonnie McGloklin

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

Background Readings
4-12-93 HNU = 0 ppm
βγ = 80 cpm

314

FERNALD
RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 10.03.05 RDC 11	PROJECT NAME. CRU 2 Phase II	
BORING NUMBER 2951	COORDINATES.	DATE 4-13-93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 4-12-9
ENGINEER/GEOLOGIST K. Payne	Depth Date/Time	DATE COMPLETED 4-23-9
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 (ISF)	REMARKS
16	111399 1610 4-13-93	2 4 8	5	Medium Dense (5Y, 5/2) Olive Gray, Clayey Silt, low plasticity, moist	ML	N/A	HNU = 0 ppm βγ = 60 cpm α = 0 cpm
17 18	111400 1630 4-13-93	1 4 8	7	SAA	ML	N/A	HNU = 0 ppm βγ = 60 cpm α = 0 cpm
19	111401 1640 4-13-93	2 4 8	6	Medium Dense (5Y, 5/2) Olive Gray, Clayey Silt with trace gravel, low plasticity, moist	ML	N/A	HNU = 0 ppm βγ = 60 cpm α = 0 cpm
20 21	111402 0850 4-15-93	25 27 8	14	Dense (5Y, 5/1) Gray Silty Sand with trace gravel, non-plastic, moist	SM	N/A	HNU = 0 ppm βγ = 120 cpm α = 0 cpm
22	111403 0910 4-15-93	8 16 45	6	Very Dense (5Y, 4/2) Olive Gray Silty Sand, non-plastic, moist	SM	N/A	HNU = 0 ppm βγ = 60 cpm α = 0 cpm
23 24	111404 0925 4-15-93	31 21 35	8	Very Dense (5Y, 5/2) Olive Gray Silty Sand with trace gravel, non-plastic, moist	SM	N/A	HNU = 0 ppm βγ = 60 cpm α = 0 cpm
25	111405 0945 4-15-93	11 25 31	5	Very Dense (5Y, 5/2) Olive Gray Silty Sand with trace gravel, non-plastic, moist	SM	N/A	HNU = 0 ppm βγ = 60 cpm α = 0 cpm
26 27	111406 1005 4-15-93	12 19 50/.3	9	Very Dense (5Y, 5/1) Gray Clayey Silt, non-plastic, moist	ML	N/A	HNU = 0 ppm βγ = 60 cpm α = 0 cpm
28	111407 1030 4-15-93	10 12 14	13	Medium Dense (5Y, 5/1) Gray Clayey Silt with trace organics and gravel, slightly plasticity, moist	ML	N/A	HNU = 0 ppm βγ = 60 cpm α = 0 cpm
29 30	111408 1040 4-15-93	11 11 17	12	Medium Dense (5Y, 5/1) Gray Clayey Silt, slight plasticity, moist	ML	N/A	HNU = 0 ppm βγ = 80 cpm α = 0 cpm

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment Cyclone 42
Driller Bob Johnson
Lonnie McGloklin

SAA - Same as above
NA - Not Applicable

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

406

Background Readings
4-13-93 { HNU = 0 ppm, βγ = 80 cpm
4-15-93 { HNU = 0 ppm, βγ = 60 cpm

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FERNALD RI/FS

- -4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME CRU 2 Phase II	
BORING NUMBER 2951	COORDINATES	DATE 4-15-93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 4-12-93
ENGINEER/GEOLOGIST Keith Payne	Depth Date/Time	DATE COMPLETED 4-17-93
DRILLING METHODS Cable Tool		PAGE 3

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31.0	111409 1350 4-15-93	10 11 15	14	Medium dense (5Y, 4/1) dark gray clayey silt, non plastic, moist	MC	N/A	HNU = 0 ppm βγ = 100 cpm α = 0 cpm
32.0 – 33.0	111410 1405 4-15-93	5 6 15	8	Medium dense (5Y, 4/1) dark gray silty sand, non plastic, moist	SM	N/A	HNU = 0 ppm βγ = 60 cpm α = 0 cpm
34.0	111411 0910 4-16-93	12 30 25	18	Hard (5Y, 4/1) dark gray, silty gravelly, medium plasticity clay, moist	CL	4.5	HNU = 0 ppm βγ = 60 cpm α = 0 cpm
35.0 – 36.0	111412 0930 4-16-93	17 21 30	13	Very Dense (2.5Y, 4/4) olive brown, well graded, pebbly sand, dry	SW	N/A	HNU = 0 ppm βγ = 60 cpm α = 0 cpm
37.0	111413 0940 4-16-93	22 28 25	11	Very Dense (2.5Y, 6/3) light yellowish brown, well graded sand, dry	SW	N/A	HNU = 0 ppm βγ = 60 cpm α = 0 cpm
38.0 – 39.0	111414 0955 4-16-93	16 15 21	9	Dense (10YR, 6/3) pale brown well graded sand, dry	SW	N/A	HNU = 0 ppm βγ = 60 cpm α = 0 cpm
40.0							
41.0	111415 1045 4-16-93	9 9 9	10	Very soft (2.5Y, 5/2) grayish brown silty, sandy, medium plasticity clay, wet	CL	<0.25	HNU = 0 ppm βγ = 60 cpm α = 0 cpm
42.0 – 43.0	111416 1330 4-16-93	27 50/.4	10	Very dense (2.5Y, 6/3) light yellowish brown, well graded pebbly sand, dry	SW	N/A	HNU = 0 ppm βγ = 60 cpm α = 0 cpm
44.0							
45.0				Resumed sampling at 5 ft intervals			

NOTES

Drilling Subcontractor: Pennsylvanian Drilling

Drilling Equipment: Cyclone 42

Driller: Bob Johnson
Lonnie McGlocklin

4-16-93
βγ background = 40-60 cpm
α background = 0 cpm
HNU background = 0 ppm

FERNALD
RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. CLU 2 Phase II	
BORING NUMBER. 2951	COORDINATES.	DATE 4-16-93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 4-12-93
ENGINEER/GEOLOGIST Keith Payne	Depth Date/Time	DATE COMPLETED: 4-23-93
DRILLING METHODS Cable Tool		PAGE 4 OF 8

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (cm)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45.0							
46.0	111417 1350 4-16-93	7 21 45	7	Very Dense (10YR, 6/2) light brownish gray, well graded, gravelly sand, dry	SW	N/A	HNU = 0ppm $\beta\gamma$ = 60cpm α = 0cpm
47.0							
48.0							
49.0							
50.0							
51.0	111418 1440 4-16-93	11 10 21	10	Dense (10YR, 4/2) dark grayish brown, well graded, silty, clayey sand, wet	SC	N/A	HNU = 0ppm $\beta\gamma$ = 60cpm α = 0cpm
52.0							
53.0							
54.0							
55.0							
56.0	111419 1500 4-16-93	21 19 50/.4	10	Very Dense (2.5Y, 6/2) light grayish brown, poorly graded, gravelly sand, dry	SP	N/A	HNU = 0ppm $\beta\gamma$ = 60cpm α = 0 cpm
57.0				Begin continuous sampling for sieve analysis and total U			
58.0							
59.0	111420 0910 4-17-93	18 29 30	8	Very Dense (2.5Y, 6/2) light brownish gray, poorly graded, gravelly sand, dry	SP	N/A	Microtip(MT) = 5.2 ppm $\beta\gamma$ = 60cpm α = 0cpm
60.0	111421			See Page 5			

NOTES

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment: Cyclone 42
Driller: Bob Johnson
Lonnie McGlocklin

4-17-93
MT background = 2-3 ppm
$\beta\gamma$ background = 60cpm
α background = 0cpm

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 20.03.05	PROJECT NAME. CRU 2 Phase II	
BORING NUMBER. 2951	COORDINATES.	DATE 4-17-93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 4-12-93
ENGINEER/GEOLOGIST Keith Payne	Depth Date/Time	DATE COMPLETED: 4-17-93
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
61.0	111421 0930 4-17-93	4 9 10	9	Medium Dense (2.5Y, 5/4) light olive brown, well graded, gravelly sand, wet	SW	N/A	MT = 6.6 ppm βγ = 60 cpm α = 0 cpm
62.0	111422 0945 4-17-93	9 10 12	16	Medium dense (2.5Y, 4/2) dark grayish brown, well graded, gravelly sand, wet	SW	N/A	MT = 8 ppm βγ = 60 cpm α = 0 cpm
63.0 64.0	111423 1000 4-17-93	14 13 14	12	Medium Dense (5Y, 5/1) gray, well graded sand with some gravel, wet	SW	N/A	MT = 7 ppm βγ = 60 cpm α = 0 cpm
65.0	111424 1030 4-17-93	18 23 16	11	Dense (5Y, 5/1) gray, well graded sand with some gravel, wet	SW	N/A	MT = 4.9 ppm βγ = 60 cpm α = 0 cpm
66.0 67.0	111425 1315 4-17-93	32 50/.3	10	Very Dense (10YR, 4/1) dark gray well graded sand with some gravel wet	SW	N/A	MT = 0 ppm βγ = 60 cpm α = 0 cpm
68.0	111426 1335 4-17-93	13 15 35	15	Dense (10YR, 4/1) dark gray well graded sand with some gravel, wet	SW	N/A	MT = 0 ppm βγ = 60 cpm α = 0 cpm
69.0 70.0	111427 1400 4-17-93	12 18 18	16	Dense (5Y, 4/2) olive gray, well graded, sand with some gravel, wet	SW	N/A	MT = 0 ppm βγ = 60 cpm α = 0 cpm
71.0	111428 1415 4-17-93	10 11 12	15	Medium Dense (5Y, 4/2) olive gray, well graded sand with some gravel, wet	SW	N/A	MT = 0 ppm βγ = 60 cpm α = 0 cpm
72.0 73.0	111429 1500 4-17-93	50 50/.3	10	Very Dense (5Y, 4/2) olive gray well graded sand with some gravel wet	SW	N/A	MT = 0 ppm βγ = 60 cpm α = 0 cpm
74.0 75.0				Bottom of Casing at 75.0' Bottom of boring at 75.0'			

NOTES
Drilling Contractor: Pennsylvania Drilling
Drilling Equipment: Cyclone 42
Driller: Bob Johnson
Lonnie McGlocklin

See Page 4 for background readings

FERNALD RI/FS

page 6 of

E- -4395

PIEZOMETER INSTALLATION SHEET

PROJECT NAME CRU 2 Phase II
FIELD ENG./GEO. K. Payne DATE 4-26
PROJECT NO. 20.03.05 RDC11
CHECKED BY _____ DATE _____
BORING NO. 2951
PIEZOMETER NO. ~~NA~~ 2951 BR 4-21-93
DATE OF INSTALLATION 4-23-93

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0.0 FT TO 65.0 FT
FLUID N/A FROM N/A TO N/A

TYPE OF BIT Hammer Percussion Bit
CASING SIZE (S) USED:
SIZE 10.0 in ID FROM 0.0 FT TO 75.0 F
SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4.0 ID
PERFORATION TYPE:
SLOTS [X] 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 5-10FT; 1-5FT; 2-
JOINING METHOD Screw type-flush joint threaded

PROTECTION SYSTEM

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

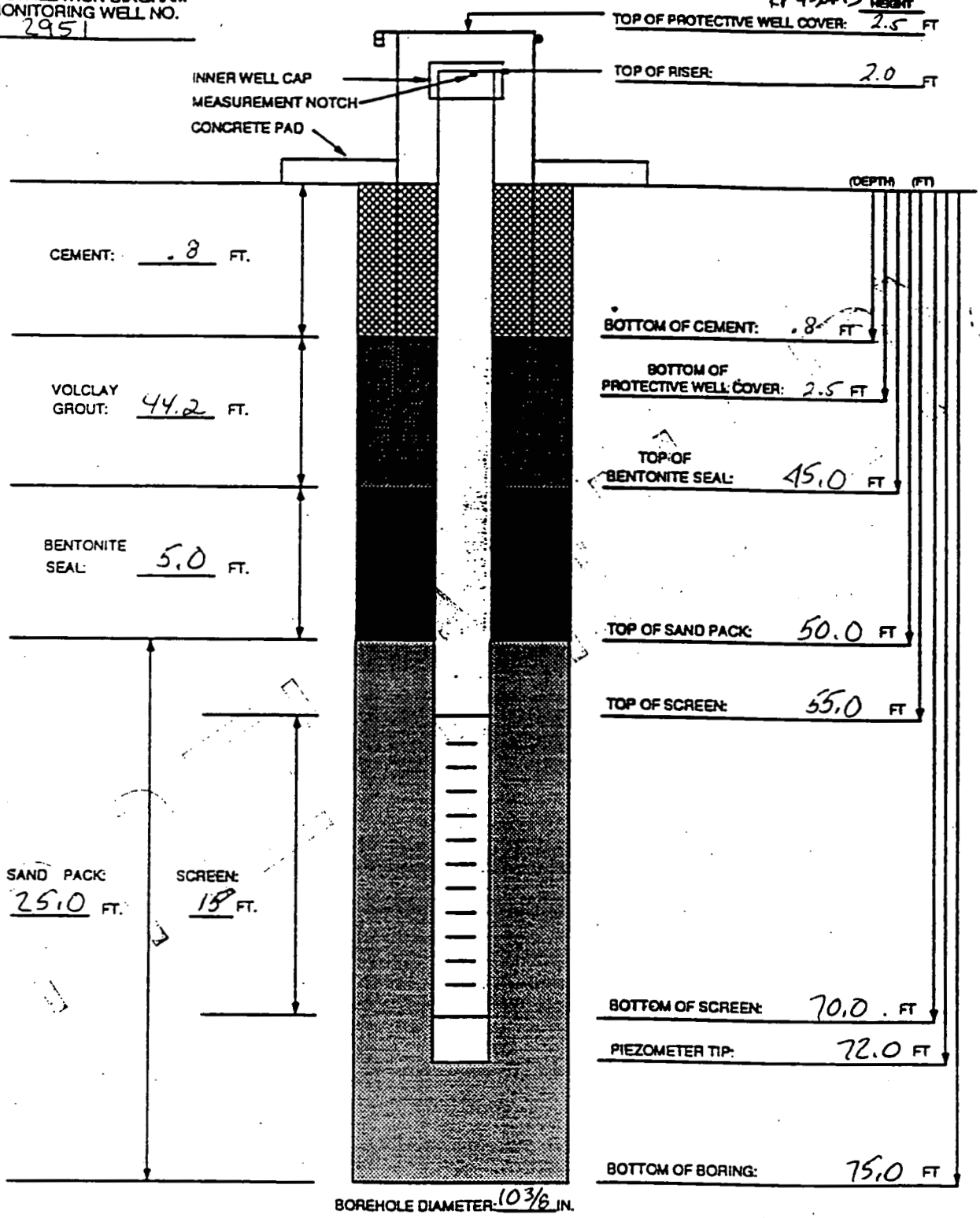
OTHER PROTECTION Hinged locking cover with padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0 FT			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 FT			
BOREHOLE FILL MATERIALS:	TOP 0.0 FT	BOTTOM .8 FT		
Cement GROUT/SLURRY	TOP .8 FT	BOTTOM 45.0 FT	TOP	BOTTOM
BENTONITE	TOP 45.0 FT	BOTTOM 50.0 FT	TOP	BOTTOM
SAND	TOP 50.0 FT	BOTTOM 75.0 FT	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 55.0 FT	BOTTOM 70.0 FT	TOP	BOTTOM
PIEZOMETER TIP	72.0 FT			
BOTTOM OF BOREHOLE	75.0 FT			
GWL AFTER INSTALLATION	61.7 FT (Top of Riser)			

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 .8 ft to hold the protective cover in place.

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 2951

INSTALLATION DATE: ~~4/19/93~~ 4-23-93
KP 4-23-93



MATERIALS USED

SAND TYPE AND QUANTITY: 10/20, 25 bags @ 50lb
BENTONITE PELLETS (5-GALLON BUCKETS): 4
BAGS OF VOLCLAY GROUT: 10.5
AMOUNT OF CEMENT: 1 bag @ 94 lb
AMOUNT OF WATER USED: 900 gal
OTHER: 13 Drums Soil; 1 Drum Alconox/Water
TASK: 20.03.05 ROC II

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 4/23/93 FT/ 61.
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: Keith Payne

ASI FORM 0157 REV. (0)

MW2951

930419-048

4-20-93 Tom McCullough

C

***** CHAIN OF CUSTODY *****

Analysis ID: 930419-048 Project No.: 0020-0001 Charge: RDC11
Customer No.: 111430 Customer Name: FERMCO
Mat'l. Descr.: OU-2 PHASE 2 Deadline: 26-APR-19
Sample Matrix: SOIL Date Sampled: 17-APR-19
Comments: SEND RESULTS TO: MIKE FRANK FAX: (513)738-0145

Sample Logged By: KS FRENCH Modified By: KS FRENCH
Sampled From: B2951 Date Modified: 19-APR-1993 13:25

ENVIRONMENTAL & PROCESS MATERIALS LABORATORY

Analysis	Units	Activ.	Prep Proc No	Analys Proc N
SIEVE ANALYSIS, 40% RETAINED	.001 INCH	9158	42	9158
SIEVE ANALYSIS, 50% RETAINED	.001 INCH	9158	32	9158
SIEVE ANALYSIS, 90% RETAINED	.001 INCH	9158	8	9158

Crosschecked by: _____ FAXED
Entered on Computer by: _____ ~~Phoned~~ in at _____ hrs on ___
Approved and Printed by: _____ Dated by _____

412

321

Customer Number: 111430

MATERIAL: 930419-048 SAMPLE NUMBER:

DETERMINATION: Particle Size METHOD: Sieve Analysis

Sample weight: 191.9

Sieve Number	Weight Retained, g	% Retained	Cumulative % Retained	Grain Size, 1/1000 inch
10	45.4	~~23.6~~ 23.7	~~23.6~~ 23.7	78.7
20	47.3	24.6	48.3	33.5
40	53.0	27.6	75.9	16.7
60	25.8	13.4	89.3	9.8
100	8.3	4.3	93.6	5.9
200	4.8	2.5	96.0	3.0
Pan	6.9	3.6	99.6	

$\frac{W_2 \times 100\%}{W_1} = R$ 191.5

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

Analyzed by: Scott McCullough

Checked by: [signature]

Date analyzed: 4-20-93

Grain Size Retained

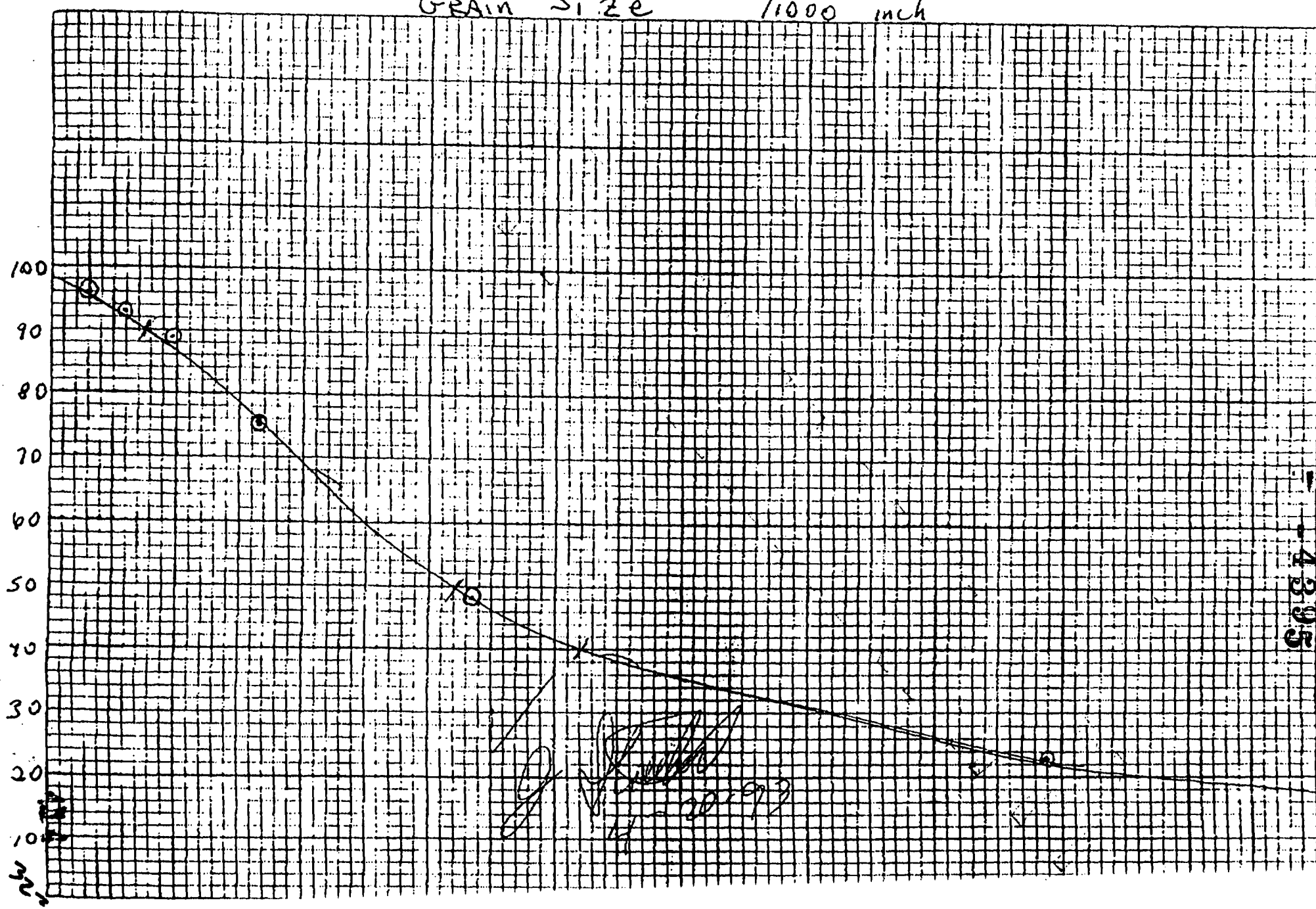
40 %	42
50 %	32
90 %	8

NO 340/ 10 DIETZGEN GRAPH PAPER
10 X 10 PER INCH

930417-048 EUGENE DIETZGEN CO. MADE IN U. S. A.

Tom McCullough

GRAIN SIZE 1/1000 inch



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FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05 (RDC11)	PROJECT NAME: CRU 2 / PHASE 2	
BORING NUMBER: 2947	COORDINATES:	DATE: 04/07/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/07/93
ENGINEER/GEOLOGIST: P. McCARREN	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	111339 0920 04/07/93	6 15 15	12	STIFF, 10 YR 3/2, DARK BROWN SILTY CLAY, MOTTELING SOME SAND AND PLANT FIBERS, LOW PLASTICITY, MOIST	CL	1.5	BZ 60-80 cpm HNU 0 ppm ALPHA 0 CPM
2 3	111340 0935 04/07/93	12 13 15	8	STIFF, 10 YR 5/4, BROWN, SILTY CLAY MOTTELING, SOME FINE SAND LOW PLASTICITY, MOIST	CL	1.5	BZ 80-120 cpm HNU 0 ppm ALPHA 0 CPM
4	111341 0940 04/07/93	10 12 11	10	SAA	CL	1.5	BZ 80-120 cpm HNU 0 ppm ALPHA 0 CPM
5 6	111342 0942 04/07/93	11 11 10	12	STIFF 10 YR 4/2, DARK BROWN, SILTY CLAY, REDDISH MOTTELING, SOME FINE SAND, LOW PLASTICITY, MOIST	CL	1.0	BZ 80-120 cpm HNU 0 ppm ALPHA 0 cpm
7	111343 0952 04/07/93	3 5 8	9.5	VERY STIFF, 10 YR 5/2, SILTY CLAY MOTTELING, SOME FINE SAND & GRAVELS LOW PLASTICITY, MOIST	CL	3.0	BZ 60-80 cpm HNU 0 ppm ALPHA 0 CPM
8 9	111344 0955 04/07/93	9 11 14	18	VERY STIFF, 10 YR 5/2, SILTY CLAY, MOTTELING SOME FINE SAND, LOW PLASTICITY, MOIST 9"-18" VERY STIFF, 10 YR 5/1 CLAYEY SILT MEDIUM PLASTICITY, MOIST	CL / ML	3.0	BZ 80-120 cpm HNU 0 ppm ALPHA 0 CPM
10	111345 1005 04/07/93	13 25 28	18	VERY STIFF, 10 YR 5/4, SILTY CLAY MOTTELING, SOME FINE SAND, TRACE SMALL GRAVELS, LOW PLASTICITY MOIST	CL	3.0	BZ 80-120 cpm HNU 0 ppm ALPHA 0 CPM
11 12	111346 1025 04/07/93	9 22 17	16	SAA	CL	3.5	BZ 80-120 cpm HNU 0 ppm ALPHA 0 CPM
13	111347 1035 04/07/93	10 13 16	18	VERY STIFF, 10 YR 5/1 CLAYEY SILT MOTTELING (RED OXIDE) SOME FINE SAND & SMALL GRAVEL, LOW PLASTICITY, MOIST	ML	3.5	BZ 80-120 cpm HNU 0 ppm ALPHA 0 CPM
14 15	111348 1335 04/07/93	12 19 16	18	VERY STIFF 10 YR 5/3 CLAYEY SILT FINE SAND, SOME SMALL GRAVELS OXIDE STAIN, LOW PLASTICITY, MOIST	ML	3.5	BZ 60-80 cpm PHOTOVAC 0.0 ppm ALPHA 0 CPM

NOTES:

DRILLING CONTRACTOR PENNSYLVANIA DRILLING
DRILLING RIG 72 SPEED STAR
DRILLER CRAIG COULTER
HELPER BILL SHACK
SAMPLE TECH - JENNIFER MILLHEIT

ABRV.: SAA - SAME AS ABOVE
NA - NOT APPLICABLE

- SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
- COLORS IDENTIFIED USING MUNSELL COLOR CHART

FERNALD RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05 (RDC11)	PROJECT NAME: CRU 2 / PHASE 2	
BORING NUMBER: 2947	COORDINATES:	DATE: 04/07/93 (08)
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/07/93
ENGINEER/GEOLOGIST: P. McCARREN	Depth Date/Time	DATE COMPLETED:
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
15 16	111349 1435 04/07/93	7 10 16	16	VERY STIFF, 2.5 Y 5/4, CLAYEY SILT FINE SAND, SOME SMALL GRAVELS, OXIDE STAIN, LOW PLASTICITY, MOIST	ML	2.0	Bz 60-80 cpm PHOTOVAC 0.0 ppm ALPHA 0 cpm
17 18	111350 1445 04/07/93	7 11 17	16	SAA	ML	2.0	Bz 60-80 cpm PHOTOVAC 0.0 ppm ALPHA 0 cpm
19	111351 1450 04/07/93	9 17 25	16	VERY STIFF 2.5Y 4/1, CLAYEY SILT SOME SMALL GRAVELS, OXIDE STAIN LOW PLASTICITY, MOIST	ML	3.0	Bz 80-100 cpm PHOTOVAC 0.0 ppm ALPHA 0 cpm
20 21	111352 1505 04/07/93	9 16 26	18	SAA	ML	2.5	Bz 60-80 cpm PHOTOVAC 0.0 ppm ALPHA 0 cpm
22	111353 1515 04/07/93	7 12 27	16	SAA	ML	3.0	Bz 60-80 cpm PHOTOVAC 0.0 ppm ALPHA 0 cpm
23 24	111354 1605 04/07/93	7 15 17	14	VERY STIFF 2.5Y 4/1 CLAYEY SILT SMALL GRAVELS; LOW PLASTICITY, MOIST	ML	2.0	Bz 60-80 cpm PHOTOVAC 0.0 ppm ALPHA 0 cpm
25	111355 1615 04/07/93	9 15 20	14	SAA	ML	2.5	Bz 60-80 cpm PHOTOVAC 0.0 ppm ALPHA 0 cpm
26 27	111356 1625 04/07/93	6 12 20	6	SAA	ML	3.5	Bz 60-80 cpm PHOTOVAC 0.0 ppm ALPHA 0 cpm
28	111357 1025 04/08/93	8 11 19	6	SAA	ML	2.5	Bz 60-80 cpm PHOTOVAC 0 ppm ALPHA 0 cpm
29 30	111358 1035 04/08/93	7 10 17	4	SAA	ML	2.0	Bz 40-60 cpm PHOTOVAC 0 ppm ALPHA 0 cpm

NOTES

DRILLING CONTRACTOR PENNSYLVANIA DRILLING
DRILLING RIG 72 SPEED STAR
DRILLER CRAIG COULTER
HELPER BILL SIBECT
SAMPLE TECH - JENNIFER MILCHERT

ABRV.: SAA - SAME AS ABOVE
NA - NOT APPLICABLE

- SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
- COLORS IDENTIFIED USING MUNSELL COLOR CHART

FERNALD RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05 (RDC11)	PROJECT NAME. CRUZ / PHASE 2	
BORING NUMBER: 2947	COORDINATES:	DATE. 04/08/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/07/93
ENGINEER/GEOLOGIST. P. McCARREN	Depth Date/Time	DATE COMPLETED:
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
30	111359	7					BZ 40-60 cpm
31	1045	17		SAA	ML	3.0	HNU 0 ppm
	04/08/93	25	3				ALPHA 0 cpm
32	111360	7					BZ 40-60 cpm
	1055	12		SAA	ML		HNU 0 ppm
33	04/08/93	23	12			2.5	ALPHA 0 cpm
	111361	0					BZ 40-60 cpm
34	1345	0		SAA	ML	2.5	HNU 0 ppm
	04/08/93	13	8				ALPHA 0 cpm
		16					
35	111362	16		very soft 2.5Y 4/1 clayey silt small gravels, low plasticity, some sand moist	ML	3.0	BZ 40-60 cpm
	1400	50/3	4				HNU 0 ppm
36	04/08/93						ALPHA 0 cpm
	111363						BZ 40-60 cpm
37	1425	50/3	3	SAA	ML	2.0	HNU 0 ppm
	04/08/93						ALPHA 0 cpm
38	111364	12					BZ 40-60 cpm
	1445	17	18	SAA	ML	3.5	HNU 0 ppm
39	04/08/93	20					ALPHA 0 cpm
	111365	40		very soft 2.5Y 4/1, clayey silt small gravels, small sand lenses, low plasticity, moist			BZ 40-60 cpm
40	1500	23	16		ML	3.5	HNU 0 ppm
	04/08/93	25					ALPHA 0 cpm
41	111366	9					BZ 40-60 cpm
	1515	17	16	SAA	ML	3.0	HNU 0 ppm
42	04/08/93	23					ALPHA 0 cpm
	111367	14		~~0-17 [illegible]~~ 0-7" SAA top of aquifer?	ML / SM	3.0 / NA	BZ 40-60 cpm
43	1530	50/2	14	7"-14" very dense 10YR 5/6 very fine silty sand moist			HNU 0 ppm
	04/08/93						ALPHA 0 cpm
44	111368	24		top of aquifer ~43.5-44.5			BZ 40-60 cpm
	1540	29	16	SAA	SM	NA	HNU 0 ppm
45	04/08/93	50					ALPHA 0 cpm

NOTES

DRILLING CONTRACTOR PENNSYLVANIA DRILLING
DRILLING RIG 72 SPEED STAR
DRILLER CRAIG COULTER
HELPER BILL SHORT
SAMPLE TECH - JENNIFER MOLLET

ABRV.s : SAA - SAME AS ABOVE
NA - NOT APPLICABLE

- SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
- COLORS IDENTIFIED USING MUNSELL COLOR CHART

FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 2003.05 (ROEH)	PROJECT NAME. CRU 2 / PHASE 2	
BORING NUMBER. 2947	COORDINATES.	DATE 04/06/93 - 04/12/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 04/07/93
ENGINEER/GEOLOGIST P. McLAREN	Depth Date/Time	DATE COMPLETED.
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
45							
50	111369 0910 04/12/93	50/4	4	VERY DENSE 10YR 5/6. medium to fine silty sand some gravels moist	SM	NA	Bz 20-40 cpm Hnu 0 ppm Alpha 0 cpm
55	111370 0935 04/12/93	50/4	6	SAA	SM	NA	Bz 20-40 cpm Hnu 0 ppm Alpha 0 cpm
60	111371 1450 04/12/93	24 40 31	12	SAA	SM	NA	Bz 20-40 cpm Hnu 0 ppm Alpha 0 cpm
62	111372 1510 04/12/93	9 24 36	14	SAA	SM	NA	Bz 20-40 cpm Hnu 0 ppm Alpha 0 cpm
64	111373 1600 04/12/93	50/4	4	SAA	SM	NA	Bz 20-40 cpm Hnu 0 ppm Alpha 0 cpm Quite large gravel
65	111374 1625 04/12/93	50/4	10	SAA	SM	NA	Bz 20-40 cpm Hnu 0 ppm Alpha 0 cpm
67	111375 1645 04/12/93	50/4	4	SAA	SM	NA	Bz 20-40 cpm Hnu 0 ppm Alpha 0 cpm

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment 72 speed STAR
Driller CRAG Coulter
Bill Sibert
Sample Tech - Jennifer McCleit

SAA - Same as above
NA - Not Applicable

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

118

327

FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05 (CELL)	PROJECT NAME. Cell 2 / PHASE 2	
BORING NUMBER 2947	COORDINATES.	DATE 04/12/93 - 04/13/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 04/07/93
ENGINEER/GEOLOGIST P. McCarren	Depth Date/Time	DATE COMPLETED.
DRILLING METHODS CABLE TOOL		PAGE 5 OF 6

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
67.5 68 69	111374 1710 04/12/93	21 42 50	10	VERY DENSE 10YR 5/6 MEDIUM TO FINE SAND SOME SMALL GRAVELS MOIST 6"-10" VERY DENSE 10YR 4/1 POORLY SORTED COARSE MEDIUM & FINE SAND AND GRAVELS WET	SM / SM	NA	BZ 20-40 cpm HNU 0 ppm ALPHA 0 cpm
70	111377 0910 04/13/93	29 41 50	12	VERY DENSE 10YR 4/1, POORLY SORTED COARSE MEDIUM & FINE SAND SOME SILT, WET AND SMALL GRAVELS	SM	NA	BZ 20-40 cpm HNU 0 ppm ALPHA 0 cpm
71 72	111378 0940 04/13/93	12 25 34	14	SAA	SM	NA	BZ 20-40 cpm HNU 0 ppm ALPHA 0 cpm
73	111379 1020 04/13/93	50/4	14	VERY DENSE 10YR 4/1 POORLY SORTED COARSE MEDIUM & FINE SAND, 15% SMALL GRAVELS WET	SM	NA	BZ 20-40 cpm HNU 0 ppm ALPHA 0 cpm
74	111380 1045 04/13/93	12 24 50	10	SAA	SM	NA	BZ 20-40 cpm HNU 0 ppm ALPHA 0 cpm
75 76	111381 1055 04/13/93	2 5 15	0	SAA	SM	NA	BZ 20-40 cpm HNU 0 ppm ALPHA 0 cpm
77	111382 1110 04/13/93	8 24 50	10	SAA	SM	NA	BZ 20-40 cpm HNU 0 ppm ALPHA 0 cpm
78 79 80 82				FINISHED SAMPLING - LAST SAMPLE 78'			

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment 72 SPEED STAR
Driller CRAIG GOULTER
BILL SIBERT
SAMPLE TECH - DENNIS PERKINS

SAA - Same as above
NA - Not Applicable

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

419

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FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 20.03.05 (RDC11)	PROJECT NAME: CRU 2 / PHASE 2	
BORING NUMBER: 2947	COORDINATES:	DATE: 04/13/93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04/07/93
ENGINEER/GEOLOGIST: P. McCarren	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: CABLE TOOL		PAGE 6 OF 6

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
82							
83							
84							
85				Bottom of Boring 85.0 ft			Collected Composite Sieve Sample 111383 from 60ft-78ft Collected Composite Total U sample 111384 from 60ft-78ft - 8" steel casing u[illegible] from 0.0ft to 85.0 ft - will install 4" stai[illegible] steel well ~300 gallons of wa[illegible] used

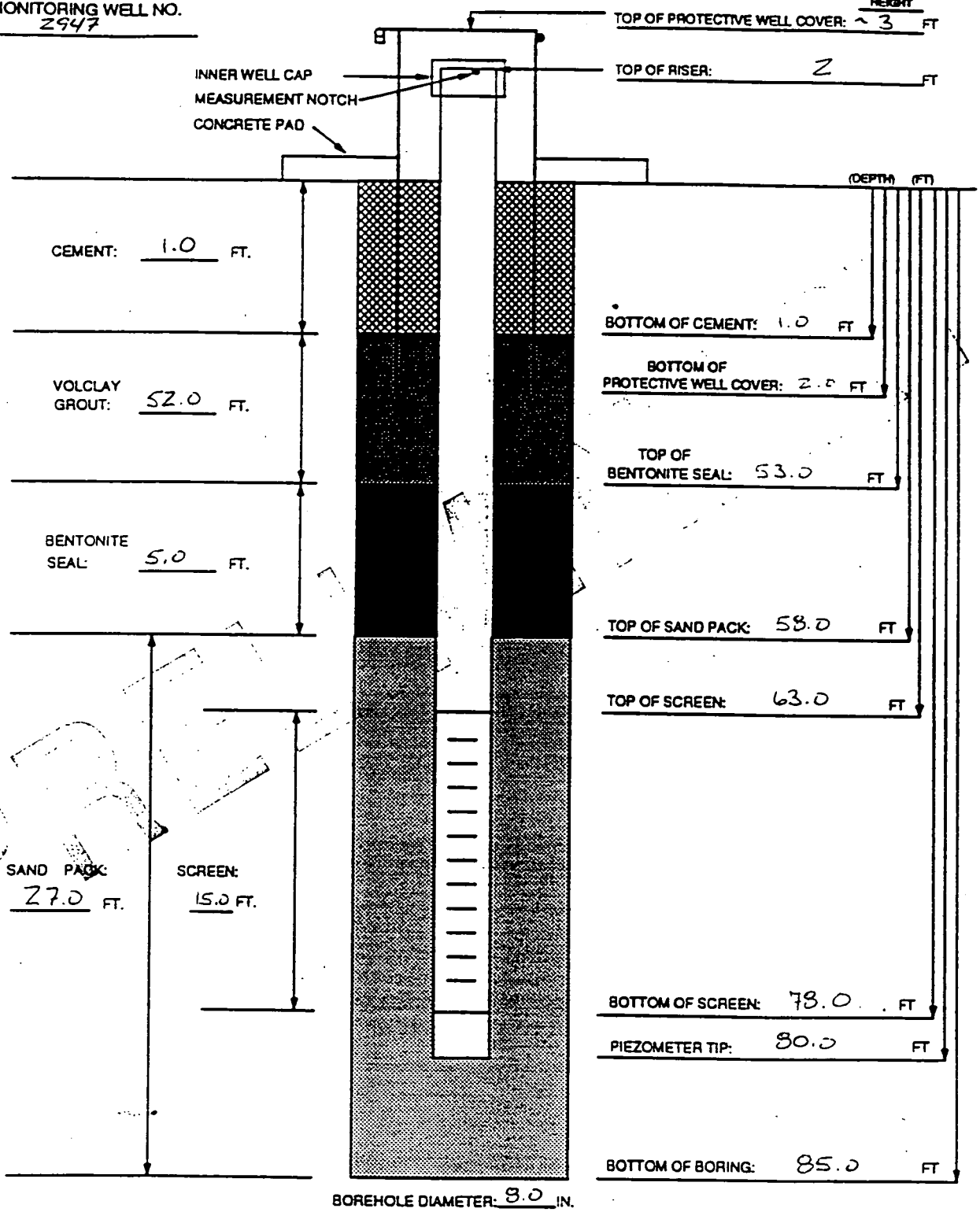
NOTES:
Drilling Contractor - Pennsylvania Drilling
Drilling Equipment - 72 Speed Star
Driller - Craig Coulter
Helper - Bill Siebert
Sample Tech - Jennifer Michert

SAA - Same as above
NA - Not Applicable

Samples collected per ASTM standard penetra[illegible] test
Munsell Color Chart used to identify colors

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 2947

INSTALLATION DATE: 04/16-18/93



MATERIALS USED

SAND TYPE AND QUANTITY: 4/30 COARSE - 18 50Lbs BAGS
BENTONITE PELLETS (5-GALLON BUCKETS): 5
BAGS OF VOLCLAY GROUT: 7 50Lbs BAGS
AMOUNT OF CEMENT: 1/2 50 Lbs BAG
AMOUNT OF WATER USED: ~300 Gallons
OTHER: 8 DRUMS SOIL/WATER 1 DRUM ALCONOX/WATER
TASK: 20.03.05 (RDCII)

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 68.1 FT/04
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: Paul C McCarren

ASI FORM 0157 REV. (0)

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME CRU 2 / PHASE 2 FIELD ENG./GEO. P. McCARREN DATE 04/15/9
PROJECT NO. 20.03.05 (RDC11) CHECKED BY _____ DATE _____
BORING NO. 2947
PIEZOMETER NO. MW 2947 DATE OF INSTALLATION 04/16-18/93

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 ft TO 85.0 ft
FLUID _____ FROM _____ TO _____

TYPE OF BIT HAMMER PERCUSSION
CASING SIZE (S) USED:
SIZE 8 IN FROM 0.0 ft TO 85.0 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 0.020 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 6-10ft 1-5 ft
JOINING METHOD SCREW TYPE - FLUSH JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft
PROTECTIVE PIPE O.D. 10 IN

OTHER PROTECTION HINGED LOCKING COVER WITH PAD 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		
~~BENTONITE~~ CEMENT GROUT / ~~SLURRY~~ PCM 04/15/93	TOP 1.0	BOTTOM 53.0	TOP	BOTTOM
BENTONITE PELLETS	TOP 53.0	BOTTOM 58.0	TOP	BOTTOM
SAND #30 COARSE	TOP 58.0	BOTTOM 85.0	TOP	BOTTOM
GRAVEL - NONE USED	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 63.0	BOTTOM 78.0	TOP	BOTTOM
PIEZOMETER TIP	80.0 ft			
BOTTOM OF BOREHOLE	85.0 ft			
GWL AFTER INSTALLATION				

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' TO HOLD PROTECTIVE PIPE IN-PLACE

P. McCarren

04/15/93 13:35 WMCO SAMPLE RECEIVING LAB 002

-4395

Customer Number: _____

MATERIAL: 930413-086 SAMPLE NUMBER: _____

DETERMINATION: Particle Size METHOD: Sieve Analysis

Sample weight: 189.3

Sieve Number	Weight Retained, g	% Retained	Cumulative % Retained	Grain Size, 1/1000 inch
10	51.2	~~51.2~~ 27.0	27.0	78.7
20	41.5	21.9	48.9	33.5
40	41.1	21.7	70.6	16.7
60	25.6	13.5	84.1	9.8
100	12.0	6.3	90.4	5.9
200	7.8	4.1	94.5	3.0
Pan	9.5	5.0	99.5	

$\frac{W_2 \times 100\%}{W_1} = R$ (188.7)

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

Analyzed by: Tom McCullough | Checked by: [illegible] | Date analyzed: 4-15-93

Grain Size Retained

40 % 44

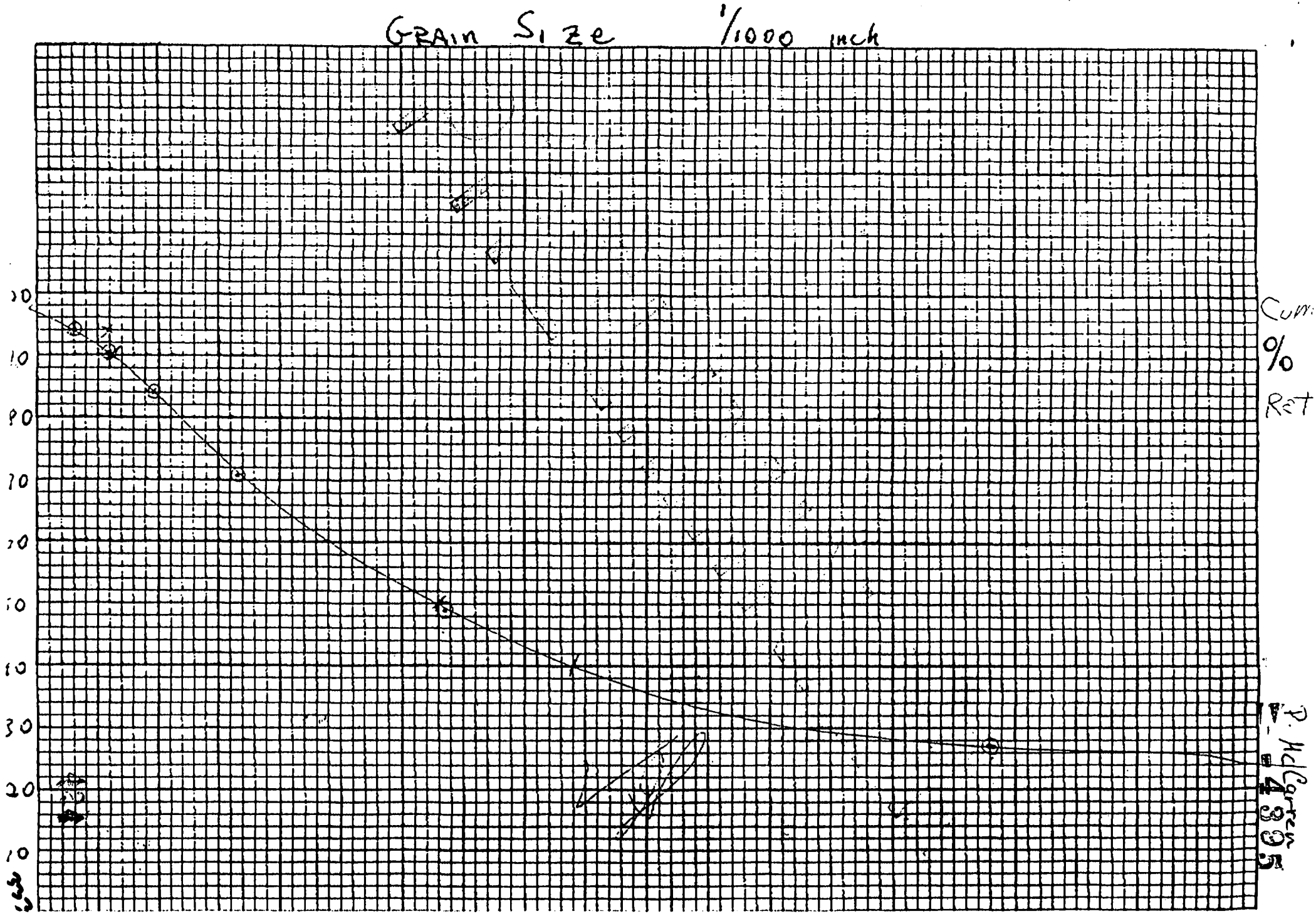
50 % 33

90 % 6

423 332

NO. 340/ 1-10 DIETZGEN GRAPH PAPER
10 X 10 PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



04/15/93
BY P. McCARREN

SIEVE ANALYSIS CALCULATION

-4395

WELL # 2947

RETAINED VALUES

90% = .006
50% = .033
40% = .044

40%/90% $.044/.006 = 7.\overline{33}$ $7.\overline{33} > 3$ USE FACTOR 4

$4 \times .033 = .132$

THE 50% RETAINED VALUE MORE CLOSELY FITS THE 4/30 COARSE SAND AND .020 SLOT SCREEN

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. OU2 - SWL		
BORING NUMBER 1952	COORDINATES.		DATE 4/30/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED 4/30/93
ENGINEER/GEOLOGIST J. Reagan	Depth	Date/Time	DATE COMPLETED. 5/1/93
DRILLING METHODS Hollow stem auger			PAGE 1 OF 3

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
							Bγ = 60-80 cpm α = 0 cpm Mt = 0 ppm @ 1/12 4/30
	111652 1430 4/30	4	6	Stiff, 10YR3/3, silty fine sand, low plasticity, moist	ml	2.0	Bγ = 60 cpm α = 0 cpm Mt = 0 ppm
1	111653 1430 4/30	8	6	very stiff, 2.5Y 4/3, olive brown, 2.5Y 5/4 mottled, silty clay, slightly plastic, moist	cl	2.0	
	111654 1430 4/30	11	6	SAA	cl	2.0	
2	111655 1430 4/30	11	6	SAA	cl	2.0	
	111656 1435 4/30	5	6	SAA	cl	2.0	Bγ = 80 cpm α = 0 cpm Mt = 0 ppm
3	111657 1435 4/30	6	6	SAA	cl	2.0	
	NA	6	0	NR	NA	NA	
	NA	9	0	NR	NA	NA	
4	111658 1450 4/30		NA	Shelby tube	NA	NA	Bγ = NA α = NA Mt = NA
	NA	NA	↓	↓	↓	↓	
5	NA						
	NA		NA	Shelby tube	NA	NA	
6	111659 1500	7	6	very stiff, 2.5Y 5/4, silty clay, slightly plastic moist	cl	2.0	Bγ = 80 cpm α = 0 cpm Mt = 0 ppm
	111660 1500	10	6	stiff, 2.5Y 5/4, silty clay, low plasticity, moist	cl	1.5	TOC Sample # 111660
7	111676 1500	11	6	very stiff, 2.5Y 2/1, black, silty clay, low plasticity, moist	cl	2.0	Total U Sample # 111676

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment Acker Soil Sentry
Driller Marty Watral
Bob Dailey

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 20.03.05	PROJECT NAME. OU2 - SWL		
BORING NUMBER. 1952	COORDINATES.		DATE 4/30/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED 4/30/93
ENGINEER/GEOLOGIST J. Reagan	Depth	Date/Time	DATE COMPLETED. 5/1/93
DRILLING METHODS Hollow Stem auger			PAGE 2 OF 3

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	111660 1500 4/30	19	6	very stiff, 2.5Y2/1, black, silty clay, low plasticity, moist	CL	2.0	
	111661 1500 4/30	4	6	very stiff, 2.5Y5/4, silty clay, low plasticity moist	CL	2.0	Bγ = 60cpm
9	111662 1510 4/30	6	6	very stiff, 2.5Y2/1, black, silty clay, low plasticity, moist	CL	2.0	α = 0cpm mt = 0ppm
	111663 1510 4/30	8	6	very stiff, 2.5Y5/4 silty clay, low plasticity, moist	CL	2.0	
	111664 1510 4/30	14	6	SAA	CL	2.0	
10	111665 1515 4/30	5	6	very stiff, 2.5Y2/1, black, silty clay, low plasticity, moist	CL	2.5	Bγ = 60cpm
	111666 1515 4/30	9	6	very stiff, 2.5Y5/4, silty clay, medium plasticity, moist	CL	3.0	α = 0 cpm
11	111667 1515 4/30	11	6	SAA	CL	2.5	mt = 0 ppm
	111668 1515 4/30	16	6	very stiff, 2.5Y5/4, silty clay trace sand, low plasticity, wet	CL	2.5	
12	111669 1530 4/30		NA	Shelby tube	NA	NA	Bγ = NA
	~~111670~~						α =
13		NA					mt =
	111669 1530 4/30		NA	Shelby tube	NA	NA	
14	111670 1545 4/30	5	6	very stiff, 2.5Y5/4, silty clay trace sand, low plasticity, moist	CL	3.0	Bγ = 100cpm
	111670 1545 4/30	12	6	SAA	CL	3.0	α = 0cpm mt = 0ppm
15							

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment Acker Soil Sentry
Driller Marty Watral
Bob Deiley

SAA - Same as above
NA - Not Applicable

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

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 20.03.05	PROJECT NAME. OU2-SWL		DATE 4/30/93 + 5/1/93
BORING NUMBER 1952	COORDINATES.		DATE STARTED 4/30/93
ELEVATION:	GWL: Depth	Date/Time	DATE COMPLETED. 5/1/93
ENGINEER/GEOLOGIST J. Reagan	Depth	Date/Time	PAGE 3 OF 3
DRILLING METHODS Hollow stem auger			

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15	111671 1545 4/30	17	6	very stiff, 2.5Y5/4, silty clay, trace sand, low plasticity, moist	cl	3.0	TOC Sample # 11167
	111677 1545 4/30	20	6	SAA	cl	3.0	Total U Sample # 1116
16	111672 1600 4/30	5	6	very stiff, 2.5Y 5/4, 2.5Y 6/1 mottles clay, medium plasticity, moist, few gravels	cl	3.0	βγ = 40cpm
	111673 1600 4/30	5	6	SAA	cl	2.5	α = 0 cpm
17	111674 1600 4/30	12	6	very stiff, 2.5Y5/4, 2.5Y6/1 and 10YR5/4 mottles clay, medium plasticity moist	cl	2.5	mt = 0ppm
	NA	21	0	NR	NA	NA	
18	111675 840	16	6	very stiff, 2.5Y5/1 gray, 2.5Y6/4 mottles, silty clay, slightly plastic moist	cl	2.5	βγ = 80cpm
	NA	36	NA	NR			α = 0cpm
19	NA	50	NA	NR			mt = 1.4ppm
	NA	50	NA	NR			
20							5/1/93 Backg
							βγ = 60-80cp
							mt = 1.4ppm
							α = 0cpm

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment Acker Soil Sentry
Driller Marty Watral
Bob Deiley / Bill Sibert

SAA - Same as above
NA - Not Applicable

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

FERNALD RI/FS

4395

PIEZOMETER INSTALLATION SHEET

PROJECT NAME OU2 - SWL
PROJECT NO. 20-03.05
BORING NO. 1952
PIEZOMETER NO. MW1952

FIELD ENG./GEO. J. Reagan DATE 5/1/9
CHECKED BY _____ DATE _____
DATE OF INSTALLATION 5/1/93

BOREHOLE DRILLING

DRILLING METHOD hollow stem auger
DRILLING FLUID (S) USED:
FLUID NA FROM NA TO NA
FLUID NA FROM NA TO NA

TYPE OF BIT auger
CASING SIZE (S) USED:
SIZE NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Stainless
DIAMETER OF PERFORATED SECTION 2 in
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010 in
TOTAL PERFORATED AREA 10%

RISER PIPE MATERIAL Stainless
RISER PIPE DIAMETERS:
O.D. _____ I.D. 2 in
LENGTH OF PIPE SECTIONS 10
JOINING METHOD flush joint

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION clean, overturned drum

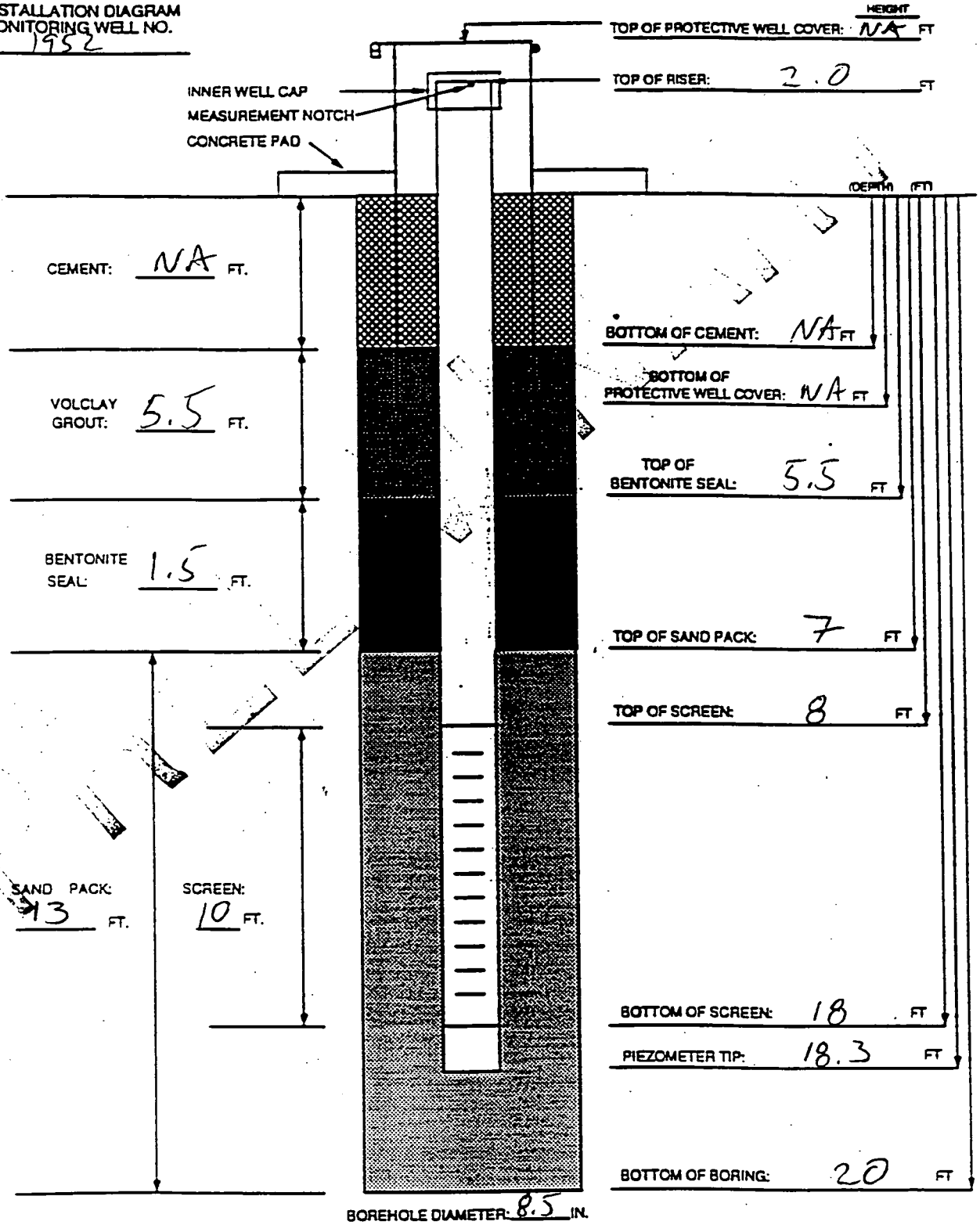
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0'		NA	
GROUND SURFACE	0.0		NA	
BOTTOM OF PROTECTIVE PIPE	NA		NA	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 5.5	TOP NA	BOTTOM NA
BENTONITE	TOP 5.5	BOTTOM 7.0	TOP NA	BOTTOM NA
SAND	TOP 7.0	BOTTOM 20.0	TOP NA	BOTTOM NA
GRAVEL	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP 8'	BOTTOM 18'	TOP NA	BOTTOM NA
PIEZOMETER TIP	18.3'		NA	
BOTTOM OF BOREHOLE	20'		NA	
GWL AFTER INSTALLATION	17.88'		NA	

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. 1952

INSTALLATION DATE: 5/1/93



MATERIALS USED

SAND TYPE AND QUANTITY: 10x20, 8 bags
BENTONITE PELLETS (5-GALLON BUCKETS): 1/2
BAGS OF VOLCLAY GROUT: 1
AMOUNT OF CEMENT: None
AMOUNT OF WATER USED: 20
OTHER: NA
TASK: 20.03.05

NOTES:

1) RISER PIPE IS 2 IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2 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 18 FT/5
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BELO GROUND LEVEL
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: J. Reagan

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBA-40	PROJECT NAME: RCRA Phase II		
BORING NUMBER: MW 4451	COORDINATES:		DATE: 2/23/93
ELEVATION:	GWL: Depth 60.8 Ft	Date/Time: 12/25/93	DATE STARTED: 2/23/93
ENGINEER/GEOLOGIST: B. Yeardley	Depth 52.1 Ft	Date/Time: 3/10/93 0800	DATE COMPLETED: 4-2-93
DRILLING METHODS Cable Tool	Depth 53.7 Ft	Date/Time: 4/08/93	PAGE 1 OF 17

DEPTH (ft)	SAMPLE TYPE AND No.	BLOWS ON SAMPLER PER (6in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	0950 107346 2/23/93	27 34 42	12	Hard, 10YR(5/4) yellowish brown silty clay, low plasticity, dry	CL	Top 2' Frozen >4, FROZEN	BG = 60-80 cpm HNU = 0 ppm
2 3	1000 BG 2/23/93 ~~107347~~ 2/23/93	19 13 16	0	No Recovery	NA	NA	BG = - cpm HNU = - ppm
4	1010 107348 2/23/93	25 34 25	3	St. ft 2.5Y(4/3) olive brown and (5/4) lt olive brown mottled, silty clay, med plasticity, moist	CL	1.5	BG = 40-60 cpm HNU = 0 ppm
5 6	1015 107348 2/23/93	14 16 21	6	SAA	CL	1.25	BG = 40-60 cpm HNU = 0 ppm
7	1020 107349 2/23/93	24 34 35	8	V. stiff 2.5Y(5/3) lt. olive brown, silty clay, med. plasticity, moist	CL	2.25	BG = 40-60 cpm HNU = 0 ppm
8 9	1025 107350 2/23/93	11 11 11	18	Stiff 2.5Y(5/3) lt. olive brown silty clay, med. plasticity, wet	CL	1.25	BG = 80-100 cpm HNU = 0 ppm
10	1030 BG 2/23/93 107352 2/23/93	5 8 9	17	Stiff 10YR(5/3) Brown, silty clay, high plast, wet med. dense 10YR(5/3) Brown, clayey sand, p.gr, wet Med. Dense (5/4) yellowish br, silty sand, p.gr, wet	CL SC SM	1.00 NA	BG = 80-100 cpm HNU = 0 ppm
11 12	1515 BG 2/23/93 107352 2/23/93	13 17 19	14	2.5Y(5/4) lt. olive brown silt, wkly plastic, wet	ML	NA	BG = 40-60 cpm HNU = 0 ppm
13	1525 107353 BG 2/23/93 2/23/93	9 11 13	13	2.5Y(5/4) lt. olive brown silt, wkly plastic, wet last 3" stiff 2.5Y(4/2) dk grayish brown, med plasticity, wet	ML CL	NA 1.00	BG = 40-60 cpm HNU = 0 ppm
14	1550 107354 2/23/93	12 10 9	14	BG 2/23/93 5Y(5/1) Gray grades from silty clay, high plasticity to silt, wet	ML CL ML	NA 21.0 NA	BG = 60-80 cpm HNU = 0 ppm

NOTES

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

SAA - Same as above
NA - Not Applicable
Background = 40-60cpm 2/23/93
Samples collected per ASTM standard penetration test
Colors identified using Munsell Color Chart

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBA-40	PROJECT NAME: RCRA Phase II		
BORING NUMBER: MW 4451	COORDINATES:		DATE: 2/23/93
ELEVATION:	GWL: Depth 66.8 Ft	Date/Time: 12/25/93	DATE STARTED: 2/23/93
ENGINEER/GEOLOGIST: B. Yeardley	Depth 52.1 Ft	Date/Time: 3/10/93 0900	DATE COMPLETED: 4/2/93
DRILLING METHODS Cable Tool	Depth 53.7 Ft	Date/Time: 4/08/93	PAGE 2 OF 17

DEPTH (Ft)	SAMPLE TYPE AND No.	BLOWS ON SAMPLER PER (6in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	1605 10735~~85~~ 2/23/93	12 7 6	11	M. Dense, 5Y (5/1) Gray, silt w/ some clay, weak plasticity, wet	ML	NA	Bγ = 40-60 cpm HNU = 0 ppm
17 18	1640 10735~~86~~ 2/23/93	6 3 10	9	M. Dense, 5Y (4/1) Dk Gray, grades from silt to silty sand, poorly graded to stiff gravelly clay, wet	ML SP CL	NA 1.25	Bγ = 40-60 cpm HNU = 0 ppm
19	1650 10735~~87~~ 2/23/93	5 12 3	10	Stiff 5Y (5/2) Olive, silty clay w/ minor crse. gravel (silica), med. plasticity, moist	CL	1.25	Bγ = 40-60 cpm HNU = 0 ppm
20 21	1705 107358 2/23/93	34 50/.5	14	V. Stiff 5Y (4/3) Olive silty clay w/ some (most crse. gravel), medium plasticity, moist	CL	3.00	Bγ = 40-60 cpm HNU = 0 ppm
22	1105 107360 2/24/93	9 16 17	3	Stiff, 5Y (5/2) Gray sandy gravelly (most) clay, med. plasticity, wet	CL	2.25	Bγ = 40-60 cpm HNU = 0 ppm
23 24	1115 107360 2/24/93	42 50 50/.5	17	V. Stiff 5Y (5/1) Gray gravelly clay, med plasticity, moist V. Dense 10YR (5/6) yellowish brown sand, poorly graded, dry to silt, dry	CL SP ML	3.75 NA NA	Bγ = 40-60 cpm HNU = 0 ppm
25	By 3/2/93			note: go to page 3 Note: Sampling will be at 5 ft intervals			Bγ = cpm HNU = ppm
26							Bγ = cpm HNU = ppm
27							Bγ = cpm HNU = ppm
28							Bγ = cpm HNU = ppm
29							Bγ = cpm HNU = ppm

NOTES

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

SAA - Same as above
N.A - Not Applicable
Background = 60 cpm 2/23/93 & 2/24/93
Samples collected per ASTM standard penetration test
Colors identified using Munsell Color Chart

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBA-40	PROJECT NAME: RCRA Phase II		
BORING NUMBER: MW4451	COORDINATES:	DATE: 2/24/93	
ELEVATION:	GWL: Depth 60.4 Ft Date/Time 12/25/93	DATE STARTED: 2/23/93	
ENGINEER/GEOLOGIST: B. Yeardley	Depth 52.1 Ft Date/Time 3/10/93	DATE COMPLETED: 4/2/93	
DRILLING METHODS: Cable Tool	Depth 53.7 Ft Date/Time 4/08/93	PAGE 3 OF 17	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30	1350	17		V. Dense 10YR(5/4) yellowish brown sand, poorly graded, moist to gravelly	SP	NA	BG = 40-60 cpm
	107361	25	8	sand, poorly graded, moist*			HNU = 0 ppm
31.5	2/24/93	31					
							* moist = due to added water
35	1410	36		V. Dense 10YR(5/4) yellowish brown,			
	107362	50/5	7	sand, poorly graded, moist*	SP	NA	BG = 40-60 cpm
36.5	2/24/93						HNU = 0 ppm
40.	1510	34		V. Dense 10YR(5/4) yel brown sandy			
	107363		12	gravel, poorly graded, moist	GP	NA	BG = 60-80 cpm
		50/5		SAA Sand, poorly graded, moist*	SP		HNU = 0 ppm
41.5	2/24/93						

NOTES:

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

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

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FERNALD RI/FS

- -4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBA-40	PROJECT NAME: RCRA Phase II		
BORING NUMBER: MW4451	COORDINATES:	DATE: 2/24/93	
ELEVATION:	GWL: Depth 60.8 ft Date/Time 2/25/93	DATE STARTED: 2/23/93	
ENGINEER/GEOLOGIST: B. Yeardley	Depth 52.1 ft Date/Time 3/10/93	DATE COMPLETED: 4-2-93	
DRILLING METHODS: Cable Tool	Depth 53.7 ft Date/Time 4/08/93	PAGE 4 OF 17	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45 46.5	1515 107364 2/24/93	32 50/5	11	V. Dense 10YR (5/4) yellowish brown, gravelly sand, poorly graded, dry	SP	NA	βγ = 60-80 cpm HNU = 0 ppm
50							
51.5	1030 107365 2/24/93	50/3	8	V. Dense 10YR (5/4) yellowish brown, gravel, well graded, wet	GW ~~SP~~	GW ~~SP~~	NA 2/12/93 βγ = 60-80 cpm HNU = 0 ppm
55							
56.5	0950 107366 2/25/93	50/2	6	V. Dense 10YR (5/4) yellowish brown, gravel, poorly graded; moist to V. Dense, 10YR (5/4) sand, poorly graded, moist	GP ↓ SP	NA	βγ = 60-80 cpm HNU = 0 ppm

NOTES:

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

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: WBA-40	PROJECT NAME: RCRA Phase II		
BORING NUMBER: MW4451	COORDINATES:	DATE: 2-25-93	
ELEVATION:	GWL: Depth 60.8 ft Date/Time 12/25/93	DATE STARTED: 2-23-93	
ENGINEER/GEOLOGIST: B. Yeardley	Depth 52.1 ft Date/Time 3/10/93	DATE COMPLETED: 4-2-93	
DRILLING METHODS: Cable Tool	Depth 53.7 ft Depth/Time 4/08/93	PAGE 5	OF 17

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60	1110	10		M. Dense 10YR(5/4) Yellowish brown			βγ = 40-60 cpm
	107367	15	14	medium grained sandy gravel, well graded	GW	NA	HNU = 0 ppm
61.5	12/25/93	10		wet			
				Water Table at 60.8 ft. -M-scope			
65	1334	37		Dense 25Y(5/4) Lt. Olive brown			βγ = 60-80 cpm
	107368	50/3	5	gravel - sand mixture, well graded,	GW	NA	HNU = 0 ppm
66.5	12/25/93			wet			
70	1430	13		Dense 25Y(5/4) Lt. Olive brown			βγ = 40-60 cpm
	107369	14	5	sandy gravel, well graded, wet	GW v SP	NA	HNU = 0 ppm
71.5	2/25/93	20		to a sand, poorly graded, wet			

NOTES:

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

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.

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RI/FS

VISUAL CLASSIFICATION OF SOILS

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Page of

PROJECT NUMBER: WBA-40	PROJECT NAME: RCRA Phase II		
BORING NUMBER: MW 4451	COORDINATES:		DATE:
ELEVATION:	GWL: Depth 60.8 Ft	Date/Time: 12/25/93	DATE STARTED: 2-23-93
ENGINEER/GEOLOGIST: B. Yeardley	Depth 52.1 Ft	Date/Time: 3/10/93	DATE COMPLETED: 4-2-93
DRILLING METHODS Cable Tool	Depth 53.7 Ft	Date/Time 4/09/93	PAGE 6 OF 17

DEPTH (ft)	SAMPLE TYPE AND No.	BLOWS ON SAMPLER PER (6in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75	1110	14					βγ = NA cpm
76.5	12/26/93	32 34	0	No Recovery (Sorry)	NA	NA	HNU = NA ppm
80.0							
81.5	1330 107370 12/26/93	28 28 16	12	Dense, 2.5Y(5/4) Olive Brown, gravelly sand, well graded, wet	BY 2/26/93 SP SW	NA	βγ = 40-60 cpm HNU = 0 ppm
85.0							
86.5	1445 CB 8/3/93 ~~107372~~ 12/26/93	10 13 16	0	No Recovery	NA	NA	βγ = NA cpm HNU = NA ppm

NOTES

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

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

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FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBA-40	PROJECT NAME: RCRA Phase II		
BORING NUMBER: MW 4451	COORDINATES:		DATE: 3-1-93
ELEVATION:	GWL: Depth 60.8 Ft	Date/Time: 12/25/93	DATE STARTED: 2-23-93
ENGINEER/GEOLOGIST: B. Yeardley	Depth 52.1 Ft	Date/Time: 3/10/93	DATE COMPLETED: 4-2-93
DRILLING METHODS Cable Tool	Depth 53.7 Ft	Date/Time 4/05/93	PAGE 7 OF 17

DEPTH (ft)	SAMPLE TYPE AND No.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90.0	1505 107372 12/28/93	10 24 16	18	Dense 2.5Y (5/4) lt. olive brown sand, poorly graded, wet to sandy gravel, well graded to	SP ↓ GW	NA	BG = 40-60 cpm HNU = 0 ppm
91.5							
95	1000 107373 3/1/93	30 50/6"	12"	very Dense, grayish brown (2.5Y, 5/2), poorly graded, saturated sand trace some gravel	SP	NA	BG = 40-60 cpm HNU: ∅ ppm
96.5				-Hydropunch sample collected at 95.0 ft.: sample number - 107374			
100	1345 107375 3-1-93	5 10 17	18"	medium dense, very dark gray (2.5Y, 3/1), medium sand trace gravel, poorly graded, wet	SP	NA	BG = 40-60 cpm HNU: ∅ ppm
101.5							

NOTES

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

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

FERNALD
RI/FS

E-4395

VISUAL CLASSIFICATION OF SOILS

Page of

PROJECT NUMBER: WBA-40	PROJECT NAME: RCRA Phase II		
BORING NUMBER: MW 4451	COORDINATES:		DATE: 3-1-93
ELEVATION:	GWL: Depth 60.9 Ft	Date/Time: 12/25/93	DATE STARTED: 2-23-93
ENGINEER/GEOLOGIST: B. Yeardley	Depth 52.1 Ft	Date/Time: 3/10/93	DATE COMPLETED: 4-2-93
DRILLING METHODS Cable Tool	Depth 53.7 Ft	Date/Time 4/08/93	PAGE 8 OF 17

DEPTH (ft)	SAMPLE TYPE AND No.	BLOWS ON SAMPLER PER (6in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
105	1445 107376 3-1-93	7 7 7	12 in	medium dense, dark gray (2.5Y, 4/1) medium sand some gravel, poorly graded, wet	SP	NA	βγ = 40-60 cpm HNU = Ø ppm
106.5							
110	1515 107377 3-1-93	5 10 12	15 in	medium dense, dark gray (2.5Y, 4/1), medium to coarse sand some gravel, poorly graded wet	SP	NA	βγ = 40-60 cpm HNU = Ø ppm
111.5							
115	1710 107378 3-2-93 3-1-93	39 50/5	5	Vy Dense 5Y (5/1) Gray, medium to coarse grain sand w/ gravel, well graded, wet	SW ~~SP~~ CG 5/4/93	NA	βγ = 40-60 cpm HNU : 0 ppm
116.5							

NOTES

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

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

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FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBA-40	PROJECT NAME: RCRA Phase II		
BORING NUMBER: MW4451	COORDINATES:	DATE: 3/5/93, 3/8/93	
ELEVATION:	GWL: Depth 60.8 Ft Date/Time 12/25/93	DATE STARTED: 2-23-93	
ENGINEER/GEOLOGIST: B. Yeardley	Depth 52.1 Ft Date/Time 3/10/93	DATE COMPLETED: 4-2-93	
DRILLING METHODS: Cable Tool	Depth 53.7 Ft Date/Time 4/08/93	PAGE 9 OF 17	

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120.0	1650 10737K 3/5/93	50/4	4	V. Dense 5Y(4/1) Dk. Gray gravelly coarse sand, poorly graded, wet	SP	NA	BY = 40-60 cpm HNU = 0 ppm
125	By 3/8/93 ~~0855~~ 1030 3/8/93	13 15 19	0	(~~Dense~~) By 3/8/93 No Sample recovery	NA	NA	BY = NA HNU = NA
126.5				Driller displays sample from interval			
130	1110 10738K 3/8/93	22 50/5	12	V. Dense 5Y(4/1) Dk Grey ~~medium~~ fine grained sand, poorly graded, wet. Last 2 in. a coarse gravel w/ 2.5Y (7/4) very pale brown clay, (minor), wet By 3/8/93	SP	NA	BY = 40-60 cpm HNU = 0 ppm
131.5							

NOTES:

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

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: WBA-40	PROJECT NAME: RCRA Phase II		
BORING NUMBER: MW4451	COORDINATES:	DATE: 3/8/93, 3/10/93	
ELEVATION:	GWL: Depth 60.8 Ft Date/Time 12/25/93	DATE STARTED: 2-23-93	
ENGINEER/GEOLOGIST: B. Yeardley	Depth 52.1 Ft Date/Time 3/10/93, 0800	DATE COMPLETED: 4-2-93	
DRILLING METHODS: Cable Tool	Depth 53.7 Ft Date/Time 4/05/93	PAGE 10 OF 17	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
135	1530 10382 3/8/93	50/5 50/2	7	V. Dense 5Y(4/1) DK Gray fine grain sand, poorly graded, wet to crse grained sand, poorly graded, wet - last 2 in crse gravel w/ ~~clay, ABS wet~~ CB 5/12/93	SP	NA	βγ = 60-80 cpm HNU = 0 ppm
136.5							
140							
	1015 107303 3/8/93	14 17 29	2	Dense 5Y(4/1) DK Gray, fine sand w/ fine to coarse gravels, poorly graded, wet Also layer of med. gravel, poorly graded wet	SP GP SP	NA	βγ = 40-60 cpm HNU = 0 ppm
141.5							
145							
	1415 10738H 3/10/93	9 11 10	5	Med. Dense 5Y(4/1) DK Gray, fine sand, poorly graded, wet to fine gravel, poorly graded, wet	SP GP	NA	βγ = 40-60 cpm HNU = 0 ppm
145							

NOTES:

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

SAA = Same As Above
N/A = Not Applicable

Background = 40-60 cpm 3/8/93
40-60 cpm 3/10/93

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

402-11-46

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FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBA-40	PROJECT NAME: RCRA Phase II		
BORING NUMBER: MW4451	COORDINATES:	DATE: 3/10/93 3/11/93	
ELEVATION:	GWL: Depth 60.8 ft Date/Time 4/2/93	DATE STARTED: 2-23-93	
ENGINEER/GEOLOGIST: B. Yeardley	Depth 52.1 ft Date/Time 3/10/93	DATE COMPLETED: 4-2-93	
DRILLING METHODS: Cable Tool	Depth 53.7 ft Date/Time 4/05/93	PAGE 11 OF 17	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
150	3/10/93 1630 107386	50/4	3	V. Dense 5Y(4/1) Dk. Grey, sandy ~~coarse~~ gravel, well graded, wet.	GW ~~NA~~ By	NA	BS = 40-60 cpm HNU = 0 ppm
151							
155							
	174 > 107387 3/10/93	15 50/5	4	V. Dense 5Y(4/1) Dk Grey, medium gravel w/ minor crse gravel, well graded, wet	GW	NA	BS = 60-80 cpm HNU = 0 ppm
156.5							
160							
	1068 107388 3/11/93	5 5 6	8	M. Dense 5Y(4/2) Olive Grey, medium sand, poorly graded, wet. to medium gravel w/ minor coarse, well graded wet	SP GW	NA	BS = 40-60 cpm HNU = 0 ppm
161.5							

NOTES:

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

SAA = Same As Above
N/A = Not Applicable

Background = 40-60cpm 3/10/93
= 40-60cpm 3/11/93

* 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: WBA-40	PROJECT NAME: RCRA Phase II		
BORING NUMBER: MW4451	COORDINATES:	DATE: 3-11-93 3/12/93	
ELEVATION:	GWL: Depth 60.8 ft Date/Time 2/25/93	DATE STARTED: 2-23-93	
ENGINEER/GEOLOGIST: B. Yeardley	Depth 52.1 ft Date/Time 3-10-93	DATE COMPLETED: 4-2-93	
DRILLING METHODS: Cable Tool	Depth 53.7 ft Date/Time 4/08/93	PAGE 12 OF 17	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 6in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (ISF)	REMARKS
165	1400 107399 3/11/93	10 15 25	14	Dense 2.5Y(4/2) Dk gray brown fine sand w/ some gravel, poorly graded, wet	SP	NA	Bγ = 60 cpm HNU 0 ppm
166.5							
170	1430 3-11-93	5 5 10	0	No Recovery	NA	NA	Bγ = NA cpm HNU = NA ppm
171.5				Sample being pulled through 120 feet of water & flushed out			
175	1030 107391 3/12/93	18 18 15	14	Dense 2.5Y(4/2) Dk. Grey brown fine sand w/ some gravel, poorly graded, wet	SP	NA	Bγ = 40 cpm HNU = 0 ppm
176.5							

NOTES:

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

SAA = Same As Above
N/A = Not Applicable

Background = 40-60 cpm 3/11/93
= 40-60 cpm 3/12/93

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

402-11-88

351

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBA-40	PROJECT NAME: RCRA Phase II		
BORING NUMBER: MW4451	COORDINATES:	DATE: 3/12/93	
ELEVATION:	GWL: Depth 60.9 Ft Date/Time 2-25-93	DATE STARTED: 2-23-93	
ENGINEER/GEOLOGIST: B. Yeardley	Depth 52.1 Ft Date/Time 3-10-93	DATE COMPLETED: 4-2-93	
DRILLING METHODS: Cable Tool	Depth 53.7 Ft Date/Time 4/08/93	PAGE 13 OF 17	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
180	~~1110~~ 1320 107393 3/12/93	13 25 26	10	V Dense 2.5Y (4/2) Dk. Grey Brown fine sand, poorly graded grading to crs sand, poorly graded trace gravel wet 03/31/93	SP	NA	BZ = 40-60 cpm HNU = 0 ppm
181.5							
185	1500 107393 3/12/93	12 10 9	8	Dense 2.5Y (4/2) Dk Grey Brown fine sand w/ gravel, poorly graded, wet	SP	NA	BZ = 40-60 cpm HNU = 0 ppm
186.5							
190	0930 107394 3/16/93	15 15 30	5	Dense, 2.5Y (4/2) Dk Grey Brown Fine sand w/ gravel, poorly graded, wet	SP	NA	BZ = 40-60 cpm HNU = 0 ppm
191.5							

NOTES:

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

SAA = Same As Above
N/A = Not Applicable

Background = 40-60 ppm 3/12/93
= 40-60 cpm 3/16/93

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

402-11-86

FERNALD
RI/FS

-4395

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: WBA-40	PROJECT NAME: RCRA Phase II		
BORING NUMBER: MW 4451	COORDINATES:	DATE: 3/22/93	
ELEVATION:	GWL: Depth 60.8 Date/Time 2-25-93	DATE STARTED: 2-23-93	
ENGINEER/GEOLOGIST: B. Yeardley	Depth 52.1 Date/Time 4-2-93	DATE COMPLETED: 4-2-93	
DRILLING METHODS: Cable Tool	Depth 53.7 Date/Time 3-10-93	PAGE 14 OF 17	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
191	*	*	*	*See previous page	*	*	βγ: * HNU: *
192	0900 107396 3/22/93	50/5 50/1	5	Vy. Dense 2.5Y (4/2) Dk Gray Brown fine to coarse grain sand w/ minor gravel poorly graded, wet	SP	NA	βγ: 40-60cpm HNU: 0ppm
193	0920 107397 3/22/93	50/6 45	14	Very Dense 2.5Y (4/2) Dk. Gray Brown fine to coarse grain sand w/ some gravel, well graded, wet	SW	NA	βγ: 40-60 cpm HNU: 0 ppm
195	0940 107398 3/22/93	35 42 50/5	12	SAA	SW	NA	βγ: 40-60cpm HNU: 0ppm
196	0955 107399 3/22/93	40 50/6	By 3/22/93 16	SAA	SW	NA	βγ: 40-60cpm HNU: 0ppm
198 By 3/22	1020 ~~107400~~ 3/22/93	50/5 45 50/6	13	SAA	SW	NA	βγ: 40-60cpm HNU: 0ppm
199	1535 ~~107401~~ 3/22/93	50/5 50/5	10	Very Dense 2.5Y (4/2) Dk Gray Brown fine sand, poorly graded, wet	SP	NA	βγ: 40-60cpm HNU: 0ppm
200	107502	By 3/23/93					
							~~βγ: HNU:~~ 4/2/93
							~~βγ: HNU:~~ NA
							~~βγ: HNU:~~
205							

NOTES:

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

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.

402-11-86

353

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: UBA-40	PROJECT NAME: RCRA Phase II		
BORING NUMBER: MW 445I	COORDINATES:	DATE: 3/22/93, 3/23/93	
ELEVATION:	GWL: Depth 60.8 Ft Date/Time 2-25-93	DATE STARTED: 2-23-93	
ENGINEER/GEOLOGIST: B. Yeardley	Depth 52.1 Ft Date/Time 3-10-93	DATE COMPLETED: 4-2-93	
DRILLING METHODS: Cable Tool	Depth 53.7 Ft Date/Time 4/08/93	PAGE 15 OF 17	

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
205	1115 107503 3/23/93	30/10	10	Dense 2.5 Y(4/2) Dk Gray Brown fine to coarse gravel, well graded, wet friable	GW	NA	B/B = 40-60 cpm HNU = 0ppm
206.5				Shale, wet to moist.	SH		
				★ Bottom of Boring Sampling at 206.5 Ft			Sieve Analysis #107503, 1100

NOTES:

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

SAA = Same As Above
N/A = Not Applicable

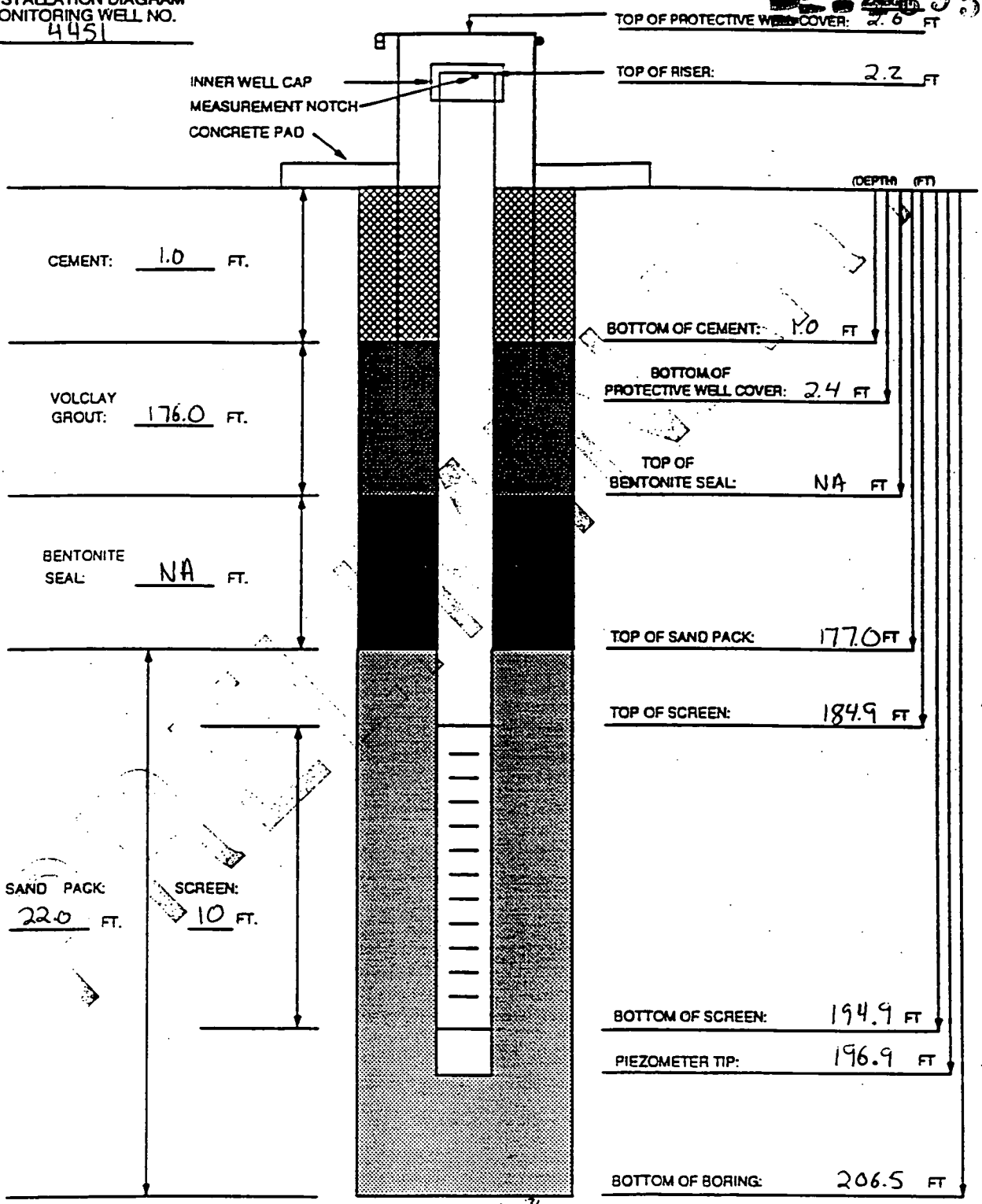
Background = 40-60 cpm 3/23/93

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

402-11-86

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 4451

INSTALLATION DATE: 2-23-93 to 4-2-93



BOREHOLE DIAMETER: 10 3/4 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: 12 bags of 4/30, 4 bags 9/20
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 48 bags
AMOUNT OF CEMENT: 1 bag
AMOUNT OF WATER USED: 2000 gal
OTHER: 42 drums soil, 3 drums water
TASK: WBA-40 (04.28)

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 53.7 FT/ 4-9
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: Brian Yeardley

ASI FORM 0157 REV. (0)

PIEZOMETER INSTALLATION SHEET

PROJECT NAME RCRA Phase II
PROJECT NO. WBA-40 (04.28)
BORING NO. 4451
PIEZOMETER NO. 4451

FIELD ENG./GEO. B. Yeardley DATE 4-7-
CHECKED BY C. Brier DATE 5/2/
DATE OF INSTALLATION 2-23-93 - 4-2-93

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID water FROM 0.0 Ft TO 52.0 Ft
FLUID NA FROM NA TO NA

TYPE OF BIT Hammer Percussion
CASING SIZE (S) USED:
SIZE 10.0 in ID FROM 0.0 Ft TO 205.0
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Monitor Well
DIAMETER OF PERFORATED SECTION 4.0 in I.D.
PERFORATION TYPE:
SLOTS [X] 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 19 - 10 ft., 1 - 5 ft., 2 -
JOINING METHOD Screw Type - flush joint

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	2.2			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.4			
BOREHOLE FILL MATERIALS:	TOP 0.0	BOTTOM 1.0		
CEMENT GROUT / ~~SLURRY~~ VOLCLAY 02/5/93	TOP 1.0	BOTTOM 177.0	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND 10/20	TOP 177.0	BOTTOM 183.0	TOP	BOTTOM
CB 5/3/93 ~~GRAVEL~~ Sand 4/30	TOP 183.0	BOTTOM 198.0	TOP	BOTTOM
PERFORATED SECTION	TOP 185.0	BOTTOM 195.0	TOP	BOTTOM
PIEZOMETER TIP	197.0			
BOTTOM OF BOREHOLE	206.5			
GWL AFTER INSTALLATION	53.7			

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

REMARKS

mw-4451

Customer Number: ~~930323-060~~ 107500

MATERIAL: _____ SAMPLE NUMBER: 930323-060

DETERMINATION: Particle Size METHOD: Sieve Analysis

Sample weight: 250.10

Sieve Number	Weight Retained, g	% Retained	Cumulative % Retained	Grain Size, 1/1000 inch
10	41.94	16.77	16.77	78.7
20	73.51	29.39	46.16	33.5
40	93.70	37.46	83.62	16.7
60	23.61	9.44	93.06	9.8
100	4.77	1.91	94.97	5.9
200	3.54	1.42	96.39	3.0
Pan	5.73	2.29	98.68	

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

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

Analyzed by:	Checked by:	Date analyzed:
[illegible]	[illegible]	3-24-93

Grain Size Retained

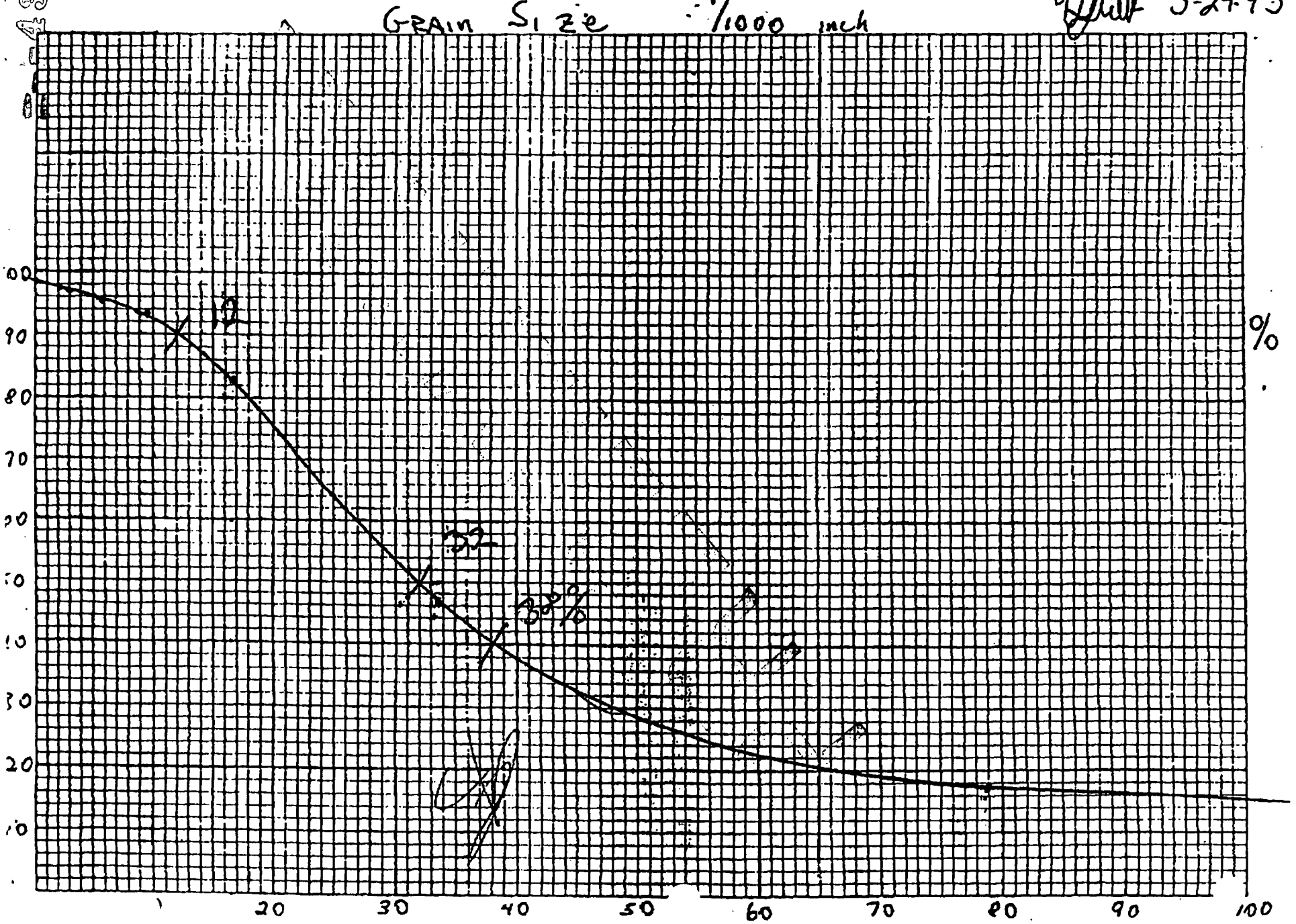
40 %	38
50 %	32
90 %	12

MW-4451

NO 340/ .40 DIETZGEN GRAPH PAPER
10 X 10 PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.

930323-060
3-24-93



MW 4451

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

① WEMCO grain size
40% = .038 in
50% = .032 in
90% = .012 in

② 40% 90% Ratio (uniformity coefficient)
= 3.16 > 3 ∴ use 4 factor

③ 50% value × 4
.032 × 4 = 0.128

④ Look at distribution curves. 0. 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