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TRANSMITAL OF PRELIMINARY DESIGN PACKAGE (30%) FOR THE WASTE UNITS REMEDIATION PROJECT

05/24/96

DOE-0936-96
DOE-FN EPAS
325
DESIGN

287

Department of Energy

Ohio Field Office
Fernald Area Office
P. O. Box 538705
Cincinnati, Ohio 45253-8705
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MAY 2 4 1996
DOE-0936-96

Mr. James A. Saric, Remedial Project Director
U.S. Environmental Protection Agency
Region V. - SRF-5J
77 West Jackson Blvd.
Chicago, IL 60604-3590

Mr. Tom Schneider, Project Director
Ohio Environmental Protection Agency
401 East 5th Street
Dayton, OH 45402-2911

Dear Mr. Saric and Mr. Schneider:

TRANSMITTAL OF PRELIMINARY DESIGN PACKAGE (30%) FOR THE WASTE UNITS REMEDIATION PROJECT

This letter formally transmits the enclosed Preliminary Design Package (30%) for the Waste Units Remediation Project to the U.S. Environmental Protection Agency (USEPA) and Ohio Environmental Protection Agency (OEPA) for review. This package includes the following:

- Drawings
  - Southern Waste Units (Active Flyash Pile, Inactive Flyash Pile, and South Field)
  - Lime Sludge Ponds
  - Solid Waste Landfill
- Outline Specifications
- Design Criteria Package
- South Field Waste Units Geotechnical Report
- Flyash Pile Geotechnical Report

If you have any questions, please contact Jay Jalovec at (513) 648-3122.

Sincerely,

Johnny Reising

Johnny W. Reising
Fernald Remedial Action
Project Manager

FN:Jalovec

Enclosure: As Stated

Recycled and Recyclable

cc w/enc:

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EDC

Outline Specifications for Waste Units Remediation Project Design and Construction

Operable Unit 2
Project Order 165

May 1996
Revision B
30 Percent Design Package

Environmental Remedial Action Project
Fernald Environmental Management Project
Fernald, Ohio
FERMCO Subcontract No. 2-21487

PARSONS

25 Merchant Street
Cincinnati, Ohio 45246

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P - 287

Outline Specifications for Waste Units Remediation Project Design and Construction

Operable Unit 2
Project Order 165

May 1996
Revision B
30 Percent Design Package

Environmental Remedial Action Project
Fernald Environmental Management Project
Fernald, Ohio
FERMCO Subcontract No. 2-21487

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Cincinnati, Ohio 45246

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Outline Specifications for Waste Units Remediation Project Design and Construction

CONTENTS

SECTION

1.0 General 1-1
General Requirements (Section 01010) 1-1
Submittals (Section 01011) 1-1
Schedule of Drawings (Section 01012) 1-1

2.0 Material Handling 2-1
Performance Requirements for SWL Waste Separation and Transportation (Section 01120) 2-1
Performance Requirements for LSP Waste Transportation (Section 01121) 2-2
Performance Requirements for SWU Waste Separation and Transportation (Section 01122) 2-2
Separation and Packaging of Asbestos Waste (Section 01123) 2-3

3.0 Civil 3-1
Site Clearing and Preparation (Section 02110) 3-1
Gross Decontamination Pads and Equipment (Section 02131) 3-1
Construction Water Management (Section 02142) 3-2
Earthwork (Section 02200) 3-2
Waste Excavation, Consolidation, and Disposal (Section 02219) 3-3
Erosion Control (Section 02270) 3-3
Aggregate Road Surface (Section 02506) 3-4
Water Lines (Section 02667) 3-4
Storm Drainage and Stormwater Management (Section 02720) 3-4
Chain Link Fencing and Gates (Section 02831) 3-5
Soil Preparation and Seeding (Section 02900) 3-5

4.0 Structural 4-1
Concrete (Section 03000) 4-1
Structural Steel (Section 05120) 4-1

5.0 Mechanical Process/Piping 5-1
Tanks (Section 13205) 5-1
Tank Modifications (Section 13206) 5-1
Piping, Fittings, Valves, and Accessories (Section 15060) 5-1
Piping Supports and Anchors (Section 15090) 5-2
Pumps (Section 15160) 5-2
Insulation (Section 15250) 5-2

6.0 Mechanical Utilities 6-1
Plumbing (Section 15400) 6-1

7.0 Electrical 7-1
Heating Cables and Panel (Section 16855) 7-1

000006

LIST OF ACRONYMS AND ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
AFAP	Active Fly Ash Pile
CB	Catch Basin
FERMCO	Fernald Environmental Restoration Management Corporation
IFAP	Inactive Fly Ash Pile
LSP	Lime Sludge Pond
ODOT	Ohio Department of Transportation
OSDF	On-Site Disposal Facility
OU	Operable Unit
SF	South Field
SWL	Solid Waste Landfill
SWRB	Stormwater Retention Basin
SWU	Southern Waste Unit
WAC	Waste Acceptance Criteria
WURP	Waste Units Remediation Project

Specifications/Design Package Matrix

Specification Section	LSP Design Package	SWL Design Package	SWU Design Package
Section 01010	X	X	X
Section 01011	X	X	X
Section 01012	X	X	X
Section 01120		X	
Section 01121	X		
Section 01122			X
Section 01123		X	X
Section 02110	X	X	X
Section 02131		X	X
Section 02142	X	X	X
Section 02200	X	X	X
Section 02219	X	X	X
Section 02270	X	X	X
Section 02506	X	X	X
Section 02667	X	X	X
Section 02720	X	X	X
Section 02831	X	X	X
Section 02900	X	X	X
Section 03000	X	X	X
Section 05120	X	X	X
Section 13205		X	
Section 13206			X
Section 15060	X	X	X
Section 15090	X	X	X
Section 15160	X	X	X
Section 15250	X	X	X
Section 15400		X	X
Section 16855	X	X	X

SECTION 1

GENERAL

General Requirements (Section 01010)

This section lists the general requirements of the Waste Units Remediation Project (WURP) including terminology and acronyms, code and criteria requirements, and listing requirements for materials, manufacturers, or equipment.

Submittals (Section 01011)

This section details the general submittal requirements from the excavation contractor to perform the remediation of the Lime Sludge Pond (LSP), Solid Waste Landfill (SWL), and Southern Waste Unit (SWU) areas. The SWU area consists of the Inactive Fly Ash Pile (IFAP), the South Field (SF), and the Active Fly Ash Pile (AFAP). Included will be a summary listing of all submittals required in each of the specification sections, types and format of submittals, and minimum data requirements.

Schedule of Drawings (Section 01012)

This section contains a listing of all drawings applicable to and/or referenced in the WURP design.

SECTION 2

MATERIAL HANDLING

Performance Requirements for SWL Waste Separation and Transportation (Section 01120)

This specification section describes the methods for separating and transporting the waste material and/or contaminated soils into the appropriate waste stream after excavation.

The waste materials above the On-Site Disposal Facility (OSDF) Waste Acceptance Criteria (WAC) will be excavated and delivered to the Operable Unit 1 (OU-1) Staging Area. This waste may contain Resource Conservation and Recovery Act/Hazardous materials, and debris materials. During excavation of the waste, surveys will be conducted for radioactivity. Waste meeting the OSDF WAC will be transported to the OSDF. To meet the material size requirements for the OSDF WAC, size reduction may be required for some debris material. This function will be performed in the excavation area. Biological and asbestos waste will be packaged and shipped to the OSDF.

OU-1 operations will assume the responsibility for separating and packaging above-WAC waste for delivery to a designated Permitted Commercial Disposal Facility (off-site).

Subcontractor responsibilities will be identified including recommended size reduction methods, transportation and safety requirements, and functions to be performed by the Fernald Environmental Restoration Management Corporation (FERMCO), including radiation monitoring, required testing, etc.

This section includes:

A. Transportation requirements
B. Waste separation requirements
C. Safety requirements
D. Size reduction methods
E. Dust suppression methods
F. Subcontractor and FERMCO responsibilities
G. Waste packaging (if required)
H. Submittals

Performance Requirements for LSP Waste Transportation (Section 01121)

This specification section describes the methods for transporting the waste material to the OSDF after excavation.

LSP wastes with excessively high moisture content will be mixed with lower moisture content material in the pond excavation prior to transportation to the OSDF. All waste in the ponds will be disposed of at the OSDF. All vegetation will be removed, size reduced (as necessary), and transported to the OSDF during excavation operations. Impacted soils below the sludge ponds will be removed and disposed of at the OSDF.

Subcontractor responsibilities will be identified including recommending size reduction methods, transportation and safety requirements, and functions to be performed by FERMCO, including radiation monitoring, required testing, etc.

This section includes:

A. Transportation requirements
B. Waste mixing requirements
C. Safety requirements
D. Size reduction methods
E. Moisture control methods
F. Subcontractor and FERMCO responsibilities
G. Submittals

Performance Requirements for SWU Waste Separation and Transportation (Section 01122)

This specification section describes the methods for separating and transporting the waste material or contaminated soils into the appropriate waste stream after excavation. Areas to be remediated include the AFAP, IFAP, and the SF area.

Trees and vegetation will be removed and size reduced. Waste which meets the OSDF WAC will be transported to the OSDF, while waste exceeding the WAC will be delivered to the OU-1 Staging Area. During excavation of the waste, surveys will be conducted for radioactivity. To meet the material size requirements for the OSDF WAC, size reduction may be required for some debris material. This function will be performed in the excavation area. Lead contaminated soil will be excavated and placed in dump trucks and delivered to the OU-1 Staging Area.

OU-1 will assume the responsibility for separating and packaging above-WAC waste for delivery to a designated Permitted Commercial Disposal Facility (off-site).

Subcontractor responsibilities will be identified including recommending size reduction methods, transportation and safety requirements, and functions to be performed by FERMCO, including radiation monitoring, required testing, etc.

This section includes:

A. Transportation requirements
B. Waste separation requirements
C. Safety requirements
D. Size reduction methods
E. Dust suppression methods
F. Subcontractor and FERMCO responsibilities
G. Waste packaging (if required)
H. Submittals

Separation and Packaging of Asbestos Waste (Section 01123)

This specification section describes the methods for separating and packaging for asbestos or asbestos-containing materials, and transporting to the OSDF.

These waste materials are present in the SWL and SWU areas. It is expected that asbestos waste is randomly mixed with debris material in the SWL and within the SWU. Visual inspection and manual separation will be required during the excavation process, and may also require methods for dust suppression and containment for dust control during excavation and packaging. Packaged asbestos waste will be transported to the OSDF.

This section includes:

A. Transportation requirements
B. Asbestos separation requirements
C. Safety requirements
D. Size reduction requirements
E. Dust suppression requirements
F. Subcontractor and FERMCO responsibilities
G. Waste packaging requirements
H. Containment and ventilation requirements (if required)
I. Submittals

SECTION 3

CIVIL

Site Clearing and Preparation (Section 02110)

Erosion, sediment control measures, and stormwater diversion and collection controls are to be installed prior to any clearing or earth moving activities (see Section 02270). Vegetation, fencing, and other miscellaneous items are to be cleared from the limits of the construction as required. Native vegetation will be maintained as long as possible. Cleared material will be disposed of in the OSDF. Excavation activities may require dewatering of the soils and possibly the waste materials. Water removed from the ground as part of this activity will be piped to on-site treatment facilities for disposal (see Section 02142). Monitoring wells within the work zone will be abandoned by FERMCO prior to the commencement of the work.

This section includes:

A. Removal of surface debris
B. Clearing of site plant material and grass, where it affects construction only
C. Removal of fencing
D. Removal of only designed underground and above grade utilities
E. Submittals

Gross Decontamination Pads and Equipment (Section 02131)

The Contractor will be required to furnish and install materials, equipment, controls, and incidentals required to provide operational gross truck decontamination (wheel wash) pads at the SWL and SF disposal areas. Each wheel wash pad will consist of a drive pad, trench drain, sump and sump pump, water supply, and pressure washer. The Contractor will also be required to manage contaminated wash waters and contaminated sediments.

This section includes:

A. System description
B. Performance requirements
C. Submittals

Construction Water Management (Section 02142)

Temporary berms will be utilized to control stormwater inside the construction limits during the construction process. Water inside the berms and excavations will be collected, the solids allowed to settle, and the water pumped into a new force main. Stormwater from the LSP will be pumped to the Biodenitrification Surge Lagoon via the Leachate Transmission Line. Stormwater runoff from the SWL will be pumped to Catch Basin (CB) 229 located in the former production area. Stormwater collected from the SWU area will be pumped to the Stormwater Retention Basin (SWRB). All collected stormwater will eventually be treated at the Advanced Wastewater Treatment facility. Areas surrounding the disposal areas will be graded to direct runoff away from active construction areas. Discharge lines will consist of double-walled High-Density Polyethylene pipe at the SWU, and single-walled at the LSP and SWL, unless pressure exceeds 120 pounds per square inch, in which case material lines will be made of ductile iron pipe. Discharge lines will adhere to American Water Works Association standards.

This section includes:

A. Performance requirements
B. Submittals

Earthwork (Section 02200)

This section addresses general grading and excavating required to prepare the site for waste excavation activities, drainage, and site structures. This section will also address excavation, backfilling, and compacting of trenches for utility water and effluent lines.

This section includes:

A. Excavation for drainage ditches, silt fences, swales, diversion berms, sediment traps, erosion protection, erosion repair, and stormwater management facilities

B. Preparing areas for constructed facilities or features (such as staging areas and construction trailers)

C. Preparation prior to excavating trenches

D. Excavation procedures

E. Backfilling and compaction requirements

F. Tolerances and quality control

G. Submittals

Waste Excavation, Consolidation, and Disposal (Section 02219)

Delineation of below-grade and surface boundaries will be established and marked by field survey. Appropriate exclusion zones and staging areas will also be established and physically marked prior to excavation.

Radiologically contaminated soil and waste material will be excavated from the disposal areas and relocated for interment in the OSDF. Excavated material exceeding the OSDF WAC levels will be segregated and staged at the OU-1 staging area for eventual disposal at an off-site location.

This section also addresses moisture control of the lime sludge from the LSPs prior to disposal.

This section includes:

A. Excavation and management of contaminated soil and waste fill with contamination greater than OSDF WAC limits

B. Excavation, hauling, and disposal of contaminated soil and waste fill with contamination meeting OSDF WAC limits into the OSDF

C. Submittals

Erosion Control (Section 02270)

This section addresses measures to control soil erosion and sedimentation for areas graded or disturbed as part of this work.

This section includes:

A. Performance and general requirements to control erosion and sedimentation
B. Materials and methods for temporary erosion and sediment control
C. Maintenance and removal of all temporary erosion control measures
D. Submittals

Aggregate Road Surface (Section 02506)

Temporary roads and parking will be constructed of crushed stone gravel paving. Work will include grading, preparation of the pavement subbase, and placement of the base courses and surfacing materials. Gravel materials will be the primary surface for temporary roads. All construction shall meet American Association of State Highway and Transportation Officials (AASHTO) and Ohio Department of Transportation (ODOT) standards for the type and function of road placed.

This section includes:

A. Material requirements
B. Installation requirements
C. Testing
D. Submittals

Water Lines (Section 02667)

This section addresses materials and installation of buried temporary water service to the Contractor trailer complex and contaminated effluent lines.

This section includes:

A. Pipe, fittings, and accessories
B. Valves, valve boxes, and pipe detector
C. Quality assurance
D. Disinfection of potable water lines
E. Submittals

Storm Drainage and Stormwater Management (Section 02720)

Culverts and other drainage appurtenances will be constructed to manage the stormwater flow under access roads and at points of concentration. Culverts will consist of smooth interior, corrugated exterior High-Density Polyethylene pipe. Culverts will be constructed to ODOT or AASHTO standards.

This section includes:

A. Site storm sewage drainage piping, fittings, manholes, catch basins, and accessories
B. Installation
C. Submittals

Chain Link Fencing and Gates (Section 02831)

Removing and replacing existing fencing will be as required, as well as installing new fencing. The new fencing will be required around the disposal areas. Standard site practices on security fencing in these areas will be adhered to.

This section includes:

A. Fence framework, fabric, and accessories
B. Excavation for post bases, concrete foundations for posts, and center drop for gates
C. Fence repair needed as a result of Subcontractor construction or demolition activities
D. Salvage of existing fence material for re-use
E. Submittals

Soil Preparation and Seeding (Section 02900)

Subsequent to final remediation/restoration of the project areas, a revegetation program will be implemented to establish a permanent variety of vegetation to stabilize exposed soils.

This section includes:

A. Seeding and mulching to stabilize disturbed areas
B. Maintenance of seeded areas until final acceptance of the work
C. Submittals

SECTION 4

STRUCTURAL

Concrete (Section 03000)

This section includes:

A. Concrete work for foundations, slabs, equipment supports, and other miscellaneous concrete
B. Formwork and accessories
C. Reinforcement and accessories
D. Cast-in-place concrete, grout, and accessories
E. Finishing and curing
F. Sampling and testing of concrete work by an independent testing laboratory
G. Quality control requirements

Structural Steel (05120)

This section includes:

A. Structural steel for framing members, baseplates, connection bolts, anchor bolts, welding, and details required to complete the work

B. Submittal of steel shop drawings

C. Material specifications for steel bolts, nuts, anchor bolts, and welding

D. Fabrication of connection design requirements

E. Quality control requirements

SECTION 5

MECHANICAL PROCESS/PIPING

Tanks (Section 13205)

Tanks will be provided as required for the gross decontamination/tire wash areas. Tanks will be provided with interlocking controls to prevent overfilling and spills.

This section includes:

A. Tanks
B. Level and spill prevention controls
C. Submittals

Tank Modifications (Section 13206)

A transfer tank will be constructed from the modular tank materials formerly used for the two 1 million gallon nitrate tanks. The tank framing will be modified and reassembled. New liners will be installed and tested, if required, by the Subcontractor prior to reuse.

This section includes:

A. Tank modifications
B. Testing requirements
C. Submittals

Piping, Fittings, Valves, and Accessories (Section 15060)

Single-walled pipe will be used to transport contaminated stormwater from the LSP and SWL. Double-walled pipe will be used to transport contaminated stormwater from the SWU. Aboveground piping, if required, will be carbon steel. Aboveground piping which will require relocation, such as discharge piping from portable pumps, will be constructed of flexible hose. Leakage monitoring will not be provided to detect leakage into the space between the inner and outer pipes. Fittings, valves, and accessories in double-walled pipe will also be double contained. Water piping, fittings, valves, and accessories will be of single-walled, carbon steel construction. All piping, fittings, valves, and accessories which are subject to freezing temperatures and which cannot achieve positive drainage will be electrically heat traced and insulated.

This section includes:

A. Aboveground piping, fittings, valves, and accessories
B. Double-walled/contained aboveground piping, fittings, valves, and accessories
C. Flexible hose for stormwater transport from portable pumps
D. Submittals

Piping Supports and Anchors (Section 15090)

Pipe supports and anchors will be provided for all aboveground piping.

This section includes:

A. All piping support and anchor system components.
B. Submittals

Pumps (Section 15160)

SWU pumps will be provided for stormwater transfer from the relocated nitrate (transfer) tank to the SWRB and for emptying of sumps. LSP pumps will be provided for stormwater transfer to the BSL via the Leachate Transmission System Connector. SWL pumps will be provided for stormwater transfer to CB-229 located in the former production area.

This section includes:

A. Horizontal, centrifugal pumps
B. Submersible sump pumps
C. Submittals

Insulation (Section 15250)

All pipe, fittings, valves, and accessories which cannot achieve positive drainage and are subject to freezing temperatures will be electrically heat traced and insulated.

This section includes:

A. Insulation for pipe, fittings, valves, and accessories
B. Submittals

SECTION 6

MECHANICAL UTILITIES

Plumbing (Section 15400)

The potable water supply for the Personnel Monitoring Trailer will start at a connection to the 4-inch potable water force main and terminate at the single inlet connection in the trailer. The piping will be copper with wrought copper fittings and solder joints. A bronze ball valve with solder joint ends located at the trailer will allow for isolation of the trailer potable system from the force main. This piping will be heat traced and insulated.

This section includes:

A. Potable water piping and fittings from the force main to the trailer

B. Isolation valve

C. Pressure testing, including cleaning and flushing prior to testing, and cleaning after completion of testing

D. Flushing procedure

E. Procedure for repair or replacement of piping that fails pressure test

F. Installation procedures

G. Procedure for disinfection of potable water piping

H. Submittals

SECTION 7

ELECTRICAL

Heating Cables and Panel (Section 16855)

Freeze protection for piping subject to freezing temperatures will be provided via this performance specification. The subcontractor will be responsible for sizing the heat trace cable and wattage to preclude freezing down to -10 degrees F. Piping to be traced will be designated on Piping and Instrumentation Diagram drawings.

This section includes:

A. Heating cable and accessories
B. Installation of cable and accessories
C. Submittals

Design Criteria Package for Waste Units Remediation Project Design and Construction

Operable Unit 2
Project Order 165

EDC

May 1996
Revision C

Environmental Remedial Action Project
Fernald Environmental Management Project
Fernald, Ohio
FERMCO Subcontract No. 2-21487

PARSONS

25 Merchant Street
Cincinnati, Ohio 45246

Design Criteria Package for Waste Units Remediation Project Design and Construction

Operable Unit 2
Project Order 165

May 1996
Revision C

Environmental Remedial Action Project
Fernald Environmental Management Project
Fernald, Ohio
FERMCO Subcontract No. 2-21487

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25 Merchant Street
Cincinnati, Ohio 45246

Design Criteria Package
for
Waste Units Remediation Project
Design and Construction
Revision C

CONTENTS

SECTION

1.0 Project Description 1-1
- 1.1 Project Scope 1-1
- 1.2 Description of Alternative Selected 1-2
- 1.3 General Description of the Project Components 1-2
- 1.4 Assumptions/Clarifications 1-4
- 1.5 Project Interfaces 1-5

2.0 Design 2-1
- 2.1 Functional Requirements 2-1
- 2.2 Design Criteria 2-1
- 2.3 Discipline Criteria 2-6

3.0 References 3-1

APPENDICES

A ARARs

B Functional Requirements Document

LIST OF ILLUSTRATIONS

TABLES

2-1 Civil Drawings
2-2 Material Handling Drawings
2-3 Mechanical Process/Piping Drawings
2-4 Mechanical Utilities Drawings
2-5 Structural Drawings

000026

LIST OF ACRONYMS AND ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ACGIH	American Conference of Governmental Industrial Hygienists
AFAP	Active Fly Ash Pile
ALARA	As Low As Reasonably Achievable
ASCE	American Society of Civil Engineers
ANSI	American National Standards Institute
ARAR	Applicable or Relevant and Appropriate Requirement
ASME	American Society of Mechanical Engineers
ASNT	American Society for Non-Destructive Testing
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWWT	Advanced Wastewater Treatment
BSL	Biodenitrification Surge Lagoon
CB	Catch Basin
CCE	Construction Cost Estimate
CFC	Certified for Construction
CFR	Code of Federal Regulations
DCP	Design Criteria Package
DOE	United States Department of Energy
FEMP	Fernald Environmental Management Project
FERMCO	Fernald Environmental Restoration Management Corporation
FRD	Functional Requirements Document
FRL	Final Remediation Level
FS	Feasibility Study
gpm	gallons per minute
HDPE	High Density Polyethylene
IFAP	Inactive Fly Ash Pile
ISC3	Industrial Source Complex Version 3
LSP	Lime Sludge Pond
μg	micrograms
m	meter
MSS	Manufacturers Standardization Society
MTO	Material Takeoff
NEMA	National Electrical Manufacturers Association
OAC	Ohio Administrative Code
ODNR	Ohio DEpartment of Natural Resources
ODOT	Ohio Department of Transportation
OSDF	On-Site Disposal Facility

OU	Operable Unit
PCDF	Permitted Commercial Disposal Facility
PSHSP	Project-Specific Health and Safety Plan
psi	pounds per square inch
rem	roentgens-equivalent man
RI	Remedial Investigation
SCS	Soil Conservation Service
SF	South Field
SFES	South Field Extraction System
S/RID	Standards/Requirements Identification Document
SSC	Structure, System, and Component
SWRB	Stormwater Retention Basin
SWL	Solid Waste Landfill
SWU	Southern Waste Unit
TBC	To Be Considered
TWA	Time-Weighted Average
UBC	Uniform Building Code
WAC	Waste Acceptance Criteria
WURP	Waste Units Remediation Project

SECTION 1

PROJECT DESCRIPTION

The Fernald Environmental Management Project (FEMP) is a 1,050-acre facility located in southwestern Ohio approximately 18 miles northwest of downtown Cincinnati. The FEMP facility contains low-level radioactive, solid, and hazardous wastes. Much of the waste material is to be disposed of in an On-Site Disposal Facility (OSDF) as delineated in the Operable Units Records of Decision. It is anticipated that approximately 2.5 million cubic yards of material will be removed from the FEMP operable units during the remediation activities and will be placed in the OSDF for permanent disposition. The impacted material that has been approved for placement in the OSDF from the Operable Unit 2 (OU-2) Waste Units consists of approximately 315,000 cubic yards of soil (in situ), debris, fly ash, sludge, and solid waste.

This Design Criteria Package (DCP) addresses the issues and concerns for design and construction of the OU-2 Waste Units Remediation Project (WURP). The DCP is developed consistent with the functional requirements presented in Subsection 2.1, the Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) requirements listed in Appendix A, appropriate United States Department of Energy (DOE) regulations and orders, United States Environmental Protection Agency directives, and Fernald Environmental Restoration Management Corporation (FERMCO) Standards/Requirements Identification Documents (S/RIDs). The Functional Requirements Document (FRD) and ARAR/TBC list was prepared solely by FERMCO.

This DCP will serve as the basis for Title I, II, and III design services for design and construction of the WURP.

This DCP was prepared consistent with the outline provided in the FEMP Engineering Procedure Number 12-4003, *Design Criteria Package*, Revision 0.

1.1 Project Scope

PARSONS will provide Title I/II engineering services to prepare Certified for Construction (CFC) design packages for the following OU-2 Waste Units:

1) Southern Waste Units (SWUs) Design Package
   - (1) South Field (SF) Area
   - (2) Inactive Fly Ash Pile (IFAP)
   - (3) Active Fly Ash Pile (AFAP)

2) Lime Sludge Ponds (LSPs) Design Package

3) Solid Waste Landfill (SWL) Design Package

Construction Cost Estimates (CCEs) and Material Takeoffs (MTOs) will be prepared for each of the design packages. Title III services will be provided during construction of the WURP.

1.2 Description of Alternative Selected

The selected remedy for the OU-2 Waste Units includes excavation of all material with contaminants of concern above the established OU-2 Remedial Investigation (RI)/Feasibility Study (FS) final remediation levels (FRLs) or all waste fill material, whichever extends deeper. For the LSP this includes excavating all lime sludge material. For the remediation of the SWU and SWL areas, this includes excavating down to the original grade or deeper if indicated by the RI/FS FRLs. In addition to excavation, the remediation process will include material processing for size reduction and moisture control, and on-site disposal in the OSDF. Excavated waste material that exceeds the waste acceptance criteria (WAC) of the OSDF will be segregated and transported to a staging area designated by OU-1. This material will be packaged and shipped by OU-1 to a permitted commercial disposal facility (PCDF). It is estimated that approximately 315,000 cubic yards of in situ waste will meet the OSDF WAC and thus be disposed of on site. Approximately 3,100 cubic yards of material may not meet the WAC for the OSDF and will be disposed of off site at the PCDF. Additionally, approximately 300 cubic yards of soil containing lead will be removed from the Firing Range and transported to the OU-1 staging area for packaging and shipment to the PCDF.

1.3 General Description of the Project Components

1.3.1 Excavation

Subsequent to clearing and grubbing, SWU, LSP, and SWL waste units excavation will generally proceed from the highest to lowest elevations. Material with contaminant levels exceeding the OSDF WAC will be excavated and segregated as it is encountered. Material that meets the OSDF WAC will be transported to the OSDF for disposal. Contaminated material will be removed and the underlying substrate monitored for contaminant levels. As each area is remediated it will be graded to provide for positive drainage (if possible) and seeded for erosion control.

1.3.2 Stormwater Controls

Stormwater runon will be controlled by using non-contaminated material to construct swales or berms upslope of excavations. The excavated areas within the waste units will serve as collection sumps for

stormwater control. Sediment traps and other sediment control measures will be installed along the downgradient perimeter of the waste units. At the SWUs, a temporary transfer tank will be used to collect contaminated water from the work areas before discharging to the Stormwater Retention Basin (SWRB). Contaminated water from the LSP excavation will be piped to the Biodenitrification Surge Lagoon (BSL) via the Leachate Transmission System Connector. Contaminated water from the SWL excavation will be pumped to catch basin (CB) 229 in the production area. All stormwater control systems will be designed for a 10-year, 24-hour storm event.

A Stormwater Management Plan will be prepared and will include construction and post-construction stormwater management controls for surface water runon and runoff. It will be used as a guide to minimize remedial construction-related impacts on water quality and minimize the spread of hazardous and radiological contamination.

1.3.3 Pipeline and Tanks

Contaminated stormwater piping will be double-walled at the SWUs. Since minimal contamination of stormwater from the LSPs is expected, and for the SWL routing is within the production area which will be remediated at a later date, single-walled pipes will be used for these areas. High Density Polyethylene (HDPE) pipe will be used for piping located below grade. This pipe will be buried a minimum of 3 feet, 6 inches to prevent freezing where adequate slope for drainage cannot be provided. Above-grade piping will be double-walled carbon steel with heat tracing and insulation.

1.3.4 Truck (Tire) Wash Stations

Truck (tire) wash stations will be required prior to accessing the Haul Road at the SWU and SWL excavation areas. Wash wheel pads will be constructed along with collection sumps and water storage tanks, as necessary. Potable water will be used. Wash water pressure will be increased with a commercially available pressure washing unit. The truck wash stations will be used for gross decontamination by removing loose contaminants from vehicle tires and undercarriages.

1.3.5 Personnel Access Control Point

Support facilities (trailers) will be provided at the SWU and SWL access points. The trailers will be used as the normal ingress and egress point for the contamination areas and will include a radiological control point (equipped with personnel contamination monitoring and radiological access control equipment), lockers, a change-out area, and emergency showers. Contaminated wash water will be collected in a tank and periodically removed by FERMCO to be handled in accordance with site water treatment requirements. Personnel in the LSP areas will enter and exit any established contamination areas through

a radiological control point and will use OU-1 personnel decontamination facilities. Sanitary facilities will consist of portable toilets, located outside of contamination areas, at all three waste unit areas.

1.3.6 Construction Cost Estimate and Material Take-Off

CCEs and MTOs will be prepared for each of the design packages in accordance with FERMCO and DOE cost estimating guidelines. The CCE will be provided in FERMCO format.

1.3.7 Erosion and Sedimentation Control Plan

An Erosion and Sedimentation Control Plan will be provided that includes construction and post-construction erosion and sedimentation controls.

1.3.8 Construction and Post-Construction Operations and Maintenance Plan

A Construction and Post-Construction Operations and Maintenance Plan will be developed which will include instructions for safe operations and maintenance requirements. If appropriate, it will also include manufacturer's information including spare parts lists, model and serial numbers, and addresses and phone numbers.

1.3.9 Title III Services

Title III services will be provided during the construction of the WURP. These services include attendance at construction meetings, preparation of observation reports, and review of excavation contractor submittals including Vendor Data Submittals, Requests for Clarification of Information, and Design Change Notices.

1.4 Assumptions/Clarifications

1) A 10-year, 24-hour storm will be used for design of stormwater controls for the WURP.

2) FERMCO will be responsible for compliance with stormwater management and wetlands issues, including all National Pollutant Discharge Elimination System requirements and permits. FERMCO will provide guidance on stormwater and wetland compliance.

3) The need for a Project-Specific Health and Safety Plan (PSHSP) will be determined by FERMCO as the project scope is better defined.

4) The construction contractor will remove and handle contaminated soil as directed by FERMCO.

5) FERMCO will prepare and implement any sampling and analysis plans to characterize soil, guide excavation, and determine compliance with clean-up levels.

6) Air monitoring will be provided by FERMCO in accordance with ARARs.

7) Heat tracing will be provided on all aboveground piping where adequate slope for drainage cannot be achieved.

8) Double-walled pipe will be required for stormwater runoff from the SWUs.
Single-walled pipe will be used for stormwater runoff from the LSP and SWL areas.

9) Leak detection will not be required for stormwater runoff piping.

10) FERMCO will provide electrical power for all pumps, motors, lighting, and alarms. PARSONS will design electrical heat tracing for all above-grade piping, pumps, and valves as required.

11) The construction subcontractor will provide all instrumentation and controls for pumps and tanks.

12) Above-grade vegetation will be size reduced and staged for disposal in the OSDF.

13) The personnel monitoring trailers will be specified, procured, and installed by FERMCO. Drawings and specifications on the personnel monitoring trailer will be provided to PARSONS prior to start of the 90 Percent SWU Design Package.

14) Quantities of drawings and specifications are approximate.

15) Structures, systems, and components (SSCs) are classified as PC-2 for Natural Phenomena Hazards design.

16) FERMCO will provide the steel modular tank components for the SWU transfer tank. The subcontractor is to erect the tank and furnish/install liners.

1.5 Project Interfaces

The WURP requires interfacing with existing systems and procedures. The physical interfaces include:

1) Site access and haul roads
2) Site utilities and storm drains
3) BSL
4) Advanced Wastewater Treatment (AWWT)

5) Proposed OSDF
6) SWRB

WURP stormwater from the SWL will be piped to CB-229 located in the production area. The SWL shall have storage capacity for the 10-year, 24-hour storm. The LSP contaminated water will be pumped to the BSL via the Leachate Transmission System Connector. FERMCO should confirm that the capacity of the BSL is adequate for the WURP stormwater as well as additional wastewater expected from other OUs.

It is recommended that a master level control be established by FERMCO at the BSL due to the number and volume of sources discharging to the BSL and its limited pumping rate to the AWWT. OU-2 should coordinate with OU-1 on modifications to the main spur railroad line adjacent to the SWL. The stormwater diversions and controls required for the SWL remediation will need to be coordinated with the proposed rail line drainage system. OU-2 should coordinate with OU-5 concerning the utility lines between the SF and AFAP, and access to the South Field Extraction System (SFES) facilities. The design considerations that will be followed in attaining these interfaces are addressed in Section 2.

SECTION 2

DESIGN

2.1 Functional Requirements

The functional requirements for the WURP are listed in the FRD for this project (see Appendix B).

2.2 Design Criteria

State and local building codes will be followed unless they conflict with DOE Order 6430.1A, in which case the most conservative will apply. Title I, II, and III work will be performed in compliance with pertinent S/RIDs as identified in the FERMCO *Policies and Requirements Manual*. Pertinent S/RIDs for this project are those requirements in the following S/RIDs contained in PARSONS Generic Requirements List forwarded to FERMCO on April 19, 1996 (PARSONS ID# 27:000:041:0132-96).

1) S/RID No. 2, Engineering Design
2) S/RID No. 3, Emergency Preparedness and Management
3) S/RID No. 5, Environmental Protection
4) S/RID No. 6, Fire Protection
5) S/RID No. 8, Management Systems
6) S/RID No. 9, Nuclear and Systems Safety
7) S/RID No. 10, Occupational Safety and Health
8) S/RID No. 12, Packaging and Transportation
9) S/RID No. 14, Radiological Protection
10) S/RID No. 15, Security
11) S/RID No. 17, Environmental Restoration and Waste Management

2.2.1 National and State Regulations, Codes, Standards, and DOE Orders

This section presents the general regulations, codes, standards, and orders that are to be followed for the design of the WURP other than ARARs/TBCs. This information is organized by engineering discipline. Pertinent ARARs/TBCs are listed in Appendix A.

Civil

1) American Association of State Highway and Transportation Officials (AASHTO), GDHS-90, "Policy on Geometric Design of Highways and Streets," 1990, by AASHTO.

2) American Society of Civil Engineers (ASCE), Manual 37, "Design and Construction of Sanitary and Storm Sewers," ASCE.

3) American Water Works Association (AWWA) C 906-90 Polyethylene Pressure Pipe and Fittings, 4 Inch through 63 Inch for Water Distribution.

4) AWWA, C 600-93 Installation of Ductile-Iron Water Mains and their Appurtenances.

5) FEMP Stormwater Pollution Prevention Plan for Construction Activities.

6) North American Datum of 1983.

7) North American Vertical Datum of 1929.

8) Ohio Department of Transportation (ODOT), Location and Design Manual, Volume II, Drainage Design.

9) ODOT, Construction and Material Specifications, January 1995.

10) Ohio Department of Natural Resources (ODNR), "Rainwater and Land Development, Ohio's Standard for Stormwater Management, Land Development, and Urban Stream Protection," 2nd ed., 1996.

11) Soil Conservation Service (SCS), Soil Survey of Hamilton County, Ohio.

12) SCS, Soil Survey of Butler County, Ohio.

13) SCS, "TR-55 Urban Hydrology for Small Watersheds," Technical Release 55, SCS.

14) TM 5 814-2, "Sanitary and Industrial Wastewater Collection - Pumping Stations and Force Mains," U.S. Dept. of Army.

15) AASHTO HS-20, Traffic Loadings across Force Mains.

Cost Estimating

1) FEMP, PCS-002, Cost Estimating.

2) DOE Office of Infrastructure Acquisition (FM-50), "Cost Estimating Guide, Cost Guide, Volume 6."

Electrical

1) American National Standards Institute (ANSI) C80.1-90 Rigid Steel Conduit - Zinc Coated.

2) Underwriters Laboratories Electrical Construction Materials Directories, 1995.

3) National Electrical Manufacturers Association (NEMA) AB 1-93, Molded Case Circuit Breakers and Molded Case Switches.

4) NEMA ICS 6-93, Industrial Controls and Systems Enclosures.

5) NEMA PB 1-90, Panelboards.

6) NEMA PB 1.1-91, General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.

7) NEMA 250-91, Enclosures for Electrical Equipment (1000 Volts Maximum).

8) National Fire Protection Association 70-96, National Electrical Code.

Environmental Safety and Health

1) 29 Code of Federal Regulations (CFR) 1910, "Occupational Safety and Health Standards."

2) 29 CFR 1926, "Safety and Health Regulations for Construction."

3) 10 CFR 835, "Occupational Radiation Protection" (this is the promulgation of DOE Order 5480.11).

4) DOE Order 5480.10, "Contractor Industrial Hygiene Program."

5) DOE/EH-0256T, Radiological Control Manual.

6) DOE-EM-STD-5502-94, "Hazard Baseline Documentation."

7) DOE-STD-1088-95, DOE Standard "Fire Protection for Relocatable Structures," June 1995.

8) RM-0016, Management Plan FERMCO Policies and Requirements Manual.

9) RM-0021, Safety Performance Requirements Manual.

Geotechnical

1) American Society for Testing and Materials (ASTM) D2216, Laboratory Determination of Water (Moisture) Content of Soil and Rock.

2) ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.

3) ASTM D4318, Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

4) ASTM D698, Laboratory Compaction Characteristics of Soil Using Standard Effort.

5) ASTM D5084, Measurement of Hydraulic Conductivity of Saturated Porous Material Using a Flexible Wall Permeameter.

6) ASTM D5321, Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic Friction by Direct Shear Method.

Material Handling

1) ANSI B30.10-87, Hooks
2) DOE/ID-10500, Hoisting and Rigging Manual
3) Ohio Administrative Code (OAC) 3745-20-05, Standards for Asbestos Waste Handling

Mechanical Process/Piping

1) American Society of Mechanical Engineers (ASME) B73.1M, Specification for Horizontal End Suction Centrifugal Pumps for Chemical Process.

2) ASME B31.3, Chemical Plant and Refinery Piping.

3) American Society for Non-Destructive Testing (ASNT) SNT-TC-1A, Recommended Practices.

4) ASTM A-36, Standard Specifications for Steel.

5) ASTM A-576, Standard Specification for Steel Bars, Carbon, Hot Wrought, Special Quality.

6) ASTM A-53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

7) ASTM A-105/A-105M Revision B, Standard Specification for Carbon Steel Forgings for Piping Applications.

8) ASTM A-126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

9) ASTM A-181/A-181M Revision A, Standard Specification for Carbon Steel Forgings for General Purpose Piping.

10) ASTM A-193, Standard Specification for Alloy-Steel and Stainless Steel Bolting Material for High Temperature Service.

11) ASTM A-194, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service.

12) ASTM C-552, Standard Specification for Cellular Glass Thermal Insulation.

13) American Welding Society D1.1, Structural Welding Code, Steel.

14) Manufacturers Standardization Society (MSS) SP-58, Pipe Hangers and Support-Materials, Design, and Manufacture.

15) MSS SP-69, Pipe Hangers and Support-Selection and Application.

16) MSS SP-89, Pipe Hangers and Support-Fabrication and Installation Practices.

Mechanical Utilities

1) Ohio Plumbing Code, 1995.

Structural

1) ASCE 7-95, Minimum Design Loads for Buildings and Other Structures.

2) DOE Order 5480.28, "Natural Phenomena Hazards Mitigation."

3) DOE-STD-1020-94, "Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities."

4) Ohio Basic Building Code, 1995.

5) Uniform Building Code, 1994.

2.3 Discipline Criteria

2.3.1 Civil and Site Development

General

The emphasis of the civil design will relate to site development required to support construction activities; site preparation of the SWUs, SWL, and LSP waste units; control of stormwater; sending contaminated water to treatment; excavation of waste; sediment control; and final grading and stabilization.

Site Development and Preparation

The SWU and SWL excavation areas will have a personnel monitoring trailer to support the construction activities. The trailers will require utilities in order to function. A public water source is available for the trailer and truck (tire) wash station at the SWUs. If necessary, FERMCO will route utility water to the SWL trailer and truck (tire) wash station. FERMCO will route electrical power to the trailers, all pumps, and all fire and evacuation alarm services (as required). New roads or drives will also be required to serve the trailers and construction activities as well as access to OU-5 SFES activities. The design of these improvements shall meet the requirements specified in DOE Order 6430.1A, Division 2. The locations for the roads, trailers, and utilities will be coordinated with FERMCO OU-2 (Soil Remediation Project).

Clearing

Clearing for the SWL and LSPs will be minimal, as these areas are essentially clear of any major vegetation or debris. However, the IFAP and SF areas are moderately to heavily wooded. Trees, bushes, and high grass will need to be removed from the areas that require excavation. The vegetation will be chipped and staged prior to being transported to the OSDF for disposal. The removal of vegetation needs to be sequenced with the excavation. This is to limit the area that has been cleared at any one time to limit the amount of erosion and sedimentation from exposed/disturbed areas.

Stormwater Controls

One of the major design issues is how stormwater is controlled, both during and after construction. Stormwater runon needs to be minimized to the extent practical, since stormwater that contacts contaminated areas must also be considered contaminated and be treated prior to leaving the site. This will be accomplished primarily by diversion dikes, culverts, ditches, and similar drainage controls upstream of the contaminated areas being excavated. Stormwater diversion at the SWL will require substantial effort, given the limits of contamination and the SWL's proximity to the existing channel. The diversions and controls will include the diversion of the existing channel north of the SWL prior to its reaching the SWL and containing the portion of the channel adjacent to the SWL. During the excavation of the SWL, the stormwater contacting the channel area adjacent to the SWL will be assumed to be contaminated. Stormwater controls at the LSP and SWU areas will focus on preventing runon from adjacent areas and preventing runoff from the excavation area from reaching existing drainage systems. Drainage at the northeast corner of the SF will be routed to the existing channel north of the AFAP.

Per FERMCO direction, contaminated water will be pumped in single-walled pipe except at the SWUs. The LSP areas will pump contaminated water into the Leachate Transmission System Connector then to the BSL. The SWL contaminated water will be pumped to CB-229 in the production area. Contaminated stormwater from the SWUs will be pumped for temporary storage to an aboveground transfer tank which will be constructed to the southeast of the trailer complex and from there to the SWRB. The BSL and SWRB discharge to the AWWT. The stormwater sumps, pumps, and tank systems shall be designed for the 10-year, 24-hour storm event due to the capacities of the receiving facilities. Other perimeter sediment control measures will be used to limit sediment from leaving the work area. Sediment and erosion control measures will follow ODOT, ODNR, SCS, and FEMP standards.

The excavation of the waste areas shall be designed and sequenced to minimize the contaminated area (each approximately 3 acres, maximum) open for stormwater contact. Up to three excavation areas may be opened at once. Stormwater from areas that have been excavated to FRLs indicated in the OU-2 RI/FS may be routed through a sediment control device, such as a sediment trap, for discharge. Temporary controls can be used to help segregate contaminated areas from uncontaminated areas. As necessary, temporary sumps will be established within the contaminated areas to collect the contaminated water. These sumps will be pumped outside the construction area to temporary transfer tanks until the receiving system (BSL, CB-229, or SWRB) can handle their flow.

Permanent stormwater management facilities will not be required, as the post-remediation land use condition of grassed open space will not be significantly different than its present condition.

Excavation

Contaminated soil removal will be accomplished through a controlled excavation process. The excavation will generally begin at the highest elevation and work toward the established excavation low points. Contaminated soil that meets the OSDF WAC will be transported to the OSDF. Pockets of contaminated soil exceeding the WAC will be excavated and transported to the OU-1 staging area as they are encountered. Each of the excavated areas will serve as the initial sump for stormwater control. The sequence of excavation needs to consider the stormwater control and floodplain issues. For the IFAP and SF areas, this will involve maintaining an existing berm along the western and southern sides of these areas, preferably in a vegetated condition, for as long as possible. This berm will restrict runoff from the work area, as well as protect the IFAP/SF site from the impact from the flow along Paddys Run if there is a major storm event.

Stabilization and Landscaping

During excavation of the waste units, interim seeding with a quick-germinating seed mixture or other temporary stabilization measures, such as erosion control mats, may be used to limit erosion of excavated or denuded areas not expected to be worked for a period of time. Soil will be covered with reinforced plastic or biodegradable mats, and hydroseeded. The final configuration of the sites will be to grade them to blend in with the adjacent topography, with positive drainage if possible. However, at the SWL and LSPs positive drainage will not be feasible without major fill and/or grading. These low areas are to remain and be maintained until the FEMP Final Sitewide Remediation Grading is performed.

Maximum slopes during initial excavation/grading will be determined by slope stability calculations and may be exceeded only with the approval of the FERMCO Construction Manager. The maximum slope after final grading shall be 2 horizontal to 1 vertical. Flatter slopes shall be used where feasible to provide a slope that is easier to maintain. Once final excavation has occurred, seed and mulch will be applied according to ODOT standards. No other landscaping or improvements are planned as part of this project.

Pipeline and Tanks

The stormwater force main will be double-walled at the SWU, and single-walled at the SWL and LSPs. When possible, stormwater piping will be buried a minimum of 3 feet, 6 inches to prevent freezing. Underground force mains shall be protected at all road crossings from AASHTO HS-20 traffic loadings. The minimum force main velocity shall be 3.0 feet per second to resuspend solids that may have settled during quiescent periods. FERMCO has indicated that aboveground piping that has positive drainage will not need to be heat traced. A minimum slope of 1/4 inch per foot fall is assumed to provide adequate positive drainage. Draining the fluid back through the pump is not recommended, so additional valving and piping will be required.

The maximum flow is anticipated to occur following significant precipitation events when the maximum area allowable for waste excavation is open. Because of the difference in the flow rate into and out of the SWRB, temporary transfer tanks will be necessary to provide surge storage. A temporary transfer tank for surge control at the SWUs will be located southeast of the personnel trailer complex. The tank will be aboveground and double-lined. The sump pumps in the excavation areas will pump to the temporary transfer tank to promote dry excavations. A maximum stay time of 5 days in the temporary transfer tank is recommended. The SWL will pipe contaminated water to CB-229. The SWL shall have storage capacity for the 10-year, 24-hour storm. The LSP-contaminated water will be pumped to the BSL in a common pipeline with the Leachate Transmission System Connector.

Leak Detection System/High Level Alarm

A leak detection system is not required. The high level alarm will be designed and installed by the subcontractor. The alarm shall detect liquid levels above a maximum setpoint in the sumps and tanks. The setpoint shall have sufficient freeboard to provide response time for maintenance personnel to repair the station. The setpoint must be located high enough above the normal maximum liquid level to prevent turbulence in the wet well from falsely activating the high water alarm. The setpoint shall be no more than 6 feet above the invert of the inlet per OAC 3745-27-08.

Pump Control System

The pumps will provide redundancy such that the sumps and tanks can handle the design flows with one pump out of service. The sumps and tanks shall be sized to provide the volume necessary to prevent rapid cycling of the pumps. Pumps at the excavation areas will be typical portable trash or submersible type.

Site Development

1) SWU Transfer Tank Area: The areas surrounding the site shall be graded to keep stormwater drainage away from the installation. The temporary transfer tanks require a large flat area. A culvert or other drainage improvements may be needed at the temporary transfer tank area. An access road shall be provided to the station and around the tanks for observation and maintenance activities. Site grades shall be between 1 and 6 percent for paved areas and 2 to 10 percent for vegetated surfaces. Transitional areas shall not exceed the maximum slope as determined by slope stability analyses unless approved by the FERMCO Construction Manager. Erosion control measures will be planned. Stormwater drainage elements shall be tied to the existing system, to the extent possible. Topsoil and contaminated dirt, if above the OSDF WAC, will be transported to the OU-1 staging area. Topsoil and contaminated dirt meeting the OSDF WAC will be transported to the OSDF.

2) Roads: Roads shall be crowned with a transverse slope of 2 percent. Longitudinal slopes shall be between 1 and 6 percent. Roads shall comply with AASHTO GDHS-90.

3) Dust control will be required for activities within a contaminated area. Dust control procedures will be provided by the contractor as required by ODOT or as directed by FERMCO. Air particulate emission requirements are listed in the ARARs in Appendix A.

The contractor will apply water or a dust suppressant using tanks with a suitable sprinkling device to control dust within the project area for all activities involving the potential for generating airborne emissions.

4) Access Control: The type, size, and location of fences and gates will be determined in conjunction with FERMCO.

5) Stormwater diversion in the area north of the SF and the AFAP will discharge to the existing channel adjacent to the north side of the AFAP. This channel has some major erosion problems at its confluence with the SWRB outfall channel. The erosion problems will require repair.

Utilities

The locations of existing utilities are available on FEMP Grid Utilities drawings. Major utilities include the Cincinnati Gas and Electric-supplied 6-inch gas line, the FEMP's public water supply line, South Plume groundwater extraction line, electric lines, South Field leachate collector, pump, and force main, all of which are in the gravel road between the SF and the AFAP. The K-65 Trench adjacent to the southern LSP is also a major concern. Due to site conditions, utility relocation will be avoided if possible. Potable and process water will be obtained from the 6-inch public water supply line. A back-flow preventer will be installed at the tie-in to the water supply line.

The stormwater discharge line from the LSP area will be connected to the OSDF Leachate Transmission System Connector to the BSL. OU-1 will have a gas supply line and a process water line in this area which will need to be crossed.

Civil Design Drawings and Specifications

The following design drawings and specifications will be included in the CFC Design Packages:

Table 2-1 - Civil Drawings

Drawing	Qty. SWU DP	Qty. LSP DP	Qty. SWL DP	Initial Submittal
Title Sheet	1	1	1	30%
Index of Sheets	1	1	1	30%
Legend and Symbols	1	1	1	30%
Master Site/Utility Plan	1	1	1	30%
Grading Plans-				
Site Preparation/Drainage Control	1	1	1	30%
Above WAC/Initial Excavation	1		1	30%
Final Excavation	2	1	1	30%
Cross-Sections	9	1	1	2 - 30% 7 - 90%
Profiles	3			90%
Details/Sections/Enlargements	5	2	2	90%
Enlarged Site/Grading/Utility Plan - Wheel Wash Area Support Area Wash Pad	3			90%
TOTAL	28	9	10	

Specifications

1) Section 01010 - General Requirements
2) Section 01011 - Submittals
3) Section 01012 - Schedule of Drawings
4) Section 02110 - Site Clearing and Preparation
5) Section 02131 - Decontamination Pads and Equipment
6) Section 02142 - Construction Water Management
7) Section 02200 - Earthwork

8) Section 02219 - Waste Excavation, Consolidation, and Disposal
9) Section 02270 - Erosion Control
10) Section 02506 - Aggregate Road Surface
11) Section 02667 - Water Lines
12) Section 02720 - Storm Drainage and Stormwater Management
13) Section 02831 - Chain Link Fencing and Gates
14) Section 02900 - Soil Preparation and Seeding

Calculations

The following calculations will be provided:

1) System total dynamic head
2) Earthwork
3) Stormwater (runon and runoff) management
4) Erosion and sediment control

2.3.2 Electrical

General

Electrical power will be provided at each of the three WURP areas by FERMCO for services to the trailers, stormwater excavation pumping, truck (tire) wash station, equipment decontamination facility, lighting, and other loads. PARSONS will provide performance specifications for freeze protection (heat tracing) for all piping and other features subject to freezing where positive drainage (i.e., 1/4-inch drop per foot of run) cannot be achieved.

Freeze Protection

As required, electrical freeze protection will be provided for aboveground (and underground for depths less than 3 feet, 6 inches) piping and other features (e.g., pumps, valves, etc.) where sloped drainage is inadequate.

Electrical Design Drawings and Specifications

No electrical drawings will be produced for this project.

Specification

1) Section 16855 - Heating Cables

2.3.3 Environmental Safety and Health Requirements

The subsections below describe worker health and safety, radiation exposure, and other regulatory requirements. All of the requirements provided are derived from pertinent S/RIDs identified in the *Management Plan, FERMCO Policies and Requirements Manual (RM-0016)*, and PARSONS Generic Requirements List.

Worker Health and Safety

Several health-and-safety-related requirements for this project are provided below. This subsection complements the PSHSP (to be prepared later by FERMCO) and is not to be considered a replacement or summary of the Health and Safety Plan.

Waste unit excavation activities will take place in controlled areas; therefore, workers shall be required to have Hazardous Waste Operations and Emergency Response training in accordance with 29 CFR 1910.120.

Site clearing activities shall be done in accordance with 29 CFR 1926.604. Equipment used in site clearing activities shall also meet this requirement.

Material handling equipment shall meet the requirements of 29 CFR 1926.602. These requirements address seat belts, brakes, rollover protection, audible alarms, and scissor points.

Workers may be required to enter excavated trenches to relocate or remove utilities. This type of work will be minimized to the maximum extent possible. Excavations shall be maintained in accordance with 29 CFR 1926, Subpart P.

Measures shall be identified and implemented which comply with American Conference of Governmental Industrial Hygienists (ACGIH) and FERMCO requirements to prevent heat stress during warm weather. Heat stress hazards are more serious for activities where special protective clothing and equipment are required.

Valves, switches, and like devices shall be designed to accept a FERMCO Facility Owner's lock shank to provide a means for energy control.

Worker Exposure

1) Radiological: Internal exposure is the primary concern for this project. Radiologically contaminated soil and waste unit material will become airborne during earth-moving activities in contaminated areas. 10 CFR 835.1002 requires that airborne radioactive material be controlled

and that the inhalation of such material by workers be kept to levels that are As Low As Reasonably Achievable (ALARA). Industrial Source Complex Version 3 (ISC3) will be used to model dispersion of airborne contaminated soil generated during excavation activities. A dense gas dispersion model (DEGADIS) may be used to model radon dispersion.

To control airborne emissions from soil, conventional dust suppression methods, as discussed in Subsection 2.3.1 of this DCP, shall be used. Eating, drinking, and smoking shall not be allowed in radiologically controlled areas. The need for respirators will be specified in the PSHSP and/or the Radiation Work Permit, when it is prepared.

External exposure is a secondary concern for this project. Waste materials of varying concentrations are expected and may require modeling of external dose components with Microshield 4.0. 10 CFR 835.1002 requires that personnel exposure to external sources of radiation be controlled to an average of 1 rem per year, or ALARA. The need for modeling of external dose components will be assessed based on a review of sample data provided in the *Feasibility Study Report for Operable Unit 2* (DOE 1995) during preliminary design.

2) Asbestos: The *Feasibility Study Report for Operable Unit 2* indicates that asbestos is present in the landfill. Asbestos emissions from the SWL will be modeled during design to estimate worker exposure. Modeling will be performed using ISC3. Per 29 CFR 1910.1001, the Permissible Exposure Limits for asbestos are:

   (1) Time-Weighted Average (TWA) of 0.1 fiber per cubic centimeter of air as an 8-hour TWA

   (2) Excursion limit of 1.0 fiber per cubic centimeter of air as averaged over a sampling period of 30 minutes

   Exposure monitoring shall be required that is representative of the 8-hour TWA and 30-minute short-term exposures of each employee. FERMCO shall establish appropriate action levels and monitoring of workers per Appendix A of 29 CFR 1910.1001.

3) Particulates, Gases, and Vapors: Remedial activities will have the potential to generate various particulates, gases, and vapors. Where necessary, exposure monitoring will be provided to ensure that worker exposures are properly controlled within Occupational Safety and Health Administration (29 CFR 1910 and 1926) and ACGIH limits. Specific control measures and Personal Protective Equipment will be identified in the PSHSP to be developed by FERMCO.

   The excavation of the IFAP and the AFAP will generate particulate emissions that may exceed regulatory requirements for airborne particulates. Particulates are regulated under OAC 3745-17-02. This requirement states that the level of the primary and secondary 24-hour ambient air quality standards for total suspended particulates is 150 $\mu g/m^3$, 24-hour average concentrations.

The level of the primary and secondary annual standards for total suspended particulates is 50 $\mu g/m^3$, annual arithmetic mean. Also, the emission rates provided in OAC 3745-17-11 apply (see Appendix A for values). Particulate emissions from excavation of the piles will be modeled using ISC3.

Applicable or Relevant and Appropriate Requirements

The ARARs for this project have been prepared by FERMCO and are provided in Appendix A of this DCP. The table provides a requirement summary and implementation strategy for each ARAR. The implementation strategy references appropriate sections of this DCP where appropriate.

2.3.4 Geotechnical

General

The nature, level, and extent of contamination at the OU-2 waste units and the clean-up levels defined in the OU-2 Record of Decision provide the bases for establishing the extent, boundaries, and approach for the excavation required for the design. Data regarding the nature, level, and extent of radiological contamination at the OU-2 Waste Units is summarized in the *Remedial Investigation Report for Operable Unit 2*, the *Feasibility Study Report for Operable Unit 2*, and in associated electronic data bases maintained and provided by FERMCO.

Geotechnical data that provide the bases for the remedial design are summarized in the above Remedial Investigation/Feasibility Study documents as supplemented by data summarized in the following geotechnical reports:

Solid Waste Landfill Waste Unit

Solid Waste Landfill Pre-Design Activities and Evaluation Report, Revision 0, May 1994

Active Fly Ash Pile, Inactive Fly Ash Pile and South Field Waste Units

Fly Ash Piles and South Field Waste Units Geotechnical Report, Revision 0, April 1996

The emphasis of geotechnical design will relate to support for excavation planning and slope stability analyses. An Intergraph Geologic Information System computer platform will be used to assist in developing the civil excavation plan for the SWUs. The platform will be used to evaluate contaminant data provided by FERMCO. The results of the testing and evaluation will be summarized in a Geotechnical Memorandum. Specifications for a retention basin clay liner will be prepared and incorporated into the civil specifications. Slope stability analyses will use XSTABL slope stability

software and will consider temporary slopes during excavation and permanent slopes established in the final grading plan.

Calculations

1) Slope stability

2.3.5 Material Handling

General

The design will describe methods for waste excavation or retrieval, size reduction, and segregation into separate waste streams. Packaging and transportation requirements will be established for on-site disposal for the various waste streams, including low-level radioactive, hazardous, and mixed waste. The method for separation, handling, and packaging of asbestos and lead will be addressed in separate specifications. Material Handling will develop these specifications with input from Environmental Safety and Health. Asbestos encountered during this remedial action must be prepared for disposal in accordance with the requirements of OAC 3745-20-05 (Standards for Asbestos Waste Handling) and the Impacted Material Placement Plan for the OSDF.

Waste material that is to be placed within the OSDF must satisfy OSDF criteria concerning moisture content and compactibility.

Equipment

1) Mobile size reduction equipment may include chipper, shredder, shear, and baler

2) Excavation equipment may include front-end loaders, backhoe, hydraulic crane, and track dozers

3) Transportation equipment may include covered or uncovered dump trucks, stake-bed trucks, forklift, flatbed semi trucks, and tank trucks

Testing

Lifting devices shall be tested in accordance with DOE/ID-10500 Hoisting and Rigging Manual.

Material Handling Design Drawings and Specifications

The following design drawings and specifications will be included in the CFC Design Packages:

Table 2-2 - Material Handling Drawings

Drawing	Qty. SWU DP	Qty. LSP DP	Qty. SWL DP	Initial Submittal
Process Flow Diagram	1	1	1	30%
TOTAL	1	1	1	

Specifications

1) Section 01120 - Performance Requirements for SWL Waste Separation and Transportation
2) Section 01121 - Performance Requirements for LSP Waste Transportation
3) Section 01122 - Performance Requirements for SWU Waste Separation and Transportation
4) Section 01123 - Separation and Packaging of Asbestos Waste

2.3.6 Mechanical Process/Piping

General

Storage and transfer systems shall meet the requirements of DOE Order 6430.1A, Paragraph 1323-4.3. Design shall emphasize the use of multiple barriers to restrict the movement of radioactive waste that has the potential for human contact or reducing groundwater quality. Materials shall be selected for corrosion resistance and ease of decontamination. Provisions shall be made so that liquids can be analyzed prior to transfer.

Tank/basin systems will be equipped with spill prevention devices (check valves, dry disconnect couplings, etc.) and overfill controls (high level alarms, interlocks to stop flow, etc.). Mechanical Process is responsible for the specifications of tanks, pumps, above-ground pipe, pipe supports, and insulation.

Equipment

Confinement systems shall meet the criteria in DOE Order 6430.1A, Paragraphs 1300-7 and 1323-5. Pumps shall be provided to transfer SWU surge tank contents at a rate of 600 gpm (maximum) to the SWRB.

Temporary transfer tank transport pumps shall meet the requirements of ASME B73.1M.

Truck (Tire) Wash Stations

Truck (tire) wash stations will be located near the Haul Road exit of the SWU and the egress point from the SWL. These facilities are intended to be used to remove bulk solids from haul vehicles by high-pressure spray. Collected wash water from the SWL will be pumped to CB-229 located in the former production area. Collected wash water from the SWU will be piped to the existing seepage lift station.

Process Water

Process water will be obtained from the existing 6-inch public water supply line. A back-flow preventer will be placed at the tie-in to the supply line.

Piping

Single-walled pipe will be used for both above- and below-grade piping except at the SWUs. No leakage monitoring will be provided to detect leakage into the space between the inner and outer pipes.

Testing

Pipe and pipe systems testing shall conform to the requirements set forth in ASME B31.3 and ASNT SNT-TC-1A.

Heat Tracing and Insulation

Electrical heat tracing and insulation will be provided for above-grade piping, fittings, valves, and equipment that are subject to freezing temperatures and for below-grade piping less than a frost depth of 3 feet, 6 inches as required. Insulation requirements shall be in accordance with the applicable ASTM insulation and sheeting specifications.

Pipe Supports

Pipe supports shall be spaced in accordance with ASME B31.3 and PARSONS' span table. Pipe hanger material, design, manufacture, selection, application, fabrication, and installation shall be in accordance with MSS SP-58, SP-69, and SP-89. Auxiliary steel supports shall be in accordance with ASTM A-36 and A-576.

Welding/Joining

Welding shall be in accordance with ASME B31.3 and American Welding Society D1.1. HDPE pipe material shall be joined/fused per manufacturer's instructions.

Materials

Corrosion, abrasion resistance, and ease of decontamination shall be considered when selecting pipe, fittings, valves, and equipment items.

Mechanical Process/Piping Design Drawings and Specifications

Table 2-3 lists the design drawings that will be included in the CFC Package.

Table 2-3 - Mechanical Process/Piping Drawings

Drawing	Qty. SWU DP	Qty. LSP DP	Qty. SWL DP	Initial Submittal
P&ID - Symbols and Legend Sheet	1	1	1	30%
P&ID - Wastewater Collection and Transfer	1	1	1	30%
P&ID - Equipment Decon Facilities	1			30%
Piping Plan	1		1	90%
Piping Sections and Details	1		1	90%
TOTAL	5	2	4	

Specifications

1) Section 13205 - Tanks
2) Section 13206 - Tank Modification
3) Section 15060 - Piping, Fittings, Valves, and Accessories
4) Section 15090 - Piping Supports and Anchors
5) Section 15160 - Pumps
6) Section 15250 - Insulation

Calculations

The following calculations will be provided:

1) Pipeline sizing
2) Pump sizing

2.3.7 Mechanical Utilities

General

A personnel access control point will be established at the egress point of the SWU and SWL excavations. Lockers, change-out area, and emergency showers will be provided. Shower wash water will be collected in a tank and will be periodically removed by FERMCO. Utility water will be supplied to the trailers by connection to the 6-inch public water supply line at the SWU. Potable water for the personnel monitoring trailer at the SWL will be provided via a self-contained storage tank. Portable sanitary facilities will be used at all of the waste units.

Piping

Utility piping for the personnel trailers will be constructed of copper tubing and will comply with ASTM B88. Outside aboveground piping will be heat traced and insulated.

Mechanical Utilities Design Drawing and Specification

The following design drawing and specification will be included in the CFC Package:

Table 2-4 - Mechanical Utilities Drawing

Drawing	Qty. SWU DP	Qty. LSP DP	Qty. SWL DP	Initial Submittal
Personnel Trailer Plumbing Plan	1		1	90%
TOTAL	1		1	

Specification

1) Section 15400 - Plumbing

2.3.8 Structural

General

The design and evaluation of SSCs due to wind, earthquake, and flood shall be in accordance with DOE Order 6430.1A and DOE-STD-1020 for PC-2 type structures. SSCs for the WURP include miscellaneous steel supports and concrete foundations.

Dead Loads

Dead loads are all loads that remain permanently in place, including weights of all permanent materials, equipment, piping, self-weights, and provisions for future loads, if required. The unit weights of materials and assemblies may be based on sources or data from manufacturers' drawings and catalogs, and Table C3-1A of ASCE 7-95.

Live Loads

Live loads shall include all loads resulting from use of the SSCs. Live loads may act in any direction. Impact loads, moving loads, and operating loads shall be considered as part of live loads. Live loads for structures shall not be less than the minimum uniform or concentrated loads stipulated in ASCE 7-95.

Wind Loads

Wind loads design criteria presented in this section shall be based on the requirements of DOE Order 6430.1A, DOE-STD-1020, and ASCE 7-95. The Ohio Basic Building Code Exposure "C" shall be used for all wind load calculations.

Tornado Loads

Tornado loads are not applicable and will not be considered given that the SSCs are assumed PC-2, that most piping will be located underground, and construction/excavation operation will cease during rain/stormy weather.

Seismic Design and Evaluation

The seismic criteria for the design and evaluation of SSCs shall be based on procedures detailed in Subsection 2.3.1 of DOE-STD-1020, PC-2, and Uniform Building Code (UBC) Section 1628. The earthquake response shall be evaluated in accordance with procedures given in UBC Section 1627.8 using the static force method. The capacities will be evaluated using the strength design or allowable stress design method. Story drift limitations shall be per UBC Section 1628.8. Nonbuilding structures shall meet the requirements of UBC Section 1632. Lateral forces on elements of structures and nonstructural components supported by structures shall be in accordance with UBC Section 1630.

Other Loads

Load criteria not specified above shall be in accordance with DOE Order 6430.1A, paragraph 0111-2.8, "Other Loads for Buildings and Other Structures."

Other Structural Material/Design Requirements

Design requirements for structural materials and design are as follows:

1) Concrete: Concrete material, design, and construction shall be per American Concrete Institute 318-89. Minimum concrete strength at 28 days shall be 3,000 psi for foundations and 4,000 psi for slabs.

2) Reinforcement: Deformed billet steel shall conform to ASTM A615, Grade 60.

3) Grout: High strength, nonshrink grout shall be 1 inch minimum thickness.

4) Structural Steel: Design, details, fabrication, and erection of structural steel shall conform to the UBC and the American Institute of Steel Construction Manual, Ninth Edition. The material for structural steel shapes and plates shall conform to ASTM A36. All structural steel shall be painted or galvanized. Primary connection bolts shall be high-strength ASTM A325 with hardened nut and washer. Secondary connections may be made with A307 bolts, nuts, and washers.

5) Field Connections: Connections may be bolted or welded using E70XX electrodes.

6) Foundations/Slabs: The provisions of UBC Chapter 18 shall govern the design of foundations. Footings will be placed in the upper natural soils of properly compacted fill. Foundations and slabs will be designed for an allowable soil bearing pressure based on available geotechnical data

or pressure or presumptive values. The bottoms of footings will be placed a minimum of 3 feet below adjacent final grade for frost protection.

Structural Design Drawings and Specifications

The following design drawings and specifications will be included in the CFC Package:

Table 2-5 - Structural Drawings

Drawing	Qty. SWU DP	Qty. LSP DP	Qty. SWL DP	Initial Submittal
Misc. Steel Details	1	1	1	90%
Foundations/Plan and Details	1	1	1	90%
TOTAL	2	2	2	

Specifications

1) Section 03000 - Concrete
2) Section 05120 - Structural Steel

Calculations

The following calculations will be provided:

1) Foundations/slabs
2) Structural steel/pipe supports

SECTION 3

REFERENCES

This DCP is based on the following documents:

1) FERMCO, September 1994. FEMP Engineering Procedure, Document No. 12-4003, Design Criteria Package. Fernald, Ohio: FERMCO.

2) ----------, February 16, 1996. *Policies and Requirements Manual.* Fernald: FERMCO.

3) ----------, September 30, 1994. Document No. RM-0012, *Quality Assurance Program, Revision 3.* Fernald: FERMCO.

4) ----------, February 28, 1996. *Site Procedures Manuals*, Volumes 1 - 12. Fernald: FERMCO.

5) Project Order 165, Revision 0, *Operable Unit 2 Waste Units Remediation Statement of Work*, December 7, 1995.

6) United States Department of Energy, 1987/1992. DOE Order 4700.1, "Project Management System."

7) ----------, 1989. DOE Order 6430.1A, "General Design Criteria."

8) ----------, January 1995. *Remedial Investigation for Operable Unit 2.* Fernald: DOE Fernald Field Office.

9) ----------, March 1995. *Feasibility Study Report for Operable Unit 2.* Fernald: DOE Fernald Field Office.

10) ----------, May 1995. *Final Record of Decision for Operable Unit 2.* Fernald: DOE Fernald Field Office.

11) ----------, December 1995. *Remedial Design Work Plan for Remedial Actions at Operable Unit 2.* Fernald: DOE Fernald Field Office.

12) United States Environmental Protection Agency, 1990. *OSWER Directive 9355.5-01, Interim Guidance on EPA Oversight of Remedial Designs and Remedial Actions Performed by Potentially Responsible Parties.*

APPENDIX A

ARARS

Appendix A has been prepared by FERMCO and identifies design-related ARARs/TBCs for the WURP. Compliance with these ARARs is addressed therin. Compliance with all WURP ARARs (design and non-design) will be addressed in the Remedial Action Work Plan.

APPENDIX A
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND TO BE CONSIDERED REQUIREMENTS FOR THE WASTE UNITS REMEDIATION PROJECT DESIGN AND CONSTRUCTION

The tables in this appendix identify the subset of chemical-, location-, and action-specific applicable or relevant and appropriate requirements (ARARs) and To Be Considered (TBC) criteria for the design phase of remediating the Operable Unit 2 waste units. These design-specific ARARs/TBCs were selected from the full set of ARARS defined for the selected remedy in Appendix B of the Operable Unit 2 Record of Decision (ROD).

These tables include: 1) an explanation of what the requirement is about, 2) identification as an ARAR or TBC, and 3) why it is an ARAR or TBC. Note that the requirement column in these tables provides only a summary; the regulation, statute, or Federal Register citation listed should be consulted for a full description of the requirement. The column under the heading "ARAR/TBC" indicates the site specific (FEMP) status of the regulation in accordance with the Comprehensive Environmental Response, Compensation and Liability Act. The column designated as "Remarks/Compliance" includes a cross-reference of how the requirement will be met during design or remediation. The "compliance" portion of this column will be completed for submittal of the pre-final package to the U.S. Environmental Protection Agency and the Ohio Environmental Protection Agency.

TABLE A-1
CHEMICAL-SPECIFIC REQUIREMENTS

Citation	Chemical	Requirement	Determination	Remarks/Compliance
OHIO WATER QUALITY STANDARDS				
Ohio Water Quality Standards OAC 3745-1-07	Warmwater Habitat Water Quality Criteria	outside mixing zone / inside mixing zone Parameter (µg/L) — Max. — Avg. — Max. Antimony (total) — 650 — 190 — 1,300 Arsenic — 360 — 190 — 720 Beryllium (total) — 520 — 23 — 1,000 Dieldrin — - — 0.005 — - Polychlorinated Biphenyls — - — 0.001 — -	Applicable	Compliance is addressed through the FEMP's NPDES permit and Section 2.3.1 of this DCP.
Ohio Water Quality Standards OAC 3745-1-07	Human Health and Agricultural Water Supply Criteria	Parameter (µg/L) — Human Health (outside mixing zone) — Agricultural Antimony (total) — 780 — - Arsenic — - — 100 Beryllium (total) — 1.17 — 100 Dieldrin — 0.00076 — - Polychlorinated Biphenyls — 0.00079 — -	Applicable	Compliance is addressed through the FEMP's NPDES permit and Section 2.3.1 of this DCP.
RADIATION DOSE LIMITS				
Radioactive Waste Management DOE Order 5820.2A Chapter III (3)(a)(2)	Protection of the General Population from Releases of Radioactivity	Concentrations of radioactive material which may be released to the general environment in surface water, ground water, soil, plants or animals must not result in an effective dose equivalent that exceeds 25 mrem per year to any member of the public. Reasonable effort should be made to maintain releases of radioactivity in effluents to the general environment as low as is reasonably achievable.	TBC	Compliance is addressed through in Section 2.3.1, the WURP RA Work Plan, and consistent with the Operable Unit 5 SEP. Site-wide monitoring will be conducted as directed in the IEMP.

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TABLE A-1
(CONT'D)

Citation	Chemical	Requirement	Determination	Remarks/Compliance
		RADIATION DOSE LIMITS (continued)		
Radiation Protection of the Public and the Environment DOE Order 5400.5 Chapter II (1)	Public Dose Limits	The public dose limits include consideration of all exposure modes from all DOE activities (including remedial activities). Effective dose equivalent is the sum of the effective dose equivalent (weighted summation of doses to various organs of the body) from exposures to radiation sources external to the body during the year plus the committed effective dose equivalent from radionuclides taken into the body during the year. Medical sources, consumer products, residual fallout from past nuclear accidents and weapons tests and naturally occurring radiation sources are not included in this summation.	TBC	Compliance is addressed through in Section 2.3.1, the WURP RA Work Plan, and consistent with the Operable Unit 5 SEP. Site-wide monitoring will be conducted as directed in the IEMP.
National Emission Standards for Hazardous Air Pollutants 40 CFR §61.92, 61.93 Subpart H [Radiation Protection of the Public and the Environment DOE Order 5400.5 Chapter II (1)(b)]	National Emissions Standards for Emissions of Radionuclides Other than Radon from DOE Facilities	Emissions of radionuclides (except radon-220 and radon-222) to the ambient air from Department of Energy facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr. To determine compliance with the standard, radionuclide emissions shall be determined and effective dose equivalent values to members of the public calculated using EPA approved sampling procedures, computer models CAP-88 or AIRDOS-PC, or other procedures for which EPA has granted prior approval.	Applicable	Compliance is addressed through in Section 2.3.1, the WURP RA Work Plan, and consistent with the Operable Unit 5 SEP. Site-wide monitoring will be conducted as directed in the IEMP.
Radiation Protection of the Public and the Environment DOE Order 5400.5 Chapter II (3)(a)(5)	Interim Dose Limit for Native Aquatic Animal Organisms	The absorbed dose to native aquatic animal organisms shall not exceed 1 rad per day from exposure to the radioactive material in liquid wastes discharged to natural waterways.	TBC	Compliance will be met through the NPDES permit, and will be described in the WURP RA Work Plan.
Radiation Protection of the Public and the Environment DOE Order 5400.5 Chapter IV (4)(c)	External Gamma Radiation	External gamma radiation levels on open lands shall comply with the basic public dose limit of 100 mrem effective dose equivalent in a year and the ALARA process, considering appropriate-use scenarios for the area.	TBC	Compliance is addressed through in Section 2.3.1, the WURP RA Work Plan, and consistent with the Operable Unit 5 SEP. Site-wide monitoring will be conducted as directed in the IEMP.

TABLE A-1
(CONT'D)

Citation	Chemical	Requirement	Determination	Remarks/Compliance
		EFFLUENT AND AIR EMISSION STANDARDS		
Radiation Protection of the Public and the Environment DOE Order 5400.5 Chapter II (3)(a)	Discharges of Liquid Waste to Surface Waters	The best available technology is the prescribed level of treatment for liquid radioactive discharges to surface waters that would otherwise contain radioactive concentrations greater than the DCG values. Implementation of the best available technology process is not required for waste streams that contain radionuclide concentrations of not more than the DCG values at the point of discharge to a surface waterway. The DCG for waste streams containing more than one type of radionuclide shall be the sum of the fractional DCG values. Liquid process waste streams containing radioactive material in the solid present in the waste stream must not exceed 5 pCi/g above background level of settleable solids for alpha-emitting radionuclides or 50 pCi/g above background of settleable solids for beta-gamma-emitting radionuclides.	TBC	
Radiation Protection of the Public and the Environment DOE ORder 5400.5 Chapter III	Derived Concentration Guides for Air and Water	The derived concentration guides (DCGs) are provided as reference values for conducting radiological environmental protection programs at operational DOE facilities and sites. DCG values are presented in Figures III-1 and III-3 of DOE Order 5400.5 for the following exposure modes: • ingestion of water • inhalation of air • immersion in a gaseous cloud The DCG values for internal exposure based on a committed effective dose equivalent of 100 mrem for the radionuclide taken into the body by ingestion or inhalation during one year. The DCG values account for only three exposure pathways (ingested water <u>or</u> inhaled air <u>or</u> air immersion) and do not include other potentially significant pathways. When more complex environmental pathways are involved, a more complete pathway analysis is required for calculating public radiation doses resulting from the operation of DOE facilities.	TBC	

TABLE A-1
(CONT'D)

Citation	Chemical	Requirement	Determination	Remarks/Compliance
		EFFLUENT AND AIR EMISSION STANDARDS (continued)		
National Emission Standards for Hazardous Air Pollutants 40 CFR §61.192 Subpart Q	National Emission Standards for Radon Emissions from Department of Energy Facilities	No source at a Department of Energy facility shall emit more than 20 pCi/m^{2}s as an average for the entire source, into the air.	Applicable	Compliance and monitoring will be conducted through the FEMP's IEMP.
		RADIONUCLIDE CONCENTRATIONS IN SOILS		
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings 40 CFR §192.12(a) Subpart B 40 CFR §192.20 Subpart C	Cleanup of Soils Contaminated with Residual Radioactive Materials	Remedial actions shall be conducted so as to provide reasonable assurance that, as a result of residual radioactive materials, the concentration of radium-226 in land averaged over any area of 100 m^2 shall not exceed the background level by more than: • 5 pCi/g, averaged over the first 15 cm of soil below the surface • 15 pCi/g, averaged over 15 cm thick layers of soil more than 15 cm below the surface Compliance with this requirement should be shown through measurements performed within the accuracy of currently available types of field and laboratory instruments in conjunction with reasonable survey and sampling procedures.	Relevant and Appropriate	This ARAR was considered in the development of the selected remedy for Operable Unit 2 ROD. It is addressed by more stringent clean-up levels for radium-226 of 1.8 pCi/g as opposed to 5.0 pCi/g.
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings 40 CFR §192.21(f) and §192.22(b) Subpart C	Supplemental Standards	Where radionuclides other than radium-226 and its decay product are present in sufficient quantity and concentration to constitute a significant radiation hazard from residual radioactive materials, remedial actions shall, in addition to satisfying the standards of 40 CFR §§ 192.02, Subpart A and 192.12, Subpart B (both listed above), reduce other residual radioactivity to levels that are as low as is reasonably achievable.	Relevant and Appropriate	This ARAR was considered in the development of the selected remedy for Operable Unit 2. Compliance will be addressed in the WURP RA Work Plan. Radionuclides other than radium were assessed for risk and FRLs were developed for those that have demonstrated risk in excess of conservative criteria.

TABLE A-1
(CONT'D)

Citation	Chemical	Requirement	Determination	Remarks/Compliance
		RADIONUCLIDE CONCENTRATIONS IN SOILS (continued)		
Radiation Protection of the Public and the Environment DOE Order 5400.5 Chapter IV (4)(a)	Guidelines for Residual Radioactive Material	Guidelines for residual concentrations of radionuclides other than thorium and radium shall be derived from the basic dose limits by means of an environmental pathway analysis using specific property data where available. Procedures for these derivations are given in DOE/CH-8901. Residual concentrations of radioactive material in soil are defined as those in excess of background concentrations averaged over an area of 100 m^2.	TBC	This ARAR was considered in the development of the Operable Unit 2 selected remedy. Compliance with this ARAR will be addressed in the WURP RA Work Plan.
Radiation Protection of the Public and the Environment DOE Order 5400.5 Chapter IV (4)(a)(2),(3)	Generic Guidelines for Residual Concentrations	The generic guidelines for residual concentrations (in excess of background) of radium-226, radium-228, thorium-230, and thorium-232 are: • 5 pCi/g, averaged over the first 15 cm of soil below the surface; and • 15 pCi/g, averaged over 15-cm-thick layers of soil more than 15 cm below the surface. These guidelines take into account ingrowth of radium-226 from thorium-230 and of radium-228 from thorium-232, and assume secular equilibrium. If both thorium-230 and radium-226, or both thorium-232 and radium-228, are present and not in secular equilibrium, the appropriate guideline is applied as a limit for the radionuclide with the higher concentration.	TBC	Compliance with this requirement was considered in the Operable Unit 2 FS to determine the FRLs. This ARAR was considered in the development of the Operable Unit 2 selected remedy. Compliance with this ARAR will be addressed in the WURP RA Work Plan.
Radiation Protection of the Public and the Environment DOE Order 5400.5 Chapter IV (4)(a)(1)	Hot Spots	If the average concentration in any surface or below surface area less than or equal to 25 m^2, exceeds the limit or guideline by a factor of $(100/A)^{0.5}$ [where A is the area (in square meters) of the region in which the concentrations are elevated], limits for "hot spots" shall also be developed and applied. Procedures for calculating these hot spots limits, which depend on the extent of the elevated local concentrations, are given in DOE/CH-8901. In addition, reasonable efforts shall be made to remove any source of radionuclide that exceeds 30 times the appropriate limit in the soil, irrespective of the average concentration in the soil.	TBC	This ARAR was considered in the development of the Operable Unit 2 selected remedy. Compliance with this ARAR will be addressed in the WURP RA Work Plan.

TABLE A-1
(CONT'D)

Citation	Chemical	Requirement	Determination	Remarks/Compliance
RADIONUCLIDE CONCENTRATIONS IN SOILS (continued)				
EPA Guidance Methods for Evaluating the Attainment of Cleanup Standards, Vol. 1	Attainment of Soil Cleanup Standards	This document describes methods for testing whether soil chemical concentrations at a site are statistically below a cleanup standard or ARAR. If it can be reasonably concluded that the remaining soil or treated soil at a site has concentrations that are statistically less than relevant cleanup standards then the site can be judged protective of human health and the environment.	TBC	This ARAR was considered in the development of the Operable Unit 2 selected remedy. Compliance with this ARAR will be addressed in the WURP RA Work Plan.
Resource Conservation and Recovery Act 40 CFR §268.41	Requirements for Lead Disposal	The maximum concentration of lead in the extract of any sample of treated soil is 5 mg/L.	Relevant and Appropriate	This requirement may be pertinent to material excavated from the firing range. This material will be managed by Operable Unit 1 for disposal off-site.
Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (OSWER Directive 9355.4-12)	Screening Level for Lead in Soil	EPA recommends using 400 ppm soil lead as a screening level for lead in soil for residential scenarios at CERCLA sites and at RCRA Corrective Action sites. Residential areas with soil lead below 400 ppm generally require no further action.	TBC	Compliance with this proposed standard was considered in the Operable Unit 2 FS to determine the FRLs.

TABLE A-2
RADIOLOGICAL ACTION-SPECIFIC REQUIREMENTS

Citation	Action	Requirement	Determination	Remarks/Compliance
		MANAGEMENT OF LOW-LEVEL RADIOACTIVE WASTE		
Radioactive Waste Management DOE Order 5820.2A Chapter III (3)(a)	Performance Objectives of Low-Level Radioactive Waste Management	DOE low-level radioactive waste shall be managed to accomplish the following performance objectives: • protection of public health and safety; • protection of the public and the environment from releases of radioactivity (see chemical-specific requirements for radioactive dose limitations); and • protection of groundwater resources, consistent with Federal, State, and local requirements.	TBC	This ARAR was considered in the development of the Operable Unit 2 selected remedy. Compliance with this ARAR will be addressed in the WURP RA Work Plan.
Radioactive Waste Management DOE Order 5820.2A Chapter III (3)(d)	Waste Characterization	Low-level waste shall be characterized with sufficient accuracy to permit proper segregation, treatment, storage, and disposal. This characterization shall that, upon generation after processing, the actual physical and chemical characteristics and major radionuclide content are recorded and known during all stages of the waste management process. Waste characterization data shall be recorded on a waste manifest and shall include: • the physical and chemical characteristics of the waste: • volume of the waste (total of waste and any solidification or absorbent media); • weight of the waste (total of waste and any solidification or absorbent media); • major radionuclides and their concentrations; and • packaging date, package weight, and external volume.	TBC	This ARAR will be addressed in the WURP RA Work Plan, and will be consistent with the Operable Unit 5 SEP, where appropriate.

TABLE A-3
OTHER ACTION-SPECIFIC REQUIREMENTS

Citation	Action	Requirement	Determination	Remarks/Compliance
		AIR POLLUTION CONTROL		
Ohio General Provisions on Air Pollution Control OAC 3745-15-07 ORC 3704.01-.05	Prevention of Air Pollution Nuisance	Measures shall be taken to adopt and maintain a program for the prevention, control, and abatement of air pollution in order to protect and enhance the quality of the state's air resource so as to promote the public health, welfare, and economic vitality of the people of the state. The emission or escape into open air from any source whatsoever of smoke, ashes, dust, dirt, grime, acids, fumes, gases, vapors, odors, and combinations of the above in such a manner or in such amounts as to endanger the health, safety, or welfare of the public or to cause unreasonable injury or damage to property shall be declared to be a public nuisance. It is unlawful for any person to cause, permit, or maintain any such public nuisance.	Applicable	Real-time air monitoring will be addressed in the WURP RA Work Plan and will be consistent with the Operable Unit 5 SEP. Site-wide monitoring at the FEMP will be addressed in the IEMP.
Ohio Emissions of Particulate Matter OAC 3745-17-07(B)(4),(5),(6)	Control of Visible Particulate Emissions	There shall be no visible particulate emissions from any paved roadway or parking area except for a period of time not to exceed six minutes during any sixty-minute observation period. There shall be no visible particulate emissions from any unpaved roadway, parking area, or material storage piles except for a period of time not to exceed thirteen minutes during any sixty-minute observation period.	Applicable	This ARAR will be addressed in the WURP RA Work Plan, and will be consistent with the Operable Unit 5 SEP, where appropriate.
Ohio Emissions of Particulate Matter OAC 3745-17-08	Restriction of Emission of Fugitive Dust	No person shall cause or permit any fugitive dust source to be operated; or any materials to be handled, transported or stored; or a building or its appurtenances or a road to be used constructed, altered, repaired or demolished without taking or installing reasonably available control measures to prevent fugitive dust from becoming airborne. Such reasonably available control measure shall include, but not be limited to, one or more of the following which are appropriate to minimize or eliminate visible particulate emissions of fugitive dust:	Relevant and Appropriate	This requirement is applicable only to certain cities in Butler and Hamilton Counties. This ARAR will be addressed in the WURP RA Work Plan, and will be consistent with the Operable Unit 5 SEP, where appropriate.

TABLE A-3
(CONT'D)

Citation	Action	Requirement	Determination	Remarks/Compliance
		AIR POLLUTION CONTROL (continued)		
		• the use of water or other suitable dust suppression chemicals for the control of fugitive dust from the demolition of existing buildings or structures, construction operations, the grading or roads or the clearing of land; or • the periodic application of asphalt, oil, water, or other suitable dust suppression chemicals on dirt or gravel roads and parking lots, and any other surfaces which cause emissions of fugitive dust.		
Ohio Particulate Matter Standards OAC 3745-17-11	Restrictions on Particulate Emissions	The following are restrictions for particulates from any operation, process, or activity which releases or may release particulate emissions into the ambient air. These limits are based on the weight of material being processed.	Applicable	This ARAR will be addressed in the WURP RA Work Plan, and will be consistent with the Operable Unit 5 SEP, where appropriate.
		WATER POLLUTION CONTROL		
National Pollutant Discharge Elimination System 40 CFR §122.26 (a)(1)(ii) 40 CFR §122.26 (b)(14)(v),(x)	Storm Water Discharge Associated with Industrial Activity	A discharge composed entirely of storm water associated with industrial activity is required to obtain a NPDES permit.	Applicable	Engineering controls will be implemented to monitor and control stormwater runoff during removal, treatment, and disposal of Operable Unit 2 material. Compliance with this ARAR is addressed in Section 2.3.1 and will be consistent with the Operable Unit 2 WURP RA Work Plan and the SEP. Compliance will also be met through the FEMP's NPDES permit and the Stormwater Pollution Prevention Plan.

TABLE A-3
(CONT'D)

Citation	Action	Requirement	Determination	Remarks/Compliance
		WATER POLLUTION CONTROL (continued)		
		These categories of facilities are considered to be engaging in "industrial activity": • landfills, land application sites, and open dumps that receive or have received any industrial wastes (waste that is received from any of the facilities described under this subsection) including those that are subject to regulation under subtitle D of RCRA; and • construction activity including clearing, grading, and excavation activities that disturbs 5 acres or more of total land area.		
Clean Water Act §404 (33 U.S.C. §1344) Guidelines for Specifications of Disposal Sites for Dredged or Fill Material 40 CFR §230.10	Discharge of Dredged or Fill Material	No discharge of dredged or fill material shall be permitted: • if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as, the alternative does not have other significant adverse environmental consequences. • unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem. No discharge of dredged or fill material shall be permitted if it: • causes or contributes, after consideration of disposal site dilution and dispersion, to violations of any applicable state water quality standard. • violates any applicable toxic effluent standard or prohibition under section 307 of the Clean Water Act.	Applicable	Dredge and fill material is not anticipated to be released to waters of the State because of design for erosion and sedimentation control. Compliance is addressed in Section 1.3.8 and the WURP RA Work Plan.

TABLE A-3
(CONT'D)

Citation	Action	Requirement	Determination	Remarks/Compliance
		WATER POLLUTION CONTROL (continued)		
		• jeopardizes the continued existence of species listed as endangered or threatened under the Endangered Species Act of 1973, as amended, or results in likelihood of the destruction or adverse modification or a habitat which is determined to be a critical habitat under the Endangered Species Act of 1973, as amended.		
Clean Water Act General Regulatory Policies 33 CFR §323.3	Permits for Discharges of Dredged or Fill Material	Permits will be required for the discharge of dredged or fill material into waters of the United States including wetlands. Certain discharges specified in 33 CFR Part 330 are permitted by that regulation (nationwide permits). If a discharge of dredged or fill material is not permitted by 33 CFR Part 330 (Nationwide Permits), an individual section 404 permit will be required for the discharge of dredged or fill material into waters of the United States. Discharges of dredged or fill material into waters of the United States done by or on behalf of any Federal agency, other than the Corps of Engineers, are subject to the authorization procedures of these regulations.	Applicable	Dredge and fill material is not anticipated to be released to waters of the State because of design for erosion and sedimentation control.
Ohio Water Pollution Control Regulations ORC 6111.04	Acts of Pollution Prohibited	No person shall cause pollution or place or cause to be placed any sewage, industrial waste, or other wastes in a location where they cause pollution of any waters of the state. No person to whom a permit has been issued shall place or discharge, or cause to be placed or discharged, in any waters of the state any sewage, industrial waste, or other wastes in excess of the permissive discharges specified under such existing permit without first receiving a permit from the Director to do so.	Applicable	Compliance is addressed in Section 1.3.8 and the WURP RA Work Plan
		NOISE POLLUTION CONTROL		
Noise Control Act 42 U.S.C. §4901, *et seq.* Noise Pollution and Abatement Act 42 U.S.C. §7641	Noise Pollution Control	The public must be protected from noises that jeopardize health and welfare.	Applicable	Compliance will be addressed in the WURP RA Work Plan.

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TABLE A-4
LOCATION-SPECIFIC REQUIREMENTS

Citation	Location	Requirement	Determination	Remarks/Compliance
THREATENED AND ENDANGERED SPECIES PROTECTION				
Procedures for Implementing the National Environmental Policy Act 40 CFR §6.302(h) Endangered and Threatened Wildlife and Plants 50 CFR §17.21,§17.94 Interagency Cooperation-Endangered Species Act 50 CFR §402.01	Endangered Species and Critical Habitat	All Federal agencies must insure that any action authorized, funded, or carried out by them is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of the constituent elements essential to the conservation of a listed species within a defined critical habitat.	Applicable	In 1993 and 1994, updated surveys at the FEMP determined the presence of the state-listed Sloan's crayfish (*Orconectes sloanii*) in Paddys Run. Additionally, it was determined that good habitat exists for the federally-listed endangered Indiana bat (*Myotis sodalis*) along Paddys Run and the storm sewer outfall ditch. Moderate and marginal habitat exist in a very limited area for the state-listed endangered cave salamander (*Eurycea lucifuga*). Surveys did not locate habitat or populations for the federally-listed endangered running buffalo clover (*Trifolium stoloniferum*) or the state-listed endangered mountain bindweed (*Polugonum cilinode*) and slender fingergrass (*Digitaria filiformis*). In addition, neither habitat nor populations of the state-listed threatened spring coralroot (*Corallorhiza wisteriana*) were found on FEMP property. Compliance with this requirement is addressed in the 1993 and 1994 FEMP surveys.
Ohio Endangered Species Regulations ORC 1531.25	Endangered Animal Species	No person shall take or possess any native species of wild animal, or any eggs or offspring thereof, that is threatened with state-wide extinction.	Applicable	See first remark. Compliance with this requirement is addressed in the 1993 and 1994 FEMP surveys.

TABLE A-4
(CONT'D)

Citation	Location	Requirement	Determination	Remarks/Compliance
THREATENED AND ENDANGERED SPECIES PROTECTION (continued)				
Ohio Endangered Species Regulations ORC 1518.02 OAC 1501:18-1	Endangered Plant Species	No person shall root up, injure, destroy, remove, or carry away on or from public highways, public property, or waters of the state, or on or from the property of another, without the written permission of the owner, lessee, or other person entitled to possession, any endangered or threatened plant listed in OAC 1501:18-1.	Applicable	See first remark. Compliance with this requirement is addressed in the 1993 and 1994 FEMP surveys.
HISTORIC AND CULTURAL RESOURCE PROTECTION				
Archaeological Resources Protection Act 16 U.S.C. §470aa-470ll Procedures for Implementing the National Environmental Policy Act 40 CFR §6.301(c) Protection of Archaeological Resources 43 CFR §7.4(a)	Archaeological Resource Recovery and Preservation	No person may appropriate, excavate, injure, or destroy any historic or prehistoric ruin or monument, or any object of antiquity situated or controlled by the Government of the United States.	Applicable	All archaeological work at the FEMP will be associated with the management of archaeological resources. No permit is required. Substantive provisions of 43CFR7.4(a) are met through the procurement process, and through compliance with NHPA nad NAGPRA.
National Historic Preservation Act 16 U.S.C. §470 36 CFR 800 Procedures for Implementing the National Environmental Policy Act 40 CFR §6.301 (a),(b)	Historic Preservation	A Federal agency must take into account how each of its undertakings could affect historic properties. The purpose of this Act is not only to protect those properties listed in or eligible for the National Register of Historic Places, but also those properties that have not been listed or formally determined eligible for the listings. The heads of all Federal agencies shall assume responsibility for the preservation of historic properties which are owned or controlled by such agency. Prior to any Federal undertaking which may directly and adversely affect any National Historic Landmark, the head of the responsible agency shall, to the extent possible, minimize the harm to such landmark.	Applicable	See above remark. Areas of disturbance assicated with Operable Unit 2 remedial activities have been or will be surveyed to determine applicable requirements and the Advisory Council will be consulted, as agreed upon in a draft programmatic agreement with DOE, SHPO, and the Advisory Council. DOE will conduct data recovery of historic site properties that will be considered for each.

TABLE A-4
(CONT'D)

Citation	Location	Requirement	Determination	Remarks/Compliance
HISTORIC AND CULTURAL RESOURCE PROTECTION (continued)				
Native American Graves Protection and Repatriation Act 25 U.S.C. §3001	Protection of American Indian Grave Sites	Provides for the return of human remains and cultural objects from Native American graves to affiliated tribes.	Applicable	DOE will consult with likely culturally arrived tribes to determine the excavation, treatment, analysis, and preparation of any extra reviews, associated funerary objects, sacred objects, or objects of cultural patrimony. Consultation will be coordinated with NHAA compliance when possible.
Procedures for Implementing the National Environmental Policy Act 40 CFR §6.302(b) [Executive Order 11988]	Floodplain Management	Federal agencies must evaluate the potential effects of actions they may take in a floodplain to avoid, to the extent possible, adverse effects associated with direct and indirect development of a floodplain.	Applicable	An updated floodplain determination was performed for Paddys Run in October 1993 using the Army Corps of Engineers' standard HEC2 water surface profile analysis program. The 100-year flood elevations reach the western slope of the Inactive Flyash Pile and the toe of the South Field slope. Indirect, short-term floodplain impacts will occur during remediation. A Wetland/Floodplain Assessment was conducted.
FLOODPLAINS/WETLANDS PROTECTION				
DOE Compliance with Floodplain/Wetlands Environmental Review Requirements 10 CFR §1022.12(a)	Floodplain/Wetlands	If DOE determines, pursuant to 10 CFR § 1022.5 and 1022.11, that this part is applicable to the proposed action, DOE shall prepare a floodplain/wetlands assessment, according to the requirements in this section (10 CFR §1022.12).	Applicable	These are the DOE implementing regulations for Executive Orders §11988 and §11990. Impacts to floodplains and wetlands where identified through the preparation of a floodplain/wetland assessment, which was identified in Appendix H of the Operable Unit 2 FS and in Section 2.3.1.

APPENDIX B

FUNCTIONAL REQUIREMENTS DOCUMENT

Appendix B has been prepared by FERMCO and provides the functional requirements for the Waste Units Remediation project.

DETAILED PROJECT DESCRIPTION/FUNCTIONAL REQUIREMENTS DOCUMENT

TABLE OF CONTENTS

LIST OF ACRONYMS AND ABBREVIATIONS ii

1.0 INTRODUCTION AND BACKGROUND 1

2.0 DOCUMENT SCOPE 2

3.0 GENERAL FUNCTIONAL REQUIREMENTS 3

4.0 REGULATORY REQUIREMENTS 4

5.0 NUCLEAR SAFETY AND RADIATION PROTECTION 5

6.0 SPECIFIC FUNCTIONAL REQUIREMENTS 6

6.1 Project Phasing 6

6.2 Design Criteria 6

6.2.1 Stormwater and Erosion Control 6

6.2.2 Equipment and Personnel Decontamination 7

6.2.3 Haul Roads and Contamination Control 7

6.2.4 Excavation of Lead Impacted Material 8

7.0 REFERENCE MATERIALS 9

8.0 PROJECT MILESTONES 10

LIST OF ACRONYMS AND ABBREVIATIONS

ACI	American Concrete Institute
ADT	Average Daily Traffic
A/E	Architect/Engineer
ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Index
ARAR	applicable or relevant and appropriate requirement
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
AWWT	Advanced Wastewater Treatment
BA	Borrow Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFC	Certified For Construction
CFR	Code of Federal Regulations
cm/sec	centimeters per second
COCs	Contaminant Of Concern
COE	U.S. Army Corps of Engineers
CY	Calendar Year
DF	Disposal Facility
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
FEMP	Fernald Environmental Management Project
FERMCO	Fernald Environmental Restoration Management Company
FRLs	Final Remediation Levels
NAD	North American Datum
NEC	National Electrical Code
OEPA	Ohio Environmental Protection Agency
OSDF	On-Site Disposal Facility
OU2	Operable Unit 2
RCRA	Resource Conservation and Recovery Act
ROD	Record Of Decision
SOW	Statement Of Work
SWU	Southern Waste Unit
WAC	Waste Acceptance Criteria
WPRAP	Waste Pit Remedial Action Project.

1.0 INTRODUCTION AND BACKGROUND

This document presents the functional requirements for the preparation of the design documents to address the Operable Unit 2 Waste Units for the Fernald Environmental Management Project (FEMP) Soil Remediation Project (SRP). The design shall address excavation of the soil, debris, flyash, sludge, and other material from the Operable Unit 2 waste units and subsequent transportation to either the On-Site Disposal Facility (OSDF) or to an interim staging area prior to shipment off-site. This document is a Functional Requirements Document as defined by the Fernald Environmental Restoration and Management Company (FERMCO) Engineering Procedure No. 12-4001, Revision D. Functional Requirements are defined as the fundamental technical criteria and design requirements necessary to develop a project design.

2.0 DOCUMENT SCOPE

The scope of this document includes defining the functional requirements of the impacted material excavation, transport and delivery of the material to the OSDF or designated staging area for off-site disposition, and associated supporting functions including surface water and waste water handling. Excavated material below the waste acceptance criteria (WAC) will be delivered to the OSDF; material above the WAC will be transferred to the Waste Pit Remedial Action Project (WPRAP) near the Waste Pit Area.

The Scope of Work (SOW) is to prepare design packages to address the strategy to support and attain the remediation goals as defined in the FERMCO "276" plan. This SOW includes: the review of information available in the Remedial Investigations and Feasibility Studies as produced by FERMCO; determine limits of excavation; prepare excavation sequencing plans, interim grading plans, final grading plans, and associated stormwater and erosion and sediment control plans. Additional work will include construction cost estimates, scheduling and regulatory requirements.

3.0 GENERAL FUNCTIONAL REQUIREMENTS

This portion of the overall strategy of the 276 plan is to excavate contaminated soil and rubble previously placed in the Southern Waste Units (SWU) area, Lime Sludge Ponds (LSPs) and the Solid Waste Landfill (SWL) and deposit the material in the OSDF or transport to an interim storage area prior to disposal in an appropriate off-site disposal facility. Approximately 260,000 cubic yards (bank/unbulked) of soil, rubble and fly ash material will be removed from the SWU waste units during remediation activities. Approximately 18,500 cubic yards of lime sludge material will be removed from the LSPs, and 24,200 cubic yards of material will be removed from the SWL. These materials will be transported and delivered to the OSDF or staged prior to shipment off-site for ultimate disposal. The majority of the material will be soil, rubble, and flyash impacted with radionuclides.

Material exceeding the WAC [primarily 346 picocuries per gram (pCi/g) uranium-238, or 1,030 parts per million (ppm) total uranium] will be transferred to the WPRAP for loading into rail cars and off-site shipment. This is estimated to be less than 1 percent of the total amount of waste material. Material less than the WAC will be transported for placement in the OSDF. As necessary, debris will be processed (reduced) for size prior to placement and placed in the OSDF. Moisture will be controlled at the OSDF to support waste placement and compaction.

Excavation will be completed to the depth and contour defined by the excavation plan. This excavation plan will be developed from the FERMCO Operable Unit 2 three-dimensional computer models of soil contamination, historical topography (illustrating the ground prior to waste placement) and other information.

A haul road will be constructed to transport the excavated materials to the OSDF. The haul road will be located in the contaminated area and is not a part of this SOW. The road will be a two lane, asphalt paved, undivided road with shoulders on each side. Haul trucks must be sized to work effectively with the haul road as designed.

Handling of surface water will be addressed in the design. Surface water from undisturbed areas and where excavation activities have removed material above FRL will be routed through sediment basins prior to discharge. Seepage and surface water from areas with material above the FRL will be collected and conveyed to the SWRB (SF and SWL) and BSL (LSP). From the SWRB and BSL, the water will be transferred to the advance waste water treatment facility (AWWT) for treatment prior to discharge. As discussed in the Operable Unit 2 FS, intermediate sedimentation will be evaluated during design to optimize flow to the AWWT. Piping systems conveying potentially contaminated water through areas below FRLs will be double walled. Runoff will be controlled in accordance with the Water Management and Sediment Control for Urbanized Areas, latest edition, as published by the Soil Conservation Service.

4.0 REGULATORY REQUIREMENTS

The impacted material excavation detailed design will conform with CERCLA ^U121(d)(2) which requires that remedial actions protect human health and the environment and comply with applicable or relevant and appropriate requirements (ARARs). The complete list of Operable Unit 2 ARARs can be found in Appendix A.

EPA has identified three categories of ARARs:

- Chemical-specific ARARs are usually health- or risk-based numerical values or methodologies used to determine acceptable concentrations of chemicals that may be found in or discharged to the environment [e.g., maximum contaminant levels (MCLs) that establish safe levels in drinking water].

- Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions or conditions involving special substances.

- Location-specific ARARs restrict actions or contaminant concentrations in certain environmentally sensitive areas. Examples of areas regulated under various federal laws include floodplains, wetlands, and locations where endangered species or historically significant cultural resources are present.

Sources of Operable Unit 2 ARARs are federal and state laws, regulations, and guidance and DOE Orders that address the site-specific circumstances in Operable Unit 2.

The chemical-specific requirements include ARARs associated with potential releases to air, surface water, groundwater, and penetrating radiation. Releases of dust and radiation to the air will meet applicable requirements; discharges to surface water will meet Ohio Water Quality Criteria; the groundwater will be protected to drinking water standards; and the public will be protected according to DOE Orders from potential releases of radiation.

Action-specific ARARs require that the impacted material excavation be designed and completed to comply with appropriate DOE Orders (including the As Low As Reasonably Achievable [ALARA] policy); 40 Code of Federal Regulations (CFR) 192 (uranium mill tailings); and RCRA requirements for control of hazardous waste.

The protection of endangered species, cultural resources, floodplains, and wetlands in excavation and hauling locations is covered under the location-specific requirements.

5.0 NUCLEAR SAFETY AND RADIATION PROTECTION

Radiation protection shall comply with ARARs identified for this project and ALARA principles. This project will not involve handling, storage, or treatment of special nuclear materials; therefore, safeguards for these materials are not required.

Since the maximum uranium radioactivity of waste materials to be encountered in the impacted material excavation is within a range not greatly exceeding 1,030 picoCuries/gram, no shielding or special nuclear handling requirements are needed.

6.0 SPECIFIC FUNCTIONAL REQUIREMENTS

6.1 Project Phasing

The three project areas (SWU, LSP, and the SWL) are separate and distinct; they may be excavated at separate times depending on the actual sequencing of construction for the entire site. Within each area, the design documents will present and outline a phasing concept for the controlled excavation of the each project area. The phasing concept will be developed by the design team and FERMCO as necessary for the remediation.

The SOW will be to develop an excavation and grading plan to logically remove material and soil to minimize potential contamination of the Great Miami Aquifer, Paddys Run, and adjacent non-contaminated soil. Interim (post-excavation) grading plans will be developed to maintain control of stormwater and future excavation activities. The interim final grading plan may eventually be modified after the final use of the site is selected. However, the final site grading plans are not part of this SOW.

The design will assure that the entire sequence of excavation and associated support facilities can be completed in compliance with the ARARs and good engineering practice.

6.2 Design Criteria

The SWUs contain soil, flyash, and debris with contaminant concentrations above and below the WAC. The LSPs contain solidified lime and soil. The SWL contains soil and debris. The objective of excavation will be to remove debris and fill, and material above FRLs in the SWUs and SWL areas, and lime sludge and material above FRLs in the LSP. Design documents will be developed to illustrate excavation in each area. Final excavation limits will be set in the field based on testing of actual material encountered. Sampling and analysis will be performed to verify compliance with FRLs. Air quality and radiological monitoring will be performed during excavation. Geotechnical analysis and review will be performed during design to establish maximum cut slopes. Other issues to be addressed during design include stormwater, erosion and sediment control, equipment and personnel decontamination, haul road, and excavation of lead impacted material.

6.2.1 Stormwater and Erosion and Sediment Control

Runoff from all waste units will be addressed via two different methods: 1) noncontaminated runoff from undisturbed areas and excavated areas that are below FRLs will be conveyed to sediment traps prior to discharge; 2) contaminated runoff from the active excavation areas and those areas that are not below FRLs will be collected in excavation pit sumps and conveyed to the AWWT.

Noncontaminated Runoff - Sediment basins will be used at the SWUs area to provide erosion and sediment control measures during construction. All runoff from the LSP and SWL will be collected

during excavation and eventually conveyed to the AWWT. After the areas are below FRL, the LSP and SWL excavations will act as control ponds and water will be discharged to nearby existing ditches.

Contaminated Runoff - Excavation in each area will be performed to form a low spot within the disturbed area. A sump pump will be placed within each low area. Runoff and potentially contaminated water from each low area will be collected and eventually conveyed to the AWWT. Contaminated runoff from the SWUs will be pumped to the SWRB prior to the AWWT. Runoff from the active excavation area of the LSP will be conveyed to the BSL prior to the AWWT. Contaminated runoff from the SWL will discharge into the stormwater management system in the production area and then to the SWRB prior to treatment in the AWWT.

The sediment traps and the stormwater management system will be designed to handle the 10 year, 24 hour storm. Piping systems which convey potentially contaminated water through areas which are below FRLs will be double-walled.

6.2.2 Equipment and Personnel Decontamination

Decontamination facilities for personnel will be constructed at the egress points next to the staging areas. The decontamination facilities will include a trailer to remove/store/dispose PPE and decontamination facilities for construction equipment and personnel. Waste water and runoff from the decontamination areas at the LSP will be collected and routed to the site's treatment system via the BSL with provision for sending the water to the SWRB. Waste water and runoff from the SWUs will be collected and routed to the AWWT via the SWRB. Waste water and runoff from the SWL will be collected and routed to the existing stormwater management system within the production area and then to the AWWT via the SWRB.

For waste and contaminated soil excavation, personnel decontamination facilities near the excavation area will be used to pass from the controlled work area to the administrative support area. Personal vehicles will not be allowed in any of the work areas.

A personnel decontamination trailer will be provided at the personnel decontamination facilities. This decontamination trailer will also contain lockers, emergency showers, portable eye wash, and sanitary facilities.

Equipment decontamination includes the following effort: the under carriage and exterior of all haul vehicles leaving the contaminated excavation work area will be cleaned to remove particulate matter. Each haul vehicle will be decontaminated with a high pressure spray. This decontamination procedure is intended to remove bulk solids from the vehicles. The haul roads will be consider contaminated for radiation control purposes. These decontamination stations will be temporary facilities or transportable units since the egress points from the project will vary considerably with time.

6.2.3 Haul Roads and Contamination Control

Haul roads for transportation of the material to the OSDF and staging area will be constructed from the SWU, LSP, and SWL areas under a separate contract and is not part of this design. The vehicular traffic pattern and truck size must be coordinated with the haul road design engineer. Truck traffic will be considered during the design of the underground utilities and haul roads. Wheel wash facilities will be constructed at the SWUs and the SWL to remove larger pieces of soil prior to entering the haul roads.

6.2.4 Excavation of Lead Impacted Material

Lead bullets and fragments from the Firing Range are embedded in the embankment of the SWUs east of the running track. Approximately 360 cubic yards of soil containing lead bullets will be excavated along the embankment. The soils containing the lead bullets and fragments will be excavated and transported to the FERMCO Waste Management Department treatment area. After treatment the Waste Management Department will ship the waste to an off-site mixed waste disposal facility.

7.0 REFERENCE MATERIALS

This section identifies the primary documents used for reference during remedial design. This includes those documents prepared to date to support the Remedial Design and Remedial Actions. Specific codes, standards, and DOE Orders which apply to this project will be identified in the Design Criteria Package (DCP) of the impacted material excavation.

The following are the primary reference documents which apply to this project:

- Remedial Investigation Report

  U.S. Department of Energy, 1995a. "Final Remedial Investigation Report for Operable Unit 2, FEMP, Fernald, OH, Remedial Investigation, Feasibility Study" U.S. DOE Fernald Office, Fernald Ohio.

- Feasibility Study

  U.S. Department of Energy, 1995a. "Final Feasibility Study Report for Operable Unit 2, FEMP, Fernald, OH, Remedial Investigation, Feasibility Study" U.S. DOE Fernald Office, Fernald Ohio.

- Record Of Decision

  U.S. Department of Energy, 1995a. "Final Record of Decision for Remedial Actions at Operable Unit 2, FEMP, Fernald, OH," U.S. DOE Fernald Office, Fernald Ohio.

- Remedial Design Work Plan

  U.S. Department of Energy, 1995. "Draft Remedial Design Work Plan for Remedial Actions at Operable Unit 2" FEMP, Fernald, OH," U.S.DOE Fernald Office, Fernald Ohio.

- Waste Units Geotechnical Report, due January 1996.

8.0 PROJECT MILESTONES

The following milestones are defined in the Draft Remedial Design Work Plan for Remedial Actions at Operable Unit 2."

• Submit Waste Units Preliminary Design Review Package to DOE	3/29/96
• Submit Waste Units Preliminary Design Review Package to EPA	5/28/96
• Submit impacted material excavation Southern Waste Units Pre-Final Design Review Package to DOE	8/5/96
• Submit impacted material excavation Southern Waste Units Pre-Final Design Review Package to EPA	9/13/96
• Submit Southern Waste Units Title I/II CFC Package to EPA	2/21/97

Fly Ash Piles and South Field Waste Units Geotechnical Report

Operable Unit 2
Project Order 154

April 1996
Revision 0

Environmental Remedial Action Project
Fernald Environmental Management Project
Fernald, Ohio
FERMCO Subcontract No. 2-21487

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25 Merchant Street
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CONTENTS

SECTION

1.0 Introduction 1-1
- 1.1 Scope and Objectives 1-1
- 1.2 Background 1-3

2.0 Prior Geotechnical Investigations 2-1
- 2.1 Active Fly Ash Pile Geotechnical Investigations 2-1
- 2.2 Inactive Fly Ash Pile Geotechnical Investigations 2-5
- 2.3 South Field Geotechnical Investigations 2-5

3.0 Field and Geotechnical Laboratory Testing Program 3-1
- 3.1 Soil Test Borings 3-1
- 3.2 Shallow Borings 3-2
- 3.3 Geotechnical Laboratory Testing 3-3

4.0 Laboratory Test Results 4-1
- 4.1 Index/Classification Tests 4-1
- 4.2 Compaction Tests 4-1
- 4.3 Remolded Consolidation Tests 4-7
- 4.4 Remolded Strength Tests 4-7
- 4.5 Remolded Laboratory Permeability Tests 4-10

5.0 Evaluation, Analyses, and Recommendations 5-1
- 5.1 Excavation Operations 5-1
- 5.2 Geotechnical Parameters 5-3
- 5.3 Temporary Slope Stability 5-14
- 5.4 Site Restoration 5-20

6.0 References 6-1

CONTENTS (Continued)

APPENDICES

A Boring Coordinates

B PO-154 Geotechnical Test Boring Field Logs, Geotechnical Logging Reports, and Trenching Logs

C PO-154 Shallow Boring Field Logs and Geotechnical Logging Reports

D Modal Diameter Tests

E Compaction Curves

F Mohr Circles

G Typical Engineering Properties of Fly Ash

LIST OF ILLUSTRATIONS

FIGURES

1-1 Location of OU-2 Waste Units
1-2 Topographic Map of the Active Fly Ash Pile, Inactive Fly Ash Pile and South Field Waste Units
1-3 Generalized Geologic Cross-Section at Active Fly Ash Pile
1-4 Generalized Geologic Cross-Section at Inactive Fly Ash Pile
1-5 Generalized Geologic Cross-Section at South Field
1-6 Typical Perched Groundwater Elevations at Active Fly Ash Pile, Inactive Fly Ash Pile and South Field Waste Units
1-7 Typical GMA Groundwater Elevations at Active Fly Ash Pile, Inactive Fly Ash Pile and South Field Waste Units

2-1 Map of Geotechnical Boring and Test Locations and Cross-Section Locations at the Active Fly Ash Pile, Inactive Fly Ash Pile, and South Field Waste Units
2-2 Trench Locations from Prior RI Investigations

TABLES

2-1 Summary of Index Properties from Prior Geotechnical Investigation of Active Fly Ash Pile, Inactive Fly Ash Pile and South Field
2-2 Summary of Physical Properties from Prior Geotechnical Investigation of Active Fly Ash Pile, Inactive Fly Ash Pile and South Field

3-1 Summary of Geotechnical Laboratory Program
3-2 Remolded Specimen Test Conditions
3-3 Standard Proctor Maximum Dry Density and OMC Criteria for Remolded Tests of Material from Tube/Barrel Samples

4-1 Summary of Index Properties
4-2 Summary of Organic Content Tests
4-3 Summary of Standard Compaction Tests of Bulk Samples
4-4 Summary of Consolidation Tests, Remolded Specimens
4-5 Summary of Mohr Circle Constructions from Unconsolidated, Undrained Triaxial Compression Tests, Remolded Specimens
4-6 Summary of Mohr Circle Constructions from Consolidated, Undrained Triaxial Compression Tests, Remolded Specimens
4-7 Summary of Laboratory Permeability Tests, Remolded Specimens

LIST OF ILLUSTRATIONS (Continued)

TABLES

5-1 Summary of Index Properties of AFAP, IFAP, and SF Materials

5-2 In Place Wet and Dry Density Parameters

5-3 Total Organic Content Parameters for Top Soils at AFAP, IFAP, and SF

5-4 Standard Proctor Compaction Test Parameters, from Materials from the AFAP, IFAP and SF

5-5 Range and Typical Values of Strength Parameters for In Place AFAP, IFAP, and SF Materials

5-6 Range and Typical Values of Strength Parameters for Remolded AFAP, IFAP, and SF Materials

5-7 Consolidation Parameters for Remolded AFAP, IFAP, and SF Materials

5-8 Summary of Shear Strength and Unit Weight Values Used for the OU-2 Southern Waste Unit Slope Stability Analyses

5-9 Summary of Shear Strength and Unit Weight Values Used for the Stratified Glacial Deposits Sections

5-10 Summary of OU-2 Southern Waste Unit Slope Stability Analyses

LIST OF ACRONYMS AND ABBREVIATIONS

AFAP	Active Fly Ash Pile
ASTM	American Society for Testing and Materials
ATT	Advanced Terra Testing, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm	centimeter
CU	Consolidated, Undrained (Triaxial Compression Test)
DOE	United States Department of Energy
FEMP	Fernald Environmental Management Project
FERMCO	Fernald Environmental Restoration Management Corporation
FOS	Factor of Safety
FS	Feasibility Study
GMA	Great Miami Aquifer
GSTP	Geotechnical Sampling and Testing Plan
ID	Inner Diameter
IFAP	Inactive Fly Ash Pile
LL	Liquid Limit
MDD	Maximum Dry Density
MSL	Mean Sea Level
OCR	Overconsolidation Ratio
OMC	Optimum Moisture Content
OU	Operable Unit
pcf	pounds per cubic foot
PI	Plasticity Index
PL	Plastic Limit
PO	Project Order
psf	pounds per square foot
psi	pounds per square inch
RI	Remedial Investigation
SAIC	Science Applications International Corporation
SCS	Soil Conservation Service
sec	second
SF	South Field
SPT	Standard Penetration Test
tsf	tons per square foot
USCS	Unified Soil Classification System
UU	Unconsolidated, Undrained (Triaxial Compression Test)
WAC	Waste Acceptance Criteria

SECTION 1

INTRODUCTION

This report summarizes the results of a geotechnical investigation performed at the Active Fly Ash Pile (AFAP), Inactive Fly Ash Pile (IFAP) and South Field (SF) waste units at the Fernald Environmental Management Project (FEMP), Fernald, Ohio. Figure 1-1 shows the locations of these waste units, collectively referred to as the Southern Waste Unit. The geotechnical investigation was performed to provide subsurface soil properties and parameters to support development of design criteria, and to provide parameters for excavation, disposal facility design, and site restoration. The materials excavated at these waste units will be removed, and either shipped off site for disposal or disposed of in the On-Site Disposal Facility (OSDF). The report summarizes the data from geotechnical field and laboratory tests, and provides preliminary recommendations based on analysis of these data.

1.1 Scope and Objectives

PARSONS was tasked by the Fernald Environmental Restoration Management Corporation (FERMCO) under Project Order 154 (PO-154) (PARSONS 1995a) to provide geotechnical engineering services for a geotechnical design investigation at the AFAP, IFAP and SF waste units. Specifically, PARSONS' scope was to:

1) Provide geotechnical sampling oversight during field activities

2) Provide geotechnical laboratory testing services

3) Perform preliminary geotechnical engineering evaluations and analyses based on field and laboratory data

4) Prepare a report that summarizes the field and laboratory data, and provide preliminary geotechnical and civil engineering recommendations

The overall objective of the evaluations and analyses is to provide preliminary geotechnical and civil engineering recommendations for the following general aspects for the proposed design:

1) Excavation
2) Geotechnical material parameters
3) Temporary slope stability
4) Site restoration

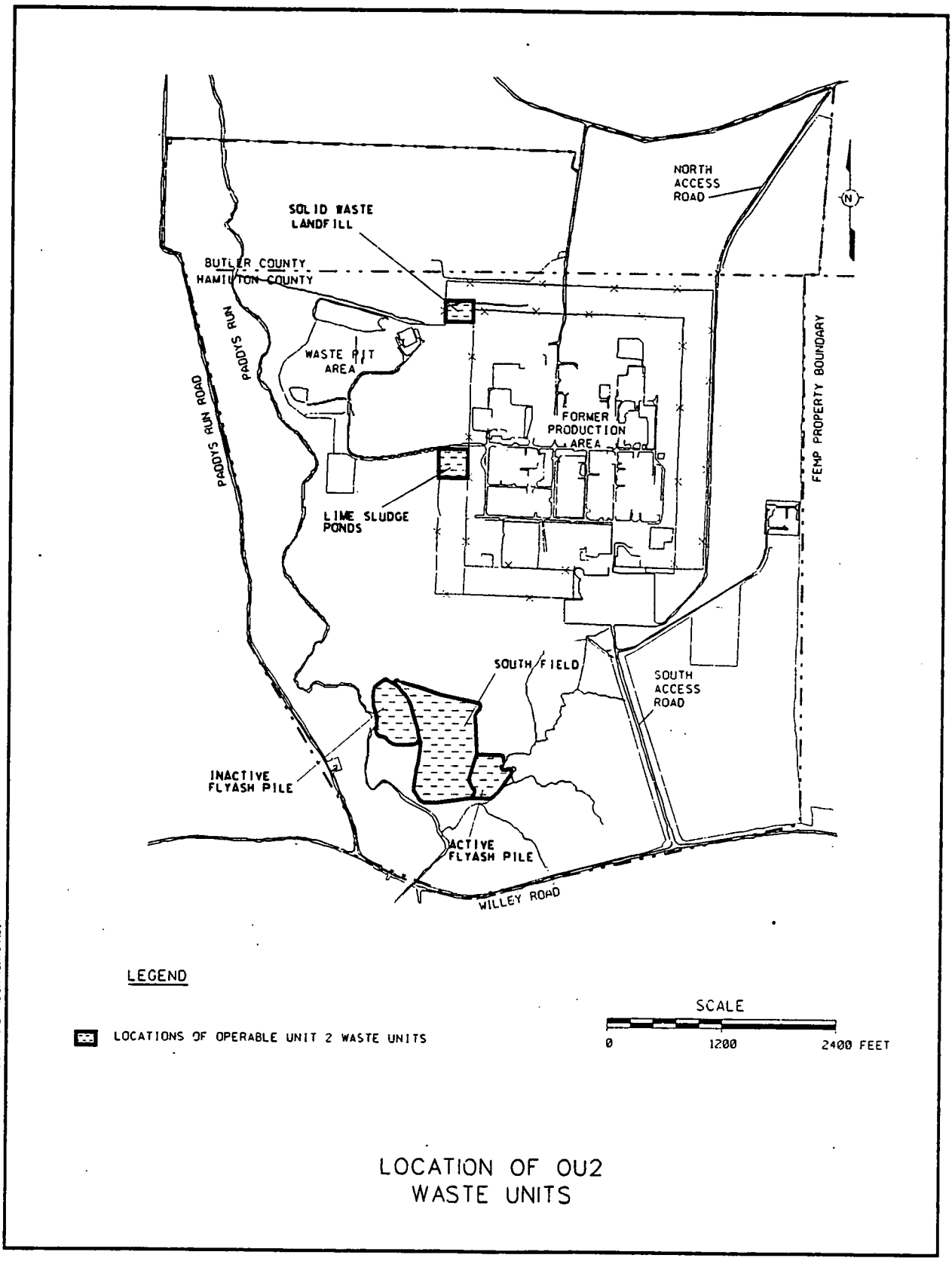

Figure 1-1 - Location of OU-2 Waste Units

Section 4 summarizes the results of the geotechnical laboratory testing conducted as part of the investigation. Section 5 summarizes the geotechnical evaluations and analyses performed and contains specific geotechnical and civil engineering design recommendations for the proposed design.

1.2 Background

The FEMP is a 1050 acre facility located about 17 miles northwest of downtown Cincinnati near Fernald, Ohio. The primary mission of the FEMP during its 37 years as an operating production facility was to process, refine, and machine high grade natural uranium ores into high purity uranium metal. These uranium production activities generated large quantities of waste materials. The storage and disposal of wastes at the site and their potential for impacting human health led to the site being placed on the National Priorities List for cleanup. For management of cleanup activities, various waste units at the site have been categorized and grouped. The resultant grouping formed the five operable units (OU) of the FEMP. Operable Unit 2 (OU-2), is comprised of 5 areas, or waste units, in which various conventional industrial wastes were disposed: Solid Waste Landfill (SWL), Lime Sludge Ponds (LSP), AFAP, IFAP, and SF. The subsections below provide a brief description of the AFAP, IFAP and SF waste units, which are the subject of this geotechnical investigation report. Figure 1-2 shows the topography at the AFAP, IFAP and SF waste units.

1.2.1 Description of Active Fly Ash Pile

The AFAP is bounded to the east and north by the Storm Sewer Outfall Ditch, and is separated from the SF to the west by an unpaved road. The AFAP appears as a large, steep pile of black fly ash, and covers about 3 acres. Wind screens and silt fences have been installed to prevent wind and water erosion, and a crusting agent has been applied (DOE 1995a).

Ash from the site's coal-fired boiler plant was disposed at the AFAP from the mid-1960s until December 1992. Coal analysis indicates that the Kentucky bituminous coal purchased for use at the FEMP has an ash content of approximately 8 percent. The waste at the AFAP is comprised of about 70 percent bottom ash and 30 percent fly ash. Small quantities of unburned coal and rock are present, as is typical of boiler ashes (DOE 1995a,b).

1.2.2 Description of Inactive Fly Ash Pile

The IFAP is located about 2,000 feet southwest of the former Production Area and covers approximately 2 acres. Paddys Run, a tributary of the Great Miami River, forms the western boundary; the SF lies to the east. The IFAP and SF are contiguous and lack a defined physical boundary. In appearance, this waste unit resembles a relatively steep hill covered with shrubs and trees. The soil covering the southern half of the IFAP is of unknown origin (DOE 1995a).

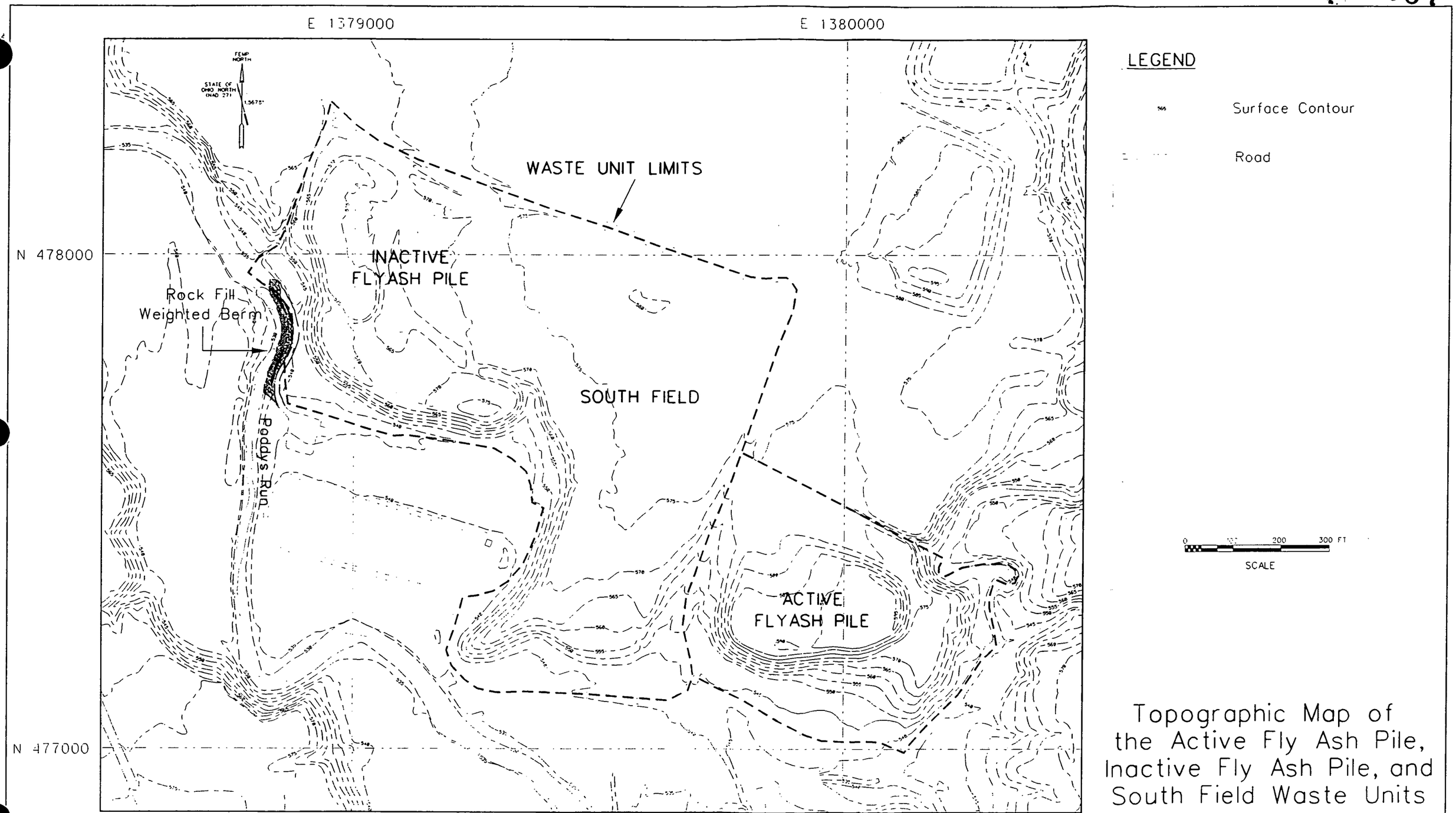

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Figure 1-2 - Topographic Map of the Active Fly Ash Pile, Inactive Fly Ash Pile, and South Field Waste Units

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The operating history of the IFAP is not well documented. The bulk of the waste material in the pile is reported to be bottom ash and fly ash from the facility's boiler plant operations, commonly referred to as fly ash. Based on a review of historical aerial photographs, fly ash appears to have taken by truck to an existing slope at Paddys Run and dumped. The photographs indicate that fly ash disposal at this waste unit had ceased by the mid-1960s. Various other wastes, including building rubble, gravel, asphalt and process waste, were also deposited at the IFAP (DOE 1995a).

A time-critical removal action was implemented in Paddys Run to stabilize the bank adjacent to the Inactive Fly Ash Pile. Continued erosion of the bank could have undermined the Inactive Fly Ash Pile's western slope and resulted in a discharge of contamination into Paddys Run. During late April and early May 1993, the slope was improved by installing a weighted rock berm to address the erosion problem. This interim action constituted the first phase of the removal action. The second phase was completed during September 1993, when additional riprap stone was installed at the top and toe of the weighted berm. The additional height was sufficient to cover the exposed soil face adjacent to Paddys Run, and toe protection was added to ensure the long-term stability of the berm (DOE 1995b). Figure 1-2 shows the approximate location of the weighted berm.

1.2.3 Description of South Field

The SF is an 11-acre area that lies between the IFAP and the AFAP. A physical boundary with the IFAP is not distinguishable. Currently, the SF is relatively flat and is covered with grasses, shrubs, and trees.

The operational history of the SF is neither well documented nor understood. It is not an engineered disposal site. A review of historical aerial photographs indicates that disposal may have been initiated in 1954 and continued until the mid 1960s. Disposal appears to have taken place in a random manner. Available documentation indicates that a number of wastes were disposed in the SF, including construction and demolition materials, fly ash, soils that may have been contaminated with low levels of radioactive materials, and possibly process wastes (DOE 1995a).

1.2.4 Subsurface Conditions

Subsurface materials at the FEMP site generally can be placed into six major categories:

1) Ash or fly ash
2) Fill
3) Stratified Glacial Deposits
4) Brown Till
5) Gray Till
6) Great Miami Aquifer (GMA)

The first two categories are not natural materials inasmuch as they have been moved and/or artificially placed. The remaining four categories consist entirely of natural, in place materials.

Although all of these materials are relatively common in various areas at the FEMP site, it is typical to find some combination of them at any particular location, and not necessarily a complete section of each, at all specific drilled locations. To promote clarity in the engineering evaluation and provide a reasonable set of labels for the purpose of discussing these various materials, common names have been used without particular emphasis on depositional environments.

1.2.4.1 Generalized Material Type Descriptions

For purposes of this evaluation, the following general descriptions broadly address each of the six general material types. After the general descriptions, a general discussion focuses on the various types and combinations of materials encountered during the detailed investigation of the Southern Waste Unit.

1) Ash or Fly Ash

These materials are predominantly composed of black or nearly black granular coal ash remnants stockpiled in the area of the AFAP and IFAP waste units in the general SF area. In general, the inactive pile has been covered with a soil veneer, and the "active" pile either is covered with a synthetic or, in places, remains uncovered. The material is often loose and moist, with scattered zones of coarser deposits with some rubble.

2) Fill

Understandably, fill materials consist principally of mixtures of the other material types (with the exception of the GMA) found across the FEMP site. These mixtures have been moved and/or artificially placed, and are typically clayey, moist, and have a wide range of consistencies and thickness.

3) Stratified Glacial Deposits

Stratified glacial deposits consist of mottled mixtures of brown till and gray till deposits, as well as localized areas and zones of well-sorted materials of various depositional origin and composition. These deposits are typically higher in silt and sand content than other glacial deposits at the site, and seem to be less gravelly. Stratified glacial deposits exhibit a wide range of consistencies, densities, and moisture contents; from soft to stiff, loose to very dense, and moist to wet. Typically, however, the materials are stiff, dense, and moist. They also display localized clear stratification, as well as zones of mottled coloration; mainly mixtures of brown and gray.

4) Brown Till

The Brown Till consists predominantly of low to medium plasticity silt/clay mixtures with localized pockets of high-plasticity clay or silt. The till matrix commonly has scattered gravel throughout, with some local, predominantly silty or clayey sand lenses. Typically the till is stiff to very stiff, and moist.

5) Gray Till

The Gray Till consists predominantly of low-plasticity sandy clay mixtures with scattered gravel throughout. Sand, silty sand, or clayey sand lenses with scattered gravel are present locally. Typically, the till is very stiff to locally hard, and moist.

6) GMA

The GMA consists of sand/gravel mixtures that are typically dense to hard. The upper portion of this stratum lies in the vadose zone, and is typically dry.

1.2.4.2 General Discussion

Subsurface materials investigated and sampled generally consist of varying mixtures of fine-grained and coarse-grained soils typical of glacial till and glacio-fluvial deposits. Fine-grained soils within the till units are predominantly lean clay, with sand contents ranging between values that result in the materials being classified as sandy lean clay or lean clay with sand; sand contents generally increase with depth. Consistency (firmness or stiffness) of the lean clay generally increases with depth (through both the brown and gray till layers) from stiff to very stiff and hard; the plasticity tends to decrease with depth. It should be noted that layers of coarse-grained materials were encountered in borings in the brown till as well as the gray till, and locally displayed perched water conditions. The coarse-grained materials range from poorly graded to well-graded sand with scattered gravel, and are typically dense. Also present in the till deposits are units of silty sand and clayey sand that are typically medium dense.

Locally, there are areas of stratified glacial deposits composed of fine-grained materials that have been deposited in thinly laminated to massive, alternating layers ranging in thickness from fractions of an inch to a few feet. These materials are predominantly silt and silty clays with less common sand/silt mixtures. Where the alternating materials were observed, saturation was common and the soils displayed relatively high in-place consistencies and densities as measured by the pocket penetrometer, laboratory testing, and standard penetration test. Underlying these stratified materials are deposits of brown till and gray till underlain in turn by the GMA.

1.2.4.3 Southern Waste Unit

Figures 1-3 through 1-5 show generalized geological cross sections of the AFAP, IFAP, and SF. Geologic cross-section lines are shown on Figure 2-1. The cross sections are from *Feasibility Study Report for Operable Unit 2* (DOE 1995b) and have been updated to incorporate revisions to the 3-D geological model provided by FERMCO and USCS soil classification data from PO-154 and prior laboratory tests.

Within the Southern Waste Unit, and in its general vicinity, there are noticeably more stratified deposits than typically observed east of the South Access Road during other investigations. The alternating layers of silt and clay with interbeds of fine sand, coupled with the generally mottled coloration of the till deposits, have created gradational contacts within the till deposits, and between till and the GMA. Although stratified glacial deposits are not intercepted by the lines of cross sections shown, this distinctive material was encountered within the limits of the Southern Waste Unit, mainly in the northern portion of the SF. Stratified glacial deposits were encountered in borings G2-161, 163, 164, 167, 168, 169, and in shallow borings G2-SB-98 and 99 (Figure 2-1). These deposits thicken toward the east to in excess of 20 feet at boring G2-169, and tend to thin to about 10 feet in thickness in the vicinity of G2-161.

Directly below the till are sands and gravels of the GMA. Borings G2-163, G2-166, G2-168, G2-170, and G2-171 encountered the sands and gravels of the GMA at depths ranging from 22 to 38 feet. Bedrock was not encountered in any of the PO-154 field investigation borings and is not expected to be encountered as part of the local remediation activities.

1.2.4.4 Groundwater Conditions at Active Fly Ash Pile

Figure 1-6 presents typical perched ground water elevations in the vicinity of the AFAP/IFAP/SF. Figure 1-7 shows typical water levels within the GMA (DOE 1995a). The Dry Fork and Shandon Tributary portions of the GMA converge in the vicinity of the AFAP and form a natural groundwater flow divide line. Although the location of the divide line fluctuates depending on flow conditions, groundwater flow in the area generally occurs in a southeasterly direction. Monitoring wells which extend into the upper portion or the GMA indicate a potentiometric surface that can vary annually from 517 to 525 feet above Mean Sea Level (MSL) (DOE 1995b).

Perched groundwater in the glacial deposits beneath and adjacent to the pile can range from 1 to 9 feet below the natural ground surface at the piles northern perimeter and from 2 to 7 feet at the southern end. These ranges correspond to annual fluctuations of piezometric head of 5 and 7 feet, respectively. Natural ground surface is 571 feet MSL at the north end of the AFAP and 545 at the south end (DOE 1995a).

In perched groundwater, the surface soil Contaminant of Concern (COC) detected above background was neptunium-237 (DOE 1995a). Other radionuclides detected above background were plutonium-238,

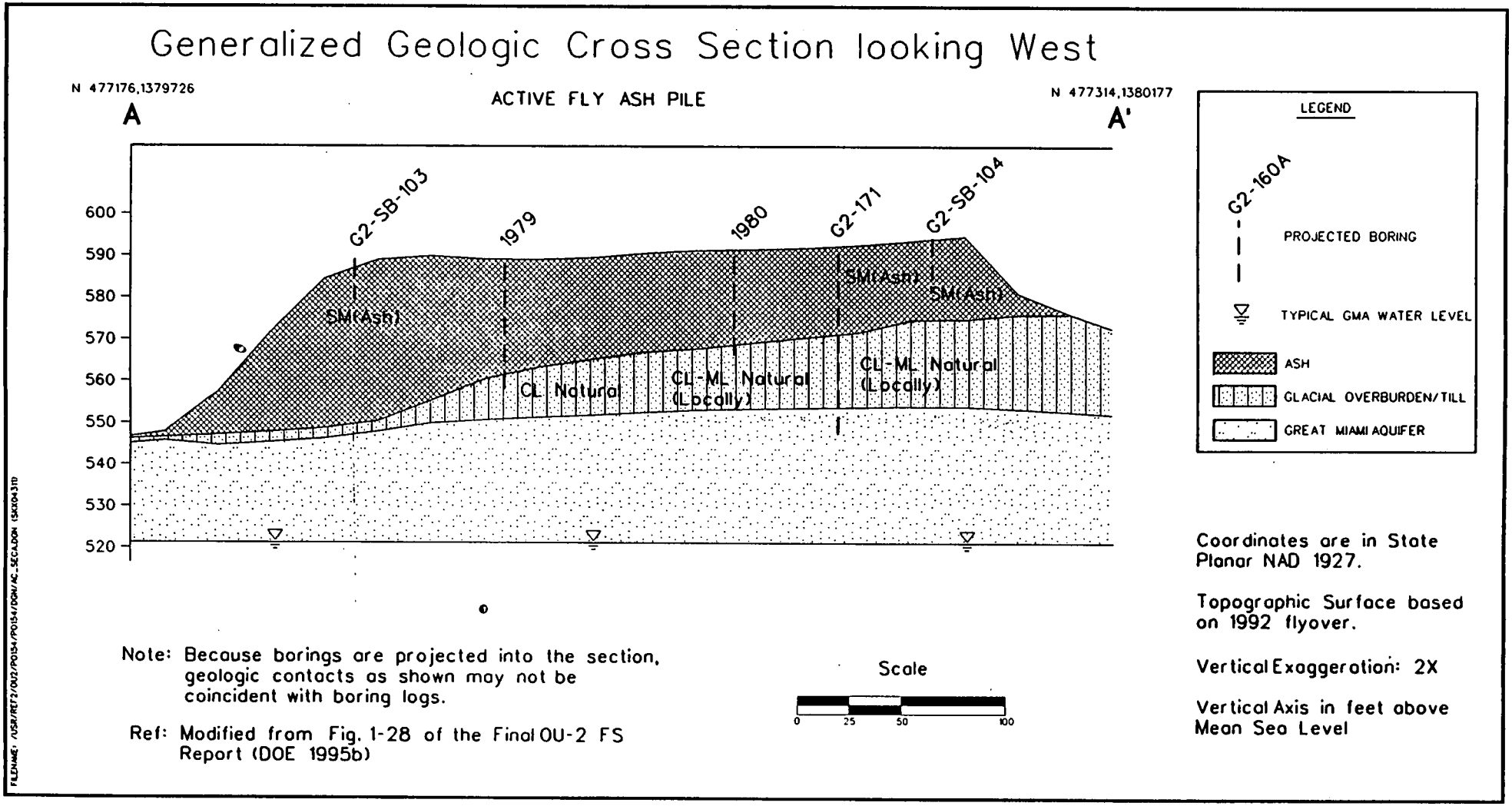

Figure 1-3 - Generalized Geologic Cross-Section at Active Fly Ash Pile

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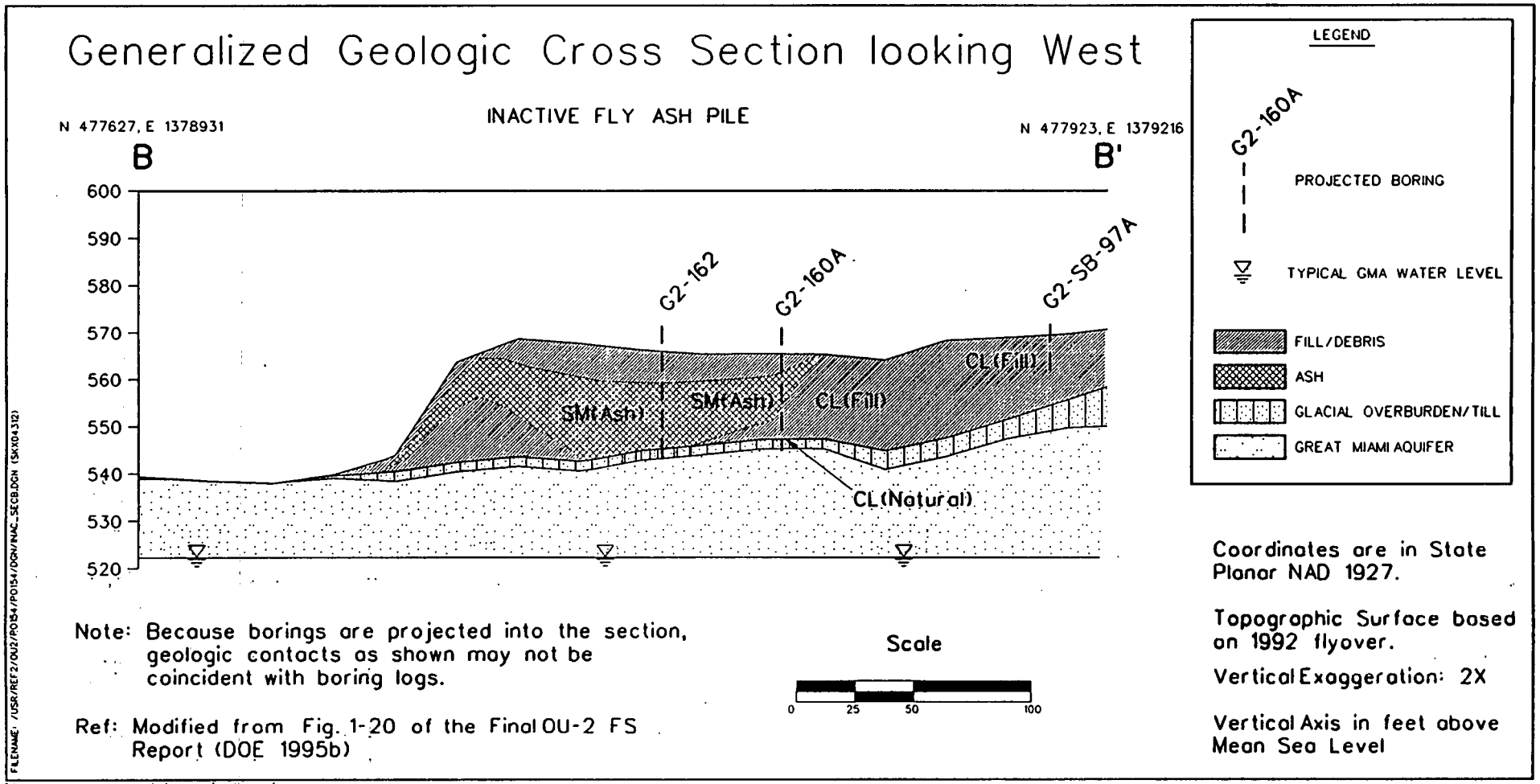

Figure 1-4 - Generalized Geologic Cross-Section at Inactive Fly Ash Pile

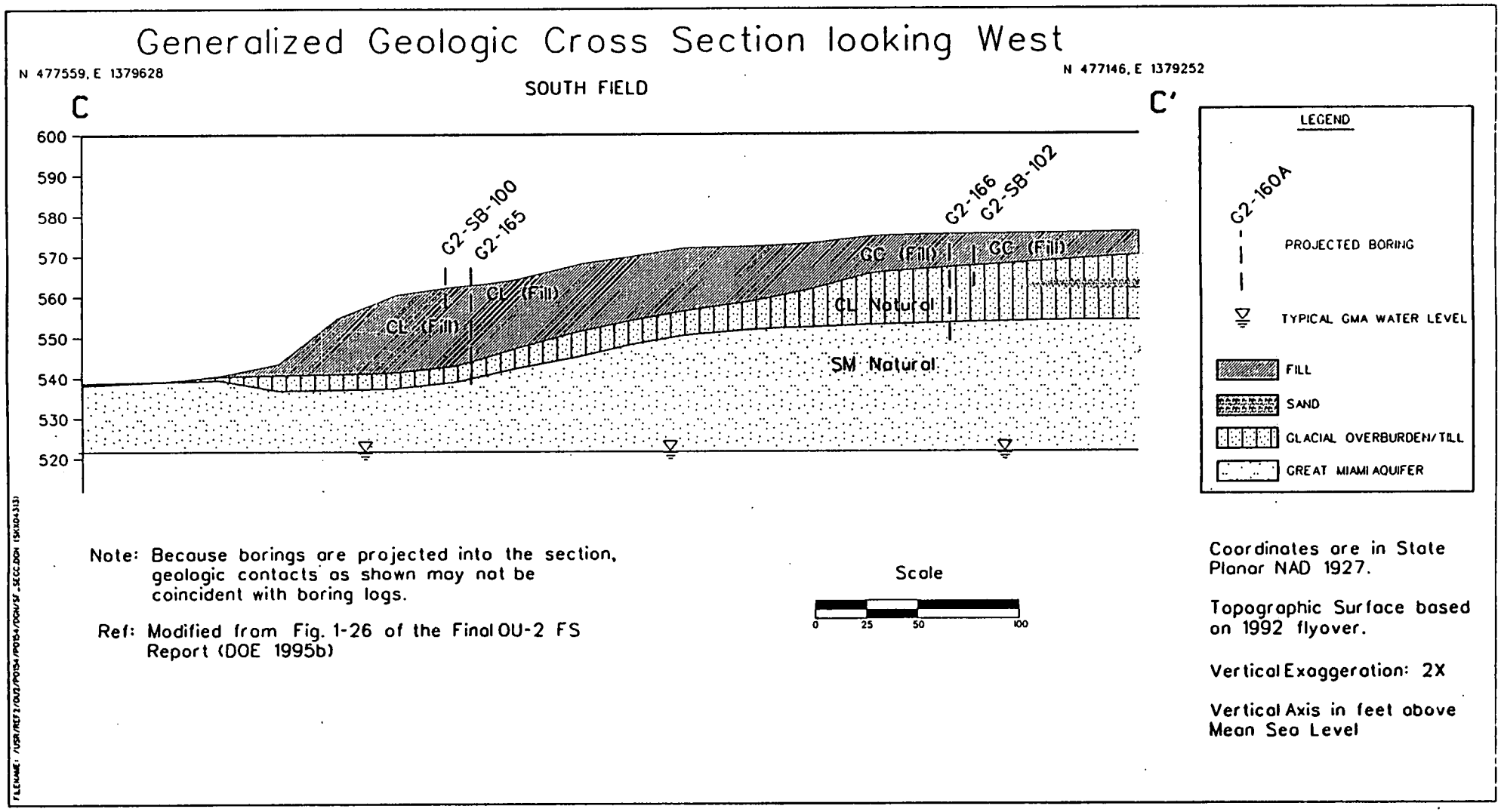

Figure 1-5 - Generalized Geologic Cross-Section at South Field

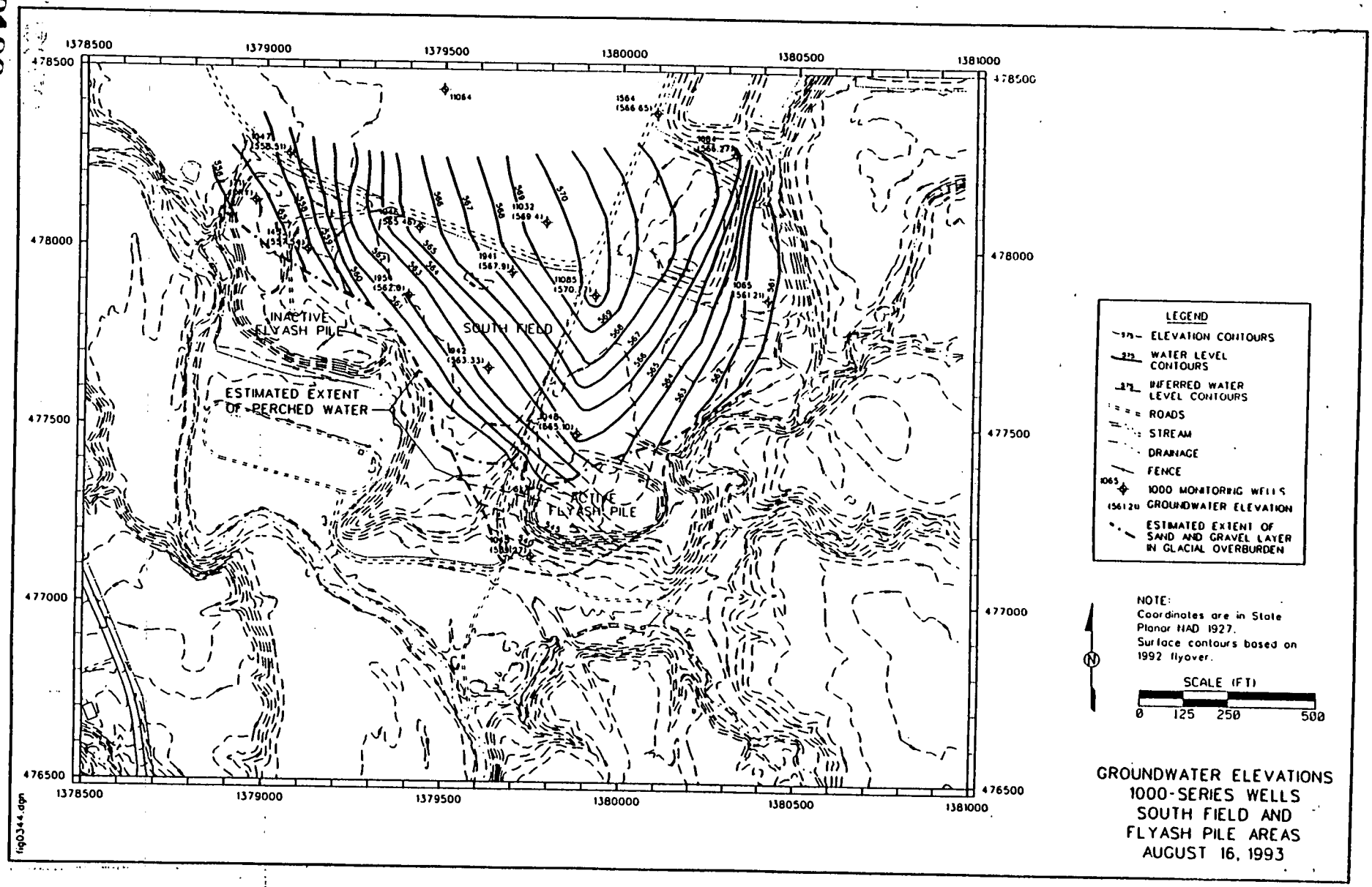

Figure 1-6 - Typical Perched Groundwater Elevations at Active Fly Ash Pile, Inactive Fly Ash Pile, and South Field Waste Units

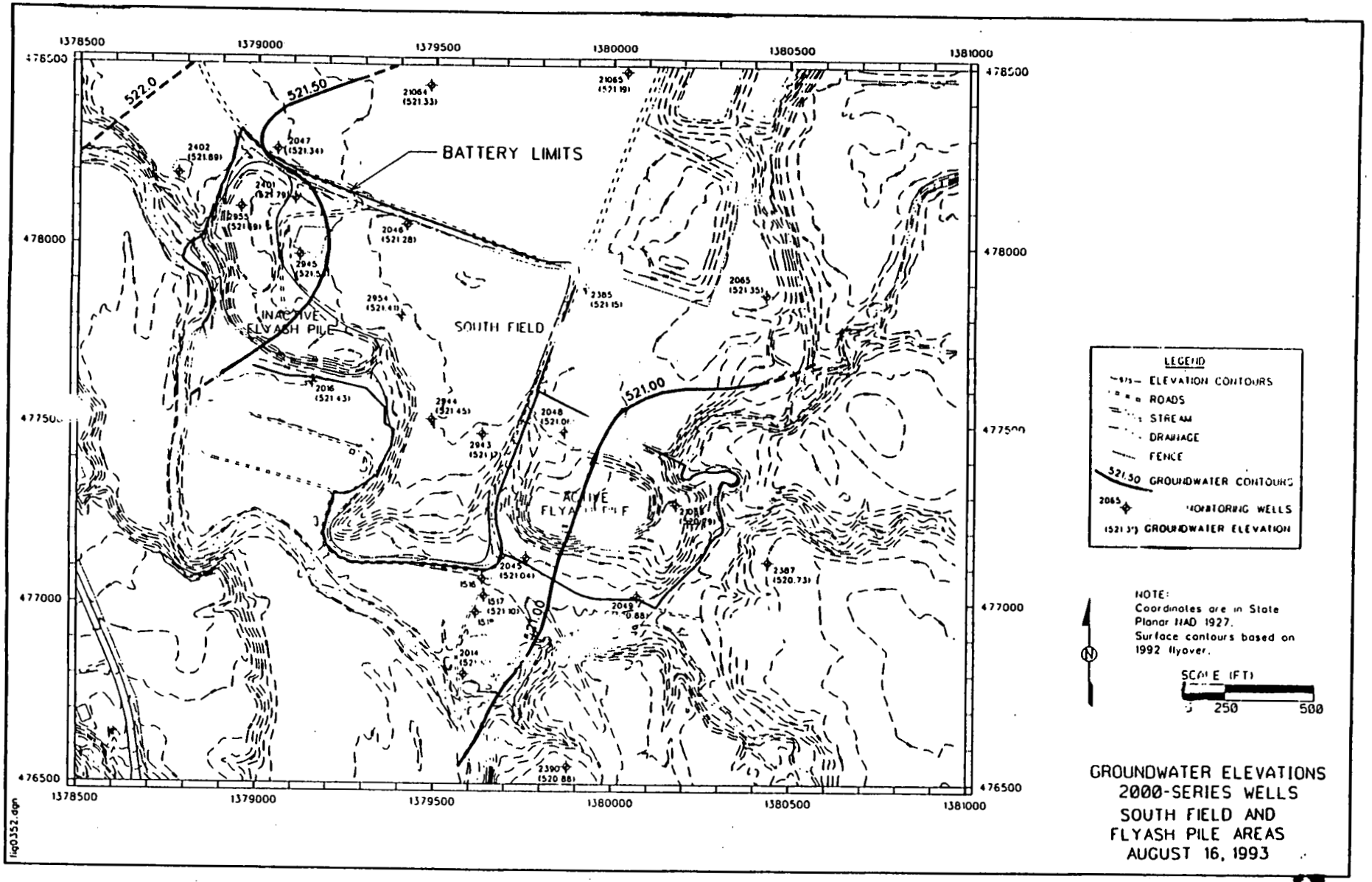

Figure 1-7 - Typical GMA Groundwater Elevations at Active Fly Ash Pile, Inactive Fly Ash Pile, and South Field Waste Units

strontium-90, uranium-234, uranium 235/236, uranium-238 and thorium-232. Based on the perched groundwater flow directions in the area of the AFAP and SF, and contaminants detected, perched groundwater quality near the AFAP seems to be impacted by the SF and not the AFAP.

The OU-2 RI and FS reports (DOE 1995a and 1995b) contain additional data and information regarding the nature, level, and extent of perched groundwater contamination at the AFAP.

1.2.4.5 Groundwater Conditions at Inactive Fly Ash Pile/South Field

Based on water level measurements from wells in the vicinity of the IFAP/SF, groundwater elevations in the GMA can range from approximately 520 to 525 feet MSL beneath the IFAP/SF area. Flow direction is generally to the east. Perched water has also been observed in the northwest portion of the area and can range annually from approximately 560 to 574 feet MSL. Flow direction in the perched zone is to the south and west (DOE 1995a).

1.2.4.6 Inactive Fly Ash Pile Perched Groundwater Contamination

Perched groundwater analyses during the RI detected the surface soil COCs radium and uranium (also a cross-media groundwater COC) (DOE 1995a). The perched groundwater is located in saturated silty sand lenses within the till beneath the ash, and in a saturated zone of ash that is directly above the till surface. The till under the IFAP is suspected to slope to the west, southwest, and south. Therefore the fill/till interface truncates on the surface of the GMA. This is a possible mechanism to transport contaminants to the GMA. Also it is suspected that the saturated ash/fill comes into contact with the GMA, which would be another mechanism for introducing contaminants into the GMA. During the RI, the highest concentrations of Aroclor-1254 and total uranium were found associated with the trace of a buried drainage feature that existed before the IFAP was developed. In the upper GMA (2000-series RI wells) uranium-234, uranium-235/236, uranium-238, total uranium, neptunium-37, and plutonium-238 were detected above background, suggesting a potential impact to the GMA.

Hydropunch data collected during the RI suggest that in the northern portion of the IFAP, perched groundwater is flowing through waste material containing uranium that is located in the northern portion of the IFAP, upgradient of the hydropunch test locations (DOE 1995a). Perched groundwater was encountered beneath the north end of the IFAP, but not at the south end of the IFAP during attempted sampling in April and May 1993. Water samples collected from Hydropunch sample locations had total uranium concentrations ranging from 9.5 to 6,700 μg/l. Seepage in the drainage to the west may be associated with perched groundwater. The correlation can be made that the total uranium concentrations from the Hydropunch samples upgradient of the seepage were of the same order of magnitude as those collected from the proximity of the seep. Also, seepage continued for extended periods after precipitation events, which may indicate that perched water is charging the seepage.

An RI monitoring well (1711) completed in the upper perched groundwater zone within the northern portion of the IFAP provided additional non-radiological contaminant data (DOE 1995a). Ten metals were detected above background in this well, including cobalt, nickel, and thallium. These metals were also detected at elevated concentrations in ash.

The OU-2 RI and FS reports (DOE 1995a and 1995b) contain additional data and information regarding the nature, level, and extent of perched groundwater contamination at the IFAP.

1.2.4.7 South Field Perched Water Contamination

The surface soil COCs detected above background for perched groundwater were beryllium, chromium, neptunium-237, radium-226, thorium-228, thorium-230, thorium-232, uranium-234, uranium-235/236, and total uranium (DOE 1995a). Other radionuclides detected were plutonium and strontium. Additionally, total uranium was detected in all perched groundwater wells, which indicates impact from the SF.

Uranium contamination detected in RI Hydropunch and well samples in the southeastern portion of the SF indicate that the GMA may receive contaminated groundwater recharge from perched groundwater in the north and southeast corner of the waste unit (DOE 1995a). Water samples from the drainage northeast and east of the SF detected elevated uranium concentrations. Uranium was the only surface soil COC detected in surface water in the SF. The levels of concentrations for these samples were of the same order of magnitude as the Hydropunch samples in the northeastern portion of the SF. This would indicate that the drainage is possibly impacted by the seepage of perched groundwater from the northeastern portion.

For the RI 2000-series wells screened in the upper GMA, the surface soil COCs detected above background were neptunium, radium-226, thorium-230, thorium-232, uranium-234, uranium-235/236, uranium-238, and total uranium. Two RI wells (2045 and 2945) had elevated concentrations of uranium, which indicates the possibility of the SF impacting groundwater of the GMA. Additionally, from data collected from RI 2000-series wells, 1,1,1-trichloroethane and 1,1-dichloroethane may be present due to placement of wastes from maintenance activities or other activities where solvents were used.

The OU-2 RI and FS reports (DOE 1995a and 1995b) contain additional data and information regarding the nature, level, and extent of perched groundwater contamination at the SF.

SECTION 2

PRIOR GEOTECHNICAL INVESTIGATIONS

This section describes and summarizes geotechnical laboratory data from prior geotechnical investigation at the AFAP, IFAP and SF. Additional information regarding prior investigations, including the SWL and LSP, and the nature and extent of contamination at the five OU-2 waste units, is found in *Remedial Investigation Report for Operable Unit 2* (DOE 1995a). Prior geotechnical investigations at the Operable Unit 2 Waste Units were performed as part of the FEMP Remedial Investigation (RI). The RI investigative activities that pertain to OU-2 were conducted in two phases. The RI field investigation activities conducted from 1988 through 1992 are referenced collectively as the RI Phase 1 Field Investigation (Phase 1 RI). Additional field investigations conducted in 1993 are referenced as the RI Phase 2 Field Investigation (Phase 2 RI). Additionally, a geotechnical field investigation at the IFAP was performed in April, 1993 to support design of erosion control measures of Paddys Run east bank at the pile. The results of the field investigation and associated geotechnical laboratory testing are summarized in *Subsurface Exploration at the Inactive Fly Ash Pile* (PARSONS 1993). Figure 2-1 shows boring and sampling locations of prior geotechnical investigations at the AFAP, IFAP and SF. Appendix A provides a summary of the boring location coordinates and ground surface elevations. Tables 2-1 and 2-2 provide a summary of the geotechnical laboratory data from these investigations. The following subsections summarize the prior geotechnical investigations. Additional information and data concerning geology, hydrology, and the nature, level, and extent of contamination of the AFAP, IFAP, and SF waste units from prior investigations are found in the OU-2 RI Report (DOE 1995a).

2.1 Active Fly Ash Pile Geotechnical Investigations

In October 1991 (Phase 1 RI), in-place density and moisture was measured at three locations (GEO 1, GEO 2, and GEO 3) by nuclear density instrument (ASTM D 2922). Also during this investigation, a Shelby tube sample was collected at Boring 1724 for geotechnical testing. This sample from the 12 to 14.5 depth interval was tested for moisture content, specific gravity, and grain size distribution (DOE 1995a).

During the Phase 2 RI investigation, geotechnical samples were taken from AFAP-SD-01, ASF-SS-01, and Borings 1979, 1980 and 1981. The samples from these locations were taken from varying depths and testing included different combinations of the following tests: specific gravity, moisture content, unit weight, Atterberg limits, grain size distribution, consolidated drained triaxial compression, and direct shear (DOE 1995a).

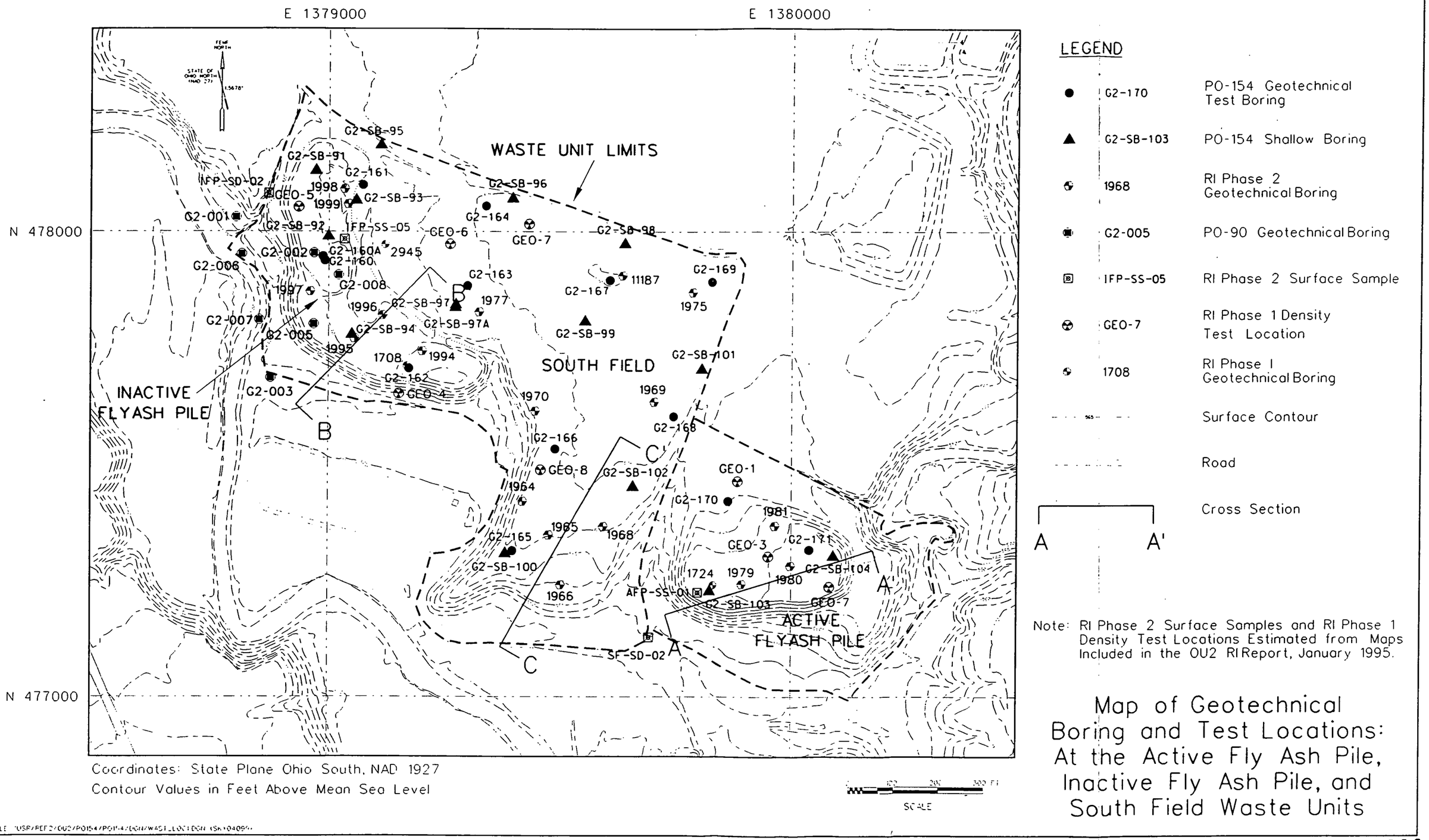

Figure 2-1 - Map of Geotechnical Boring and Test Locations and Cross-Section Locations at the Active Fly Ash Pile, Inactive Fly Ash Pile, and South Field Waste Units

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Table 2-1 - Summary of Index Properties from Prior Geotechnical Investigation of Active Fly Ash Pile, Inactive Fly Ash Pile and South Field

On-Site Location	Boring No.	Sample No.	Sample Type	Top Depth (feet)	Bottom Depth (feet)	Color (from field log)	General Stratum	USCS Group Name[4]	USCS Group Symbol	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Gravel (%)	Grain Size Sand (%)	Grain Size Silt & Clay (%)	Clay (%) (.005mm)	Clay (%) (.002mm)	Specific Gravity	Data Source
IFAP	1708	67097	SS	9.0	10.5	Black	Fly Ash	Silty Sand with Gravel (Ash)	SM	22.1	--	--	--	15.5	56.7	27.8	7	3	2.31	RI/1
IFAP	1708	67098	SS	10.5	12.0	Black	Fly Ash	Silty Sand (Ash)	SM	32.7	--	--	--	10.4	55.9	33.7	3	0	2.26	RI/1
IFAP	IFP-SD-02	111823	Bulk	0.0	0.5	--	--	--	--	--	--	--	--	3.4	55.2	41.4	6	5	--	RI/2
IFAP	IFP-SS-05	111826	Bulk	0.0	0.5	--	--	--	--	23.8	--	--	--	9.6	43.2	47.2	10	7	--	RI/2
IFAP	1994	116309	SS	32.0	34.0	Light Olive Brown	Brown Till	Sandy Lean Clay	CL	20.0	34	16	18	0.3	36.2	63.5	27	20	2.27	RI/2
IFAP	1997	116255	SS	36.0	38.0	Light Olive Brown	Brown Till	Silty Gravel with Sand	GM	13.8	NP	NP	NP	44.6	31.8	23.6	4	2	2.73	RI/2
IFAP	1998	112040	SS	0.0	2.0	Black	Fly Ash	Silty Sand (Ash)	SM	39.3	NP	NP	NP	7.7	53.2	39.1	3	1	2.41	RI/2
IFAP	1998	112063	SS	14.0	16.0	Gray	Gray Till	Sandy Silt	ML	20.8	NP	NP	NP	13.5	35.6	50.9	3	1	2.74	RI/2
IFAP	G2-001	1/2	ST	2.0	4.0	Brown	Brown Till	Sandy Lean Clay	CL	19.3[3]	30[2]	20[2]	10	1.0[2]	37.5[2]	61.6[2]	18[2]	13[2]	2.72[2]	PO 90
IFAP	G2-001	1/6	SS	10.0	12.0	Dark Yellowish Brown	GMA	Silty Sand with Gravel	SM	7.2	NP	NP	NP	21.5	61.9	16.6	2	1	2.99	PO 90
IFAP	G2-001	1/8	ST	14.0	16.0	Dark Yellowish Brown	GMA	Silty Sand with Gravel (V)	--	3.8	--	--	--	--	--	--	--	--	--	PO 90
IFAP	G2-001	1/12	SS	28.0	30.0	Dark Yellowish Brown	GMA	Well-Graded Sand with Silt	SW-SM	--	NP	NP	NP	0.7	90.7	8.6	0	0	2.74	PO 90
IFAP	G2-001	1/13	SS	33.0	35.0	Dark Yellowish Brown	GMA	Well-Graded Sand with Silt	SW-SM	--	NP	NP	NP	2.0	87.5	10.5	1	0	2.76	PO 90
IFAP	G2-002	2/3	ST	4.0	6.0	Black	Fly Ash	Silty Sand (Ash)	SM	31.7[3]	NP	NP	NP	2.1	49.5	48.4	2	1	2.20	PO 90
IFAP	G2-002	2/6	ST	10.0	12.0	Black	Fly Ash	Silty Sand (Ash)	SM	30.0[3]	NP	NP	NP	4.5	47.0	48.5	3	1	2.29	PO 90
IFAP	G2-002	2/8	ST	14.0	16.0	Black	Fly Ash	Sandy Silt (Ash)	ML	27.0[3]	NP	NP	NP	3.3	43.5	53.2	2	0	2.16	PO 90
IFAP	G2-002	2/13	ST	24.0	26.0	Dark Yellowish Brown	Brown Till	Sandy Lean Clay	CL	16.7[3]	26	17	9	3.9	32.3	63.8	26	18	2.81	PO 90
IFAP	G2-002	2/15	SS	28.0	30.0	Yellowish Brown	GMA	Well-Graded Sand with Silt	SW-SM	6.9	NP	NP	NP	6.1	91.0	9.0	1	1	2.77	PO 90
IFAP	G2-002	2/19	SS	38.0	40.0	Dark Yellowish Brown	GMA	Silty Sand	SM	8.5	NP	NP	NP	0.1	87.6	12.4	1	1	2.77	PO 90
IFAP	G2-003	3/2	SS	2.0	4.0	Very Dark Grayish Brown	Brown Till	Silty Sand (V)	--	15.9	--	--	--	--	--	--	--	--	--	PO 90
IFAP	G2-003	3/3	ST	4.0	6.0	Dark Yellowish Brown	Brown Till	Silty Sand	SM	13.8[3]	NP	NP	NP	1.0	65.9	33.1	10	8	2.80	PO 90
IFAP	G2-003	3/4	SS	6.0	8.0	Brown	GMA	Silty Sand with Gravel (V)	--	10.3	--	--	--	--	--	--	--	--	--	PO 90
IFAP	G2-003	3/6	SS	10.0	12.0	Brown	GMA	Silty Sand with Gravel	SM	6.6	NP	NP	NP	26.8	57.2	16.0	2	1	2.74	PO 90
IFAP	G2-003	3/12	SS	22.0	24.0	Brown	GMA	Silty Sand	SM	--	NP	NP	NP	1.0	85.6	13.4	1	0	2.76	PO 90
IFAP	G2-003	3/20	SS	38.0	40.0	Brown	GMA	Well-Graded Sand with Silt	SW-SM	--	NP	NP	NP	4.3	86.8	8.9	0	0	2.73	PO 90
IFAP	G2-005	5/3	SS	4.0	6.0	Dark Yellowish Brown	GMA	Silty Sand with Gravel	SM	--	NP	NP	NP	42.3	44.8	12.9	3	2	2.77	PO 90
IFAP	G2-005	5/4	SS	6.0	8.0	Dark Yellowish Brown	GMA	Well-Graded Sand with Silt	SW-SM	--	NP	NP	NP	39.2	52.5	8.3	2	1	2.79	PO 90
IFAP	G2-005	5/5	SS	8.0	10.0	Dark Grayish Brown	GMA	Poorly-Graded Sand with Silt	SP-SM	--	NP	NP	NP	2.4	89.3	8.3	1	1	2.77	PO 90
IFAP	G2-005	5/8	SS	18.0	20.0	Dark Grayish Brown	GMA	Silty Sand	SM	--	NP	NP	NP	4.8	81.6	13.6	3	2	2.74	PO 90
IFAP	G2-005	5/9	SS	23.0	25.0	Dark Grayish Brown	Brown Till	Poorly-Graded Sand with Silt	SP-SM	--	NP	NP	NP	0.0	93.2	6.8	1	1	2.76	PO 90
IFAP	G2-006	6/4	SS	6.0	8.0	Dark Yellowish Brown	Brown Till	Well-Graded Gravel with Silt and Sand	GW-GM	--	NP	NP	NP	48.7	42.6	8.7	3	2	2.78	PO 90
IFAP	G2-006	6/7	SS	18.0	20.0	Dark Yellowish Brown	Brown Till	Poorly-Graded Sand with Silt	SP-SM	--	NP	NP	NP	0.0	92.0	8.0	1	1	2.74	PO 90
SF	SF-SD-02	112992	Bulk	0.0	1.5	--	--	--	--	--	--	--	--	4.1	29.1	66.8	5	4	--	RI/2
SF	1964	112647	SS	3.0	5.0	Dark Grayish Brown	Brown Till	Lean Clay with Sand	CL	15.5	36	16	20	4.7	19.8	75.5	31	13	2.69	RI/2
SF	1964	112671	SS	20.0	22.0	Gray	Gray Till	Silty, Clayey Sand	SC-SM	3.7	16	11	5	8.3	73.9	17.8	1	1	2.69	RI/2
SF	1965	112735	SS	0.0	2.0	Light Olive Brown	Brown Till	Lean Clay with Sand	CL	19.9	31	16	15	6.8	21.9	71.3	17	11	2.71	RI/2
SF	1965	112761	SS	22.5	24.5	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	19.3	30	14	16	4.2	29.8	66.0	23	16	2.72	RI/2
SF	1966	112858	SS	2.5	4.5	Light Olive Brown	Brown Till	Lean Clay with Sand	CL	16.7	37	17	20	9.1	20.5	70.4	12	6	2.71	RI/2
SF	1966	112867	SS	11.5	13.0	Olive Brown	Brown Till	Lean Clay with Sand	CL	21.8	35	15	20	0.9	15.2	83.9	30	5	2.76	RI/2
SF	1968	112834	ST	1.0	3.0	Black	Fly Ash	Silty Sand (Ash) (V)	--	--	28	18	10	--	--	--	--	--	--	RI/2
SF	1969	112557	SS	2.0	4.0	Grayish Brown	Brown Till	Lean Clay	CL	23.2	37	18	19	0.0	3.1	96.9	14	5	2.76	RI/2
SF	1969	112562	SS	7.0	9.0	Grayish Brown	Stratified Glacial Deposits	Lean Clay	CL	30.6	31	17	14	0.1	1.6	98.3	30	11	2.76	RI/2
SF	1969	112564	SS	10.5	12.0	Brown	Brown Till	Sandy Silt	ML	16.6	NP	NP	NP	4.2	37.3	58.5	4	2	2.70	RI/2
SF	1970	112691	SS	5.0	7.0	Brown	Brown Till	Sandy Lean Clay with Gravel	CL	16.9	34	19	15	20.8	22.5	56.7	18	10	2.73	RI/2
SF	1974	112519	SS	2.0	4.0	Olive Brown	Brown Till	Sandy Lean Clay with Gravel	CL	16.3	29	17	12	19.7	23.5	56.8	16	9	2.70	RI/2
SF	1975	112544	SS	2.0	4.0	Brown	Brown Till	Sandy Lean Clay	CL	20.8	34	16	18	10.7	20.2	69.1	25	15	2.71	RI/2
SF	1977	110569	SS	5.0	8.0	Light Olive Brown	Brown Till	Sandy Lean Clay	CL	22.9	38	15	23	3.8	28.0	68.2	29	19	2.75	RI/2
SF	1977	110575	SS	11.5	13.5	Light Olive Brown/Gray	Brown Till	Silty Clay with Sand	CL-ML	25.0	20	16	4	0.9	21.6	77.5	13	8	2.75	RI/2
SF	2945	110239	SS	3.0	4.5	Brown	Brown Till	Silty Clay with Sand (V)	--	--	--	--	--	11.7	21.4	66.9	12	5	--	RI/2
SF	2945	110240	SS	4.5	6.0	Brown	Brown Till	Clayey Sand with Gravel	SC	--	26	17	9	17.3	34.9	47.8	13	7	--	RI/2
SF	2945	110253	SS	25.0	27.0	Dark Yellowish Brown	GMA	Silty Sand	SM	12.7	NP	NP	NP	3.9	81.0	15.1	2	1	2.72	RI/2
AFAP	1724	67199	SS	13.0	14.5	Black	Fly Ash	Silty Sand (V)	--	24.9	--	--	--	12.1	70.1	28.8	4	0	2.25	RI/1
AFAP	1724	67220	SS	43.0	44.5	Dark Yellowish Brown	Brown Till	Silty Sand (V)	--	29.8	--	--	--	6.7	51.5	41.8	7	1	2.23	RI/1
AFAP	AFP-SS-01	112260	Bulk	0.0	0.5	--	--	Ash (V)	--	29.2	--	--	--	2.2	65.4	32.4	1	0	--	RI/2
AFAP	AFP-SS-01	12263	Bulk	--	--	--	--	Ash (V)	--	--	--	--	--	1.6	67.2	31.2	2	0	--	RI/2
AFAP	1979	112095	SS	6.0	8.0	Black	Fly Ash	Silty Sand (V)	--	--	--	--	--	0.4	59.2	40.4	0	0	--	RI/2
AFAP	1979	112122	SS	24.0	25.5	Black	Fly Ash	Silty Sand (V)	--	--	--	--	--	1.9	57.1	41.0	5	1	--	RI/2
AFAP	1979	112125	SS	27.5	29.5	Light Olive Brown	Brown Till	Sandy Lean Clay	CL	10.4	24	13	11	12.6	27.1	60.3	4	2	2.74	RI/2
AFAP	1980	112144	SS	13.0	15.0	Black	Fly Ash	Silty Sand (V)	--	--	--	--	--	0.7	63.2	36.1	0	0	--	RI/2
AFAP	1980	112156	SS	22.0	24.0	Light Olive Brown	Brown Till	Silty Clay	CL-ML	21.7	25	18	7	0.0	9.1	90.9	11	9	2.31	RI/2
AFAP	1981	112179	SS	16.0	17.0	Black	Fly Ash	Silty Sand (V)	--	48.4	--	--	--	0.5	67.5	32.0	2	0	--	RI/2

Notes:

AFAP	Active Fly Ash Pile
IFAP	Inactive Fly Ash Pile
SF	South Field
1	Plasticity of fines estimated to perform classification
2	Average of two tests
3	Average of multiple tests
4	(V) indicates group name classification by inspection of boring logs and/or laboratory test results
RI/1	Remedial Investigation Report for OU2, Phase I, January 1995, Final
RI/2	Remedial Investigation Report for OU2, Phase II, January 1995, Final
PO 90	Subsurface Exploration Erosion Control at the Inactive Flyash Pile, OU2, Project Order 90, June 1993, Rev 0
SS	Split Spoon Sample
ST	Shelby Tube Sample
NP	Non-Plastic

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Table 2-2 - Summary of Physical Properties from Prior Geotechnical Investigation of Active Fly Ash Pile, Inactive Fly Ash Pile and South Field

On-Site Location	Boring No.	Sample No.	Sample Type	Top Depth (feet)	Bottom Depth (feet)	Color (from field log)	General Stratum	USCS Group Name[1]	USCS Group Symbol	Wet Density (pcf)	Dry Density (pcf)	Moisture Content (%)	Shear Strength Effective Cohesion (psf)	Shear Strength Effective Friction Angle (degrees)	Shear Strength Total Cohesion (psf)	Shear Strength Total Friction Angle (degrees)	Initial Void Ratio	Compression Index Cc	Recompression Index Cr	Permeability[7] (cm/sec)	Data Source
IFAP	GEO 4	--	In Situ	--	--	--	Fly Ash	Ash (V)	--	56.3[2]	52.9[2]	6.5[2]	--	--	--	--	--	--	--	--	RI/1
IFAP	GEO 5	--	In Situ	--	--	--	Fly Ash	Ash (V)	--	53.7[2]	47.4[2]	13.3[2]	--	--	--	--	--	--	--	--	RI/1
IFAP	1994	116304	ST	28.0	30.0	Olive	Brown Till	Clayey Silt (V)	--	133.5	113.9	--	--	--	--	--	--	--	--	--	RI/2
IFAP	1996	112080	ST	10.0	12.0	Black	Fly Ash	Ash (V)	--	57.4	40.1	--	--	--	--	--	--	--	--	--	RI/2
IFAP	1997	116249	ST	32.0	34.0	Dark Olive Gray	Gray Till	Clayey Silt (V)	--	128.2	106.5	--	--	--	--	--	--	--	--	--	RI/2
IFAP	1998	112041	ST	2.0	4.0	Black	Fly Ash	Ash (V)	--	75.9	48.4	--	--	--	--	--	--	--	--	--	RI/2
IFAP	1998	112064	ST	16.0	17.0	Gray	Gray Till	Silty Clay (V)	--	142.3	124.5	--	--	--	--	--	--	--	--	3.2E-08	RI/2
IFAP	G2-001	1/2	ST	2.5	4.0	Brown	Brown Till	Sandy Lean Clay	CL	131.8[3]	112.4[3]	19.3[3]	100[4]	37[4]	50[4]	23[4]	--	--	--	--	PO 90
IFAP	G2-002	2/3	ST	4.5	6.0	Black	Fly Ash	Silty Sand (Ash)	SM	67.3[3]	51.8[3]	31.7[3]	0[4]	42[4]	0[4]	21[4]	--	--	--	--	PO 90
IFAP	G2-002	2/6	ST	10.5	12.0	Black	Fly Ash	Silty Sand (Ash)	SM	55.0[3]	42.3[3]	30.0[3]	0[4]	39[4]	0[4]	17[4]	--	--	--	--	PO 90
IFAP	G2-002	2/8	ST	14.5	16.0	Black	Fly Ash	Sandy Silt (Ash)	ML	51.6[3]	40.7[3]	27.0[3]	0[4]	41[4]	0[4]	19[4]	--	--	--	--	PO 90
IFAP	G2-002	2/13	ST	24.5	26.0	Dark Yellowish Brown	Brown Till	Sandy Lean Clay	CL	135.2[3]	117.1[3]	16.7[3]	500[4]	32[4]	150[4]	28[4]	--	--	--	--	PO 90
IFAP	G2-003	3/3	ST	4.5	6.0	Dark Yellowish Brown	Brown Till	Silty Sand	SM	123.6[3]	108.5[3]	13.8[3]	0[4]	37[4]	0[4]	16[4]	--	--	--	--	PO 90
SF	GEO 6	--	In Situ	--	--	--	--	--	--	111.0[2]	110.2[2]	10.7[2]	--	--	--	--	--	--	--	--	RI/2
SF	GEO 7	--	In Situ	--	--	--	--	--	--	103.7[2]	95.6[2]	8.5[2]	--	--	--	--	--	--	--	--	RI/2
SF	GEO 8	--	In Situ	--	--	--	--	--	--	107.6[2]	94.9[2]	13.4[2]	--	--	--	--	--	--	--	--	RI/2
SF	1965	112736	ST	2.0	4.0	Light Olive Brown	Brown Till	Silty Sand (V)	--	136.6	117.5	--	--	--	--	--	--	--	--	--	RI/2
SF	1965	112762	ST	24.5	26.5	Yellowish Brown	Brown Till	Clayey Silt (V)	--	133.7	124.9	--	--	--	--	--	0.3818	0.1110	0.0105	--	RI/2
SF	1966	112860	ST	6.5	8.5	Olive Brown	Brown Till	Silty Clay (V)	--	130.7	107.6	--	--	--	--	--	--	--	--	--	RI/2
SF	1966	112868	ST	13.0	15.0	Olive Brown	Brown Till	Silty Clay (V)	--	130.4	109.6	--	--	--	--	--	--	--	--	--	RI/2
SF	1968	112833	ST	1.0	3.0	Black	Fly Ash	Ash (V)	--	117.8	102.5	--	--	--	--	--	--	--	--	--	RI/2
SF	1969	112565	ST	12.0	13.5	Gray	Gray Till	Sand (V)	--	143.6	128.1	--	--	--	--	--	--	--	--	--	RI/2
SF	1970	112688	ST	0.0	2.0	--	--	--	--	135.7	115.3	--	--	--	--	--	--	--	--	--	RI/2
SF	1970	112689	ST	2.0	4.0	--	--	--	--	--	--	--	--	--	--	--	0.5510	0.1625	0.0350	--	RI/2
SF	1970	112892	ST	7.0	9.0	Brown	Brown Till	Silty Clay (V)	--	123.2	101.6	--	--	--	--	--	--	--	--	3.7E-08	RI/2
SF	11187	112518	ST	0.0	2.0	Olive Brown	Brown Till	Silty Sand (V)	--	126.1	106.8	--	--	--	--	--	--	--	--	--	RI/2
SF	1975	112546	ST	5.0	7.0	Brown	Brown Till	Silty Clay (V)	--	122.2	96.9	--	--	--	--	--	--	--	--	--	RI/2
SF	1977	110568	ST	3.0	5.0	Light Olive Brown	Brown Till	Silty Clay (V)	--	139.0	122.9	--	--	--	--	--	0.3359	0.1359	0.0125	--	RI/2
SF	1977	110578	ST	14.5	16.5	Light Olive Brown/Gray	Brown Till	Silty Clay (V)	--	135.1	114.9	--	--	--	--	--	--	--	--	1.4E-07	RI/2
AFAP	GEO 1	--	In Situ	--	--	--	Fly Ash	Ash (V)	--	74.3[2]	65.8[2]	13.0[2]	--	--	--	--	--	--	--	--	RI/1
AFAP	GEO 2	--	In Situ	--	--	--	Fly Ash	Ash (V)	--	51.7[2]	49.0[2]	5.5[2]	--	--	--	--	--	--	--	--	RI/1
AFAP	GEO 3	--	In Situ	--	--	--	Fly Ash	Ash (V)	--	68.8[2]	65.5[2]	5.1[2]	--	--	--	--	--	--	--	--	RI/1
AFAP	1979	112094	ST	4.0	6.0	Black	Fly Ash	Ash (V)	--	63.6	49.4	--	--	--	--	--	--	--	--	--	RI/2
AFAP	1979	112096	ST	8.0	10.0	Black	Fly Ash	Ash (V)	--	59.2	--	--	340[5]	32[5]	NA	NA	--	--	--	--	RI/2
AFAP	1980	112142	ST	9.0	11.0	Black	Fly Ash	Ash (V)	--	74.1	55.6	--	--	--	--	--	--	--	--	--	RI/2
AFAP	1980	112143	ST	11.0	13.0	Black	Fly Ash	Ash (V)	--	127.3	--	--	420[5]	26[5]	NA	NA	--	--	--	--	RI/2
AFAP	1981	112162	ST	4.0	6.0	Black	Fly Ash	Ash (V)	--	57.4	48.5	--	--	--	--	--	--	--	--	--	RI/2
AFAP	1981	112173	ST	12.0	14.0	Black	Fly Ash	Ash (V)	--	78.1	--	--	0[5]	42[6]	NA	NA	--	--	--	--	RI/2

Notes:

IFAP	Inactive Fly Ash Pile
SF	South Field
AFAP	Active Fly Ash Pile
1	(V) indicates group name classification by inspection of boring logs and/or laboratory test results
2	Results of Nuclear Density Device Tests, ASTM D2922
3	Averaged from multiple tests
4	Consolidated-Undrained Triaxial Compression Test Results, Performed According to ASTM D4767
5	Direct Shear Test Results, Performed According to ASTM D3080
6	Consolidated-Drained Triaxial Compression Test Results
7	Constant Head Test Performed According to EPA Method 9100 (SW 846)
RI/1	Remedial Investigation Report for OU2, Phase I, January 1995, Final
RI/2	Remedial Investigation Report for OU2, Phase II, January 1995, Final
PO 90	Subsurface Exploration Erosion Control at the Inactive Flyash Pile, OU2, Project Order 90, June 1993, Rev 0

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2.2 Inactive Fly Ash Pile Geotechnical Investigations

In October 1991 (Phase 1 RI), in-place density and moisture were measured by ASTM D 2922 at locations GEO 4 and GEO 5. Shelby tube samples for geotechnical testing were collected at Boring 1708. These samples were collected from the 7.5 to 12 foot depth interval and tested for moisture content, specific gravity and grain size distribution (DOE 1995a).

Geotechnical sampling and testing was also completed during the Phase 2 RI investigation. IFAP samples were collected at IFAP-SD-02, IFAP-SS-05, and Borings 1994, 1995, 1996, 1997 and 1998. The samples from these locations were taken from varying depths and testing included different combinations of the following tests: specific gravity, moisture content, unit weight, Atterberg limits, grain size distribution, and hydraulic conductivity (DOE 1995a).

In April 1993, a geotechnical field investigation at the IFAP was performed to support design of erosion control measures of Paddys Run east bank at the pile. The investigation consisted of advancing seven test borings at the IFAP. Split-spoon samples were recovered in general accordance with the Standard Method for Penetration Test (SPT) and Split Barrel Sampling of Soils (ASTM D 1586). Additional samples included relatively undisturbed thin-walled Shelby tube samples (ASTM D 1587). Selected samples were shipped to Advanced Terra Testing, Inc., for geotechnical laboratory testing. The purpose of the testing was to determine the index and physical properties of subsurface soils for slope stability analyses. Laboratory tests included moisture content (ASTM D 2216), grain size distribution (ASTM D 422), Atterberg Limits (ASTM D 4318) and triaxial compression tests (Consolidated, Undrained with pore pressure measurements [ASTM D 4767]) (PARSONS 1993).

2.3 South Field Geotechnical Investigations

In October 1991 (Phase 1 RI), in-place density and moisture were measured by ASTM D 2922 at locations GEO 6, GEO 7 and GEO 8.

During the Phase 2 RI, geotechnical samples at the SF were collected from SF-SD-02, and Borings 1964, 1965, 1966, 1968, 1969, 1970, 11187 (1974), 1975, 1977, and 2945. The samples from these locations were taken from varying depths and testing included different combinations of the following tests: specific gravity, moisture content, unit weight, Atterberg limits, grain size distribution, one-dimensional consolidation, and hydraulic conductivity (DOE 1995a).

Six trenches were excavated during the Phase I RI Investigation from the surface through the fill and into the underlying native soil. The trenches had an approximate north-to-south orientation and their depths ranged from 3.75 to 5.75 feet. During the Phase 2 RI Investigation trenches excavated using a backhoe

were completed at suspect locations in the SF to determine if rubble/debris might be a source of contamination to surrounding subsoils and groundwater (DOE 1995a). Ten SF trenching locations were selected based on anomalous RI electromagnetic data. The trenches were backfilled upon completion. Figure 2-2 shows the approximate locations of the 16 trenches. The trenching confirmed the RI investigation borehole data: that the materials in the SF are comprised of clean fill, construction debris and radioactive materials mixed with the above materials and the native till. Trenching activities uncovered a variety of waste materials including concrete, steel pipe, sheet steel, wood, and clay tile. Surface wipe samples from some of these materials had a maximum reading of 150,000 disintegrations per minute (dpm), suggesting that the contamination is removable, so the materials are potential leaching sources of radionuclides to groundwater. Appendix B contains a summary table and trench logs from the RI investigation. The RI Report (DOE 1995a) contains additional information concerning the trenching.

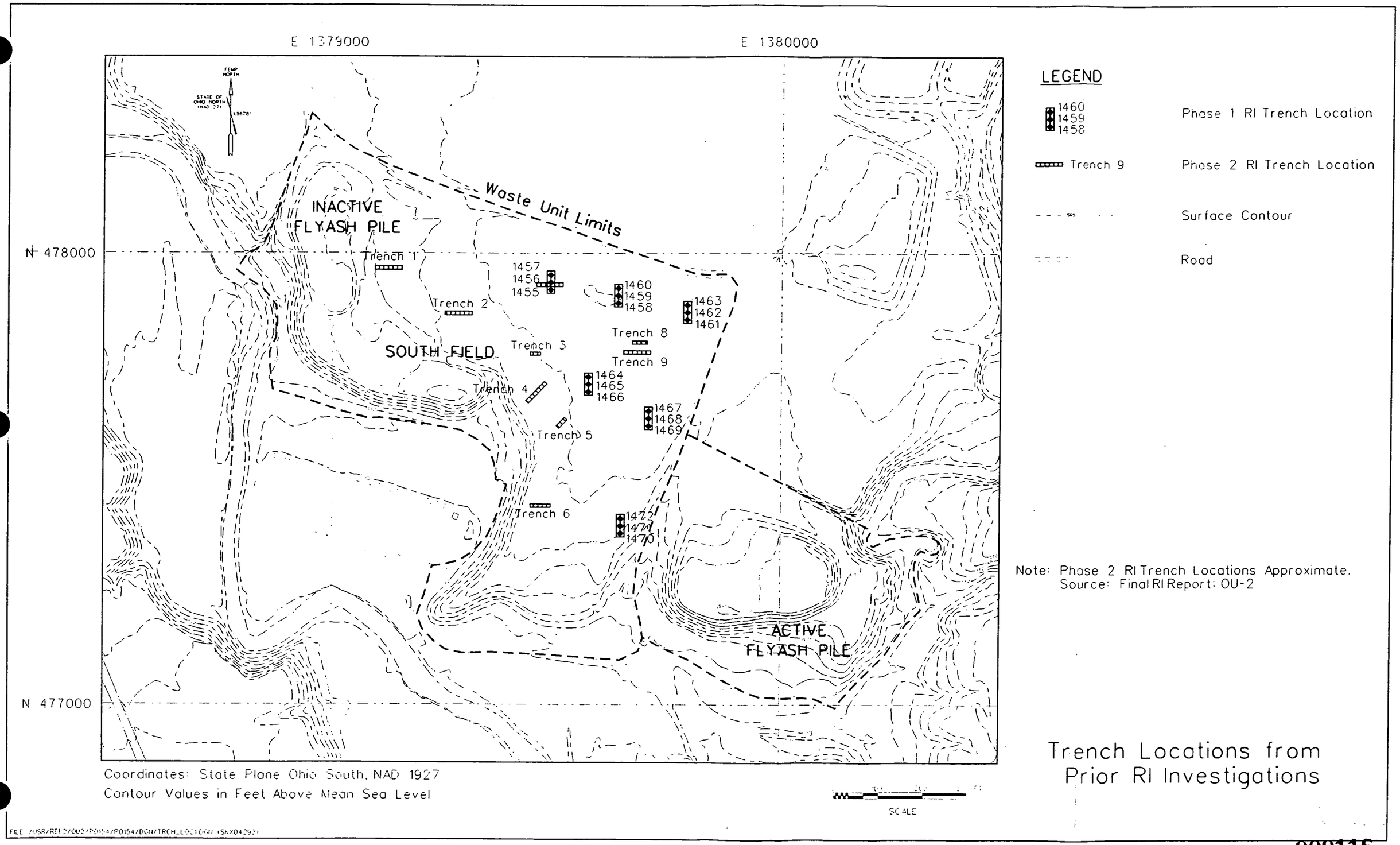

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Figure 2-2 - Trench Locations from Prior RI Investigation

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SECTION 3

FIELD AND GEOTECHNICAL LABORATORY TESTING PROGRAM

This section describes the geotechnical field and laboratory test program implemented per the *Draft Geotechnical Sampling and Testing Plan for On-Site Clay Borrow Areas, Off-Site Material Sources and Operable Unit 2 Waste Units* (FERMCO 1995a), as revised by Field Change Notice/Variance documents. Geotechnical test borings were advanced at 12 locations, and 14 shallow borings were performed at the AFAP, IFAP and SF waste units during September, 1995. Geotechnical laboratory testing was performed by Advanced Terra Testing, Inc. (ATT), Lakewood, Colorado, during September, 1995 through January, 1996. The laboratory data sheets from this testing are compiled in a geotechnical laboratory data report entitled *Fly Ash Piles and South Field Waste Units Geotechnical Investigation Geotechnical Laboratory Data Report* (SAIC 1996). Geotechnical field and laboratory activities were conducted following the guidelines of the *Sitewide CERCLA Quality Assurance Project Plan* (DOE 1994b). Additionally, as part of the laboratory program, modal diameter tests of soil samples collected during the field investigation were performed by FERMCO at the on-site laboratory.

3.1 Soil Test Borings

Twelve geotechnical test borings (G2-160 through G2-171) were advanced by FERMCO's drilling subcontractor, Alliance Environmental, Inc., at the locations shown on Figure 2-1. The boring locations were established and staked by FERMCO. Upon completion of the geotechnical test borings, the location and elevation of each were surveyed by FERMCO. Appendix A summarizes the Ohio State Plane Coordinates and ground surface elevations for the test borings.

Typically, the test borings were advanced with 4-1/4 inch, inside-diameter (ID), hollow-stem augers to depths ranging from 19 to 44 feet. For borings G2-161 and G2-167 an 8-1/4 inch, ID, hollow stem auger was used as temporary casing in zones of shallow subsurface contamination. These borings were advanced and sampled using an 8-1/4 inch ID auger (14-inch outer diameter) to a depth of about 4 feet below the estimated depth of contamination. The drill string was then raised to vacate the bottom of the boring to allow for an approximate 3 foot bentonite seal to be installed by tremie. Following hydration of the seal, drilling and sampling was continued below the zone of contamination using a 3-1/4 inch ID hollow stem auger.

During drilling, a PARSONS geotechnical engineer or geologist was at the drill rig to visually classify the soil samples, log the borings, and record water levels if groundwater was encountered. During sampling activities, FERMCO sampling technicians screened the soil samples and drill cuttings, using hand-held instruments for volatile organics and radiation.

Soil samples were recovered in the undisturbed material below the bottom of the augers using either the Standard Method for Penetration Resistance and Split-Barrel Sampling (ASTM D 1586), 3-inch-diameter Shelby Tubes (ASTM D 1587), or a Denison sampler. A three inch diameter split spoon was also used at some locations to provide adequate sample material for remolded test specimens. Samples were collected following the sample plan described in the Geotechnical Sampling and Testing Plan (GSTP) (FERMCO 1995a). Variations in the GSTP due to conditions encountered in the field were documented on Field Change Notice/Variance documents provided to FERMCO. These documents are maintained by FERMCO Quality Assurance.

Of the 12 test borings (G2-160 through G2-171), only G2-160 met refusal before achieving the planned depth. At a depth of 19 feet, G2-160 could not be advanced any further with the Mobile B61 hollow stem drilling machine. The auger met refusal on what appeared to be concrete rubble, based on visual examination of material retained on the cutting teeth of the auger. To maintain continuity in the designed sample collection program, another boring was drilled (G2-160A) approximately 10 feet toward the south from the original staked location and was advanced to the depth of 26.5 feet which met the requirements of the GSTP.

Upon completion of each boring, the soil test borings were backfilled with a bentonite grout tremied into the borehole. A PARSONS geotechnical engineer or geologist oversaw the grouting operations.

Appendix B contains a field boring log and a Geotechnical Logging Report for each of the geotechnical test borings from the investigation. The Geotechnical Logging Report updates the soil classification based on the results of laboratory classification tests and lists tests performed on selected samples.

3.2 Shallow Borings

Fourteen shallow borings (G2-SB-91 through G2-SB-104) were conducted at the AFAP, IFAP and SF. Figure 2-1 shows the locations of the shallow borings. Appendix A summarizes the Ohio State Plane Coordinates and ground surface elevations for the shallow borings. Various sampling equipment was used by FERMCO sampling technicians to collect bulk samples of soil to depths of about 10 feet for classification and remolded laboratory tests. The equipment used was based on the required sample volume and planned depths for the geotechnical tests listed in the GSTP and included Geoprobe Van mounted core samplers and augers, a hydraulic power auger, and hand sampling equipment. Four-inch OD continuous flight augers were used to auger the shallow boring with torque provided by FERMCO's Geoprobe vans. The hydraulic power auger used was a portable wheel mounted unit that also used 4-inch OD continuous flight augers. During sampling, a PARSONS geotechnical engineer or geologist was at the shallow boring location to visually classify the soil samples, log the borings, and record water levels if groundwater was encountered.

The shallow borings were backfilled with a bentonite grout. A PARSONS geotechnical engineer or geologist oversaw the grouting operations.

All shallow borings achieved planned depth; none met refusal. Samples were collected to planned depths in accordance with the GSTP. In some borings, although planned depth was achieved, sample volumes were judged in the field to be insufficient for the planned testing. Consequently, an additional sample was collected from hand-augered borings generally offset less than 1 foot from the original staked boring location.

Appendix C contains a field boring log and a Geotechnical Logging Report for each of the geotechnical shallow borings. The Geotechnical Logging Report updates the soil classification based on the results of laboratory classification tests.

3.3 Geotechnical Laboratory Testing

Geotechnical laboratory testing of soil and ash samples was performed by ATT. The laboratory testing program was directed toward classifying the soils and ash and determining their remolded engineering properties. A variety of index tests were performed on selected samples to aid in classification and to extend the utility of the more sophisticated strength, consolidation and permeability tests. Table 3-1 lists the number of tests performed and the laboratory test methods. The testing was performed on split-spoon samples, bulk samples (collected from auger cuttings, Geoprobe core samples, and hand samplers), Shelby tube samples, and Denison tube samples obtained during the field investigation. A PARSONS geotechnical engineer assigned laboratory tests after reviewing the test plan, field boring logs, and sample recovery.

Consolidation, triaxial compression, and permeability tests were performed on test specimens remolded from materials from split-spoon, bulk, Shelby, and Denison samples. Table 3-2 summarizes the test conditions for remolded specimens. Maximum Dry Densities (MDDs) and Optimum Moisture Contents (OMCs) for remolding of the test specimens from large volume bulk samples (5-10 gallon containers) of auger cuttings came from Standard Proctor Compaction tests of material from the bulk sample itself. Remolded tests were also performed on material from split-spoon, Shelby tube, and Denison samples. For these tests, the MDD and OMC for remolding was based on Standard Compaction test data for FEMP soils obtained during the Disposal Facility Pre-Design Investigation (PARSONS 1995b) and compaction tests of ash from the AFAP and IFAP collected during the field investigation. Table 3-3 summarizes the MDD and OMC data that the geotechnical laboratory used as target values for remolding specimens obtained from split-spoon, Shelby tube and Denison samples.

Modal diameter tests of soil samples collected during the field investigation were conducted by FERMCO at the on-site laboratory.

Table 3-1 - Summary of Geotechnical Laboratory Program

Test Method	Title	Number Performed
ASTM D 2216	Method for Laboratory Determination of Water Content of Soil and Rock (natural moisture) [MC][1]	139[2]
ASTM D 4318	Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils [AL]	71
ASTM D 422	Test Method for Particle-Size Analysis of Soils [GS]	71
ASTM D 854	Test Method for Specific Gravity of Soils [SG]	73[3]
ASTM D 2974	Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils [OC]	42
ASTM D 698	Test Method for Laboratory Compaction of Soil Using Standard Effort [SP]	18
ASTM D 5084	Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall [P_r] Permeameter	18[4]
ASTM D 4767	Test Method for Consolidated-Undrained Triaxial Compression Test on Cohesive Soils [CU_{r85}]	5[5]
ASTM D 2850	Test Method for Unconsolidated, Undrained Compressive Strength of Cohesive Soils [UU_{r85}]	3[6]
ASTM D 2435	Test Method for One-Dimensional Consolidation Properties of Soils [CON_{r85}]	19[7]
EPA/600/8-85/002 (pg. 23)	Modal Diameter Test	6

Notes:

1 Symbols in brackets [ ] correspond to test code from GSTP.

2 Additional natural moisture contents were determined in conjunction with organic content tests.

3 Specific gravity tests were performed in conjunction with hydrometer (i.e., grain-size analyses).

4 Two-stage permeability tests on remolded test specimens.

5 Consolidated, undrained (CU) triaxial compression tests (with pore pressure measurements) on remolded test specimens.

6 Unconsolidated, undrained (UU) triaxial compression tests on remolded test specimens.

7 Consolidation tests on remolded test specimens.

Table 3-2 - Remolded Specimen Test Conditions

	Consolidation Test, Remolded, 85 percent r.c., (ASTM D 2435)	Triaxial Compression Test, Unconsolidated, Undrained, (TX-UU), Remolded, 85 percent r.c., (ASTM D 2850)	Triaxial Compression Test, Consolidated, Undrained, (TX-CUw/pp), Remolded, 85 percent r.c., (ASTM D 4767)	Triaxial Permeability, Two-stage, Remolded, 97 percent r.c., (ASTM D 5084)
GSTP Test Code	CON_{r85}	UU_{r85}	CU_{r85}	P_r
Specimen Remolding Requirements	Dry Density: 85 percent of the maximum Standard Proctor Dry Density Moisture Content: at or near optimum	Dry Density: 85 percent of the maximum Standard Proctor Dry Density Moisture Content: at or near optimum	Dry Density: 85 percent of the maximum Standard Proctor Dry Density Moisture Content: at or near optimum	Minimum Dry Density: 97 percent of the maximum Standard Proctor Dry Density Moisture Content: at or near 4 percent wet of optimum
Confining Pressure		10 psi Perform test at saturated condition	5 psi 10 psi 20 psi	Stage 1: 2 psi Stage 2: 5 psi
Consolidation Test Conditions	at saturated condition			
Head Pressure				2 psi

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Table 3-2 - Remolded Specimen Test Conditions (Continued)

	Consolidation Test, Remolded, 85 percent r.c., (ASTM D 2435)	Triaxial Compression Test, Unconsolidated, Undrained, (TX-UU), Remolded, 85 percent r.c., (ASTM D 2850)	Triaxial Compression Test, Consolidated, Undrained, (TX-CUw/pp), Remolded, 85 percent r.c., (ASTM D 4767)	Triaxial Permeability, Two-stage, Remolded, 97 percent r.c., (ASTM D 5084)
Standard Compaction Data to Use for Remolding Specimens	Use max. dry density and OMC from Standard Compaction Test of Material from same bulk sample; or where compaction data is not available (i.e., material from tube/barrel samples) use Table 3-3 for max. dry density and OMC.	Use max. dry density and OMC from Standard Compaction Test of Material from same bulk sample; or where compaction data is not available (i.e., material from tube/barrel samples) use Table 3-3 for max. dry density and OMC.	Use max. dry density and OMC from Standard Compaction Test of Material from same bulk sample; or where compaction data is not available (i.e., material from tube/barrel samples) use Table 3-3 for max. dry density and OMC.	Use max. dry density and OMC from Standard Compaction Test of Material from same bulk sample; or where compaction data is not available (i.e., material from tube/barrel samples) use Table 3-3 for max. dry density and OMC.

Notes:

CON_{r85} = Consolidation with time readings, ASTM D 2435, remolded sample with 85 percent relative compaction at optimum moisture content in accordance with ASTM D 698.

UU_{r85} = Unconsolidated, undrained triaxial compression, ASTM D 2850, remolded sample with 85 percent relative compaction at optimum moisture content in accordance with ASTM D 698.

CU_{r85} = Consolidated, undrained triaxial compression with pore pressure measurements, ASTM D 4767, remolded sample with 85 percent relative compaction at optimum moisture content in accordance with ASTM D 698. Three samples to be used at three different confining pressures. If three samples were not available, a staged test was performed on one sample.

P_r = Two-stage Permeability, ASTM D 5084, remolded sample with 97 percent relative compaction at moisture content wet of optimum in accordance with ASTM D 698.

r.c. = relative compaction (i.e., dry density relative to standard MDD).

Table 3-3 - Standard Proctor Maximum Dry Density and OMC Criteria for Remolded Tests of Material From Tube/Barrel Samples

Material	Approximate Sample Depth (feet)	Maximum Standard Proctor Dry Density (pcf)	Optimum Moisture Content (percent)
Brown CL	2 - 7.5	118	14.5
Brown CL	7.5 - 13	123	12.6
Gray CL	(see Note 3)	125	11.3
Brown CH	(see Note 3)	106	19.3
Brown ML	(see Note 3)	125	11.3
Ash	-	60	30.0

Notes:

1. This table applies to remolded tests of material from Shelby tubes, Denison Tubes or split-barrel samplers where compaction test data is not available.
2. The data for soils are derived from the Disposal Facility Pre-Design Investigation (PO-132) Standard Compaction Test (ASTM D 698, Method A) results of FEMP Soils.
3. In general for till above the sand and gravel stratum, the "brown" colored soil material comes from depths less than about 10 - 15 feet; the "gray" colored soil material comes from depths of greater than about 10 -15 feet.
4. Values for ash based of results of Standard Compaction test results from PO-154 testing.
5. If sample conditions (i.e., color, USCS classification, depth) did not fall within the criteria listed in this table, a PARSONS geotechnical engineer provided the testing laboratory with MDD and OMC target values for remolding specimens, based upon review of boring log, classification data, and compaction data for similar FEMP soils. The sample identification, MDD and OMC the affected samples are listed below.

Boring	Sample No.	Depth	MDD (pcf)	OMC (%)
G2-160A	410562	24.5-26'	118.0	14.5
G2-163	410320	15-17'	125.0	11.3
G2-165	410213	20-22'	118.0	14.5
G2-168	410344	10-12'	125.0	11.3
G2-170	410106	15-17'	123.0	12.6
G2-171	410120	25-27'	123.0	12.6

SECTION 4

LABORATORY TEST RESULTS

This section summarizes the results of the geotechnical laboratory testing of samples collected at the AFAP, IFAP and SF during the field investigation. These data are presented in a series of tables that incorporate the sample's identification as well as the sample's color, USCS group symbol, and USCS group name.

4.1 Index/Classification Tests

Moisture content tests (ASTM D 2216) were performed on selected samples to provide natural soil moisture profiles at the borings. Moisture content was also determined as a routine part of test procedures for the organic content (ASTM D 2974) tests. Plasticity tests (ASTM D 4318), commonly referred to as Atterberg limits, and grain size analyses (ASTM D 422) were conducted for classification (ASTM D 2487) of the materials. Table 4-1 presents a summary of the moisture content test results along with the Liquid Limit (LL), Plastic Limit (PL), Plasticity Index (PI), grain size, and specific gravity of the materials tested.

Samples of topsoil were collected at various boring locations for organic content tests (ASTM D 2974). Table 4-2 contains the results of the these tests.

Modal particle diameter tests were performed on soil samples collected at Borings G2-164 and G2-169 to provide data for air modeling. The tests were performed by FERMCO at the on-site laboratory. The procedure used for the modal diameter tests was adapted from a field procedure in the EPA document *Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites* (US EPA 1985). The procedure and test results are contained in Appendix D.

4.2 Compaction Tests

Standard Proctor compaction tests (ASTM D 698) were performed on bulk samples or from shallow borings/excavations to determine the maximum dry density and the optimum moisture content of the soils and ash to provide compaction data about the waste materials, and to provide a basis for remolding test specimens for consolidation, strength and permeability tests. The amount of compaction and degree of wetting/drying operations required during earthwork operations can be estimated from the compaction test results. Table 4-3 summarizes the optimum moisture contents and maximum dry densities for compaction tests on bulk samples. Appendix E contains compaction curves for the samples tested.

Table 4-1 - Summary of Index Properties

On-Site Location	Boring No.	Sample No.	Sample Type	Top Depth (feet)	Bottom Depth (feet)	Color (from field log)	General Stratum	USCS Group Name	USCS Group Symbol	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Gravel (%)	Sand (%)	Grain Size Silt and Clay (%)	Clay (0.002 mm) (%)	Specific Gravity	Data Source
IFAP	G2-SB-91	410000	Bulk	1.5	10.0	Black	Fly Ash	Silty Sand (Ash)	SM	25.0	NP	NP	NP	6.7	60.1	33.2	1.8	2.24	PO 154
IFAP	G2-SB-92	409996	Bulk	1.5	10.0	Black	Fly Ash	Silty Sand (Ash)	SM	19.8	NP	NP	NP	5.7	50.5	43.8	4.2	2.23	PO 154
IFAP	G2-SB-93	409991	Bulk	1.5	7.0	Light Olive Brown	Fill	Lean Clay with Sand	CL	13.9	40.9	22.5	18.4	3.0	26.0	71.0	22.1	2.58	PO 154
IFAP	G2-SB-93	409992	Bulk	7.0	10.0	Light Olive Brown	Fill	Sandy Lean Clay	CL	17.7	27.7	13.4	14.3	6.3	38.4	55.3	17.0	2.76	PO 154
IFAP	G2-SB-94	409986	Bulk	7.0	10.0	Black	Fly Ash	Ash (V)	NT	21.2	NT	NT	NT	17.9	50.6	31.5	2.9	2.28	PO 154
IFAP	G2-SB-94	409987	Bulk	1.5	7.0	Black	Fly Ash	Silty Sand with Gravel	SM	27.2	NP	NP	NP	28.5	43.5	28.0	4.0	2.24	PO 154
SF/SFBA	G2-SB-95	409898	Bulk	1.5	5.0	Light Brownish Gray	Brown Till	Lean Clay	CL	20.0	29.3	15.6	13.8	0.8	10.1	89.1	28.6	2.74	PO 154
SF/SFBA	G2-SB-95	409899	Bulk	5.0	10.0	Greenish Gray	Gray Till	Lean Clay with Sand	CL	14.9	21.4	13.9	7.5	3.2	15.6	81.2	20.5	2.74	PO 154
SF/SFBA	G2-SB-96	409903	Bulk	1.5	5.0	Dark Yellowish Brown	Fill	Lean Clay	CL	23.3	38.6	16.4	22.2	0.1	13.6	86.3	29.3	2.75	PO 154
SF/SFBA	G2-SB-96	409904	Bulk	5.0	10.0	Dark Yellowish Brown	Fill	Lean Clay	CL	22.1	27.1	14.7	12.4	0.1	11.8	88.1	25.9	2.72	PO 154
SF	G2-SB-97A	409912	Bulk	1.5	10.0	Dark Yellowish Brown	Fill	Sandy Lean Clay	CL	16.3	31.3	15.6	15.7	6.1	30.5	63.4	19.5	2.70	PO 154
SF/SFBA	G2-SB-98	409908	Bulk	1.5	10.0	Yellowish Brown	Stratified Glacial Deposits	Lean Clay	CL	22.6	37.5	16.9	20.5	0.2	3.4	96.4	33.0	2.75	PO 154
SF/SFBA	G2-SB-99	409923	Bulk	1.5	5.0	Light Yellowish Brown	Fill	Lean Clay with Gravel	CL	18.3	44.4	17.6	26.9	12.6	9.8	77.6	29.3	2.67	PO 154
SF/SFBA	G2-SB-99	409924	Bulk	5.0	10.0	Yellowish Brown	Stratified Glacial Deposits	Lean Clay	CL	23.7	35.8	16.2	19.5	1.5	5.0	93.5	32.7	2.81	PO 154
SF	G2-SB-100	409938	Bulk	1.5	10.0	Dark Grayish Brown	Fill	Gravelly Lean Clay with Sand	CL	13.4	34.2	15.6	18.6	21.3	20.1	58.6	19.2	2.73	PO 154
SF	G2-SB-101	409930	Bulk	1.5	10.0	Light Olive Brown	Brown Till	Lean Clay	CL	21.1	39.6	17.6	22.0	2.1	2.5	95.4	37.6	2.76	PO 154
SF	G2-SB-102	409934	Bulk	1.5	10.0	Dark Grayish Brown	Fill	Clayey Gravel with Sand	GC	15.1	35.8	15.8	20.0	28.8	24.9	46.3	16.0	2.70	PO 154
AFAP	G2-SB-103	409808	Bulk	1.5	10.0	Black	Fly Ash	Silty Sand (Ash)	SM	29.4	NP	NP	NP	10.9	44.8	44.3	1.0	2.24	PO 154
AFAP	G2-SB-104	409804	Bulk	1.5	10.0	Black	Fly Ash	Silty Sand (Ash)	SM	27.7	NP	NP	NP	12.6	44.7	42.7	1.8	2.19	PO 154
IFAP	G2-SB-91,92,93,94	409982	Bulk	0.0	1.5	Olive Brown	Composite	Flyash and Clay (V)	NT	18.8	NT	NT	NT	NT	NT	NT	NT	2.50	PO 154
SF	G2-SB-96,99,100,102	409915	Bulk	0.0	1.5	Dark Yellowish Brown	Composite	Lean Clay (V)	NT	14.6	NT	NT	NT	NT	NT	NT	NT	2.77	PO 154
IFAP	G2-160	410232	SS	2.5	4.5	Black	Fly Ash	Silty Sand (Ash)	SM	36.4	NP	NP	NP	10.3	54.7	35.0	2.7	2.19	PO 154
IFAP	G2-160	410233	SS	5.0	6.5	Black	Fly Ash	Ash (V)	NT	31.5	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
IFAP	G2-160	410234	SS	7.5	9.0	Black	Fly Ash	Silty Sand (Ash)	SM	31.8	NP	NP	NP	6.7	59.2	34.1	1.3	2.20	PO 154
IFAP	G2-160	410235	SS	10.0	11.5	Black	Fly Ash	Ash (V)	NT	35.0	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
IFAP	G2-160	410236	SS	12.5	14.0	Black	Fly Ash	Silty Sand with Gravel (Ash)	SM	33.4	NP	NP	NP	15.1	56.5	28.4	2.4	2.11	PO 154
IFAP	G2-160	410237	SS	15.0	16.5	Black	Fly Ash	Ash (V)	NT	36.9	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
IFAP	G2-160	410238	SS	17.5	19.0	Black	Fly Ash	Ash (V)	NT	48.0	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
IFAP	G2-160A	410249	SS	2.5	4.0	Black	Fly Ash	Silty Sand (Ash)	SM	NT	NP	NP	NP	3.7	50.9	45.4	3.4	2.17	PO 154
IFAP	G2-160A	410250	SS	7.5	9.0	Black	Fly Ash	Ash (V)	NT	NT	NP	NP	NP	NT	NT	NT	NT	NT	PO 154
IFAP	G2-160A	410559	SS	12.5	14.0	Black	Fly Ash	Silty Sand (Ash)	SM	NT	NP	NP	NP	6.2	62.7	31.1	0.1	2.11	PO 154
IFAP	G2-160A	410560	SS	20.0	21.5	Black	Fly Ash	Ash (V)	NT	16.2	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
IFAP	G2-160A	410561	SS	22.5	24.0	Dark Olive Gray	Brown Till	Sandy Lean Clay	CL	22.2	35.3	21.6	13.8	11.7	32.0	56.3	13.4	2.60	PO 154
IFAP	G2-160A	410562	SS	24.5	26.5	Olive Brown	Brown Till	Sandy Lean Clay	CL	10.9	26.4	13.3	13.1	9.9	30.0	60.1	20.7	2.76	PO 154
SF	G2-161	410222	SS	2.5	4.0	Dark Yellowish Brown	Fill	Lean Clay (V)	NT	25.6	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-161	410223	SS	5.0	6.5	Dark Yellowish Brown	Fill	Fat Clay with Sand	CH	27.0	56.8	28.5	28.3	0.1	18.8	81.1	43.8	2.73	PO 154
SF	G2-161	410224	SS	7.5	9.0	Olive	Stratified Glacial Deposits	Fat Clay with Sand (V)	NT	25.3	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-161	410225	SS	10.0	11.5	Olive Brown	Stratified Glacial Deposits	Silt with Sand	ML	16.8	20.4	16.6	3.8	1.1	20.5	78.4	13.5	2.77	PO 154
SF	G2-161	410226	SS	12.5	14.5	Dark Gray	Gray Till	Sandy Lean Clay	CL	13.7	21.8	12.5	9.3	6.8	29.3	63.9	16.9	2.74	PO 154
SF	G2-161	410227	SS	15.0	16.5	Gray	Gray Till	Sandy Lean Clay	CL	11.0	25.0	13.9	11.1	7.0	27.0	66.0	17.8	2.75	PO 154
SF	G2-161	410228	SS	17.5	19.0	Light Olive Brown	Gray Till	Silty Sand (V)	NT	3.0	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-161	410229	SS	19.5	21.0	Light Olive Brown	Gray Till	Silty Sand (V)	NT	3.2	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
IFAP	G2-162	410239	SS	2.5	4.0	Black	Fly Ash	Silty Sand (Ash)	SM	27.5	NP	NP	NP	6.7	56.0	37.3	3.7	2.16	PO 154
IFAP	G2-162	410240	SS	5.0	6.5	Black	Fly Ash	Ash (V)	NT	34.2	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
IFAP	G2-162	410241	SS	7.0	9.0	Black	Fly Ash	Silty Sand (Ash)	SM	28.8	NP	NP	NP	7.7	58.2	34.1	0.7	2.17	PO 154
IFAP	G2-162	410242	SS	10.0	11.5	Black	Fly Ash	Ash (V)	NT	33.1	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
IFAP	G2-162	410243	SS	12.5	14.0	Black	Fly Ash	Ash (V)	NT	35.8	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
IFAP	G2-162	410244	SS	15.0	16.5	Black	Fly Ash	Ash (V)	NT	31.6	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
IFAP	G2-162	410245	SS	17.0	19.0	Black	Fly Ash	Silty Sand (Ash)	SM	31.7	NP	NP	NP	5.0	56.4	38.6	0.2	2.12	PO 154
IFAP	G2-162	410246	SS	20.0	21.5	Black	Fly Ash	Ash (V)	NT	35.8	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
IFAP	G2-162	410247	SS	25.0	26.5	Black	Fly Ash	Silty Sand (Ash)	SM	31.9	NP	NP	NP	9.3	56.1	34.6	NT	2.42	PO 154
IFAP	G2-162	410248	SS	27.0	29.0	Black	Fly Ash	Silty Sand with Gravel (Ash)	SM	23.8	NP	NP	NP	17.4	58.0	24.6	3.2	2.22	PO 154
SF	G2-163	410315	SS	2.5	4.0	Olive Brown	Stratified Glacial Deposits	Lean Clay with Sand (V)	NT	13.3	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-163	410316	SS	4.5	6.5	Olive Brown	Stratified Glacial Deposits	Lean Clay with Sand (V)	NT	11.0	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-163	410317	SS	7.5	9.0	Dark Olive Brown	Stratified Glacial Deposits	Lean Clay with Sand	CL	21.0	31.6	15.8	15.8	5.4	24.3	70.3	18.9	2.67	PO 154
SF	G2-163	410318	SS	10.0	11.5	Olive Brown	Brown Till	Sandy Lean Clay (V)	NT	16.2	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-163	410319	SS	12.5	14.0	Dark Yellowish Brown	Brown Till	Sandy Lean Clay	CL	12.4	21.9	12.9	9.0	4.6	32.8	62.6	17.3	2.73	PO 154
SF	G2-163	410320	ST	15.0	17.0	Gray	Gray Till	Sandy Silty Clay	CL-ML	14.7	19.4	13.7	5.7	1.6	29.2	69.2	14.9	2.74	PO 154
SF	G2-163	410321	SS	17.5	19.0	Dark Gray	Gray Till	Sandy Silt (V)	NT	9.9	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-163	410322	SS	20.0	21.5	Dark Gray	Gray Till	Sandy Silt	ML	12.0	14.4	12.1	2.3	13.1	30.8	56.1	17.0	2.76	PO 154
SF	G2-163	410323	SS	22.5	24.0	Dark Yellowish Brown	GMA	Sand with Gravel (V)	NT	3.1	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF/SFBA	G2-164	410298	SS	2.5	4.0	Dark Yellowish Brown	Stratified Glacial Deposits	Lean Clay (V)	NT	18.2	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF/SFBA	G2-164	410299	SS	5.0	6.5	Light Brownish Gray	Stratified Glacial Deposits	Lean Clay	CL	19.2	26.5	16.0	10.4	1.4	9.5	89.1	26.3	2.76	PO 154
SF/SFBA	G2-164	410301	SS	7.5	9.0	Gray	Stratified Glacial Deposits	Fat Clay (V)	NT	23.8	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF/SFBA	G2-164	410302	ST	10.0	12.0	Gray	Stratified Glacial Deposits	Lean Clay	CL	22.3	26.4	16.4	10.0	0.0	0.6	99.4	22.0	2.72	PO 154
SF/SFBA	G2-164	410304	SS	12.5	14.0	Olive Brown	Stratified Glacial Deposits	Sandy Silt	ML	21.0	NP	NP	NP	0.0	44.2	55.8	3.8	2.77	PO 154
SF/SFBA	G2-164	410306	SS	15.0	16.5	Olive Brown	Stratified Glacial Deposits	Sandy Silt (V)	NT	15.7	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF/SFBA	G2-164	410307	SS	17.5	19.0	Gray	Stratified Glacial Deposits	Sandy Silt	ML	16.7	14.4	12.1	2.3	3.1	46.8	50.1	9.9	2.76	PO 154

000125

Table 4-1 - Summary of Index Properties (Continued)

On-Site Location	Boring No.	Sample No.	Sample Type	Top Depth (feet)	Bottom Depth (feet)	Color (from field log)	General Stratum	USCS Group Name	USCS Group Symbol	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Gravel (%)	Sand (%)	Grain Size Silt and Clay (%)	Clay (0.002 mm) (%)	Specific Gravity	Data Source
SF/SFBA	G2-164	410308	SS	20.0	21.5	Gray	Stratified Glacial Deposits	Sandy Lean Clay (V)	NT	15.2	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF/SFBA	G2-164	410309	SS	22.5	24.0	Gray	Gray Till	Sandy Lean Clay (V)	NT	15.0	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-165	410199	SS	2.5	4.0	Dark Yellowish Brown	Fill	Lean Clay with Sand	CL	16.1	45.1	17.6	27.5	4.6	14.9	80.5	28.5	2.71	PO 154
SF	G2-165	410201	SS	5.0	6.5	Dark Yellowish Brown	Fill	Sandy Lean Clay with Gravel	CL	12.6	33.9	15.8	18.1	23.3	23.6	53.1	18.4	2.69	PO 154
SF	G2-165	410203	SS	7.5	9.0	Olive	Fill	Sandy Lean Clay with Gravel (V)	NT	19.8	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-165	410205	SS	10.0	12.0	Olive Gray	Fill	Sandy Lean Clay with Gravel	CL	21.4	35.8	15.5	20.2	16.3	19.4	64.3	22.2	2.70	PO 154
SF	G2-165	410207	SS	12.5	14.0	Olive	Fill	Sandy Lean Clay with Gravel (V)	NT	17.7	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-165	410209	SS	15.0	16.5	Olive Gray	Fill	Sandy Lean Clay	CL	21.4	32.2	16.3	15.9	9.7	20.7	69.6	23.6	2.72	PO 154
SF	G2-165	410211	SS	17.5	19.0	Olive	Fill	Sandy Lean Clay (V)	NT	13.4	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-165	410213	SS	20.0	22.0	Olive Brown	Fill	Lean Clay with Sand	CL	18.9	34.0	15.8	18.2	5.6	18.8	75.6	24.8	2.66	PO 154
SF	G2-165	410215	SS	22.5	24.0	Olive Brown	Fill	Lean Clay with Sand (V)	NT	17.4	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-165	410217	SS	25.0	26.5	Olive Brown	Fill	Lean Clay with Sand (V)	NT	27.3	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-165	410219	SS	27.5	29.0	Dark Olive Gray	Gray Till	Sandy Lean Clay	CL	13.2	30.9	16.3	14.6	4.7	34.0	61.3	18.4	2.68	PO 154
SF	G2-166	410183	SS	2.5	4.0	Yellowish Brown	Fill	Gravelly Clay (V)	NT	19.6	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-166	410184	SS	5.0	6.5	Olive	Fill	Clayey Gravel with Sand	GC	12.9	34.3	16.1	18.2	34.8	21.2	44.0	14.5	2.74	PO 154
SF	G2-166	410185	SS	7.5	9.0	Olive	Brown Till	Lean Clay with Gravel (V)	NT	18.4	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-166	410186	ST	10.0	11.5	Olive Brown	Brown Till	Lean Clay	CL	23.5	30.1	19.6	10.5	0.8	12.1	87.1	15.8	2.77	PO 154
SF	G2-166	410188	ST	12.5	14.0	Olive Brown	Brown Till	Lean Clay with Sand (V)	NT	12.8	NT	NT	NT	NT	NT	NT	NT		PO 154
SF	G2-166	410190	SS	17.5	19.5	Dark Greenish Gray	Gray Till	Sandy Lean Clay	CL	9.9	25.6	14.1	11.5	5.1	26.3	68.6	19.9	2.79	PO 154
SF	G2-166	410191	SS	20.5	21.5	Yellowish Brown	GMA	Silty Sand with Gravel	SM	7.0	NP	NP	NP	15.1	69.6	15.3	2.0	2.75	PO 154
SF	G2-166	410192	SS	22.5	24.0	Pale Brown	GMA	Silty Sand with Gravel (V)	NT	3.7	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF/SFBA	G2-167	410327	SS	2.5	4.0	Very Dark Grayish Brown	Fill	Clayey Gravel with Sand	GC	11.7	37.0	17.5	19.4	30.7	22.3	47.0	14.6	2.73	PO 154
SF/SFBA	G2-167	410328	SS	5.0	6.5	Dark Yellowish Brown	Stratified Glacial Deposits	Fat Clay (V)	NT	20.3	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF/SFBA	G2-167	410329	ST	7.5	9.5	Yellowish Brown	Stratified Glacial Deposits	Lean Clay	CL	22.1	43.1	18.7	24.3	0.0	4.6	95.4	35.0	2.75	PO 154
SF/SFBA	G2-167	410330	SS	10.0	11.5	Yellowish Brown	Stratified Glacial Deposits	Lean Clay (V)	NT	20.0	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF/SFBA	G2-167	410331	SS	12.5	14.0	Brown	Stratified Glacial Deposits	Lean Clay (V)	NT	20.9	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF/SFBA	G2-167	410332	SS	15.0	16.5	Dark Gray	Stratified Glacial Deposits	Lean Clay	CL	23.9	30.3	15.8	14.6	0.0	0.6	99.4	28.8	2.79	PO 154
SF/SFBA	G2-167	410333	SS	17.5	19.0	Grayish Brown	Stratified Glacial Deposits	Clayey Silt (V)	NT	21.4	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF/SFBA	G2-167	410334	SS	20.0	21.5	Dark Grayish Brown	Gray Till	Sandy Lean Clay (V)	NT	15.0	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF/SFBA	G2-167	410335	SS	22.5	24.0	Dark Gray	Gray Till	Sandy Lean Clay (V)	NT	12.7	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-168	410341	SS	0.5	2.0	Mottled Dark Grayish Brown	Fill	Sandy Lean Clay (V)	NT	10.4	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-168	410342	SS	2.5	4.0	Dark Yellowish Brown	Stratified Glacial Deposits	Fat Clay	CH	20.6	57.9	20.1	37.8	0.0	1.6	98.4	47.8	2.75	PO 154
SF	G2-168	410343	SS	5.0	6.5	Brownish Yellow	Stratified Glacial Deposits	Sandy Silty Clay (V)	NT	13.9	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-168	410344	ST	10.0	12.0	Grayish Brown	Stratified Glacial Deposits	Sandy Silty Clay	CL-ML	13.8	19.4	13.6	5.9	12.9	33.6	53.5	10.8	2.74	PO 154
SF	G2-168	410345	SS	12.5	14.0	Grayish Brown	Stratified Glacial Deposits	Silt	ML	19.2	20.1	17.3	2.8	1.0	9.7	89.3	15.1	2.76	PO 154
SF	G2-168	410346	SS	15.0	16.5	Grayish Brown	Stratified Glacial Deposits	Silt (V)	NT	17.3	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-168	410347	SS	17.5	19.0	Dark Grayish Brown	Stratified Glacial Deposits	Silt, Clayey Silt, Sand (V)	NT	17.4	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-168	410348	SS	20.0	21.5	Dark Gray	Gray Till	Sandy Lean Clay (V)	NT	10.2	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-168	410349	SS	22.5	24.0	Dark Yellowish Brown	GMA	Sand (V)	NT	6.3	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-169	410353	SS	0.5	2.0	Olive Brown	Fill	Sandy Lean Clay (V)	NT	14.5	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-169	410354	SS	2.5	4.0	Olive Brown	Stratified Glacial Deposits	Lean Clay	CL	22.0	46.5	18.5	27.9	0.0	7.6	93.1	31.5	2.74	PO 154
SF	G2-169	410355	SS	5.0	6.5	Dark Yellowish Brown	Stratified Glacial Deposits	Lean Clay (V)	NT	18.8	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-169	410356	ST	7.5	9.5	Light Olive Brown	Stratified Glacial Deposits	Lean Clay	CL	21.3	28.0	16.5	11.5	0.0	5.2	94.8	25.2	2.74	PO 154
SF	G2-169	410357	SS	10.0	11.5	Olive Brown	Stratified Glacial Deposits	Fat Clay (V)	NT	22.0	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-169	410358	SS	12.5	14.0	Gray	Stratified Glacial Deposits	Silt (V)	NT	22.1	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-169	410359	SS	15.0	16.5	Dark Grayish Brown	Stratified Glacial Deposits	Silty Sand	SM	22.9	NP	NP	NP	0.0	62.2	37.8	3.6	2.74	PO 154
SF	G2-169	410360	SS	17.5	19.0	Dark Grayish Brown	Stratified Glacial Deposits	Lean Clay with Sand (V)	NT	14.5	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-169	410551	SS	20.0	21.5	Dark Gray	Stratified Glacial Deposits	Lean Clay with Sand (V)	NT	15.9	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-169	410552	SS	22.5	24.0	Dark Gray	Gray Till	Sandy Lean Clay (V)	NT	11.0	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SF	G2-169	410553	SS	24.5	26.0	Dark Yellowish Brown	Gray Till	Sandy Lean Clay (V)	NT	10.0	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
AFAP	G2-170	410101	SS	2.5	4.0	Black	Fly Ash	Ash (V)	NT	35.9	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
AFAP	G2-170	410102	SS	4.5	6.5	Black	Fly Ash	Silty Sand (Ash)	SM	27.5	NP	NP	NP	0.2	59.4	40.4	2.0	2.28	PO 154
AFAP	G2-170	410103	SS	7.5	9.0	Black	Fly Ash	Sandy Silt (Ash)	ML	24.3	33.1	25.0	8.1	6.1	33.4	60.5	15.3	2.63	PO 154
AFAP	G2-170	410104	SS	10.0	11.5	Light Olive Brown	Brown Till	Lean Clay with Sand (V)	NT	18.0	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
AFAP	G2-170	410105	SS	12.5	14.0	Light Olive Brown	Brown Till	Lean Clay with Sand	CL	16.1	24.1	14.0	10.0	0.1	18.5	81.4	23.2	2.76	PO 154
AFAP	G2-170	410106	ST	15.0	17.0	Light Olive Brown	Brown Till	Lean Clay with Sand	CL	13.1	25.8	14.2	11.6	4.1	23.6	72.3	20.0	2.68	PO 154
AFAP	G2-170	410108	SS	17.5	19.0	Light Olive Brown	Brown Till	Lean Clay with Sand (V)	NT	12.8	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
AFAP	G2-170	410109	SS	20.0	21.5	Dark Greenish Gray	Gray Till	Lean Clay (V)	NT	10.8	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
AFAP	G2-170	410110	SS	23.5	25.0	Light Yellowish Brown	GMA	Sand (V)	NT	3.2	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
AFAP	G2-171	410111	SS	2.5	4.0	Black	Fly Ash	Ash (V)	NT	25.6	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
AFAP	G2-171	410112	SS	5.0	6.5	Black	Fly Ash	Silty Sand (Ash)	SM	29.9	NP	NP	NP	1.6	53.8	44.6	3.4	2.22	PO 154
AFAP	G2-171	410113	SS	7.5	9.0	Black	Fly Ash	Ash (V)	NT	41.1	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
AFAP	G2-171	410114	SS	10.0	11.5	Black	Fly Ash	Ash (V)	NT	34.9	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
AFAP	G2-171	410115	SS	12.0	14.0	Black	Fly Ash	Silty Sand (Ash)	SM	31.4	NP	NP	NP	6.0	56.1	37.9	2.0	2.19	PO 154
AFAP	G2-171	410116	SS	15.0	16.5	Black	Fly Ash	Ash (V)	NT	43.4	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
AFAP	G2-171	410117	SS	17.5	19.0	Black / Light Olive Brown	Fly Ash	Lean Clay with Sand	CL	51.8	42.6	24.5	18.0	0.4	20.2	79.4	25.6	2.22	PO 154
AFAP	G2-171	410118	SS	20.0	21.5	Light Olive Brown	Stratified Glacial Deposits	Lean Clay with Sand (V)	NT	17.5	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
AFAP	G2-171	410120	ST	25.0	27.0	Light Olive Brown	Brown Till	Sandy Lean Clay	CL	24.0	25.6	13.9	11.7	4.0	29.0	67.0	28.7	2.72	PO 154

Table 4-1 - Summary of Index Properties Samples (Continued)

On-Site Location	Boring No.	Sample No.	Sample Type	Top Depth (feet)	Bottom Depth (feet)	Color (from field log)	General Stratum	USCS Group Name	USCS Group Symbol	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Grain Size Gravel (%)	Sand (%)	Silt and Clay (%)	Clay (0.002 mm) (%)	Specific Gravity	Data Source
AFAP	G2-171	410122	SS	30.0	31.5	Greenish Gray	Gray Till	Sandy Silty Clay	CL-ML	14.5	19.7	13.8	5.9	2.5	29.2	68.3	15.1	2.76	PO 154
AFAP	G2-171	410123	SS	32.5	34.0	Dark Greenish Gray	Gray Till	Sandy Silty Clay (V)	NT	13.2	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
AFAP	G2-171	410124	SS	35.0	36.5	Dark Greenish Gray	Gray Till	Sandy Silty Clay (V)	NT	7.6	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
AFAP	G2-171	410125	SS	37.5	39.0	Yellowish Brown	GMA	Sand (V)	NT	3.5	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
AFAP	G2-171	410126	SS	40.0	41.5	Brown	GMA	Sand (V)	NT	3.5	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
AFAP	G2-171	410127	SS	42.5	44.0	Brown	GMA	Sand (V)	NT	3.2	NT	NT	NT	NT	NT	NT	NT	NT	PO 154

Notes

1. On-Site Location:
   - AFAP — Active Fly Ash Pile
   - IFAP — Inactive Fly Ash Pile
   - SF — South Field
   - SF/SFBA — South Field (Waste Unit) / South Field Borrow Area
2. Sample Type:
   - Bulk — Bulk Sample
   - SS — Split Spoon Sample
   - ST — Shelby Tube Sample (ASTM D 1587)
3. Moisture Content determined by ASTM D 2216, Plasticity Indicies by ASTM D 4318, Grain Size by ASTM D 422, Specific Gravity by ASTM D 854
4. NP - Reported as non-plastic from laboratory plasticity test (ASTM D 4318)
   NT - Not Tested
5. USCS Group Name (V) — Visual Classification; not classified from laboratory test data
6. Data Source: PO 154 — Flyash Piles and South Field Waste Units Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, February, 1996.

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Table 4-2 - Summary of Organic Content Tests

On-Site Location	Boring	Sample Number	Sample Type	Top Depth (feet)	Bottom Depth (feet)	Moisture Content (% dry wgt.)	Total Organic Content (% dry wgt.)	Data Source
IFAP	G2-SB-91	409997	Bulk	0.0	0.5	14.5	2.4	PO 154
IFAP	G2-SB-91	409998	Bulk	0.5	1.0	20.4	7.2	PO 154
IFAP	G2-SB-91	409999	Bulk	1.0	1.5	19.4	5.9	PO 154
IFAP	G2-SB-92	409993	Bulk	0.0	0.5	18.8	5.4	PO 154
IFAP	G2-SB-92	409994	Bulk	0.5	1.0	25.0	8.1	PO 154
IFAP	G2-SB-92	409995	Bulk	1.0	1.5	23.8	9.1	PO 154
IFAP	G2-SB-93	409988	Bulk	0.0	0.5	24.5	3.4	PO 154
IFAP	G2-SB-93	409989	Bulk	0.5	1.0	19.9	4.6	PO 154
IFAP	G2-SB-93	409990	Bulk	1.0	1.5	31.9	4.8	PO 154
IFAP	G2-SB-94	409983	Bulk	0.0	0.5	7.8	1.2	PO 154
IFAP	G2-SB-94	409984	Bulk	0.5	1.0	15.6	2.0	PO 154
IFAP	G2-SB-94	409985	Bulk	1.0	1.5	31.2	1.6	PO 154
SF/SFBA	G2-SB-95	409895	Bulk	0.0	0.5	21.0	3.3	PO 154
SF/SFBA	G2-SB-95	409896	Bulk	0.5	1.0	19.2	2.1	PO 154
SF/SFBA	G2-SB-95	409897	Bulk	1.0	1.5	18.9	1.5	PO 154
SF/SFBA	G2-SB-96	409900	Bulk	0.0	0.5	25.7	4.7	PO 154
SF/SFBA	G2-SB-96	409901	Bulk	0.5	1.0	25.5	2.5	PO 154
SF/SFBA	G2-SB-96	409902	Bulk	1.0	1.5	26.0	3.1	PO 154
SF	G2-SB-97A	409909	Bulk	0.0	0.5	12.3	2.4	PO 154
SF	G2-SB-97A	409910	Bulk	0.5	1.0	6.5	1.3	PO 154
SF	G2-SB-97A	409911	Bulk	1.0	1.5	13.9	3.8	PO 154
SF/SFBA	G2-SB-98	409905	Bulk	0.0	0.5	18.8	3.8	PO 154
SF/SFBA	G2-SB-98	409906	Bulk	0.5	1.0	9.0	1.3	PO 154
SF/SFBA	G2-SB-98	409907	Bulk	1.0	1.5	9.4	1.2	PO 154
SF/SFBA	G2-SB-99	409920	Bulk	0.0	0.5	19.3	5.4	PO 154
SF/SFBA	G2-SB-99	409921	Bulk	0.5	1.0	14.5	4.6	PO 154
SF/SFBA	G2-SB-99	409922	Bulk	1.0	1.5	7.7	1.8	PO 154
SF	G2-SB-100	409935	Bulk	0.0	0.5	17.2	5.2	PO 154
SF	G2-SB-100	409936	Bulk	0.5	1.0	16.1	3.3	PO 154
SF	G2-SB-100	409937	Bulk	1.0	1.5	15.7	3.4	PO 154
SF	G2-SB-101	409927	Bulk	0.0	0.5	9.8	2.1	PO 154
SF	G2-SB-101	409928	Bulk	0.5	1.0	8.7	1.8	PO 154
SF	G2-SB-101	409929	Bulk	1.0	1.5	10.0	1.2	PO 154
SF	G2-SB-102	409931	Bulk	0.0	0.5	12.9	3.7	PO 154
SF	G2-SB-102	409932	Bulk	0.5	1.0	9.3	1.9	PO 154
SF	G2-SB-102	409933	Bulk	1.0	1.5	7.6	1.6	PO 154
AFAP	G2-SB-103	409805	Bulk	0.0	0.5	11.8	7.7	PO 154
AFAP	G2-SB-103	409806	Bulk	0.5	1.0	17.9	9.9	PO 154
AFAP	G2-SB-103	409807	Bulk	1.0	1.5	23.8	8.1	PO 154
AFAP	G2-SB-104	409801	Bulk	0.0	0.5	13.7	5.8	PO 154
AFAP	G2-SB-104	409802	Bulk	0.5	1.0	20.5	7.8	PO 154
AFAP	G2-SB-104	409803	Bulk	1.0	1.5	22.1	7.0	PO 154

Notes:

1. On-Site Location:
   - AFAP — Active Fly Ash Pile
   - IFAP — Inactive Fly Ash Pile
   - SF — South Field
   - SF/SFBA — South Field (Waste Unit) / South Field Borrow Area
2. Total organic content determined by ASTM D 2974.
3. Data Source: PO 154 — Flyash Piles and South Field Waste Units Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, February, 1996.

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Table 4-3 - Summary of Standard Compaction Tests of Bulk Samples

On-Site Location	Boring No.	Sample No.	Sample Type	Top Depth (feet)	Bottom Depth (feet)	General Stratum	USCS Group Name	USCS Group Symbol	Natural Moisture Content	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Grain Size Gravel (%)	Sand (%)	Silt and Clay (%)	Clay (.002mm) (%)	Specific Gravity	Compaction Method	Opt. Moisture Content (%)	Maximum Dry Density (pcf)	Data Source
IFAP	G2-SB-91	410000	Bulk	1.5	10.0	Fly Ash	Silty Sand (Ash)	SM	25.0	NP	NP	NP	6.7	60.1	33.2	1.8	2.24	Standard	38.5	65.3	PO 154
IFAP	G2-SB-92	409996	Bulk	1.5	10.0	Fly Ash	Silty Sand (Ash)	SM	19.8	NP	NP	NP	5.7	50.5	43.8	4.2	2.23	Standard	45.2	59.0	PO 154
IFAP	G2-SB-93	409991	Bulk	1.5	7.0	Fill	Lean Clay with Sand	CL	13.9	40.9	22.5	18.4	3.0	26.0	71.0	22.1	2.58	Standard	18.2	100.5	PO 154
IFAP	G2-SB-94	409987	Bulk	1.5	7.0	Fly Ash	Silty Sand with Gravel	SM	27.2	NP	NP	NP	28.5	43.5	28.0	4.0	2.24	Standard	33.3	72.0	PO 154
SF/SFBA	G2-SB-95	409898	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	20.0	29.3	15.6	13.8	0.8	10.1	89.1	28.6	2.74	Standard	14.3	118.2	PO 154
SF/SFBA	G2-SB-96	409903	Bulk	1.5	5.0	Fill	Lean Clay	CL	23.3	38.6	16.4	22.2	0.1	13.6	86.3	29.3	2.75	Standard	16.3	115.2	PO 154
SF/SFBA	G2-SB-96	409904	Bulk	5.0	10.0	Fill	Lean Clay	CL	22.1	27.1	14.7	12.4	0.1	11.8	88.1	25.9	2.72	Standard	12.8	122.8	PO 154
SF	G2-SB-97A	409912	Bulk	1.5	10.0	Fill	Sandy Lean Clay	CL	16.3	31.3	15.6	15.7	6.1	30.5	63.4	19.5	2.70	Standard	12.9	121.0	PO 154
SF/SFBA	G2-SB-98	409908	Bulk	1.5	10.0	Stratified Glacial Deposits	Lean Clay	CL	22.6	37.5	16.9	20.5	0.2	3.4	96.4	33.0	2.75	Standard	15.8	115.8	PO 154
SF/SFBA	G2-SB-99	409923	Bulk	1.5	5.0	Fill	Lean Clay with Gravel	CL	18.3	44.4	17.6	26.9	12.6	9.8	77.6	29.3	2.67	Standard	17.5	110.8	PO 154
SF/SFBA	G2-SB-99	409924	Bulk	5.0	10.0	Stratified Glacial Deposits	Lean Clay	CL	23.7	35.8	16.2	19.5	1.5	5.0	93.5	32.7	2.81	Standard	16.0	115.0	PO 154
SF	G2-SB-100	409938	Bulk	1.5	10.0	Fill	Gravelly Lean Clay with Sand	CL	13.4	34.2	15.6	18.6	21.3	20.1	58.6	19.2	2.73	Standard	13.8	119.0	PO 154
SF	G2-SB-101	409930	Bulk	1.5	10.0	Brown Till	Lean Clay	CL	21.1	39.6	17.6	22.0	2.1	2.5	95.4	37.6	2.76	Standard	16.0	114.0	PO 154
SF	G2-SB-102	409934	Bulk	1.5	10.0	Fill	Clayey Gravel with Sand	GC	15.1	35.8	15.8	20.0	28.8	24.9	46.3	16.0	2.70	Standard	12.5	121.9	PO 154
AFAP	G2-SB-103	409808	Bulk	1.5	10.0	Fly Ash	Silty Sand (Ash)	SM	29.4	NP	NP	NP	10.9	44.8	44.3	1.0	2.24	Standard	35.9	62.0	PO 154
AFAP	G2-SB-104	409804	Bulk	1.5	10.0	Fly Ash	Silty Sand (Ash)	SM	27.7	NP	NP	NP	12.6	44.7	42.7	1.8	2.19	Standard	28.8	63.0	PO 154
IFAP	G2-SB-91,92,93,94	409982	Bulk	0.0	1.5	Composite	Flyash and Clay (V)	NT	18.8	NT	NT	NT	NT	NT	NT	NT	2.50	Standard	19.5	94.7	PO 154
SF	G2-SB-96,99,100,102	409915	Bulk	0.0	1.5	Composite	Lean Clay (V)	NT	14.6	NT	NT	NT	NT	NT	NT	NT	2.77	Standard	17.2	109.0	PO 154

Notes:

1. On-Site Location:
   - AFAP — Active Fly Ash Pile
   - IFAP — Inactive Fly Ash Pile
   - SF — South Field
   - SF/SFBA — South Field (Waste Unit) / South Field Borrow Area
2. Sample Type: Bulk — Bulk Sample
3. Compaction Method: Standard — Standard Proctor Compactive Effort (ASTM D 698)
4. USCS Group Name (V) — Visual Classification; not classified from laboratory test data
5. Abbreviations:
   - NT — Not Tested
   - NP — Non-plastic
6. Data Source: PO 154 — Flyash Piles and South Field Waste Units Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, February, 1996.

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000129

4.3 Remolded Consolidation Tests

Consolidation tests (ASTM D 2435) were performed on remolded specimens of soil and ash. Materials for remolding came from bulk samples from shallow borings, split-spoon samples, Shelby tube sample, or Denison samples. For bulk samples of auger cuttings, the MDD and OMC for remolding were based on the results of standard compaction tests performed on material from the bulk sample. For specimens from split-spoon, Shelby Tube or Denison samples, the MDD and OMC for remolding were based on results of compaction tests performed on similar FEMP soils during the Disposal Facility Pre-Design investigation and compaction test of the bulk samples of ash (see Table 3-3). The specimens undergoing consolidation testing were remolded at the laboratory to maximum target dry densities of about 85 percent Standard MDD at or near OMC. Table 4-4 summarizes the results of the tests. Taylor's square root of time method was used to evaluate time-rate of consolidation data that are reported in Table 4-4. Data from these tests can be used to estimate potential settlement of waste materials placed and compacted in the On-Site Disposal Facility.

4.4 Remolded Strength Tests

Two types of laboratory triaxial compression strength tests of FEMP soils were conducted on remolded specimens of materials from the AFAP, IFAP and SF. These tests are:

1) Unconsolidated, Undrained (UU) triaxial compression tests
2) Consolidated, Undrained (CU) triaxial compression tests (with pore pressure measurements)

These tests provide soil strength parameters that can be used in geotechnical analysis and design. The engineer or designer selects the appropriate test parameters to be used based on the loads, drainage conditions, and construction sequence for the particular analysis.

The MDD and OMC used as target values for remolding specimen for strength were based remolding criteria as described in Subsection 4.3.

4.4.1 Remolded Unconsolidated, Undrained (UU) Triaxial Compression Tests

Unconsolidated, undrained triaxial compression tests (ASTM D 2850) were performed on remolded test specimens of material from the AFAP,IFAP and SF investigation. The test specimens were remolded at the laboratory to minimum target dry densities of 85 percent MDD, at or near OMC. Table 4-5 summarizes the UU test results. It should be noted that the strength parameters shown on Table 4-5 for fly ash sample 409808 are for remolded unconsolidated, undrained conditions, which from field observation may not be the conditions present at the IFAP and AFAP. Table 2-2 provides strength

Table 4-4 - Summary of Consolidation Tests, Remolded Specimens

On-Site Location	Boring No.	Sample No.	Sample Type	Top Depth (feet)	Bottom Depth (feet)	Color (from field log)	General Stratum	USCS Group Name	USCS Group Symbol	Test Type	Pre-test Moisture Content (%)	Pre-test Wet Density (pcf)	Pre-test Dry Density (pcf)	Pre-test Percent Saturation (%)	Specific Gravity	Coefficient of Consolidation (Cv) Square inch/minute, @ t90 Loading 0.8 (tsf)	1.6 (tsf)	3.2 (tsf)	6.4 (tsf)	Initial Void Ratio	Compression Index (Cc)	Recompression Index (Cr)	Data Source
IFAP	G2-SB-91	410000	Bulk	1.5	10.0	Black	Fly Ash	Silty Sand (Ash)	SM	$CONr_{85}$	28.4	71.9	56.0	42.5	2.24	0.118	0.270	0.134	0.155	1.50	0.380	0.008	PO 154
IFAP	G2-SB-92	409996	Bulk	1.5	10.0	Black	Fly Ash	Silty Sand (Ash)	SM	$CONr_{85}$	28.8	64.8	50.3	36.3	2.23	0.150	0.142	0.135	0.132	1.77	0.480	0.054	PO 154
IFAP	G2-SB-93	409991	Bulk	1.5	7.0	Light Olive Brown	Fill	Lean Clay with Sand	CL	$CONr_{85}$	18.0	100.7	85.4	52.3	2.58	0.139	0.159	0.259	0.239	0.89	0.243	0.035	PO 154
IFAP	G2-SB-94	409987	Bulk	1.5	7.0	Black	Fly Ash	Silty Sand with Gravel	SM	$CONr_{85}$	29.8	79.1	61.0	51.5	2.24	0.087	0.148	0.135	0.066	1.29	0.312	0.032	PO 154
SF	G2-SB-97A	409912	Bulk	1.5	10.0	Dark Yellowish Brown	Fill	Sandy Lean Clay	CL	$CONr_{85}$	12.7	116.0	102.9	53.7	2.70	0.057	0.078	0.066	0.043	0.64	0.190	0.020	PO 154
SF/SFBA	G2-SB-99	409923	Bulk	1.5	5.0	Light Yellowish Brown	Fill	Lean Clay with Gravel	CL	$CONr_{85}$	17.0	110.5	94.5	59.3	2.67	0.153	0.143	0.110	0.068	0.76	0.230	0.031	PO 154
SF	G2-SB-100	409938	Bulk	1.5	10.0	Dark Grayish Brown	Fill	Gravelly Lean Clay with Sand	CL	$CONr_{85}$	13.3	114.8	101.4	53.2	2.73	0.144	0.115	0.111	0.055	0.68	0.184	0.025	PO 154
AFAP	G2-SB-103	409808	Bulk	1.5	10.0	Black	Fly Ash	Silty Sand (Ash)	SM	$CONr_{85}$	24.0	61.1	49.3	29.2	2.24	0.113	0.114	0.135	0.160	1.84	0.319	0.031	PO 154
IFAP	G2-SB-91,92,93,94	409982	Bulk	0.0	1.5	Olive Brown	Composite	Flyash and Clay (V)	NT	$CONr_{85}$	18.8	95.3	80.2	49.7	2.50 (5)	0.222	0.118	0.106	0.258	0.95	0.081	0.032	PO 154
SF	G2-SB-96,99,100,102	409915	Bulk	0.0	1.5	Dark Yellowish Brown	Composite	Lean Clay (V)	NT	$CONr_{85}$	16.9	108.4	92.8	54.0	2.77	0.145	0.134	0.098	0.070	0.86	0.251	0.042	PO 154
IFAP	G2-160	410232	SS	2.5	4.5	Black	Fly Ash	Silty Sand (Ash)	SM	$CONr_{85}$	29.8	65.8	50.7	38.4	2.19	0.072	0.079	0.095	0.112	1.70	0.108	0.044	PO 154
IFAP	G2-160A	410562	SS	24.5	26.5	Olive Brown	Brown Till	Sandy Lean Clay	CL	$CONr_{85}$	13.3	114.7	101.3	52.2	2.76	0.051	0.043	0.039	0.022	0.70	0.125	0.021	PO 154
IFAP	G2-162	410241	SS	7.0	9.0	Black	Fly Ash	Silty Sand (Ash)	SM	$CONr_{85}$	28.3	66.1	51.5	37.6	2.17	0.135	0.072	0.143	0.127	1.63	0.432	0.034	PO 154
IFAP	G2-162	410245	SS	17.0	19.0	Black	Fly Ash	Silty Sand (Ash)	SM	$CONr_{85}$	30.4	65.8	50.4	39.7	2.12	0.505	1.454	1.757	0.754	1.62	0.129	0.108	PO 154
IFAP	G2-162	410248	SS	27.0	29.0	Black	Fly Ash	Silty Sand with Gravel (Ash)	SM	$CONr_{85}$	28.1	65.9	51.4	36.9	2.22	0.098	0.072	0.106	0.133	1.69	0.113	0.035	PO 154
SF	G2-163	410317	SS	7.5	9.0	Dark Olive Brown	Stratified Glacial Deposits	Lean Clay with Sand	CL	$CONr_{85}$	12.2	116.5	103.8	53.9	2.67 (5)	0.143	0.141	0.123	0.113	0.61	0.179	0.014	PO 154
SF	G2-165	410205	SS	10.0	12.0	Olive Gray	Fill	Sandy Lean Clay with Gravel	CL	$CONr_{85}$	11.9	117.4	104.9	53.1	2.70 (5)	0.134	0.060	0.044	NT	0.61	0.170	0.032	PO 154
SF	G2-165	410213	SS	20.0	22.0	Olive Brown	Fill	Lean Clay with Sand	CL	$CONr_{85}$	13.5	115.2	101.6	56.4	2.66	0.154	0.127	0.114	0.080	0.64	0.164	0.025	PO 154
AFAP	G2-170	410102	SS	4.5	6.5	Black	Fly Ash	Silty Sand (Ash)	SM	$CONr_{85}$	29.6	66.1	51.0	37.7	2.28	0.103	0.101	0.043	0.087	1.79	0.226	0.023	PO 154
AFAP	G2-171	410115	SS	12.0	14.0	Black	Fly Ash	Silty Sand (Ash)	SM	$CONr_{85}$	34.1	66.0	49.2	42.0	2.19	0.122	0.113	0.069	0.124	1.78	0.334	0.025	PO 154

Notes:

1. On-Site Location:
   - AFAP Active Fly Ash Pile
   - IFAP Inactive Fly Ash Pile
   - SF South Field
   - SF/SFBA South Field (Waste Unit) / South Field Borrow Area
2. Sample Type:
   - Bulk Bulk Sample
   - SS Split Spoon Sample
3. Test Type: $CONr_{85}$ Consolidation with time readings. ASTM D2435, remolded specimen with 85 percent relative compaction at moisture content at or near optimum in accordance with ASTM D698
4. USCS Group Name (V) Visual Classification; not classified from laboratory test data

(5) Indicates a loading schedule of 1.6, 3.2, 6.4, and 12.8 tsf.

6. NT - Not Tested
7. Data Source: PO 154 Flyash Piles and South Field Waste Units Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, February, 1996.

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000131

Table 4-5 - Summary of Mohr Circle Constructions from Unconsolidated, Undrained Triaxial Compression Tests, Remolded Specimens

On-Site Location	Boring No.	Sample No.	Sample Type	Top Depth (feet)	Bottom Depth (feet)	Color (from field log)	General Stratum	USCS Group Name	USCS Group Symbol	Test Type	Confining Pressure (psf)	Total Cohesion (psf)	Total Friction Angle (degrees)	Testing Condition	Data Source
SF	G2-SB-97A	409912	Bulk	1.5	10.0	Dark Yellowish Brown	Fill	Sandy Lean Clay	CL	UU_{r85}	1440	375	0	Saturated	PO 154
SF	G2-SB-100	409938	Bulk	1.5	10.0	Dark Grayish Brown	Fill	Gravelly Lean Clay with Sand	CL	UU_{r85}	1440	300	0	Saturated	PO 154
AFAP	G2-SB-103	409808	Bulk	1.5	10.0	Black	Fly Ash	Silty Sand (Ash)	SM	UU_{r85}	1440	237	0	Saturated	PO 154

Notes:

1. On-Site Location: AFAP Active Fly Ash Pile; SF South Field
2. Sample Type: Bulk Bulk Sample
3. Test Type: UU_{r85} Unconsolidated, Undrained Triaxial Compression, ASTM D 2850, remolded specimen with 85 percent relative compaction at or near optimum moisture content
4. Data Source: PO 154 Flyash Piles and South Field Waste Units Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, February, 1996.

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000132

parameters from consolidated, undrained tests of fly ash. These data are more representative of the drained and undrained strength parameters anticipated of the in-place fly ash material. Appendix F contains the Mohr strength envelopes.

4.4.2 Remolded Consolidated, Undrained (CU) Triaxial Compression Tests

Consolidated, undrained triaxial compression strength tests (with pore pressure measurements) (ASTM D 4767) were performed on remolded test specimens of material from the AFAP, IFAP and SF investigation. For each test, three specimens were tested under varying confining pressures to determine the effective and total shear strength parameters. Where three specimens could not be obtained, a staged test was performed on a single specimen. The test specimens were remolded at the laboratory to minimum target dry densities of 85 percent MDD, at or near OMC. Table 4-6 summarizes the cohesion and friction angles from Mohr circle constructions. Appendix F contains the Mohr strength envelopes.

4.5 Remolded Laboratory Permeability Tests

Two-stage laboratory permeability tests (ASTM D 5084) were performed on remolded test specimens of materials from the AFAP,IFAP and SF investigation. The test specimens were remolded at the laboratory to minimum target dry densities of 97 percent of the Standard Proctor maximum dry density, at or near 4 percent wet of optimum moisture content. The permeability test of the same test specimen was performed in two stages. In the first stage, an unconsolidated specimen was confined at 2 psi and permeability measurements taken. Upon completion of the first stage test, a second stage test of the consolidated specimen an effective confining pressure of 5 psi was performed. Table 4-7 summarizes the results of the two-stage remolded laboratory permeability tests.

Table 4-6 - Summary of Mohr Circle Constructions from Consolidated, Undrained Triaxial Compression Tests, Remolded Specimens

On-Site Location	Boring No.	Sample No.	Sample Type	Top Depth (feet)	Bottom Depth (feet)	General Stratum	USCS Group Name	USCS Group Symbol	Compaction Method	Opt. Moisture Content (%)	Maximum Dry Density (pcf)	Type Test	Average Pre-Test Moisture (%)	Average Pre-Test Dry Density (pcf)	Effective Cohesion (psf)	Effective Friction Angle (degrees)	Total Cohesion (psf)	Total Friction Angle (degrees)	Data Source
IFAP	G2-SB-91	410000	Bulk	1.5	10.0	Fly Ash	Silty Sand (Ash)	SM	Standard	38.5	65.3	CU_{r85}	29.7	54.8	250	30	550	13	PO 154
IFAP	G2-SB-92	409996	Bulk	1.5	10.0	Fly Ash	Silty Sand (Ash)	SM	Standard	45.2	59.0	CU_{r85}	30.2	49.8	200	30	200	15	PO 154
IFAP	G2-SB-93	409991	Bulk	1.5	7.0	Fill	Lean Clay with Sand	CL	Standard	18.2	100.5	CU_{r85}	18.8	84.9	300	18	350	11	PO 154
SF	G2-SB-97A	409912	Bulk	1.5	10.0	Fill	Sandy Lean Clay	CL	Standard	12.9	121.0	CU_{r85}	12.7	103.4	0	25	0	15	PO 154
SF/SFBA	G2-SB-99	409923	Bulk	1.5	5.0	Fill	Lean Clay with Gravel	CL	Standard	17.5	110.8	CU_{r85}	17.4	94.2	0	26	0	15	PO 154

Notes:

1. On-Site Location: IFAP Inactive Fly Ash Pile; SF South Field; SF/SFBA South Field (Waste Unit) / South Field Borrow Area
2. Sample Type: Bulk — Bulk Sample
3. Compaction Method: Standard — Standard Proctor Compactive Effort (ASTM D 698)
4. Type Test: CU_{r85} — Triaxial Shear, Consolidated, Undrained with Pore Pressure Measurements (ASTM D 4767), 85 percent relative compaction at moisture content at or near optimum in accordance with ASTM D 698
5. Data Source: PO 154 — Flyash Piles and South Field Waste Units Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, February, 1996.

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000134

Table 4-7 - Summary of Laboratory Permeability Tests, Remolded Specimens

On-Site Location	Boring No.	Sample No.	Sample Type	Top Depth (feet)	Bottom Depth (feet)	General Stratum	USCS Group Name	USCS Group Symbol	Opt. Moisture Content (%)	Maximum Dry Density (pcf)	Test Type	Confining Pressure (psf)	Compaction Method	Target Remold Conditions	Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)	Data Source
SF/SFBA	G2-SB-95	409898	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	14.3	118.2	P_r	288	Standard	Note 5	17.9	114.2	4	97	4.2E-08	PO 154
SF/SFBA	G2-SB-95	409898	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	-	-	P_r	720	Standard	Note 5	-	-	-	-	3.0E-08	PO 154
SF/SFBA	G2-SB-96	409903	Bulk	1.5	5.0	Fill	Lean Clay	CL	16.3	115.2	P_r	288	Standard	Note 5	18.7	110.8	2	96	2.0E-08	PO 154
SF/SFBA	G2-SB-96	409903	Bulk	1.5	5.0	Fill	Lean Clay	CL	-	-	P_r	720	Standard	Note 5	-	-	-	-	1.4E-08	PO 154
SF/SFBA	G2-SB-96	409904	Bulk	5.0	10.0	Fill	Lean Clay	CL	12.8	122.8	P_r	288	Standard	Note 5	16.2	120.0	3	98	3.3E-08	PO 154
SF/SFBA	G2-SB-96	409904	Bulk	5.0	10.0	Fill	Lean Clay	CL	-	-	P_r	720	Standard	Note 5	-	-	-	-	2.7E-08	PO 154
SF/SFBA	G2-SB-98	409908	Bulk	1.5	10.0	Stratified Glacial Deposits	Lean Clay	CL	15.8	115.8	P_r	288	Standard	Note 5	19.5	112.2	4	97	2.8E-08	PO 154
SF/SFBA	G2-SB-98	409908	Bulk	1.5	10.0	Stratified Glacial Deposits	Lean Clay	CL	-	-	P_r	720	Standard	Note 5	-	-	-	-	2.1E-08	PO 154
SF/SFBA	G2-SB-99	409924	Bulk	5.0	10.0	Stratified Glacial Deposits	Lean Clay	CL	16.0	115.0	P_r	288	Standard	Note 5	19.5	110.7	3	96	2.3E-08	PO 154
SF/SFBA	G2-SB-99	409924	Bulk	5.0	10.0	Stratified Glacial Deposits	Lean Clay	CL	-	-	P_r	720	Standard	Note 5	-	-	-	-	1.8E-08	PO 154
SF	G2-SB-101	409930	Bulk	1.5	10.0	Brown Till	Lean Clay	CL	16.0	114.0	P_r	288	Standard	Note 5	18.5	111.4	2	98	2.4E-08	PO 154
SF	G2-SB-101	409930	Bulk	1.5	10.0	Brown Till	Lean Clay	CL	-	-	P_r	720	Standard	Note 5	-	-	-	-	3.1E-08	PO 154
SF	G2-SB-102	409934	Bulk	1.5	10.0	Fill	Clayey Gravel with Sand	GC	12.5	121.9	P_r	288	Standard	Note 5	15.8	117.5	3	96	5.3E-08	PO 154
SF	G2-SB-102	409934	Bulk	1.5	10.0	Fill	Clayey Gravel with Sand	GC	-	-	P_r	720	Standard	Note 5	-	-	-	-	4.1E-08	PO 154
AFAP	G2-SB-104	409804	Bulk	1.5	10.0	Fly Ash	Silty Sand (Ash)	SM	28.8	63.0	P_r	288	Standard	Note 5	27.0	59.5	-2	94	4.9E-04	PO 154
AFAP	G2-SB-104	409804	Bulk	1.5	10.0	Fly Ash	Silty Sand (Ash)	SM	-	-	P_r	720	Standard	Note 5	-	-	-	-	4.7E-04	PO 154
SF	G2-161	410226	SS	12.5	14.5	Gray Till	Sandy Lean Clay	CL	(7) 11.3	(7) 125.0	P_r	288	Standard	Note 5	14.4	122.7	3	98	3.8E-08	PO 154
SF	G2-161	410226	SS	12.5	14.5	Gray Till	Sandy Lean Clay	CL	-	-	P_r	720	Standard	Note 5	-	-	-	-	2.8E-08	PO 154
SF	G2-163	410320	ST	15.0	17.0	Gray Till	Sandy Silty Clay	CL-ML	(7) 11.3	(7) 125.0	P_r	288	Standard	Note 5	14.7	122.1	3	98	2.5E-07	PO 154
SF	G2-163	410320	ST	15.0	17.0	Gray Till	Sandy Silty Clay	CL-ML	-	-	P_r	720	Standard	Note 5	-	-	-	-	2.3E-07	PO 154
SF/SFBA	G2-164	410302	ST	10.0	12.0	Stratified Glacial Deposits	Lean Clay	CL	(7) 11.3	(7) 125.0	P_r	288	Standard	Note 5	15.1	120.2	4	96	7.6E-08	PO 154
SF/SFBA	G2-164	410302	ST	10.0	12.0	Stratified Glacial Deposits	Lean Clay	CL	-	-	P_r	720	Standard	Note 5	-	-	-	-	4.8E-08	PO 154
SF	G2-166	410186	ST	10.0	11.5	Brown Till	Lean Clay	CL	(7) 11.3	(7) 125.0	P_r	288	Standard	Note 5	16.2	119.4	5	96	7.4E-08	PO 154
SF	G2-166	410186	ST	10.0	11.5	Brown Till	Lean Clay	CL	-	-	P_r	720	Standard	Note 5	-	-	-	-	8.5E-08	PO 154
SF	G2-166	410190	SS	17.5	19.5	Gray Till	Sandy Lean Clay	CL	(7) 11.3	(7) 125.0	P_r	288	Standard	Note 5	14.9	120.2	4	96	2.6E-08	PO 154
SF	G2-166	410190	SS	17.5	19.5	Gray Till	Sandy Lean Clay	CL	-	-	P_r	720	Standard	Note 5	-	-	-	-	2.4E-08	PO 154
SF/SFBA	G2-167	410329	ST	7.5	9.5	Stratified Glacial Deposits	Lean Clay	CL	(7) 12.6	(7) 123.0	P_r	288	Standard	Note 5	16.0	117.7	3	96	3.0E-08	PO 154
SF/SFBA	G2-167	410329	ST	7.5	9.5	Stratified Glacial Deposits	Lean Clay	CL	-	-	P_r	720	Standard	Note 5	-	-	-	-	2.4E-08	PO 154
SF	G2-168	410344	ST	10.0	12.0	Stratified Glacial Deposits	Sandy Silty Clay	CL-ML	(7) 11.3	(7) 125.0	P_r	288	Standard	Note 5	14.7	121.8	3	97	3.7E-08	PO 154
SF	G2-168	410344	ST	10.0	12.0	Stratified Glacial Deposits	Sandy Silty Clay	CL-ML	-	-	P_r	720	Standard	Note 5	-	-	-	-	2.9E-08	PO 154
SF	G2-169	410356	ST	7.5	9.5	Stratified Glacial Deposits	Lean Clay	CL	(7) 12.6	(7) 123.0	P_r	288	Standard	Note 5	15.7	118.0	3	96	8.1E-08	PO 154
SF	G2-169	410356	ST	7.5	9.5	Stratified Glacial Deposits	Lean Clay	CL	-	-	P_r	720	Standard	Note 5	-	-	-	-	5.4E-08	PO 154
AFAP	G2-170	410106	ST	15.0	17.0	Brown Till	Lean Clay with Sand	CL	(7) 12.6	(7) 123.0	P_r	288	Standard	Note 5	15.9	118.4	3	96	1.5E-08	PO 154
AFAP	G2-170	410106	ST	15.0	17.0	Brown Till	Lean Clay with Sand	CL	-	-	P_r	720	Standard	Note 5	-	-	-	-	1.3E-08	PO 154
AFAP	G2-171	410120	ST	25.0	27.0	Brown Till	Sandy Lean Clay	CL	(7) 12.6	(7) 123.0	P_r	288	Standard	Note 5	15.5	117.5	3	95	3.6E-07	PO 154
AFAP	G2-171	410120	ST	25.0	27.0	Brown Till	Sandy Lean Clay	CL	-	-	P_r	720	Standard	Note 5	-	-	-	-	2.7E-07	PO 154

Notes:

1. On-Site Location: AFAP Active Fly Ash Pile; SF South Field; SF/SFBA South Field (Waste Unit) / South Field Borrow Area
2. Sample Type: Bulk Bulk Sample; SS Split Spoon Sample; ST Shelby Tube Sample
3. Compaction Method: Standard Standard Proctor Compactive Effort (ASTM D 698)
4. Test Type: P_r Two-stage, Triaxial, Remolded, Back-Pressure Permeability (ASTM D 5084)
5. Target Remold Conditions: 97% relative compaction at +4% wet of optimum moisture content
6. Formulas: Relative Compaction = (Pretest Dry Density/Maximum Dry Density) x 100%
7. Assumed values for optimum moisture content and maximum dry density based on PO 132 soils compaction data.
8. Average permeability is the average of the last four determinations from the test.
9. Data Source: PO 154 Flyash Piles and South Field Waste Units Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, February, 1996.

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000135

SECTION 5

EVALUATION, ANALYSES, AND RECOMMENDATIONS

This section describes the engineering evaluations and analyses performed to support preliminary design recommendations for excavation and site restoration of the AFAP, IFAP and SF waste units. The evaluations and analyses are based on site-specific data from the geotechnical investigations described previously, and on supplemental technical data and methodologies, as required, from engineering literature. Also included are PARSONS' recommendations regarding specific preliminary geotechnical and civil engineering design aspects of the proposed AFAP, IFAP, and SF waste unit remediation tasked by FERMCO under PO-154 (PARSONS 1995a). These design recommendations are general in nature with the actual design and construction details defined during remedial design.

The recommendations in this report are based on soil data at test boring locations which are assumed to be representative of the AFAP/IFAP/SF site. However, the actual area of the test borings is small and finite in relation to the area of the site, and the soils encountered may not necessarily be typical for the entire site.

5.1 Excavation Operations

This subsection describes the recommended general approach for excavation operations at the IFAP/SF (combined) and AFAP waste units. Initially, stormwater and erosion controls are established. Excavation of the IFAP/SF site will likely use a phased approach which starts by excavating materials with levels above the Waste Acceptance Criteria (WAC) for the OSDF, and then excavating northward to create a "clean" area from which to base further construction operations. The excavation then proceeds generally from north to south in the direction of natural drainage. The AFAP will be excavated in a safe manner that minimizes spread of contamination and generation of dust. The excavation phasing plan will be modified if the excavation contractor submits an acceptable alternative plan. Additionally, suggested equipment, and handling of debris and rubble are discussed.

5.1.1 Stormwater/Erosion Controls

The excavations will be phased and controlled to divert stormwater runon. Runoff will be controlled to collect and treat stormwater contacting impacted soils. Erosion and sediment controls will be consistent with soil conservation service (SCS) guidelines.

5.1.2 Waste Excavation Approach

This subsection describes the recommended general approach for excavation of waste materials at the IFAP/SF and AFAP sites.

Inactive Fly Ash Pile/South Field

The first phase of the excavation in IFAP/SF will be the removal of materials with radiation levels above the WAC for the OSDF delineated during the Remedial Investigation. A backhoe, or other suitable equipment, will be used to excavate the materials with radiation levels above the WAC for the OSDF to the limits necessary, and then the material will be transferred to Operable Unit 1 for disposition off site. Existing vegetative cover should be left in place until just prior to waste excavation to minimize denuded areas and sediment load. Then the material should be stripped and stockpiled. The stripping process should proceed just ahead of the waste removal operations.

The second phase excavation would start from the areas where materials with radiation levels above the WAC for the OSDF have been excavated and expand deeper until the bottom limits of waste removal are reached as determined by the final remediation levels established by the OU-2 Feasibility Study. It would then proceed north until it "daylights" on clean material. This would provide a clean staging area from which to base the remainder of the waste removal.

The next phase of waste removal will proceed generally from north to south in the direction of natural drainage. This allows the clean side to be segregated from the dirty side by use of temporary berms and ditches thus limiting the amount of contaminated water to be collected and treated. Water sprays or crusting agents should be used on the working face of the excavation for dust control especially on ash materials. Only that amount of working face that can be worked during the day should be exposed at a given time. Inactive areas should be covered with plastic sheeting or erosion matting to minimize dust emissions and sediment. Current plans are for an undisturbed berm of impacted soil to be left along the south and southwest boundaries until all of the impacted soil has been removed. The final berm will be carefully removed to control runoff of impacted stormwater. Perched groundwater conditions and seepage into excavation are anticipated, but not expected to be severe if normal sump and pump controls are used and areas are kept from saturated conditions. Excavation plans should consider the final disposition of the weighted rock fill berm along Paddys Run at the toe of the IFAP.

Active Fly Ash Pile

The AFAP has steep slopes, at the material's natural repose angle, on the southern edge of the pile. As such, the pile will be excavated in a safe manner than minimizes spread of contamination and generation of dust. This excavation method chosen should allow for a uniform and stable approach to fugitive dust control. The same general philosophy for drainage, run-off controls and excavation mentioned previously

applies for the AFAP. Groundwater and seepage is not expected to be severe, if normal sump and pump controls are used and areas are kept from saturated conditions.

5.1.3 Construction Debris and Rubble

Various construction debris, such as concrete, re-bar etc. are expected to be encountered during the waste removal. These material should be segregated and later size reduced, if required, for easier placement in the OSDF. While placing of rubble or other debris, measures should be taken to protect the integrity the critical components of the low permeability liner and cover (i.e., flexible membrane liners, compacted clay barriers, etc.). Minimizing the void space within the rubble should be considered during placement of large quantities of bulky rubble. This minimizes the potential for settlement of the fill while maximizing use of available space within the OSDF. The ash material could potentially be used to fill these voids.

5.1.4 Organic Materials

Minimizing the amount of organic materials placed in the OSDF is important to limit potential settlement of the cover. Fine hair roots of grass and tree roots less than 1/4-inch in diameter are not normally considered detrimental to justifying wasting structural fill material (USBR 1974).

5.2 Geotechnical Parameters

This subsection summarizes the geotechnical parameters of the various materials investigated at the AFAP, IFAP and SF waste units. The geotechnical parameters summarized in this section come from geotechnical test data presented in Section 2 (prior testing) and Section 4 (PO-154 testing). The AFAP and IFAP ash material, described in DOE 1995b to be composed of bottom ash and fly ash, has engineering properties generally within the range typical of a Class F fly ash (as described in "The Typical Engineering Properties of Fly Ash" [McLaren and DiGioia 1987]). Class F fly ash is produced by burning bituminous or anthracite coal, and is principally produced in the eastern United States. It has pozzolanic properties but is not appreciably self-cementing (McLaren and DiGioia 1987). Values for the typical engineering properties of Class F fly ash are described in a paper by McLaren and DiGioia (Appendix G); they include specific gravity, grain size distribution, compaction behavior, shear strength and compressibility.

5.2.1 Index Properties

Table 5-1 summarizes the index properties of the various materials tested from the AFAP, IFAP, and SF. Using the Unified Soil Classification System (USCS) criteria, which are dependent on grain size, the ash materials from the AFAP and IFAP classify as predominantly Silty Sand (SM). In general, the ash

material tested from the AFAP and IFAP is coarser than typical Class F fly ash which is a relatively fine, uniform material. Sampling ash from stockpiled fills can result in samples that are substantially more coarse than typical Class F fly ash (See Appendix G, Table 1). This situation usually results from bottom ash being mixed with fly ash (McLaren and DiGioia 1987). Analysis of IFAP and AFAP grain size data strongly supports this observation.

The ash in both the AFAP and IFAP show a wide range of moisture contents (16 to 52 percent), which is much higher than moisture contents typical of earthen silty sand or silt materials. The variability of the moisture contents suggests that some conditioning of ash materials may be advantageous to lower the moisture content of very wet ash materials encountered to improve handling and placement in the disposal facility. Additionally, for relatively dry ash materials sufficient water should be added to moisten it so that it can be handled and placed like soil.

The brown and gray till have index properties characteristic of earthen soils and significant difficulties in excavating, handling and placing materials are not anticipated. The contractor may experience zones of wet material due to perched groundwater within the till.

The stratified glacial deposits commonly contained areas of highly plastic fat clay (CH). Excavation of these materials is not expected to be difficult. Some sticking of excavated materials to equipment when excavating this clay can be expected, although it is not anticipated that this will affect excavation. Additionally, the contractor may experience wet zones or seepage into the excavation resulting from perched water in the sand and silt layers of the stratified glacial deposits.

Laboratory-tested earthen fill materials generally classified as lean to fat clays with varying amounts of gravel, or clayey gravel. Difficulties handling these types of earthen materials are not anticipated. However, they may be wet and require some special handling, especially in areas with porous debris and rubble mixtures.

Table 5-1 - Summary of Index Properties of AFAP, IFAP and SF Materials

On-Site Location	General Stratum	USCS Symbols of Materials Tested	Natural Moisture Content (% dry wgt.)		Gravel (%)		Sand (%)		Silt and Clay (%)		Clay (0.002mm)		Specific Gravity		Liquid Limit	Plasticity Index
			avg.	range	avg.	range	avg.	range	avg.	range	avg.	range	avg.	range	range	range
AFAP	Fly Ash	SM, ML, CL[1]	34	24-52	5	1-13	53	20-71	44	28-80	5	0-26	2.28	2.19-2.63	NP-43[1]	NP-18[1]
	Brown Till	CL, CL-ML	18	10-30	5	0-13	27	9-52	69	41-91	14	1-29	2.57[2]	2.23[1]-2.76	1-26	1-12
	Gray Till	CL-ML	12	-	3	-	29	-	68	-	15	-	2.76	-	20	6
	Stratified Glacial Deposits	(CL)[12]	18	-	-	-	-	-	-	-	-	-	-	-	-	-
IFAP	Fly Ash	SM, ML	31	16-48	10	2-29	54	43-63	37	24-54	2	0-5	2.22	2.11-2.42	NP	NP
	Brown Till	CL, GM, SM	17	10-23	11	1-45	38	30-66	52	23-64	14	2-21	2.67	2.27-2.81	NP-36[3]	NP-18[3]
	Gray Till	ML	21	-	13	-	36	-	51	-	1	-	2.74	-	NP	NP
	Fill	CL	16	13-18	5	3-7	33	26-39	64	55-71	20	17-23	2.67	2.58-2.76	27-41	14-19
SF	Brown Till	CL	19	12-25	7	0-21	21	2-38	72	47-97	13	2-38	2.73	2.69-2.77	NP-40[4]	NP-23[4]
	Gray Till	CL, CL-ML, ML, SC-SM	11	3-15	6	1-13	39	16-81	56	15-82	14	1-21	2.73	2.68-2.79	NP-31[5]	NP-15[5]
	Stratified Glacial Deposits	CL, CH, CL-ML, ML, SM	19	11-26	2	0-13	18	1-63	81	37-99	22	3-48	2.75	2.67-2.81	NP-58[6]	NP-38[6]
	Fill	CL, GC, (CH)[13]	18	10-28	14	1-35	19	9-31	67	44-89	24	14-44	2.71	2.66-2.75	27-57	12-29
AFAP, IFAP, and SF	Fly Ash	SM, ML, CL[1]	32	16-52	8	1-29	54	20-71	40	24-80	3	0-26	2.24	2.11-2.63	NP-43[1,7]	NP-18[1,7]

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Table 5-1 - Summary of Index Properties of AFAP, IFAP and SF Materials (Continued)

On-Site Location	General Stratum	USCS Symbols of Materials Tested	Natural Moisture Content (% dry wgt.)		Gravel (%)		Sand (%)		Silt and Clay (%)		Clay (0.002mm)		Specific Gravity		Liquid Limit	Plasticity Index
AFAP, IFAP, and SF	Brown Till	CL, CL-ML, GM, SM	18	10-30	8	0-45	26	2-66	67	23-97	13	1-38	2.68	2.23[2]-2.81	NP-40[7]	NP-23[7]
	Gray Till	CL, CL-ML, ML, SC-SM	11	3-21	7	2-14	38	16-81	57	15-82	13	1-21	2.74	2.68-2.79	NP-31[9]	NP-15[9]
	Stratified Glacial Deposits	CL, CH, CL-ML, ML, SM	20	11-26	2	0-13	18	1-63	81	37-99	23	3-48	2.75	2.67-2.81	NP-58[10]	NP-38[10]
	Fill	CL, GC, (CH)[13]	18	10-28	13	1-35	21	9-39	66	44-89	23	14-44	2.71	2.58-2.76	27-57	12-29
	GMA[11]	GW-GM, SW-SM, SP-SM, SM	6	3-10	14	0-49	76	43-94	11	6-17	1	0-2	2.77	2.73-2.99	NP	NP

Notes:

(1) CL material is actually clay/ash mixture at fly ash/brown till interface. Ash in AFAP fly ash general stratum is typically non-plastic (NP). 5 of 7 plasticity tests in the AFAP fly ash general stratum were NP

(2) Low average, and wide range of specific gravities due to testing of fly ash/clay mixtures at AFAP fly ash/brown till interface.

(3) 2 of 7 plasticity tests from the IFAP brown till general stratum were NP

(4) 1 of 17 plasticity tests from the SF brown till general stratum were NP

(5) 1 of 10 plasticity tests from the SF gray till general stratum were NP

(6) 2 of 16 plasticity tests from the SF stratified glacial deposits general stratum were NP

(7) 23 of 25 plasticity tests from the flyash general stratum were NP

(8) 3 of 29 plasticity tests from the brown till general stratum were NP

(9) 2 of 12 plasticity tests from the gray till general stratum were NP

(10) 2 of 16 plasticity tests from the stratified glacial deposits general stratum were NP

(11) Unsaturated sands and gravels of the GMA

(12) Visual classification

(13) Classification based on plasticity tests results

(14) Ash (SM,ML) Grain Diameter Data:

	Average Grain Size in Millimeters
D15	0.01
D50	0.22
D85	2.8

(15) See tables 2-1 and 4-1 for a summary of individual test results

5.2.2 In Place Density

Table 5-2 provides general in place density parameters for the various materials in the AFAP, IFAP and SF waste units. The specific gravity of the ash (see Table 5-1) is less than most earthen soils, which typically range from about 2.6 to 2.8. Therefore ash fills tend to be less dense than those constructed of natural soils.

Table 5-2 - In Place Wet and Dry Density Parameters

On-Site Location	Material	Dry Density (pcf)		Wet Density (pcf)	
		avg.	range	avg.	range
AFAP	Ash(1)	56	48-66	66	51-79
IFAP	Ash	46	40-53	60	51-76
AFAP and IFAP	Ash(1)	51	40-66	63	51-79
IFAP and SF	Brown Till	112	96-125	131	122-139
IFAP and SF	Gray Till	120	106-129	138	128-144

Notes:
(1) Excludes wet density = 127.3 pcf from Boring 1980, 11-13 feet (#112143). This sample had characteristic density of an ash/soil mixture
(2) See Table 2-2 for summary of individual density measurements

5.2.3 Organic Content of Topsoil

Table 5-3 summarizes the organic content parameters for the top 1.5 feet of material at the AFAP, IFAP and SF waste units. The slightly higher organic contents at the AFAP relative to the SF may be attributed to the nature of these "top soils". The AFAP generally has black coal ash at the ground surface, whereas the SF has topsoil with the typical organic matter associated with topsoil.

Table 5-3 - Total Organic Content Parameters for Top Soils at AFAP, IFAP and SF

On-Site Location	Top Soil Depth Interval (feet)	Natural Moisture Content (% dry wgt.)		Total Organic Content (% dry wgt.)	
		avg.	range	avg.	range
AFAP	0 - 0.5	12.8	11.8-13.7	6.8	5.8-7.7
	0.5 - 1.0	19.2	17.9-20.5	8.9	7.8-9.9
	1.0 - 1.5	23.0	22.1-23.8	7.6	7.0-8.1
IFAP	0 - 0.5	16.4	7.8-24.5	3.1	1.2-5.4
	0.5 - 1.0	20.2	15.6-25.0	5.5	2.0-8.1
	1.0 - 1.5	26.6	19.4-31.9	5.4	1.6-9.1
SF	0 - 0.5	17.1	9.8-25.7	3.8	2.1-5.4
	0.5 - 1.0	13.6	6.5-25.5	2.4	1.3-4.6
	1.0 - 1.5	13.7	7.6-26.0	2.2	1.2-3.8
AFAP, IFAP, and SF	0 - 0.5	16.3	7.8-25.7	4.0	1.2-7.7
	0.5 - 1.0	16.3	6.5-25.5	4.2	1.3-9.9
	1.0 - 1.5	18.7	7.6-31.9	3.9	1.2-9.1

Notes: (1) See Table 4-3 for summary of individual test results

5.2.4 Compaction Characteristics

Table 5-4 provides general compaction parameters for the various materials tested at the AFAP, IFAP and SF waste Units. The average values for ash were: MDD of 64 pcf, and OMC of 36 percent. Additionally, there was a relatively wide range of optimum moisture contents (28 to 46 percent) when compared to the results of the other earthen soils tested. From review of compaction curves for ash, contained in Appendix D, it can be seen that the curves are very "flat" when compared to typical cohesive earthen soils (such as clays), suggesting that the material may be characteristically free draining. The flatness of the compaction curves demonstrates the wide range of OMCs reported, but also shows that the ash material can be compacted to near its MDD over a fairly wide range of water content. It also

suggests that other considerations such as handling and workability may have a greater priority than incremental increases in density when selecting moisture-density criteria for placement of ash. From comparison of the natural water content of the ash versus the optimum moisture content, it appears that the moisture contents of in-place ash are conducive to placement at optimum density conditions with minimal conditioning. Additionally, from Table 5-3 the average dry density of ash from the AFAP and IFAP is about 51 pcf. This suggests that the in place ash in the existing piles is at about 80 percent relative compaction based on Standard Proctor. Based on these in place densities, it is anticipated that the materials can be placed at 85 percent relative compaction with reasonable effort.

Comparing the natural water contents to optimum water content for the earthen fill materials, suggests that these materials may require moisture conditioning to reduce the water content for placement at optimum densities.

Table 5-4 - Standard Proctor Compaction Test Parameters for Materials from the AFAP, IFAP and SF

On-Site Location	General Stratum	USCS Symbols of Materials Tested	Natural Water Content (% dry wgt.)		Optimum Moisture Content (% dry wgt.)		Maximum Dry Density (pcf)	
			avg.	range	avg.	range	avg.	range
AFAP and IFAP	Fly Ash	SM (Ash)	32	16-51	36	28-46	64	59-72
SF	Brown Till	CL	18	10-30	15	14-16	116	114-119
SF	Stratified Glacial Deposits	CL	20	11-26	16	15-16	116	115-116
IFAP and SF	Fill	CL, GC	18	10-28	15	12-19	116	100-123

Notes:

(1) The natural water contents shown are from Table 5-1 for the "AFAP, IFAP and SF" data group

(2) See Table 4-3 for a summary of Standard Proctor Compaction test results for the individual bulk samples tested

5.2.5 Strength Parameters

This subsection provides as summary of strength parameters for in place and remolded materials from the AFAP, IFAP and SF waste units.

In-place Strength Parameters

Table 5-5 lists in place strength parameters for ash, brown till clay, and brown till silty sand. These values come from evaluation of test data from prior RI and PO-90 geotechnical investigations in the southern waste units area.

Table 5-5 - Range and Typical Values of Strength Parameters for In Place AFAP, IFAP and SF Materials

General Stratum and Soil Type (USCS Symbol)	Effective Stress Parameters				Total Stress Parameters			
	Friction Angle (degrees)		Cohesion (psf)		Friction Angle (degrees)		Cohesion (psf)	
	range	typical value	range	typical value	range	typical value	range	typical value
Fly Ash (SM [Ash], ML [Ash])	26-42	39	0-420	0	17-21	19	0	0
Brown Till (CL)	32-37	32	100-500	100	23-28	23	50-150	50
Brown Till (SM)	37	37	0	0	16	16	0	0
Notes: (1) See Table 2-2 for a summary of strength test results for individual undisturbed samples								

Remolded Strength Parameters

Table 5-6 lists remolded strength parameters for ash and earthen fill (CL). These values come from evaluation of test data from the PO-154 geotechnical investigation in the southern waste units area. The values shown are for materials remolded to 85 percent relative compaction at OMC based on Standard Proctor Compactive Effort (ASTM D 698).

Table 5-6 - Range and Typical Values of Strength Parameters for Remolded AFAP, IFAP and SF Materials

General Stratum and Soil Type (USCS Symbol)	Consolidated Conditions								Unconsolidated Conditions	
	Effective Stress Parameters (Drained Conditions)				Total Stress Parameters (Undrained Conditions)				Undrained Conditions	
	Friction Angle (degrees)		Cohesion (psf)		Friction Angle (degrees)		Cohesion (psf)		Undrained Shear Strength (psf)	
	range	typical value	range	typical value	range	typical value	range	typical value	range	typical value
Fly Ash (SM [Ash])	30	30	200-250	200	13-15	14	200-550	200	237	237
Fill (CL)	18-26	25	0-300	0	11-15	15	0-350	0	300-375	325

Notes:
(1) Values shown are for materials remolded to 85 percent relative compaction at OMC based on Standard Proctor Compactive Effort (ASTM D 698)
(2) See Tables 4-6 and 4-7 for a summary of remolded strength test results

5.2.6 Remolded Consolidation Parameters

Table 5-7 lists consolidation parameters for remolded materials from the AFAP, IFAP and SF waste units. These values come from evaluation of consolidation test data from the PO-154 geotechnical investigation in the Southern Waste Unit. The values shown are for materials remolded to 85 percent relative compaction at OMC based on Standard Proctor Compactive Effort (ASTM D 698). These parameters can be used by the design contractor to estimate potential settlement of waste fill placed and compacted in the OSDF.

Table 5-7 - Consolidation Parameters for Remolded AFAP, IFAP and SF Materials

On-Site Location	General Stratum	USCS Symbols of Materials Tested	Pre-Test Wet Density (pcf)		Initial Void Ratio (e_o)		Compression Index (c_c)		Recompression Index (c_r)		Coefficient of Consolidation at t_{90} (c_v) [sq. in/min] Loading							
											0.8 tsf		1.6 tsf		3.2 tsf		6.4 tsf	
			avg.	range	avg.	range	avg.	range	avg.	range	avg.	range	avg.	range	avg.	range	avg.	range
AFAP and IFAP	Fly Ash	SM	67	61-79	1.66	1.29-1.84	0.283	0.108-0.480	0.039	0.008-0.108	0.150	0.072-0.505	0.257	0.072-1.454	0.275	0.043-1.76	0.185	0.066-0.754
IFAP	Brown Till	CL	115	-	0.70	-	0.125	-	0.021	-	0.051	-	0.043	-	0.039	-	0.022	-
SF	Stratified Glacial Deposits	CL	117	-	0.61	-	0.179	-	0.014	-	-	-	0.143	-	0.141	-	0.123	-
IFAP and SF	Fill	CL	113	100-118	0.70	0.61-0.89	0.197	0.164-0.243	0.028	0.020-0.035	0.129	0.057-0.154	0.126	0.078-0.159	0.120	0.061-0.259	0.088	0.043-0.239

Notes:
(1) Values shown are for materials remolded to 85 percent relative compaction at OMC based on Standard Proctor Compactive Effort (ASTM D 698)
(2) See Table 4-4 for a summary of remolded consolidation test results
(3) t_{90} is time to 90 percent consolidation

000148

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5.3 Temporary Slope Stability

Slope stability of temporary slopes in different materials that will be encountered during the OU-2 Southern Waste Unit excavation was investigated. The temporary slopes referred to in these slope stability analyses are those that would be left in place or constructed by the excavation contractor for short periods as excavation progresses, and are not necessarily the working or active face of the excavation. The temporary slopes will result from the excavation of the OU-2 Southern Waste Unit materials for placement in the OSDF.

5.3.1 Methodology

Slope stability of temporary slopes was analyzed in the following general types of material:

1) Fly ash
2) Fill
3) Brown till
4) Gray till
5) Great Miami Aquifer
6) Stratified glacial deposits

The cohesive materials (fill, brown till, and gray till) were analyzed using an undrained analysis ($\phi=0°$), which is consistent with recommendations made in Bishop and Bjerrum 1960 for temporary excavated slopes and is valid since the cohesive soils at the FEMP commonly have degrees of saturation near 100% and have low permeability. In addition, perched water was encountered in the brown and gray tills in the OU-2 Southern Waste Unit. Several of the boring logs from the South Field and Inactive Fly Ash Pile indicated that perched water was present in the brown till deposits between 10 and 12 feet below the ground surface. The gray till deposits were also described as wet. As a result, the brown till section analyzed for slope stability had a water table placed at 10 feet below the top of the slope; and the gray till section had a water table that extended from the bottom of the slope, up the face of the slope, and along the top of the slope.

Soil Parameters

Undrained in situ strength was measured on one gray till sample taken during the PO-154 Borrow Area investigation (PARSONS 1996); as a result, undrained cohesion (c_u) and unit weight values from PARSONS 1995b and 1995c Unconsolidated-Undrained (UU) triaxial compression tests were used for additional shear strength values. The c_u values for the brown till and gray till were chosen from the PARSONS 1995b and 1995c samples that had similar index properties as the soil samples tested during

PO-154 and one test from PARSONS 1996. Unit weight values were assumed equal to average values presented in Table 5-2. The fill was assumed to have c_u values equivalent to values reported in PARSONS 1995c corresponding to samples having similar index properties and remolded to 95% MDD according to standard proctor.

The noncohesive materials (fly ash and GMA sands) were analyzed using drained (effective) shear strength parameters due to their general free-draining nature. The shear strength and unit weight values of the fly ash materials were estimated from Consolidated-Undrained (CU) triaxial compression test results reported in PARSONS 1993. The shear strength and unit weight values of the GMA sands were assumed to be equivalent to the values used in the slope stability calculation of the OSDF reported in PARSONS 1995c. Table 5-8 summarizes the shear strength values and unit weights used during OU-2 southern waste unit analyses.

The stratified glacial deposits section consisted of alternating layers of lean clay, silt, sand, and fat clay. The shear strength values and unit weights used for the fat and lean clay were from UU triaxial compression tests from PARSONS 1995c. The shear strength and unit weight values of the silt was from CU triaxial compression tests reported in PARSONS 1995c. The shear strength parameters used were the total strength parameters. The shear strength values and unit weights of the poorly graded sands were typical values reported in Holtz and Kovacs 1981. The well graded sand shear strength and unit weight values were assumed to be equal to the values used for the GMA in PARSONS 1995c. Table 5-9 summarizes the shear strength and unit weight values used in the stratified glacial deposits sections, which was assumed to be equivalent to the stratigraphy encountered in borings G2-168 and G2-169.

Factor of Safety

For the slope stability analyses, slope configurations that produced Factors of Safety (FOS) greater than 1.2 against slope failure were considered acceptable. Slopes steeper than 1H:1V and flatter than 4H:1V were not analyzed. The heights of the slopes varied between 10 and 20 feet. The height of the slopes depended on the encountered thicknesses of the soil strata in the field, estimated excavation depths into the strata, or stability of the slope at a given height.

Simulated Surcharge Load

It was assumed that a tracked excavator would excavate the materials from the surface of the soil unit. As a result, the slope stability analysis included a surcharge at the top of each slope equivalent to the ground contact pressure produced by a Caterpillar 375 tracked excavator. According to the *Caterpillar Performance Handbook* (Caterpillar 1994), the ground contact pressure of the CAT 375 is 2754 psf, and the track length is approximately 20 feet. To simulate this load a 2754 psf load with a width of 20 feet was placed at the top of each slope, 5 feet back from the crest of the slope.

Table 5-8 - Summary of Shear Strength and Unit Weight Values Used for the OU-2 Southern Waste Unit Slope Stability Analyses

Soil Type	Drainage Condition	Unit Weight		Shear Strength	
		Moist (pcf)	Saturated (pcf)	Cohesion (psf)	ϕ (°)
Fly Ash	Drained	75.0	80.0	0	39
Fill	Undrained	126.0	129.8	750	0
Brown Till	Undrained	131.0	134.0	2000	0
Gray Till	Undrained	138.0	138.0	1800	0
GMA	Drained	140.0	150.0	0	33

Table 5-9 - Summary of Shear Strength and Unit Weight Values Used for the Stratified Glacial Deposits Sections

Soil Type	Drainage Condition	Unit Weight		Shear Strength	
		Moist (pcf)	Saturated (pcf)	Cohesion (psf)	ϕ (°)
Silt	Undrained	135.2	138.0	0	25
Lean Clay	Undrained	135.0	138.0	2000	0
Fat Clay	Undrained	127.7	130.0	3500	0
Poorly Graded Sand	Undrained	114.0	117.0	0	28
Well Graded Sand	Drained	140.0	150.0	0	33

5.3.2 Fly Ash

Using the boring logs in the AFAP and IFAP, it was determined that temporary slopes having heights of at least 20 feet would be possible. The maximum height analyzed for temporary slopes in the fly ash materials was 20 feet. The maximum slope that resulted in a FOS of 1.2 or slightly higher was 1.5H:1V.

Steeper slopes may be attainable in the field if the slopes are worked from the toe of the slope. Allowing a narrow face of a slope that is being worked to slough may actually be desirable during excavation if

the excavator works from the toe of the slope. The ash material would simply slough and slide to the toe of the slope where the excavator or a track loader could load dump trucks used for hauling the ash to the OSDF. If this method is used no equipment or personnel should be allowed at the top of the slope during the excavation process. At the end of work each day the face being worked should be cut to a 1.5H:1V slope, and no equipment should be parked near the top of the slope.

If perched water would be encountered in the IFAP or AFAP, flatter slopes may be necessary to counter the effects of the forces created by any seeping water. Since the ash material is generally free draining, any encountered water should seep from the face of the slope until the water source is diminished, at which time the 1.5H:1V slope should be safe.

5.3.3 Fill

According to the boring logs in the South Field and the IFAP, the fill material appears to be clayey in nature mixed with varying amounts of debris. The fill was placed as a non-engineered fill which means the fill was not compacted to any designated relative compaction (if compacted at all) and the moisture and thicknesses of the fill were not controlled. As a result, it difficult to estimate the shear strength characteristics of the fill due to its heterogeneous nature and since in situ samples of the fill were not tested for shear strength.

It was assumed that since the fill had been in place for several years, that considerable consolidation has taken place due to the weight of the overlying fill. Therefore, it was assumed that the fill had strength characteristics similar to on-site lean clays that had been recompacted to approximately 95 percent of maximum dry density according to standard proctor. Values of internal friction and cohesion were taken from test results measured in PARSONS 1995c.

According to the PO-154 boring logs and the RI/FS reports(DOE 1995a and 1995b), the fill varies from a few feet to approximately 27 feet. Therefore, an initial slope height of 20 feet was analyzed. The resulting safe maximum slope with the CAT 375 surcharge was flatter than 4H:1V, which would not provide for efficient excavation. Next the slope height was reduced to 10 feet, which also provided a maximum safe slope of 4H:1V. Due to the extremely flat slopes that were determined safe using the CAT 375 surcharge load, a slope having a height of 10 feet and a surcharge equivalent to a lighter CAT 350 (approximately 2000 psf on 17 feet long tracks) was evaluated. The resulting safe slope was determined to be 1.5H:1V. If it is necessary to use the larger excavator or a similar excavator, then the slopes should be maintained at a maximum slope of 4H:1V with a height of 10 feet, or be worked from the toe of the slope.

Due to the variability of the fill material, it may be determined during excavation that steeper slopes are safe or that flatter slopes are necessary. If no load is applied at the top of the slope, which would be a result of excavating from the toe of the slope, would allow for steeper slopes. Water was not encountered

in borings during the PO-154 geotechnical investigation in the fill strata in the IFAP or South Field areas. However, zones of perched water are anticipated especially in porous zones of rubble. If perched water conditions are encountered, flatter slopes will be necessary to maintain safe slopes.

Upon completion of work each day, the slope face that is being worked should be cut back to a minimum of 1.5H:1V, and all equipment should be moved away from the top of the slope.

5.3.4 Brown and Gray Till

Brown and gray till temporary slopes were analyzed using slope heights of 20 feet. According to the boring logs from the PO-154 geotechnical investigation, the brown till in the OU-2 Southern Waste Unit could possibly be 20 feet thick, while it is doubtful that 20 feet of gray till would be encountered.

According to the slope stability analyses, both the brown and gray till strata could maintain maximum temporary slopes of 1H:1V safely. Due to possible difficulties in distinguishing between fill and brown till, it is suggested that the maximum slope cut in the brown till or fill strata is 1.5H:1V.

At the end of work each day the slope face being worked should be cut to a maximum slope of 1.5H:1V, and all equipment should be moved away from the top of the slope.

5.3.5 Great Miami Aquifer Sand and Gravel

According to contamination contour maps, it does not appear that excavation deeper than about 10 feet in the GMA will be necessary. As a result, the GMA slopes analyzed had heights of 10 feet.

The maximum safe slope from the slope stability analyses was 2H:1V. According to the PO-154 geotechnical investigation and other investigations performed in the OU-2 Southern Waste Unit, the top portion of the GMA is unsaturated. If saturated conditions are encountered during excavation (due to either the water table or an external source) flatter slopes may be necessary to offset the effects of seepage forces from seeping water.

Again, all slopes in the GMA sands and gravels should be cut to a maximum slope of 2H:1V at the end of work each day. In addition all equipment should be moved away from the top of the slope at the end of each work day.

5.3.6 Stratified Glacial Deposits

Borings G2-168 and G2-169 were used for the typical stratified glacial deposits sections. The maximum safe slope calculated was 1H:1V. The section developed from G2-168 produced a slightly lower FOS

than the section developed from G2-169. It is recommended that the slope be kept to a maximum of 1.5H:1V since the stratified glacial deposits could easily be mistaken with the fill (in the absence of debris). From the analyses of the stratified glacial deposits, it appears that the silt is the weakest material in the stratified glacial deposits since many of the failure circles with the lowest FOS values were located in the silt layers.

At the end of work each day, the slope in the stratified glacial deposits should be cut to 1.5H:1V. In addition, all equipment should be moved away from the top of the slope.

5.3.7 Summary

Table 5-10 summarizes the results of the OU-2 Southern Waste Unit slope stability analyses. Table 5-10 presents the maximum safe slope and the maximum height of the safe slope from the slope stability analyses.

The typical existing side slopes of the IFAP range from 1.3H to 2.0H:1.0V, and the typical existing side slopes of the AFAP range from 1.4H to 2.0H:1.0V. These existing side slopes appear to confirm the results of the OU-2 Southern Waste Unit slope stability analyses. The reason that steeper slopes than the suggested slopes from the analyses currently exist at the IFAP and the AFAP is that the current slopes have no surcharge, the slopes of the IFAP are vegetated, the slopes of the AFAP are partially covered with a geomembrane that reduces erosion and infiltration of water, and the suggested maximum slopes from the analyses are based on a factor of safety equal to 1.2 (slopes may remain safe at FOS values equal to just above 1.0).

During excavation the contractor should be careful not to overload the top of the slopes with excess equipment. The analyses performed assumed that the top of the slope would be loaded with an excavator producing ground contact pressures of either 2000 or 2800 psf. If additional equipment is present at the top of the slopes (track loaders, dump trucks, fuel trucks, etc.) flatter slopes will be necessary and should be adjusted according to observation made by an engineer in the field.

Unintentionally cutting the toe of any slope should be avoided during excavation. Cutting the toe of a slope will reduce the forces that prevent slope failure from occurring. As a result, cutting a slope toe could result in slope failure.

In addition, if personnel will be present at the top of the slope, the temporary slopes should be cut no steeper than 2H:1V. Flatter slopes than the suggested slopes may be necessary if soft or wet spots are encountered during excavation.

During actual excavation of the OU-2 Southern Waste Unit materials, slopes from time to time may be cut steeper than the recommended slopes. These slopes will more than likely not fail, but the slopes

should not be left for extended periods of time steeper than the recommended slopes. In addition, when work is not being performed, the excavating and hauling equipment should be kept away from the top of the excavated slopes. During the slope stability analyses it was observed that the FOS values were much higher when no surcharge was applied at the top of the slope.

Table 5-10 - Summary of OU-2 Southern Waste Unit Slope Stability Analyses

Stratum	Slope Height (ft)	Suggested Maximum Slope
Fly Ash	20	1.5H:1V
Fill	10[1]	1.5H:1V
Brown Till	20	1.5H:1V
Gray Till	20	1H:1V
GMA Sand and Gravel	20	2H:1V
Stratified Glacial Deposits	20	1.5H:1V

Notes: (1) Based on CAT 350 Surcharge (2000 psf) instead of the CAT 375 surcharge (2800 psf) used for other strata

5.4 Site Restoration

After excavation, erosion control matting could be used on barren earthen slopes to minimize erosion and sedimentation prior to the final site restoration. After all wastes have been removed the area will be finish graded to provide a natural smooth contour to the site. The area will be graded generally from north to south with minimum practical slopes. In the unlikely event that additional material is required to finish grade the site, it will be hauled in from an on-site borrow source. All cut and fill materials will be compacted in about 8-inch loose lifts, placed level, and compacted to 95 percent standard proctor within about 3 percent of optimum moisture content. When the finish grading is complete the area will be seeded and mulched to promote a thick stand of native grasses. Any erosion control measures needed for slope protection or for drainage way protection will be installed. There will be no grading within the limits of Paddys Run or any disturbance of the creek banks. The final disposition of the rock berm that was previously constructed along Paddys Run should be considered in excavation plans. After final grading and seeding, the retention basins will be removed and the areas will be regraded to near their normal contour. Thus no change of land use is incurred.

SECTION 6

REFERENCES

(Bishop and Bjerrum 1960) Bishop, A.W. and L. Bjerrum, 1960. "The Relevance of the Triaxial Test to the Solution at Stability Problems." Proceedings ASCE Research Conference on Shear Strength or Cohesive Soils, Boulder, Colorado. pp. 437-501.

(Caterpillar 1994) Caterpillar, Inc., 1994. *Caterpillar Performance Handbook*. Peoria, Illinois: Caterpillar, Inc.

(DOE 1994a) United States Department of Energy, February 1994. *Remedial Investigation Report for Operable Unit 5*, Draft. Unites States Department of Energy: Fernald Field Office.

(DOE 1994b) United States Department of Energy, May 1994. *Sitewide CERCLA Quality Assurance Project Plan*, Revision 0.2. United States Department of Energy: Fernald Field Office.

(DOE 1995a) United States Department of Energy, January 1995. *Remedial Investigation Report for Operable Unit 2*, Final. United States Department of Energy: Fernald Field Office.

(DOE 1995b) --------, March 1995. *Feasibility Study Report for Operable Unit 2*, Final. United States Department of Energy: Fernald Field Office.

(FERMCO 1995a) Fernald Environmental Restoration Management Corporation, July 24, 1995. *Draft Geotechnical Sampling and Testing Plan for On-Site Clay Borrow Areas, Off-Site Material Sources Operable Unit 2 Waste Units*, Revision 1. FERMCO: Cincinnati, Ohio.

(McLaren and Digioia, 1987) McLaren Robert J., and A.M. Digioia, 1987. "The Typical Engineering Properties of Fly Ash," *Geotechnical Practices for Waste Disposal '87*, Geotechnical Special Publication No. 13. American Society of Civil Engineers: New York.

(PARSONS 1993) PARSONS ERA Project, June 1993. *Subsurface Exploration Erosion Control at the Inactive Fly Ash Pile*, Revision 0. PARSONS ERA Project: Fairfield, Ohio.

(PARSONS 1995a) PARSONS ERA Project, 1995. *Project Order Plan for Project Order 154, A-E Support Service for Geotechnical Investigation, Operable Unit 2*, Revision 2. PARSONS ERA Project: Fairfield, Ohio.

(PARSONS 1995b) ---------, July 1995. *Disposal Facility Pre-Design Geotechnical Investigation Soil Investigation Data Report Summary Document*, Revision 0. PARSONS ERA Project: Fairfield, Ohio.

(PARSONS 1995c) ---------, December 1995. *Geotechnical Investigation Report On-Site Disposal Facility*, Revision 0, PARSONS ERA Project: Cincinnati, Ohio.

(PARSONS 1996) ---------, March 1996. *Geotechnical Data and Evaluation Report for East and South Field Borrow Areas*, Revision A. PARSONS ERA Project: Cincinnati, Ohio.

(SAIC 1996) Science Application International Corporation, February 29, 1996. *Fly Ash Piles and South Field Waste Units Geotechnical Investigation Geotechnical Laboratory Data Report*. SAIC: Golden, Colorado.

(USBR 1974) United States Bureau of Reclamation, 1974. *Earth Manual*, 2nd Edition. Washington, D.C.: U.S. Department of the Interior.

(US EPA 1985) United States Environmental Protection Agency, 1985. *Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites*. EPA/600/8-85/002. U.S. EPA: Washington, D.C.

APPENDIX A

BORING COORDINATES

PO 154 Auger Boring Locations In The OU2 Waste Units

On-Site Location	Boring Identification	Northing (NAD 27)	Easting (NAD 27)	Northing (NAD 83)	Easting (NAD 83)	Surface Elevation	Depth
IFP	G2-160	477938	1378992	477967	1347523	577.4	19.0
IFP	G2-160A	477947	1378987	477976	1347518	576.9	26.5
SF	G2-161	478100	1379072	478130	1347603	568.3	21.0
IFP	G2-162	477705	1379171	477735	1347703	572.1	29.0
SF	G2-163	477884	1379298	477913	1347829	573.6	24.0
SF	G2-164	478055	1379337	478085	1347868	576.1	24.0
SF	G2-165	477313	1379397	477342	1347928	568.5	29.0
SF	G2-166	477532	1379488	477561	1348019	573.4	24.0
SF	G2-167	477895	1379603	477925	1348134	580.3	24.0
SF	G2-168	477602	1379743	477631	1348274	576.0	24.0
SF	G2-169	477892	1379827	477922	1348358	578.5	26.0
AFP	G2-170	477420	1379864	477449	1348395	576.7	25.0
AFP	G2-171	477315	1380039	477344	1348570	592.2	44.0

PO 154 Shallow Boring Locations In The OU2 Waste Units

On-Site Location	Boring Identification	Northing (NAD 27)	Easting (NAD 27)	Northing (NAD 83)	Easting (NAD 83)	Surface Elevation	Depth
IFP	G2-SB-91	478131	1378972	478160	1347504	575.9	10.0
IFP	G2-SB-92	477991	1378999	478020	1347530	574.8	10.0
SF	G2-SB-93	478066	1379058	478096	1347590	568.0	10.0
IFP	G2-SB-94	477778	1379051	477808	1347582	567.5	10.0
SF	G2-SB-95	478187	1379111	478216	1347642	569.5	10.0
SF	G2-SB-96	478071	1379395	478100	1347926	576.0	10.0
SF	G2-SB-97A	477837	1379272	477866	1347803	572.4	10.0
SF	G2-SB-98	477973	1379636	478003	1348167	572.3	10.5
SF	G2-SB-99	477807	1379552	477836	1348083	577.9	10.3
SF	G2-SB-100	477307	1379382	477336	1347913	577.4	10.1
SF	G2-SB-101	477703	1379805	477732	1348336	568.0	10.0
SF	G2-SB-102	477451	1379655	477480	1348186	576.1	10.0
AFP	G2-SB-103	477226	1379824	477256	1348355	572.8	10.0
AFP	G2-SB-104	477301	1380091	477330	1348622	588.6	10.0

Locations of Existing Borings having Geotechnical Data in the OU2 Waste Units

On-Site Location	Boring Identification	Northing (NAD 27)	Easting (NAD 27)	Northing (NAD 83)	Easting (NAD 83)	Surface Elevation	Total Depth
IFP	1708	477711	1379167	477740	1347698	570.9	33.0
IFP	1994	477742	1379200	477771	1347731	570.3	38.0
IFP	1995	477770	1379055	477799	1347586	567.9	32.0
IFP	1996	477820	1379115	477849	1347646	565.5	22.0
IFP	1997	477871	1378961	477900	1347492	570.4	40.0
IFP	1998	478092	1379033	478121	1347564	569.5	19.0
SF	1964	477419	1379418	477448	1347949	571.6	31.0
SF	1965	477347	1379475	477376	1348006	574.1	28.5
SF	1966	477240	1379500	477269	1348031	558.0	25.5
SF	1968	477365	1379591	477394	1348122	569.0	18.5
SF	1969	477633	1379700	477662	1348231	575.5	14.0
SF	1970	477613	1379445	477642	1347976	571.0	11.0
SF	11187	477905	1379630	477934	1348161	580.5	11.0
SF	1975	477869	1379784	477898	1348315	578.8	10.5
SF	1977	477827	1379323	477856	1347854	571.8	18.5
SF	2945	477972	1379120	478001	1347651	566.7	55.0
AFP	1724	477240	1379831	477269	1348362	586.8	44.5
AFP	1979	477242	1379893	477271	1348424	588.1	31.5
AFP	1980	477280	1379998	477310	1348529	591.1	26.0
AFP	1981	477366	1379964	477396	1348495	587.6	21.5
AFP	G2-001	478031	1378801	478061	1347332	541.1	35.0
AFP	G2-002	477959	1378799	477988	1347330	577.1	50.0
AFP	G2-003	477885	1378876	477915	1347407	539.5	50.0
AFP	G2-005	477810	1378851	477840	1347382	530.0	27.0
AFP	G2-006	477952	1378813	477981	1347345	531.7	23.0
AFP	G2-007	477801	1378968	477830	1347499	571.7	20.0
AFP	G2-008	477907	1379021	477936	1347552	578.7	20.0

APPENDIX B

GEOTECHNICAL TEST BORING FIELD LOGS, GEOTECHNICAL LOGGING REPORTS, AND TRENCHING LOGS

PO-154 TEST BORING FIELD LOGS AND GEOTECHNICAL LOGGING REPORTS

Pro[illegible]o: PO154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-160	Drilling Method: Mobile B-61 HSA	Date Started: 09/19/95
Coordinates: N 477,938 E 1,378,992	Engineer: J. Dunlap	Date Completed: 09/19/95
Ground Surface Elevation: 577.4 ft above MSL	GWL/DATE: None 9/10/95	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Cover soil, dark gray brown						
2.5	Silty Sand (ash), 2.5y 2.5/1, black. loose, moist, nonplastic, trace of wood at 5.0 feet, trace 1/4 inch to 3/4 inch gravel SM	410232	2.5 - 4.5	SS	4, 4, 5, 5	20	MC, GS, AL, SG, CON_{res}
		410233	5.0 - 6.5	SS	3, 2, 2	9	MC
		410234	7.5 - 9.0	SS	1, 1, 2	15	MC, GS, AL
		410235	10.0 - 11.5	SS	1, 1, 1	7	MC
		410236	12.5 - 14.0	SS	1 ,2 ,1	13	MC, GS, AL
		410237	15.0 - 16.5	SS	2 ,1 ,2	11	MC
		410238	17.5 - 19.0	SS	3, 11, 23	11.5	MC
18.5	Concrete						
	Final boring depth - 19.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

FEMP
LITHOLOGIC LOG

CONTROL NO: 200310G2160-004

Page 1 of 2

PROJECT NAME: Geotechnical Investigation Borrow Areas/OU2 Waste Units

PROJECT NUMBER: 20.03.10

BORING NUMBER:	COORDINATES:	RELATED FAL NOs.:
G2-160	Refer to Survey Report	200310G2160-003

SURFACE ELEVATION:	GROUNDWATER LEVEL:	DATE:	TIME:	DATE STARTED:
Refer to Survey Report	None	9-19-95	14:45	9-19-95
GEOLOGIST: Engineer J. Dunlap	**GROUNDWATER LEVEL:** NK	**DATE:** NK	**TIME:** NK	**DATE COMPLETED:** 9-19-95

WATER USED DURING DRILLING:	DRILLING CONTRACTOR:	DRILLING EQUIPMENT:	DRILLER/HELPER:
	Alliance	Mobile B61: HSA	M Proctor / B. Fortney / T. French

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1.0, 2.0							Initial Cuttings Dark Grayish Brown w/Grass And Roots Doesn't Appear To Be Fly Ash
3.0, 4.0	1251 9-19-95 410232	4 4 5 5	20"	FLY Ash (2.5Y 2.5/1) Moist, Non Plastic, Trace Iron Slag, loose. slag Dia ≈1/4", Subrounded	SM	9-19-95 ~~0~~ N/A	2" O.D. Split Spoon Consistency From N-Value
5.0, 6.0	1258 9-19-95 410233	3 2 2	9"	SAA, Trace Of Wood, Very Loose, Trace Gravel (Subangular, ~1/4" Dia.)		N/A	2" O.D. Split Spoon Consistency From N-Value
7.0							
8.0, 9.0	1306 9-19-95 410234	1 1 2	15"	SAA, Slag Diam 1/4" to 3/4", Subrounded		N/A	2" O.D Split Spoon
10.0							

7.5-9' N/A Screen

INSTRUMENT	BACKGROUND	DATE	TIME
PID	1.2	9-19-95	1252
FHA		NA	
BETA/GAMMA	50	9-19-95	1246

NOTES: Visual Description Performed Using Samples Retrieved Using Split Spoon Sampler
Consistency Of Soils Determined Using Penetrometer Values Unless Otherwise Stated
SAA - Same As Above
N/A - Not Applicable

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS/MISC/GEOTECH/LITHO LOG.EPS

200310621160-005

FEMP
LITHOLOGIC LOG

PROJECT NAME:	PROJECT NUMBER:	BORING NUMBER:
Geotechnical Investigation Borrow Areas/OU2 Waste Units	20.03.10	G2-160

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
11.0	1312 9-19-95 410235	1 1 1	7"	SAA		N/A	2" O.D. Split Spoon
12.0							
13.0	1321 9-19-95 410236	1 2 1	13"	SAA		N/A	2" O.D Split Spoon Last Blow On Final 6", Drove Spoon ~10"
14.0							
15.0	1327 9-19-95 410237	2 1 2	11"	SAA, w/ Light Gray Nodules, Occasional olive Brown Spots w/metalli. Sheen		N/A	2" O.D Split Spoon
17.0							
18.0	1337 9-19-95 410238	3 11 23	11.5"	SAA			2" O.D. Split Spoon
				Concrete			Up To 160cpm on B8 Stopped Drilling @ 13:40
19.0				Bottom Of Boring 19.0ft			Concrete Refused Any Further Augering Beyond 19.0ft Depth
20.0	JC 9-19-95						JC 9-19-95
21.0	JC 9-19-95 410239		JC				JC 9-19-95
22.0							

NOTES: Boring Terminated @ 19.0ft Due To Refusal Of Augers On Concrete Rubble Buried @ G2-160
JC 9-19-95

Proj[illegible]: PO154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-160A	Drilling Method: Mobile B-61 HSA	Date Started: 09/21/95
Coordinates: N 477,947 E 1,378,987	Engineer: J. Dunlap	Date Completed: 09/22/95
Ground Surface Elevation: 576.9 ft above MSL	GWL/DATE: None 9/22/95	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
2.5	Fly ash N 2.5/black, loose to very loose, moist, some rion slag and gravel to 3/4 inch, concrete at 20.8 feet, medium dense (SM)	410249	2.5 - 4.0	SS	3, 4, 4	17	GS, AL
		410250	7.5 - 9.0	SS	1 ,2 ,1	10	AL
		410559	12.5 - 14.0	SS	1, 1 ,1	14	GS, AL
		410560	20.0 - 21.5	SS	6, 3, 13	4	MC
22.5	Sandy lean clay 5Y 3/2 dark olive gray, soft to medium stiff, moist to wet CL	410561	22.5 - 24.0	SS	2, 13, 12	17	MC, GS, AL
24.5	Sandy lean clay, some gravel 2.5Y 4/3 olive brown, dense to very dense, moist CL	410562	24.5 - 26.5	SS	15, 20, 23, 37	18	MC GS, AL, CON_{85}
26.[illegible]	Sand with trace of gravel 2.5Y 5/4 light olive brown, dense to very dense, moist (SP)						
	Total depth 26.5						
	*Note: USCU Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

FEMP
LITHOLOGIC LOG

CONTROL NO: 2003106G2160A-007

Page 1 of 3

PROJECT NAME: Geotechnical Investigation Borrow Areas/OU2 Waste Units

PROJECT NUMBER: 20.03.10

BORING NUMBER: G2-160A

COORDINATES: SEE Survey map

RELATED FAL NOs.: 2003106G2160A-003 Thru 006

SURFACE ELEVATION: SEE Survey map

GROUNDWATER LEVEL: None

DATE: 9-22-95 TIME: 11:00am

DATE STARTED: 9-21-95

GEOLOGIST: Engineer J. Dunlap

GROUNDWATER LEVEL: N/K

DATE: N/K TIME: N/K

DATE COMPLETED: 9-22-95

WATER USED DURING DRILLING: N/K

DRILLING CONTRACTOR: Alliance

DRILLING EQUIPMENT: Mobile B-61: HSA

DRILLER/HELPER: M Proctor / B. Fortney T. French

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1.0							
2.0							
3.0	15:40 9-21-95 410249	3 4 4	17"	Fly Ash (N 2.5/) Black, w/ Iron Slag Up To 1/4" Diam, w/ Fine Roots, Moist, Loose, Some white Nodules		N/A	2" O.D. Split Spoon Consistency From N-Value
4.0							
5.0							
6.0							
7.0							
8.0	1548 9-21-95 410250	1 2 1	10"	SAA, Very Loose, Iron Slag Up To 3/4" Dia, No Roots		N/A	2" O.D. Split Spoon Consistency From N-value
9.0							

INSTRUMENT	BACKGROUND	DATE	TIME
PID	0.0	9-21-95	1530
[illegible]A	N/A		
BETA/GAMMA	50	9-21-95	1531

NOTES: SAA - Same As Above
N/A - Not Applicable
Consistency Determined Using Penetrometer Values Unless Stated Otherwise
This Hole Is Located 10' Due North Of Original G2-160 Location

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

BGS = Below Ground Surface

*ILLUS\MISC\GEOTECH\LITHO LOG.EPS

4/95

JW 4-11-96

B 200310621160A-008

FEMP
LITHOLOGIC LOG

PROJECT NAME:	PROJECT NUMBER:	BORING NUMBER:
Geotechnical Investigation Borrow Areas/OU2 Waste Units	20.03.10	G2-160A

(FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
10.0							
11.0							
12.0							
13.0	1555	1		SAA, with Porous Iron Slag, Up To 3/8" Dia, Sub Angular To Sub Rounded, ~~Little~~ 4-10-96		N/A	2" O.D. Split Spoon
	9-21-95 410559	1	14"	True White Nodules			Consistency From N-Value
14.0	~~410251~~ 90 4-10-96	1					
15.0							
16.0							Ground Vibrating As Augers Advancing May Be Rubble or Gravel. 16.0 ft to 20.0 ft
17.0							
18.0							
19.0							
20.0	1604	6		SAA. 90 4-10-96 ~~Loose~~ Med. Dense 20.3ft Piece Of Concrete, Sub Angular to Angular, 2" In Diam		N/A	2" O.D. Split Spoon
	9-21-95	3	4"				Consistency From N-Values
21.0	410560 ~~410252~~ 90 4-10-96	13					Piece of Concrete In Sand Catcher. Blocked, Caused Little Recovery
22.0							Piece Of Wire On Center Bit Broke Drill Rod Pulled

NOTES: Sampling Locations Above 19.0ft BGS Per Phone Conversation w/ T. Snider @ ~1:30p on 9-21-95. Sampling Locations Below 19.0ft BGS Per P.O.154 GSTP.

200310G2160A-009

FEMP
LITHOLOGIC LOG

PROJECT NAME:	PROJECT NUMBER:	BORING NUMBER:
Geotechnical Investigation Borrow Areas/OU2 Waste Units	20.03.10	G2-160A

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
23.0	1616	2		Lean to Fat Clay (~~2.5Y~~ 7/2) Dark Olive Gray w/occasional Black Lenses, Trace Wood, Trace Gravel (Up to 1/2" Diam) Moist To Wet, Soft To Med. Stiff	CL-CH		Description & Recovery Are Estimates From Memory Because The Sample Was Taken By Rad. Control. D.J. Not Get To Feel Soil @ Location Encountered @ 23.7 ft
	9-21-95	3	~17"				
23.7	410562	12		Lean Clay w/Sand, Trace Gravel (Up to 1/2" Dia, Sub Angular) Moist, Stiff, Appeared to Be Natural material But Could Have Been Fill.	CL		
24.0	~~410253~~ 4-10-96						
	1113	15		Lean Clay w/Sand & Gravel (Up to 3/4" Dia, Sub Angular To Sub Rounded), (2.5Y 4/3) Olive Brown, Low Plasticity, Moist, Occasional Black Nodule, Hard to Very Hard.	CL	7.5	2" O.D Split Spoon
25.0		20	18"				
	9-22-95	23		@ 25.8 ft Lean Clay Mottled w/Greenish Gray			
26.0	410562	37					Hammer Slipping Badly, Least 6 Blows On 3rd 6" Less Than 20" Fall
26.5	~~410254~~			Bottom Of Boring 26.5 ft	SM		23 Blows Accounts For These 6 Blows w/Less Than 20" Fall.
27.0				Silty ~~with Gravel~~ Sand, Trace Gravel (~1/4" Diam, Sub Rounded To Sub Angular), Moist Dense to Very Dense, (2.5Y 5/4) Light Olive Brown.			
28.0							Looking At Final 6" Blowcount And Way Last Position Of The Final 6" Driven By Hammer Estimate N-Value Would Be Between 45 To 50. ∴ Density Is Dense to Very Dense. Due To Lack Of Fines In Sand @ 26.4 ft, Feel The Sand Is Part Of The GMA.
29.0	~~410255~~						

NOTES: 409943 A/B screen 7.5'-9' 9-21-96 1548
409944 A/B screen 12.5'-14' 9-21-96 1555

Proje[illegible] PO154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-161	Drilling Method: Mobile B-61 HSA	Date Started: 09/18/95
Coordinates: N 478,100 E 1,379,072	Engineer: J. Dunlap	Date Completed: 09/18/95
Ground Surface Elevation: 568.3 ft above MSL	GWL/DATE: None	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Ash						
2.5	Lean clay, dark yellowish brown, very stiff, moist (CL) (fill)	410222	2.5 - 4.0	SS	4, 7, 7	16	MC
5.8	Fat clay with sand, olive to light olive brown mottled with dark yellowish brown or gray, moist to wet, soft to very soft CH	410223	5.0 - 6.5	SS	3, 4, 4	20	MC, GS, AL
		410224	7.5 - 9.0	SS	1, 2, 2	10	MC
10.3	Silt with sand, olive brown, stiff, wet ML	410225	10.0 - 11.5	SS	5, 12, 13	19	MC, GS, AL
11.5	Sandy lean clay, alternating between olive brown and dark gray, moist to wet, stiff to very stiff, occasional gravel up to 1/2 inch in diameter CL	410226	12.5 - 14.5	SS (3")	4, 6, 9, 26	24	MC, GS, AL, P,
	At 14.0 feet, 1/2-inch-thick silty sand layer, gray, wet (SM) Lean clay resumes at 14.1 feet and becoming hard	410227	15.0 - 16.5	SS	16, 22, 43	20	MC, GS, AL
16.5	Silty sand, yellowish brown to light olive brown, dry to moist, dense, becoming loose at 20.0 feet and having 1/4 inch diameter subrounded gravel (SM)	410228	17.5 - 19.0	SS	14, 15, 21	14	MC
		410229	19.5 - 21.0	SS	19, 6, 1	10	MC
	Final boring depth = 21.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

FEMP
LITHOLOGIC LOG

CONTROL NO: 20031062161-006

Page 1 of 2

PROJECT NAME: Geotechnical Investigation Borrow Areas/Waste Units OU2

PROJECT NUMBER: 20.03.10

BORING NUMBER: G2-161

COORDINATES: SEE SURVEY MAP

RELATED FAL NOs.: 20031062161-003, 4 + 5

SURFACE ELEVATION: SEE SURVEY MAP

GROUNDWATER LEVEL: None — DATE: 9-18-95 — TIME: 17.30

DATE STARTED: 9-18-95

GEOLOGIST: Engineer J. Dunlap

GROUNDWATER LEVEL: None — DATE: 9-19-95 — TIME: 0910

DATE COMPLETED: 9-19-95

WATER USED DURING DRILLING: 5gal to Hydrate Bentonite Seal

DRILLING CONTRACTOR: Alliance

DRILLING EQUIPMENT: Mobile B-61; HSA

DRILLER/HELPER: M. Proctor / T. French / B. Fortney

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1.0 2.0							Initial Cuttings: Black Fly Ash w/ Fine Roots
3.0	1338 9-18-95 410222	4 7 7	16"	Sandy Silt (Fly Ash) (10yr 2/1) Black, Moist, Non Plastic, w/ Fine Roots, Very Stiff, Trace slag ~~Sandy Silt (Fly Ash) (10YR 2/1) Black, Moist, Non Plastic~~ 90 Lean Clay (10YR 4/6) Dk. Yellowish Brown, Moist, Very Stiff, Occasional 90 Black Nodules, Becoming Mottled w/ Gray @ 3.8ft	~~CL~~ ML CL	2.25 2.0	2" O.D. Split Spoon
4.0 5.0							
5.75 6.0	1345 9-18-95 410223	3 4 4	20"	SAA Clay (5Y 5/4) Olive, Moist To Wet, Very Soft To Soft, Mottled w/ Dk. Yellowish Brown	CH	2.25 .25	2" O.D. Split Spoon No Sand Catcher In Split Spoon
7.0							
8.0 8.25 9.0	1400 9-18-95 410224	1 2 2	10"	Clay w/ Sand (2.5Y 5/6) Light Olive Brown, Wet, Mottled w/ Gray, Very Soft Clay w/ Sand (5Y 5/3) Olive, Mottled w/ Dk Yellowish Brown, Wet, Very Soft, (Sand Fraction): Coarse	CH CH	0 0	2" O.D. Split Spoon

INSTRUMENT	BACKGROUND	DATE	TIME
PID	0.4	9-18-95	13:30
[illegible]	N/A		
BETA/GAMMA	50	9-18-95	13:30

NOTES: N/A - Not Applicable
SAA - Same As Above
Consistency From Penetrometer Readings
Blow Counts Above 12.5' Depth Are 1/4 8.25'
ID Hollow Stem Auger

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS\MISC\GEOTECH\UTHO LOG EPS

* 1400 A/B SCREEN COLLECTED AT 7.5' CUSTOMER # 410230 JW 4-10-96

FEMP
LITHOLOGIC LOG

20031062161-007

PROJECT NAME:	PROJECT NUMBER:	BORING NUMBER:
Geotechnical Investigation Borrow Areas/Waste Units	20.03.10	G2-161

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.0	1410	5		Lean Clay w/Sand (2.5Y 4/4) Olive Brown, Moist, Very Stiff	CL	2.25	2" O.D. Split Spoon
0.3	9-18-95	12	19"	Lean Clay w/Sand, Trace Gravel (¼" Dia, Subangular) (2.5Y 4/1) Dark Gray, Moist, Very Stiff	CL	3.5	
1.0	410225	13		Silty Lean Clay, Trace Sand (2.5Y 4/3) Olive Brown Moist, Very Stiff, Occasional Gravel (¼" Dia, Subangular) Becoming Wet, Stiff, (10YR 5/6) Yellowish Brown @ 11.3ft @ 10.8ft, 10.9ft	CL	3.75	
12.0				Becoming Very Stiff (3.75 TSF), Moist @ 11.3ft			
13.0	16:58	4		Clay w/Gravel (¼" to 1 1/2" Dia, Subangular to Sub Rounded), Moist, Occasional Brown Nodules, Med. Stiff, (2.5Y 4/1) Dk. Gray	CL	.75	3" O.D Split Spoon Not Standard SPT Test
	9-18-95	6	24"				Sample Placed In Plastic Bag To Be Transferred to Jar Later
14.0	410225 410226	9 26		@ 14.0ft Gray Silty Sand Layer wet ~ ½" thick (SM) Becoming Hard @ 14.1ft		14.0	Spoon Completely Full
15.0	17:09	16		SAA			2" O.D. Split Spoon
	9-18-95	22	20"				
	410226 410227	43		Sandy Lean Clay, Occasional Gravel (~¼" Dia, Sub Angular to Sub Rounded), (2.5Y 5/4) Light Olive Brown, Moist, Stiff	CL	14.0	SM Layer @ Very Bottom of Spoon
17.0				Silty Sand (10YR 5/6) Yellowish Brown Moist @ 16.5ft thickness unknown	SM		
	17:19	14		Silty Sand (2.5Y 5/6) Lt. Olive Brown, Well Graded, Dry with Some Moist Areas, Dense	SM		2" O.D. Split Spoon
18.0	9-18-95	15	14"				Density or Consistency From N-Values (SPT)
	410228	21					
19.0							
	17:29	9		Silty Sand (2.5Y 5/6) Lt. Olive Brown, Well Graded, Moist, Loose, Trace Gravel (~¼" Dia, Subrounded)	SM		2" O.D. Split Spoon
20.0	9-18-95	6	10"				
	410229	1					Last 6": 1 Blow Forced Spoon ~12"
21.0				Bottom Of Boring 21.0ft			

NOTES: * AIB SCREEN COLLECTED AT 1658 AT 13.0' CUSTOMER # 410231 on 4-10-96

ILLUS\MISC\GEOTECH\LITHO LOG-PG 2.EPS

Proje[illegible]: PO154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-162	Drilling Method: Mobile B-61 HSA	Date Started: 09/21/95
Coordinates: N 477,705 E 1,379,171	Engineer: J. Dunlap	Date Completed: 09/21/95
Ground Surface Elevation: 572.1 ft above MSL	GWL/DATE:	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, dark yellowish brown, with roots	410239	2.5 - 4.0	SS	5, 4, 4,	16.5	MC, GS, AL
2.0	Silty sand (ash), black, occasional fine roots, loose, trace of iron slag and wood roots stop at 7.4 feet SM	410240	5.0 - 6.5	SS	2, 2, 2	11	MC
		410241	7.0 - 9.0	SS	1, 1, 1, 1	17	MC, GS, AL CON_{r85}
		410242	10.0 - 11.5	SS	1, 2, 1	10.5	MC
		410243	12.5 - 14.0	SS	1, 1, 1	14	MC
		410244	15.0 - 16.5	SS	1 ,2 ,1	10	MC
		410245	17.0 - 19.0	SS	1, 1, 1, 1	18	MC, GS, AL, CON_{r85}
		410246	20.0 - 21.5	SS	2, 1, 2	11	MC
	Silty sand with gravel (ash), SM, with occasional clods of clay 3/8 - 1/2 inch in diameter and gravel up to 1/4 inch in diameter starting at 25.0 feet	410247	25.0 - 26.5	SS	2, 1, 2	13.5	MC, GS, AL
		410248	27.0 - 29.0	SS	3, 6, 5, 4	12	MC, GS, AL, CON_{r85}
28.9	Silty sand with trace gravel up to 1/4 inch in diameter, olive brown, moist, loose (SM)						
	Final boring depth = 29.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

FEMP
LITHOLOGIC LOG

CONTROL NO: 20031062162-004

PROJECT NAME: Technical Investigation Borrow Areas / OU2 Waste Units				PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-162	COORDINATES: Refer to Survey Report	RELATED FAL NOs.: 20031062162-002		
SURFACE ELEVATION: Refer to Survey Report	GROUNDWATER LEVEL: None	DATE: 9-21-95	TIME: 1040	DATE STARTED: 9-21-95
GEOLOGIST: Engineer J. Dunlap	GROUNDWATER LEVEL: NK	DATE: NK	TIME: NK	DATE COMPLETED: 9-21-95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: Alliance	DRILLING EQUIPMENT: Mobile B-61: HSA	DRILLER/HELPER: M. Proctor / B. Fortney / T. French	

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1.0							Initial Auger Cuttings Dk. Yellowish Brown Lean Clay w/ Roots
2.0							@ ~2.0ft Black Fly Ash
3.0	0832 9-21-95 410239	5 4 4	6.5"	Fly Ash (N 2.5/) Black, Moist, Non Plastic, Occassional Fine Roots, with ~~Bhit~~ with Nodules Dispersed Throughout, Loose	~~SM~~ SP 9-21-95	N/A	2" O.D. Split Spoon Consistency From N-Value
5.0							
6.0	0838 9-21-95 410240	2 2 2	11"	SAA, Occasional Iron Slag, Very Loose	~~SM~~ SP 9-21-95	N/A	2" O.D. Split Spoon Consistency From N-Value
7.0							
8.0	0845 9-21-95 410241	1 1 1 1	17"	SAA Fine Roots Ending @ 7.4ft Trace Wood @ 8.0ft	~~SM~~ SP 9-21-95	N/A	2" O.D. Split Spoon Consistency From N-Value
9.0							

'4/8' Screen

INSTRUMENT	BACKGROUND	DATE	TIME
PID	0.0	9-21-95	8:12
[illegible]MA	NA		
[illegible]/GAMMA	60	9-21-95	8:11

NOTES: N/A - Not Applicable
SAA - Same As Above
Consistency Determined Using Penetrometer Readings Unless Otherwise Stated

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUSMISC\GEOTECH\LITHO LOG.EPS

6/95

200310G21602-005

FEMP
LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation Borrow Areas/OU2 Waste Units

PROJECT NUMBER: 20.03.10

BORING NUMBER: G2-162

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
10.0	0850 9-21-95 410242	1 2 1	10.5"	SAA, Trace Subangular Gravel, ~1/4" Dia		N/A	2" O.D. Split Spoon Consistency From N-Value
11.0				9"			
12.0							
13.0	0857 9-21-95 410243	1 1 1	14"	SAA, Trace Subangular Gravel, Up To 3/4" Dia.		N/A	2" O.D. Split Spoon Consistency From N-Value
14.0							
15.0							
16.0	0902 9-21-95 410244	1 2 1	10"	SAA, Trace Subangular Gravel, ~1/4" Dia		N/A	2" O.D. Split Spoon Consistency From N-Value
17.0							
18.0	0909 9-21-95 410245	1 1 1 1	18"	SAA, Trace Subangular Gravel, Up to ~3/8" Dia		N/A	2" O.D. Split Spoon Consistency From N-Value
19.0							
20.0						9-21-95 40	
21.0	0916 9-21-95 410246	2 1 2	11"	SAA, Trace Subangular Grave, ~1/4" Dia		N/A	2" O.D Split Spoon Consistency From N-Value
22.0							

0031 12.5'-14' No Screen

NOTES:

20031052162-006

FEMP
LITHOLOGIC LOG

PROJECT NAME:	PROJECT NUMBER:	BORING NUMBER:
Geotechnical Investigation Borrow Areas/OU2 Waste Units	20.03.10	G2-162

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
23.0							
24.0							
25.0	1008 9-21-95 410247	2 1 2	13.5"	SAA, Trace Wood, Trace Subangular Gravel, ~1/4" Diam., Occasional Brown ~~Clay~~ clay Clods (~3/8-1/2")		N/A	2" O.D. Split Spoon Consistency From N-Values
26.0							
27.0	1034 9-21-95 410248	3 6 5 4	12"	SAA		N/A	2" O.D. Split Spoon Consistency From Blow Counts (N-Value)
				@ 28.5ft Silty Sand Trace Gravel (Subangular w/ Diam ~1/4") (2.5Y 4/4) Olive Brown, Moist, Loose Bottom Of Boring 29.0ft	SM	N/A	Consistency On Sand From Taking Last Blow Count x2, Last 6" Of Sample Drove As Easy At End Of 6" Than The Beginning

NOTES:

ILLUS\MISC\GEOTECH\LITHO LOG-PG 2.EPS

4/95

196

Project No: PO154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-163	Drilling Method: Mobile B-61 HSA	Date Started: 09/14/95
Coordinates: N 477,884 E 1,379,298	Geologist: R. Nicks	Date Completed: 09/14/95
Ground Surface Elevation: 573.6 ft above MSL	GWL/DATE:	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay with sand and trace gravel up to 1/4 inch in diameter, mottled to dark olive brown, very stiff to hard, moist CL	410315	2.5 - 4.0	SS	8, 10, 10	5	MC
10.0	Sandy lean clay, olive and brown, gravel up to 1 inch in diameter, very stiff to hard, becoming dark yellowish brown at 14.0 feet						
15.0	Sandy, silty clay, gray to dark gray, very stiff to hard, wet, trace sand CL-ML	410320	15.0 - 17.0	ST	NA	24	MC, GS, AL
18.5	Sandy, silt, dark gray, some gravel to 1 inch in diameter between 18.5 and 19.0 feet ML	410321	17.5 - 19.0	SS	6, 17, 24	14	MC
	Becoming dark yellowish brown at 20.9 feet	410322	20.0 - 21.5	SS	10, 15, 28	15	MC, GS, AL
21.5	Sand with trace gravel to 1/2 inch in diameter, dark yellowish brown, dense, moist with wet stringers to 1/4 inch thick (SM)	410323	22.5 - 24.0	SS	16, 18, 17	12	MC
	Final boring depth - 24.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

CONTROL NO: 200310G2143-003

FEMP
LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation Burrow Areas/OU2 Waste Units			PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-163	COORDINATES: See Survey Report	RELATED FAL NOs.: 200310G2 163 001 thru 013	
SURFACE ELEVATION: See Survey Report	GROUNDWATER LEVEL: N/A ams 4-10-96	DATE: / TIME: /	DATE STARTED: 9/14/95
GEOLOGIST: R. Nicks	GROUNDWATER LEVEL: N/A	DATE: ams 4-10-96 TIME: /	DATE COMPLETED: 9/14/95
WATER USED DURING DRILLING: NONE	DRILLING CONTRACTOR: ALLIANCE	DRILLING EQUIPMENT: MOBILE B-61 HSA 8"	DRILLER/HELPER: Ben Geim, Ed Miller, Dean Dickson

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				Silty Clay with sand and trace gravel to 1/4" 2.5 Y 4/4 and 5/4 mottled olive brown, v. stiff to hard, moist	CL		G2-163 location moved 7' N/o staked location
	1048 9/14/95 410315	8 10 10	5"		CL	>4.5	
5	1055 9/14/95 410316	4 4 5	6"		CL	>4.5	Drove 2' (4-4-5-5) but only got 6" recovery
	1102 9/14/95 410317	2 2 3	18"	2.5Y 3/3 dk. olive brown w/ decomposed (stems rotted), Med. stiff to stiff, moist		1.75	B2 2" sandy gravel layer.
10	1110 9/14/95 410318	5 13 19	15"	Sandy Lean Clay 2.5Y 4/4 olive brown, v. stiff to hard, moist, w/ scattered gravel to 1".		2.5 3.75	
	1117 9/14/95 410319	6 15 17	15"	10YR 4/4 dark yellowish brown		>4.5	
15	1129 9/14/95 410320	NA	24"	Lean Clay 10YR 5/1 gray, v. stiff, moist w/ trace of sand		2.75	Sample "shrinking" away from shelby about 1/16" - Dilatancy
	1311 9/14/95 410321	6 17 24	14"	10YR 4/1 dark gray v. stiff to hard w/ gravel to 1" @ 18.5-19.0.			upper 6" soft to firm lower 8" hard

INSTRUMENT	BACKGROUND	DATE	TIME
PID	N/A ams 4-10-96	9-14-95	09:00
ALPHA	N/A ams	/	/
BETA/GAMMA	N/A ams 4-10-96	9-14-95	

NOTES:

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS:MISC\GEOTECH\LITHO LOG.EPS

Samples #410325 (14') @ 1129 hrs & #410326 (2.5'→4') @ 1048 hrs were submitted as QB screening samples. [illegible]

[illegible] 4-11-96

2003100G2163-004

FEMP
LITHOLOGIC LOG

PROJECT NAME: GEOTECHNICAL INVESTIGATION BORROW AREAS OU2 WASTE UNITS

PROJECT NUMBER: 20.08.10

BORING NUMBER: G2-163

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
20	1320 9/14/95 410322	10 15 28	15"	Lean Clay w/SAND 2.5Y 4/1, dark gray, Hard, moist w/scat. gravel to 1/4" becoming 10YR 4/4 dk. yel. brn. at 20'10" 21'5"	CL	4.5	
	1332 9/14/95 410323	16 18 17	12"	SAND w/trace gravel to 1/2" 10YR 4/6 dark yellowish brown, Dense, moist w/wet stringers to 1/4"	SW		
				TOTAL DEPTH 24'			

NOTES: Grouted shut with 3 bags of volclay and 70 gal. water - tremied to bottom and grouted an auger at a time to within 1' of surface. Upper foot cemented with expansive cement plug.

4-11-96

Project No: PO154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-164	Drilling Method: Mobile B-61 HSA	Date Started: 09/13/95
Coordinates: N 478,055 E 1,379,337	Geologist: R. Nicks	Date Completed: 09/13/95
Ground Surface Elevation: 576.1 ft above MSL	GWL/DATE:	Page 1 of 1

Notes: Samples collected per USCS D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, dark yellowish brown, very stiff, moist CL	410298	2.5 - 4.0	SS	6, 8, 13	10	MC
		410299	5.0 - 6.5	SS	5, 8, 9	15	MC, GS, AL
	1 to 2 inch thick silt layers, light brownish gray beginning at 5.0 feet	410300	2.0 - 6.0	B	NA	NA	Modal Dia.
7.0	Fat clay, gray, soft to medium stiff, moist to wet (CH), with lean clay CL stringers below 10.0 feet	410301	7.5 - 9.0	SS	3, 4, 5,	21	MC
		410302	10.0 - 12.0	ST	NA	27	MC, GS, AL, P,
		410303	6.0 - 10.0	B	NA	NA	Modal Dia.
12.7	Sandy silt, olive brown, medium dense, wet ML	410304	10.0 - 14.0	B	NA	NA	Modal Dia.
		410305					
		410306	15.0 - 16.5	SS	3, 6, 12	16	MC
16.0	Lean clay with sand and scattered gravel to 1/2 inch, gray, very stiff, wet (CL)						
17.5	Sandy silt, gray, dense, wet ML	410307	17.5 - 19.0	SS	5, 7, 10	12	MC, GS, AL
18.5	Sandy lean clay, gray, stiff, wet (CL)	410308	20.0 - 21.5	SS	3, 20, 35	10	MC
	Scattered gravel to 1-1/2 inches in diameter and becoming very stiff at 20.0 feet	410309	22.5 - 24.0	SS	5, 17, 29	20	MC
23.8	Sand with scattered gravel, dark yellowish brown, very dense, wet (SW)						
	Final boring depth = 24.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

FEMP
LITHOLOGIC LOG

CONTROL NO: 200310G2164-ØØ3

PROJECT NAME: Geotechnical Investigation Borrow Areas / OU2 Waste Units				PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-164	COORDINATES: Refer to Survey Report	RELATED FAL NOs.: 200310G2164-001		
SURFACE ELEVATION: Refer to Survey Report	GROUNDWATER LEVEL: NK	DATE: NK	TIME: NK	DATE STARTED: 9/13/95
GEOLOGIST: R. Nieks	GROUNDWATER LEVEL: NK	DATE: NK	TIME: NK	DATE COMPLETED: 9/13/95
WATER USED DURING DRILLING:	DRILLING CONTRACTOR: Alliance	DRILLING EQUIPMENT: Mobile B-61 HSA 8"	DRILLER/HELPER: Ben Grima, Ed Millsa, Dean Dickson	

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				Lean Clay 10YR 4/6 Dark yellowish brown very stiff, moist	CL		
	1438 9/13/95 410298	6 8 13	10"			2.5	
5	1445 9/13/95 410299	5 8 9	15"	with silt layers 1-2" @ 6". Stiff to very stiff - moist to wet 2.5 Y 6/2 light brownish gray		1.75 / 3.25	
	1452 9/13/95 410301	3 5 4	21"	Fat Clay 10YR 5/1 gray, soft to med. stiff, v. moist to wet	CH	0.5-1.0	Color transition top to bottom 2.5Y 5/3 to 10YR 5/1.
10	~~1459~~ 1603 9/13/95 410302	NA	27"	with Lean clay stringers		1.75	
	1515 9/13/95 410304	4 10 13	13"	Sand 2.5 Y 4/4 olive brn, med. dense, wet	SP		12'9" from Fat Clay to Sand.
15	1524 9/13/95 410306	3 6 12	16"	Lean Clay with sand, and scattered gravel to 1/2" very stiff, wet 2.5Y 5/1 gray	CL	2.5	
	1533 9/13/95 410307	5 7 10	12	Sand 2.5Y 5/1 gray, dense, wet	SW		
20				Sandy lean Clay 2.5 Y 5/1 gray, v. stiff, wet	CL	3.5	

INSTRUMENT	BACKGROUND	DATE	TIME	NOTES:
PID		NK		
ALPHA				
BETA/GAMMA				

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS/MISC/GEOTECH/LITHO LOG EPS

4/95

000182

20031062164-004

FEMP
LITHOLOGIC LOG

PROJECT NAME:	PROJECT NUMBER:	BORING NUMBER:
GEOTECHNICAL INVESTIGATION BORROW AREAS/OU2 WASTE UNITS	20.08.10	G2-164

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
20	1542 9/13/95 410308	3 20 35	10"	SANDY Lean Clay w/scat. gravel to 1½" 2.5Y 5/1 gray, v. stiff, wet, with localized stiff layers to 3".	CL	1.0-2.0	Erroneous blow count due to gravels.
	1556 9/13/95 410309	5 17 29	28"	10YR 4/4 dk. yel. brn		5.0 4.0	
				Sand w/scat. grav. v. Dense Wet	SW		← Bottom 3" Sand
25				Total Depth 24ft			

NOTES: Hole grouted w/pelclay 20gal/bag, tremie from bottom to 1' from top. Grout and pull augur section, grout and pull section etc. etc. 1' cement plug at surface. 42 Bags, 22 gallons for grout

Proj[illegible]o: PO154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-165	Drilling Method: Mobile B-61 HSA	Date Started: 09/14/95
Coordinates: N 477,313 E 1,379,397	Engineer: K. Ernst/J. Dunlap	Date Completed: 09/14/95
Ground Surface Elevation: 568.5 ft above MSL	GWL/DATE: None	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, yellowish brown, dry (CL)						
2.5	Lean clay with sand, dark yellowish brown, moist, fragments of brick, very stiff, fine roots, occasional angular gravel, fill CL	410199	2.5 - 4.0	SS	6, 8, 11	12	MC, GS, AL
	4-inch interval of limestone fragments at 5.4 feet						
5.7	Sandy lean clay with gravel, brown to olive brown, moist, medium stiff to very stiff, brick fragments, rounded gravel to 1/2 inch in diameter, trace black nodules CL	410201	5.0 - 6.5	SS	11, 13, 9	15	MC, GS, AL
		410203	7.5 - 9.0	SS	3, 2, 3	9	MC
		410205	10.0 - 12.0	SS	2, 3, 2, 7	14	MC, GS, AL, CON_{res}
	Becoming less sandy at 7.5 feet	410207	12.5 - 14.0	SS	3, 2, 4	14	MC
	Becoming olive gray at 10.0 feet	410209	15.0 - 16.5	SS	3, 4, 4	17	MC, GS, AL
	Becoming soft at 12.5 feet	410211	17.5 - 19.0	SS	3, 3, 5	14	MC
18.8	Sandy lean clay, yellowish brown, moist, very stiff CL						
20.0	Lean clay with sand, olive brown, moist, soft, mottled with brown, fill, CL	410213	20.0 - 22.0	SS	3, 4, 6, 7	21	MC, GS, AL, CON_{res}
		410215	22.5 - 24.0	SS	4, 6, 10	10.5	MC
	Having trace gravel up to 1.5 inches in diameter below 22.5 feet	410217	25.0 - 26.5	SS	6, 6, 8	4	MC
27.5	Sandy lean clay, dark olive gray, trace gravel to 3/4 inch diameter, moist, hard, wood fragments, fill CL	410219	27.5 - 29.0	SS	9, 19, 19	16	MC, GS, AL
	Final boring depth - 29.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

CONTROL NO: 20031OG2165-0003

FEMP
LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation OU2 Waste Units			PROJECT NUMBER: 20.03.10
BORING NUMBER: GZ-165	COORDINATES: NA	RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: None	DATE: 9-14-95	TIME: 13:30	DATE STARTED: 9-14-95
GEOLOGIST/Engineer: J. Dunlap / K. Ernst	GROUNDWATER LEVEL: NA	DATE:	TIME:	DATE COMPLETED: 9-14-95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: Alliance Env., Inc	DRILLING EQUIPMENT: Mobile Drill B-61, HSA	DRILLER/HELPER: M. Proctor / T. French /	

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.0							Initial Cuttings Yellowish Brown Dry.
1.0							
2.0							
3.0	9:45 9-14-95 410199	6 8 11	12"	Lean Clay, Trace Sand (10YR 3/6) DK. Yellowish Brown, Moist, Mottled w/ Yellowish Brown, Fragments of Brick, Hard, FILL, Occasional Angular Gravel, Fine Roots	CL	4.0	2" O.D. Split Spoon Fill
4.0							Hard Augering @ 4'
5.0	10:00 9-14-95 410201	11 13 9	15"	*SAA, very Stiff. Limestone (10YR 4/1) DK Greenish Gray. Sandy Lean Clay (10YR 5/3) Brown, Moist Very Stiff Trace Brick Fragments, Trace Rounded Gravel (~¼ to ½" D.m), Wood @ 6.3ft, FILL	CL	2.5 3.5	2" O.D. Split Spoon Broken In Pieces. Hard Augering @ 6.0ft Easier Below 6.0ft
5.4							
5.7							
6.0							
7.0							
8.0	10:14 9-14-95 410203	3 2 3	9"	Lean Clay, Few Sand (2.5Y 4/3) Olive Brown, Moist, Stiff, Trace Black Nodules, Becoming more Olive Toward 8.3ft Fill	CL	1.5	2" O.D. Split Spoon
9.0							
10.0							

INSTRUMENT	BACKGROUND	DATE	TIME
PID	4.8	~~9-14-95~~ 9-14-95	9:48
ALPHA			
BETA/GAMMA	50	9-14-95	9:50

NOTES: Measured Consistency Using Soil Test Pocket Penetrometer
HSA = Hollow Stem Auger 4¼" ID
SAA - Same As Above
Visual Description From Split Spoon Samples
N/A Not Applicable

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS/MISC/GEOTECH/LITHO LOG.EPS

000185

1-17-96

200310G2165-004

FEMP
LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation OU2 Waste Units

PROJECT NUMBER: 20.03.10

BORING NUMBER: G2-165

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
10.0 10.2	10:17 9-14-95 ~~401205~~ 410205	2 3 2 7	2 14" 2 7	SAA Lean Clay w/Sand (5Y 4/2) Olive Gray Very Moist, Trace Gravel (Sub Angular to Rounded ~1/2" Diam.), Stiff, Fill	CL	1.9	2" O.D. Split Spoon
11.0 12.0							
13.0 14.0	10:26 9-14-95 ~~401207~~ 410207	3 2 4	3 2 14" 4	SAA, Soft Limestone Fragment (~1.5" Diam, Angular) 3/25" Piece of Wood @ 13.0 ft Piece of Wood @ 14.0 ft	CL	0.5	2" O.D. Split Spoon Wood Smells Rotten
15.0							
16.0	10:38 9-14-95 ~~401209~~ 410209	3 4 4	17"	SAA, w/ Sub Rounded to Rounded Gravel (1/4 to 3/4"), w/Wood Fragments, Stiff, Fill Limestone Fragment @ 15.8 ft	CL	1.75	2" O.D. Split Spoon
17.0							
18.0 18.8 19.0	10:52 9-14-95 ~~401211~~ 410211	3 3 5	14"	Lean Clay w/Sand (5Y 4/3) Olive, Very Moist, Med. Stiff, Trace Gravel (1/4 to 3/4" Diam, Sub Angular To Sub Rounded), Trace Wood, Fill Small Wet, Gray Course Sand Seam @ 18.3 ft (~.25" Thick) Sandy Lean Clay (10YR 5/6) Yellowish Brown, Moist Very Stiff	CL CL	.75 3.0	2" O.D. Split Spoon Sand Is Course + Rounded Sand Is Course
20.0							
21.0 22.0	11:01 9-14-95 ~~401213~~ 410213	3 4 6 7	21"	Lean Clay Trace Sand (2.5 Y 4/4) Olive Brown, Moist, Soft, Mottled w/ Brown, Fill Becoming Med. Stiff @ 21.0 ft Sand Becomes Coarser w/Depth	CL	.5 1.0	2" O.D. Split Spoon

NOTES: See Pg #1

*ILLUS/MISC/GEOTECH/LITHO LOG-PG 2.EPS

1-17-96

200310G2165-005

FEMP
LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation OU2 Wash Units

PROJECT NUMBER: 20.03.10

BORING NUMBER: G2-165

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
22.5 23.0 24.0	1342 9-14-95 410215 ~~401215~~	4 6 10	10.5"	Lean Clay w/sand (5Y 4/3) Olive Brown, Moist, Med. Stiff, Occasional Gravel (3/4" to 1.5" Diam; Angular to Subangular), occasionally Mottled w/ Yellowish Brown, Fill	CL	1.0	2" O.D. Split Spoon Rock Caught In Sand Catcher
25.0							
26.0	1321 9-14-95 410217 ~~401217~~	6 6 8	4"	SAA (5Y 4/4) Olive Brown /w Wood Frags. Med. Stiff, Fill	CL	.75	2" O.D. Split Spoon Piece of Wood Large ~~Gravel~~ Caught In Drive Shoe, Prevented Sample Acquisition
27.0							
28.0 29.0 30.0	1335 9-14-95 410219 ~~401219~~	9 19 19	16"	Sandy Lean Clay (5Y 3/2) Dark Olive Grey, Trace Gravel (Subangular to Subrounded, 1/2"-3/4" Diam), Moist, Hard, w/ Wood Fragments, Fill 1/4" Thick Silt Seam, (Yellowish Brown) @ 28.0 ft. Bottom Of Boring 29.0 ft	CL	4.5	2" O.D. Split Spoon

NOTES: SAA - Same As Above

See Pg #1

1-17-96

Project No: PO154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-166	Drilling Method: Mobile B-61 HSA	Date Started: 09/13/95
Coordinates: N 477,532 N 1,379,488	Engineer: K. Ernst	Date Completed: 09/13/95
Ground Surface Elevation: 573.4 ft above MSL	GWL/DATE: Dry	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Gravelley clay, yellowish brown, subrounded gravel, moist, stiff, fill (GC)	410183	2.5 - 4.0	SS	7, 11, 12	6	MC
		410184	5.0 - 6.5	SS	6, 14, 11	9	MC, GS, AL
7.5	Lean clay with gravel to 1.5 inches in diameter, olive with black and light olive brown zones, moist, medium stiff to stiff CL	410185	7.5 - 9.0	SS	3, 3, 5	12	MC
	Gravel stops at 10.0 feet, clay becomes sandy	410186	10.0 - 11.5	ST	NA	15	MC, GS, AL, P,
12.5	Lean clay with sand, light olive brown, streaks of gray, few gravel to 1/4 inch diameter, moist, very stiff to hard (CL)	410188	12.5 - 14.0	SS	9, 11, 14	15	MC
		410189	15.0 - 17.0	ST	NA	0	
18.4	Sandy lean clay with gravel to 1.5 inches in diameter, dark greenish gray, some limestone fragments, moist, very hard CL	410190	17.5 - 19.5	SS (3")	15, 41, 44, 42	22	MC, GS, AL, P,
20.0	Clayey silt, yellowish brown, with sand, moist, dense (ML)						
20.5	Silty sand with gravel to 2 inches in diameter, pale brown, dry to moist, very dense SM	410191	20.5 - 21.5	SS	18, 25, 3, 3	16	MC, GS, AL
		410192	22.5 - 24.0	SS	17, 17, 22	14	MC
	Final boring depth = 24.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

CONTROL NO: 200310G2166-0004

FEMP
LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation OU2 Waste Units	PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-166	COORDINATES: NA
RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: Dry
DATE: 9-13-95	TIME: 1640
DATE STARTED: 9-13-95	
~~GEOLOGIST:~~ Engineer: K. Ernst	GROUNDWATER LEVEL: NA
DATE:	TIME:
DATE COMPLETED: 9-13-95	
WATER USED DURING DRILLING:	DRILLING CONTRACTOR: Alliance Env, Inc.
DRILLING EQUIPMENT: Mobile Drill, B-61 HSA	DRILLER/HELPER: M. Proctor/T. French

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.0				Augered to 2.5'			Gravelly, hard drilling to 2.5' pieces of concrete in auger cuttings (1½") - fill
1.0							
2.0							
3.0	~~1410~~ 1350, 9-13-95 # 410183	7-11-12	6"	Lean clay (10YR 5/6) ~~dark~~ yellowish brown ~~lean clay~~ with subrounded gravel frags moist, low plasticity, fill, stiff	CL (Fill)	1.5	2" O.D Split Spoon 2.5-4'
4.0	1355 Driller notices odor from drilling						
5.0				fill, mainly brown clay auger cuttings			3" round gravel piece, ½" red brick piece, nail augered up 2.5-5'
6.0	1358, 9-13-95, # 410184	6-14-11	9"	Top 6": Lean clay with sand and fine gravel (¼" (pea gravel, typ.) (5Y 5/4 olive) low plasticity, moist (Fill), v. stiff Bottom 3": Coarse gravel fragments (1" typical) with sand (Fill), dry	CL (Fill) GP (Fill)	3.5	2" O.D split spoon 5-6.5'
7.0	Augered to 7.5'						Augered up brown clay and olive clay, gravel from 5-7.5'
				? 7.5' - - - - - - - - - Fill - ?			
8.0	1407, 9-13-95, # 410185	3-3-5	12"	Lean clay with gravel fine to coarse, subangular 1.5" max to ⅛" typical, mottled with black and light olive brown zones, low plasticity, moist (Lean clay is (5Y 5/4) olive in color), med stiff to stiff	CL	2.0	2" O.D Split spoon 7.5-9'
9.0							
10.0							

INSTRUMENT	BACKGROUND	DATE	TIME
PID	0	9-13-95	1350
ALPHA	N/A	N/A	N/A
BETA/GAMMA	50 cpm	9-13-95	1350

NOTES: HSA = Hollow stem Auger 4¼" ID

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*R:\US\MISC\GEOTECH\JTHO LOG.EPS

REVIEWED BY JL DATE 1-17-96

20030G2166-005

FEMP LITHOLOGIC LOG

PROJECT NAME: OU2 Geotechnical Investigation Waste Unit

PROJECT NUMBER: 20.03.10

BORING NUMBER: G2-166

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
10.0	1447, 9-13-95, #410186	P_{u} sh	15"	Sandy lean clay, olive brown (2.5Y 4/4) mottled with gray, sand is fine to medium, low plasticity, moist, very stiff	CL	4.0 (on bot of tube)	Shelby Tube, 3" O.D. 18" push 150 psi 1st 6" 300 psi 2nd 6" rig starts to lift at 13"
11.0				11.5' Description above is from bottom of shelby tube			
12.0							#410187 is jar archive from bot of Shelby Tube
13.0	1455, 9-13-95, #410188	9-11-14	15"		CL	4.5	Split-spoon, 2" O.D. 12.5-14'
14.0				Lean clay with sand, light olive brown (2.5Y5/3), streaks of gray (2.5Y5/1) few gravel, fine, 1/4" typical, subround to subangular low plasticity, moist, hard to v. stiff			Augered to 15'
15.0							
16.0	1507, 9-13-95, #410189 (Archive) Jar only	P_{u} sh		From material Jug from crushed tube Lean clay with sand and gravel, gravel fine to coarse 3/4" to 1/8" typical, subangular to angular, low plasticity, moist, light olive brown (2.5Y 5/3)	CL	-	3" O.D. Shelby Tube 24" push 300 psi - 6" (1st 450 psi - 2nd 6" 700 psi - last 12" Shelby Tube crushed, seam flattened 2' of length
17.0							
18.0	1525, 9-13-95, #410190	15-41-44-42 (1)	22"	Top 10" Lean clay with sand and gravel (3/4" to 1/8" typical) light olive brown (2.5Y 5/3), subround to subangular, low plasticity, moist, gray mottling, iron stains, v. stiff	CL	3.75	3" O.D. Stainless steel split spoon
				18.4' Bottom 12": Sandy lean clay with gravel, dark greenish gray (10Y 4/1), gravel scattered (1 1/2" fossil fragment (limestone) to 1/8" subangular to subround fine gravel, low plasticity, moist, hard	CL	>4.5	(1) Note: Blows are not SPT blow counts; 140 lb hammer used for sample recovery
20.0	1542, 9-13-95, #410191	18-25-33	16"	20.5' Top 4": Slaty silt to 5/6 yellowish brown with sand fine to coarse, low plasticity, moist, dense	ML	>4.5	
21.0				Poorly graded sand with gravel, sand is fine to coarse, gravel is subrounded to subangular, dry to moist, color is (10YR 6/3), pale brown, typical gravel size 1/8" to 2", Very Dense	SP	-	Split spoon 2" O.D. 20-21.5' #410190 is sand and gravel 20.5-21.5' 2" subround piece of gravel in spoon
22.0							

NOTES: SPT = Standard Penetration Test

ILLUS/MISC/GEOTECH/LITHO LOG-PG 2.EPS

000190

REVIEWED BY JL DATE 1-17-96

2003106216 6-006

FEMP
LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation OU2 Waste Units

PROJECT NUMBER: 20.03.10

BORING NUMBER: G2-166

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
22.5							
23.0	1556, 9-13-95 410192	17 17 ~~22~~ 22	14"	Same as Above	SP	—	2" O.D split Spoon
24.0				Bottom of boring = 24'			
25.0							

NOTES:

Project No: PO154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-167	Drilling Method: Mobile B-61 HSA	Date Started: 09/18/95
Coordinates: N 477,895 E 1,379,603	Geologist: R. Nicks	Date Completed: 09/19/95
Ground Surface Elevation: 580.3 ft above MSL	GWL/DATE:	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Clayey gravel with sand, dark brown, very stiff, moist, with some sand and scattered gravel to 3 inches in diameter, fill GC	410327	2.5 - 4.0	SS	6, 11, 50	10	MC, GS, AL
5.3	Fat clay, dark yellowish brown, very stiff, moist (CH)	410328	5.0 - 6.5	SS	2, 6, 11	14	MC
8.3	Lean clay, yellowish brown, very stiff, moist, with silt layers to 3 inches from 10.5 to 13.5 feet, CL	410329	7.5 - 9.5	ST	NA	21	MC, GS, AL, P,
		410330	10.0 - 11.5	SS	4, 10, 11	17	MC
		410331	12.5 - 13.0	SS	2, 10, 9	18	MC
13.5	Alternating layers of fat clay, brown, and lean clay, grayish brown, stiff to very stiff, moist to wet (CH) and CL	410332	15.0 - 16.5	SS	3, 10, 16	18	MC, GS, AL
17.5	Clayey silt, grayish brown, stiff, wet (ML)	410333	17.5 - 19.0	SS	7, 9, 12	13	MC
		410334	20.0 - 21.5	SS	5, 8, 10	15	MC
20.0	Sandy lean clay, dark grayish brown, very stiff, moist (CL) Becoming dark gray with scattered gravel at 22.5 feet	410335	22.5 - 24.0	SS	6, 12, 20	15	MC
	Final boring depth - 24.0 feet						
	*Note: USCSt Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

FEMP
LITHOLOGIC LOG

Page 1 of 2

CONTROL NO: 2003IOG2167-002A

PROJECT NUMBER: 20.03.10

PROJECT NAME: ~~G2 +~~ Geotechnical Investigation Borrow Areas/OU2 Waste Units

RELATED FAL NOs.: 2003IOG2167-001 thru 014

BORING NUMBER: G2-167

COORDINATES: See Survey Report

DATE STARTED: 9/18/95

SURFACE ELEVATION: See Survey Report

GROUNDWATER LEVEL: N/k — DMS 4-10-96 | DATE: | TIME:

DATE COMPLETED: ~~9/19/95~~ 9-18-95

GEOLOGIST: R. Nicks

GROUNDWATER LEVEL: N/k - DMS - 4-10-96 | DATE: | TIME:

DRILLER/HELPER: Ed. Miller,

WATER USED DURING DRILLING: None

DRILLING CONTRACTOR: Alliance

DRILLING EQUIPMENT: Mobile B-61

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				Lean Clay 10YR 3/3 dk. brn., v. stiff, moist with some sand and scat. gravel to 3"	CL		Ground surface irregular, hummocky and rutted.
							Hair roots @ 3"
	1000 9/18/95 410329	6 11 50-for 5"	10"	10YR 3/2 v. dk. grayish brown @ 3"		4.5	Rock in tip
5	1010 9/18/95 410328	2 6 11	14"	Clay 10YR 4/4 dk. yel. brn, v. stiff, moist 10YR 4/4 @ 6"	CH	3.25	
	1020 9/18/95 410329	NA	21"	Lean Clay 10YR 5/4 yellowish brown, v. stiff moist	CL	4.5	top of Grout seal @ 10'4"
10	1040 9/18/95 410330	4 10 11	17"	with silt layers to 3" 10YR 5/8 yellowish brown, v. stiff, moist to wet		3.0-4.0	
							← ½" outlet
	1050 9/18/95 410331	2 10 9	18"	Clay 10YR 5/3 brown, v. stiff, moist	CH	2.5-3.25	← Bottom of grout seal 14"
				Lean Clay 10YR 5/2 grayish brown stiff to v. stiff with wet silt laminae to ½"	CL	2.0	
15	1507 9/18/95 410332	3 10 16	18"	Clay 10YR 4/1 dark gray, stiff to v. stiff wet	CH	1.25-2.00	
				Lean Clay 10YR 5/2 grayish brown v. stiff wet	CL	2.0-2.0	
	1515 9/18/95 410333	7 9 12	13"	Clayey Silt 10YR 5/2 grayish brown, stiff wet w/laminae of lean clay to ½"	ML	1.25-1.5	

INSTRUMENT	BACKGROUND	DATE	TIME
PID	N/k DMS 4-10-96	9-18-95	09:00
ALPHA	/— N/A	DMS 4-10-96	
BETA/GAMMA	/- N/k	DMS 4-10-96	

NOTES: Drill w/14" auger to 14' pull back 1 ft Grout w/ "Hole Plug" to 10'4" (3'8" plugs) let bentonite hydrate seal (hydrate ≈ 8 hrs.) - Reenter with 8¼" auger SPT's in 14" auger (O.D.) 8¼ (I.D) may have erroneous count due to non-ASTM standard which calls for 6.5" I.D. Maximum see ASTM D 1586 sec. 5.1.3

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS\MISC\GEOTECH\LITHO LOG.EPS

N/k = Not known

N/A = Not applicable

N 4-10-96

200310G2167 ØØ3

FEMP
LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation Burrow Areas/low units waste

PROJECT NUMBER: 20.03.10

BORING NUMBER: G2-167

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
20	1534 9/18/95 410334	5 8 10	15"	Sandy Lean Clay 10YR 4/2 dk. grayish brn v. stiff, moist	CL	3.5	
	1540 9/18/95 410335	6 12 20	15"	10YR 4/1 dk. gray, w/scat. gravel to 1".		4.0	
25				Total Depth 24'			

NOTES:

JK 4-1-96

Project No: PO154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-168	Drilling Method: Mobile B-61 HSA	Date Started: 09/19/95
Coordinates: N 477,602 E 1,379,743	Geologist: R. Nicks	Date Completed: 09/19/95
Ground Surface Elevation: 576.0 ft above MSL	GWL/DATE:	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Sandy lean clay with scattered gravel to 1/2 inch in diameter, mottled, dark grayish brown, and light yellowish brown, very stiff, moist, fill (CL)	410341	0.5 - 2.0	SS	3, 13, 32	14	MC
2.5	Fat clay, dark yellowish brown, very stiff, moist CH	410342	2.5 - 4.0	SS	7, 10, 14	13	MC, GS, AL
5.2	Sandy silty clay, brownish yellow, very stiff, moist CL-ML becoming grayish brown to brown at 10 feet	410343	5.0 - 6.5	SS	8, 15, 21	14	MC
		410344	10.0 - 12.0	ST	NA	12	MC, GS, AL, P,
13.5	Silt, grayish brown, stiff, wet, with scattered gravel to 1/2 inch diameter ML	410345	12.5 - 14.0	SS	6, 8, 12	12	MC, GS, AL
		410346	15.0 - 16.5	SS	8, 8, 7	14	MC
18.7	Sand, gray, wet (SP)	410347	17.5 - 19.0	SS	4, 5, 12	12	MC
20.0	Sandy lean clay, dark gray, with scattered gravel to 1/2 inch diameter, very stiff to hard, moist (CL)	410348	20.0 - 21.5	SS	13, 16, 18	18	MC
21.5	Sand, dark yellowish brown, dense to very dense, moist (SW)	410349	22.5 - 24.0	SS	16, 22, 26	16	MC
	Final boring depth = 24.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

FEMP LITHOLOGIC LOG

CONTROL NO: 200310G2168-005

Page 1 of 2

PROJECT NAME:	Geotechnical Investigation Burrow Areas / OU2 Waste Units
PROJECT NUMBER:	20.03.10
BORING NUMBER:	G2-168
COORDINATES:	SEE Survey map
RELATED FAL NOs.:	200310G2168-001A - 004
SURFACE ELEVATION:	SEE Survey map
GROUNDWATER LEVEL:	N/K
DATE:	N/K
TIME:	N/K
DATE STARTED:	9/19/95
GEOLOGIST:	R. Nicks
GROUNDWATER LEVEL:	N/K
DATE:	N/K
TIME:	N/K
DATE COMPLETED:	9/19/95
WATER USED DURING DRILLING:	NK
DRILLING CONTRACTOR:	Alliance
DRILLING EQUIPMENT:	Mobile B-61 HSA
DRILLER/HELPER:	Ed Miller, Brian

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY* (TSF)	REMARKS
FILL	0932 9/19/95 410341	3 13 32	14"	Sandy lean clay w/scat. gravel to 1/2" v.s mottled 10yr 4/4, 10yr 3/4, dk grayish brown, lt. yellowish brown respectively v.stiff, moist.	CL	>4.5	
	0940 9/19/95 410342	7 10 14	13"	Lean Clay 10yr 4/4 dk. yel. brn., v.stiff moist.		>4.5	
5	0950 9/19/95 410343	8 15 21	14"	Clayey Silt 10yr 6/6 brownish yellow, v.stiff moist	ML	>4.5	
	1010 9/19/95 ~~410344~~ 410.96	NA	No Recovery (SH)				Shelby empty upon recovery - even after waiting 5 min.
10	1025 9/19/95 410344	NA	12"	10yr 5/4 to 10yr 5/2 gn brn - brown, v.stiff, moist		2.25	Bottom of shelby "rolled" up.
	1035 9/19/95 410345	6 8 12	12"			4.10.96 2.75	
				Silt 10yr 5/2 grayish brown, stiff, wet to 2.5y 5/2 grayish brown, 4.10.96 w/ scattered gravel to 1/2"	ML	1.75	
15	1045 9/19/95 410346	8 8 7	14"			2.0	
	1052 9/19/95 410347	4 5 12	12"	Clayey Silt 4.10.96			
				clayey Silt 2.5y 4/2 dk.gn brn firm-stiff, wet	ML	1.5	
20				Sand 2.5y 5/1 gray, liquefying, wet	SP		

INSTRUMENT	BACKGROUND	DATE	TIME
PID			
ALPHA			
BETA/GAMMA			

NOTES: 2½ Bags of Volclay and 50 gal H2O to mix grout and grout hole to within 1 ft. of surface. Expansive grout plug put in remaining foot to surface w/ ½ bag cement.

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS\MISC\GEOTECH\UTHO LOG.EPS

4.11.96

2003100G2168-006

FEMP
LITHOLOGIC LOG

PROJECT NAME:	PROJECT NUMBER:	BORING NUMBER:
GEOTECHNICAL INVESTIGATION BORROW AREAS/DUWASTE UNITS	20.D3.10	G2-168

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
20	1100 9/19/95 410348	13 16 18	18"	Sandy Lean Clay 2.5Y 4/1, w/scattered gravel to ½" v stiff to hard, moist	CL	>4.5	
				Sand 10YR 4/6 dk. yellowish brown, dense to v. dense, moist	SW		
	1112 9/19/95 410349	14 22 26	16"				
25				TOTAL DEPTH 24ft			

NOTES:

*ILLUS\MISC\GEOTECH\LITHO LOG-PG 2.EPS

4/95

JK 4/1-96

Project No: PO154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-169	Drilling Method: Mobile B-61 HSA	Date Started: 09/19/95
Coordinates: N 477,892 E 1,379,827	Geologist: R. Nicks	Date Completed: 09/19/95
Ground Surface Elevation: 578.5 ft above MSL	GWL/DATE: 1/4 inch in bottom of hole 9/21/95	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Sandy lean clay with gravel to 1-1/2 inch in diameter, olive brown, very stiff, moist (CL)	410353	0.5 - 2.0	SS	4, 7, 9	15	MC
2.0	Lean clay with trace sand, olive brown, very stiff, moist CL	410354	2.5 - 4.0	SS	7, 7, 10	14	MC, GS, AL
		410365	2.0 - 6.0	B	NA	NA	Modal Dia.
5.0	Lean clay, dark yellowish brown, very stiff, moist CL	410355	5.0 - 6.5	SS	4, 8, 8	14	MC
		410356	7.5 - 9.5	ST	NA	6	MC, GS, AL, P,
	Becoming light olive brown at 7.5 feet	410366	6.0 - 10.0	B	NA	NA	Modal Dia.
10.0	Fat clay, olive brown, very stiff, moist (CH)	410357	10.0 - 11.5	SS	4, 7, 12	20	MC
	At 12.5 feet, becomes gray	410367	10.0 - 14.0	B	NA	NA	Modal Dia.
13.5	Silt, gray, stiff to very stiff, wet (ML)	410358	12.5 - 14.0	SS	1, 4, 8	20	MC
15.0	Silty sand, dark grayish brown, very fine, very loose, wet SM	410359	15.0 - 16.5	SS	0, 2, 2	17	MC, GS, AL
17.5	Clay, gray, very stiff, moist (CH)						
18.0	Lean clay with sand, gray, stiff to very stiff, wet, scattered gravel to 1/2 inch in diameter (CL)	410360	17.5 - 19.0	SS	5, 9, 12	12	MC
		410551	20.0 - 21.5	SS	3, 4, 6	17	MC
22.0	Sandy lean clay with gravel, dark gray, very stiff to hard, moist (CL)	410552	22.5 - 24.0	SS	10, 15, 16	20	MC
		410553	24.5 - 26.0	SS	7, 30, 34	16	MC
25.5	Sand, dark yellowish brown, dense to very dense, moist (SW)						
	Final boring depth = 26.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

FEMP LITHOLOGIC LOG

CONTROL NO: 2003 10G2169-004A

Page 1 of 2

PROJECT NAME: GEOTECHNICAL INVESTIGATION BORROW AREAS / OU2 WASTE UNITS			PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-169	COORDINATES: See Survey Report	RELATED FAL NOs.: 2003 10G2169-001 thru -017	
SURFACE ELEVATION: See Survey Report	GROUNDWATER LEVEL: 1/4" in bottom of hole through	DATE: 9/21/95	TIME: 0815	DATE STARTED: 9/19/95
GEOLOGIST: R. Nicks	GROUNDWATER LEVEL: ~~open~~ N/K - Dims - 4-10-96	DATE:	TIME:	DATE COMPLETED: 9/21/95
WATER USED DURING DRILLING: None	DRILLING CONTRACTOR: Alliance	DRILLING EQUIPMENT: Mobile B-61	DRILLER/HELPER: ED MILLER, Brian, Brian	

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1420 9/19/95 410353	4 7 8	16"	Sandy Lean Clay w/ gravel to 1½" 2.5Y 4/3 olive brown, v.stiff, moist - mottled	CL	3.5	organic odor in upper 6"
	1428 9/19/95 410354	7 7 10	14"	Silty Clay w/ trace sand 2.5Y 4/4 olive brown v.stiff., moist		4.25 3.75 4.5 2.25	
5	1435 9/19/95 410355	4 8 8	14"	Clayey Silt 10YR 4/6 dk. yel. brn. v.stiff moist	ML	3.0	
	1455 9/19/95 410356	NA	6"	2.5Y 5/4 light olive brown			only 6" recovery in mid section of shelby
10	1506 9/19/95 410357	4 7 12	20"	Clay 2.5Y 4/4 olive brown, v.stiff, moist	CH	2.25	
	1517 9/19/95 410358	1 4 8	20"	10YR 5/1 Gray @ 12.5 Silt 10YR 5/1 Gray stiff to v.stiff, wet	ML	1.5 2.25	
15	1525 9/19/95 410359	0 2 2	17"	Sand 2.5Y 4/2 dk gr. brn. v.fine, v.loose wet -	SP	0.5	- mostly liquefied after some handling
	1535 9/19/95 410360	5 9 12	12"	Clay 2.5Y 4/2 v.stiff, moist Lean Clay w/ sand 2.5Y 4/2 stiff to v.stiff, wet, and scattered gravel to ½"	CH CL	3.25 2.0	
20							

1426 410555 JC 10-2-95 VAR

1055b JC 10-2-95 1525 JA

1526 410557 JC 10-2-95

INSTRUMENT	BACKGROUND	DATE	TIME
PID	N/K 4-10-96 Dims	9-19-95	07:30
ALPHA	N/A		
BETA/GAMMA	60 cpm	9-19-95	14:20

NOTES: Grouted thru hollow stem auger, pulling auger as grouting, grout to within 1 ft. of surface, place 1 grout cement plugin remaining ft. after decision as to what to do regarding thin grout ~~[illegible]~~ bags - 70 gallons, only equivalent of about 2½ bags went into hole, some grout left over.

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUSMISC\GEOTECH\UTHO LOG.EPS

N/K = Not known

N/A = Not applicable

N 4-11-96

5003100 2169-005

FEMP
LITHOLOGIC LOG

PROJECT NAME: GEOTECHNICAL INVESTIGATION BORROW AREAS/OU2 WASTE UNITS

PROJECT NUMBER: 20.03.10

BORING NUMBER: 62-169

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
20	1544 9/19/95 410361	3 4 6	17"	Lean Clay w/sand 2.5Y 4/1 dk.gr. soft to ~~firm~~ stiff wet.	CH	1.5 1.0 0.5	
	1557 9/19/95 410362	10 15 16	20"	Sandy lean Clay w/gravel 2.5Y 4/1 dk. gray v.stiff to hard moist	CL	>4.5	
25	1645 9/19/95 410363	7 20 34	16"	Sand 10YR 4/4 dk.yel brn, dense to v dense, moist	SW	2.5	1" Silt 10YR 4/6 dk.yel. brn. on top of Sand
30				TOTAL DEPTH 26'			

NOTES: 9/28/95 Cement Plus placed from surface to 18"

K 11-96

Project No: PO154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-170	Drilling Method: Mobile B-61 HSA	Date Started: 09/05/95
Coordinates: N 477,420 E 1,379,864	Geologist: J. Erjavec	Date Completed: 09/05/95
Ground Surface Elevation: 576.7 ft above MSL	GWL/DATE:	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. *Colors identified using Munsell Color Chart. Consistency based on Standard* Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	*Laboratory Tests*
0	Sandy silt ML, silty sand SM (fly ash and bottom ash), black, loose to medium dense, dry	410101	2.5 - 4.0	SS	10, 11, 12	17	MC
		410102	4.5 - 6.0	SS	7, 13, 13	18	MC, GS, AL, CON_{res}
		410103	7.5 - 9.0	SS	6, 10, 13	16	MC, GS, AL
10.0	Lean clay with sand, trace gravel, light olive brown, trace organics, trace gravel, very stiff, moist to wet CL	410104	10.0 - 11.5	SS	13, 26, 30	17	MC
		410105	12.5 - 14.0	SS	10, 15, 22	20	MC, GS, AL
	Becoming hard to very hard at 12.5 feet	410106	15.0 - 17.0	ST	NA	17	MC, GS, AL, P,
		410108	17.5 - 19.0	SS	11, 31, 30	16	MC
20.0	Lean clay, dark greenish gray, layers of yellowish brown, moist, stiff (CL)	410109	20.0 - 21.5	SS	18, 26, 48	19	MC
21.3	Poorly graded sand, yellowish brown, dense, moist (SP)	410110	23.5 - 25.0	SS	26, 27, 28	15	MC
	Final boring depth = 25.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification *Coordinates are NAD 1927*						

FEMP
LITHOLOGIC LOG

CONTROL NO: 200310G2170-004

Page 1 of 2

PROJECT NAME: GEOTECHNICAL INVESTIGATION BORROW AREAS/OU2 WASTE UNITS PO-154 BORROW STUDY

PROJECT NUMBER: WBS 20.63.10

BORING NUMBER:	COORDINATES:	RELATED FAL NO.:
G2-170	SEE survey map	200310G2170-002

SURFACE ELEVATION:	GROUNDWATER LEVEL:	DATE:	TIME:	DATE STARTED:
SEE Survey map	N/K	N/K	13:50	9/5/95

GEOLOGIST:	GROUNDWATER LEVEL:	DATE:	TIME:	DATE COMPLETED:
Jim Eipavec	N/K	N/K	16:24	9/5/95

WATER USED DURING DRILLING:	DRILLING CONTRACTOR:	DRILLING EQUIPMENT:	DRILLER/HELPER:
None	Alliance Env., Inc.	Mobile B-61, HSA	M Proctor/Bryan Clough/L. Fo[illegible]

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
2							Augured to 2.5' black ash
4	13:54 9/5/95 410101	-10 -11 -12	17"	Friable, black ash with some sand (2.5Y; 2.5/1), trace gravel (fine), loose to ~~med dense~~, dry	SM		SS 2" OD 2.5-4'
6	14:00 9/5/95 410102	-7 -13 -13	18"	Friable, black ash with some sand & (dry) trace gravel (fine) (2.5Y; 2.5/1) * (Actual 4.5-6.0') Trace iron staining, loose to med dense	SM		Augured SS. 4.5-6.5'*
8	14:15 9/5/95 410103	-6 -10 -13	16"	9" of friable black ash with some sand & gravel (wet) (fine) 7" of light olive brown clay (2.5Y; 5/4) low plasticity, mottled, trace organics & iron staining, moist Aquifer, very stiff to hard	CL	3.5-5.0	Augured SS 7.5-9.0'
10	14:31 9/5/95 410104	-13 -26 -30	17"	light olive brown clay (2.5Y; 5/4) wet to moist, mottled, trace organics, trace gravel low plasticity, very stiff	CL	2.5	Augured S.S 10.0-11.5'
12							Augured
14	14:39 9/5/95 410105	-18 -25 -22	20"	light olive brown (2.5Y, 5/3) clay, moist, low-med plasticity, stiff, trace fine gravel, trace gray v.f. sand stringers, trace organics (black); silt? hard to very hard	CL	4.0 to >5	S.S 12.5-14.0'
16	15:30 9/5/95 410106		17"	light olive brown clay (2.5Y; 5/4), with some gravel (fine-med) + some brown sand, silt? low plasticity, moist, stiff, hard to very hard	CL	4.0 to >5.0	Augured Shelby Tube 15-17.0' 150lbs 6"/350 6"/[illegible] 410107 (15:32) Augured (8-2[illegible]
18	15:42 9/5/95 410108	-11 -31 -30	16"	light olive brown clay (2.5Y, 5/4) with some gravel (fine-med) + some dark gray clay. Trace sand. Moist - low-med plasticity, hard to very hard	CL	4.0 to >5.	Augured S.S. 17.5-19.0'
20							Augured

INSTRUMENT	BACKGROUND	DATE	TIME
PID	0 ppm	9-5-95	
ALPHA	N/A	N/A	N/A
BETA/GAMMA	'r cpm	9-5-95	N/A

NOTES:

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUSTMISC/GEOTECH/LITHO LOG EPS

D GW

2003G2170-005

FEMP
LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation Borrow ~~Area Study~~ Area/OU2 Waste Units

PROJECT NUMBER: 20.03.10

BORING NUMBER: G2-170

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
20	16:52 9/5/95 910107	-18 -26 -48	19"	Some gravel (fine) silt?, trace sand. 12" ~~dark~~ greenish gray clay (10Y; 4/1) moist, stiff, hard. 5" yellowish brown clay, some sand (10YR; 5/6) moist, ~~loose~~ → GMA? 2" brown, poorly graded sand, friable, moist (10YR; 5/6) med sand, ~~medium~~ iron staining? dense	CL SP	5 clay	20-21.5' SS ~~20.5-22.0~~ JE 4.11.96
22				to yellowish brown (5/4) JE 4.11.96 ~~light yellowish brown~~ (10YR; 6/4)			Augered ~~22.5-23~~ 4.11.96 JE
24	16:24 9/5/95 910116	-26 -27 -28	15"	Sand, med-coarse grained sand w. little gravel, poorly graded, well sorted, moist GMA ~~medium dense~~	SP		23.5-25.0' SS JE
25				BOB 25'			

NOTES:

W 1.96

Project No: PO154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-171	Drilling Method: Mobile B-61 HSA	Date Started: 09/06/95
Coordinates: N 477,315 E 1,380,039	Geologist: J. Erjavec	Date Completed: 09/06/95
Ground Surface Elevation: 592.2 ft above MSL	GWL/DATE: Dry	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Silty sand (ash), black, loose to medium dense, dry to moist SM	410111	2.5 - 4.0	SS	8, 8, 7	17	MC
		410112	5.0 - 6.5	SS	9, 8, 12	17	MC, GS, AL
		410113	7.5 - 9.0	SS	6, 5, 8	19	MC
		410114	10.0 - 11.5	SS	6, 6, 11	16	MC
		410115	12.0 - 14.0	SS	8, 7, 5, 5	21	MC, GS, AL, CON_{r85}
	Becomes wet at 17.5 feet	410116	15.0 - 16.5	SS	0, 1, 1	11	MC
18.2	Lean clay with sand, light olive brown, moist, stiff to very stiff CL	410117	17.5 - 19.0	SS	0, 1, 3	14	MC, GS, AL
		410118	20.0 - 21.5	SS	4, 19, 14	22	MC
	Trace of fine gravel and sand at 20 feet	410119	22.5 - 24.5	ST	NA	3	
	Clayey sand seam at 27.0 feet	410120	25.0 - 27.0	ST	NA	21	MC, GS, AL
30.0	Sandy, silty clay, greenish gray, wet, stiff to very stiff CL-ML	410122	30.0 - 31.5	SS	7, 12, 6	17	MC, GS, AL, P,
		410123	32.5 - 34.0	SS	11, 17, 19	17	MC
	Becoming dark greenish gray at 32.5 feet	410124	35.0 - 36.5	SS	10, 12, 25	19	MC
36.3	Poorly graded sand, trace gravel, yellowish brown to brown, moist, dense (SP)	410125	37.5 - 39.0	SS	12, 18, 20	11	MC
		410126	40.0 - 41.5	SS	15, 20, 25	17	MC
		410127	42.5 - 44.0	SS	20, 21, 25	16	MC
	Final boring depth = 44.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

FEMP LITHOLOGIC LOG

CONTROL NO: 200308G2171-005

PROJECT NAME: Geotech Investigation OU2 Waste Units / Borrow Areas			PROJECT NUMBER: 20.03.01
BORING NUMBER: G2-171 AFP	COORDINATES: SEE survey map	RELATED FAL NOs.: 200310G2171-002 Thru 004	
SURFACE ELEVATION: SEE survey map	GROUNDWATER LEVEL: DRY	DATE: 9/6/95	TIME: 10:01	DATE STARTED: 9/6/95
GEOLOGIST: Jim Erjavec	GROUNDWATER LEVEL: N/K	DATE: N/K	TIME: 15:35	DATE COMPLETED: 9/6/95
WATER USED DURING DRILLING: None	DRILLING CONTRACTOR: Alliance, Env. Inc	DRILLING EQUIPMENT: Mobile B-61, HSA	DRILLER/HELPER: M. Proctor / B. Clough / L. Fortney	

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
2							Augered to 2.5' stand 20 ppm PID 1.8 background, black ash
4	10:12 9/6/95 41Ø111	-8 -8 -7	17"	friable, black ash (2.5Y; 2.5/1) with some sand + trace gravel (fine), loose to med dense, dry to moist	SM		SS 2" OD 2.5-4'
							Augered SS 5.0-6.5
6	10:20 9/6/95 41Ø112	-9 -8 -12	17"	friable black ash (2.5Y; 2.5/1) with some sand (v fine to fine) + silt, loose to med dense, moist to dry. Trace gravel (fine)	SM		
							Augered SS 7.5-9.0
8	10:26 9/6/95 41Ø113	-6 -5 -8	19"	friable black ash (2.5Y; 2.5/1) with some sand (v fine) + trace gravel (fine), loose to med dense, moist to dry.	SM		
							Augered SS 10.0-11.5
10	10:35 9/6/95 41Ø114	-6 -6 -11	16"	friable black ash (2.5Y/2.5/1) with trace sand (v fine) + trace gravel (fine), loose to med dense appearance now lite charcoal in color, moist/dry	SM		
							Augered SS 12.0-14.0
12	10:51 9/6/95 41Ø115	-8 -7 -5 -5	21"	friable black ash (2.5Y/2.5/1) with trace sand (v fine) + trace gravel (fine), loose to med dense, moist to dry	SM		
							Augered SS 15-16.5
16	10:57 9/6/95 41Ø116	-0.5 -0.5 -1	11"	friable black ash (2.5Y/2.5/1) with some sand (v f-f) + trace gravel (fine) loose to med dense, moist. Blue cement grab. not visible, suspect void in sediment.	SM		
							Augered SS 17.5-19.0
18	11:04 9/6/95 41Ø117	-.5 -.5 -3	14"	friable black ash (2.5Y/2.5/1) with some sand (v f-f) + trace gravel (fine), loose to med dense, wet 6" light olive brown clay (2.5Y-5/4), moist, low-med plasticity, mottled, a bit to very stiff	SM CL	25	
20							Augered

INSTRUMENT	BACKGROUND	DATE	TIME
PID			
ALPHA			
BETA/GAMMA			

NOTES:

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ELUS\MISC\GEOTECH\LITHO LOG EPB

200310G2171-006

FEMP
LITHOLOGIC LOG

PROJECT NAME: Geotech. Investig. Borrow Areas / OU2 waste units

PROJECT NUMBER: 20.03.01

BORING NUMBER: G2-171

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
20	12:47 9/6/95 410118	-4 -9 -14	22"	Light olive brown clay (2.5Y-5/4) with some sand (cg-fg) + trace gravel (fine) moist, very stiff, low plasticity, ~1" Ash slough in top of core	CL	2.5-4.0	SS 20-21.5
22							Augered ST 22.5-24.5' 150-1546" 800-End 12" 600-800 3.46" ~~410120 Archived~~ JE
24	13:21 9/6/95 410119 Archived		3"	Light olive brown clay (2.5Y-5/4) with some (mottled) sand (cg-fg) + silt. moist. Very stiff (est) (VIS.) Ash slough in top of ST	CL		
26	13:46 9/6/95 410120	ST SAMPLE INTAKE	21"	25-27' ST		4.10	Augered ST 25.0'-27.6' JE 300-500-800 PC
				Light olive brown sandy clay (2.5Y-5/4) with gravel (coarse to fine), wet. (~~sandy~~ or clayey sand)	SC or CL/SP		~~SS 26.0-27.5~~ ~1" bottom cmp ST wet 410121 Archived JE 4.10.96
28							Augered to 30'
30	14:05 9/6/95 410122	-7 -12 -6	17"	Greenish Gray clay (10G/5/1) with pockets of brown fg-mg sand. wet, low plasticity, ~~stiff~~ to very stiff. Sand (10YR-4/4) (dark yellowish brown)	CL	2.5-3.0	SS 30-31.5
32							
	14:36 9/6/95 410123	-11 -17 -19	17"	Dark Greenish gray clay (10G-4/1) with coarse gravel & trace sand (mg-cg). Very hard, wet to moist, low plasticity, ~~organic odor~~ (plants)	CL	>5	SS wet- 32.5-34.0
34							
36	14:45 9/6/95 410124	-10 -12 -25	19" (16")	Dark greenish gray clay (10Y-4/1) some gravel (fine to medium), moist v. hard, low plasticity, ~~organic matter (plant stems)~~	CL	>5	SS 35.0-36.5
				3" Dark yellowish brown clay with trace sand & some silt (10YR-4/4), moist, ~~stiff~~ (poss. top Gnd)			~36.3±1'
38	~~14:57~~ 15:00 9/6/95 410125	-12 -18 -20	11"	yellowish brown fine-cg sand (10YR/5/4), trace gravel (fine-med), moist, poorly graded, med dense to dense, well sorted	SP		SS 37.5-39.0
40	15:15 9/26/95 410126	-15 -20 -25	17"	Brown cg to fg sand with gravel (fine to coarse) (10YR-5/3), moist, poorly graded, dense, well sorted, ~~grades at base~~ med grained to fine grained in horizontal transitions.	SP		SS 40.0-41.5
42	15:37 9/26/95 410127	-20 -21 -25	16"	Brown cg to fg sand with gravel (fine to coarse, yellowish-orange-brown), moist, poorly graded, ~~fine, well sorted~~	SP		SS 42.5-44.0
				DUB 44			

NOTES: *1 Sample at end of Shelby not sufficient to make determination between sandy clay or clayey sand.

GEOTECHNICAL TEST BORING LOGS FROM PRIOR INVESTIGATIONS

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-001	COORDINATES: FS 4690.95 FE 2351.67	DATE STARTED: 04/15/93
GEOLOGIST: J. HANEY	ELEVATION: 541.05 FT	DATE COMPLETED: 04/16/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 1 OF 5

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLE	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
0.5	#1/1 1016hrs	2	6	SANDY CLAY - SOFT, VERY DARK GRAYISH BROWN (10YR 3/2), LOW PLASTICITY, MOIST		0.5	Hnu = 20 ppm B/G = 50 cpm 2" O.D. S.S., 140# Hammer
1.0	#1/1 1016hrs	2	3	SANDY CLAY - SOFT, VERY DARK GRAYISH BROWN (10YR 3/2), LOW PLASTICITY, MOIST			Hnu = 20 ppm B/G = 50 cpm 2" O.D. S.S., 140# Hammer
1.5	#1/1 1016hrs	2	-				
2.0	#1/1 1016hrs	3	-				
2.5	#1/2 1022hrs	SHELBY TUBE	6	SANDY LEAN CLAY - SOFT, BROWN (7.5YR 4/4), LOW PLASTICITY, MOIST	CL		Hnu = 20 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
3.0	#1/2 1022hrs		6	SANDY LEAN CLAY - SOFT, BROWN (7.5YR 4/4), LOW PLASTICITY, MOIST	CL		Hnu = 20 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
3.5	#1/2 1022hrs		6	SANDY LEAN CLAY - SOFT, BROWN (7.5YR 4/4), LOW PLASTICITY, MOIST	CL		Hnu = 20 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
4.0	#1/2 1022hrs		6	SANDY LEAN CLAY - SOFT, BROWN (7.5YR 4/4), LOW PLASTICITY, MOIST	CL		Hnu = 20 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
4.5	#1/3 1035hrs	2	6	SANDY LEAN CLAY - SOFT, BROWN (7.5YR 4/4), LOW PLASTICITY, MOIST		0.5	Hnu = 19 ppm B/G = 50 cpm 2" O.D. S.S., 140# Hammer
5.0	#1/3 1035hrs	2	6	SILTY SAND - LOOSE, DARK YELLOWISH BROWN (10YR 4/4), TRACE GRAVEL (.25 - .75 IN), MOIST			Hnu = 19 ppm B/G = 50 cpm 2" O.D. S.S., 140# Hammer
5.5	#1/3 1035hrs	5	-				
6.0	#1/3 1035hrs	6	-				
6.5	#1/4 1048hrs	6	6	SILTY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), TRACE GRAVEL (.25 - .75 IN), MOIST			Hnu = 20 ppm B/G = 50 cpm 2" O.D. S.S., 140# Hammer
7.0	#1/4 1048hrs	7	6	SILTY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), TRACE GRAVEL (.25 - .75 IN), MOIST			Hnu = 20 ppm B/G = 50 cpm 2" O.D. S.S., 140# Hammer

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-001	COORDINATES: FS 4690.95 FE 2351.67	DATE STARTED: 04/15/93
GEOLOGIST: J. HANEY	ELEVATION: 541.05 FT	DATE COMPLETED: 04/16/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 2 OF 5

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLE	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
7.5	#1/4 1048hrs	6	-				
8.0	#1/4 1048hrs	11	-				
8.5	#1/5 1055hrs	13	6	SILTY SAND - DENSE, DARK YELLOWISH BROWN (10YR 4/4), TRACE GRAVEL (.25 - .75 IN), MOIST			Hnu = 20 ppm B/G = 50 cpm 2" O.D. S.S., 140# Hammer
9.0	#1/5 1055hrs	16	6	SILTY SAND - DENSE, DARK YELLOWISH BROWN (10YR 4/4), TRACE GRAVEL (.25 - .75 IN), MOIST			Hnu = 20 ppm B/G = 50 cpm 2" O.D. S.S., 140# Hammer
9.5	#1/5 1055hrs	26	6	SILTY SAND, GRAVELLY - DENSE, DARK YELLOWISH BROWN (10YR 4/4), APPROX. 20% GRAVEL (.25 - .75 IN), MOIST			Hnu = 20 ppm B/G = 50 cpm 2" O.D. S.S., 140# Hammer
10.0	#1/5 1055hrs	23	-				
10.5	#1/6 1110hrs	31	6	SILTY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), MOIST	SM		Hnu = 20 ppm B/G = 50 cpm 3" O.D. S.S., 140# Hammer
11.0	#1/6 1110hrs	22	6	SILTY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), MOIST	SM		Hnu = 20 ppm B/G = 50 cpm 3" O.D. S.S., 140# Hammer
11.5	#1/6 1110hrs	15	6	SILTY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), MOIST	SM		Hnu = 20 ppm B/G = 50 cpm 3" O.D. S.S., 140# Hammer
12.0	#1/6 1110hrs	16	6	SILTY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), MOIST	SM		Hnu = 20 ppm B/G = 50 cpm 3" O.D. S.S., 140# Hammer
12.5	#1/7 1130hrs	19	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), SAND WELL GRADED, APPROX. 10% GRAVEL (.25 - 1.0 IN), MOIST			Hnu = 20 ppm B/G = 50 cpm 3" O.D. S.S., 140# Hammer
13.0	#1/7 1130hrs	18	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), SAND WELL GRADED, APPROX. 10% GRAVEL (.25 - 1.0 IN), MOIST			Hnu = 20 ppm B/G = 50 cpm 3" O.D. S.S., 140# Hammer
13.5	#1/7 1130hrs	17	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), SAND WELL GRADED, APPROX. 10% GRAVEL (.25 - 1.0 IN), MOIST			Hnu = 20 ppm B/G = 50 cpm 3" O.D. S.S., 140# Hammer
14.0	#1/7 1130hrs	23	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), SAND WELL GRADED, APPROX. 10% GRAVEL (.25 - 1.0 IN), MOIST			Hnu = 20 ppm B/G = 50 cpm 3" O.D. S.S., 140# Hammer

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-001	COORDINATES: FS 4690.95 FE 2351.67	DATE STARTED: 04/15/93
GEOLOGIST: J. HANEY	ELEVATION: 541.05 FT	DATE COMPLETED: 04/16/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 3 OF 5

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLE	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
14.5	#1/8 1137hrs	20	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), SAND WELL GRADED, APPROX. 10% GRAVEL (.25 - .50 IN), MOIST			Hnu = 20 ppm B/G = 50 cpm 3" O.D. S.S, 140# Hammer
15.0	#1/8 1137hrs	14	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), SAND WELL GRADED, APPROX. 10% GRAVEL (.25 - .50 IN), MOIST			Hnu = 20 ppm B/G = 50 cpm 3" O.D. S.S, 140# Hammer
15.5	#1/8 1137hrs	17	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), SAND WELL GRADED, APPROX. 10% GRAVEL (.25 - .50 IN), MOIST			Hnu = 20 ppm B/G = 50 cpm 3" O.D. S.S, 140# Hammer
16.0	#1/8 1137hrs	21	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), SAND WELL GRADED, APPROX. 10% GRAVEL (.25 - .50 IN), MOIST			Hnu = 20 ppm B/G = 50 cpm 3" O.D. S.S, 140# Hammer
16.5	#1/9 1150hrs	14	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), SAND WELL GRADED, APPROX. 10% GRAVEL (.25 - .50 IN), MOIST			Hnu = 15 ppm B/G = 50 cpm 3" O.D. S.S, 140# Hammer
17.0	#1/9 1150hrs	19	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), SAND MEDIUM GRAINED - POORLY GRADED, TRACE GRAVEL (.25 - .50 IN), MOIST			Hnu = 15 ppm B/G = 50 cpm 3" O.D. S.S, 140# Hammer
17.5	#1/9 1150hrs	27	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), SAND MEDIUM GRAINED - POORLY GRADED, TRACE GRAVEL (.25 - .50 IN), MOIST			Hnu = 15 ppm B/G = 50 cpm 3" O.D. S.S, 140# Hammer
18.0	#1/9 1150hrs	30	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), SAND MEDIUM GRAINED - POORLY GRADED, TRACE GRAVEL (.25 - .50 IN), MOIST			Hnu = 15 ppm B/G = 50 cpm 3" O.D. S.S, 140# Hammer
18.5	#1/10 1320hrs	SHELBY TUBE	6	SAND - UNCONSOLIDATED (HEAVING), DARK YELLOWISH BROWN (10YR 4/4), SAND MEDIUM GRAINED - POORLY GRADED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu = 20 ppm B/G = 50 ppm 3" O.D. SHELBY, 18" PUSH
19.0	#1/10 1320hrs		6	SAND - UNCONSOLIDATED, DARK YELLOWISH BROWN (10YR 4/4), SAND MEDIUM GRAINED - POORLY GRADED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu = 20 ppm B/G = 50 ppm 3" O.D. SHELBY, 18" PUSH
19.5	#1/10 1320hrs		6	SAND - UNCONSOLIDATED, DARK YELLOWISH BROWN (10YR 4/4), SAND MEDIUM GRAINED - POORLY GRADED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu = 20 ppm B/G = 50 ppm 3" O.D. SHELBY, 18" PUSH
20.0							AUGERED 20 - 23 FT
20.5							
21.0							

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-001	COORDINATES: FS 4690.95 FE 2351.67	DATE STARTED: 04/15/93
GEOLOGIST: J. HANEY	ELEVATION: 541.05 FT	DATE COMPLETED: 04/16/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 4 OF 5

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLE	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
21.5							
22.0							
22.5							
23.0							
23.5	#1/11 1333hrs	31	6	SAND - DENSE, DARK YELLOWISH BROWN (10YR 3/4), MEDIUM GRAINED - POORLY GRADED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu = 20 ppm B/G = 50 cpm 3" O.D. S.S., 140# Hammer
24.0	#1/11 1333hrs	27	6	SAND - DENSE, DARK YELLOWISH BROWN (10YR 3/4), MEDIUM GRAINED - POORLY GRADED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu = 20 ppm B/G = 50 cpm 3" O.D. S.S., 140# Hammer
24.5	#1/11 1333hrs	33	6	SAND - DENSE, DARK YELLOWISH BROWN (10YR 3/4), MEDIUM GRAINED - POORLY GRADED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu = 20 ppm B/G = 50 cpm 3" O.D. S.S., 140# Hammer
25.0	#1/11 1333hrs	32	-				
25.5							AUGERED 25 - 28 FT
26.0							
26.5							
27.0							
27.5							
28.0							

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PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-001	COORDINATES: FS 4690.95 FE 2351.67	DATE STARTED: 04/15/93
GEOLOGIST: J. HANEY	ELEVATION: 541.05 FT	DATE COMPLETED: 04/16/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 5 OF 5

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLE	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
28.5	#1/12 1352hrs	35	6	WELL GRADED SAND WITH SILT - DENSE, DARK YELLOWISH BROWN (10YR 4/4), WET	SW-SM		Hnu = 20 ppm B/G = 50 cpm 3" O.D. S.S., 140# Hammer
29.0	#1/12 1352hrs	32	6	WELL GRADED SAND WITH SILT - DENSE, DARK YELLOWISH BROWN (10YR 4/4), WET	SW-SM		Hnu = 20 ppm B/G = 50 cpm 3" O.D. S.S., 140# Hammer
29.5	#1/12 1352hrs	37	3	WELL GRADED SAND WITH SILT - DENSE, DARK YELLOWISH BROWN (10YR 4/4), WET	SW-SM		Hnu = 20 ppm B/G = 50 cpm 3" O.D. S.S., 140# Hammer
30.0	#1/12 1352hrs	40	-				
30.5							AUGERED 30 - 33 FT
31.0							
31.5							
32.0							
32.5							
33.0							
33.5	#1/13 1414hrs	27	6	WELL GRADED SAND WITH SILT - DENSE, DARK YELLOWISH BROWN (10YR 4/4), WET	SW-SM		Hnu = 20 ppm B/G = 50 cpm 3" O.D. S.S., 140# Hammer
34.0	#1/13 1414hrs	34	6	WELL GRADED SAND WITH SILT - DENSE, DARK YELLOWISH BROWN (10YR 4/4), WET	SW-SM		Hnu = 20 ppm B/G = 50 cpm 3" O.D. S.S., 140# Hammer
34.5	#1/13 1414hrs	36	-				
35.0	#1/13 1414hrs	34	-				

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT) . ALL FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-002	COORDINATES: FS 4763.54 FE 2351.67	DATE STARTED: 04/20/93
GEOLOGIST: J. HANEY	ELEVATION: 577.09 FT	DATE COMPLETED: 04/21/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 1 OF 8

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
0.5	#2/1 1202hrs	2	6	SILTY CLAY - MEDIUM STIFF, DARK OLIVE GRAY (5Y 3/2), MODERATELY PLASTIC, MOIST		2.0	Hnu = .5 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
1.0	#2/1 1202hrs	3	6	SILTY CLAY - MEDIUM STIFF, DARK OLIVE GRAY (5Y 3/2), MODERATELY PLASTIC, TRACE GRAVEL (.25 - 1.0 IN), MOIST		3.0	Hnu = .5 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
1.5	#2/1 1202hrs	5	4	GRAVELLY CLAY, SILTY - MEDIUM STIFF, DARK OLIVE GRAY (5Y 3/2) WITH OLIVE BROWN (2.5Y 4/4) MOTTLE, MODERATELY PLASTIC, GRAVEL (.25 - .5 IN), MOIST			Hnu = .5 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
2.0	#2/1 1202hrs	5	-				
2.5	#2/2 1210hrs	3	6	SILTY CLAY - MEDIUM STIFF, DARK OLIVE GRAY (5Y 3/2), MODERATELY PLASTIC, TRACE GRAVEL (.25 - 1.0 IN), MOIST			Hnu = .1 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
3.0	#2/2 1210hrs	4	6	FLY ASH - LOOSE (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN) SUB-ROUNDED, MOIST			Hnu = .1 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
3.5	#2/2 1210hrs	3	6	FLY ASH - LOOSE (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN) SUB-ROUNDED, MOIST			Hnu = .1 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
4.0	#2/2 1210hrs	3	6	FLY ASH - LOOSE (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN) SUB-ROUNDED, MOIST			Hnu = .1 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
4.5	#2/3 1219hrs	SHELBY TUBE	6	FLY ASH (SILTY SAND) - LOOSE (VERY LOW DENSITY), BLACK (N2.5/), NON PLASTIC, TRACE SLAG (.25 - .75 IN) SUB-ROUNDED, MOIST	SM		Hnu = .2 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
5.0	#2/3 1219hrs		6	FLY ASH (SILTY SAND) - LOOSE (VERY LOW DENSITY), BLACK (N2.5/), NON PLASTIC, TRACE SLAG (.25 - .75 IN) SUB-ROUNDED, MOIST	SM		Hnu = .2 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
5.5	#2/3 1219hrs		6	FLY ASH (SILTY SAND) - LOOSE (VERY LOW DENSITY), BLACK (N2.5/), NON PLASTIC, TRACE SLAG (.25 - .75 IN) SUB-ROUNDED, MOIST	SM		Hnu = .2 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
6.0	#2/3 1219hrs		6	FLY ASH (SILTY SAND) - LOOSE (VERY LOW DENSITY), BLACK (N2.5/), NON PLASTIC, TRACE SLAG (.25 - .75 IN) SUB-ROUNDED, MOIST	SM		Hnu = .2 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
6.5	#2/4 1250hrs	2	6	FLY ASH - VERY LOOSE (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN) SUB-ROUNDED, DRY			Hnu = 0 ppm B/G = 50 ppm 3" O.D. S.S., 300# Hammer
7.0	#2/4 1250hrs	1	6	FLY ASH - VERY LOOSE (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN) SUB-ROUNDED, DRY			Hnu = 0 ppm B/G = 50 ppm 3" O.D. S.S., 300# Hammer

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-002	COORDINATES: FS 4763.54 FE 2351.67	DATE STARTED: 04/20/93
GEOLOGIST: J. HANEY	ELEVATION: 577.09 FT	DATE COMPLETED: 04/21/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 2 OF 8

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLE	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
7.5	#2/4 1250hrs	2	6	FLY ASH - VERY LOOSE (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY			Hnu = .0 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
8.0	#2/4 1250hrs	1	-				
8.5	#2/5 1301hrs	2	6	FLY ASH - VERY LOOSE (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY			Hnu = .2 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
9.0	#2/5 1301hrs	1	6	FLY ASH - VERY LOOSE (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY			Hnu = .2 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
9.5	#2/5 1301hrs	1	6	FLY ASH - VERY LOOSE (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY			Hnu = .2 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
10.0	#2/5 1301hrs	1	6	FLY ASH - VERY LOOSE (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY			Hnu = .2 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
10.5	#2/6 1307hrs	SHELBY TUBE	6	FLY ASH (SILTY SAND) - VERY LOOSE (VERY LOW DENSITY), BLACK (N2.5/), NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY	SM		Hnu = .2 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
11.0	#2/6 1307hrs		6	FLY ASH (SILTY SAND) - VERY LOOSE (VERY LOW DENSITY), BLACK (N2.5/), NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY	SM		Hnu = .2 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
11.5	#2/6 1307hrs		6	FLY ASH (SILTY SAND) - VERY LOOSE (VERY LOW DENSITY), BLACK (N2.5/), NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY	SM		Hnu = .2 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
12.0	#2/6 1307hrs		6	FLY ASH (SILTY SAND) - VERY LOOSE (VERY LOW DENSITY), BLACK (N2.5/), NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY	SM		Hnu = .2 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
12.5	#2/7 1612hrs	3	6	FLY ASH - VERY LOOSE (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY			Hnu= 1.6 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
13.0	#2/7 1612hrs	2	6	FLY ASH - VERY LOOSE (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY			Hnu= 1.6 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
13.5	#2/7 1612hrs	1	4	FLY ASH - VERY LOOSE (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY			Hnu= 1.6 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
14.0	#2/7 1612hrs	2	-				

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-002	COORDINATES: FS 4763.54 FE 2351.67	DATE STARTED: 04/20/93
GEOLOGIST: J. HANEY	ELEVATION: 577.99 FT	DATE COMPLETED: 04/21/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 3 OF 8

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLE	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
14.5	#2/8 1615hrs	SHELBY TUBE	6	FLY ASH (SILTY SAND) - VERY SOFT (VERY LOW DENSITY), BLACK (N2.5/), NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY	ML		Hnu= 1.8 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
15.0	#2/8 1615hrs		6	FLY ASH (SILTY SAND) - VERY SOFT (VERY LOW DENSITY), BLACK (N2.5/), NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY	ML		Hnu= 1.8 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
15.5	#2/8 1615hrs		6	FLY ASH (SILTY SAND) - VERY SOFT (VERY LOW DENSITY), BLACK (N2.5/), NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY	ML		Hnu= 1.8 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
16.0	#2/8 1615hrs		6	FLY ASH (SILTY SAND) - VERY SOFT (VERY LOW DENSITY), BLACK (N2.5/), NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY	ML		Hnu= 1.8 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
16.5	#2/9 1646hrs	2	6	FLY ASH - VERY SOFT (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY			Hnu= 5.0 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
17.0	#2/9 1646hrs	1	6	FLY ASH - VERY SOFT (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY			Hnu= 5.0 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
17.5	#2/9 1646hrs	1	5	FLY ASH - VERY SOFT (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY			Hnu= 5.0 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
18.0	#2/9 1646hrs	2	-				
18.5	#2/10 1649hrs	2	6	FLY ASH - VERY SOFT (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY			Hnu= 4.8 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
19.0	#2/10 1649hrs	1	6	18.5 - 18.8' SILTY CLAY - SOFT, DARK YELLOWISH BROWN (10YR 4/6) WITH BROWNISH YELLOW (10YR 6/8) MOTTLE, MODERATELY PLASTIC, MOIST		1.5	Hnu= 4.8 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
19.5	#2/10 1649hrs	2	3	FLY ASH - VERY SOFT (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY			Hnu= 4.8 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
20.0	#2/10 1649hrs	1	-				
20.5	#2/11 1808hrs	2	6	FLY ASH - VERY SOFT (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY			Hnu= 4.8 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
21.0	#2/11 1808hrs	2	6	FLY ASH - VERY SOFT (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY			Hnu= 4.8 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-002	COORDINATES: FS 4763.54 FE 2351.67	DATE STARTED: 04/20/93
GEOLOGIST: J. HANEY	ELEVATION: 577.99 FT	DATE COMPLETED: 04/21/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 4 OF 8

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
21.5	#2/11 1808hrs	1	6	FLY ASH - VERY SOFT (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY			Hnu= 4.8 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
22.0	#2/11 1808hrs	2	4	BOTTOM ASH - BLACK (N2.5/), MOST GRAVEL SIZED (.25 - .75 IN), SUB-ROUNDED, ASH - FINE TO COARSE GRAINED, MOIST			Hnu= 4.8 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
22.5	#2/12 1812hrs	1	6	FLY ASH - VERY SOFT (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, DRY			Hnu= 5.2 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
23.0	#2/12 1812hrs	1	6	FLY ASH - VERY SOFT (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, WET			Hnu= 5.2 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
23.5	#2/12 1812hrs	1	6	FLY ASH - VERY SOFT (VERY LOW DENSITY), BLACK (N2.5/), GRAIN SIZE - SILT TO FINE, NON PLASTIC, TRACE SLAG (.25 - .75 IN), SUB-ROUNDED, WET			Hnu= 5.2 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
24.0	#2/12 1812hrs	4	6	23.5 - 23.7' FLY ASH - BLACK/GREY/RUST COLORED, COARSE GRAINED, WET. 23.7 - 24.0' SILTY CLAY - SOFT, DARK YELLOWISH BROWN, TRACE GRAVEL, WET			Hnu= 5.2 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
24.5	#2/13 1820hrs	SHELBY TUBE	6	SLOUGH - ASH AND SILTY CLAY			Hnu= 8.2 ppm B/G = 50 cpm 3" O.D. SHELBY, 18" PUSH
25.0	#2/13 1820hrs		6	SANDY LEAN CLAY - VERY STIFF, DARK YELLOWISH BROWN (10YR 4/4), MODERATELY PLASTIC, MOIST	CL		Hnu= 8.2 ppm B/G = 50 cpm 3" O.D. SHELBY, 18" PUSH
25.5	#2/13 1820hrs		6	SANDY LEAN CLAY - VERY STIFF, DARK YELLOWISH BROWN (10YR 4/4), MODERATELY PLASTIC, MOIST	CL		Hnu= 8.2 ppm B/G = 50 cpm 3" O.D. SHELBY, 18" PUSH
26.0	#2/13 1820hrs		6	SANDY LEAN CLAY - VERY STIFF, DARK YELLOWISH BROWN (10YR 4/4), MODERATELY PLASTIC, MOIST	CL		Hnu= 8.2 ppm B/G = 50 cpm 3" O.D. SHELBY, 18" PUSH
26.5	#2/14 1842hrs	5	6	SANDY LEAN CLAY - VERY STIFF, YELLOWISH BROWN (10YR 5/4), MODERATELY PLASTIC, TRACE GRAVEL (.25 - .75 IN), MOIST		3.0	Hnu= 14 ppm B/G = 50 cpm 3"O.D. S.S, 300# Hammer
27.0	#2/14 1842hrs	8	6	SANDY LEAN CLAY - VERY STIFF, YELLOWISH BROWN WITH BROWNISH YELLOW (10YR 6/8) STAINING, MODERATELY PLASTIC, TRACE GRAVEL (.25 - .75 IN), MOIST		2.0	Hnu= 14 ppm B/G = 50 cpm 3"O.D. S.S, 300# Hammer
27.5	#2/14 1842hrs	10	6	SAND - MEDIUM DENSE, YELLOWISH BROWN (10YR 5/4), WELL GRADED, FINE TO COARSE GRAINED, TRACE GRAVEL (.25 - .75 IN), MOIST			Hnu= 14 ppm B/G = 50 cpm 3"O.D. S.S, 300# Hammer
28.0	#2/14 1842hrs	12	6	SAND - MEDIUM DENSE, YELLOWISH BROWN (10YR 5/4), WELL GRADED, FINE TO COARSE GRAINED, TRACE GRAVEL (.25 - .75 IN), MOIST			Hnu= 14 ppm B/G = 50 cpm 3"O.D. S.S, 300# Hammer

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-002	COORDINATES: PS 4763.54 FE 2351.67	DATE STARTED: 04/20/93
GEOLOGIST: J. HANEY	ELEVATION: 577.99 FT	DATE COMPLETED: 04/21/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 5 OF 8

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLE	RECOVERY inches	DESCRIPTION	USCS SYM	TSP	REMARKS
28.5	#2/15 1850hrs	8	6	WELL GRADED SAND WITH SILT - LOOSE, YELLOWISH BROWN (10YR 5/4), MOIST	SW-SM		Hnu=12.4 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
29.0	#2/15 1850hrs	6	6	WELL GRADED SAND WITH SILT - LOOSE, YELLOWISH BROWN (10YR 5/4), MOIST	SW-SM		Hnu=12.4 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
29.5	#2/15 1850hrs	4	6	WELL GRADED SAND WITH SILT - LOOSE, YELLOWISH BROWN (10YR 5/4), MOIST	SW-SM		Hnu=12.4 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
30.0	#2/15 1850hrs	5	6	WELL GRADED SAND WITH SILT - LOOSE, YELLOWISH BROWN (10YR 5/4), MOIST	SW-SM		Hnu=12.4 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
30.5	#2/16 0822hrs	9	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/6), WELL GRADED, MEDIUM TO COARSE GRAINED, MOIST			Hnu= 1.4 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
31.0	#2/16 0822hrs	11	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/6), WELL GRADED, MEDIUM TO COARSE GRAINED, MOIST			Hnu= 1.4 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
31.5	#2/16 0822hrs	10	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/6), WELL GRADED, MEDIUM TO COARSE GRAINED, MOIST			Hnu= 1.4 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
32.0	#2/16 0822hrs	11	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/6), WELL GRADED, MEDIUM TO COARSE GRAINED, MOIST			Hnu= 1.4 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
32.5	#2/17 0830hrs	10	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/6), WELL GRADED, MEDIUM TO COARSE GRAINED, MOIST			Hnu= 1.3 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
33.0	#2/17 0830hrs	11	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/6), POORLY GRADED, FINE GRAINED, MOIST			Hnu= 1.3 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
33.5	#2/17 0830hrs	11	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/6), WELL GRADED, MEDIUM TO COARSE GRAINED, MOIST			Hnu= 1.3 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
34.0	#2/17 0830hrs	10	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/6), WELL GRADED, MEDIUM TO COARSE GRAINED, TRACE GRAVEL (.25 - .50 IN), MOIST			Hnu= 1.3 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
34.5	#2/18 0840hrs	8	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/6), POORLY GRADED, FINE GRAINED, MOIST			Hnu= 1.0 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
35.0	#2/18 0840hrs	8	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/6), POORLY GRADED, FINE GRAINED, MOIST			Hnu= 1.0 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-002	COORDINATES: FS 4763.54 FE 2351.67	DATE STARTED: 04/20/93
GEOLOGIST: J. BANEY	ELEVATION: 577.99 FT	DATE COMPLETED: 04/21/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 6 OF 8

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
35.5	#2/18 0840hrs	9	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/6), WELL GRADED, MEDIUM GRAINED, TRACE GRAVEL (.25 - .50 IN), MOIST			Hnu= 1.0 ppm B/G = 50 CPM 3" O.D. S.S., 300# Hammer
36.0	#2/18 0840hrs	9	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/6), WELL GRADED, MEDIUM GRAINED, TRACE GRAVEL (.25 - .50 IN), MOIST			Hnu= 1.0 ppm B/G = 50 CPM 3" O.D. S.S., 300# Hammer
36.5	#2/19 0850hrs	6	6	SILTY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/6), MOIST	SM		Hnu= 1.4 ppm B/G = 50 CPM 3" O.D. S.S., 300# Hammer
37.0	#2/19 0850hrs	9	6	SILTY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), MOIST	SM		Hnu= 1.4 ppm B/G = 50 CPM 3" O.D. S.S., 300# Hammer
37.5	#2/19 0850hrs	9	6	SILTY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), MOIST	SM		Hnu= 1.4 ppm B/G = 50 CPM 3" O.D. S.S., 300# Hammer
38.0	#2/19 0850hrs	9	6	SILTY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), MOIST	SM		Hnu= 1.4 ppm B/G = 50 CPM 3" O.D. S.S., 300# Hammer
38.5	#2/20 0900hrs	5	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), POORLY GRADED, FINE GRAINED, MOIST			Hnu= 0.9 ppm B/G = 50 CPM 3" O.D. S.S., 300# Hammer
39.0	#2/20 0900hrs	7	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), POORLY GRADED, FINE GRAINED, MOIST			Hnu= 0.9 ppm B/G = 50 CPM 3" O.D. S.S., 300# Hammer
39.5	#2/20 0900hrs	8	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), POORLY GRADED, FINE GRAINED, MOIST			Hnu= 0.9 ppm B/G = 50 CPM 3" O.D. S.S., 300# Hammer
40.0	#2/20 0900hrs	8	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), POORLY GRADED, FINE GRAINED, MOIST			Hnu= 0.9 ppm B/G = 50 CPM 3" O.D. S.S., 300# Hammer
40.5	#2/21 0910hrs	8	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), POORLY GRADED, FINE GRAINED, MOIST			Hnu= 1.1 ppm B/G = 50 CPM 3" O.D. S.S., 300# Hammer
41.0	#2/21 0910hrs	9	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), POORLY GRADED, FINE GRAINED, MOIST			Hnu= 1.1 ppm B/G = 50 CPM 3" O.D. S.S., 300# Hammer
41.5	#2/21 0910hrs	18	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), WELL GRADED, MEDIUM GRAINED, GRAVEL (.25 - .75 IN), MOIST			Hnu= 1.1 ppm B/G = 50 CPM 3" O.D. S.S., 300# Hammer
42.0	#2/21 0910hrs	18	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), WELL GRADED, MEDIUM GRAINED, GRAVEL (.25 - .75 IN), MOIST			Hnu= 1.1 ppm B/G = 50 CPM 3" O.D. S.S., 300# Hammer

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-002	COORDINATES: FS 4763.54 FE 2351.67	DATE STARTED: 04/20/93
GEOLOGIST: J. HANEY	ELEVATION: 577.99 FT	DATE COMPLETED: 04/21/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 7 OF 8

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
42.5	#2/22 0920hrs	11	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), WELL GRADED, MEDIUM GRAINED, GRAVEL (.25 - .75 IN), MOIST			Hnu= 1.0 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
43.0	#2/22 0920hrs	20	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), WELL GRADED, MEDIUM GRAINED, GRAVEL (.25 - .75 IN), MOIST			Hnu= 1.0 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
43.5	#2/22 0920hrs	18	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), WELL GRADED, MEDIUM GRAINED, GRAVEL (.25 - .75 IN), MOIST			Hnu= 1.0 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
44.0	#2/22 0920hrs	21	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN, WELL GRADED, MEDIUM GRAINED, GRAVEL (.25 - .75 IN), SOME IRON STAINING, MOIST			Hnu= 1.0 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
44.5	#2/23 0930hrs	13	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN, WELL GRADED, MEDIUM GRAINED, GRAVEL (.25 - .50 IN), SOME IRON STAINING, MOIST			Hnu= 0.5 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
45.0	#2/23 0930hrs	10	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN, WELL GRADED, MEDIUM GRAINED, GRAVEL (.25 - .75 IN), SOME IRON STAINING, MOIST			Hnu= 0.5 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
45.5	#2/23 0930hrs	9	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN, WELL GRADED, MEDIUM GRAINED, GRAVEL (.25 - .75 IN), SOME IRON STAINING, MOIST			Hnu= 0.5 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
46.0	#2/23 0930hrs	8	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), WELL GRADED, MEDIUM GRAINED, MOIST			Hnu= 0.5 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
46.5	#2/24 0946hrs	17	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), WELL GRADED, MEDIUM GRAINED, GRAVEL (.25 - .50 IN), MOIST			Hnu= 0.7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
47.0	#2/24 0946hrs	20	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), WELL GRADED, MEDIUM GRAINED, GRAVEL (.25 - .50 IN), MOIST			Hnu= 0.7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
47.5	#2/24 0946hrs	17	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), WELL GRADED, MEDIUM GRAINED, GRAVEL (.25 - .50 IN), MOIST			Hnu= 0.7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
48.0	#2/24 0946hrs	19	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), WELL GRADED, MEDIUM GRAINED, GRAVEL (.25 - .50 IN), MOIST			Hnu= 0.7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
48.5	#2/25 0950hrs	11	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), WELL GRADED, MEDIUM GRAINED, GRAVEL (.25 - .50 IN), MOIST			Hnu= 1.5 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
49.0	#2/25 0950hrs	10	6	GRAVELLY SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), WELL GRADED, MEDIUM GRAINED, GRAVEL (.25 - .50 IN), MOIST			Hnu= 1.5 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-002	COORDINATES: FS 4763.54 FE 2351.67	DATE STARTED: 04/20/93
GEOLOGIST: J. HANEY	ELEVATION: 577.99 FT	DATE COMPLETED: 04/21/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 8 OF 8

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
49.5	#2/25 0950hrs	11	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), WELL GRADED, MEDIUM GRAINED, MOIST			Hnu=1.5 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
50.0	#2/25 0950hrs	13	6	SAND - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), WELL GRADED, MEDIUM GRAINED, MOIST			Hnu=1.5 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-003	COORDINATES: FS 4834.76 FE 2430.70	DATE STARTED: 04/16/93
GEOLOGIST: J. HANEY	ELEVATION: 539.49 FT	DATE COMPLETED: 04/17/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 1 OF 8

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
0.5	#3/1 1345hrs	2	6	SANDY SILT - SOFT, VERY DARK GRAYISH BROWN (2.5Y 3/2), LOW PLASTICITY, SAND FINE GRAINED, MOIST		.5	Hnu = 1 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
1.0	#3/1 1345hrs	2	6	SANDY SILT - SOFT, VERY DARK GRAYISH BROWN (2.5Y 3/2), LOW PLASTICITY, SAND FINE GRAINED, MOIST		.5	Hnu = 1 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
1.5	#3/1 1345hrs	3	6	SANDY SILT - SOFT, VERY DARK GRAYISH BROWN (2.5Y 3/2), LOW PLASTICITY, SAND FINE GRAINED, MOIST		.5	Hnu = 1 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
2.0	#3/1 1345hrs	4	-				
2.5	#3/2 1350hrs	2	6	SANDY SILT - SOFT, VERY DARK GRAYISH BROWN (2.5Y 3/2), LOW PLASTICITY, SAND FINE GRAINED, MOIST			Hnu = 1 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
3.0	#3/2 1350hrs	3	6	SILTY SAND - VERY LOOSE, DARK YELLOWISH BROWN (10YR 4/4), POORLY GRADED, FINE GRAINED, MOIST			Hnu = 1 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
3.5	#3/2 1350hrs	2	6	SILTY SAND - VERY LOOSE, DARK YELLOWISH BROWN (10YR 4/4), POORLY GRADED, FINE GRAINED, MOIST			Hnu = 1 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
4.0	#3/2 1350hrs	3	4	SILTY SAND - VERY LOOSE, DARK YELLOWISH BROWN (10YR 4/4), POORLY GRADED, FINE GRAINED, MOIST			Hnu = 1 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
4.5	#3/3 1355hrs	SHELBY TUBE	6	SILTY SAND - LOOSE, DARK YELLOWISH BROWN (10YR 4/4), POORLY GRADED, FINE GRAINED, MOIST	SM		Hnu = 1 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
5.0	#3/3 1355hrs		6	SILTY SAND - LOOSE, DARK YELLOWISH BROWN (10YR 4/4), POORLY GRADED, FINE GRAINED, MOIST	SM		Hnu = 1 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
5.5	#3/3 1355hrs		6	SILTY SAND - LOOSE, DARK YELLOWISH BROWN (10YR 4/4), POORLY GRADED, FINE GRAINED, MOIST	SM		Hnu = 1 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
6.0	#3/3 1355hrs		6	SILTY SAND - LOOSE, BROWN (10YR 4/3), TRACE BROWNISH YELLOW CLAY, GRAVEL (.25 - 1.0 IN), MOIST	SM		Hnu = 1 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
6.5	#3/4 1443hrs	10	6	SILTY GRAVEL, SANDY - MEDIUM DENSE, BROWN (10YR 4/3), TRACE BROWNISH YELLOW CLAY, GRAVEL (.25 - 1.0 IN), SAND WELL GRADED, MOIST			Hnu = 5 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
7.0	#3/4 1443hrs	10	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, GRAVEL (.25 - 1.0 IN), MOIST			Hnu = 5 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-003	COORDINATES: FS 4834.76 FE 2430.70	DATE STARTED: 04/16/93
GEOLOGIST: J. HANEY	ELEVATION: 539.49 FT	DATE COMPLETED: 04/17/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 2 OF 8

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
7.5	#3/4 1443hrs	9	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, GRAVEL (.25 - 1.0 IN), MOIST			Hnu = 5 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
8.0	#3/4 1443hrs	10	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, GRAVEL (.25 - 1.0 IN), MOIST			Hnu = 5 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
8.5	#3/5 1453hrs	SHELBY TUBE	6	SILTY SAND WITH GRAVEL - MEDIUM DENSE, BROWN (10YR 4/3), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, GRAVEL (.25 - 1.0 IN), MOIST	SM		Hnu = 1 ppm B/G = 50 cpm 3" O.D. SHELBY, 12" PUSH
9.0	#3/5 1453hrs		4	SILTY SAND WITH GRAVEL - MEDIUM DENSE, BROWN (10YR 4/3), GRAVEL (.25 - 1.0 IN), SAND WELL GRADED, SILT - NONPLASTIC, TRACE CLAY, MOIST	SM		Hnu = 1 ppm B/G = 50 cpm 3" O.D. SHELBY, 12" PUSH
9.5							AUGERED
10.0							AUGERED
10.5	#3/6 1506hrs	8	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, GRAVEL (.25 - .75 IN), MOIST			Hnu = 2 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
11.0	#3/6 1506hrs	8	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, GRAVEL (.25 - .75 IN), MOIST			Hnu = 2 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
11.5	#3/6 1506hrs	7	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, GRAVEL (.25 - .75 IN), MOIST			Hnu = 2 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
12.0	#3/6 1506hrs	9	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, GRAVEL (.25 - .75 IN), MOIST			Hnu = 2 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
12.5	#3/7 1515hrs	11	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, GRAVEL (.25 - .75 IN), MOIST			Hnu = 5 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
13.0	#3/7 1515hrs	14	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, GRAVEL (.25 - .75 IN), MOIST			Hnu = 5 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
13.5	#3/7 1515hrs	12	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, GRAVEL (.25 - .75 IN), MOIST			Hnu = 5 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
14.0	#3/7 1515hrs	12	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, GRAVEL (.25 - .75 IN), MOIST			Hnu = 5 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-003	COORDINATES: FS 4834.76 FE 2430.70	DATE STARTED: 04/16/93
GEOLOGIST: J. HANEY	ELEVATION: 539.49 FT	DATE COMPLETED: 04/17/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 3 OF 8

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
14.5	#3/8 1558hrs	10	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, GRAVEL (.25 - .75 IN), MOIST			Hnu = 5 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
15.0	#3/8 1558hrs	9	6	SANDY GRAVEL - MEDIUM DENSE, BROWN (10YR 4/3), GRAVEL (.25 - 1.0 IN), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, MOIST			Hnu = 5 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
15.5	#3/8 1558hrs	7	6	SANDY GRAVEL - MEDIUM DENSE, BROWN (10YR 4/3), GRAVEL (.25 - 1.0 IN), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, MOIST			Hnu = 5 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
16.0	#3/8 1558hrs	7	6	SANDY GRAVEL - MEDIUM DENSE, BROWN (10YR 4/3), GRAVEL (.25 - 1.0 IN), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, MOIST			Hnu = 5 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
16.5	#3/9 0826hrs	7	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu= 12 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
17.0	#3/9 0826hrs	9	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu= 12 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
17.5	#3/9 0826hrs	10	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu= 12 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
18.0	#3/9 0826hrs	10	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu= 12 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
18.5	#3/10 0834hrs	7	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu= 12 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
19.0	#3/10 0834hrs	7	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), POORLY GRADED, FINE GRAINED, WET			Hnu= 12 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
19.5	#3/10 0834hrs	9	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu= 12 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
20.0	#3/10 0834hrs	9	2	SAND - MEDIUM DENSE, BROWN (10YR 4/3), SAND WELL GRADED, MEDIUM TO COARSE GRAINED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu= 12 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
20.5	#3/11 0855hrs	10	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), POORLY GRADED, FINE / MEDIUM GRAINED, WET			Hnu= 13 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
21.0	#3/11 0855hrs	12	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), POORLY GRADED, FINE / MEDIUM GRAINED, WET			Hnu= 13 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-003	COORDINATES: PS 4834.76 PE 2430.70	DATE STARTED: 04/16/93
GEOLOGIST: J. HANEY	ELEVATION: 539.49 FT	DATE COMPLETED: 04/17/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 4 OF 8

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
21.5	#3/11 0855hrs	22	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, MEDIUM TO COURSE GRAINED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu = 13 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
22.0	#3/11 0855hrs	18	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), POORLY GRADED, FINE / MEDIUM GRAINED, WET			Hnu = 13 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
22.5	#3/12 0905hrs	7	6	SILTY SAND - MEDIUM DENSE, BROWN (10YR 4/3), SOME STAINING - STRONG BROWN (7.5YR 5/8), WET	SM		Hnu = 9 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
23.0	#3/12 0905hrs	7	6	SILTY SAND - MEDIUM DENSE, BROWN (10YR 4/3), SOME STAINING - STRONG BROWN (7.5YR 5/8), WET	SM		Hnu = 9 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
23.5	#3/12 0905hrs	7	5	SILTY SAND - MEDIUM DENSE, BROWN (10YR 4/3), SOME STAINING - STRONG BROWN (7.5YR 5/8), WET	SM		Hnu = 9 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
24.0	#3/12 0905hrs	7	-				
24.5	#3/13 0915hrs	9	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), SOME STAINING - STRONG BROWN (7.5YR 5/8), POORLY GRADED, FINE / MEDIUM GRAINED, WET			Hnu= 11 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
25.0	#3/13 0915hrs	9	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), SOME STAINING - STRONG BROWN (7.5YR 5/8), POORLY GRADED, FINE / MEDIUM GRAINED, WET			Hnu= 11 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
25.5	#3/13 0915hrs	8	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), SOME STAINING - STRONG BROWN (7.5YR 5/8), POORLY GRADED, FINE / MEDIUM GRAINED, WET			Hnu= 11 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
26.0	#3/13 0915hrs	9	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, MEDIUM TO COURSE GRAINED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu= 11 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
26.5	#3/14 0930hrs	10	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, MEDIUM TO COURSE GRAINED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu= 14 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
27.0	#3/14 0930hrs	10	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, MEDIUM TO COURSE GRAINED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu= 14 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
27.5	#3/14 0930hrs	13	4	SAND - MEDIUM DENSE, BROWN (10YR 4/3), SOME STAINING - STRONG BROWN (7.5YR 5/8), POORLY GRADED, FINE / MEDIUM GRAINED, WET			Hnu= 14 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
28.0	#3/14 0930hrs	11	-				

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-003	COORDINATES: FS 4834.76 FE 2430.70	DATE STARTED: 04/16/93
GEOLOGIST: J. HANEY	ELEVATION: 539.49 FT	DATE COMPLETED: 04/17/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 5 OF 8

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
28.5	#3/15 1010hrs	10	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), SOME STAINING (7.5YR 5/8), POORLY GRADED, FINE / MEDIUM GRAINED, WET			Hnu = 12 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
29.0	#3/15 1010hrs	12	6	SAND - MEDIUM DENSE (HEAVING), BROWN (10YR 4/3), WELL GRADED, MEDIUM TO COARSE GRAINED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu = 12 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
29.5	#3/15 1010hrs	14	6	SAND - MEDIUM DENSE (HEAVING), BROWN (10YR 4/3), WELL GRADED, MEDIUM TO COARSE GRAINED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu = 12 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
30.0	#3/15 1010hrs	12	6	SAND - MEDIUM DENSE (HEAVING), BROWN (10YR 4/3), WELL GRADED, MEDIUM TO COARSE GRAINED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu = 12 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
30.5	#3/16 1025hrs	8	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), POORLY GRADED, FINE GRAINED, WET			Hnu = 7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
31.0	#3/16 1025hrs	7	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, COARSE TO MEDIUM GRAINED, GRAVEL (.25 - .50 IN), WET			Hnu = 7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
31.5	#3/16 1025hrs	7	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, MEDIUM TO COARSE GRAINED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu = 7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
32.0	#3/16 1025hrs	9	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, MEDIUM TO COARSE GRAINED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu = 7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
32.5	#3/17 1035hrs	14	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, COARSE TO MEDIUM GRAINED, TRACE FINES, GRAVEL (.25 - 1.0 IN), WET			Hnu = 7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
33.0	#3/17 1035hrs	17	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, COARSE TO MEDIUM GRAINED, TRACE FINES, GRAVEL (.25 - 1.0 IN), WET			Hnu = 7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
33.5	#3/17 1035hrs	19	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, COARSE TO MEDIUM GRAINED, TRACE FINES, GRAVEL (.25 - 1.0 IN), WET			Hnu = 7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
34.0	#3/17 1035hrs	25	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, COARSE TO MEDIUM GRAINED, TRACE FINES, GRAVEL (.25 - 1.0 IN), WET			Hnu = 7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
34.5	#3/18 1055hrs	24	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), POORLY GRADED, MEDIUM GRAINED, WET			Hnu = 2 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
35.0	#3/18 1055hrs	14	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, COARSE TO MEDIUM GRAINED, TRACE FINES, GRAVEL (.25 - 1.0 IN), WET			Hnu = 2 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-003	COORDINATES: FS 4834.76 FE 2430.70	DATE STARTED: 04/16/93
GEOLOGIST: J. HANEY	ELEVATION: 539.49 FT	DATE COMPLETED: 04/17/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 6 OF 8

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
35.5	#3/18 1055hrs	8	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, COARSE TO MEDIUM GRAINED, TRACE FINES, GRAVEL (.25 - 1.0 IN), WET			Hnu = 2 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
36.0	#3/18 1055hrs	8	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, COARSE TO MEDIUM GRAINED, TRACE FINES, GRAVEL (.25 - 1.0 IN), WET			Hnu = 2 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
36.5	#3/19 1112hrs	11	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), POORLY GRADED, MEDIUM / FINE GRAINED, WET			Hnu = 1 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
37.0	#3/19 1112hrs	13	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), POORLY GRADED, MEDIUM / FINE GRAINED, WET			Hnu = 1 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
37.5	#3/19 1112hrs	15	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, COARSE TO MEDIUM GRAINED, TRACE GRAVEL (.25 - 1.0 IN), WET			Hnu = 1 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
38.0	#3/19 1112hrs	21	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, COARSE TO MEDIUM GRAINED, TRACE GRAVEL (.25 - 1.0 IN), WET			Hnu = 1 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
38.5	#3/20 1130hrs	14	6	WELL GRADED SAND WITH SILT - MEDIUM DENSE, BROWN (10YR 4/3), WET	SW-SM		Hnu = 0 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
39.0	#3/20 1130hrs	16	6	WELL GRADED SAND WITH SILT - MEDIUM DENSE, BROWN (10YR 4/3), WET	SW-SM		Hnu = 0 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
39.5	#3/20 1130hrs	23	6	WELL GRADED SAND WITH SILT - MEDIUM DENSE, BROWN (10YR 4/3), WET	SW-SM		Hnu = 0 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
40.0	#3/20 1130hrs	26	6	WELL GRADED SAND WITH SILT - MEDIUM DENSE, BROWN (10YR 4/3), WET	SW-SM		Hnu = 0 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
40.5	#3/21 1150hrs	15	6	SAND - DENSE, BROWN (10YR 4/3), WELL GRADED, MEDIUM / COARSE GRAINED, TRACE GRAVEL (.25 - .75 IN), WET			Hnu = 0 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
41.0	#3/21 1150hrs	20	6	SAND - DENSE, BROWN (10YR 4/3), WELL GRADED, MEDIUM / COARSE GRAINED, TRACE GRAVEL (.25 - .75 IN), WET			Hnu = 0 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
41.5	#3/21 1150hrs	23	6	SAND - DENSE, BROWN (10YR 4/3), WELL GRADED, MEDIUM / COARSE GRAINED, TRACE GRAVEL (.25 - .75 IN), WET			Hnu = 0 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
42.0	#3/21 1150hrs	24	6	SAND - DENSE, BROWN (10YR 4/3), WELL GRADED, MEDIUM / COARSE GRAINED, TRACE GRAVEL (.25 - .75 IN), WET			Hnu = 0 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL PERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-003	COORDINATES: FS 4834.76 FE 2430.70	DATE STARTED: 04/16/93
GEOLOGIST: J. BANEY	ELEVATION: 539.49 FT	DATE COMPLETED: 04/17/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 7 OF 8

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
42.5	#3/22 1215hrs	23	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, COARSE GRAINED, TRACE GRAVEL (.25 - 1.0 IN), WET			Hnu = 0 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
43.0	#3/22 1215hrs	19	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, COARSE GRAINED, TRACE GRAVEL (.25 - 1.0 IN), WET			Hnu = 0 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
43.5	#3/22 1215hrs	17	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, COARSE GRAINED, TRACE GRAVEL (.25 - 1.0 IN), WET			Hnu = 0 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
44.0	#3/22 1215hrs	16	6	GRAVELLY SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, MEDIUM TO COARSE GRAINED, GRAVEL (.25 - 1.0 IN), WET			Hnu = 0 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
44.5				(SAND)			AUGERED 44 - 48'
45.0				(SAND)			
45.5				(SAND)			
46.0				(SAND)			
46.5				(SAND)			
47.0				(SAND)			
47.5				(SAND)			
48.0				(SAND)			
48.5	#3/23 1255hrs	15	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, MEDIUM TO COARSE GRAINED, TRACE GRAVEL (.25 - .75 IN), WET			Hnu = 3 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
49.0	#3/23 1255hrs	15	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, MEDIUM TO COARSE GRAINED, TRACE GRAVEL (.25 - .75 IN), WET			Hnu = 3 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-003	COORDINATES: FS 4834.76 FE 2430.70	DATE STARTED: 04/16/93
GEOLOGIST: J. BANEY	ELEVATION: 539.49 FT	DATE COMPLETED: 04/17/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 8 OF 8

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
49.5	#3/23 1255hrs	16	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), WELL GRADED, MEDIUM TO COARSE GRAINED, TRACE GRAVEL (.25 - .75 IN), WET			Hnu = 3 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
50.0	#3/23 1255hrs	18	-				

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PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-005	COORDINATES: FS 4910.32 FE 2407.89	DATE STARTED: 04/22/93
GEOLOGIST: J. HANEY	ELEVATION: 530.04 FT	DATE COMPLETED: 04/22/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 1 OF 4

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
0.5	#5/1 0846hrs	SHELBY TUBE	0*	SAND - VERY LOOSE, DARK YELLOWISH BROWN (10YR 4/4), WELL GRADED, MEDIUM GRAINED, TRACE GRAVEL (.25 - .75 IN), VERY MOIST			
1.0	#5/1 0846hrs		-	ALL SOIL FELL OUT OF SHELBY TUBE AS IT WAS PULLD, COLLECTED SPLIT TUBE SAMPLE FOR SOIL DESCRIPTION			
1.5	#5/1 0846hrs		-				
2.0	#5/1 0846hrs		-				
2.5	#5/2 0852hrs	SHELBY TUBE	6	GRAVELLY SAND - VERY LOOSE, DARK YELLOWISH BROWN (10YR 4/4), WELL GRADED, MEDIUM GRAINED, GRAVEL (.25 - 2.5 IN), WET			Hnu = .4 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
3.0	#5/2 0852hrs		6	GRAVELLY SAND - VERY LOOSE, DARK YELLOWISH BROWN (10YR 4/4), WELL GRADED, MEDIUM GRAINED, GRAVEL (.25 - 2.5 IN), WET			Hnu = .4 ppm B/G = 50 cpm 3" O.D. SHELBY, 24" PUSH
3.5	#5/2 0852hrs		-				
4.0	#5/2 0852hrs		-				
4.5	#5/3 0907hrs	8	6	SILTY SAND WITH GRAVEL - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), WET	SM		Hnu= 2.2 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
5.0	#5/3 0907hrs	16	6	SILTY SAND WITH GRAVEL - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), WET	SM		Hnu= 2.2 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
5.5	#5/3 0907hrs	13	2	SILTY SAND WITH GRAVEL - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), WET	SM		Hnu= 2.2 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
6.0	#5/3 0907hrs	13	-				
6.5	#5/4 0924hrs	18	6	WELL GRADED SAND WITH SILT - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), WET	SW-SM		Hnu= 2.2 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
7.0	#5/4 0924hrs	14	6	WELL GRADED SAND WITH SILT - MEDIUM DENSE, DARK YELLOWISH BROWN (10YR 4/4), WET	SW-SM		Hnu= 2.2 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-005	COORDINATES: FS 4910.32 FE 2407.89	DATE STARTED: 04/22/93
GEOLOGIST: J. HANEY	ELEVATION: 530.04 FT	DATE COMPLETED: 04/22/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 2 OF 4

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
7.5	#5/4 0924hrs	9	6	WELL GRADED SAND WITH SILT - MEDIUM DENSE, DARK GRAYISH BROWN (2.5Y 4/2), WET	SW-SM		Hnu= 2.2 ppm B/G = 50 cpm 3" O.D. S.S, 300# Hammer
8.0	#5/4 0924hrs	9	2	WELL GRADED SAND WITH SILT - MEDIUM DENSE, DARK GRAYISH BROWN (2.5Y 4/2), WET	SW-SM		Hnu= 2.2 ppm B/G = 50 cpm 3" O.D. S.S, 300# Hammer
8.5	#5/5 0939hrs	9	6	POORLY GRADED SAND WITH SILT, MEDIUM DENSE, DARK GRAYISH BROWN (2.5Y 4/2), WET	SP-SM		Hnu= 2.3 ppm B/G = 50 cpm 3" O.D. S.S, 300# Hammer
9.0	#5/5 0939hrs	8	6	POORLY GRADED SAND WITH SILT, MEDIUM DENSE, DARK GRAYISH BROWN (2.5Y 4/2), WET	SP-SM		Hnu= 2.3 ppm B/G = 50 cpm 3" O.D. S.S, 300# Hammer
9.5	#5/5 0939hrs	8	6	POORLY GRADED SAND WITH SILT, MEDIUM DENSE, DARK GRAYISH BROWN (2.5Y 4/2), WET	SP-SM		Hnu= 2.3 ppm B/G = 50 cpm 3" O.D. S.S, 300# Hammer
10.0	#5/5 0939hrs	9	6	POORLY GRADED SAND WITH SILT, MEDIUM DENSE, DARK GRAYISH BROWN (2.5Y 4/2), WET	SP-SM		Hnu= 2.3 ppm B/G = 50 cpm 3" O.D. S.S, 300# Hammer
10.5	#5/6 0950hrs	SHELBY TUBE	0*	SAND - MEDIUM DENSE, DARK GRAYISH BROWN (2.5Y 4/2), WELL GRADED, MEDIUM TO FINE GRAINED, TRACE GRAVEL (.25 - .50 IN), WET			3" SHELBY, 24" PUSH
11.0	#5/6 0950hrs		-	* ALL SOIL FELL OUT OF SHELBY ON TO GROUND SURFACE			
11.5	#5/6 0950hrs		-				
12.0	#5/6 0950hrs		-				
12.5	#5/7 1000hrs	11	6	SAND - MEDIUM DENSE, DARK GRAYISH BROWN (10Y 4/2), MODERATED GRADED, MEDIUM TO FINE GRAINED, WET			Hnu= 1.8 ppm B/G = 50 ppm 3" O.D. S.S., 300# Hammer
13.0	#5/7 1000hrs	9	6	SAND - MEDIUM DENSE, DARK GRAYISH BROWN (10Y 4/2), MODERATED GRADED, MEDIUM TO FINE GRAINED, WET			Hnu= 1.8 ppm B/G = 50 ppm 3" O.D. S.S., 300# Hammer
13.5	#5/7 1000hrs	7	6	SAND - MEDIUM DENSE, DARK GRAYISH BROWN (10Y 4/2), MODERATED GRADED, MEDIUM TO FINE GRAINED, WET			Hnu= 1.8 ppm B/G = 50 ppm 3" O.D. S.S., 300# Hammer
14.0	#5/7 1000hrs	8	6	SAND - MEDIUM DENSE, DARK GRAYISH BROWN (10Y 4/2), MODERATED GRADED, MEDIUM TO FINE GRAINED, WET			Hnu= 1.6 ppm B/G = 50 ppm 3" O.D. S.S., 300# Hammer

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-005	COORDINATES: FS 4910.32 FE 2407.89	DATE STARTED: 04/22/93
GEOLOGIST: J. HANEY	ELEVATION: 530.04 FT	DATE COMPLETED: 04/22/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 3 OF 4

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
14.5							AUGERED 14 - 18 ft
15.0							
15.5							
16.0							
16.5							
17.0							
17.5							
18.0							
18.5	#5/8 1030hrs	12	6	SILTY SAND - MEDIUM DENSE, DARK GRAYISH BROWN (10YR 4/2) WITH BROWNISH YELLOW STAINING (10YR 6/8), WET	SM		Hnu= 1.6 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
19.0	#5/8 1030hrs	13	6	SILTY SAND - MEDIUM DENSE, DARK GRAYISH BROWN (10YR 4/2) WITH BROWNISH YELLOW STAINING (10YR 6/8), WET	SM		Hnu= 1.6 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
19.5	#5/8 1030hrs	18	6	SILTY SAND - MEDIUM DENSE, DARK GRAYISH BROWN (10YR 4/2) WITH BROWNISH YELLOW STAINING (10YR 6/8), WET	SM		Hnu= 1.6 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
20.0	#5/8 1030hrs	22	6	SILTY SAND - MEDIUM DENSE, DARK GRAYISH BROWN (10YR 4/2) WITH BROWNISH YELLOW STAINING (10YR 6/8), WET	SM		Hnu= 1.6 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
20.5							AUGERED 20 - 23 ft
21.0							

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PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-005	COORDINATES: PS 4910.32 FE 2407.89	DATE STARTED: 04/22/93
GEOLOGIST: J. HANEY	ELEVATION: 530.04 FT	DATE COMPLETED: 04/22/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 4 OF 4

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
21.5							
22.0							
22.5							
23.0							
23.5	#5/9 1045hrs	15	6	POORLY GRADED SAND WITH SILT - MEDIUM DENSE (HEAVING), DARK GRAYISH BROWN (10YR 4/2), WET	SP-SM		Hnu= 1.6 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
24.0	#5/9 1045hrs	12	6	POORLY GRADED SAND WITH SILT - MEDIUM DENSE (HEAVING), DARK GRAYISH BROWN (10YR 4/2), WET	SP-SM		Hnu= 1.6 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
24.5	#5/9 1045hrs	10	6	POORLY GRADED SAND WITH SILT - MEDIUM DENSE (HEAVING), DARK GRAYISH BROWN (10YR 4/2), WET	SP-SM		Hnu= 1.6 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
25.0	#5/9 1045hrs	11	6	POORLY GRADED SAND WITH SILT - MEDIUM DENSE (HEAVING), DARK GRAYISH BROWN (10YR 4/2), WET	SP-SM		Hnu= 1.6 ppm B/G = 50 cpm 3"O.D. S.S., 300# Hammer
25.5				(HEAVING SAND)			AUGERED 25 - 27 ft
26.0				(HEAVING SAND)			
26.5				(HEAVING SAND)			
27.0				(HEAVING SAND)			

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PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-006	COORDINATES: FS 4769.89 FE 2366.30	DATE STARTED: 04/22/93
GEOLOGIST: J. HANEY	ELEVATION: 531.68 FT	DATE COMPLETED: 04/22/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 1 OF 4

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
0.5	#6/1 1638hrs	1	6	SILTY SAND - VERY LOOSE, DARK YELLOWISH BROWN (10YR 4/4), SAND FINE GRAINED, SILT NONPLASTIC, MOIST			Hnu = .7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
1.0	#6/1 1638hrs	1	6	SILTY CLAY - SOFT, DARK GRAYISH BROWN (2.5Y 4/2), MODERATELY PLASTIC, MOIST			Hnu = .7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
1.5	#6/1 1638hrs	2	6	SAND - VERY LOOSE, DARK YELLOWISH BROWN (10YR 4/4), SAND WELL GRADED, MEDIUM TO FINE GRAINED, TRACE GRAVEL (.25 - .50 IN), MOIST			Hnu = .7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
2.0	#6/1 1638hrs	3	6	SAND - VERY LOOSE, DARK YELLOWISH BROWN (10YR 4/4), SAND WELL GRADED, MEDIUM TO FINE GRAINED, TRACE GRAVEL (.25 - .50 IN), MOIST			Hnu = .7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
2.5	#6/2 1642hrs	5	6	SILTY SAND - LOOSE, DARK YELLOWISH BROWN (10YR 4/4), SAND FINE GRAINED, SILT NONPLASTIC, MOIST			Hnu = .7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
3.0	#6/2 1642hrs	5	6	SILTY SAND - LOOSE, DARK YELLOWISH BROWN (10YR 4/4), SAND FINE GRAINED, SILT NONPLASTIC, MOIST			Hnu = .7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
3.5	#6/2 1642hrs	3	6	SILTY GRAVEL, SANDY - LOOSE, DARK YELLOWISH BROWN (10YR 4/4), GRAVEL (.25 - 1.0 IN), SILT NONPLASTIC, SAND WELL GRADED, MOIST			Hnu = .7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
4.0	#6/2 1642hrs	2	6	SILTY GRAVEL, SANDY - LOOSE, DARK YELLOWISH BROWN (10YR 4/4), GRAVEL (.25 - 1.0 IN), SILT NONPLASTIC, SAND WELL GRADED, MOIST			Hnu = .7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
4.5	#6/3 1650hrs		6	SILTY GRAVEL, SANDY - LOOSE, DARK YELLOWISH BROWN (10YR 4/4), GRAVEL (.25 - 1.0 IN), SILT NONPLASTIC, SAND WELL GRADED, MOIST			Hnu = .6 ppm B/G = 50 cpm 3" O.D. SHELBY, 18" PUSH
5.0	#6/3 1650hrs		2	SILTY SAND - LOOSE, DARK YELLOWISH BROWN (10YR 4/4), SAND FINE GRAINED, SILT NONPLASTIC, MOIST			Hnu = .6 ppm B/G = 50 cpm 3" O.D. SHELBY, 18" PUSH
5.5	#6/3 1650hrs		-				
6.0							AUGERED
6.5	#6/4 1702hrs	6	6	WELL GRADED GRAVEL WITH SILT AND SAND - LOOSE, DARK YELLOWISH BROWN (10YR 4/4), NONPLASTIC, WET	GW-GM		Hnu = .2 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
7.0	#6/4 1702hrs	5	6	WELL GRADED GRAVEL WITH SILT AND SAND - LOOSE, DARK YELLOWISH BROWN (10YR 4/4), NONPLASTIC, WET	GW-GM		Hnu = .2 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL PERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-006	COORDINATES: FS 4769.89 FE 2366.30	DATE STARTED: 04/22/93
GEOLOGIST: J. HANEY	ELEVATION: 531.68 FT	DATE COMPLETED: 04/22/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 2 OF 4

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
7.5	#6/4	6	6	WELL GRADED GRAVEL WITH SILT AND SAND - LOOSE, DARK YELLOWISH BROWN (10YR 4/4), NONPLASTIC, WET	GW-GM		Hnu = .2 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
8.0	#6/4	5	6	WELL GRADED GRAVEL WITH SILT AND SAND - LOOSE, DARK YELLOWISH BROWN (10YR 4/4), NONPLASTIC, WET	GW-GM		Hnu = .2 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
8.5	#6/5 1712hrs	5	6	SILTY GRAVEL - LOOSE, DARK YELLOWISH BROWN (10YR 4/4), GRAVEL (.25 - 1.0 IN), SILT NONPLASTIC, MEDIUM SAND - WELL GRADED, WET			Hnu = .7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
9.0	#6/5 1712hrs	4	6	SILTY GRAVEL - LOOSE, DARK YELLOWISH BROWN (10YR 4/4), GRAVEL (.25 - 1.0 IN), SILT NONPLASTIC, MEDIUM SAND - WELL GRADED, WET			Hnu = .7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
9.5	#6/5 1712hrs	4	6	SAND - LOOSE, BROWN (10YR 4/3), POORLY GRADED, FINE GRAINED, WET			Hnu = .7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
10.0	#6/5 1712hrs	5	6	SAND - LOOSE, BROWN (10YR 4/3), POORLY GRADED, FINE GRAINED, WET			Hnu = .7 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
10.5							AUGERED 10 - 13 FT
11.0							
11.5							
12.0							
12.5							
13.0							
13.5	#6/6 1726hrs	10	6	SAND - MEDIUM DENSITY, BROWN (10YR 4/3), WELL GRADED, MEDIUM GRAINED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu= 1.1 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
14.0	#6/6 1726hrs	7	6	SAND - MEDIUM DENSITY, BROWN (10YR 4/3), WELL GRADED, MEDIUM GRAINED, TRACE GRAVEL (.25 - .50 IN), WET			Hnu= 1.1 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL FERMCO SCREENING OR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-006	COORDINATES: FS 4769.89 FE 2366.30	DATE STARTED: 04/22/93
GEOLOGIST: J. HANEY	ELEVATION: 531.68 FT	DATE COMPLETED: 04/22/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 3 OF 4

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
14.5	#6/6 1726hrs	8	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), POORLY GRADED, FINE GRAINED, WET			Hnu= 1.1 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
15.0	#6/6 1726hrs	9	6	SAND - MEDIUM DENSE, BROWN (10YR 4/3), POORLY GRADED, FINE GRAINED, WET			Hnu= 1.1 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
15.5							AUGERED 15 - 18 FT
16.0							
16.5							
17.0							
17.5							
18.0							
18.5	#6/7 1740hrs	23	6	POORLY GRADED SAND WITH SILT - MEDIUM DENSE (HEAVING), DARK YELLOWISH BROWN (10YR 4/4), WET	SP-SM		Hnu= 1.0 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
19.5	#6/7 1740hrs	18	6	POORLY GRADED SAND WITH SILT - MEDIUM DENSE (HEAVING), DARK YELLOWISH BROWN (10YR 4/4), WET	SP-SM		Hnu= 1.0 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
19.5	#6/7 1740hrs	19	6	POORLY GRADED SAND WITH SILT - MEDIUM DENSE (HEAVING), DARK YELLOWISH BROWN (10YR 4/4), WET	SP-SM		Hnu= 1.0 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
20.0	#6/7 1740hrs	21	6	POORLY GRADED SAND WITH SILT - MEDIUM DENSE (HEAVING), DARK YELLOWISH BROWN (10YR 4/4), WET	SP-SM		Hnu= 1.0 ppm B/G = 50 cpm 3" O.D. S.S., 300# Hammer
20.5				(HEAVING SAND)			AUGERED 20 - 23 FT
21.0				(HEAVING SAND)			

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-006	COORDINATES: FS 4769.89 FE 2366.30	DATE STARTED: 04/22/93
GEOLOGIST: J. HANEY	ELEVATION: 531.68	DATE COMPLETED: 04/22/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 4 OF 4

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
21.5				(HEAVING SAND)			
22.0				(HEAVING SAND)			
22.5				(HEAVING SAND)			

NOTES: SAMPLES COLLECTED PER ASTM D-1586 AND ASTM D-1587. COLORS INDENTIFIED USING MUNSELL COLOR CHART. CONSISTENCY BASED ON PENETRATION RESISTANCE (BLOWS/FT). ALL FERMCO SCREENING FOR ORGANICS AND BETA/GAMMA AT OR BELOW BACKGROUND LEVELS.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-007	COORDINATES: PS 4916.63 FE 2524.59	DATE STARTED: 04/21/93
GEOLOGIST: J. HANEY	ELEVATION: 571.73	DATE COMPLETED: 04/21/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 1 OF 1

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
2.0	1324hr			0 TO 5 FT SILTY CLAY, LIGHT OLIVE BROWN (2.5Y 5/3), MODERATELY PLASTIC, MOIST			Hnu = 0.0 ppm B/G = 50 cpm
4.0	1328hr			SILTY CLAY - LIGHT OLIVE BROWN (2.5Y 5/3), MODERATELY PLASTIC, MOIST			Hnu = 0.0 ppm B/G = 50 cpm
6.0	1331hr			5 TO 20 FT FLY ASH, BLACK (N2.5/), SILT TO FINE GRAINED GRAINED SIZED PARTICLES, NON PLASTIC, MOIST			Hnu = 0.4 ppm B/G = 150 cpm *
8.0	1345hr			FLY ASH - BLACK (N2.5/), SILT TO FINE GRAINED GRAINED SIZED PARTICLES, NON PLASTIC, MOIST			Hnu = 0.0 ppm B/G = 150 cpm
10.0	1402hr			FLY ASH - BLACK (N2.5/), SILT TO FINE GRAINED GRAINED SIZED PARTICLES, NON PLASTIC, MOIST			Hnu = 0.0 ppm B/G = 120 cpm
12.0	1407hr			FLY ASH - BLACK (N2.5/), SILT TO FINE GRAINED GRAINED SIZED PARTICLES, NON PLASTIC, MOIST			Hnu = 0.0 ppm B/G = 110 cpm
14.0	1412hr			FLY ASH - BLACK (N2.5/), SILT TO FINE GRAINED GRAINED SIZED PARTICLES, NON PLASTIC, MOIST			Hnu = 0.0 ppm B/G = 100 cpm
16.0	1416hr			FLY ASH - BLACK (N2.5/), SILT TO FINE GRAINED GRAINED SIZED PARTICLES, NON PLASTIC, MOIST			Hnu = 1.2 ppm B/G = 100 cpm
18.0	1418hr			FLY ASH - BLACK (N2.5/), SILT TO FINE GRAINED GRAINED SIZED PARTICLES, NON PLASTIC, MOIST			Hnu = 1.1 ppm B/G = 110 cpm
20.0	1421hr			FLY ASH - BLACK (N2.5/), SILT TO FINE GRAINED GRAINED SIZED PARTICLES, NON PLASTIC, MOIST			Hnu = 0.0 ppm B/G = 90 cpm
				* FERMCO RAD CON TECH MEASURED 190 cpm B/G AT 6 FEET			

NOTES: COLORS IDENTIFIED USING MUNSELL COLOR CHART. ALL FERMCO SCREENING FOR ORGANICS AT OR BELOW BACKGROUND. FERMCO SCREENING FOR BETA / GAMMA ABOVE BACKGROUND FROM 6 TO 20 FEET.

PROJECT NUMBER: PO 90	PROJECT NAME: EROSION CONTROL AT THE INACTIVE FLYASH PILE	
BORING NUMBER: G2-008	COORDINATES: FS 4809.44 FE 2574.97	DATE STARTED: 04/17/93
GEOLOGIST: J. HANEY	ELEVATION: 578.66 FT	DATE COMPLETED: 04/17/93
DRILLING METHOD: AUGER (HOLLOW STEM)	GWL: NA	PAGE 1 OF 1

DEPTH FT	SAMPLE NUMBER TIME	BLOWS ON SAMPLER	RECOVERY inches	DESCRIPTION	USCS SYM	TSF	REMARKS
2.0	1733hr			0 TO 4 FT SILTY CLAY, YELLOWISH BROWN (10YR 5/4), MODERATELY PLASTIC, MOIST			Hnu = 4.0 ppm B/G = 50 cpm
4.0	1735hr			SILTY CLAY - YELLOWISH BROWN (10YR 5/4), MODERATELY PLASTIC, MOIST			Hnu = 1.6 ppm B/G = 50 cpm
6.0	1739hr			FLY ASH - BLACK (N2.5/), SILT TO FINE GRAINED PARTICLES, NON PLASTIC, MOIST			Hnu = 1.8 ppm B/G = 50 cpm
8.0	1740hr			FLY ASH - BLACK (N2.5/), SILT TO FINE GRAINED PARTICLES, NON PLASTIC, MOIST			Hnu = 1.6 ppm B/G = 50 cpm
10.0	1742hr			FLY ASH - BLACK (N2.5/), SILT TO FINE GRAINED PARTICLES, NON PLASTIC, MOIST			Hnu = 2.0 ppm B/G = 50 cpm
12.0	1743hr			FLY ASH - BLACK (N2.5/), SILT TO FINE GRAINED PARTICLES, NON PLASTIC, MOIST. (THIN SILTY CLAY LAYER AT APPROXIMATELY 10 FT)			Hnu = 1.5 ppm B/G = 50 cpm
14.0	1744hr			FLY ASH - BLACK (N2.5/), SILT TO FINE GRAINED PARTICLES, NON PLASTIC, MOIST			Hnu = 1.8 ppm B/G = 50 cpm
16.0	1748hr			15 TO 16 FT BOTTOM ASH, BLACK (N2.5/), GRAVEL SIZED PARTICLES (.25 - 1.0 IN), SUB ROUNDED TO ROUNDED, SLIGHLTY MOIST			Hnu = 1.6 ppm B/G = 50 cpm
18.0	1752hr			FLY ASH - BLACK (N2.5/), SILT TO FINE GRAINED PARTICLES, NON PLASTIC, TRACE BOTTOM ASH, SLIGHTLY MOIST			Hnu = 1.6 ppm B/G = 50 cpm
20.0	1754hr			FLY ASH - BLACK (N2.5/), SILT TO FINE GRAINED PARTICLES, NON PLASTIC, TRACE BOTTOM ASH, SLIGHTLY MOIST			Hnu = 2.0 ppm B/G = 50 cpm

NOTES: COLORS IDENTIFIED USING MUNSELL COLOR CHART. ALL FERMCO SCREENING FOR ORGANICS AND BETA / GAMMA AT OR BELOW BACKGROUND.

PROJECT NUMBER: 602 3.7	PROJECT NAME: CRU2 PHASE I FIELD INVESTIGATION	
BORING NUMBER: 1708	COORDINATES: NORTH 477710.64 EAST 1379166.88	DATE:14-JUN-91
GROUND ELEVATION: 570.9	GWL: Depth Date/Time	DATE STARTED: 14-JUN-9
ENGINEER/GEOLOGIST: J. LEAR	Depth Date/Time	DATE COMPLETE: 17-JUN-
DRILLING METHOD: AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON SAMPLE	RECOVERY INCHES		USCS SYMBOL	TSF	REMARKS *
1.5	067091	06/14/91 15:00	25 27 19	18	V. HARD BLACK, (2.5Y, 2/) ASPHALT, TRACE GRAVEL, DRY, .25-V. HARD BROWN TO YELLOWISH BROWN (10YR, 5/3 TO 10YR, 4/6) SILTY CLAY, SOME GRAVEL LOW PLASTICITY, DRY.	CL	>4.0	PID=0 ppm α=50-100 ppm BΓ=0 cpm
1.5 3.0	067092	06/14/91 15:05	14 14 14	18	V. HARD, BLACK, (2.5Y, 2/) ASPHALT, TRACE GRAVEL, DRY, .25-V. HARD BROWN TO YELLOWISH BROWN, (10YR, 5/3 TO 10YR, 4/6) SILTY CLAY, SOME GRAVEL LOW PLASTICITY., DRY, 1.75-DENSE, VERY DARK GRAY (2.5Y, 3/) SILT, TRACE SAND & GRAVEL, DRY.	CL ML	>4.0	PID=0 ppm α=50-100 ppm BΓ=0 cpm
3.0 4.5	067093	06/14/91 15:10	14 14 18	18	DENSE, VERY DARK GRAY (2.5Y, 3/) SILT, TRACE SAND & GRAVEL, DRY, 4.0-DENSE, BLACK (2.5Y, 2/) SILT, TRACE SAND TRACE GRAVEL, SL. MOIST.	ML ML	N/A	PID=0 ppm α=50-100 ppm BΓ=0 cpm
4.5 6.0	067094	06/14/91 15:15	6 6 5	18	4.0-DENSE, BLACK, (2.5Y, 2/) SILT, TRACE SAND TRACE GRAVEL, SL. MOIST, MED DENSE, 5.25-MED DENSE, VERY DARK GRAY (2.5Y, 3/) SILT, SOME SAND, SOME GRAVEL, DRY.	ML ML	N/A	PID=0 ppm α=50-100 ppm BΓ=0 cpm
6.0 7.5	067095	06/14/91 15:50	2 2 2	10	VERY LOOSE, BLACK (2.5Y, 2/) SILT, TRACE SAND AND GRAVEL, SL. MOIST.	ML	N/A	PID=0 ppm α=50-100 ppm BΓ=0 cpm
7.5 9.0	067096	06/14/91 15:55	2 2 2	16	VERY LOOSE, BLACK (2.5Y, 2/) SILT, TRACE SAND AND GRAVEL, SL. MOIST.	ML	N/A	PID=0 ppm α=50-100 ppm BΓ=0 cpm
12.0 13.5	067099	06/16/91 09:00	3 3 3	13	VERY LOOSE, BLACK, (2.5Y, 2/) SILT, TRACE SAND AND GRAVEL, SL. MOIST, SOME SAND SOME GRAVEL.	ML	N/A	PID=0 ppm α=50-100 ppm BΓ=0 cpm
13.5 15.0	067100	06/16/91 09:05	3 3 4	18	VERY LOOSE, BLACK, (2.5Y, 2/) SILT, TRACE SAND AND GRAVEL, SL. MOIST, SOME SAND SOME GRAVEL.	ML	N/A	PID=0 ppm α=50-100 ppm BΓ=0 cpm
15.0 16.5	067101	06/16/91 09:10	3 3 4	18	VERY LOOSE, BLACK, (2.5Y, 2/) SILT, TRACE SAND AND GRAVEL, SL. MOIST, SOME SAND SOME GRAVEL.	ML	N/A	PID=0 ppm α=50-100 ppm BΓ=0 cpm
16.5 18.0	067102	06/16/91 09:15	5 2 3	18	VERY LOOSE, BLACK, (2.5Y, 2/) SILT, TRACE SAND AND GRAVEL, SL. MOIST, SOME SAND SOME GRAVEL.	ML	N/A	PID=0 ppm α=50-100 ppm BΓ=0 cpm
18.0 19.5	067103	06/16/91 10:15	5 5 5	0	NO RECOVERY	N/A	N/A	PID=0 ppm α=50-100 ppm BΓ=0 cpm
[illegible]	067104	06/16/91 10:20	5 3 4	18	LOOSE, BLACK (2.5Y, 2/) SILT, TRACE SAND TRACE GRAVEL, SL. MOIST, WOOD CHIP 2".	ML	N/A	PID=0 ppm α=50-100 ppm BΓ=0 cpm

NOTES:

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 602 3.7	PROJECT NAME: CRU2 PHASE I FIELD INVESTIGATION
BORING NUMBER: 1708	COORDINATES: NORTH 477710.64 EAST 1379166.88 DATE:14-JUN-91
GROUND ELEVATION: 570.9	GWL: Depth Date/Time DATE STARTED: 14-JUN-91
ENGINEER/GEOLOGIST: J. LEAR	Depth Date/Time DATE COMPLETE: 17-JUN-91
DRILLING METHOD: AUGER	

DEPTH	SAMPLE	DATE TIME	BLOWS ON SAMPLE	RECOVERY INCHES		USCS	SYMBOL	TSF	REMARKS
21.0 22.5	067105 06/16/91 10:25		2 2 3	18	LOOSE, BLACK (2.5Y, 2/) SILT, TRACE SAND TRACE GRAVEL, SL. MOIST, WOOD CHIP 2", 21.5'-LOOSE, BLACK (2.5Y, 2/) SANDY SILT, TRACE GRAVEL SL. MOIST, 22.0-LOOSE, BLACK (2.5Y, 2/) SILT, TRACE SAND TRACE GRAVEL, MOIST.	ML ML ML		N/A	PID=0 ppm α=50-100 ppm BΓ=0 cpm
22.5 24.0	067106 06/16/91 10:30		3 3 3	18	LOOSE, BLACK (2.5Y, 2/) SILT, SOME GRAVEL, TRACE SAND, SL. MOIST, 23.8-LOOSE, BLACK TO YELLOWISH BROWN (2.5Y, 2/) TO (10YR, 5/4) SANDY SILT, TRACE GRAVEL, SL. MOIST.	ML ML		N/A	PID=0 ppm α=50-100 ppm BΓ=0 cpm
24.0 25.5	067107 06/16/91 13:30		5 5 4	18	LOOSE, BLACK (2.5Y, 2/) SILT, SOME POORLY SORTED SAND, SL. MOIST.	ML		N/A	PID=0 ppm α=50-100 ppm BΓ=0 cpm
25.5 27.0	067108 06/16/91 13:35		3 3 2	18	LOOSE, BLACK (2.5Y, 2/) SILT, SOME POORLY SORTED SAND, SL. MOIST.	ML		N/A	PID=0 ppm α=50-100 ppm BΓ=0 cpm
27.0 28.5	067109 06/16/91 13:40		2 2 4	18	LOOSE, BLACK (2.5Y, 2/) SILT, SOME POORLY SORTED SAND, SL. MOIST, 28.2-LOOSE, DARK GRAYISH BROWN (10YR, 4/) POORLY SORTED SAND, TRACE GRAVEL, SL. MOIST.	ML SP		N/A	PID=0 ppm α=50-100 ppm BΓ=0 cpm
28.5 30.0	067110 06/16/91 13:45		8 8 6	16	28.2-LOOSE DARK GRAYISH BROWN (10YR, 4/) POORLY SORTED SAND, TRACE GRAVEL, SL. MOIST, MED DENSE, 29.0-MEDIUM DENSE, VERY DARK GRAY (2.5Y, 3/) SANDY SILT, MOIST, 29.5-MEDIUM DENSE (2.5Y, 4/2) OLIVE BROWN, SILT SOME SAND SOME CLAY, SLIGHT PLASTICITY,	SP ML ML		N/A	PID=0 ppm α=50-100 ppm BΓ=0 cpm
30.0 31.5	067111 06/16/91 14:15		8 11 13	18	MEDIUM DENSE, BLACK (5Y/25/1) SILT SOME LIGHT OLIVE BROWN (2.5Y, 5/6) SAND (FINE) MOIST. 31.0-MEDIUM DENSE, DARK OLIVE GRAY TO BLACK (5Y, 3/2 TO 5Y/2.5/2) SILT TRACE SAND, MOIST.	ML ML		N/A	PID=0 ppm α=50-100 ppm BΓ=0 cpm
31.5 33.0	067112 06/16/91 14:20		8 14 20	18	DENSE, DARK OLIVE GRAY, (5Y/3/2) SILT SOME CLAY, LOW PLASTICITY, MOIST.	ML		N/A	PID=0 ppm α=50-100 ppm BΓ=0 cpm

NOTES:

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

000240

PROJECT NUMBER: 602 3.7	PROJECT NAME: CRU2 PHASE I FIELD INVESTIGATION	
BORING NUMBER: 1724	COORDINATES: NORTH 477239.70 EAST 1379830.96	DATE:12-JUL-91
GROUND ELEVATION: 586.8	GWL: Depth Date/Time	DATE STARTED: 12-JUL-91
ENGINEER/GEOLOGIST: J. LEAR	Depth Date/Time	DATE COMPLETE: 16-JUL-9
DRILLING METHOD: AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
1.5	067190	07/13/91 14:30	2 4 6	18		LOOSE, BLACK (2.5Y, 2/) SILT, TRACE SAND TRACE GRAVEL, DRY.	ML	N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
1.5 3.0	067191	07/13/91 14:35	6 6 9	18		LOOSE, BLACK (2.5Y, 2/) SILT, TRACE SAND TRACE GRAVEL, DRY MED DENSE.	ML	N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
3.0 4.5	067192	07/13/91 14:40	9 7 7	18		MED. DENSE, BLACK, TO VERY DARK GRAY, (2.5Y, 2/) TO 10YR. 3/1) SOME SAND, SOME GRAVEL, DRY.	ML	N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
4.5 6.0	067193	07/13/91 14:45	15 15 13	18		MED. DENSE, BLACK, (2.5Y, 2/) SILT, TRACE SAND, TRACE GRAVEL DRY.	ML	N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
6.0 7.5	067194	07/13/91 15:20	14 14 13	18		MED. DENSE, BLACK, (2.5Y, 2/) SILT, TRACE SAND, TRACE GRAVEL DRY.	ML	N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
7.5 9.0	067195	07/13/91 15:25	10 8 10	18		MED. DENSE, BLACK, (2.5Y, 2/) SILT, TRACE SAND, TRACE GRAVEL DRY.	ML	N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
9.0 10.5	067196	07/13/91 15:30	7 8 8	18		MED. DENSE, BLACK, (2.5Y, 2/) SILT, TRACE SAND, TRACE GRAVEL DRY.	ML	N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
10.5 12.0	067197	07/13/91 15:35	6 6 6	14		MED. DENSE, BLACK, (2.5Y, 2/) SILT, TRACE SAND & GRAVEL, TRACE BROWN (10YR. 5/3) CLAYEY SILT.	ML	N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
14.5 16.0	067200	07/14/91 09:35	8 5 3	16		LOOSE, BLACK, (2.5Y, 2/) SILT, TRACE SAND, TRACE GRAVEL, DRY.	ML	N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
16.0 17.5	067201	07/14/91 09:40	7 4 4	17		LOOSE, BLACK, (2.5Y, 2/) SILT, TRACE SAND, TRACE GRAVEL, DRY.	ML	N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
17.5 19.0	067202	07/14/91 09:45	3 3 3	18		LOOSE, BLACK, (2.5Y, 2/) SILT, TRACE SAND, TRACE GRAVEL, DRY.	ML	N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
19.0 20.5	067203	07/14/91 09:50	2 4 4	18		LOOSE, BLACK, (2.5Y, 2/) SILT, TRACE SAND, TRACE GRAVEL, DRY.	ML	N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
20.5 22.0	067204	07/15/91 09:15	3 3 5	18		LOOSE, BLACK, (2.5Y, 2/) SILT, TRACE SAND, TRACE GRAVEL, DRY.	ML	N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm

NOTES:

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

02/01/94 18:37

PROJECT NUMBER: 602 3.7	PROJECT NAME: CRU2 PHASE I FIELD INVESTIGATION	
BORING NUMBER: 1724	COORDINATES: NORTH 477239.70 EAST 1379830.96	DATE:12-JUL-91
GROUND ELEVATION: 586.8	GWL: Depth Date/Time	DATE STARTED: 12-JUL-91
ENGINEER/GEOLOGIST: J. LEAR	Depth Date/Time	DATE COMPLETE: 16-JUL-91
DRILLING METHOD: AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY INCHES		USCS	SYMBOL	TSF	REMARKS
22.0 23.5	067205	07/15/91 09:20	4 4 4		18	LOOSE, BLACK, (2.5Y, 2/) SILT, SOME SAND TRACE GRAVEL, DRY.	ML		N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
23.5 25.0	067206	07/15/91 09:25	3 4 3		18	LOOSE, BLACK, (2.5Y, 2/) SILT, SOME SAND TRACE GRAVEL, DRY.	ML		N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
25.0 26.5	067207	07/15/91 09:30	5 4 7		18	MEDIUM DENSE, (2.5Y, 2/) SILT, TRACE SAND TRACE GRAVEL, DRY.	ML		N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
26.5 28.0	067208	07/15/91 10:00	6 3 2		18	MEDIUM DENSE, (2.5Y, 2/) SILT, TRACE SAND TRACE GRAVEL, DRY.	ML		N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
28.0 29.5	067209	07/15/91 10:05	5 2 2		18	MEDIUM DENSE, (2.5Y, 2/) SILT, TRACE SAND TRACE GRAVEL, DRY.	ML		N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
29.5 31.0	067210	07/15/91 10:10	3 4 4		16	MEDIUM DENSE, (2.5Y, 2/) SILT, TRACE SAND TRACE GRAVEL, DRY.	ML		N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
31.0 32.5	067211	07/15/91 10:15	2 2 5		16	MEDIUM DENSE, (2.5Y, 2/) SILT, TRACE SAND TRACE GRAVEL, DRY TRACE ORGANICS, SL. MOIST.	ML		N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
32.5 34.0	067212	07/15/91 10:45	10 10 11		16	MEDIUM DENSE, (2.5Y, 2/) SILT, TRACE SAND TRACE GRAVEL, DRY TRACE ORGANICS, SL. MOIST.	ML		N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
34.0 35.5	067213	07/15/91 10:50	6 6 7		16	MEDIUM DENSE, (2.5Y, 2/) SILT, TRACE SAND TRACE GRAVEL, DRY TRACE ORGANICS, SL. MOIST.	ML		N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
35.5 37.0	067214	07/15/91 10:55	4 4 3		14	LOOSE, BLACK (2.5Y, 2/) SILT, ALTERNATING WITH BROWN, (10YR. 5/3) CLAYEY SILT, TRACE SAND & GRAVEL, SL. MOIST.	ML		N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
37.0 38.5	067215	07/15/91 11:00	2 2 3		0	NO RECOVERY	N/A		N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
38.5 40.0	067216	07/16/91 09:00	7 10 8		0	NO RECOVERY	N/A		N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm
40.0 41.5	067217	07/16/91 09:05	5 5 8		10	FIRM, DARK YELLOWISH BROWN, (10YR, 4/6) SANDY CLAY TRACE GRAVEL, MED PLAST. MOIST.	CL		.75	PID=0 ppm α=80-100 ppm βΓ=0 cpm

NOTES:

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 602 3.7	PROJECT NAME: CRU2 PHASE I FIELD INVESTIGATION	
BORING NUMBER: 1724	COORDINATES: NORTH 477239.70 EAST 1379830.96	DATE:12-JUL-91
GROUND ELEVATION: 586.8	GWL: Depth Date/Time	DATE STARTED: 12-JUL-91
ENGINEER/GEOLOGIST: J. LEAR	Depth Date/Time	DATE COMPLETE: 16-JUL-9
DRILLING METHOD: AUGER		

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
41.5 43.0	067218	07/16/91	09:10	9 13 13		14		FIRM, DARK YELLOWISH BROWN, (10YR, 4/6) SANDY CLAY TRACE GRAVEL, MED PLAST. MOIST.	CL		.75	PID=0 ppm α=80-100 ppm βΓ=0 cpm
43.0 44.5	067219	07/16/91	09:15	12 10 13		0		NO RECOVERY	N/A		N/A	PID=0 ppm α=80-100 ppm βΓ=0 cpm

NOTES:

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1964	COORDINATES: NORTH 477418.89 EAST 1379418.28	DATE:17-APR-93
GROUND ELEVATION: 571.6	GWL: Depth Date/Time	DATE STARTED: 17-APR-93
ENGINEER/GEOLOGIST: MUSA KESEKOIV	Depth Date/Time	DATE COMPLETE: 17-APR-
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
.5	112643	04/17/93 09:00	4		6		MEDIUM STIFF, (10YR4/1) DARK GRAY, PEAT WITH HIGH ORGANIC CONTENT, MOIST	PT		1	PID=5.2 ppm BΓ=40 cpm
.5 1.0	112644	04/17/93 09:00	4		6		VERY STIFF, (10YR5/3) BROWN, SILTY CLAY WITH PEBBLES, MEDIUM TO HIGH PLASTICITY, MOIST	CH		2	PID=5.2 ppm BΓ=40 cpm
1.0 1.5		04/17/93 00:00	12		0		NO RECOVERY	N/A		N/A	
1.5 2.0	112645	04/17/93 09:10	8		6		SAA	CH		2	PID=6.2 ppm BΓ=40 cpm
2.0 2.5	112646	04/17/93 09:10	9		6		SAA	CH		2	PID=6.2 ppm BΓ=40 cpm
2.5 3.0		04/17/93 00:00	14		0		NO RECOVERY	N/A		N/A	
3.0 3.5	112647	04/17/93 09:20	8		6		VERY STIFF, (10YR4/2) DARK GRAYISH BROWN, SILTY CLAY WITH SOME PEBBLES, MEDIUM TO HIGH PLASTICITY, MOIST	CH		1.5	PID=4.2 ppm BΓ=40 cpm
3.5 4.0	112647	04/17/93 09:20	9		6		SAA	CH		1.5	PID=4.2 ppm BΓ=40 cpm
4.0 4.5	112647	04/17/93 09:20	12		6		VERY STIFF, (10YR4/1) DARK GRAY, GRAVELLY SILTY CLAY WITH SOME PEBBLES, LOW PLASTICITY, DRY TO MOIST	CL		4	PID=4.2 ppm BΓ=40 cpm
4.5 5.0	112647	04/17/93 09:20	22		6		SAA	CL		4	PID=4.2 ppm BΓ=40 cpm
5.0 5.5	112648	04/17/93 09:30	8		6		VERY STIFF, (10YR4/3) BROWN, SILTY CLAY, MEDIUM TO HIGH PLASTICITY, SOME PEBBLES, MOIST	CH		2	PID=4.2 ppm BΓ=50 cpm
5.5 6.0	112648	04/17/93 09:30	9		6		SAA	CH		3.5	PID=4.2 ppm BΓ=50 cpm
6.0 6.5	112648	04/17/93 09:30	12		6		VERY STIFF, (10YR4/2) DARK GRAYISH BROWN, SILTY CLAY WITH SOME PEBBLES, MEDIUM PLASTICITY, MOIST	CL		4	PID=4.2 ppm BΓ=50 cpm

NOTES:
2 DRUMS FOR SOIL CUTTINGS, 1 DRUM FOR ALCONOK WATER,2 BAGS OF 50 LBS. VOLCLAY, 1/2 BAG OF 94 LBS. CEMENT

Boring Contractor: PENNSYLVANIA DRILLING
Driller: MARTY WATRAL, DONNIE ARTHUR
Drilling Equipment: ACKER

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1964	COORDINATES: NORTH 477418.89 EAST 1379418.28	DATE:17-APR-93
GROUND ELEVATION: 571.6	GWL: Depth Date/Time	DATE STARTED: 17-APR-93
ENGINEER/GEOLOGIST: MUSA KESEKOIV	Depth Date/Time	DATE COMPLETE: 17-APR-93
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
6.5 7.0	112649	04/17/93 09:45	12		6		VERY STIFF, (5YR4/2) OLIVE GRAY, SANDY SILTY CLAY, WITH SOME PEBBLES, LOW TO MEDIUM PLASTICITY, MOIST	CL		2	PID=3.6 ppm BΓ=50 cpm
7.0 7.5	112650	04/17/93 09:45	20		6		SAA	CL		2	PID=3.6 ppm BΓ=50 cpm
7.5 8.0	112651	04/17/93 09:45	28		6		VERY STIFF, (5YR4/2) OLIVE GRAY, SILTY CLAY WITH PEBBLES, MEDIUM TO HIGH PLASTICITY, MOIST(SOME COBBLES)	CH		2	PID=3.6 ppm BΓ=50 cpm
8.0 8.5	112652	04/17/93 10:00	6		8		VERY STIFF, (5YR4/2) OLIVE GRAY, SILTY CLAY WITH COBBLES, MEDIUM TO HIGH PLASTICITY, MOIST	CH		2	PID=3.5 ppm BΓ=40 cpm
8.5 9.0	112653	04/17/93 10:00	6		8		SAA	CH		2	PID=3.5 ppm BΓ=40 cpm
9.0 9.5		04/17/93 10:00	0		9		NO RECOVERY	N/A		N/A	
9.5 10.0		04/17/93 10:00	0		15		NO RECOVERY	N/A		N/A	
10.0 10.5	112654	04/17/93 10:10	6		6		VERY STIFF, (5YR4/2) OLIVE GRAY, SILTY CLAY, FEW PEBBLES, MEDIUM TO HIGH PLASTICITY, MOIST	CH		3	PID=3.5 ppm BΓ=40 cpm
10.5 11.0	112655	04/17/93 10:10	8		6		VERY STIFF, (10YR5/3) BROWN, CLAYEY SILT WITH SOME PEBBLES, LOW PLASTICITY, MOIST	ML		3	PID=3.5 ppm BΓ=40 cpm
11.0 11.5		04/17/93 00:00	6		0		NO RECOVERY	N/A		N/A	
11.5 12.0		04/17/93 00:00	12		0		NO RECOVERY	N/A		N/A	
12.0 12.5	112656	04/17/93 10:20	9		6		VERY STIFF, (10YR5/3) BROWN, SANDY CLAYEY SILT WITH SOME PEBBLES, LOW PLASTICITY, MOIST	OL		3	PID=5.3 ppm BΓ=40 cpm
12.5 13.0	112657	04/17/93 10:20	15		6		VERY STIFF, (10YR5/3) BROWN, CLAYEY SILT, LOW PLASTICITY, MOIST	OL		3.5	PID=5.3 ppm BΓ=40 cpm

NOTES:
2 DRUMS FOR SOIL CUTTINGS, 1 DRUM FOR ALCONOK WATER,2 BAGS OF 50 LBS. VOLCLAY, 1/2 BAG OF 94 LBS. CEMENT

Boring Contractor: PENNSYLVANIA DRILLING
Driller: MARTY WATRAL, DONNIE ARTHUR
Drilling Equipment: ACKER

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable.

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1964	COORDINATES: NORTH 477418.89 EAST 1379418.28	DATE:17-APR-93
GROUND ELEVATION: 571.6	GWL: Depth Date/Time	DATE STARTED: 17-APR-93
ENGINEER/GEOLOGIST: MUSA KESEKOIV	Depth Date/Time	DATE COMPLETE: 17-APR-9
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY INCHES		USCS SYMBOL	TSF	REMARKS
13.0 13.5	112658	04/17/93 10:20	22		6	VERY STIFF, (10YR5/3) BROWN, SILTY CLAY, MEDIUM TO HIGH PLASTICITY, MOIST	CL	3.5	PID=5.3 ppm BΓ=40 cpm
13.5 14.0		04/17/93 00:00	35		0	NO RECOVERY	N/A	N/A	
14.0 14.5	112659	04/17/93 10:45	13		6	DENSE, (10YR5/2) GRAYISH BROWN, SILTY SAND, LOOSE, WITH SOME PEBBLES, MOIST	SM	N/A	PID=3.5 ppm BΓ=40 cpm
14.5 15.0	112660	04/17/93 10:45	13		6	VERY STIFF, (10YR5/3) BROWN, SILTY CLAY, MEDIUM PLASTICITY, MOIST	CL	3	PID=3.5 ppm BΓ=40 cpm
15.0 15.5	112661	04/17/93 10:45	21		6	VERY STIFF, (10YR5/3) BROWN, CLAYEY SILT, LOW PLASTICITY, WET	ML	.5	PID=3.5 ppm BΓ=40 cpm
15.5 16.0	112662	04/17/93 10:45	24		6	SAA	ML	.5	PID=3.5 ppm BΓ=40 cpm
16.0 16.5	112663	04/17/93 10:55	7		6	SAA	ML	.5	PID=3.2 ppm BΓ=40 cpm
16.5 17.0	112664	04/17/93 10:55	10		6	MEDIUM STIFF, (10YR5/3) BROWN, CLAYEY SILT, MEDIUM PLASTICITY, WET TO MOIST	ML	1	PID=3.2 ppm BΓ=40 cpm
17.0 17.5	112665	04/17/93 10:55	21		6	VERY STIFF, (10YR5/3) BROWN, SILTY CLAY, MEDIUM TO HIGH PLASTICITY, MOIST	CH	4	PID=3.2 ppm BΓ=40 cpm
17.5 18.0	112666	04/17/93 10:55	26		6	SAA	CH	4.5	PID=3.2 ppm BΓ=40 cpm
18.0 18.5	112667	04/17/93 13:30	8		6	HARD (10YR, 5/3) BROWN, CLAYEY SILT WITH SOME ANGULAR PEBBLES, MEDIUM PLASTICITY, MOIST	ML	5	PID=0 ppm BΓ=40 cpm
18.5 19.0	112668	04/17/93 13:30	17		6	SAA	ML	N/A	PID=0 ppm BΓ=40 cpm
19.0 19.5	112669	04/17/93 13:30	27		6	SAA	ML	5	PID=0 ppm BΓ=40 cpm

NOTES:
2 DRUMS FOR SOIL CUTTINGS, 1 DRUM FOR ALCONOK WATER,2 BAGS OF 50 LBS. VOLCLAY, 1/2 BAG OF 94 LBS. CEMENT

Boring Contractor: PENNSYLVANIA DRILLING
Driller: MARTY WATRAL, DONNIE ARTHUR
Drilling Equipment: ACKER

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable.

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1964	COORDINATES: NORTH 477418.89 EAST 1379418.28	DATE:17-APR-93
GROUND ELEVATION: 571.6	GWL: Depth Date/Time	DATE STARTED: 17-APR-93
ENGINEER/GEOLOGIST: MUSA KESEKOIV	Depth Date/Time	DATE COMPLETE: 17-APR-93
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
19.5 20.0	112670	04/17/93 13:30	28		6		SAA	ML		5	PID=0 ppm BΓ=40 cpm
20.0 20.5	112671	04/17/93 13:50	5		6		VERY HARD, (10YR5/3) BROWN, CLAYEY SILT WITH COBBLES, MEDIUM TO HIGH PLASTICITY, MOIST	CH		4.5	PID=0 ppm BΓ=40 cpm
20.5 21.0	112671	04/17/93 13:50	16		6		DENSE, (10YR5/1) GRAY, LOOS POORLY GRADED GRAVELLY SAND, WITH SOME PEBBLES, MOIST	SP		N/A	PID=0 ppm BΓ=40 cpm
21.0 21.5	112671	04/17/93 13:50	21		6		SAA	SP		N/A	PID=0 ppm BΓ=40 cpm
21.5 22.0	112671	04/17/93 13:50	22		6		SAA	SP		N/A	PID=0 ppm BΓ=40 cpm
22.0 22.5	112672	04/17/93 14:05	35		6		SAA	SP		N/A	PID=0 ppm BΓ=40 cpm
22.5 23.0	112673	04/17/93 14:05	15		6		SAA	SP		N/A	PID=0 ppm BΓ=40 cpm
23.0 23.5	112674	04/17/93 14:05	21		6		SAA	SP		N/A	PID=0 ppm BΓ=40 cpm
23.5 24.0	112674	04/17/93 14:05	33		6		SAA	N/A		N/A	PID=0 ppm BΓ=40 cpm
24.0 24.5	112676	04/17/93 14:05	21		6		SAA	SP		N/A	PID=0 ppm BΓ=40 cpm
24.5 25.0	112677	04/17/93 14:20	31		6		HARD, (10YR5/3) BROWN, SANDY CLAYEY SILT, WITH SOME PEBBLES, LOW PLASTICITY, MOIST	ML		4.5	PID=0 ppm BΓ=40 cpm
25.0 25.5	112678	04/17/93 14:20	30		6		VERY DENSE, (10YR5/1) GRAY, LOOSE POORLY GRADED SAND WITH SOME PEBBLES, MOIST	SP		N/A	PID=0 ppm BΓ=40 cpm
25.5 26.0		04/17/93 14:20	32		0		NO RECOVERY	N/A		N/A	

NOTES:
2 DRUMS FOR SOIL CUTTINGS, 1 DRUM FOR ALCONOK WATER, 2 BAGS OF 50 LBS. VOLCLAY, 1/2 BAG OF 94 LBS. CEMENT

Boring Contractor: PENNSYLVANIA DRILLING
Driller: MARTY WATRAL, DONNIE ARTHUR
Drilling Equipment: ACKER

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1964	COORDINATES: NORTH 477418.89 EAST 1379418.28	DATE:17-APR-93
GROUND ELEVATION: 571.6	GWL: Depth Date/Time	DATE STARTED: 17-APR-93
ENGINEER/GEOLOGIST: MUSA KESEKOIV	Depth Date/Time	DATE COMPLETE: 17-APR-9
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
26.0 26.5	112679	04/17/93	14:40	9		6		SAA (25. TO 25.5 FT.)	SP	N/A	PID=0 ppm BΓ=40 cpm
26.5 27.0	112680	04/17/93	14:40	17		6		SAA	SP	N/A	PID=0 ppm BΓ=40 cpm
27.0 27.5	112681	04/17/93	14:40	11		6		SAA	SP	N/A	PID=0 ppm BΓ=40 cpm
27.5 28.0	112682	04/17/93	14:50	21		6		SAA	SP	N/A	PID=0 ppm BΓ=40 cpm
28.0 28.5	112683	04/17/93	14:50	21		6		SAA	SP	N/A	PID=0 ppm BΓ=40 cpm
28.5 29.0	112684	04/17/93	14:50	21		6		SAA	SP	N/A	PID=0 ppm BΓ=40 cpm
29.0 29.5	112685	04/17/93	15:10	20		6		SAA	SP	N/A	PID=0 ppm BΓ=40 cpm
29.5 30.0	112685	04/17/93	15:10	28		6		SAA	SP	N/A	PID=0 ppm BΓ=40 cpm
30.0 30.5	112685	04/17/93	15:10	23		6		SAA	SP	N/A	PID=0 ppm BΓ=40 cpm
30.5 31.0	112686	04/17/93	15:10	28		6		VERY DENSE, (10YR, 5/1) GRAY, LOOSE POORLY GRADED MEDIUM SAND, MOIST	SP	N/A	PID=0 ppm BΓ=40 cpm

NOTES:
2 DRUMS FOR SOIL CUTTINGS, 1 DRUM FOR ALCONOK WATER,2 BAGS OF 50 LBS. VOLCLAY, 1/2 BAG OF 94 LBS. CEMENT

Boring Contractor: PENNSYLVANIA DRILLING
Driller: MARTY WATRAL, DONNIE ARTHUR
Drilling Equipment: ACKER

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1965	COORDINATES: NORTH 477347.01 EAST 1379474.61	DATE:21-APR-93
GROUND ELEVATION: 574.1	GWL: Depth Date/Time	DATE STARTED: 20-APR-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 21-APR-93
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
.5	112735	04/20/93 09:20	4		6		MEDIUM DENSE, (2.5Y 5/6) LIGHT OLIVE BROWN, CLAYEY SILT, LOW PLASTICITY, ORGANIC, MATERIAL	ML		N/A	PID=0.6 ppm BΓ=60 cpm
1.0	112735	04/20/93 09:20	N/A 4		6		SAA	N/A ML		N/A	PID=0.6 ppm BΓ=60 cpm
1.5	112735	04/20/93 09:20	N/A 5		6		MEDIUM DENSE, (2.5Y 6/6) OLIVE YELLOW, SILTY SAND, MOIST-WET	N/A SM		N/A	PID=0.6 ppm BΓ=60 cpm
2.0	112735	04/20/93 09:20	N/A 8		5		SAA	N/A		N/A	PID=0.6 ppm BΓ=60 cpm
4.0	112736	04/20/93 09:30	N/A		18		SHELBY TUBE	N/A		N/A	
4.5	112737	04/20/93 10:10	12		6		VERY DENSE, (2.5Y 5/6) LIGHT OLIVE BROWN, CLAYEY SILT WITH GRAVEL, SLIGHTY PLASTICITY, DRY	ML CL		N/A	PID=0.3 ppm BΓ=60 cpm
5.0	112737	04/20/93 10:10	11		6		SAA	ML CL		N/A	PID=0.3 ppm BΓ=60 cpm
5.5	112737	04/20/93 10:10	31		6		SAA	ML CL		N/A	PID=0.3 ppm BΓ=60 cpm
6.0	112737	04/20/93 10:10	24		2		SAA	ML CL		N/A	PID=0.3 ppm BΓ=60 cpm
6.5	112738	04/20/93 10:35	8		6		MEDIUM DENSE, (5Y 4/4) OLIVE, CLAYEY SILT WITH SAND AND GRAVEL, LOW MEDIUM PLASTICITY, MOIST	ML		N/A	PID=0.4 ppm BΓ=60 cpm
7.0	112739	04/20/93 10:35	12		6		SAA	ML		N/A	PID=0.4 ppm BΓ=60 cpm
7.5		04/20/93 10:35	15		0		NO RECOVERY	N/A		N/A	
8.0	112740	04/20/93 10:50	5		6		MEDIUM DENSE, (5GY 5/1) GREENISH GRAY, CLAYEY SILT, TRACE SAND AND GRAVEL, MOIST	ML		N/A	PID=0.8 ppm BΓ=80 cpm

NOTES:

Driller: JOE RAAB, RODGE R DAVIS
Drilling Equipment: CME-45

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1965	COORDINATES: NORTH 477347.01 EAST 1379474.61	DATE:21-APR-93
GROUND ELEVATION: 574.1	GWL: Depth Date/Time	DATE STARTED: 20-APR-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 21-APR-
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON SAMPLE	RECOVERY INCHES		USCS	SYMBOL	TSF	REMARKS
8.0 9.0		04/20/93 00:00	4 8	0		N/A		N/A	PID=0.8 ppm BΓ=80 cpm
9.0 9.5	112741	04/20/93 11:00	3	6	MEDIUM STIFF, (5Y,5/4) OLIVE SILTY CLAY, WITH GRAVEL AND SAND, MOIST-WET, BLACK CLAY MODULES	CL		1.0	PID=0.9 ppm BΓ=60 cpm
9.5 10.0	112742	04/20/93 11:00	3	4	SAA	CL		0.5	PID=0.9 ppm BΓ=60 cpm
10.0 10.5		04/20/93 00:00	4	0		N/A		N/A	PID=0.9 ppm BΓ=60 cpm
10.5 11.0	112743	04/20/93 13:00	6	6	MEDIUM STIFF, (56Y,4/1) DARK GREENISH GRAY, SILTY CLAY, TRACE GRAVEL MEDIUM TO HIGH PLASTICITY, BLACK CLAY NOPOLES , MOIST	CL		.75	PID=0.6 ppm BΓ=120 cpm
11.0 11.5	112744	04/20/93 13:00	7	6	SAA	CL		.75	PID=0.6 ppm BΓ=120 cpm
11.5 12.0		04/20/93 13:00	8	0		N/A		N/A	PID=0.6 ppm BΓ=120 cpm
12.0 12.5	112745	04/20/93 13:10	6	6	MEDIUM STIFF, (5Y,5/2) OLIVE GRAY, SILTY CLAY, TRACE GRAVEL, MEDIUM PLASTICITY, MOIST	CL		.5	PID=0 ppm BΓ=60 cpm
12.5 13.0	112746	04/20/93 13:10	8	6	SAA	CL		.75	PID=0 ppm BΓ=60 cpm
13.0 13.5	112747	04/20/93 13:10	8	6	MEDIUM STIFF, (5Y,3/2) DARK OLIVE GRAY, SILTY CLAY, MEDIUM PLASTICITY, MOIST	CL		.5	PID=0 ppm BΓ=60 cpm
13.5 14.0	112748	04/20/93 13:20	5	6	SAA	CL		.5	PID=0 ppm BΓ=60 cpm
14.0 14.5	112749	04/20/93 13:20	7	6	SAA	CL		.7	PID=0 ppm BΓ=60 cpm
14.5 15.0	112750	04/20/93 13:20	8	2	SAA	CL		.5	PID=0 ppm BΓ=60 cpm

NOTES:

Driller: JOE RAAB, RODGE R DAVIS
Drilling Equipment: CME-45

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1965	COORDINATES: NORTH 477347.01 EAST 1379474.61	DATE:21-APR-93
GROUND ELEVATION: 574.1	GWL: Depth Date/Time	DATE STARTED: 20-APR-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 21-APR-93
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
15.0 15.5	112951	04/20/93 13:30	2		6		VERY SOFT, (5Y,3/2) DARK OLIVE GRAY, SILTY CLAY, TRACE GRAVEL, MEDIUM PLASTIC, MOIST	CL		.25	PID=0 ppm BΓ=60 cpm
15.5 16.0	112752	04/20/93 13:30	3		6		SAA	CL		.25	PID=0 ppm BΓ=60 cpm
16.0 16.5		04/20/93 00:00	3		0			N/A		N/A	PID=0 ppm BΓ=60 cpm
16.5 17.0	112753	04/20/93 13:50	6		6		VERY SOFT, (5Y,3/2) DARK OLIVE GRAY, SILTY CLAY, TRACE GRAVEL, MEDIUM PLASTICITY, MOIST	CL		.25	PID=0 ppm BΓ=60 cpm
17.0 17.5		04/20/93 00:00	50		0		SPLIT SPOON REFUSAL, HIT	N/A		N/A	PID=0 ppm BΓ=60 cpm
17.5 18.0		04/20/93 00:00	N/A		0		DOLOMITE, COBBLE (APPEARS TO BE CONCRETE) CEMENTED GRAVEL	N/A		N/A	PID=0 ppm BΓ=60 cpm
18.0 18.5	112754	04/20/93 14:30	12		6		VERY SOFT, (5Y,4/4) OLIVE, SILTY CLAY, MEDIUM PLASTICITY, MOIST, ALSO CONCRETE, WOOD CHIPS, AND TILE FRAGMENT	CL		0.25	PID=1.2 ppm BΓ=60 cpm
18.5 19.0		04/20/93 00:00	12		0		NO RECOVERY	N/A		N/A	
19.0 19.5		04/20/93 00:00	12		0		NO RECOVERY	N/A		N/A	
19.5 20.0	112755	04/20/93 14:40	6		6		STIFF, (2.5Y,5/4) LIGHT OLIVE BROWN, SILTY CLAY, TRACE GRAVEL, LOW PLASTICITY, DRY	CL		1.5	PID=1.0 ppm BΓ=75 cpm
20.0 20.5	112756	04/20/93 14:40	7		6		SAA	CL		1.75	PID=1.0 ppm BΓ=75 cpm
20.5 21.0		04/20/93 00:00	10		0		NO RECOVERY	N/A		N/A	
21.0 21.5	112758	04/20/93 09:30	7		6		VERY SOFT, (5Y,4/3) OLIVE, SILTY CLAY, TRACE GRAVEL, SLIGHT PLASTICITY, MOIST	CL		.25	PID=1.7 ppm BΓ=60 cpm

NOTES:

Driller: JOE RAAB, RODGE R DAVIS
Drilling Equipment: CME-45

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1965	COORDINATES: NORTH 477347.01 EAST 1379474.61	DATE:21-APR-93
GROUND ELEVATION: 574.1	GWL: Depth Date/Time	DATE STARTED: 20-APR-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 21-APR-9
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
21.5 22.0	112759	04/20/93 09:30	9		6		STIFF, (10YR,4/6) DARK YELLOWISH BROWN, SILTY CLAY, TRACE GRAVEL, LOW PLASTICITY, MOIST	CL		2.5	PID=1.7 ppm BΓ=60 cpm
22.0 22.5	112760	04/20/93 09:30	21		6		SAA	CL		2.0	PID=1.7 ppm BΓ=60 cpm
22.5 23.0	112761	04/20/93 10:00	4		6		STIFF, (10YR,4/6) DARK YELLOWISH BROWN, SILTY CLAY, WITH GRAVEL, SLIGHT PLASTICITY, DRY	CL		1.5	PID=2 ppm BΓ=60 cpm
23.0 23.5	112761	04/20/93 10:00	7		6		DENSE, (10YR,5/4) YELLOWISH BROWN, CLAYEY SILT WITH GRAVEL, NO TO SLIGHT PLASTICITY, DRY	ML		N/A	PID=2 ppm BΓ=60 cpm
23.5 24.0	112761	04/20/93 10:00	16		6		SAA	ML		N/A	PID=2 ppm BΓ=60 cpm
24.0 24.5	112761	04/20/93 10:00	32		6		SAA	ML		N/A	PID=2 ppm BΓ=60 cpm
24.5 26.5	112762	04/20/93 10:20	N/A		N/A		SHELBY TUBE	N/A		N/A	
26.5 27.0	112763	04/20/93 11:00	7		6		DENSE, (10YR,5/6) YELLOWISH BROWN, POORLY GRADED SAND, WITH GRAVEL, DRY	SP		N/A	PID=0 ppm BΓ=40 cpm
27.0 27.5	112763	04/20/93 11:00	10		6		SAA	N/A SP		N/A	PID=0 ppm BΓ=40 cpm
27.5 28.0	112763	04/20/93 11:00	12		6		SAA	N/A SP		N/A	PID=0 ppm BΓ=40 cpm
28.0 28.5	112764	04/20/93 11:00	23		6		SAA	SP		N/A	PID=0 ppm BΓ=40 cpm

NOTES:

Driller: JOE RAAB, RODGE R DAVIS
Drilling Equipment: CME-45

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1966	COORDINATES: NORTH 477240.00 EAST 1379500.34	DATE:22-APR-93
GROUND ELEVATION: 558	GWL: Depth Date/Time	DATE STARTED: 21-APR-93
ENGINEER/GEOLOGIST: J REAGAN	Depth Date/Time	DATE COMPLETE: 22-APR-93
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
.5	112854	04/21/93	09:50	2		6		SOFT, (2.5Y 3/1) VERY DARK GRAY,SILTY FINE SAND, LOW PLASTICITY, MOIST	ML		.5	PID=16.1 ppm BΓ=300 cpm
.5 1.0		04/21/93	09:50	5		6		SAA SAMPLE TAKEN BY IH PERSONNEL	ML		.5	PID=16.1 ppm BΓ=60 cpm
1.0 1.5	112855	04/21/93	09:50	8		2		STIFF (2.5Y 5/4) LIGHT OLIVE BROWN, (2.5Y 3/1) VERY DARK GRAY, MOTTLES, SILTY CLAY, SLIGHTLY PLASTIC, MOIST	CL		1	PID=16.1 ppm BΓ=200 cpm
1.5 2.0	112856	04/21/93	10:00	6		6		VERY STIFF (2.5Y 5/4) LIGHT OLIVE BROWN, (2.5Y 3/1) VERY DARK GRAY MOTTLES, SILTY CLAY, SLIGHTLY PLASTIC, MOIST	CL		2.5	PID=1 ppm BΓ=60 cpm
2.0 2.5	112857	04/21/93	10:00	12		6		STIFF (2.5Y 5/4) LIGHT OLIVE BROWN, (2.5Y 3/1) VERY DARK GRAY MOTTLES, SILTY CLAY, SLIGHTLY PLASTIC, MOIST	CL		1.75	PID=1 ppm BΓ=60 cpm
2.5 3.0	112858	04/21/93	10:35	4		6		SAA	CL		2	PID=1 ppm BΓ=60 cpm
3.0 3.5	112858	04/21/93	10:35	6		6		SAA	CL		2.0	PID=0 ppm BΓ=60 cpm
3.5 4.0	112858	04/21/93	10:35	8		6		SAA	CL		2	PID=0 ppm BΓ=60 cpm
4.0 4.5	112858	04/21/93	10:35	8		6		SAA	CL		2	PID=0 ppm BΓ=60 cpm
4.5 5.0	112859	04/21/93	10:50	4		6		STIFF (2.5Y 5/4) LIGHT OLIVE BROWN, SILTY CLAY, SLIGHTLY PLASTIC, MOIST	CL		1.25	PID=0 ppm BΓ=50 cpm
5.0 5.5	112859	04/21/93	10:50	4		6		SAA	CL		1	PID=0 ppm BΓ=50 cpm
5.5 6.0	112859	04/21/93	10:50	5		6		MEDIUM STIFF, SAA	CL		0.5	PID=0 ppm BΓ=50 cpm
6.0 6.5	112859	04/21/93	10:50	5		6		SAA	CL		1.5	PID=0 ppm BΓ=50 cpm

NOTES:
BACKGROUND: HNU = 0.5 PPM BETA GAMMA 60 CPM

Boring Contractor: PENNSYLVANIA DRILLING
Driller: MARTY WATRAL, BOB DEILEY
Drilling Equipment: ACKER SOIL SENTRY

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1966	COORDINATES: NORTH 477240.00 EAST 1379500.34	DATE:22-APR-93
GROUND ELEVATION: 558	GWL: Depth Date/Time	DATE STARTED: 21-APR-93
ENGINEER/GEOLOGIST: J REAGAN	Depth Date/Time	DATE COMPLETE: 22-APR-
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON SAMPLE	RECOVERY INCHES		USCS SYMBOL	TSF	REMARKS
6.5 8.5	112860	04/21/93 13:30	N/A	N/A	SHELBY TUBE	N/A	N/A	
8.5 9.0	112861	04/21/93 13:45	2	6	STIFF (2.5Y 4/3) OLIVE BROWN, SILTY CLAY, LOW PLASTICITY, MOIST	CL	1.25	
9.0 9.5	112862	04/21/93 13:45	2	6	STIFF (2.5Y 4/2) DARK GRAYISH BROWN, SILTY CLAY, LOW PLASTICITY, MOIST	CL	1.0	PID=0 ppm BΓ=50 cpm
9.5 10.0	112863	04/21/93 13:45	4	4	SAA	CL	1.25	PID=0 ppm BΓ=50 cpm
10.0 10.5	112864	04/21/93 14:00	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	PID=0 ppm BΓ=50 cpm
10.5 11.0	112865	04/21/93 14:00	3	6	SAA	CL	1.0	PID=0 ppm BΓ=50 cpm
11.0 11.5	112866	04/21/93 14:00	3	6	SAA	CL	1.0	PID=0 ppm BΓ=50 cpm
11.5 12.0	112867	04/21/93 14:05	7	6	STIFF, (2.5Y 4/4) OLIVE BROWN, SILTY CLAY, LOW PLASTICITY, MOIST	CL	1.25	PID=0 ppm BΓ=50 cpm
12.0 12.5	112867	04/21/93 14:05	8	6	STIFF, (2.5Y 4/4) OLIVE BROWN, (2.5Y 5/6) LIGHT OLIVE BROWN MOTTLES, SILTY CLAY, SLIGHTLY PLASTIC, GRAVELS	CL	1.25	
12.5 13.0	112867	04/21/93 14:05	10	6	SAA	CL	1.5	
13.0 15.0	112868	04/21/93 14:30	N/A	N/A	SHELBY TUBE	N/A	N/A	
15.0 15.5	112869	04/21/93 14:50	3	6	STIFF, (2.5Y 4/4) OLIVE BROWN, SILTY CLAY, LOW PLASTICITY, MOIST GRAVELS	CL	1.0	PID=1.8 ppm BΓ=60 cpm
15.5 16.0	112870	04/21/93 14:50	5	6	SAA	CL	2.0	PID=1.8 ppm BΓ=60 cpm

NOTES:
BACKGROUND: HNU = 0.5 PPM BETA GAMMA 60 CPM

Boring Contractor: PENNSYLVANIA DR[illegible]G
Driller: MARTY WATRAL, BOB DEILEY
Drilling Equipment: ACKER SOIL SENTR[illegible]

SAA = Same as above
PID = Photoio[illegible]tion Detector
N/A = Not App[illegible]ble.

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1966	COORDINATES: NORTH 477240.00 EAST 1379500.34	DATE:22-APR-93
GROUND ELEVATION: 558	GWL: Depth Date/Time	DATE STARTED: 21-APR-93
ENGINEER/GEOLOGIST: J REAGAN	Depth Date/Time	DATE COMPLETE: 22-APR-93
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
16.0 16.5	112871	04/21/93 14:50	12		6		STIFF, (5GY 4/1) DARK GREENISH GRAY, SILTY CLAY, LOW PLASTICITY, MOIST, GRAVELS	CL	1.5	PID=1.8 ppm BΓ=60 cpm
16.5 17.0	112872	04/21/93 15:00	3		6		SAA	CL	1.5	PID=1.7 ppm BΓ=50 cpm
17.0 17.5	112873	04/21/93 15:00	10		6		SAA	CL	1.5	PID=1.7 ppm BΓ=50 cpm
17.5 18.0		04/21/93 15:00	14		0		NO RECOVERY	N/A	N/A	
18.0 18.5		04/21/93 15:00	20		0		NO RECOVERY	N/A	N/A	
18.5 19.0		04/21/93 15:00	25		0		NO RECOVERY	N/A	N/A	
19.0 19.5		04/21/93 15:00	25		0		NO RECOVERY	N/A	N/A	
19.5 20.0	112874	04/21/93 15:40	12		6		VERY STIFF, (10YR 3/1) VERY DARK GRAY, SILTY CLAY, LOW PLASTICITY, MOIST	CL	3.0	PID=0 ppm BΓ=50 cpm
20.0 20.5	112875	04/21/93 15:40	20		6		VERY STIFF, (2.5Y 4/4) OLIVE BROWN, SILTY CLAY, LOW PLASTICITY, MOIST	CL	4.0	PID=0 ppm BΓ=50 cpm
20.5 21.0	112876	04/21/93 15:40	24		6		SAA	CL	4.5	PID=0 ppm BΓ=50 cpm
21.0 21.5	112878	04/22/93 09:20	6		6		STIFF, (2.5Y 4/4) OLIVE BROWN, SILTY CLAY, LOW PLASTICITY, MOIST	CL	1.5	PID=0 ppm BΓ=50 cpm
21.5 22.0	112879	04/22/93 09:20	6		6		VERY STIFF, (2.5Y 4/4) OLIVE BROWN, SILTY CLAY, SLIGHTLY PLASTIC, MOIST	CL	2.5	PID=0 ppm BΓ=50 cpm
22.0 22.5		04/22/93 09:20	12		0		NO RECOVERY	N/A	N/A	

NOTES:
BACKGROUND: HNU = 0.5 PPM BETA GAMMA 60 CPM

Boring Contractor: PENNSYLVANIA DRILLING
Driller: MARTY WATRAL, BOB DEILEY
Drilling Equipment: ACKER SOIL SENTRY

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable.

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1966	COORDINATES: NORTH 477240.00 EAST 1379500.34	DATE:22-APR-93
GROUND ELEVATION: 558	GWL: Depth Date/Time	DATE STARTED: 21-APR-93
ENGINEER/GEOLOGIST: J REAGAN	Depth Date/Time	DATE COMPLETE: 22-APR-9
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
22.5 23.0	112880	04/22/93 09:40	8		6		VERY STIFF, (2.5Y 3/2) VERY DARK GRAYISH BROWN, SILTY CLAY, SLIGHTLY PLASTIC, MOIST	CL		3.5	PID=0 ppm BΓ=50 cpm
23.0 23.5	112881	04/22/93 09:40	8		6		STIFF, (10YR 4/3) BROWN, SILTY CLAY, LOW PLASTICITY, MOIST, SOME SAND	CL		1.5	PID=0 ppm BΓ=50 cpm
23.5 24.0	112882	04/22/93 09:40	12		6		SAA	CL		1.5	PID=0 ppm BΓ=50 cpm
24.0 24.5	112883	04/22/93 09:55	8		6		SAA	CL		1.5	PID=0 ppm BΓ=50 cpm
24.5 25.0	112883	04/22/93 09:55	10		6		SAA	CL		1.5	PID=0 ppm BΓ=50 cpm
25.0 25.5	112884	04/22/93 09:55	17		6		MEDIUM DENSE, (10YR 4/3) BROWN, SAND-SILT-GRAVEL MIXTURE, LOW PLASTICITY, MOIST	GM		N/A	PID=0 ppm BΓ=50 cpm

NOTES:
BACKGROUND: HNU = 0.5 PPM BETA GAMMA 60 CPM

Boring Contractor: PENNSYLVANIA DRILLING
Driller: MARTY WATRAL, BOB DEILEY
Drilling Equipment: ACKER SOIL SENTRY

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1968	COORDINA : NORTH 477364.98 EAST 1379590.55	DATE:19-APR-93
GROUND ELEVATION: 569	GWL: Depth Date/Time	DATE STARTED: 19-APR-93
ENGINEER/GEOLOGIST: J REAGAN	Depth Date/Time	DATE COMPLETE: 20-APR-
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
1.0		04/19/93 00:00	50		0		NO RECOVERY	N/A		N/A	
1.0 3.0	112833	04/19/93 08:20	N/A		N/A		SHELBY TUBE SAMPLE	N/A		N/A	
3.0 3.5	112834	04/19/93 08:35	13		6		(2.5Y,2.5/1) BLACK, COAL PIECES	N/A		N/A	PID=0 ppm BΓ=60 cpm
3.5 4.0	112834	04/19/93 08:35	17		6		STIFF, (2.5Y, 5/4) LIGHT OLIVE BROWN, CLAYEY SILTY FINE SANDY, LOW PLASTICITY, DRY	ML		1.5	PID=0 ppm BΓ=60 cpm
4.0 4.5	112834	04/19/93 08:35	18		6		STIFF, (2.5Y, 4/1) DARK GRAY, SILTY CLAYEY FINE SAND, LOW PLASTIC[illegible] DRY	ML		1.5	PID=0 ppm BΓ=60 cpm
4.5 5.0	112835	04/19/93 08:50	6		6		STIFF (2.5Y, 4/4[illegible] [illegible]VE BROWN, SILTY CLAY, LOW PLASTICITY, MOIST	CL		1.5	PID=0 ppm BΓ=60 cpm
5.0 5.5	112835	04/19/93 08:50	12		6		VERY STIFF, (2.5Y, [illegible]) DARK GRAYISH BROWN, SILTY CLAY, SLIGHTLY PLA[illegible], MOIST	CL		2.5	PID=0 ppm BΓ=60 cpm
5.5 6.0	112835	04/19/93 08:50	12		6		SAA	CL		2.5	PID=0 ppm BΓ=60 cpm
6.0 6.5	112835	04/19/93 08:50	10		6		SAA	CL		2.25	PID=0 ppm BΓ=60 cpm
6.5 7.0	112836	04/19/93 09:05	10		6		SAA	CL		2	PID=0 ppm BΓ=60 cpm
7.0 7.5	112837	04/19/93 09:05	7		6		SAA	CL		2	PID=0 ppm BΓ=60 cpm
7.5 8.0	112838	04/19/93 09:05	8		6		VERY STIFF, (2.5Y, 4/2), DARK GRAYISH BROWN, SILTY CLAY, SLIGHTLY PLASTIC, MOIST	CL		2.5	PID=0 ppm BΓ=60 cpm
8.0 8.5	112839	04/19/93 09:15	4		6		STIFF, (2.5Y, 4/1) DARK GRAY, SILTY CLAY, LOW PLASTICITY, MOIST	CL		1.5	PID=0 ppm BΓ=60 cpm

NOTES:

Driller: MARTY WATRAL, DOC DETLEY
Drilling Equipment: ACKER SOIL SENTRY

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1968	COORDINATES: NORTH 477364.98 EAST 1379590.55	DATE:19-APR-93
GROUND ELEVATION: 569	GWL: Depth Date/Time	DATE STARTED: 19-APR-93
ENGINEER/GEOLOGIST: J REAGAN	Depth Date/Time	DATE COMPLETE: 20-APR-93

DRILLING METHOD: HOLLOW STEM AUGER

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
8.5 9.0		04/19/93 09:15	4		0		NO RECOVERY	N/A		N/A	
9.0 9.5		04/19/93 09:15	5		0		NO RECOVERY	N/A		N/A	
9.5 10.0	112840	04/19/93 09:20	3		6		STIFF, (2.5Y 4/1) DARK GRAY, SILTY CLAY, LOW PLASTLICITY, MOIST	CL		2	PID=0 ppm BΓ=80 cpm
10.0 10.5	112841	04/19/93 09:20	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	PID=0 ppm BΓ=80 cpm
10.5 11.0		04/19/93 09:25	4		0		NO RECOVERY	N/A		N/A	
11.0 11.5	112842	04/19/93 09:30	15		6		STIFF, (2.5Y, 4/1) DARK GRAY, (2.5Y, 3/1) VERY DARK GRAY, MOTTLES, SILTY CLAY, SLIGHTLY PLASTIC, WET	CL		1.0	PID=0 ppm BΓ=40 cpm
11.5 12.0	112843	04/19/93 09:30	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	PID=0 ppm BΓ=40 cpm
12.0 12.5	112844	04/19/93 09:30	23		6		VERY STIFF, (2.5Y, 4/2) DARK GRAYISH BROWN, SILTY CLAY, SLIGHTLY PLASTIC, MOIST	CL		2.5	PID=0 ppm BΓ=60 cpm
12.5 13.0	112845	04/19/93 09:45	7		6		SAA	CL		2.5	PID=0 ppm BΓ=60 cpm
13.0 13.5	112846	04/19/93 09:45	10		6		SAA	CL		2.75	PID=0 ppm BΓ=60 cpm
13.5 14.0		04/19/93 00:00	12		0		NO RECOVERY	N/A		N/A	PID=0 ppm BΓ=60 cpm
14.0 14.5	112847	04/19/93 10:05	5		6		VERY STIFF, (2.5Y, 5/4) LIGHT OLIVE BROWN, SILTY CLAY, LOW PLASTICITY, MOIST	CL		2.5	PID=0 ppm BΓ=60 cpm
14.5 15.0	112848	04/19/93 10:05	12		6		SAA	CL		2.5	PID=0 ppm BΓ=60 cpm

NOTES:

Driller: MARTY WATRAL, DOC DETLEY
Drilling Equipment: ACKER SOIL SENTRY

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1968	COORDINATES: NORTH 477364.98 EAST 1379590.55	DATE:19-APR-93
GROUND ELEVATION: 569	GWL: Depth Date/Time	DATE STARTED: 19-APR-93
ENGINEER/GEOLOGIST: J REAGAN	Depth Date/Time	DATE COMPLETE: 20-APR-9
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
15.0 15.5		04/19/93 00:00	20		0		NO RECOVERY	N/A		N/A	PID=0 ppm BΓ=60 cpm
15.5 16.0	112849	04/19/93 10:30	10		6		STIFF, (2.5Y, 5/4) LIGHT OLIVE BROWN, SILTY CLAY, DRY, LOW PLASTICITY	CL		2	PID=0 ppm BΓ=60 cpm
16.0 16.5	112849	04/19/93 10:30	24		6		SAA	CL		2	PID=0 ppm BΓ=60 cpm
16.5 17.0	112850	04/19/93 10:30	50		4		SAA	CL		3	PID=0 ppm BΓ=50 cpm
17.0 17.5	112851	04/19/93 13:30	10		6		LOOSE, (2.5Y, 4/3) OLIVE BROWN, POORLY GRADED SAND, MOIST	SP		N/A	PID=0 ppm BΓ=50 cpm
17.5 18.0	112852	04/19/93 13:30	10		4		SAA	N/A		N/A	PID=0 ppm BΓ=50 cpm
18.0 18.5		04/19/93 00:00	11		0		NO RECOVERY	N/A		N/A	

NOTES:

Driller: MARTY WATRAL, DOC DETLEY
Drilling Equipment: ACKER SOIL SENTRY

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

02/02/94 17:03

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1969	COORDINATES: NORTH 477633.01 EAST 1379700.05	DATE:15-APR-93
GROUND ELEVATION: 575.5	GWL: Depth Date/Time	DATE STARTED: 15-APR-93
ENGINEER/GEOLOGIST: MUSA M KESEBIR	Depth Date/Time	DATE COMPLETE: 15-APR-93
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON SAMPLE	RECOVERY INCHES		USCS SYMBOL	TSF	REMARKS
.5	112554	04/15/93 08:50	1	6	STIFF, (10YR 5/3) BROWN, SILTY CLAY WITH PLANT ROOTS, HIGH PLASTICITY, MOIST	OL	1	PID=0 ppm BΓ=80 cpm
1.0	112555	04/15/93 08:50	4	6	SAA	OL	1.5	PID=0 ppm BΓ=80 cpm
1.5	112556	04/15/93 08:50	3	6	SAA	OL	1.5	PID=0 ppm BΓ=1.5 cpm
2.0		04/15/93 00:00	3	0	NO RECOVERY	N/A	N/A	
2.5	112557	04/15/93 09:10	3	6	STIFF, (10YR 5/2) GRAYISH BROWN, SILTY CLAY WITH DECOMPOSED ROOTS, MEDIUM TO HIGH PLASTICITY, MOIST	OH	2	PID=0 ppm BΓ=40 cpm
3.0	112557	04/15/93 09:10	5	6	SAA	OH	2	PID=0 ppm BΓ=40 cpm
3.5	112557	04/15/93 09:10	10	6	SAA	OH	2	PID=0 ppm BΓ=40 cpm
4.0	112557	04/15/93 09:10	13	6	SAA	OH	2	PID=0 ppm BΓ=40 cpm
4.5	112558	04/15/93 09:35	15	6	STIFF, (10YR 5/2) GRAYISH BROWN, SILTY CLAY WITH LAMINATION, MEDIUM TO HIGH PLASTICITY, MOIST	OH	1.5	PID=2 ppm BΓ=60 cpm
5.0	112559	04/15/93 09:35	15	6	SAA	OH	2	PID=2 ppm BΓ=60 cpm
5.5	112559	04/15/93 09:35	15	6	SAA	OH	2	PID=2 ppm BΓ=60 cpm
6.0	112559	04/15/93 09:35	15	6	SAA	OH	2	PID=2 ppm BΓ=60 cpm
6.5	112560	04/15/93 10:00	5	6	VERY STIFF, (10YR 5/2) GRAYISH BROWN, LAMINATED CLAY, MEDIUM TO HIGH PLASTICITY, MOIST	CL	3	PID=1.5 ppm BΓ=60 cpm

NOTES:
2 X 50 LBS VOLCLAY & 1/2 X 94 LBS CEMENT WERE USED TO GROUT.

Boring Contractor: PENNSYLVANIA DRILLING
Driller: MARTY WATRAL
Drilling Equipment: ACKER

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1969	COORDINATES: NORTH 477633.01 EAST 1379700.05	DATE:15-APR-93
GROUND ELEVATION: 575.5	GWL: Depth Date/Time	DATE STARTED: 15-APR-93
ENGINEER/GEOLOGIST: MUSA M KESEBIR	Depth Date/Time	DATE COMPLETE: 15-APR-
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
6.5 7.0	112561	04/15/93 10:00	14		6		SAA	CL		3	PID=1.5 ppm BΓ=60 cpm
7.0 7.5	112562	04/15/93 10:10	9		6		SAA	CL		3	PID=2 ppm BΓ=60 cpm
7.5 8.0	112562	04/15/93 10:10	20		6		SAA	CL		3	PID=2 ppm BΓ=60 cpm
8.0 8.5	112562	04/15/93 10:10	25		6		SAA	CL		3	PID=2 ppm BΓ=60 cpm
8.5 9.0	112562	04/15/93 10:10	30		6		SAA	CL		3	PID=2 ppm BΓ=60 cpm
9.0 9.5	112563	04/15/93 10:20	5		6		VERY STIFF, (10YR 5/2) GRAYISH BROWN, CLAY WITH 2" (10YR, 5/1) GRAY CLAY, HIGH PLASTICITY, MOIST	CL		3	PID=1 ppm BΓ=100 cpm
9.5 10.0	112563	04/15/93 10:20	9		6		SAA	CL		3	PID=1 ppm BΓ=100 cpm
10.0 10.5	112563	04/15/93 10:20	15		6		MEDIUM STIFF, (10YR 5/3) BROWN, CLAYEY SILT, LOW PLASTICITY, MOIST TO WET	OL		1	PID=1 ppm BΓ=100 cpm
10.5 11.0	112564	04/15/93 10:45	5		6		MEDIUM DENSE, (10YR 5/3) BROWN, FINE SAND, WET, LOOSE	SM		N/A	PID=1 ppm BΓ=60 cpm
11.0 11.5	112564	04/15/93 10:45	7		6		STIFF, (10YR 5/3) BROWN, CLAYEY SILT, LOW PLASTICITY, MOIST	OL		1.5	PID=1 ppm BΓ=60 cpm
11.5 12.0	112564	04/15/93 10:45	14		6		MEDIUM DENSE, (10YR 5/1) GRAY, FINE SAND, MOIST TO WET, LOOSE	SM		N/A	PID=1 ppm BΓ=60 cpm
12.0 13.5	112565	04/15/93 11:05	N/A		N/A		SHELBY NOT DESCRIBED	N/A		N/A	PID=1 ppm BΓ=60 cpm
13.5 14.0	112566	04/15/93 11:15	6		5		VERY STIFF, (10YR 5/1) GRAY FINE SANDY SILT, MEDIUM DENSE, MOIST	MH		3	PID=1 ppm BΓ=60 cpm

NOTES:
2 X 50 LBS VOLCLAY & 1/2 X 94 LBS CEMENT WERE USED TO GROUT.

Boring Contractor: PENNSYLVANIA DRILLING
Driller: MARTY WATRAL
Drilling Equipment: ACKER

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1970	COORDINATES: NORTH 477613.30 EAST 1379444.79	DATE:18-APR-93
GROUND ELEVATION: 571	GWL: Depth Date/Time	DATE STARTED: 18-APR-93
ENGINEER/GEOLOGIST: MUSA KESIBIR	Depth Date/Time	DATE COMPLETE: 18-APR-93
DRILLING METHOD: HOLLOW STEM AUGER (HSA)		

DEPTH	SAMPLE	DATE TIME	BLOWS ON SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
.5	112688	04/18/93 09:20	N/A	6		SHELBY	N/A		N/A	BΓ=40 cpm
1.0	112688	04/18/93 09:20	N/A	6		SHELBY	N/A		N/A	BΓ=40 cpm
1.5	112688	04/18/93 09:20	N/A	3		SHELBY	N/A		N/A	BΓ=40 cpm
2.0	112688	04/18/93 09:20	N/A	0		SHELBY	N/A		N/A	BΓ=40 cpm
2.5	112689	04/18/93 09:30	N/A	6		SHELBY	N/A		N/A	BΓ=40 cpm
3.0	112689	04/18/93 09:30	N/A	6		SHELBY	N/A		N/A	BΓ=40 cpm
3.5	112689	04/18/93 09:30	N/A	6		SHELBY	N/A		N/A	BΓ=40 cpm
4.0	112689	04/18/93 09:30	N/A	6		SHELBY	N/A		N/A	BΓ=40 cpm
4.5	112690	04/18/93 10:00	4	6		STIFF, (10YR 4/3) BROWN, SILTY CLAY, MEDIUM TO HIGH PLASTICITY, MOIST	CL		2	PID=0 ppm BΓ=40 cpm
5.0	112690	04/18/93 10:00	10	6		VERY STIFF, SAA	CL		2.5	BΓ=40 cpm
5.5	112690	04/18/93 10:00	12	6		VERY STIFF, (10YR 4/3) BROWN, SILTY CLAY WITH BROKEN COBBLES, MEDIUM TO HIGH PLASTICITY, MOIST	CL		2.5	PID=0 ppm BΓ=40 cpm
6.0	112691	04/18/93 10:20	4	6		STIFF, (10YR 4/3) BROWN, SILTY CLAY MEDIUM TO HIGH PLASTICITY, MOIST	CL		2	PID=0 ppm BΓ=40 cpm
6.5	112691	04/18/93 10:20	4	6		SAA	CL		2	PID=0 ppm BΓ=40 cpm

NOTES:
1 DRUM FOR DRILL CUTTINS 1 DRUM FOR ALCO NOX WATER WERE GENERATED

Boring Contractor: PENNSYLVANIA DRILLING
Driller: MARTY WATRAL
Drilling Equipment: ACKER #393

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1970	COORDINATES: NORTH 477613.30 EAST 1379444.79	DATE:18-APR-93
GROUND ELEVATION: 571	GWL: Depth Date/Time	DATE STARTED: 18-APR-93
ENGINEER/GEOLOGIST: MUSA KESIBIR	Depth Date/Time	DATE COMPLETE: 18-APR-93
DRILLING METHOD: HOLLOW STEM AUGER (HSA)		

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
.5	112688	04/18/93	09:20	N/A		6		SHELBY	N/A		N/A	BΓ=40 cpm
1.0	112688	04/18/93	09:20	N/A		6		SHELBY	N/A		N/A	BΓ=40 cpm
1.5	112688	04/18/93	09:20	N/A		3		SHELBY	N/A		N/A	BΓ=40 cpm
2.0	112688	04/18/93	09:20	N/A		0		SHELBY	N/A		N/A	BΓ=40 cpm
2.5	112689	04/18/93	09:30	N/A		6		SHELBY	N/A		N/A	BΓ=40 cpm
3.0	112689	04/18/93	09:30	N/A		6		SHELBY	N/A		N/A	BΓ=40 cpm
3.5	112689	04/18/93	09:30	N/A		6		SHELBY	N/A		N/A	BΓ=40 cpm
4.0	112689	04/18/93	09:30	N/A		6		SHELBY	N/A		N/A	BΓ=40 cpm
4.5	112690	04/18/93	10:00	4		6		STIFF, (10YR 4/3) BROWN, SILTY CLAY, MEDIUM TO HIGH PLASTICITY, MOIST	CL		2	PID=0 ppm BΓ=40 cpm
5.0	112690	04/18/93	10:00	10		6		VERY STIFF, SAA	CL		2.5	BΓ=40 cpm
5.5	112690	04/18/93	10:00	12		6		VERY STIFF, (10YR 4/3) BROWN, SILTY CLAY WITH BROKEN COBBLES, MEDIUM TO HIGH PLASTICITY, MOIST	CL		2.5	PID=0 ppm BΓ=40 cpm
6.0	112691	04/18/93	10:20	4		6		STIFF, (10YR 4/3) BROWN, SILTY CLAY MEDIUM TO HIGH PLASTICITY, MOIST	CL		2	PID=0 ppm BΓ=40 cpm
6.5	112691	04/18/93	10:20	4		6		SAA	CL		2	PID=0 ppm BΓ=40 cpm

NOTES:
1 DRUM FOR DRILL CUTTINS 1 DRUM FOR ALCO NOX WATER WERE GENERATED

Boring Contractor: PENNSYLVANIA DRILLING
Driller: MARTY WATRAL
Drilling Equipment: ACKER #393

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1970	COORDINATES: NORTH 477613.30 EAST 1379444.79	DATE:18-APR-93
GROUND ELEVATION: 571	GWL: Depth Date/Time	DATE STARTED: 18-APR-93
ENGINEER/GEOLOGIST: MUSA KESIBIR	Depth Date/Time	DATE COMPLETE: 18-APR-93
DRILLING METHOD: HOLLOW STEM AUGER (HSA)		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
.5	112688	04/18/93 09:20	N/A		6		SHELBY	N/A		N/A	BΓ=40 cpm
1.0	112688	04/18/93 09:20	N/A		6		SHELBY	N/A		N/A	BΓ=40 cpm
1.5	112688	04/18/93 09:20	N/A		-3		SHELBY	N/A		N/A	BΓ=40 cpm
2.0	112688	04/18/93 09:20	N/A		0		SHELBY	N/A		N/A	BΓ=40 cpm
2.5	112689	04/18/93 09:30	N/A		6		SHELBY	N/A		N/A	BΓ=40 cpm
3.0	112689	04/18/93 09:30	N/A		6		SHELBY	N/A		N/A	BΓ=40 cpm
3.5	112689	04/18/93 09:30	N/A		6		SHELBY	N/A		N/A	BΓ=40 cpm
4.0	112689	04/18/93 09:30	N/A		6		SHELBY	N/A		N/A	BΓ=40 cpm
4.5	112690	04/18/93 10:00	4		6		STIFF, (10YR 4/3) BROWN, SILTY CLAY, MEDIUM TO HIGH PLASTICITY, MOIST	CL		2	PID=0 ppm BΓ=40 cpm
5.0	112690	04/18/93 10:00	10		6		VERY STIFF, SAA	CL		2.5	BΓ=40 cpm
5.5	112690	04/18/93 10:00	12		6		VERY STIFF, (10YR 4/3) BROWN, SILTY CLAY WITH BROKEN COBBLES, MEDIUM TO HIGH PLASTICITY, MOIST	CL		2.5	PID=0 ppm BΓ=40 cpm
6.0	112691	04/18/93 10:20	4		6		STIFF, (10YR 4/3) BROWN, SILTY CLAY MEDIUM TO HIGH PLASTICITY, MOIST	CL		2	PID=0 ppm BΓ=40 cpm
6.5	112691	04/18/93 10:20	4		6		SAA	CL		2	PID=0 ppm BΓ=40 cpm

NOTES:
1 DRUM FOR DRILL CUTTINS 1 DRUM FOR ALCO NOX WATER WERE GENERATED

Boring Contractor: PENNSYLVANIA DRILLING
Driller: MARTY WATRAL
Drilling Equipment: ACKER #393

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1970	COORDINATES: NORTH 477613.30 EAST 1379444.79	DATE:18-APR-93
GROUND ELEVATION: 571	GWL: Depth Date/Time	DATE STARTED: 18-APR-93
ENGINEER/GEOLOGIST: MUSA KESIBIR	Depth Date/Time	DATE COMPLETE: 18-APR-93
DRILLING METHOD: HOLLOW STEM AUGER (HSA)		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
.5	112688	04/18/93 09:20	N/A		6		SHELBY	N/A	N/A	BΓ=40 cpm
1.0	112688	04/18/93 09:20	N/A		6		SHELBY	N/A	N/A	BΓ=40 cpm
1.5	112688	04/18/93 09:20	N/A		3		SHELBY	N/A	N/A	BΓ=40 cpm
2.0	112688	04/18/93 09:20	N/A		0		SHELBY	N/A	N/A	BΓ=40 cpm
2.5	112689	04/18/93 09:30	N/A		6		SHELBY	N/A	N/A	BΓ=40 cpm
3.0	112689	04/18/93 09:30	N/A		6		SHELBY	N/A	N/A	BΓ=40 cpm
3.5	112689	04/18/93 09:30	N/A		6		SHELBY	N/A	N/A	BΓ=40 cpm
4.0	112689	04/18/93 09:30	N/A		6		SHELBY	N/A	N/A	BΓ=40 cpm
4.5	112690	04/18/93 10:00	4		6		STIFF, (10YR 4/3) BROWN, SILTY CLAY, MEDIUM TO HIGH PLASTICITY, MOIST	CL	2	PID=0 ppm BΓ=40 cpm
5.0	112690	04/18/93 10:00	10		6		VERY STIFF, SAA	CL	2.5	BΓ=40 cpm
5.5	112690	04/18/93 10:00	12		6		VERY STIFF, (10YR 4/3) BROWN, SILTY CLAY WITH BROKEN COBBLES, MEDIUM TO HIGH PLASTICITY, MOIST	CL	2.5	PID=0 ppm BΓ=40 cpm
6.0	112691	04/18/93 10:20	4		6		STIFF, (10YR 4/3) BROWN, SILTY CLAY MEDIUM TO HIGH PLASTICITY, MOIST	CL	2	PID=0 ppm BΓ=40 cpm
6.5	112691	04/18/93 10:20	4		6		SAA	CL	2	PID=0 ppm BΓ=40 cpm

NOTES:
1 DRUM FOR DRILL CUTTINS 1 DRUM FOR ALCO NOX WATER WERE GENERATED

Boring Contractor: PENNSYLVANIA DRILLING
Driller: MARTY WATRAL
Drilling Equipment: ACKER #393

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1970	COORDINATES: NORTH 477613.30 EAST 1379444.79	DATE:18-APR-93
GROUND ELEVATION: 571	GWL: Depth Date/Time	DATE STARTED: 18-APR-93
ENGINEER/GEOLOGIST: MUSA KESIBIR	Depth Date/Time	DATE COMPLETE: 18-APR-'
DRILLING METHOD: HOLLOW STEM AUGER (HSA)		

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
6.5 7.0	112691	04/18/93	10:20	7		6		STIFF, (10YR 4/3) BROWN, SILTY CLAY WITH BROKEN COBBLES, MEDIUM TO HIGH PLASTICITY, MOIST	CL		2	PID=0 ppm BΓ=40 cpm
7.0 7.5	112892	04/18/93	10:50	N/A		6		SHELBY	N/A		N/A	BΓ=40 cpm
7.5 8.0	112892	04/18/93	10:50	N/A		6		SHELBY	N/A		N/A	BΓ=40 cpm
8.0 8.5	112892	04/18/93	10:50	N/A		6		SHELBY	N/A		N/A	BΓ=40 cpm
8.5 9.0	112892	04/18/93	10:50	N/A		0		SHELBY	N/A		N/A	BΓ=40 cpm
9.0 9.5	112893	04/18/93	13:10	3		6		MEDIUM STIFF, (10YR 4/3) BROWN, SILTY CLAY HIGH PLASTICITY, MOIST	CL		1	PID=0 ppm BΓ=40 cpm
9.5 10.0	112893	04/18/93	13:10	2		6		MEDIUM STIFF, (5GY 5/1) GREENISH GRAY, SILTY CLAY, HIGH PLASTICITY, MOIST	CL		1	PID=0 ppm BΓ=40 cpm
10.0 10.5	112893	04/18/93	13:10	3		6		SAA	CL		1	PID=0 ppm BΓ=40 cpm
10.5 11.0	112894	04/18/93	13:10	4		4		SAA	CL		1	PID=0 ppm BΓ=40 cpm

NOTES:
1 DRUM FOR DRILL CUTTINS 1 DRUM FOR ALCO NOX WATER WERE GENERATED

Boring Contractor: PENNSYLVANIA DRILLING
Driller: MARTY WATRAL
Drilling Equipment: ACKER #393

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION
BORING NUMBER: 1975	COORDINATES: NORTH 477869.01 EAST 1379784.06 DATE:13-APR-93
GROUND ELEVATION: 578.8	GWL: Depth Date/Time DATE STARTED: 13-APR-93
ENGINEER/GEOLOGIST: MUSA M KESEBIR	Depth Date/Time DATE COMPLETE: 13-APR-93
DRILLING METHOD: HOLLOW STEM AUGER	

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
.5	112542	04/13/93 10:30	5		6		VERY STIFF, (10YR 4/2) DARK GRAYISH BROWN, SILTY CLAY, SOME PEBBLES, MOIST, MEDIUM PLASTICITY	CL	2.5	PID=0 ppm BΓ=80 cpm
1.0	112543	04/13/93 10:30	6		6		SAA	CL	2.5	PID=0 ppm BΓ=80 cpm
1.5		04/13/93 10:30	6		0		NO RECOVERY	N/A	N/A	
2.0		04/13/93 10:30	5		0		NO RECOVERY	N/A	N/A	
2.5	112544	04/13/93 10:45	3		6		MEDIUM STIFF (10YR 5/3) BROWN, SILTY CLAY, MOIST TO WET, MEDIUM PLASTICITY	CL	1	PID=0 ppm BΓ=60 cpm
3.0	112544	04/13/93 10:45	3		6		SAA	CL	1	PID=0 ppm BΓ=60 cpm
3.5	112544	04/13/93 10:45	3		6		SAA	CL	1	PID=0 ppm BΓ=60 cpm
4.0		04/13/93 10:45	4		0		NO RECOVERY	N/A	N/A	
4.5	112545	04/13/93 11:00	8		6		VERY STIFF, (10YR 5/3) BROWN, CLAY, HIGH PLASTICITY, MOIST	CH	3	PID=0 ppm BΓ=60 cpm
5.0	112545	04/13/93 11:00	5		6		SAA	CH	3	PID=0 ppm BΓ=60 cpm
6.5	112546	04/13/93 13:40	N/A		N/A		PUSHED SHELBY TUBE, SAMPLE NOT DESCRIBED	N/A	N/A	
7.0	112546	04/13/93 13:40	N/A		N/A			N/A	N/A	PID=0 ppm BΓ=60 cpm
7.5	112547	04/13/93 14:10	10		6		STIFF, (10YR 5/3) BROWN, SILTY CLAY, MEDIUM PLASTICITY, MOIST	CL	2	PID=0 ppm BΓ=60 cpm

NOTES:
SOIL BORING WAS GROUTED UP USING VOLCLAY-CEMET MIX. A PIEZOMETER WAS NOT INSTALLED.

Boring Contractor: PENNSYLVANIA DRILLING
Driller: MARTY WATRAL
Drilling Equipment: ACKER #393

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1975	COORDINATES: NORTH 477869.01 EAST 1379784.06	DATE:13-APR-93
GROUND ELEVATION: 578.8	GWL: Depth Date/Time	DATE STARTED: 13-APR-93
ENGINEER/GEOLOGIST: MUSA M KESEBIR	Depth Date/Time	DATE COMPLETE: 13-APR-9
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
7.5 8.0	112548	04/13/93 14:10	9		6		STIFF, (10YR 5/3) BROWN, CLAYEY SILT, LOW PLASTICITY, MOIST	ML		1.5	PID=0 ppm BΓ=60 cpm
8.0 8.5	112549	04/13/93 14:10	11		6		SAA	ML		1.5	PID=0 ppm BΓ=60 cpm
8.5 9.0	112550	04/13/93 14:25	10		6		VERY STIFF, (10YR 5/3) BROWN, LAMINATED CLAY, HIGH PLASTICITY, MOIST	CH		3	PID=0 ppm BΓ=60 cpm
9.0 9.5	112550	04/13/93 14:25	11		6		SAA	CH		3	PID=0 ppm BΓ=60 cpm
9.5 10.0	112550	04/13/93 14:25	13		6		SAA	CH		3	PID=0 ppm BΓ=60 cpm
10.0 10.5	112551	04/13/93 14:25	15		6		SAA	CH		3	PID=0 ppm BΓ=60 cpm

NOTES:
SOIL BORING WAS GROUTED UP USING VOLCLAY-CEMET MIX. A PIEZOMETER WAS NOT INSTALLED.

Boring Contractor: PENNSYLVANIA DRILLING
Driller: MARTY WATRAL
Drilling Equipment: ACKER #393

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1977	COORDINATES: NORTH 477826.80 EAST 1379322.50	DATE:06-APR-93
GROUND ELEVATION: 571.8	GWL: Depth Date/Time	DATE STARTED: 06-APR-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 07-APR-93
DRILLING METHOD: AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
.5	112498	04/06/93 08:45	3		4		STIFF, (2.5Y 4/3) OLIVE BROWN, SILTY CLAYEY WITH GRAVEL, LOW PLASTICITY, MOIST	CL	2	PID=70 ppm BΓ=40 cpm
1.0	110564	04/06/93 08:45	7		5		SAA	CL	2	PID=70 ppm BΓ=40 cpm
1.5		04/06/93 08:45	12		0		NO RECOVERY	N/A	N/A	PID=70 ppm BΓ=40 cpm
2.0	110565	04/06/93 14:40	20		6		MEDIUM DENSE, (2.5Y 5/4) LIGHT OLIVE BROWN, CLAYEY SILT, WITH GRAVEL, LOW PLASTICITY, SLIGHTLY MOIST	ML	N/A	PID=1 ppm BΓ=40 cpm
2.5	110566	04/06/93 14:40	20		6		SAA	ML	N/A	PID=1 ppm BΓ=40 cpm
3.0	110567	04/06/93 14:40	30		4		VERY STIFF, (2.5Y 5/6) LIGHT OLIVE BROWN, SILTY CLAY, LOW PLASTICITY, SLIGHTLY MOIST	CL	3.5	PID=1 ppm BΓ=40 cpm
4.5	110568	04/06/93 15:15	N/A		9		SAMPLED WITH SHELBY TUBE	CL	N/A	PID=1 ppm BΓ=40 cpm
4.5	110568	04/06/93 15:15	N/A		12		SAA	CL	N/A	
5.0	110568	04/06/93 15:15	N/A		3		SAA	CL	N/A	PID=0 ppm BΓ=40 cpm
5.5	110569	04/06/93 15:45	4		6		MEDIUM STIFF, (2.5Y 5/4) LIGHT OLIVE BROWN, SILTY CLAY, MEDIUM PLASTICITY, MOIST	CL	1	PID=0 ppm BΓ=40 cpm
6.0	110569	04/06/93 15:45	4		6		SAA	CL	1	PID=0 ppm BΓ=40 cpm
6.5	110569	04/06/93 15:45	4		6		SAA	CL	1	PID=0 ppm BΓ=40 cpm
7.0	110569	04/06/93 15:45	7		6		STIFF, (2.5Y 5/4) LIGHT OLIVE BROWN, SILTY CLAY, MEDIUM PLASTICITY, MOTTLING, MOIST	CL	1.5	PID=0 ppm BΓ=40 cpm

NOTES:

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1977	COORDINATES: NORTH 477826.80 EAST 1379322.50	DATE:06-APR-93
GROUND ELEVATION: 571.8	GWL: Depth Date/Time	DATE STARTED: 06-APR-9
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 07-APR-
DRILLING METHOD: AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
7.0 7.5	110569	04/06/93 15:45	6		6		SAA	CL	1.5	PID=0 ppm BΓ=40 cpm
7.5 8.0	110569	04/06/93 15:45	10		6		VERY STIFF, (2.5Y 5/6) LIGHT OLIVE BROWN, SILTY CLAY, MEDIUM PLASTICITY, SLIGHT MOIST	CL	2.5	PID=0 ppm BΓ=40 cpm
8.0 8.5	110570	04/06/93 16:00	13		6		VERY STIFF, (10YR 5/6) YELLOWISH BROWN, SILTY CLAY, LOW PLASTICITY, SLIGHTLY MOIST	CL	3	PID=0 ppm BΓ=40 cpm
8.5 9.0	110571	04/06/93 16:25	8		6		VERY STIFF, (2.5Y 5/4) LIGHT OLIVE BROWN, LOW PLASTICITY, SILTY CLAY, WITH GRAVEL, SLIGHTLY MOIST	CL	2	PID=0 ppm BΓ=40 cpm
9.0 9.5	110571	04/06/93 16:25	10		6		SAA	CL	2	PID=0 ppm BΓ=40 cpm
9.5 10.0	110571	04/06/93 16:25	15		6		MEDIUM DENSE, (2.5Y 6/6) OLIVE YELLOW, CLAYEY SILT, SLIGHT PLASTICITY, SLIGHTLY MOIST	ML	N/A	PID=0 ppm BΓ=40 cpm
10.0 10.5	110572	04/06/93 16:45	8		6		VERY STIFF, (2.5Y 5/4) LIGHT OLIVE BROWN, SILTY CLAY, MOTTLING, SLIGHT-LOW PLASTICITY, SLIGHTLY MOIST	CL	2	PID=0 ppm BΓ=40 cpm
10.5 11.0	110573	04/06/93 16:45	16		6		MEDIUM DENSE, (2.5Y 5/6) LIGHT OLIVE, SILTY SAND, TRACE GRAVEL, MOIST, POORLY GRADED	SM	N/A	PID=0 ppm BΓ=40 cpm
11.0 11.5	110574	04/06/93 16:45	21		6		SAA	SM	N/A	PID=0 ppm BΓ=40 cpm
11.5 12.0	110575	04/07/93 09:55	16		6		DENSE, (2.5Y 5/6) LIGHT OLIVE BROWN, POORLY GRADED, SILTY SAND, WET	SM	N/A	PID=0 ppm BΓ=40 cpm
12.0 12.5	110575	04/07/93 09:55	30		6		SAA	SM	N/A	PID=1 ppm BΓ=70 cpm
12.5 13.0	110575	04/07/93 09:55	29		6		VERY DENSE, (2.5Y 6/1) GRAY, CLAYEY SILT, SLIGHT PLASTICITY, MOIST	ML	N/A	PID=1 ppm BΓ=70 cpm
13.0 13.5	110575	04/07/93 09:55	47		6		SAA	ML	N/A	PID=1 ppm BΓ=70 cpm

NOTES:

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1977	COORDINATES: NORTH 477826.80 EAST 1379322.50	DATE:06-APR-93
GROUND ELEVATION: 571.8	GWL: Depth Date/Time	DATE STARTED: 06-APR-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 07-APR-93
DRILLING METHOD: AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
13.5 14.0	110576 04/07/93 13:35		12		6		STIFF, (2.5Y 5/6) LIGHT OLIVE BROWN, SILTY CLAY, HIGH PLASTICITY, MOIST	CL	1.5	PID=1 ppm BΓ=75 cpm
14.0 14.5	110577 04/07/93 13:35		19		6		SAA	CL	2.0	PID=1 ppm BΓ=75 cpm
14.5 15.0	110578 04/07/93 13:45		N/A		6		SHELBY TUBE SAMPLING	CL	N/A	PID=1 ppm BΓ=75 cpm
15.0 15.5	110578 04/07/93 13:45		N/A		6		SHELBY TUBE SAMPLING, SAMPLE WAS WET	CL	N/A	PID=1 ppm BΓ=65 cpm
15.5 16.0	110578 04/07/93 13:45		N/A		6		SHELBY TUBE SAMPLING, SAMPLE WAS WET	CL	N/A	PID=1 ppm BΓ=65 cpm
16.0 16.5	110578 04/07/93 13:45		N/A		6		SHELBY TUBE SAMPLING, SAMPLE WAS WET	CL	N/A	PID=1 ppm BΓ=65 cpm
16.5 17.0	110579 04/07/93 14:10		23		6		STIFF, (2.5Y 5/1) GRAY, SILTY CLAY, WITH GRAVEL TO TRACE, LOW PLASTICITY, MOIST	CL	1	PID=1 ppm BΓ=65 cpm
17.0 17.5	110579 04/07/93 14:10		35		6		SAA	CL	1.5	PID=1 ppm BΓ=65 cpm
17.5 18.0	110579 04/07/93 14:10		57		6		SAA	CL	2	PID=1 ppm BΓ=65 cpm
18.0 18.5	110579 04/07/93 14:10		78		6		VERY DENSE, (2.5Y,5/6) LIGHT OLIVE BROWN, CLAYEY SILT, SLIGHT PLASTICITY, DRY	ML	N/A	

NOTES:

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05 | PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION

BORING NUMBER: 1979 | COORDINATES: NORTH 477241.54 EAST 1379893.36 | DATE:10-MAY-93

GROUND ELEVATION: 588.1 | GWL: Depth Date/Time | DATE STARTED: 10-MAY-93

ENGINEER/GEOLOGIST: B E MUELLER | Depth Date/Time | DATE COMPLETE: 11-MAY-93

DRILLING METHOD: HOLLOW STEM AUGER

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
.5	112091	05/10/93	13:22	2		6		MEDIUM DENSE, (2.5YR 10) BLACK FLYASH, DRY	N/A		N/A	PID=0 ppm BΓ=70 cpm
1.0	112091	05/10/93	13:22	2		6		SAA, DAMP	N/A		N/A	PID=0 ppm BΓ=70 cpm
1.5	112091	05/10/93	13:22	4		5		SAA	N/A		N/A	PID=0 ppm BΓ=70 cpm
2.0		05/10/93	00:00	10		0		NO RECOVERY	N/A		N/A	
2.5	112092 112093	05/10/93	13:25	10		6		MEDIUM DENSE, SAA	N/A		N/A	PID=0 ppm BΓ=80 cpm
3.0		05/10/93	13:25	7		6		SAA	N/A		N/A	PID=0 ppm BΓ=80 cpm
3.5		05/10/93	13:25	8		6		SAA	N/A		N/A	PID=0 ppm BΓ=80 cpm
4.0		05/10/93	13:25	11		6		MEDIUM DENSE, SAA	N/A		N/A	PID=0 ppm BΓ=80 cpm
4.5	112094	05/10/93	14:00	N/A		6		SHELBY	N/A		N/A	PID=0 ppm BΓ=80 cpm
5.0	112094	05/10/93	14:00	N/A		6		SHELBY	N/A		N/A	PID=0 ppm BΓ=80 cpm
5.5	112094	05/10/93	14:00	N/A		6		SHELBY	N/A		N/A	PID=0 ppm BΓ=80 cpm
6.0	112094	05/10/93	14:00	N/A		6		SAA, SHELBY	N/A		N/A	PID=0 ppm BΓ=80 cpm
6.5	112095	05/10/93	14:16	1		6		LOOSE, SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm

NOTES:
ABANDONED BORING AS PER PLAN.
BACKGROUND READINGS:
PAGE 1-4: MICROTIP=0 PPM; BETA/GAMMA=50 CPM,
PAGE 5: MICROTIP=3 PPM; BETA/GAMMA=50 CPM

Boring Contractor: PENN DRILLING
Driller: DAN JAMESON, CON ARTHUR
Drilling Equipment: MOBILE B 80

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1979	COORDINATES: NORTH 477241.54 EAST 1379893.36	DATE:10-MAY-93
GROUND ELEVATION: 588.1	GWL: Depth Date/Time	DATE STARTED: 10-MAY-93
ENGINEER/GEOLOGIST: B E MUELLER	Depth Date/Time	DATE COMPLETE: 11-MAY-93
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON SAMPLE	RECOVERY INCHES		USCS	SYMBOL	TSF	REMARKS
6.5 7.0	112095	05/10/93 14:16	1	6	SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
7.0 7.5	112095	05/10/93 14:16	2	6	SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
7.5 8.0	112095	05/10/93 14:16	4	6	VERY LOOSE, (2.5YR, 10) BLACK FLYASH, MOIST	N/A		N/A	PID=0 ppm BΓ=60 cpm
8.0 8.5	112096	05/10/93 14:28	N/A	6	SHELBY	N/A		N/A	PID=0 ppm BΓ=70 cpm
8.5 9.0	112096	05/10/93 14:28	N/A	6	SHELBY	N/A		N/A	PID=0 ppm BΓ=70 cpm
9.0 9.5	112096	05/10/93 14:28	N/A	6	SHELBY	N/A		N/A	PID=0 ppm BΓ=70 cpm
9.5 10.0	112096	05/10/93 14:28	N/A	6	SAA, SHELBY	N/A		N/A	PID=0 ppm BΓ=70 cpm
10.0 10.5	112097	05/10/93 15:15	6	6	MEDIUM DENSE, SAA	N/A		N/A	PID=0 ppm BΓ=90 cpm
10.5 11.0	112098	05/10/93 15:15	7	6	SAA	N/A		N/A	PID=0 ppm BΓ=90 cpm
11.0 11.5	112099	05/10/93 15:15	8	6	MEDIUM DENSE, SAA	N/A		N/A	PID=0 ppm BΓ=90 cpm
11.5 12.0	112100	05/10/93 15:15	12	6	SAA, MEDIUM DENSE	N/A		N/A	PID=0 ppm BΓ=90 cpm
12.0 12.5	112101	05/10/93 15:27	9	6	MEDIUM DENSE, SAA	N/A		N/A	PID=0 ppm BΓ=80 cpm
12.5 13.0	112102	05/10/93 15:27	11	6	MEDIUM DENSE, SAA	N/A		N/A	PID=0 ppm BΓ=80 cpm

NOTES:
ABANDONED BORING AS PER PLAN.
BACKGROUND READINGS:
PAGE 1-4: MICROTIP=0 PPM; BETA/GAMMA=50 CPM,
PAGE 5: MICROTIP=3 PPM; BETA/GAMMA=50 CPM

Boring Contractor: PENN DRILLING
Driller: DAN JAMESON, DON ARTHUR
Drilling Equipment: MOBILE B 80

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1979	COORDINATES: NORTH 477241.54 EAST 1379893.36	DATE:10-MAY-93
GROUND ELEVATION: 588.1	GWL: Depth Date/Time	DATE STARTED: 10-MAY-93
ENGINEER/GEOLOGIST: B E MUELLER	Depth Date/Time	DATE COMPLETE: 11-MAY-93
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
13.0 13.5	112103 05/10/93 15:27		7		6		MEDIUM DENSE, SAA	N/A		N/A	PID=0 ppm BΓ=80 cpm
13.5 14.0	112104 05/10/93 15:27		16		6		MEDIUM DENSE, SAA	N/A		N/A	PID=0 ppm BΓ=80 cpm
14.0 14.5	112105 05/10/93 15:35		11		6		SAA	N/A		N/A	PID=0 ppm BΓ=100 cpm
14.5 15.0	112106 05/10/93 15:35		12		6		SAA	N/A		N/A	PID=0 ppm BΓ=100 cpm
15.0 15.5	112107 05/10/93 15:35		10		6		MEDIUM DENSE, (2.5YR,10) BLACK FLYASH, MOIST	N/A		N/A	PID=0 ppm BΓ=100 cpm
15.5 16.0	112108 05/10/93 15:35		9		6		SAA	N/A		N/A	PID=0 ppm BΓ=100 cpm
16.0 16.5	112109 05/10/93 15:48		2		6		LOOSE, SAA	N/A		N/A	PID=0 ppm BΓ=100 cpm
16.5 17.0	112110 05/10/93 15:48		2		6		SAA	N/A		N/A	PID=0 ppm BΓ=100 cpm
17.0 17.5	112111 05/10/93 15:48		2		6		SAA	N/A		N/A	PID=0 ppm BΓ=100 cpm
17.5 18.0	112112 05/10/93 15:48		3		6		SAA	N/A		N/A	PID=0 ppm BΓ=100 cpm
18.0 18.5	112113 05/10/93 15:56		1		6		SAA	N/A		N/A	PID=0 ppm BΓ=70 cpm
18.5 19.0	112114 05/10/93 15:56		1		6		SAA	N/A		N/A	PID=0 ppm BΓ=70 cpm
19.0 19.5	112115 05/10/93 15:56		1		6		SAA	N/A		N/A	PID=0 ppm BΓ=70 cpm

NOTES:
ABANDONED BORING AS PER PLAN.
BACKGROUND READINGS:
PAGE 1-4: MICROTIP=0 PPM; BETA/GAMMA=50 CPM,
PAGE 5: MICROTIP=3 PPM; BETA/GAMMA=50 CPM

Boring Contractor: PENN DRILLING
Driller: DAN JAMESON, DON ARTHUR
Drilling Equipment: MOBILE B 80

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1979	COORDINATES: NORTH 477241.54 EAST 1379893.36	DATE:10-MAY-93
GROUND ELEVATION: 588.1	GWL: Depth Date/Time	DATE STARTED: 10-MAY-93
ENGINEER/GEOLOGIST: B E MUELLER	Depth Date/Time	DATE COMPLETE: 11-MAY-9
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY INCHES		USCS SYMBOL	TSF	REMARKS
19.5 20.0	112116	05/10/93 15:56	1		3	SAA	N/A	N/A	PID=0 ppm BΓ=70 cpm
20.0 20.5	112117	05/10/93 16:05	1		6	SAA	N/A	N/A	PID=0 ppm BΓ=90 cpm
20.5 21.0	112117	05/10/93 16:05	1		6	SAA	N/A	N/A	PID=0 ppm BΓ=90 cpm
21.0 21.5	112117	05/10/93 16:05	1		5	SAA	N/A	N/A	PID=0 ppm BΓ=90 cpm
21.5 22.0		05/10/93 00:00	1		0	NO RECOVERY	N/A	N/A	
22.0 22.5	112118	05/10/93 16:11	1		6	MEDIUM DENSE, (2.5YR, 10) BLACK FLYASH, MOIST	N/A	N/A	PID=0 ppm BΓ=110 cpm
22.5 23.0	112119	05/10/93 16:11	1		6	SAA, VERY LOOSE	N/A	N/A	PID=0 ppm BΓ=110 cpm
23.0 23.5	112120	05/10/93 16:11	1		6	SAA	N/A	N/A	PID=0 ppm BΓ=110 cpm
23.5 24.0	112121	05/10/93 16:11	1		6	SAA	N/A	N/A	PID=0 ppm BΓ=110 cpm
24.0 24.5	112122	05/10/93 16:20	1		6	SAA	N/A	N/A	PID=0 ppm BΓ=90-110 cpm
24.5 25.0	112122	05/10/93 16:20	1		6	SAA	N/A	N/A	PID=0 ppm BΓ=90-110 cpm
25.0 25.5	112122	05/10/93 16:20	1		6	SAA	N/A	N/A	PID=0 ppm BΓ=90-110 cpm
25.5 26.0	112123	05/10/93 16:20	3		6	VERY STIFF, (5Y 5/6) OLIVE SILTY CLAY, VERY MOIST	CL	2.5	PID=0 ppm BΓ=90-110 cpm

NOTES:
ABANDONED BORING AS PER PLAN.
BACKGROUND READINGS:
PAGE 1-4: MICROTIP=0 PPM; BETA/GAMMA=50 CPM,
PAGE 5: MICROTIP=3 PPM; BETA/GAMMA=50 CPM

Boring Contractor: PE[illegible] [illegible]ILLING
Driller: DAN JAMESON, [illegible] ARTHUR
Drilling Equipment: MOBILE B 80

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

02/01/94 18:37

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION
BORING NUMBER: 1979	COORDINATES: NORTH 477241.54 EAST 1379893.36 DATE:10-MAY-93
GROUND ELEVATION: 588.1	GWL: Depth Date/Time DATE STARTED: 10-MAY-93
ENGINEER/GEOLOGIST: B E MUELLER	Depth Date/Time DATE COMPLETE: 11-MAY-93
DRILLING METHOD: HOLLOW STEM AUGER	

DEPTH	SAMPLE	DATE TIME	BLOWS ON SAMPLE	RECOVERY INCHES		USCS	SYMBOL	TSF	REMARKS
26.0 26.5	112123	05/11/93 09:00	24	6	VERY STIFF, (2.5Y 5/6) LIGHT OLIVE BROWN, TRACE GRAY MOTTLES SILTY CLAY, MOIST, TRACE GRAVEL, LOW PLASTICITY	CL		2.75	PID=0.2 ppm BΓ=60 cpm
26.5 27.0	112123	05/11/93 09:00	34	6	HARD, SAA	CL		4.5	PID=0.2 ppm BΓ=60 cpm
27.0 27.5	112123	05/11/93 09:00	47	6	SAA	CL		74.5	PID=0.2 ppm BΓ=60 cpm
27.5 28.0	112124	05/11/93 09:29	24	6	SAA	CL		74.5	PID=0.7 ppm BΓ=80 cpm
28.0 28.5	112125	05/11/93 09:29	37	6	HARD, (5Y 4/1) DARK GRAY, SILTY CLAY, TRACE GRAVEL, MOIST	CL		74.5	PID=0.7 ppm BΓ=80 cpm
28.5 29.0	112125	05/11/93 09:29	26	6	SAA, TRACE COBBLE	CL		74.5	PID=0.7 ppm BΓ=80 cpm
29.0 29.5		05/11/93 00:00	50/4"	0	NO RECOVERY	N/A		N/A	
29.5 30.0	112126	05/11/93 09:45	7	6	SAA, WITH TRACE BROWN MOTTLES	CL		3	PID=0.6 ppm BΓ=9 cpm
30.0 30.5	112126	05/11/93 09:45	12	6	HARD, (5Y 4/1) DARK GRAY, SILTY CLAY, TRACE FINE GRAVEL, MOIST, BROWN MOTTLING, LOW PLASTICITY	CL		3.5	PID=0.6 ppm BΓ=9 cpm
30.5 31.0	112126	05/11/93 09:45	21	6	SAA	CL		4.5	PID=0.6 ppm BΓ=9 cpm
31.0 31.5	112126	05/11/93 09:45	28	2	SAA	CL		3.5	PID=0.6 ppm BΓ=9 cpm
31.5		05/11/93 00:00	N/A	N/A	BOTTOM OF BORING 31.5 FEET	N/A		N/A	

NOTES:
ABANDONED BORING AS PER PLAN.
BACKGROUND READINGS:
PAGE 1-4: MICROTIP=0 PPM; BETA/GAMMA=50 CPM,
PAGE 5: MICROTIP=3 PPM; BETA/GAMMA=50 CPM

Boring Contractor: PENN DRILLING
Driller: DAN JAMESON, DON ARTHUR
Drilling Equipment: MOBILE B 80

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION
BORING NUMBER: 1980	COORDINATES: NORTH 477280.38 EAST 1379997.79 DATE:13-MAY-93
GROUND ELEVATION: 591.1	GWL: Depth Date/Time DATE STARTED: 12-MAY-93
ENGINEER/GEOLOGIST: B E MULLER	Depth Date/Time DATE COMPLETE: 13-MAY-
DRILLING METHOD: HOLLOW STEM AUGER	

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
.5	112129	05/12/93	08:35	3		6		MEDIUM DENSE, (2.5YR,10) BLACK FLYASH, DAMP	N/A	N/A	PID=2.4 ppm BΓ=80 cpm
1.0	112129	05/12/93	08:35	4		6		SAA	N/A	N/A	PID=2.4 ppm BΓ=80 cpm
1.5	112129	05/12/93	08:35	5		6		SAA	N/A	N/A	PID=2.4 ppm BΓ=80 cpm
2.0	112129	05/12/93	08:35	5		6		SAA	N/A	N/A	PID=2.4 ppm BΓ=80 cpm
2.5	112130 112131	05/12/93	08:40	10		6		SAA	N/A	N/A	PID=1.0 ppm BΓ=80 cpm
3.0	112130 112131	05/12/93	08:40	11		6		SAA	N/A	N/A	PID=1.0 ppm BΓ=80 cpm
3.5	112130 112131	05/12/93	08:40	9		6		SAA	N/A	N/A	PID=1.0 ppm BΓ=80 cpm
4.0	112130 112131	05/12/93	08:40	8		6		SAA	N/A	N/A	PID=1.0 ppm BΓ=80 cpm
4.5	112132	05/12/93	09:10	6		6		SAA	N/A	N/A	PID=0 ppm BΓ=90 cpm
5.0	112133	05/12/93	09:10	6		6		SAA	N/A	N/A	PID=0 ppm BΓ=90 cpm
5.5	112134	05/12/93	09:10	8		6		SAA	N/A	N/A	PID=0 ppm BΓ=90 cpm
6.0	112135	05/12/93	19:18	7		6		SAA	N/A	N/A	PID=0 ppm BΓ=70 cpm

NOTES:
FLYASH COLLAPSED INTO HOLE AFTER AUGERS REMOVED, TO AN ELEVATION OF 16 FEET BELOW SURFACE.
BACKGROUND READINGS
PAGE 1-2: MICROTIP=0 PPM, BETA/GAMMA=50 CPM,
PAGE 3: MICROTIP=1.8 PPM, BETA/GAMMA=50 CPM,
PAGE 4: MICROTIP=1.0-7.0 PPM, BETA/GAMMA=50 CPM

Boring Contractor: PENN DRILL
Driller: DAN JAMISON, DON ARTHOR
Drilling Equipment: MOBIL 1380

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1980	COORDINATES: NORTH 477280.38 EAST 1379997.79	DATE:13-MAY-93
GROUND ELEVATION: 591.1	GWL: Depth Date/Time	DATE STARTED: 12-MAY-93
ENGINEER/GEOLOGIST: B E MULLER	Depth Date/Time	DATE COMPLETE: 13-MAY-93
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
6.0 6.5	112136	05/12/93 09:18	7		6		SAA	N/A	N/A	PID=0 ppm BΓ=70 cpm
6.5 7.0	112137	05/12/93 09:18	11		3		SAA	N/A	N/A	PID=0 ppm BΓ=70 cpm
7.0 7.5	112138	05/12/93 09:24	4		6		SAA	N/A	N/A	PID=0 ppm BΓ=70 cpm
7.5 8.0	112139	05/12/93 09:24	7		6		MEDIUM DENSE, (2.5YR,10) BLACK FLYASH, MOIST, LOW PLASTICITY	N/A	N/A	PID=0 ppm BΓ=70 cpm
8.0 8.5	112140	05/12/93 09:24	10		6		SAA	N/A	N/A	PID=0 ppm BΓ=70 cpm
8.5 9.0	112141	05/12/93 09:24	6		6		SAA	N/A	N/A	PID=0 ppm BΓ=70 cpm
9.0 11.0	112142	05/12/93 09:32	N/A		N/A		SAA, SHELBY	N/A	N/A	PID=0 ppm BΓ=50 cpm
11.0 13.0	112143	05/12/93 09:47	N/A		N/A		SHELBY-TUBE SLIGHTLY BENT AT BOTTOM	N/A	N/A	PID=0 ppm BΓ=70 cpm
13.0 13.5	112144 112145	05/12/93 10:00	6		6		SAA	N/A	N/A	PID=0 ppm BΓ=70 cpm
13.5 14.0	112144 112145	05/12/93 10:00	12		6		SAA & SOME CLAY MIXED	N/A	N/A	PID=0 ppm BΓ=70 cpm
14.0 14.5	112144 112145	05/12/93 10:00	9		6		SAA, NO CLAY	N/A	N/A	PID=0 ppm BΓ=70 cpm
14.5 15.0	112144 112145	05/12/93 10:00	20		6		SAA	N/A	N/A	PID=0 ppm BΓ=70 cpm

NOTES:
FLYASH COLLAPSED INTO HOLE AFTER AUGERS REMOVED, TO AN ELEVATION OF 16 FEET BELOW SURFACE.
BACKGROUND READINGS
PAGE 1-2: MICROTIP=0 PPM, BETA/GAMMA=50 CPM,
PAGE 3: MICROTIP=1.8 PPM, BETA/GAMMA=50 CPM,
PAGE 4: MICROTIP=1.0-7.0 PPM, BETA/GAMMA=50 CPM

Boring Contractor: PENN DRILL
Driller: DAN JAMISON, DON ARTHOR
Drilling Equipment: MOBIL 1380

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1980	COORDINATES: NORTH 477280.38 EAST 1379997.79	DATE:13-MAY-93
GROUND ELEVATION: 591.1	GWL: Depth Date/Time	DATE STARTED: 12-MAY-93
ENGINEER/GEOLOGIST: B E MULLER	Depth Date/Time	DATE COMPLETE: 13-MAY-9.
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
15.0 15.5	112146	05/12/93 10:15	6		6		MEDIUM DENSE, (2.5YR,10) BLACK FLYASH, LOW PLASTICITY, MOIST	N/A		N/A	PID=0 ppm BΓ=70 cpm
15.5 16.0	112146	05/12/93 10:15	6		6		SAA	N/A		N/A	PID=0 ppm BΓ=70 cpm
16.0 16.5	112146	05/12/93 10:15	6		6		SAA	N/A		N/A	PID=0 ppm BΓ=70 cpm
16.5 17.0	112146	05/12/93 10:15	4		6		SAA	N/A		N/A	PID=0 ppm BΓ=70 cpm
17.0 17.5	112147	05/12/93 10:25	3		6		SAA	N/A		N/A	PID=0 ppm BΓ=80 cpm
17.5 18.0	112148	05/12/93 10:25	3		6		SAA	N/A		N/A	PID=0 ppm BΓ=80 cpm
18.0 18.5	112149	05/12/93 10:25	3		6		SAA	N/A		N/A	PID=0 ppm BΓ=80 cpm
18.5 19.0	112150	05/12/93 10:25	4		6		SAA	N/A		N/A	PID=0 ppm BΓ=80 cpm
19.0 19.5	112151	05/12/93 10:36	1		6		SAA	N/A		N/A	PID=0 ppm BΓ=50-70 cpm
19.5 20.0	112152	05/12/93 10:36	1		6		SAA, WET	N/A		N/A	PID=0 ppm BΓ=50-70 cpm
20.0 20.5	112153	05/12/93 10:36	4		6		MEDIUM STIFF, (2.5Y,6/6) OLIVE YELLOW, SILTY CLAY, TRACE BLACK AND YELLOW MOTTLES, LOW PLASTICITY, MOIST	CL		.75	PID=0 ppm BΓ=50-70 cpm
20.5 21.0	112153	05/12/93 13:23	7		6		SAA	CL		.75	PID=0 ppm BΓ=50-70 cpm
21.0 21.5	112153	05/12/93 13:23	21		6		SAA	N/A CL		N/A 74.	PID=0 ppm BΓ=50-70 cpm

NOTES:
FLYASH COLLAPSED INTO HOLE AFTER AUGERS REMOVED, TO AN ELEVATION OF 16 FEET BELOW SURFACE.
BACKGROUND READINGS
PAGE 1-2: MICROTIP=0 PPM BETA/GAMMA=50 CPM,
PAGE 3: MICROTIP=1.8 PPM BETA/GAMMA=50 CPM,
PAGE 4: MICROTIP=1.0-7.0 PPM, BETA/GAMMA 50 CPM

Boring Contractor: PENN DRILL
Driller: DAN JAMISON, DON ARTHOR
Drilling Equipment: MOBIL 1380

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION
BORING NUMBER: 1980	COORDINATES: NORTH 477280.38 EAST 1379997.79 DATE:13-MAY-93
GROUND ELEVATION: 591.1	GWL: Depth Date/Time DATE STARTED: 12-MAY-93
ENGINEER/GEOLOGIST: B E MULLER	Depth Date/Time DATE COMPLETE: 13-MAY-93
DRILLING METHOD: HOLLOW STEM AUGER	

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
21.5 22.0	112153	05/12/93	13:23	23		6		SAA, SOME FLYASH	CL		74.5	PID=0 ppm BΓ=50-70 cpm
22.0 22.5	112156	05/13/93	08:23	10		6		SAA, POCKET OF FLYASH	CL		2.75	PID=2.4 ppm BΓ=50-100 cpm
22.5 23.0	112156	05/13/93	08:23	20		6		HARD, (2.5Y,6/6) OLIVE YELLOW, SILTY CLAY, LOW PLASTICITY, MOIST	CL		74.5	PID=2.4 ppm BΓ=50-100 cpm
23.0 23.5	112156	05/13/93	08:23	31		6		VERY STIFF, (2.5Y,5/6) LIGHT OLIVE BROWN, CLAYEY SANDY SILT, LOW PLASTICITY, VERY MOIST	CL		2.5	PID=2.4 ppm BΓ=50-100 cpm
23.5 24.0	112156	05/13/93	08:23	40		6		SAA	CL		.75	PID=2.4 ppm BΓ=50-100 cpm
24.0 24.5	112157	05/13/93	08:45	9		6		SOFT, (2.5Y,6/8) OLIVE YELLOW, SILTY CLAY, BLACK MOTTLES, LOW PLASTICITY, VERY MOIST	CL		.25	PID=10.3 ppm BΓ=70 cpm
24.5 25.0	112157	05/13/93	08:45	18		6		SAA-INCREASED SILT AT SOME HORIZONS	CL		.25	PID=10.3 ppm BΓ=70 cpm
25.0 25.5	112157	05/13/93	08:45	21		6		SAA	CL		3	PID=10.3 ppm BΓ=70 cpm
25.5 26.0	112157	05/13/93	08:45	25		6		SAA-REDUCED SILT CONTENT-MOIST	CL		2	PID=10.3 ppm BΓ=70 cpm
26.0		05/13/93	00:00	N/A		N/A		BOTTOM OF BORING 26 FEET	N/A		N/A	

NOTES:
FLYASH COLLAPSED INTO HOLE AFTER AUGERS REMOVED, TO AN ELEVATION OF 16 FEET BELOW SURFACE.
BACKGROUND READINGS
PAGE 1-2: MICROTIP=0 PPM, BETA/GAMMA=50 CPM,
PAGE 3: MICROTIP=1.8 PPM, BETA/GAMMA=50 CPM,
PAGE 4: MICROTIP=1.0-7.0 PPM, BETA/GAMMA=50 CPM

Boring Contractor: PENN DRILL
Driller: DAN JAMISON, DON ARTHOR
Drilling Equipment: MOBIL 1380

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1981	COORDINATES: NORTH 477366.17 EAST 1379964.33	DATE:13-MAY-93
GROUND ELEVATION: 587.6	GWL: Depth Date/Time	DATE STARTED: 13-MAY-93
ENGINEER/GEOLOGIST: B E MULLER	Depth Date/Time	DATE COMPLETE: 14-MAY--
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
.5	112160	05/13/93	14:30	3		6		LOOSE (2.5Y, /0) BLACK FLY ASH, SLIGHTLY MOIST	N/A		N/A	PID=0 ppm BΓ=100 cpm
1.0	112160	05/13/93	14:30	5		6		SAA	N/A		N/A	PID=0 ppm BΓ=100 cpm
1.5	112160	05/13/93	14:30	5		6		SAA	N/A		N/A	PID=0 ppm BΓ=100 cpm
2.0	112160	05/13/93	14:30	5		3		SAA	N/A		N/A	PID=0 ppm BΓ=100 cpm
2.5	112161	05/13/93	14:35	7		6		SAA	N/A		N/A	PID=0 ppm BΓ=70 cpm
3.0	112161	05/13/93	14:35	9		6		SAA	N/A		N/A	PID=0 ppm BΓ=70 cpm
3.5	112161	05/13/93	14:35	12		6		SAA	N/A		N/A	PID=0 ppm BΓ=70 cpm
4.0	112161	05/13/93	14:35	14		3		SAA	N/A		N/A	PID=0 ppm BΓ=70 cpm
4.5	112162	05/13/93	15:05	N/A		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
5.0	112162	05/13/93	15:05	N/A		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
5.5	112162	05/13/93	15:05	N/A		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
6.0	112162	05/13/93	15:05	N/A		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
6.5	112163	05/13/93	15:14	6		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm

NOTES:
FLYASH COLLAPSED INTO HOLE AFTER AUGERS REMOVED, TO AN ELEVATION OF 11 FEET BELOW SURFACE.
BACKGROUND READINGS:
PAGE 1-2: MICROTIP=0 PPM, BETA/GAMMA=50 CPM,
PAGE 3: MICROTIP=0 PPM, BETA/GAMMA=60 CPM

Boring Contractor: PENN DRILL
Driller: DAM JAMISON, DON ARTHUR
Drilling Equipment: MODIL 820

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION
BORING NUMBER: 1981	COORDINATES: NORTH 477366.17 EAST 1379964.33 DATE:13-MAY-93
GROUND ELEVATION: 587.6	GWL: Depth Date/Time DATE STARTED: 13-MAY-93
ENGINEER/GEOLOGIST: B E MULLER	Depth Date/Time DATE COMPLETE: 14-MAY-93
DRILLING METHOD: HOLLOW STEM AUGER	

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
6.5 7.0	112164 05/13/93 15:14		7		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
7.0 7.5	112165 05/13/93 15:14		9		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
7.5 8.0	112166 05/13/93 15:14		9		6		MEDIUM DENSE, (2.5YR /0) BLACK FLYASH, VERY LOW PLASTICITY, SLIGHTLY MOIST	N/A	N/A	PID=0 ppm BΓ=60 cpm
8.0 8.5	112167 112168 05/13/93 15:23		5		6		SAA	N/A	N/A	PID=0 ppm BΓ=80 cpm
8.5 9.0	112167 112168 05/13/93 15:23		7		6		SAA	N/A	N/A	PID=0 ppm BΓ=80 cpm
9.0 9.5	112167 112168 05/13/93 15:23		4		6		SAA	N/A	N/A	PID=0 ppm BΓ=80 cpm
9.5 10.0	112167 112168 05/13/93 15:23		10		6		SAA	N/A	N/A	PID=0 ppm BΓ=80 cpm
10.0 10.5	112169 05/13/93 15:46		6		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
10.5 11.0	112170 05/13/93 15:46		12		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
11.0 11.5	112171 05/13/93 15:46		12		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
11.5 12.0	112172 05/13/93 15:46		12		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
12.0 14.0	112173 05/13/93 15:53		N/A		N/A		SAA, SHELBY	N/A	N/A	PID=0 ppm BΓ=50 cpm

NOTES:
FLYASH COLLAPSED INTO HOLE AFTER AUGERS REMOVED, TO AN ELEVATION OF 11 FEET BELOW SURFACE.
BACKGROUND READINGS:
PAGE 1-2: MICROTIP=0 PPM, BETA/GAMMA=50 CPM,
PAGE 3: MICROTIP=0 PPM, BETA/GAMMA=60 CPM

Boring Contractor: PENN DRILL
Driller: DAM JAMISON, DON ARTHUR
Drilling Equipment: MODIL 880

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1981	COORDINATES: NORTH 477366.17 EAST 1379964.33	DATE:13-MAY-93
GROUND ELEVATION: 587.6	GWL: Depth Date/Time	DATE STARTED: 13-MAY-93
ENGINEER/GEOLOGIST: B E MULLER	Depth Date/Time	DATE COMPLETE: 14-MAY-
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
14.0 14.5	112175	05/14/93	08:56	3		6		SAA	N/A		N/A	PID=0 ppm BΓ=80 cpm
14.5 15.0	112176	05/14/93	08:56	2		6		SAA	N/A		N/A	PID=0 ppm BΓ=80 cpm
15.0 15.5	112177	05/14/93	08:56	3		6		LOOSE, (2.5Y /0) BLACK FLY ASH, VERY LOW PLASTICITY, SLIGHTLY MOIST	N/A		N/A	PID=0 ppm BΓ=80 cpm
15.5 16.0	112178	05/14/93	08:56	5		6		SAA	N/A		N/A	PID=0 ppm BΓ=80 cpm
16.0 16.5	112179	05/14/93	09:25	4		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
16.5 17.0	112179	05/14/93	09:25	4		6		SAA, WET	N/A		N/A	PID=0 ppm BΓ=60 cpm
17.0 17.5	112180	05/14/93	09:25	10		6		STIFF, (10YR 5/6) YELLOWISH BROWN, SILTY CLAY, HIGH PLASTICITY, MOIST	CL		1	PID=0 ppm BΓ=60 cpm
17.5 18.0	112180	05/14/93	09:25	12		6		SAA	CL		1.5	PID=0 ppm BΓ=60 cpm
18.0 18.5	112180	05/14/93	09:52	5		6		MEDIUM STIFF, SAA	CL		0.75	PID=0 ppm BΓ=80 cpm
18.5 19.0	112180	05/14/93	09:52	12		6		VERY SOFT, SAA AND COARSE SAND, FINE GRAVEL	CL		0.25	PID=0 ppm BΓ=80 cpm
19.0 19.5	112181	05/14/93	09:52	14		6		STIFF, SAA	CL		1.25	PID=0 ppm BΓ=80 cpm
19.5 20.0	112181	05/14/93	09:52	22		0		NO RECOVERY	N/A		N/A	
20.0 20.5	112181	05/14/93	10:04	4		6		VERY STIFF, SAA-LOW PLASTICITY, MOIST AND INCREASED GRAVEL	CL		2	PID=0 ppm BΓ=60 cpm

NOTES:
FLYASH COLLAPSED INTO HOLE AFTER AUGERS REMOVED, TO AN ELEVATION OF 11 FEET BELOW SURFACE.
BACKGROUND READINGS:
PAGE 1-2: MICROTIP=0 PPM, BETA/GAMMA=50 CPM,
PAGE 3: MICROTIP=0 PPM, BETA/GAMMA=60 CPM

Boring Contractor: PENN DRILL
Driller: DAM JAMISON, DON ARTHUR
Drilling Equipment: MODIL B80

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION
BORING NUMBER: 1981	COORDINATES: NORTH 477366.17 EAST 1379964.33 DATE:13-MAY-93
GROUND ELEVATION: 587.6	GWL: Depth Date/Time DATE STARTED: 13-MAY-93
ENGINEER/GEOLOGIST: B E MULLER	Depth Date/Time DATE COMPLETE: 14-MAY-93
DRILLING METHOD: HOLLOW STEM AUGER	

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
20.5 21.0	112181	05/14/93	10:04	4		0		NO RECOVERY	N/A		N/A	PID=0 ppm BΓ=60 cpm
21.0 21.5		05/14/93	10:04	8		0		NO RECOVERY	N/A		N/A	PID=0 ppm BΓ=60 cpm
21.5		05/14/93	00:00	N/A		N/A		BOTTOM OF BORING 21.5 FEET	N/A		N/A	

NOTES:
FLYASH COLLAPSED INTO HOLE AFTER AUGERS REMOVED, TO AN ELEVATION OF 11 FEET BELOW SURFACE.
BACKGROUND READINGS:
PAGE 1-2: MICROTIP=0 PPM, BETA/GAMMA=50 CPM,
PAGE 3: MICROTIP=0 PPM, BETA/GAMMA=60 CPM

Boring Contractor: PENN DRILL
Driller: DAM JAMISON, DON ARTHUR
Drilling Equipment: MODIL 880

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1994	COORDINATES: NORTH 477742.39 EAST 1379200.09	DATE:12-MAY-93
GROUND ELEVATION: 570.3	GWL: Depth Date/Time	DATE STARTED: 12-MAY-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 13-MAY-93

DRILLING METHOD: HOLLOW STEM AUGER

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
1.5 2.0	116262 116263	05/12/93 09:00	8		6		(10YR, 2/1) BLACK FLYASH, SLIGHTLY MOIST	N/A	N/A	PID=1.0 ppm BΓ=60 cpm
3.5 4.0	116265 116266	05/12/93 09:15	22		6		SAA	N/A	N/A	PID=1.0 ppm BΓ=120 cpm
5.5 6.0	116268 116269	05/12/93 10:50	6		4		SAA	N/A	N/A	PID=0 ppm BΓ=80 cpm
7.5 8.0	116271 116272	05/12/93 10:55	6		6		(10YR, 2/1) BLACK, FLYASH, MOIST	N/A	N/A	PID=0 ppm BΓ=60 cpm
8.0 9.5	116273	05/21/93 13:00	3		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
9.5 10.0	116274 116275	05/21/93 13:00	1		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
11.5 12.0	116277 116278	05/12/93 13:15	2		6		SAA	N/A	N/A	PID=0 ppm BΓ=80 cpm
13.5 14.0	116280 116281	05/12/93 13:25	2		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
15.5 16.0	116284 116285	05/13/93 08:50	6		6		SAA	N/A	N/A	PID=2.7 ppm BΓ=80 cpm
17.5 18.0	116287 116288	05/13/93 09:00	6		3		SAA	N/A	N/A	PID=2 ppm BΓ=80 cpm
19.5 20.0	116290 116291	05/13/93 09:35	16		6		SAA	N/A	N/A	PID=0.6 ppm BΓ=80 cpm

NOTES:
28.0 FT TO 30.0 FT SHELBY TUBE HAS ESITMATED RECOVERY

Driller: JOE RAAB, ROGER DAVIS

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1994	COORDINATES: NORTH 477742.39 EAST 1379200.09	DATE:12-MAY-93
GROUND ELEVATION: 570.3	GWL: Depth Date/Time	DATE STARTED: 12-MAY-9.
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 13-MAY-
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
21.5 22.0	116293 116294	05/13/93 09:50	4		6		SAA	N/A	N/A	PID=1.7 ppm BΓ=80 cpm
23.5 24.0	116296 116297	05/13/93 10:00	9		6		SAA	N/A	N/A	PID=1 ppm BΓ=60 cpm
25.5 26.0	116299 116300	05/13/93 10:20	8		6		SAA	SP	N/A	PID=0 ppm BΓ=60 cpm
27.5 28.0	116302 116303	05/13/93 10:30	23		3		SAA	ML	N/A	PID=0 ppm BΓ=110 cpm
28.0 28.5	116304	05/13/93 11:00	N/A		4		UNKNOWN	N/A	N/A	
28.5 29.0	116304	05/13/93 11:00	N/A		4		UNKNOWN	N/A	N/A	
29.0 29.5	116304	05/13/93 11:00	N/A		4		UNKNOWN	N/A	N/A	
29.5 30.0	116304	05/13/93 11:00	N/A		6		(5Y, 5/4) OLIVE, CLAYEY SILT, MOIST, TRACE GRAVEL	ML	N/A	
30.0 30.5	116305	05/13/93 14:00	10		6		VERY STIFF, (10YR, 4/6) DARK YELLOWISH BROWN, SILTY CLAY, LOW PLASTICITY MOIST	CL	2.0	PID=0 ppm BΓ=60 cpm
30.5 31.0	116306	05/13/93 14:00	15		6		VERY STIFF, (10YR, 4/6) DARK YELLOWISH BROWN, SILTY CLAY WITH A 1 INCH LAYER OF FLYASH, LOW PLATICITY, MOIST	CL	4	PID=0 ppm BΓ=60 cpm
31.0 31.5	116307	05/13/93 14:00	17		2		VERY STIFF (10YR, 4/6) DARK YELLOWISH BROWN, SILTY CLAY, LOW PLASTICITY, MOIST	CL	4	PID=0 ppm BΓ=60 cpm
31.5 32.0		05/13/93 14:00	15		0		NO RECOVERY	N/A	N/A	

NOTES:
28.0 FT TO 30.0 FT SHELBY TUBE HAS ESITMATED RECOVERY

Driller: JOE RAAB, ROGER DAVIS

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1994	COORDINATES: NORTH 477742.39 EAST 1379200.09	DATE:12-MAY-93
GROUND ELEVATION: 570.3	GWL: Depth Date/Time	DATE STARTED: 12-MAY-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 13-MAY-93
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
32.0 32.5	116308 116309	05/13/93 14:15	32		6		VERY STIFF (2.5YR, 5/4) LIGHT OLIVE BROWN, SILTY CLAY, LOW PLASTICITY, MOIST	CL		4	PID=0 ppm BΓ=80 cpm
32.5 33.0	116308 116309	05/13/93 14:15	21		6		SAA	CL		4	PID=0 ppm BΓ=80 cpm
33.0 33.5	116308 116309	05/13/93 14:15	26		6		VERY DENSE, (10YR, 3/6) DARK YELLOWISH BROWN, POORLY GRADED SILTY SAND, MOIST	SM		N/A	PID=0 ppm BΓ=80 cpm
33.5 34.0	116308 116309	05/13/93 14:15	31		6		SAA	SM		N/A	PID=0 ppm BΓ=80 cpm
34.0 34.5	116311	05/13/93 14:30	5		6		MEDIUM DENSE, (10YR, 4/6) DARK YELLOWISH BROWN, POORLY GRADED SAND WITH GRAVEL, MOIST	SP		N/A	PID=0 ppm BΓ=60 cpm
34.5 35.0	116311	05/13/93 14:30	4		6		SAA	SP		N/A	PID=0 ppm BΓ=60 cpm
35.0 35.5		05/13/93 14:30	11		0		NO RECOVERY	N/A		N/A	
35.5 36.0		05/13/93 14:30	10		0		NO RECOVERY	N/A		N/A	
36.0 36.5	116312	05/13/93 14:50	9		6		VERY DENSE (2.5Y, 5/4) LIGHT OLIVE BROWN, POORLY GRADED SAND WITH GRAVEL, MOIST	SP		N/A	PID=0 ppm BΓ=60 cpm
36.5 37.0	116312	05/13/93 14:50	9		6		SAA	SP		N/A	PID=0 ppm BΓ=60 cpm
37.0 37.5	116312	05/13/93 14:50	15		6		SAA	SP		N/A	PID=0 ppm BΓ=60 cpm
37.5 38.0	116313 116314	05/13/93 14:50	44		6		VERY DENSE (2.5Y, 5/4) LIGHT OLIVE BROWN, POORLY GRADED SAND, TRACE GRAVEL, MOIST	SP		N/A	

NOTES:
28.0 FT TO 30.0 FT SHELBY TUBE HAS ESITMATED RECOVERY

Driller: JOE RAAB, ROGER DAVIS

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1995	COORDINATES: NORTH 477770.18 EAST 1379054.76	DATE:01-MAY-93
GROUND ELEVATION: 567.9	GWL: Depth Date/Time	DATE STARTED: 01-MAY-9
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 02-MAY-
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON SAMPLE	RECOVERY INCHES		USCS SYMBOL	TSF	REMARKS
.5	116077	05/01/93 09:15	4	6	MEDIUM DENSE, (2.5Y, 5/4) LIGHT OLIVE BROWN, CLAYEY SILT WITH GRAVEL TRACE FLYASH	ML	N/A	PID=40-100 ppm BΓ=1.9 cpm
.5 1.0	116077	05/01/93 09:15	9	6	SAA	ML	N/A	PID=1.9 ppm BΓ=40-100 cpm
1.0 1.5	116077	05/01/93 09:15	12	6	SAA	ML	N/A	PID=1.9 ppm BΓ=40-100 cpm
1.5 2.0	116078 116079	05/01/93 09:15	14	3	SAA; AND (10YR, 2/1) BLACK, FLYASH, SLIGHTLY MOIST	ML	N/A	PID=1.9 ppm BΓ=40-100 cpm
2.0 2.5	116080	05/01/93 09:30	9	6	(10YR, 2/1) BLACK, FLYASH, SLIGHTLY MOIST, TRACE SILTY CLAY	N/A	N/A	BΓ=180 cpm
2.5 3.0	116080	05/01/93 09:30	9	6	STIFF, (2.5Y, 5/4) LIGHT OLIVE BROWN, SILTY CLAY WITH GRAVEL, TRACE FLYASH	N/A CL	N/A 1.5	BΓ=120 cpm
3.0 3.5	116080	05/01/93 09:30	11	6	SAA	N/A CL	N/A	BΓ=120 cpm
3.5 4.0	116081 116082	05/01/93 09:30	15	6	(10YR, 2/1) BLACK FLYASH, SLIGHTLY MOIST, TRACE CLAY	N/A	N/A	PID=1.5 ppm BΓ=120 cpm
4.0 4.5	116083	05/01/93 10:00	2	6	LOOSE, (2.5Y, 5/6) LIGHT OLIVE BROWN, CLAYEY SILT WITH GRAVEL, TRACE FLYASH	ML	N/A	PID=0 ppm BΓ=80 cpm
4.5 5.0	116083	05/01/93 10:00	3	6	SAA	ML	N/A	PID=0 ppm BΓ=80 cpm
5.0 5.5	116083	05/01/93 10:00	2	6	(10YR, 2/1) BLACK, FLYASH, SLIGHTLY MOIST	N/A	N/A	PID=0 ppm BΓ=80 cpm
5.5 6.0	116084 116085	05/01/93 10:00	4	6	LOOSE, (2.5Y, 5/6) LIGHT OLIVE BROWN, CLAYEY SILT WITH GRAVEL, TRACE FLYASH	ML	N/A	PID=0 ppm BΓ=80 cpm

NOTES:
AT 26-26.5' MAGNESIM MODULES WERE FOUND IN THE SILT
THIS MAY INDICATE AN ORIGINARY SOIL HORIZON.

Driller: JOE RAAB, ROGER DAVIS
Drilling Equipment: CME-45

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1995	COORDINATES: NORTH 477770.18 EAST 1379054.76	DATE:01-MAY-93
GROUND ELEVATION: 567.9	GWL: Depth Date/Time	DATE STARTED: 01-MAY-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 02-MAY-93
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
6.0 6.5	116086	05/01/93	10:15	3		6		STIFF, (2.5Y, 5/6) LIGHT OLIVE BROWN, SILTY CLAY WITH GRAVEL AND FLYASH	CL		1.0	PID=.1 ppm BΓ=80 cpm
6.5 7.0	116087	05/01/93	10:15	4		6		SAA	CL		1	PID=.1 ppm BΓ=80 cpm
7.0 7.5	116088	05/01/93	10:15	4		3		SAA	CL		1	PID=.1 ppm BΓ=80 cpm
7.5 8.0		05/01/93	10:15	49		0		NO RECOVERY	N/A		N/A	
8.0 8.5	116090	05/01/93	13:15	1		6		(10YR, 2/1) BLACK, FLYASH, SLIGHTLY MOIST	N/A		N/A	PID=0 ppm BΓ=60 cpm
8.5 9.0	116090	05/01/93	13:15	1		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
9.0 9.5	116091 116092	05/01/93	13:15	1		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
9.5 10.0		05/01/93	13:15	1		0		NO RECOVERY	N/A		N/A	
10.0 10.5	116093	05/01/93	13:30	1		6		(10YR, 2/1) BLACK, FLYASH, SLIGHTLY MOIST	N/A		N/A	PID=0 ppm BΓ=60 cpm
10.5 11.0	116093	05/10/93	13:30	2		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
11.0 11.5	116094 116095	05/01/93	13:30	2		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
11.5 12.0		05/01/93	13:30	1		0		NO RECOVERY	N/A		N/A	
12.0 12.5	116096	05/01/93	14:00	2		6		(10YR, 2/1) BLACK, FLYASH, SLIGHTLY MOIST	N/A		N/A	PID=0 ppm BΓ=90 cpm

NOTES:
AT 26-26.5' MAGNESIM MODULES WERE FOUND IN THE SILT
THIS MAY INDICATE AN ORIGINARY SOIL HORIZON.

Driller: JOE RAAB, ROGER DAVIS
Drilling Equipment: CME-45

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1995	COORDINATES: NORTH 477770.18 EAST 1379054.76	DATE:01-MAY-93
GROUND ELEVATION: 567.9	GWL: Depth Date/Time	DATE STARTED: 01-MAY-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 02-MAY-9
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON SAMPLE	RECOVERY INCHES		USCS SYMBOL	TSF	REMARKS
12.5 13.0	116096 05/01/93 14:00		2	6	SAA	N/A	N/A	PID=0 ppm BΓ=90 cpm
13.0 13.5	116096 05/01/93 14:00		2	6	SAA	N/A	N/A	PID=0 ppm BΓ=90 cpm
13.5 14.0	116097 116098 05/01/93 14:00		2	6	SAA	N/A	N/A	PID=90 ppm BΓ=0 cpm
14.0 14.5	116099 05/01/93 14:15		1	6	SAA	N/A	N/A	PID=0 ppm BΓ=80 cpm
14.5 15.0	116099 05/01/93 14:15		1	6	SAA	N/A	N/A	PID=0 ppm BΓ=80 cpm
15.0 15.5	116100 116101 05/01/93 14:15		1	6	(10YR, 2/1) BLACK, FLYASH, SLIGHTLY MOIST	N/A	N/A	PID=0 ppm BΓ=80 cpm
15.5 16.0	05/01/93 14:15		1	0	NO RECOVERY	N/A	N/A	
16.0 16.5	116102 05/01/93 14:30		2	6	(10YR, 2/1) BLACK, FLYASH, SLIGHTLY MOIST	N/A	N/A	PID=0 ppm BΓ=60 cpm
16.5 17.0	116102 05/01/93 14:30		3	6	SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
17.0 17.5	116103 116104 05/01/93 14:30		3	3	SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
17.5 18.0	05/01/93 14:30		4	0	NO RECOVERY	N/A	N/A	
18.0 18.5	116105 05/01/93 14:50		5	6	(10YR, 2/1) BLACK, FLYASH, SLIGHTLY MOIST	N/A	N/A	PID=0 ppm BΓ=60 cpm

NOTES:
AT 26-26.5' MAGNESIM MODULES WERE FOUND IN THE SILT
THIS MAY INDICATE AN ORIGINARY SOIL HORIZON.

Driller: JOE RAAB, ROGER DAVIS
Drilling Equipment: CME-45

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1995	COORDINATES: NORTH 477770.18 EAST 1379054.76	DATE:01-MAY-93
GROUND ELEVATION: 567.9	GWL: Depth Date/Time	DATE STARTED: 01-MAY-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 02-MAY-93
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
18.5 19.0	116105	05/01/93 14:50	3		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
19.0 19.5	116105	05/01/93 14:50	2		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
19.5 20.0	116106 116107	05/01/93 14:50	6		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
20.0 20.5	116108	05/01/93 15:30	1		6		SAA	N/A		N/A	PID=.3 ppm BΓ=60 cpm
20.5 21.0	116108	05/01/93 15:30	2		6		SAA	N/A		N/A	PID=.3 ppm BΓ=60 cpm
21.0 21.5	116108	05/01/93 15:30	1		6		SAA	N/A		N/A	PID=0.3 ppm BΓ=60 cpm
21.5 22.0	116109 116110	05/01/93 15:30	1		6		SAA	N/A		N/A	PID=.3 ppm BΓ=60 cpm
22.0 22.5	116111	05/01/93 15:40	2		6		SAA	N/A		N/A	PID=.3 ppm BΓ=40 cpm
22.5 23.0	116111	05/01/93 15:40	2		6		(10YR, 2/1) BLACK, FLYASH, SLIGHTLY MOIST	N/A		N/A	PID=.3 ppm BΓ=40 cpm
23.0 23.5	116111	05/01/93 15:40	4		6		SAA	N/A		N/A	PID=.3 ppm BΓ=40 cpm
23.5 24.0	116112 116113	05/01/93 15:40	7		6		SAA	N/A		N/A	PID=.3 ppm BΓ=40 cpm
24.0 24.5	116114	05/01/93 15:55	2		6		SAA	N/A		N/A	PID=.1 ppm BΓ=40 cpm

NOTES:
AT 26-26.5' MAGNESIM MODULES WERE FOUND IN THE SILT
THIS MAY INDICATE AN ORIGINARY SOIL HORIZON.

Driller: JOE RAAB, ROGER DAVIS
Drilling Equipment: CME-45

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1995	COORDINAT ": NORTH 477770.18 EAST 1379054.76	DATE:01-MAY-93
GROUND ELEVATION: 567.9	GWL: Depth Date/Time	DATE STARTED: 01-MAY-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 02-MAY-'
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
24.5 25.0	116114	05/01/93 15:55	3		6		SAA	N/A	N/A	PID=.1 ppm BΓ=40 cpm
25.0 25.5	116114	05/01/93 15:55	4		6		SAA	N/A	N/A	PID=.1 ppm BΓ=40 cpm
25.5 26.0	116115 116116	05/01/93 15:55	1		6		SAA	N/A	N/A	PID=.1 ppm BΓ=40 cpm
26.0 26.5	116117	05/01/93 16:10	3		6		MEDIUM DENSE, (10YR, 3/2) VERY DARK GRAYISH BROWN, SILT, MOIST	ML	N/A	PID=0 ppm BΓ=60 cpm
26.5 27.0	116117	05/01/93 16:10	7		6		SAA	ML	2	PID=0 ppm BΓ=60 cpm
27.0 27.5	116118 116169	05/01/93 16:10	4		6		SAA	ML	3	PID=0 ppm BΓ=60 cpm
27.5 28.0	116118 116169	05/01/93 16:10	14		6		SAA	ML	3	PID=0 ppm BΓ=60 cpm
28.0 28.5	116170	05/01/93 16:30	15		6		VERY DENSE, MEDIUM DENSE, (10YR, 4/3) BROWN, CLAYEY SILT, NO PLATICITY, SLIGTHLY MOIST	ML	2.5	PID=.3 ppm BΓ=60 cpm
28.5 29.0	116170	05/01/93 16:30	21		6		SAA	ML	3.5	PID=.3 ppm BΓ=60 cpm
29.0 29.5	116170	05/01/93 16:30	27		6		SAA	ML	3.5	PID=.3 ppm BΓ=60 cpm
29.5 30.0	116170	05/01/93 16:30	28		4		SAA	ML	3	PID=.3 ppm BΓ=60 cpm
30.0 30.5	116172	05/02/93 09:30	34		6		DENSE, (10YR, 4/4) DARK YELLOWISH BROWN, CLAYEY SILT, TRACE GRAVEL, LOW PLASTICITY, MOIST	ML	N/A	PID=.9 ppm BΓ=80 cpm

NOTES:
AT 26-26.5' MAGNESIM MODULES WERE FOUND IN THE SILT
THIS MAY INDICATE AN ORIGINARY SOIL HORIZON.

Driller: JOE RAAB, ROGER DAVIS
Drilling Equipment: CME-45

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1995	COORDINATES: NORTH 477770.18 EAST 1379054.76	DATE:01-MAY-93
GROUND ELEVATION: 567.9	GWL: Depth Date/Time	DATE STARTED: 01-MAY-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 02-MAY-93
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
30.5 31.0	116172	05/02/93 09:30	13		6		SAA	ML		N/A	PID=.9 ppm BΓ=80 cpm
31.0 31.5	116172	05/02/93 09:30	16		6		MEDIUM DENSE, (10YR, 5/4) YELLOWISH BROWN, SILTY GRAVEL WITH COARSE SAND, POORLY GRADED, MOIST	GM		N/A	PID=.9 ppm BΓ=80 cpm
31.5 32.0	116173 116174	05/02/93 09:30	22		4		SAA	GM		N/A	PID=.9 ppm BΓ=80 cpm

NOTES:
AT 26-26.5' MAGNESIM MODULES WERE FOUND IN THE SILT
THIS MAY INDICATE AN ORIGINARY SOIL HORIZON.

Driller: JOE RAAB, ROGER DAVIS
Drilling Equipment: CME-45

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1996	COORDINATES: NORTH 477819.85 EAST 1379114.90	DATE:29-APR-93
GROUND ELEVATION: 565.5	GWL: Depth Date/Time	DATE STARTED: 29-APR-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 29-APR-9
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
1.5	112070	04/29/93	10:55	9 9 14		6		MEDIUM DENSE, (10YR,4/6) SANDY SILT WITH GRAVEL, MOIST TO DRY; (10YR,2/1), FLYASH, BLACK	ML SM		N/A	PID=0 ppm BΓ=80 cpm
1.5 2.0	112071 112072	04/29/93	10:55	27		6		MEDIUM DENSE, (10YR, 4/6) DARK YELLOWISH, CLAYEY SILTY WITH GRAVEL, SLIGHT PLASTICITY, MOIST	ML		N/A	PID=80 ppm BΓ=0 cpm
2.0 4.0	112073	04/29/93	11:15	N/A 22		0		SAA	N/A		N/A	PID=80 ppm BΓ=.0 cpm
2.0 2.5	112073	04/29/93	11:15	10		6		(10YR, 2/1) BLACK, FLYASH, WET	N/A		N/A	PID=80 ppm BΓ=0 cpm
2.5 3.0	112073	04/29/93	11:15	14		6		SAA	N/A		N/A	PID=80 ppm BΓ=0 cpm
4.0 4.5	112074	04/29/93	13:20	8		6		(10YR, 2/1) BLACK, FLYASH, WITH SILTY CLAY, AND GRAVEL	N/A		N/A	PID=60 ppm BΓ=0 cpm
4.5 6.0		04/29/93	13:20	8 6 8		0		NO RECOVERY	N/A		N/A	
6.0 6.5	112075 112076	04/29/93	13:25	6		6		(10YR, 2/1) BLACK, FLYASH, DRY	N/A		N/A	PID=60 ppm BΓ=0 cpm
6.5 7.0	112075 112076	04/29/93	13:25	6		6		SAA	N/A		N/A	PID=60 ppm BΓ=0 cpm
7.0 8.0		04/29/93	13:25	8		0		NO RECOVERY	N/A		N/A	
8.0 8.5	112077	04/29/93	13:40	4		6		(10YR, 2/1) BLACK, FLYASH, DRY	N/A		N/A	PID=80 ppm BΓ=0 cpm
8.5 9.0	112077	04/29/93	13:40	2		6		SAA	N/A		N/A	PID=80 ppm BΓ=0 cpm

NOTES:

Boring Contractor: PENNSYLVANIA DRILLING
Driller: JOE RAAB, ROGER DAVIS
Drilling Equipment: CME-45

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1996	COORDINATES: NORTH 477819.85 EAST 1379114.90	DATE:29-APR-93
GROUND ELEVATION: 565.5	GWL: Depth Date/Time	DATE STARTED: 29-APR-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 29-APR-93
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
9.0 9.5	112077	04/29/93 13:40	1		6		SAA	N/A		N/A	PID=80 ppm BΓ=0 cpm
9.5 10.0	112078 112079	04/29/93 13:40	2		3		SAA	N/A		N/A	PID=80 ppm BΓ=0 cpm
10.0 12.0	112080	04/29/93 13:50	N/A		N/A		SHELBY TUBE	N/A		N/A	
12.0 12.5	112081	04/29/93 14:00	1		6		(10YR, 2/1) BLACK, FLYASH, DRY	N/A		N/A	PID=80 ppm BΓ=0 cpm
12.5 13.0	112081	04/29/93 14:00	1		6		SAA	N/A		N/A	PID=80 ppm BΓ=0 cpm
13.0 13.5	112082 112083	04/29/93 14:00	1		6		SAA	N/A		N/A	PID=80 ppm BΓ=0 cpm
13.5 14.0		04/29/93 14:00	1		0		NO RECOVERY	N/A		N/A	
14.0 14.5	112084	04/29/93 14:30	4 3		6		(10YR, 2/1) BLACK, FLYASH, DRY	N/A		N/A	PID=80 ppm BΓ=0 cpm
14.5 15.0	112084	04/29/93 14:30	8		6		SAA	N/A		N/A	PID=80 ppm BΓ=0 cpm
15.0 15.5	112085 112086	04/29/93 14:50	11		6		(10YR, 2/1) BLACK, FLYASH, DRY, PLYWOOD FRAGMENT	N/A		N/A	PID=80 ppm BΓ=0 cpm
15.5 16.0		04/29/93 14:30	N/A		0		NO RECOVERY	N/A		N/A	
16.0 16.5	112087	04/29/93 14:45	7		6		(10YR, 2/1) BLACK, FLYASH, MOIST, WITH WOOD ODOR	N/A		N/A	BΓ=80 cpm

NOTES:

Boring Contractor: PENNSYLVANIA DRILLING
Driller: JOE RAAB, ROGER DAVIS
Drilling Equipment: CME-45

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1996	COORDINATES: NORTH 477819.85 EAST 1379114.90	DATE:29-APR-93
GROUND ELEVATION: 565.5	GWL: Depth Date/Time	DATE STARTED: 29-APR-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 29-APR-9
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON SAMPLE	RECOVERY INCHES		USCS SYMBOL	TSF	REMARKS
16.5 17.0	112088	04/29/93 14:45	21	6	MEDIUM DENSE, (2.5Y,6/4) LIGHT YELLOWISH BROWN, POORLY GRADED SAND, SLIGHTLY MOIST	N/A	N/A	BΓ=80 cpm
17.0 17.5		04/29/93 14:45	12	3	SAA	SP	N/A	PID=13.1 ppm BΓ=80 cpm
17.5 18.0		04/29/93 14:45	12	0	NO RECOVERY	N/A	N/A	
18.0 18.5	112090	04/29/93 15:20	11	6	MEDIUM DENSE, (2.5Y,5/6) LIGHT OLIVE BROWN, POORLY GRADED SAND, SLIGHTLY MOIST	SP	N/A	PID=14.1 ppm BΓ=80 cpm
18.5 19.0	116069	04/29/93 15:20	14	6	SAA	SP	N/A	PID=14.1 ppm BΓ=80 cpm
19.0 19.5	112089	04/29/93 15:20	10	2	SAA	SP	N/A	PID=14.1 ppm BΓ=80 cpm
19.5 20.0		04/29/93 15:20	9	0	NO RECOVERY	N/A	N/A	
20.0 20.5	116070	04/29/93 15:40	21	6	MEDIUM DENSE, (2.5Y,5/6) LIGHT OLIVE BROWN, POORLY GRADED SAND, SLIGHTLY MOIST	SP	N/A	PID=5.1 ppm BΓ=80 cpm
20.5 21.0	116070	04/29/93 15:40	12	6	SAA	SP	N/A	PID=5.1 ppm BΓ=80 cpm
21.0 21.5	116070	04/29/93 15:40	14	6	SAA	N/A	N/A	PID=5.1 ppm BΓ=80 cpm
21.5 22.0	116071 116072	04/29/93 15:40	11	4	SAA	SP	N/A	PID=5.1 ppm BΓ=80 cpm

NOTES:

Boring Contractor: PENNSYLVANIA DRILLING
Driller: JOE RAAB, ROGER DAVIS
Drilling Equipment: CME-45

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1997	COORDINATES: NORTH 477871.13 EAST 1378960.50	DATE:
GROUND ELEVATION: 570.4	GWL: Depth Date/Time	DATE STARTED: 05-MAY-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 07-MAY-93
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
.5	116177	05/05/93	09:20	4		6		LOOSE, (2.5Y,5/6) LIGHT OLIVE BROWN, CLAYEY SILT, TRACE GRAVEL, NO PLASTICITY, MOIST	ML		N/A	PID=0 ppm BΓ=60 cpm
1.0	116177	05/05/93	09:20	4		6		SAA	ML		N/A	PID=0 ppm BΓ=60 cpm
1.5	116177	05/05/93	09:20	4		6		VERY STIFF, (5Y,5/6) OLIVE, SILTY CLAY, TRACE GRAVEL, LOW PLASTICITY, MOIST	CL		3	PID=0 ppm BΓ=60 cpm
2.0	116178 116179	05/05/93	09:20	8		4		SAA	CL		2.75	PID=0 ppm BΓ=60 cpm
2.5	116180	05/05/93	09:40	5		6		SAA	CL		2.25	PID=0 ppm BΓ=60 cpm
3.0	116180	05/05/93	09:40	7		6		SAA	CL		2.75	PID=0 ppm BΓ=60 cpm
3.5	116180	05/05/93	09:40	5		6		STIFF, (5Y,4/4) OLIVE, SILTY CLAY, WITH FLYASH, TRACE GRAVEL, LOW PLASTICITY, MOIST	CL		1.5	PID=0 ppm BΓ=60 cpm
4.0	116181 116182	05/05/93	09:40	7		3		SAA	CL		1.5	PID=0 ppm BΓ=60 cpm
4.5	116183	05/05/93	10:00	7		6		VERY STIFF, (2.5Y,5/6) LIGHT OLIVE BROWN, SILTY CLAY WITH GRAVEL, TRACE FLYASH, LOW PLASTICITY, MOIST	CL		3.5	PID=0 ppm BΓ=60 cpm
5.0	116183	05/05/93	10:00	11		6		SAA	CL		2.75	PID=0 ppm BΓ=60 cpm
5.5	116183	05/05/93	10:00	13		6		(10YR 2/1) BLACK, FLYASH, DRY	N/A		N/A	PID=0 ppm BΓ=60 cpm
6.0	116184 116185	05/05/93	10:00	15		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm

NOTES:

Driller: JOE RAAB
Drilling Equipment: HOLLOW STEM AUGER

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

000297

000364

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1997	COORDINATES: NORTH 477871.13 EAST 1378960.50	DATE:
GROUND ELEVATION: 570.4	GWL: Depth Date/Time	DATE STARTED: 05-MAY-9.
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 07-MAY-(
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
6.0 6.5	116186	05/05/93	10:20	11		6		(10YR,2/1) BLACK, FLYASH, SLIGHTLY MOIST	N/A		N/A	PID=0 ppm BΓ=60 cpm
6.5 7.0	116186	05/05/93	10:20	17		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
7.0 7.5	116186	05/05/93	10:20	22		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
7.5 8.0	116187 116188	05/05/93	10:20	34		6		(10Y 2/1) BLACK, FLYASH, SLIGHTLY MOIST	N/A		N/A	PID=0 ppm BΓ=60 cpm
8.0 8.5	116189	05/05/93	10:30	2		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
8.5 9.0	116189	05/05/93	10:30	2		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
9.0 9.5	116189	05/05/93	10:30	2		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
9.5 10.0	116190 116191	05/05/93	10:30	2		2		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
10.0 10.5	116192	05/05/93	13:00	3		6		SAA	N/A		N/A	PID=0 ppm BΓ=40 cpm
10.5 11.0	116192	05/05/93	13:00	2		6		SAA	N/A		N/A	PID=0 ppm BΓ=40 cpm
11.0 11.5	116192	05/05/93	13:00	3		6		SAA	N/A		N/A	PID=0 ppm BΓ=40 cpm
11.5 12.0	116193 116194	05/05/93	13:00	1		3		SAA	N/A		N/A	PID=0 ppm BΓ=40 cpm

NOTES:

Driller: JOE RAAB
Drilling Equipment: HOLLOW STEM AUGER

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

000298

000365

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION
BORING NUMBER: 1997	COORDINATES: NORTH 477871.13 EAST 1378960.50 DATE:
GROUND ELEVATION: 570.4	GWL: Depth Date/Time DATE STARTED: 05-MAY-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time DATE COMPLETE: 07-MAY-93
DRILLING METHOD: HOLLOW STEM AUGER	

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
12.0 12.5	116195	05/05/93 13:25	2		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
12.5 13.0	116195	05/05/93 13:25	2		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
13.0 13.5	116195	05/05/93 13:25	2		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
13.5 14.0	116196 116197	05/05/93 13:25	2		2		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
14.0 14.5	116198	05/05/93 13:35	4		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
14.5 15.0	116198	05/05/93 13:35	3		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
15.0 15.5	116198	05/05/93 13:35	2		6		(10Y 2/1) BLACK, FLYASH, SLIGHTLY MOIST	N/A		N/A	PID=0 ppm BΓ=60 cpm
15.5 16.0	116199 116200	05/05/93 13:35	3		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
16.0 16.5	116201	05/05/93 13:50	4		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
16.5 17.0	116201	05/05/93 13:50	3		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
17.0 17.5	116201	05/05/93 13:50	3		6		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm
17.5 18.0	116202 116203	05/05/93 13:50	2		2		SAA	N/A		N/A	PID=0 ppm BΓ=60 cpm

NOTES:

Driller: JOE RAAB
Drilling Equipment: HOLLOW STEM AUGER

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

000299

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1997	COORDINATES: NORTH 477871.13 EAST 1378960.50	DATE:
GROUND ELEVATION: 570.4	GWL: Depth Date/Time	DATE STARTED: 05-MAY-9
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 07-MAY-9
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
18.0 18.5	116204	05/05/93	14:00	4		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
18.5 19.0	116204	05/05/93	14:00	2		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
19.0 19.5	116204	05/05/93	14:00	2		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
19.5 20.0	116205 116206	05/05/93	14:00	3		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
20.0 20.5	116207	05/05/93	14:50	5		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
20.5 21.0	116207	05/05/93	14:50	3		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
21.0 21.5	116207	05/05/93	14:50	2		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
21.5 22.0	116208 116209	05/05/93	14:50	2		3		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
22.0 22.5	116210	05/05/93	15:00	5		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
22.5 23.0	116210	05/05/93	15:00	3		6		(10YR 2/1) BLACK, FLYASH, SLIGHTLY MOIST	N/A	N/A	PID=0 ppm BΓ=60 cpm
23.0 23.5	116210	05/05/93	15:00	2		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
23.5 24.0	116211 116212	05/05/93	15:00	1		4		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm

NOTES:

Driller: JOE RAAB
Drilling Equipment: HOLLOW STEM AUGER

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

000300

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1997	COORDINATES: NORTH 477871.13 EAST 1378960.50	DATE:
GROUND ELEVATION: 570.4	GWL: Depth Date/Time	DATE STARTED: 05-MAY-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 07-MAY-93
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
24.0 24.5	116213	05/05/93	15:10	2		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
24.5 25.0	116213	05/05/93	15:10	2		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
25.0 25.5	116213	05/05/93	15:10	2		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
25.5 26.0	116214 116215	05/05/93	15:10	2		4		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
26.0 26.5	116216	05/05/93	15:15	2		6		(10YR 2/1) BLACK, FLYASH, MOIST	N/A	N/A	PID=0 ppm BΓ=60 cpm
26.5 27.0	116216	05/05/93	15:15	3		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
27.0 27.5	116216	05/05/93	15:15	2		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
27.5 28.0	116217 116218	05/05/93	15:15	4		3		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
28.0 28.5	116241 116242	05/06/93	09:00	5		6		SAA	N/A	N/A	PID=0 ppm BΓ=60 cpm
28.5 29.0	116243	05/06/93	09:00	4		6		LOOSE, (5Y,4/4) OLIVE, SILT, MOIST, NO PLASTICITY	ML	N/A	PID=0 ppm BΓ=60 cpm
29.0 29.5	116243	05/06/93	09:00	5		6		SAA	ML	N/A	PID=0 ppm BΓ=60 cpm
29.5 30.0	116243	05/06/93	09:00	1		6		SAA	ML	N/A	PID=0 ppm BΓ=60 cpm

NOTES:

Driller: JOE RAAB
Drilling Equipment: HOLLOW STEM AUGER

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

000301

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1997	COORDINATES: NORTH 477871.13 EAST 1378960.50	DATE:
GROUND ELEVATION: 570.4	GWL: Depth Date/Time	DATE STARTED: 05-MAY-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 07-MAY-9
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
30.0 30.5	116244 116245	05/06/93 09:25	7		6		MEDIUM DENSE, (5Y,3/2) DARK OLIVE GRAY, CLAYEY SILT, TRACE COARSE SAND, SLIGHT PLASTICITY, MOIST	ML	N/A	PID=0 ppm BΓ=60 cpm
30.5 31.0	116246	05/05/93 09:25	9		6		SAA	ML	N/A	PID=0 ppm BΓ=60 cpm
31.0 31.5	116247	05/05/93 09:25	11		6		SAA	ML	N/A	PID=0 ppm BΓ=60 cpm
31.5 32.0	116248	05/05/93 09:25	14		4		SAA	ML	N/A	PID=0 ppm BΓ=60 cpm
32.0 32.5	116249	05/05/93 10:20	N/A		6		SAA	ML	N/A	
32.5 33.0	116249	05/05/93 10:20	N/A		6		UNKNOWN	N/A	N/A	
33.0 33.5	116249	05/05/93 10:20	N/A		6		UNKNOWN	N/A	N/A	
33.5 34.0	116249	05/05/93 10:20	N/A		6		(10YR,4/3) BROWN, CLAYEY SILT WITH COARSE SAND, SLIGHT PLASTICITY, MOIST	N/A	N/A	
34.0 34.5	116252	05/05/93 09:30	4		6		STIFF, (2.5Y,4/2) DARK GRAYISH BROWN, SILTY CLAY WITH FLYASH, LOW PLASTICITY, MOIST	CL	1	PID=0 ppm BΓ=60 cpm
34.5 35.0	116252	05/05/93 09:30	6		6		SAA	N/A CL	N/A 1	PID=0 ppm BΓ=60 cpm
35.0 35.5	116252	05/05/93 09:30	8		6		MEDIUM DENSE, (10YR,4/3) BROWN, CLAYEY SILT WITH GRAVEL, SLIGHT PLASTICITY, MOIST	N/A ML	N/A	PID=0 ppm BΓ=60 cpm
35.5 36.0	116253 116254	05/05/93 09:30	9		6		SAA	ML	N/A	PID=0 ppm BΓ=60 cpm

NOTES:

Driller: JOE RAAB
Drilling Equipment: HOLLOW STEM AUGER

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 1997	COORDINATES: NORTH 477871.13 EAST 1378960.50	DATE:
GROUND ELEVATION: 570.4	GWL: Depth Date/Time	DATE STARTED: 05-MAY-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 07-MAY-93
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
36.0 36.5	116256 05/05/93 09:50		4		N/A		SAA	ML	N/A	PID=0 ppm BΓ=60 cpm
36.5 37.0	116255 116256 05/05/93 09:50		9		N/A		MEDIUM DENSE, (2.5Y,5/4) SILT WITH GRAVEL AND FLYASH, MOIST	N/A ML	N/A	PID=0 ppm BΓ=60 cpm
37.0 37.5	116255 116256 05/05/93 09:50		12		N/A		MEDIUM DENSE, SILT WITH GRAVEL AND COARSE SAND	N/A	N/A	PID=0 ppm BΓ=60 cpm
37.5 38.0	116255 116256 05/05/93 09:50		12		N/A		MEDIUM DENSE, (2.5Y,5/6) LIGHT OLIVE BROWN, SILT WITH COARSE SAND, MOIST	ML	N/A	PID=0 ppm BΓ=60 cpm
38.0 38.5	116257 05/05/93 10:15		9		6		MEDIUM DENSE, (2.5Y,5/6) LIGHT OLIVE BROWN, SILTY GRAVEL WITH COARSE SAND, MOIST	GM	N/A	PID=0 ppm BΓ=60 cpm
38.5 39.0	116257 05/05/93 10:15		11		6		SAA	GM	N/A	PID=0 ppm BΓ=60 cpm
39.0 39.5	116258 116259 05/05/93 10:15		13		6		SAA	GM	N/A	PID=0 ppm BΓ=60 cpm
39.5 40.0	05/05/93 10:15		13		0		NO RECOVERY	N/A	N/A	PID=0 ppm BΓ=60 cpm

NOTES:

Driller: JOE RAAB
Drilling Equipment: HOLLOW STEM AUGER

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

000303

PROJECT NUMBER: WBS 20.03.05	PROJECT NAME:	
BORING NUMBER: 1998	COORDINATES: NORTH 478091.60 EAST 1379032.88	DATE:27-APR-93
GROUND ELEVATION: 569.5	GWL: Depth Date/Time	DATE STARTED: 27-APR-93
ENGINEER/GEOLOGIST: DEBES/BOYER	Depth Date/Time	DATE COMPLETE: 27-APR-9
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
.5	112040	04/27/93 16:05	7		6		BLACK, (2.5Y, 2.5/1) SILTY SAND, LOW PLASTICITY, DRY	SM		N/A	PID=0 ppm BΓ=120 cpm
.5	112042 116073 116075	04/28/93 08:40	8		6		BLACK, (2.5Y, 2.5/1) SILTY SAND, LOW PLASTICITY, DRY	SM		N/A	PID=0.3 ppm BΓ=60 cpm
.5 1.0	112040	04/27/93 16:05	9		6		BLACK, (2.5Y, 2.5/1) FLYASH	N/A		N/A	PID=0 ppm BΓ=120 cpm
.5 1.0	112042 116073 116075	04/28/93 08:40	7		6		BLACK (2.5Y 2.5/1) FLYASH	N/A		N/A	PID=0.3 ppm BΓ=60 cpm
1.0 1.5	112040	04/27/93 16:05	14		6		SAA	N/A		N/A	PID=0 ppm BΓ=120 cpm
1.0 1.5	116075 112042 116073	04/28/93 08:40	14		6		SAA	N/A		N/A	PID=0.3 ppm BΓ=60 cpm
1.5 2.0	112040	04/27/93 16:05	25		6		SAA	N/A		N/A	PID=0 ppm BΓ=120 cpm
1.5 2.0	112043 112044	04/28/93 08:40	18		6		SAA	N/A		N/A	PID=0.3 ppm BΓ=60 cpm
2.0 2.5	112041	04/27/93 16:30	N/A		6		SHELBY TUBE	N/A		N/A	
2.0 2.5	112045 116074	04/28/93 09:05	5		6		SAA	N/A		N/A	PID=0.5 ppm BΓ=80 cpm
2.5 3.0	112041	04/27/93 16:30	N/A		6		SHELBY TUBE	N/A		N/A	

NOTES:

Driller: JOE RAAB
Drilling Equipment: CME-45

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

000304

PROJECT NUMBER: WBS 20.03.05	PROJECT NAME:	
BORING NUMBER: 1998	COORDINATES: NORTH 478091.60 EAST 1379032.88	DATE:27-APR-93
GROUND ELEVATION: 569.5	GWL: Depth Date/Time	DATE STARTED: 27-APR-93
ENGINEER/GEOLOGIST: DEBES/BOYER	Depth Date/Time	DATE COMPLETE: 27-APR-93
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
2.5 3.0	112045 116074	04/28/93	09:05	5		6		SAA	N/A		N/A	PID=0.5 ppm BΓ=80 cpm
3.0 3.5	112041	04/27/93	16:30	N/A		6		SHELBY TUBE	N/A		N/A	
3.0 3.5	112045 116074	04/28/93	09:05	5		6		SAA	N/A		N/A	PID=0.5 ppm BΓ=80 cpm
3.5 4.0	112041	04/27/93	16:30	N/A		6		SHELBY TUBE	N/A		N/A	
3.5 4.0	112046 112047	04/28/93	09:05	5		6		VERY STIFF, YELLOWISH BROWN, (10YR, 5/4) SILTY CLAY, LOW PLASTICITY, DRY	CL		2.5	PID=0.5 ppm BΓ=80 cpm
4.0 4.5	112048	04/28/93	09:30	3		6		BLACK, (2.5Y, 2.5Y) SILTY SAND, LOW PLASTICITY, DRY	SM		N/A	PID=0.6 ppm BΓ=80 cpm
4.5 5.0	112048	04/28/93	09:30	3		6		BLACK, (2.5Y, 2.5/1) FLYASH	N/A		N/A	PID=0.6 ppm BΓ=80 cpm
5.0 5.5	112048	04/28/93	09:30	N/A 6		6		STIFF, YELLOWISH BROWN, (10YR, 5/4), SILTY CLAY WITH ROOTS AND WOOD FRAGMENTS, LOW PLASTICITY, DRY	N/A CL		N/A 1.7	PID=0.6 ppm BΓ=80 cpm
5.5 6.0	112049 112050	04/28/93	09:30	14		6		SAA	CL		1.75	PID=0.6 ppm BΓ=80 cpm
6.0 6.5	112051	04/28/93	09:50	5		6		BLACK, (2.5Y, 2.5/1), FLYASH, WET	N/A		N/A	PID=0.6 ppm BΓ=80 cpm
6.5 7.0	112051	04/28/93	09:50	17		6		HARD, LIGHT YELLOWISH BROWN, (10YR, 6/4) AND GRAY (10YR, 7/2) SILTY CLAY, MEDIUM PLASTICITY, SLIGHT MOIST	N/A CL		N/A 3.5	PID=0.6 ppm BΓ=80 cpm
7.0 7.5	112051	04/28/93	09:50	22		6		SAA	N/A CL		N/A 3.5	PID=0.6 ppm BΓ=80 cpm

NOTES:

Driller: JOE RAAB
Drilling Equipment: CME-45

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

000305

PROJECT NUMBER: WBS 20.03.05	PROJECT NAME:	
BORING NUMBER: 1998	COORDINATES: NORTH 478091.60 EAST 1379032.88	DATE:27-APR-93
GROUND ELEVATION: 569.5	GWL: Depth Date/Time	DATE STARTED: 27-APR-93
ENGINEER/GEOLOGIST: DEBES/BOYER	Depth Date/Time	DATE COMPLETE: 27-APR-9
DRILLING METHOD: HOLLOW STEM AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
7.5 8.0	112052 112053 04/28/93 09:50		28		6		SAA		CL	3.5	PID=0.6 ppm BΓ=80 cpm
8.0 8.5	112054 04/28/93 10:55		8		6		BLACK, (2.5Y, 2.5/1), FLYASH, MOIST		N/A	N/A	PID=0.5 ppm BΓ=60 cpm
8.5 9.0	112054 04/28/93 10:55		6		6		VERY STIFF, LIGHT YELLOWISH BROWN, (10YR, 6/4), SILTY CLAY, LOW PLASTICITY, DRY		N/A CL	N/A 2.5	PID=0.5 ppm BΓ=60 cpm
9.0 9.5	112054 04/28/93 10:55		8		6		BLACK, (2.5Y, 2.5/1), FLYASH, WET		N/A	N/A	PID=0.5 ppm BΓ=60 cpm
9.5 10.0	112055 112056 04/28/93 10:55		14		6		VERY STIFF, GRAY, (10YR, 6/1) SILTY CLAY WITH IRON STRINGERS AND GRAVEL, LOW PLASTICITY, DRY		CL	3	PID=0.5 ppm BΓ=60 cpm
10.0 10.5	112057 04/28/93 13:30		3		6		MEDIUM STIFF, LIGHT BROWNISH GRAY, (10YR, 6/2), SILTY CLAY, MEDIUM PLASTICITY, DRY		CL	1.5	PID=0.3 ppm BΓ=60 cpm
10.5 11.0	112057 04/28/93 13:30		6		6		SAA		N/A CL	N/A 1.5	PID=0.3 ppm BΓ=60 cpm
11.0 11.5	112057 04/28/93 13:30		12		6		LIGHT OLIVE BROWN, (2.5Y, 5/4), WELL GRADED, GRAVELLEY SAND, WET		N/A SW	N/A	PID=0.3 ppm BΓ=60 cpm
11.5 12.0	112058 112059 04/28/93 13:30		17		6		HARD, LIGHT OLIVE BROWN, (2.5Y, 5/4), SILTY CLAY WITH PEA GRAVEL, LOW PLASTICITY, DRY		CL	3.5	PID=0.3 ppm BΓ=60 cpm
12.0 12.5	112060 04/28/93 13:55		4		6		LIGHT OLIVE BROWN, (2.5Y 5/4), POORLY GRADED GRAVELLEY SAND, WET		SP	N/A	PID=0.5 ppm BΓ=60 cpm
12.5 13.0	112060 04/28/93 13:55		10		6		STIFF, GRAY, (2.5Y, 5/1), SILTY CLAY WITH PEA GRAVEL, DRY		N/A CL	N/A 3.5	PID=0.5 ppm BΓ=60 cpm
13.0 13.5	112060 04/28/93 13:55		17		6		SAA		N/A CL	N/A 3.5	PID=0.5 ppm BΓ=60 cpm

NOTES:

ller: JOE RAAB
lling Equipment: CME-45

SAA = Same as Above
PID = Photoionization Detector
N.A = Not Applicable

PROJECT NUMBER: WBS 20.03.05	PROJECT NAME:
BORING NUMBER: 1998	COORDINATES: NORTH 478091.60 EAST 1379032.88 DATE:27-APR-93
GROUND ELEVATION: 569.5	GWL: Depth Date/Time DATE STARTED: 27-APR-93
ENGINEER/GEOLOGIST: DEBES/BOYER	Depth Date/Time DATE COMPLETE: 27-APR-93
DRILLING METHOD: HOLLOW STEM AUGER	

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
13.5 14.0	112061 112062 04/28/93 13:55		20		6		SAA	CL		3.5	PID=0.5 ppm BΓ=60 cpm
14.0 14.5	112063 04/28/93 14:10		3		6		STIFF, GRAY, (2.5Y, 5/1), SILTY CLAY WITH PEA GRAVEL, MEDIUM PLASTICITY, SLIGHTLY MOIST	CL		3	PID=0.5 ppm BΓ=60 cpm
14.5 15.0	112063 04/28/93 14:10		5		6		SAA	N/A CL		N/A 3	PID=0.5 ppm BΓ=60 cpm
15.0 15.5	112063 04/28/93 14:10		12		6		STIFF, GRAY, (2.5Y, 5/1), SILTY CLAY WITH PEA GRAVEL, MEDIUM PLASTICITY, SLIGHT MOIST	N/A CL		N/A 3	PID=0.5 ppm BΓ=60 cpm
15.5 16.0	112063 04/28/93 14:10		14		3		GRAY, (2.5Y, 5/1), POORLY GRADED SAND, MOIST	SP		N/A	PID=0.5 ppm BΓ=60 cpm
16.0 16.5	112064 04/28/93 14:30		N/A		6		SHELBY TUBE	N/A		N/A	
16.5 17.0	112064 04/28/93 14:30		N/A		6		SHELBY TUBE	N/A		N/A	
17.0 17.5	112065 04/28/93 15:24		50		6		HARD, GRAY, (2.5Y, 5/1), SILTY CLAY WITH PEA GRAVEL, LOW PLASTICITY, DRY (HARD PAN)	CL		4	PID=0.5 ppm BΓ=60 cpm
17.5 18.0	112065 04/28/93 15:24		50		6		SAA	N/A CL		N/A 4	PID=0.5 ppm BΓ=60 cpm
18.0 18.5	112065 04/28/93 15:24		50		6		SAA	N/A CL		N/A 4	PID=0.5 ppm BΓ=60 cpm
18.5 19.0	112066 112067 04/28/93 15:24		50		6		SAA	CL		4	PID=0.5 ppm BΓ=60 cpm

NOTES:

Driller: JOE RAAB
Drilling Equipment: CME-45

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

000307

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 2945	COORDINATES: NORTH 477972.18 EAST 1379119.93	DATE:19-MAR-93
GROUND ELEVATION: 566.7	GWL: Depth 43.5 Date/Time 02-Apr-93 08:30	DATE STARTED: 19-MAR-93
ENGINEER/GEOLOGIST: KEN GEIGER	Depth 43.6 Date/Time 07-Apr-93 08:30	DATE COMPLETE: 07-APR-
DRILLING METHOD: CABLE TOOL		

DEPTH	SAMPLE	DATE TIME	BLOWS ON SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
1.5	110237	03/19/93 09:50	2 8 10	8		SOFT, BROWN (10YR 4/3), SILTY SANDY CLAY WITH LIGHT YELLOWISH BROWN (2.5Y 6/4) MOTTLING, SOME GRAVEL + CONCRETE FRAGMENTS, MEDIUM PLASTICITY, SLIGHTLY MOIST	CL	.5	PID=0 ppm α=0 ppm BΓ=60 cpm
3.0	110238	03/19/93 10:00	9 10 9	7		SOFT, BROWN (10YR 4/3), SILTY CLAY WITH SOME CONCRETE FRAGMENTS AND GRAVEL, MEDIUM PLASTICITY, SLIGHTLY MOIST	CL	.5	PID=0 ppm α=0 ppm BΓ=60 cpm
4.5	110239	03/19/93 10:05	4 7 7	5		STIFF, BROWN (10YR 4/3), SILTY SANDY CLAY WITH SOME CONCRETE FRAGMENTS AND GRAVEL, MEDIUM PLASTLICITY, SLIGHTLY MOIST	CL	1.5	PID=0 ppm α=0 ppm BΓ=60-80 cpm
6.0	110240	03/19/93 10:15	45 40 16	4		STIFF, BROWN (10YR 4/3), SILTY SANDY CLAY WITH CONCRETE FRAGMENTS AND GRAVEL, MEDIUM PLASTICITY, SLIGHTLY MOIST	CL	1.5	PID=0 ppm α=0 ppm BΓ=60-80 cpm
7.5	110241	03/19/93 10:25	32 30 28	4		STIFF, BROWN (10YR 4/3), SANDY CLAY WITH CONCRETE FRAGMENTS AND SOME GRAVEL, MEDIUM PLASTICITY, SLIGHTLY MOIST	CL	1	PID=0 ppm α=0 ppm BΓ=80 cpm
9.0	110242	03/19/93 10:30	31 28 16	5		SAME AS ABOVE	CL	1.5	PID=0 ppm α=0 ppm BΓ=80 cpm
10.5	110243	03/19/93 10:35	16 21 20	18		STIFF, DARK GRAYISH BROWN (10YR 4/2), SILTY CLAY WITH A TRACE OF GRAVEL, LOW PLASTICITY, SLIGHTLY MOIST	CL	1.5	PID=0 ppm α=0 ppm BΓ=60-80 cpm
12.0	110245	03/24/93 16:45	8 9 10	13		STIFF, DARK BROWN (10YR 3/3), SILTY CLAY WITH A TRACE OF GRAVEL, LOW PLASTICITY, SLIGHTLY MOIST	CL	1.5	PID=1-2 ppm α=0 ppm BΓ=60-80 cpm
13.5	110246	03/25/93 09:00	9 13 17	14		STIFF, DARK BROWN (10YR, 3/3), SILTY CLAY WITH A TRACE OF GRAVEL, MEDIUM PLASTICITY, SLIGHTLY MOIST	CL	1.75	PID=0 ppm α=0 ppm BΓ=80-100 cpm
15.0	110247	03/25/93 09:25	34 17 10	13		VERY STIFF, DARK BROWN (10YR 3/3), SILTY CLAY WITH A TRACE OF GRAVEL AND SAND, MEDIUM PLASTICITY, SLIGHTLY MOIST	CL	3	PID=0 ppm α=0 ppm BΓ=80-100 cpm
16.5	110248	03/25/93 10:05	17 33 50	13		STIFF, BROWN (10YR 4/3), SILTY CLAY WITH SOME GRAVEL AND SAND, MEDIUM PLASTICITY, SLIGHTLY MOIST	CL	1.5	PID=0 ppm α=0 ppm BΓ=80-100 cpm
18.0	110249	03/25/93 10:40	9 13 17	12		STIFF, BROWN (10YR 5/3), SILTY SANDY CLAY W[illegible] SOME GRAVEL, MEDIUM PLASTICITY, SLIGHTLY MOIST	CL	1.5	PID=0 ppm α=0 ppm BΓ=60-80 cpm
19.5	110250	03/25/93 14:05	17 4 3	12		STIFF, BROWN (10YR 5/3), SILTY SANDY CLAY WITH SOME GRAVEL, MEDIUM PLASTICITY, MOIST	CL	1.0	PID=0 ppm α=0 ppm BΓ=60-80 cpm

NOTES:

Boring Contractor: PENNSYLVANIA DRILLING
Driller: DAVE NEWMAN, JEFF BENTLEY

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 2945	COORDINATES: NORTH 477972.18 EAST 1379119.93	DATE:19-MAR-93
GROUND ELEVATION: 566.7	GWL: Depth 43.5 Date/Time 02-Apr-93 08:30	DATE STARTED: 19-MAR-93
ENGINEER/GEOLOGIST: KEN GEIGER	Depth 43.6 Date/Time 07-Apr-93 08:30	DATE COMPLETE: 07-APR-93

DRILLING METHOD: CABLE TOOL

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
19.5 21.0	110251	03/25/93	14:20	3 4 3		10		LOOSE, DARK YELLOWISH BROWN (10YR 4/4), POORLY GRADED SAND WITH SOME CLAY, SLIGHTLY MOIST	SP	N/A	PID=0 ppm α=0 ppm βΓ=60-80 cpm
21.0 25.0		03/25/93	14:20	N/A		N/A		NO SAMPLE TAKEN. SAMPLES TO BE TAKEN EVERY 5 FT STARTING AT 25.0 FT	N/A	N/A	
25.0 27.0	110252	03/29/93	14:30	48 49 50		13		VERY DENSE, DARK YELLOWISH BROWN (10YR 4/4), WELL GRADED SAND WITH SOME GRAVEL, DRY	SW	N/A	PID=0 ppm α=0 ppm βΓ=60 cpm
30.0 21.5	110254	03/29/93	16:15	9 14 21		10		DENSE, DARK YELLOWISH BROWN (10YR 4/4), POORLY GRADED GRAVELLY SAND WITH ROCK FRAGMENTS, DRY	SP	N/A	PID=0 ppm α=0 ppm βΓ=40-60 cpm
35.0 36.5	110255	03/30/93	10:40	41 50		7		VERY DENSE, DARK YELLOWISHY BROWN (10YR 4/4), POORLY GRADED SAND WITH SOME GRAVEL, SLIGHTLY MOIST	SP	N/A	PID=0 ppm α=0 ppm βΓ=40-60 cpm
40.0 41.5	110256	03/03/93	14:05	25 41 50		12		VERY DENSE, BROWN (10YR 5/3), POORLY GRADED GRAVELY SAND, DRY	SP	N/A	PID=0 ppm α=0 ppm βΓ=40-60 cpm
41.5 43.0	110257	03/30/93	15:25	50		4		VERY DENSE, BROWN (10YR 5/3), POORLY GRADED GRAVELLY SAND, SLIGHTLY MOIST	SP	N/A	PID=0 ppm α=0 ppm βΓ=40-60 cpm
43.0 44.5	110258	03/30/93	15:50	32 40 50		13		VERY DENSE, BROWN (10YR 5/3), WELL GRADED SAND WITH SOME GRAVEL, WET	SW	N/A	PID=0 ppm α=0 ppm βΓ=40-60 cpm
44.5 46.0	110259	03/30/93	16:40	10 13 31		16		DENSE, BROWN (10YR 5/3), POORLY GRADED SAND WITH SOME GRAVEL, WET	SP	N/A	PID=0 ppm α=0 ppm βΓ=40-60 cpm
46.0 47.5	110260	03/30/93	16:55	12 14 17		12		DENSE, BROWN (10YR 4/3) POORLY GRADED SAND WITH SOME GRAVEL, WET	SP	N/A	PID=0 ppm α=0 ppm βΓ=40-60 cpm
47.5 49.0	110261	03/30/93	08:45	7 14 21		13		DENSE, BROWN (10YR 4/3), POORLY GRADED SAND WITH SOME GRAVEL, WET	SP	N/A	PID=0 ppm α=0 ppm βΓ=60 cpm
49.0 50.5	110262	03/31/93	09:00	4 13 14		12		MEDIUM DENSE, BROWN (10YR 4/3), POORLY GRADED SAND WITH SOME GRAVEL, WET	SP	N/A	PID=0 ppm α=0 ppm βΓ=60 cpm
50.5 52.0	110263	03/31/93	09:30	8 14 12		12		MEDIUM DENSE, BROWN (10YR 4/3), POORLY GRADED SAND WITH SOME GRAVEL, WET	SP	N/A	PID=0 ppm α=0 ppm βΓ=60 cpm

NOTES:

Boring Contractor: PENNSYLVANIA DRILLING
Driller: DAVE NEWMAN, JEFF BENTLEY

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 29	COORDINATES: NORTH 477972.18 EAST 1379119.93	DATE:19-MAR-93
GROUND ELEVATION: 556.7	GW : Depth 43.5 Date/Time 02-Apr-93 08:30	DATE STARTED: 19-MAR-93
ENGINEER/GEOLOGIST: KEN GEIGER	epth 43.6 Date/Time 07-Apr-93 08:30	DATE COMPLETE: 07-APR-9
DRILLING METHOD: CABLE TOOL		

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
52.0 53.5	110264	03/31/93	09:45	6 9 8		14		MEDIUM DENSE BROWN (10YR 4/3), POORLY GRADED SAND WITH SOME GRAVEL, WET	SP	N/A	PID=0 ppm α=0 ppm βΓ=60 cpm
53.5 55.0	110265	03/31/93	10:00	11 14 10		18		MEDIUM DENSE, BROWN (10YR 4/3), POORLY GRADED SAND WITH SOME GRAVEL, WET	SP	N/A	PID=0 ppm α=0 ppm βΓ=40 cpm

NOTES:

Boring Contractor: PENNSYLVANIA DRILLING
Driller: DAVE NEWMAN, JEFF BENTLEY

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

000310

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 11187	COORDINATES: NORTH 477905.01 EAST 1379630.25	DATE:13-APR-93
GROUND ELEVATION: 580.5	GWL: Depth Date/Time	DATE STARTED: 13-APR-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 13-APR-93
DRILLING METHOD: AUGER		

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
2.0	112518	04/13/93 10:10	N/A		N/A		PUSHED SHELBY TUBE	N/A		N/A	
2.0 2.5	112519	04/13/93 10:30	5		6		SOFT, (2.5Y, 4/3) OLIVE BROWN, SILTY FINE SAND, LOW PLASTICITY, MOIST. BLACK FRAGMENTS PRESENT	ML		0.5	PID=1 ppm BΓ=50 cpm
2.5 3.0	112519	04/13/93 10:30	6		6		MEDIUM STIFF, (2.5Y, 4/3) OLIVE BROWN, SILTY CLAY, LOW PLASTICITY, MOIST, SOME GRAVEL	CL		1	PID=1 ppm BΓ=50 cpm
3.0 3.5	112519	04/13/93 10:30	12		6		VERY STIFF, (2.5Y, 4/3) OLIVE BROWN, SILTY CLAY, LOW PLASTICITY, MOIST, SOME GRAVEL	CL		3	PID=1 ppm BΓ=50 cpm
3.5 4.0		04/13/93 10:30	13		0		NO RECOVERY	N/A		N/A	
4.0 4.5	112520	04/13/93 10:35	5		6		VERY STIFF, (2.5Y, 5/4) LIGHT OLIVE BROWN, SILTY CLAY, LOW PLASTICITY, MOIST, GRAVELS, PRESENT	CL		3.0	PID=1 ppm BΓ=200 cpm
4.5 5.0	112520	04/13/93 10:35	8		6		SOFT, (2.5Y, 4/3) OLIVE BROWN, SILTY FINE SAND, LOW PLASTICITY, MOIST, GRAVELS, PRESENT	ML		.5	PID=1 ppm BΓ=200 cpm
5.0 5.5	112520	04/13/93 10:35	10		4		VERY STIFF, (2.5Y, 5/4) LIGHT OLIVE BROWN, SILTY CLAY, SLIGHTLY PLASTIC, MOIST, GRAVELS	CL		3	PID=1 ppm BΓ=200 cpm
5.5 6.0		04/13/93 10:35	11		0		NO RECOVERY	N/A		N/A	
6.0 6.5	112521	04/13/93 10:45	7		6		VERY STIFF, (2.5Y, 5/4) LIGHT OLIVE BROWN, SILTY CLAY, SLIGHTLY PLASTIC, MOIST	CL		3.0	PID=1 ppm BΓ=150 cpm
6.5 7.0	112522	04/13/93 10:45	14		6		SAA	CL		3.0	PID=1 ppm BΓ=150 cpm
7.0 7.5	112523	04/13/93 10:45	18		6		VERY STIFF, (10YR, 5/4) YELLOWISH BROWN, SILTY CLAY, SLIGHTLY PLASTIC, MOIST, BLACK CONCRETIONS PRESENT	CL		3.0	PID=1 ppm BΓ=150 cpm
7.5 8.0	112524	04/13/93 13:15	9		6		STIFF, (10YR, 4/6) DARK YELLOWISH BROWN, SILTY CLAY, SLIGHTLY PLASTIC, MOIST	CL		2.0	PID=1 ppm BΓ=150 cpm

NOTES:

Driller: JOE RAAB, ROGER DAVIS
Drilling Equipment: CME-45

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

PROJECT NUMBER: 20.03.05	PROJECT NAME: CRU2 RI PHASE II FIELD INVESTIGATION	
BORING NUMBER: 11187	COORDINATES: NORTH 477905.01 EAST 1379630.25	DATE:13-APR-93
GROUND ELEVATION: 580.5	GWL: Depth Date/Time	DATE STARTED: 13-APR-93
ENGINEER/GEOLOGIST: J BOYER	Depth Date/Time	DATE COMPLETE: 13-APR-[illegible]
DRILLING METHOD: AUGER		

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
8.0 8.5	112525	04/13/93	13:15	11		4		SOFT, (10YR, 5/4) YELLOWISH BROWN, SILTY CLAY, LOW PLASTICITY, MOIST	CL	1.0	PID=1 ppm BΓ=150 cpm
8.5 9.0		04/13/93	13:15	11		0		NO RECOVERY	N/A	N/A	
9.0 9.5	112526	04/13/93	13:30	10		6		VERY STIFF, (2.5Y, 5/4) LIGHT OLIVE BROWN, SILTY CLAY, SLIGHTLY PLASTIC, MOIST	CL	3.0	PID=1 ppm BΓ=50 cpm
9.5 10.0	112526	04/13/93	13:30	15		6		SAA	CL	3	PID=1 ppm BΓ=50 cpm
10.0 10.5	112526	04/13/93	13:30	N/A 25		6		STIFF, (2.5Y, 5/4) LIGHT OLIVE BROWN, SILTY CLAY, LOW PLASTICITY, MOIST	N/A CL	N/A 2.0	PID=1 ppm BΓ=50 cpm
10.5 11.0	112527	04/13/93	13:30	31		6		VERY STIFF, (2.5Y, 5/4) LIGHT OLIVE BROWN, SILTY CLAY, SLIGHTLY PLASTIC, MOIST	CL	3.0	PID=1 ppm BΓ=50 cpm

NOTES:

Driller: JOE RAAB, ROGER DAVIS
Drilling Equipment: CME-45

SAA = Same as Above
PID = Photoionization Detector
N/A = Not Applicable

000312

TRENCHING LOGS FROM OU2 REMEDIAL INVESTIGATION

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 1455	COORDINATES: NORTH 477,915 EAST 1,379,479	DATE: 11/ 9	
GROUND ELEVATION: 577.9	GWL: Depth N/A Date/Time N/A	DATE STARTED: 11	
ENGINEER/GEOLOGIST: E TROLLINGER	Depth N/A Date/Time N/A	DATE COMPLETED: 11/0	
DRILLING METHODS: CAT 225 B LC BACKHOE TRENCHING		PAGE 1 OF 1	

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
3.0 3.2	55900 55907 11/04/89 0930	N/A	N/A				LOOSE, BROWN (7.5YR 4/2), SILTY SAND, TRACE GRAVEL (0.5-1.5 IN.).	SM	N/A	Hnu=0.4 α =0 BΓ =60-100 ESP1=16,000
3.75 3.95	55901 55908 11/04/89 0935	N/A	N/A				VERY STIFF, YELLOWISH BROWN (10YR 5/6) MOTTLED GRAY (10YR 5/1), TRACE OF SILTY LAYERS, TRACE GRAVEL (0.5-1.0 IN), LOW TO MEDIUM PLASTICITY, MOIST.	CL	2.0	Hnu=0.0 α =0 BΓ =60 ESP/SPA-3= 16,100

BOTTOM OF EXCAVATION

NOTES:
THIS EXCAVATION AND SAMPLING AT TRENCH #1.
TOP 8 INCHES CONSISTS OF OVERGROWTH GRASS, ROOTS, ETC
SAMPLES 55900, 55901 ARE FOR FULL RAD.
FILL MATERIAL MADE FROM NON-NATIVE SOIL. SOME CONSTRUCTION RUBBLE EVIDENT IN FILL. CONCRETE FOUND (0.0-1.5
METAL SCRAP (BΓ=1000 cpm) FROM 0.5-1.0 FT.
FILL/TILL BOUNDARY AT 3.6 FT.

000314

002 84

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 1456	COORDINATES: NORTH 477,940 EAST 1,379,479	DATE: 11/04/89	
GROUND ELEVATION: 577.9	GWL: Depth N/A Date/Time N/A	DATE STARTED: 11/04/89	
ENGINEER/GEOLOGIST: E TROLLINGER	Depth N/A Date/Time N/A	DATE COMPLETED: 11/05/89	
DRILLING METHODS: CAT 225B LC		PAGE 1 OF 1	

DEPTH	SAMPLE	DATE TIME	BLOWS ON SAMPLE	RECOVERY		USCS SYMBOL	TSF	REMARKS
3.75 3.9	55902 55909 11/04/89 0955	N/A	N/A		LOOSE, BROWN (7.5YR 4/2), SILTY SAND, TRACE GRAVEL (0.5-2.5 IN), TRACE CLAY, SLIGHTLY COHESIVE, MOIST.	SM	N/A	Hnu=0.0 ppm α =0 cpm βΓ =100-140 cpm ESP1=14,400 cpm
4.25 4.4	55903 55910 11/04/89 1000	N/A	N/A		VERY STIFF, MOTTLED GRAY (10YR 5/1) WITH YELLOWISH BROWN WITH 10YR 5/6), CLAY, TRACE FINE GRAVEL (0.5-1.0 IN), MEDIUM PLASTICITY, MOIST.	CL	2.0	Hnu=0.0 ppm α =0 cpm βΓ =100 cpm ESP1= 14,400 cpm

BOTTOM OF EXCAVATION

NOTES:
THIS EXCAVATION AND SAMPLING AT TRENCH #1.
TOP 8 INCHES CONSISTS OF OVERGROWTH GRASS, ROOTS, ETC.
FILL MATERIAL CONSISTS OF CONSTRUCTION RUBBLE, NON-NATIVE SOIL, CONCRETE, ASPHALT, AND METAL SCRAP.
FILL/TILL BOUNDARY AT 4.0 FT.
SAMPLES 55902, 55903 ARE FOR FULL RAD. HSL SAMPLE #55906 TAKEN AT 3.75 FT.

FERNALD RI/FS — VISUAL CLASSIFICATION OF SOILS — SF

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 1457	COORDINATES: NORTH 477,965 EAST 1,379,479	DATE: 11/(	
GROUND ELEVATION: 577.3	GWL: Depth N/A Date/Time N/A	DATE STARTED: 11/(	
ENGINEER/GEOLOGIST: E TROLLINGER	Depth N/A Date/Time N/A	DATE COMPLETED: 11/05.	
DRILLING METHODS: CAT 225B LC		PAGE 1 OF 1	

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY		USCS SYMBOL	TSF	REMARKS
4.0 4.2	55904 55911	11/04/89	1030	N/A		N/A	LOOSE, BROWN (7.5YR 4/2), SILTY SAND, SOME GRAVEL (0.5-2.5 IN), SLIGHTLY COHESIVE, MOIST.	SM	N/A	Hnu=0.2 ppm α =0 cpm βΓ =200-400 cpm ESP1=35,000 cpm
4.4 4.6	55905 55912	11/04/89	1040	N/A		N/A	VERY STIFF, YELLOWISH BROWN (10YR 5/6), CLAY, TRACE OF SILTY LAYERS THROUGHOUT, SOME GRAVEL (0.5-1.5 IN), LOW TO MEDIUM PLASTICITY, MOIST.	CL	2.0	Hnu=0.2 ppm α =0 cpm βΓ =60-80 cpm ESP1=31,000 cpm

BOTTOM OF EXCAVATION

NOTES:
THIS EXCAVATION AND SAMPLING AT TRENCH #1.
TOP 8 INCHES OVERGROWTH GRASS, WEEDS, ROOTS.
FILL COMPOSED OF CONSTRUCTION RUBBLE, CONCRETE, ASPHALT, ORGANIC ROOTS, AND SILTY SAND WITH GRAVEL.
FILL/TILL BOUNDARY AT 4.0 FT.
SAMPLES 55904, 55905 ARE FOR FULL RAD.

000316

001086

FERNALD RI/FS — VISUAL CLASSIFICATION OF SOILS — SF

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 1458	COORDINATES: NORTH 477,880 EAST 1,379,631	DATE: 11/06/89	
GROUND ELEVATION: 578.6	GWL: Depth N/A Date/Time N/A	DATE STARTED: 11/06/89	
ENGINEER/GEOLOGIST: E TROLLINGER	Depth N/A Date/Time N/A	DATE COMPLETED: 11/06/89	
DRILLING METHODS: BACKHOE TRENCH CAT 225 B LC		PAGE 1 OF 1	

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
3.8 4.0	55913 55920	11/06/89	0900	N/A		N/A		LOOSE, BROWN (7.5YR 4/2), SILTY SAND, TRACE GRAVEL (0.5-3.5 IN), TRACE OF CLAYEY LENSES OR LAYERS, MOIST.	SM	N/A	Hnu=0.0 cc α =0 cc BΓ =100-200 cc ESP1=13,000 cc
4.5 4.7	55914 55921	11/06/89	0920	N/A		N/A		VERY STIFF, GRAYISH BROWN (10YR 4/2), CLAY, TRACE SILT, TRACE GRAVEL (0.5-1.0 IN), LOW PLASTICITY, MOIST.	CL	2.5	Hnu=0.0 cc α =0 cc BΓ =300-400 cc ESP1=13,500 cc

BOTTOM OF EXCAVATION

NOTES:
THIS EXCAVATION AND SAMPLING AT TRENCH #2, SOUTH END.
TOP 5 TO 8 INCHES OVERGROWTH. FILL MATERIAL FROM 0.0-4.0 FT CONSISTS OF OCCASIONAL PIECES OF CONSTRUCTION RUBBLE, CONCRETE (3-10 IN), ASPHALT, LESS THAN 1% OF FILL COMPOSED OF RUBBLE. FILL MATERIAL MAINLY SILTY SAND, TRACE OF GRAVE. (0.5-3.0 IN), MOIST.
FILL/TILL BOUNDARY AT 4.0 FT.
INTERFACE BETWEEN FILL AND TILL SHOWED SOME OXIDATION FROM MOISTURE OR WATER LEACHING, BETA GAMA READING WERE ELEVATED RELATIVE TO FILL MATERIAL.

FERNALD RI/FS — VISUAL CLASSIFICATION OF SOILS — SF

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 1459	COORDINATES: NORTH 477,905 EAST 1,379,631	DATE: 11/06/89	
GROUND ELEVATION: 581.0	GWL: Depth N/A Date/Time N/A	DATE STARTED: 1	
ENGINEER/GEOLOGIST: E TROLLINGER	Depth N/A Date/Time N/A	DATE COMPLETED: 11/06/89	
DRILLING METHODS: BACKHOE 225 B LC		PAGE 1 OF 1	

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
5.0 5.2	55915 55922	11/06/89 0950	N/A		N/A		LOOSE, BROWN (7.5YR 4/2), SILTY SAND, TRACE GRAVEL (0.5-1.0 IN), MOIST.	SM		N/A	Hnu=0 p α =0 c BΓ =100-120 c ESP1=11,500 c
6.0 6.2	55916 55923	11/06/89 1000	N/A		N/A		VERY STIFF, YELLOWISH BROWN (10YR 4/3), SILTY CLAY, TRACE GRAVEL (0.5 IN), MEDIUM PLASTICITY, MOIST.	CL		2.5	Hnu=0 p α =0 c BΓ =300-450 c ESP1=13,600 c

BOTTOM OF EXCAVATION

NOTES:
THIS EXCAVATION AND SAMPLING AT TRENCH #2.
TOP 5 TO 8 INCHES ORGANIC OVERGROWTH. FILL MATERIAL FROM SURFACE TO 5.5 FT (FILL/TILL BOUNDARY) CONSISTS OF OCCASION/ PIECES OF CONSTRUCTION RUBBLE, CONCRETE, ASPHALT, METAL LESS THAN 1 %. FILL MATERIAL MOSTLY UNIFORM THROUGHOUT. SILTY SAND, TRACE OF GRAVEL (0.5-3.0 IN), MOIST. CONCRETE PIECES (5 IN TO 12 IN DIA), ASPHALT PIECES (5 IN TO 10
HSL SAMPLE #55919 TAKEN AT 5.0 FT.

000318

FERNALD RI/FS — VISUAL CLASSIFICATION OF SOILS — SF

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 1460	COORDINATES: NORTH 477,930 EAST 1,379,631	DATE: 11/06/89	
GROUND ELEVATION: 578.8	GWL: Depth N/A Date/Time N/A	DATE STARTED: 11/06/89	
ENGINEER/GEOLOGIST: E TROLLINGER	Depth N/A Date/Time N/A	DATE COMPLETED: 11/06/89	
DRILLING METHODS: BACKHOE 225 B LC		PAGE 1 OF 1	

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
3.5 3.7	55917 55924	11/06/89 1040	N/A		N/A		LOOSE, BROWN (7.5YR 4/2), SILTY SAND, TRACE TO SOME GRAVEL 0.5-1.0 IN), MOIST.	SM	N/A	Hnu=0.0 ppm α =0 ppm 8Γ =150 ppm ESP1=13,200 ppm
4.25 4.45	55918 55925	11/06/89 1055	N/A		N/A		VERY STIFF, YELLOWISH BROWN TO GRAYISH BROWN (10YR 4/3), SILTY, CLAY, TRACE GRAVEL (0.5-1.0 IN), LOW PLASTICITY, MOIST.	CL	2.0	Hnu=0.0 ppm α =0 ppm 8Γ =300-500 ppm ESP1=12,000 ppm

BOTTOM OF EXCAVATION

NOTES:
THIS EXCAVATION AND SAMPLING AT TRENCH #2.
TOP 5 TO 8 INCHES ORGANIC OVERGROWTH. FILL MATERIAL (0.5-3.75 FT) COMPOSED MAINLY OF SOIL, SOME LARGE GRAVEL AND COBBLES, SEVERAL PIECES OF CONCRETE (0.5-1.0 FT), SEVERAL PIECES OF SCRAP METAL (0.5 FT LONG).

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 1461	COORDINATES: NORTH 477,842 EAST 1,379,784	DATE: 11/	
GROUND ELEVATION: 579.2	GWL: Depth N/A Date/Time N/A	DATE STARTED: 11/	
ENGINEER/GEOLOGIST: E TROLLINGER	Depth N/A Date/Time N/A	DATE COMPLETED: 11/07/89	
DRILLING METHODS: BACKHOE CAT 225 B LC		PAGE 1 OF 1	

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
4.0 4.2	55926 55933	11/07/89	1107	N/A		N/A		LOOSE, BROWN (7.5YR 4/2), SILTY SAND, SOME GRAVEL (0.5-3.0 IN), SLIGHTLY COHESIVE, MOIST.	SM		N/A	Hnu=0.2 ppm α =0 cpm Bγ =80-100 cpm ESP1/SPA-3= 7,630 cpm
5.0 5.2	55927 55934	11/07/89	1110	N/A		N/A		VERY STIFF, YELLOWISH BROWN (10YR 4/4) WITH (10YR 4/2) MOTTLED, SILTY CLAY, LOW TO MEDIUM PLASTICITY, MOIST.	CL		2.5	Hnu=0.2 ppm α =0 cpm Bγ =100-120 cpm ESP1/SPA-3= 12,600 cpm

BOTTOM OF EXCAVATION

NOTES:
THIS EXCAVATION AND SAMPLING AT TRENCH #3, SOUTH END.
TOP 3 TO 5 INCHES OVERGROWTH. FILL MATERIAL IS PREDOMINATELY FREE OF CONSTRUCTION RUBBLE AT THIS LOCATION TO T
DEPTH OF THE GLACIAL FILL. ONE OR TWO PIECES OF CONCRETE FOUND (6 IN SIZE).
FILL/TILL BOUNDARY AT 4.25 FT.

000320

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 1462	COORDINATES: NORTH 477,867 EAST 1,379,784	DATE: 11/07/89	
GROUND ELEVATION: 579.1	GWL: Depth N/A Date/Time N/A	DATE STARTED: 11/07/89	
ENGINEER/GEOLOGIST: E TROLLINGER	Depth N/A Date/Time N/A	DATE COMPLETED: 11/07/89	
DRILLING METHODS: BACKHOE TRENCHING CAT 225 B LC		PAGE 1 OF 1	

DEPTH	SAMPLE	DATE TIME	BLOWS ON SAMPLE	REC OVERY	INCHES		USCS SYMBOL	TSF	REMARKS
4.25 4.4	55928 55935	11/07/89 1130	N/A	N/A		LOOSE, BROWN (7.5YR 4/2 TO 7.5YR 4/3), SILTY SAND, TRACE GRAVEL (0.5-3.0 IN), MOIST.	SM	N/A	Hnu=0.2 ppm α =0 cpm βΓ =100 cpm ESP1/SPA-3= 11,000 cpm
5.0 5.2	55929 55936	11/07/89 1135	N/A	N/A		STIFF, YELLOWISH BROWN (10YR 4/3), CLAY, SOME SILT, LOW PLASTICITY, SLIGHTLY OXIDIZED, MOIST.	CL	1.5	Hnu=0.2 ppm α =0 cpm βΓ =110-120 cpm ESP1/SPA-3= 11,000 cpm

BOTTOM OF EXCAVATION

NOTES:
THIS EXCAVATION AND SAMPLING AT TRENCH #3, MIDPOINT.
TOP 3 TO 5 IN OVERGROWTH. FILL MATERIAL IN THIS LOCATION IS FREE OF CONSTRUCTION RUBBLE AND NO CONCRETE WAS FOUND.
FILL IS PREDOMINATELY SILTY SAND WITH A TRACE OF GRAVEL.
FILL/TILL BOUNDARY AT 4.25 FT.
HSL SAMPLE #55932 TAKEN AT 4.0 FT DEPTH.
SAMPLES 55928, 55929 ARE FOR FULL RAD ANALYSIS ONLY, ARCHIVE SAMPLES FOR THE SAME INTERVAL WERE COLLECTED BUT HAVE DIFFERENT SAMPLE #'S.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 1463	COORDINATES: NORTH 477,892 EAST 1,379,784	DATE: 11 19	
GROUND ELEVATION: 579.0	GWL: Depth N/A Date/Time N/A	DATE STARTED: 11/	
ENGINEER/GEOLOGIST: E TROLLINGER	Depth N/A Date/Time N/A	DATE COMPLETED: 11/6.	
DRILLING METHODS: CAT 225 B LC BACKHOE		PAGE 1 OF 1	

DEPTH	SAMPLE	DATE	TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
3.5 3.7	55930 55937	11/07/89	1420	N/A		N/A		LOOSE TO MEDIUM DENSE, BROWN (7.5YR 4/2) TO GRAYISH BROWN (10 YR 4/3), SILTY SAND, MOIST.	SM	N/A	Hnu=0.2 ppm α =0 cpm BΓ =80-100 cpm ESP1/SPA-3= 12,000 cpm
4.5 4.7	55931 55938	11/07/89	1425	N/A		N/A		STIFF, BROWNISH GRAY (10YR 4/2) WITH YELLOWISH BROWN (10YR 4/4), SILTY CLAY, LOW PLASTICITY, MOIST.	CL	2.0	Hnu=0.2 ppm α =0 cpm BΓ =100 cpm ESP1/SPA-3= 12,500 cpm

BOTTOM OF EXCAVATION

NOTES:
THIS EXCAVATION AND SAMPLING AT TRENCH #3, NORTH END.
OVERGROWTH GRASS, ROOTS (0 TO 6 IN); FILL MATERIAL PREDOMINATELY FREE OF CONSTRUCTION RUBBLE. MATERIAL IS MAINLY SILTY SAND WITH GRAVEL (0.5-3.0 IN), MOIST, LOOSE DENSITY. TWO PIECES OF WOOD FOUND (2x4, 2 FT LONG), ERODED.
FILL/TILL BOUNDARY AT 4.0 FT.
SAMPLES 55930, 55931 ARE FOR FULL RAD ANALYSIS ONLY, ARCHIVE SAMPLES WERE COLLECTED AT SAME LOCATIONS.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 1464	COORDINATES: NORTH 477,734 EAST 1,379,566	DATE: 11/08/89	
GROUND ELEVATION: 575.7	GWL: Depth N/A Date/Time N/A	DATE STARTED: 11/08/89	
ENGINEER/GEOLOGIST: E TROLLINGER	Depth N/A Date/Time N/A	DATE COMPLETED: 11/08/89	
DRILLING METHODS: CAT 225 BACKHOE (TRACKS)		PAGE 1 OF 1	

DEPTH	SAMPLE	DATE TIME	BLOWS ON SAMPLE	RECOVERY INCHES		USCS SYMBOL	TSF	REMARKS
3.75 3.95	55939 55946	11/08/89 1100	N/A	N/A	LOOSE, BROWN TO GRAYISH BROWN (7.5YR 4/2 TO 10YR 4/3), SILTY SAND, 30-40% SILT, TRACE GRAVEL (0.5-3.0 IN), MOIST.	SM	N/A	Hnu=0.0 ppm α =0 ppm BΓ =60-90 ppm ESP/SPA-3= 8,000 ppm
4.5 4.7	55940 55947	11/08/89 1115	N/A	N/A	STIFF, YELLOWISH BROWN (10YR 4/4), SILTY CLAY, LOW PLASTICITY, MOIST.	CL	1.5	Hnu=0.0 ppm α =0 ppm BΓ =60-80 ppm ESP/SPA-3= 10,000 ppm

BOTTOM OF EXCAVATION

NOTES:
THIS EXCAVATION AND SAMPLING AT TRENCH #4, NORTH END.
OVERGROWTH GRASS, TOP 4 INCHES. FILL MATERIAL IS A SILTY SAND, WITH GRAVEL, (0.5-3.0 IN). CONDITIONS MOIST WITH LOOSE DENSITY, SOME (3 PIECES) CONCRETE FOUND, 2 FT LONG. MATERIAL MONITORED AS STOCKPILED, READINGS WERE BACKGROUND.
FILL/TILL BOUNDARY AT 4.5 FT.
SAMPLES 55939, 55940 ARE FULL RAD SAMPLES, ARCHIVE SAMPLES HAVE DIFFERENT NUMBERS.

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 1465	COORDINATES: NORTH 477,709 EAST 1,379,566	DATE: 11/[illegible]9	
GROUND ELEVATION: 575.5	GWL: Depth N/A Date/Time N/A	DATE STARTED: 11/[illegible]	
ENGINEER/GEOLOGIST: E TROLLINGER	Depth N/A Date/Time N/A	DATE COMPLETED: 11/	
DRILLING METHODS: CAT 225 TRENCH BACKHOE TRUCK MOUNTED		PAGE 1 OF 1	

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SOIL	SYMBOL	TSF	REMARKS
3.5 3.7	55941 55948 11/08/89 1135		N/A		N/A		LOOSE, BROWN (7.5YR 4/2), SILTY SAND, CONSIDERABLE GRAVEL 0.5-3.0 IN), MOIST.	SM		N/A	Hnu=0.0 ppm α =0 cpm Bγ =60-100 cpm ESP/SPA-3= 9,000 cpm
4.5 4.7	55942 55949 11/08/89 1325		N/A		N/A		MEDIUM STIFF, YELLOWISH BROWN (10YR 4/4), SILTY CLAY, TRACE OF FINE GRAVEL (0.5 IN). LOW TO MEDIUM PLASTICITY, MOIST.	CL		1.0	Hnu=0.0 ppm α =0 cpm Bγ =100 cpm ESP/SPA-3= 11,000 cpm

BOTTOM OF EXCAVATION

NOTES:
THIS EXCAVATION AND SAMPLING AT TRENCH #4, MIDPOINT.
TOP 5 INCHES OVERGROWTH GRASS, ROOTS. FILL MATERIAL IS A SILTY SAND WITH A TRACE OF GRAVEL (0.5-3.0 IN). THREE PIECES OF WOOD FOUND (Bγ=100 cpm) AS CONSTRUCTION RUBBLE. MATERIAL SCANNED AS IT WAS STOCKPILED, NO READINGS A[illegible] BACKGROUND.
FILL/TILL BOUNDARY AT 3.75 FT.
SAMPLES 55941, 55942 ARE FULL RAD, ARCHIVE SAMPLES HAVE DIFFERENT NUMBERS.

000324

11094

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 1466	COORDINATES: NORTH 477,684 EAST 1,379,566	DATE: 11/08/89	
GROUND ELEVATION: 575.3	GWL: Depth N/A Date/Time N/A	DATE STARTED: 11/08/89	
ENGINEER/GEOLOGIST: E TROLLINGER	Depth N/A Date/Time N/A	DATE COMPLETED: 11/08/89	
DRILLING METHODS: CAT 225 BACKHOE		PAGE 1 OF 1	

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SOIL	SYMBOL	TSF	REMARKS
3.0 3.2	55943 55950 11/08/89 1345		N/A		N/A		LOOSE, BROWN (7.5YR 4/2), SILTY SAND, TRACE GRAVEL (0.5-4.0 IN), MOIST.	SM		N/A	Hnu=0.0 ppm α =0 ppm BΓ =60-80 ppm ESP/SPA-3= 9,000 ppm
4.5 4.7	55944 55951 11/08/89 1350		N/A		N/A		MEDIUM STIFF, YELLOWISH BROWN (10YR 4/4), SILTY CLAY, TRACE FINE GRAVEL, MEDIUM PLASTICITY, MOIST.	CL		1.0	Hnu=0 ppm α =0 ppm BΓ =60-80 ppm ESP/SPA-3= 11,500 ppm

BOTTOM OF EXCAVATION

NOTES:
THIS EXCAVATION AND SAMPLING AT TRENCH #4, SOUTH END.
TOP 5 INCHES, OVERGROWTH. FILL MATERIAL IS A SILTY SAND WITH GRAVEL (0.5-4.0 IN). NO RUBBLE FOUND IN SOUTH END OF TRENCH. MATERIAL MONITORED AS STOCKPILED, SOIL READINGS BELOW BACKGROUND.
FILL/TILL BOUNDARY 3.75 FT.
SAMPLES 55943, 55944 ARE FOR FULL RAD, ARCHIVE SAMPLES HAVE DIFFERENT NUMBERS.

FERNALD RI/FS — VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 1467	COORDINATES: NORTH 477,658 EAST 1,379,700	DATE: 11/1	
GROUND ELEVATION: 576.3	GWL: Depth N/A Date/Time N/A	DATE STARTED: 11/	
ENGINEER/GEOLOGIST: E TROLLINGER	Depth N/A Date/Time N/A	DATE COMPLETED: 11/14/89	
DRILLING METHODS: CAT 225 B LC BACKHOE		PAGE 1 OF 1	

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS	SYMBOL	TSF	REMARKS
2.5 2.7	55952 55960	11/14/89 0940	N/A		N/A		LOOSE, BROWN (7.5YR 4/2), SILTY SAND, SOME GRAVEL (0.5-2.0 IN), MOIST.	SM		N/A	Hnu=0 ppm α =0 cpm BΓ =40-60 cpm ESP1/SPA-3= 8,200 cpm
3.5 3.7	55953 55961	11/14/89 0950	N/A		N/A		STIFF, YELLOWISH BROWN (10YR 4/4) WITH GRAYISH BROWN (10YR 4/2), SILTY CLAY, TRACE GRAVEL (0.5 IN), LOW PLASTICITY, MOIST.	CL		1.5	Hnu=0 ppm α =0 cpm BΓ =40 cpm ESP/SPA-3= 11,500 cpm

BOTTOM OF EXCAVATION

NOTES:
THIS EXCAVATION AND SAMPLING AT TRENCH #5.
TOP 4 TO 5 INCHES OVERGROWTH GRASS, ROOTLETS, WEEDS. FILL MATERIAL COMPOSED OF SOIL AND SEVERAL PIECES OF CONSTRUCTION RUBBLE, CONCRETE (0.5 FT), ASBESTOS (6 IN LONG), BUILDING SIDING, AND WOOD FRAGMENTS. SURVEY OF FILL MATERIALS PRODUCED READINGS OF BACKGROUND.
FILL/TILL BOUNDARY 2.75 FT.
ARCHIVE SAMPLE NUMBERS 55960, 55961.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 1468	COORDINATES: NORTH 477,633 EAST 1,379,700	DATE: 11/14/89	
GROUND ELEVATION: 575.7	GWL: Depth N/A Date/Time N/A	DATE STARTED: 11/14/89	
ENGINEER/GEOLOGIST: E TROLLINGER	Depth N/A Date/Time N/A	DATE COMPLETED: 11/14/89	
DRILLING METHODS: CAT 225 B LC BACKHOE		PAGE 1 OF 1	

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SOIL	SYMBOL	TSF	REMARKS
2.5 2.7	55954 55962	11/14/89 1000	N/A		N/A		LOOSE, BROWN (7.5YR 4/2) TO GRAYISH BROWN (10YR 4/2), SILTY SAND, TRACE GRAVEL (0.5 IN), MOIST.	SM		N/A	Hnu=0.0 ppm α =0 cpm βΓ =40-80 cpm ESP/SPA-3= 8,900 cpm
3.5 3.7	55955 55963	11/14/89 1005	N/A		N/A		STIFF, YELLOWISH BROWN (10YR 4/3), SILTY CLAY, TRACE GRAVEL (0.5-1.0 IN), LOW PLASTICITY, MOIST.	CL		1.0	Hnu=0.0 ppm α =0 cpm βΓ =40-60 cpm ESP/SPA-3= 9,600 cpm

BOTTOM OF EXCAVATION

NOTES:
THIS EXCAVATION AND SAMPLING AT TRENCH #5.
TOP 4 TO 5 INCHES OVERGROWTH. FILL MATERIAL COMPOSED OF SOIL WITH LESS THAN 1% CONSTRUCTION RUBBLE; CONCRETE (0.5-1.0 FT), TRACE WOOD FRAGMENTS. FILL MATERIAL SURVEYED AS STOCKPILED, READINGS ON SOIL AT BACKGROUND LEVELS.
FILL/TILL BOUNDARY AT 2.75 FT.
ARCHIVE SAMPLE NUMBERS 55962 AND 55963.

FERNALD RI/FS — VISUAL CLASSIFICATION OF SOILS — 287 SF

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 1469	COORDINATES: NORTH 477,608 EAST 1,379,700	DATE: 11/	
GROUND ELEVATION: 575.9	GWL: Depth N/A Date/Time N/A	DATE STARTED: 11/	
ENGINEER/GEOLOGIST: E TROLLINGER	Depth N/A Date/Time N/A	DATE COMPLETED: 11/1	
DRILLING METHODS: BACKHOE CAT 225 B LC		PAGE 1 OF 1	

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
2.5 2.7	55956 55964	11/14/89 1040	N/A		N/A		LOOSE, BROWN WITH GRAYISH BROWN (10YR 4/2 WITH 7.5YR 4/2) SILTY SAND, TRACE GRAVEL (0.5-1.0 IN), MOIST.	SM	N/A	Hnu=0.0 ppm α =0 cpm βΓ =60 cpm ESP/SPA-3= 8,900 cpm
3.5 3.7	55957 55965	11/14/89 1045	N/A		N/A		STIFF, YELLOWISH BROWN (10YR 4/4), SILTY CLAY, LOW PLASTICITY, MOIST.	CL	1.0	Hnu=0.0 ppm α =0 cpm βΓ =40-60 cpm ESP/SPA-3= 10,400 cpm

BOTTOM OF EXCAVATION

NOTES:
THIS EXCAVATION AND SAMPLING AT TRENCH #5.
TOP 4 TO 5 INCHES OVERGROWTH. FILL MATERIAL COMPOSED OF SOIL WITH LESS THAN 1% RUBBLE ENCOUNTERED; CONCRETE (0.5 FT), WOOD FRAGMENTS. FILL MATERIAL SURVEYED AS STOCKPILED, READINGS AT BACKGROUND.
FILL/TILL BOUNDARY AT 2.75 FT.
ARCHIVE SAMPLE NUMBERS 55964 AND 55965.

000328

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 1470	COORDINATES: NORTH 477,370 EAST 1,379,639	DATE: 11/16/89	
GROUND ELEVATION: 568.1	GWL: Depth N/A Date/Time N/A	DATE STARTED: 11/15/89	
ENGINEER/GEOLOGIST: E TROLLINGER	Depth N/A Date/Time N/A	DATE COMPLETED: 11/16/89	
DRILLING METHODS: CAT 225 B LC TRACKHOE		PAGE 1 OF 1	

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
3.0 3.2	55966 55973 11/16/89 1100	N/A		N/A			LOOSE, BROWN (7.5YR 4/2), SILTY SAND, TRACE GRAVEL (0.5-3.0 IN), MOIST.	SM	N/A	Hnu=0.0-0.2 ppm α =0 ppm βΓ =40-60 ppm ESP/SPA-3= 8,500 ppm
4.2 4.4	55967 55974 11/16/89 1112	N/A		N/A			MEDIUM STIFF, YELLOWISH BROWN (10YR 4/3), SILTY CLAY, TRACE COARSE SAND TO FINE GRAVEL, MOIST, LOW PLASTICITY.	CL	1.0	Hnu=0.2 ppm α =0 ppm βΓ =40 ppm ESP/SPA-3= 9,900 ppm

BOTTOM OF EXCAVATION

NOTES:
THIS EXCAVATION AND SAMPLING AT TRENCH #6, SOUTH END.
TOP 3 TO 5 INCHES OVERGROWTH GRASS, ROOTS, WEEDS. FILL MATERIAL IS PREDOMINATELY SOIL WITH LESS THAN 1% RUBBLE WHICH CONSISTED OF SMALL BROKEN PIECES OF CONCRETE SLAB (0.5 FT), SEVERAL PIECES OF ASPHALT (3 TO 4 IN). FILL MATERIAL IS SILTY SAND WITH GRAVEL (0.5-3.0 IN), LOOSE DENSITY. MATERIAL MONITORED DURING STOCKPILING, READINGS WERE BACKGROUND OR LESS.
FILL/TILL BOUNDARY AT 3.5 FT.
ARCHIVE SAMPLE NUMBERS 55973 AND 55974.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 1471	COORDINATES: NORTH 477,395 EAST 1,379,639	DATE: 11, 9	
GROUND ELEVATION: 570.8	GWL: Depth N/A Date/Time N/A	DATE STARTED: 11,	
ENGINEER/GEOLOGIST: E TROLLINGER	Depth N/A Date/Time N/A	DATE COMPLETED: 11/1...	
DRILLING METHODS: CAT 225 B LC TRACKHOE		PAGE 1 OF 1	

DEPTH	SAMPLE	DATE TIME	BLOWS ON	SAMPLE	RECOVERY	INCHES		USCS SYMBOL	TSF	REMARKS
4.25 4.4	55968 55975	11/16/89 0837	N/A		N/A		LOOSE, BROWN (7.5YR 4/2 TO 10YR 5/3), SILTY SAND, TRACE GRAVEL (0.5-1.0 IN), MOIST.	SM	N/A	Hnu=0.0 ppm α =0 cm 8Γ =20-40 cm ESP/SPA-3= 8,300 cm
5.5 5.7	55969 55976	11/16/89 0845	N/A		N/A		MEDIUM STIFF, GRAYISH BROWN (10YR 5/2), SILTY CLAY, TRACE GRAVEL (0.5-0.75 IN), LOW PLASTICITY, MOIST.	CL	1.0	Hnu=0.0 ppm α =0 cm 8Γ =40 cm ESP/SPA-3= 11,000 cm

BOTTOM OF EXCAVATION

NOTES:
THIS EXCAVATION AND SAMPLING AT TRENCH #6, MIDPOINT.
TOP 3 TO 5 INCHES OVERGROWTH. FILL MATERIAL PREDOMINATELY SOIL WITH LESS THAN 1% OR LESS RUBBLE MATERIAL. TWO SMALL PIECES (0.5-1.0 FT) OF CONCRETE WERE UNCOVERED. FILL MATERIAL MONITORED DURING EXCAVATION, READINGS ON SOIL A: MATERIAL WERE BACKGROUND.
FILL/TILL BOUNDARY AT 5.25 FT.
ARCHIVE SAMPLE NUMBERS 55975 AND 55976.

000330

PROJECT NUMBER: 602 3.7	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 1472	COORDINATES: NORTH 477,420 EAST 1,379,639	DATE: 11/16/89	
GROUND ELEVATION: 571.7	GWL: Depth N/A Date/Time N/A	DATE STARTED: 11/15/89	
ENGINEER/GEOLOGIST: E TROLLINGER	Depth N/A Date/Time N/A	DATE COMPLETED: 11/16/89	
DRILLING METHODS: CAT 225 BACKHOE		PAGE 1 OF 1	

DEPTH	SAMPLE	DATE TIME	BLOWS ON SAMPLE	RECOVERY		USCS	SYMBOL	TSF	REMARKS
4.25 4.4	55970 55977	11/16/89 0900	N/A	N/A	LOOSE, BROWN TO GRAYISH BROWN (10YR 5/2), SILTY SAND, TRACE OF GRAVEL (0.5-1.5 IN), MOIST.	SM		N/A	Hnu=0.0 ppm α =0 cpm BΓ =40 cpm ESP/SPA-3* 9,200 cpm
5.0 5.2	55971 55978	11/16/89 0905	N/A	N/A	MEDIUM DENSE, GRAYISH BROWN (10YR 5/2), SILTY CLAY, TRACE FINE GRAVEL, MEDIUM PLASTICITY, MOIST.	CL		1.0	Hnu=0.0 ppm α =0 cpm BΓ =40 cpm ESP/SPA-3* 11,900 cpm

BOTTOM OF EXCAVATION

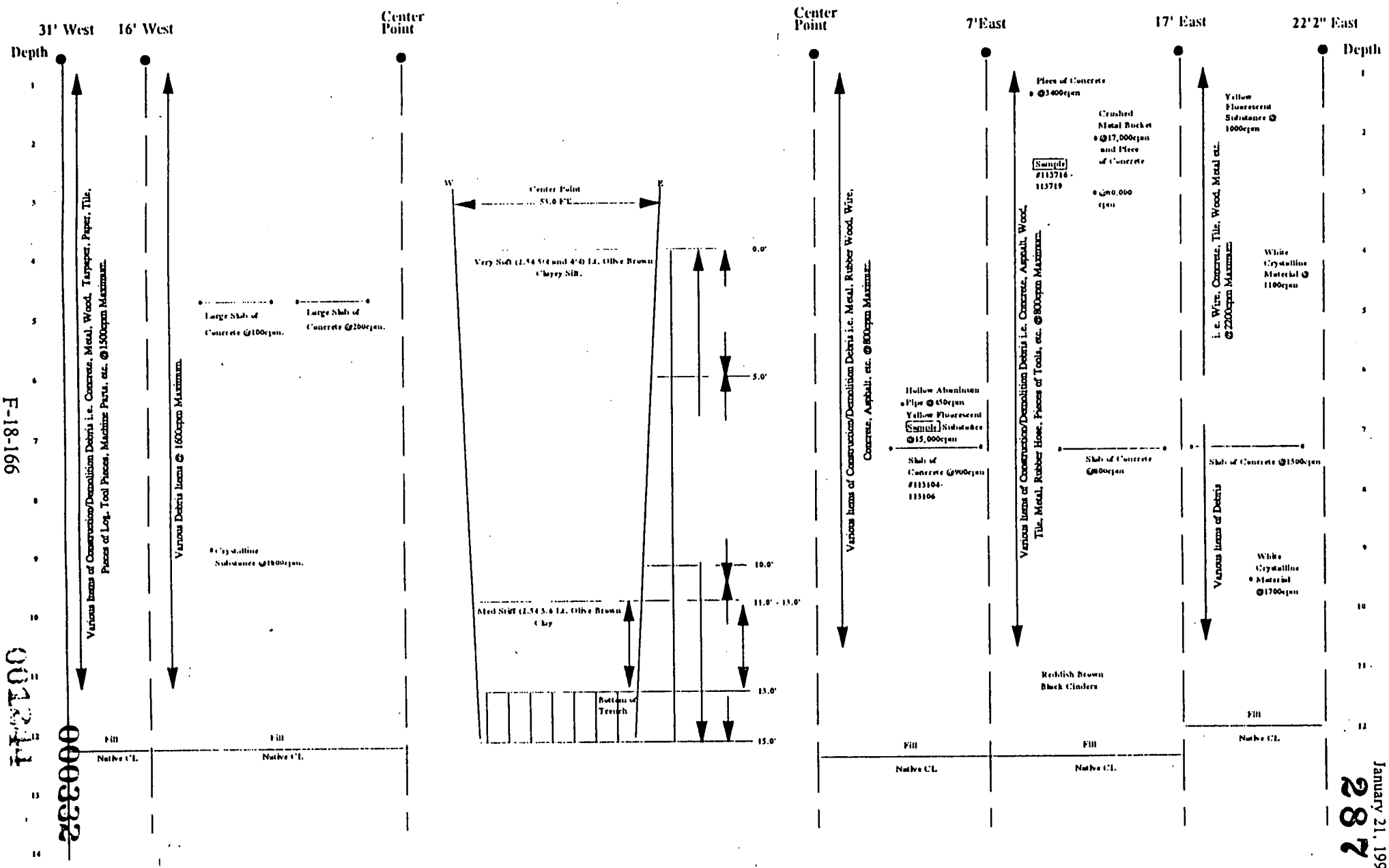
NOTES:
THIS EXCAVATION AND SAMPLING AT TRENCH #6.
TOP 3 TO 5 INCHES OVERGROWTH. FILL MATERIAL IS PREDOMINATELY SOIL WITH 1% OR LESS CONSTRUCTION RUBBLE. ONE PIECE CONCRETE FOUND (0.5 FT). SILTY SAND, TRACE GRAVEL (0.5-3.0 IN), LOOSE DENSITY, MOIST. FILL MATERIAL MONITORED DURING EXCAVATION OF TRENCH, READINGS AT BACKGROUND.
FILL/TILL BOUNDARY AT 4.5 FT.
ARCHIVE SAMPLE NUMBERS 55977 AND 55978.

000331

000331

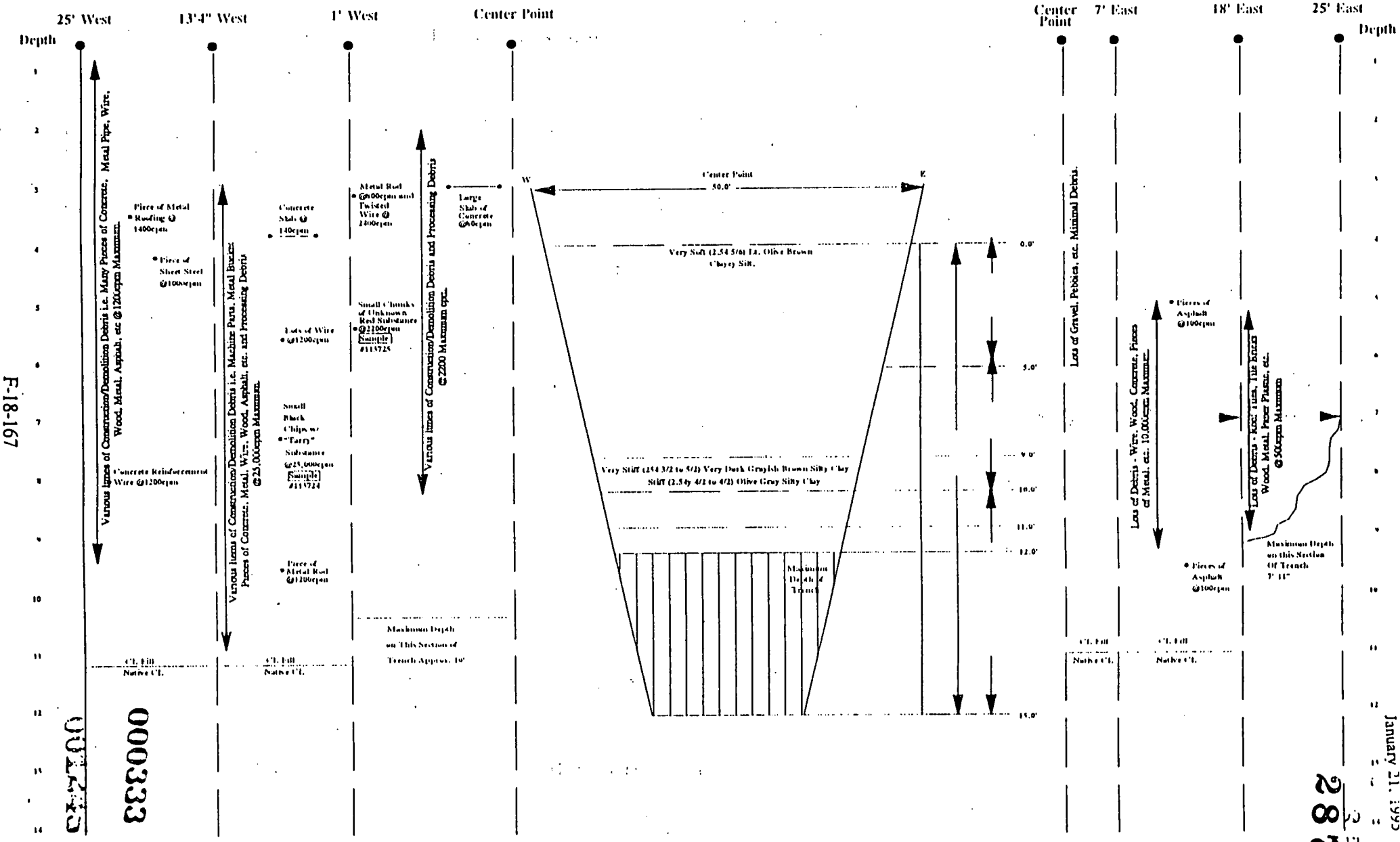
TABLE F-18B

SOUTH FIELD TRENCHING LOG 1



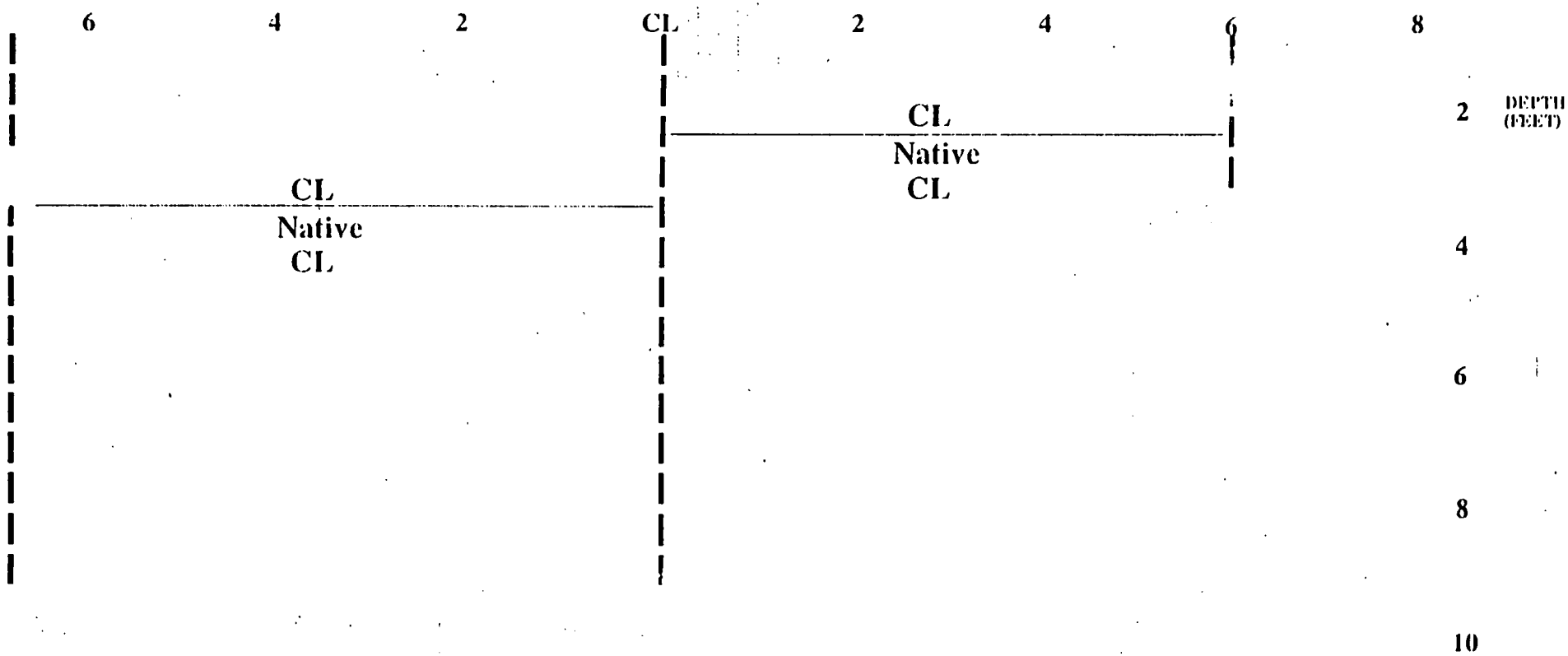
F-18-166

TABLE F-18B
(Continued)
SOUTH FIELD TRENCHING LOG 2



000333

TABLE F-18B
(Continued)
SOUTH FIELD TRENCHING LOG 3

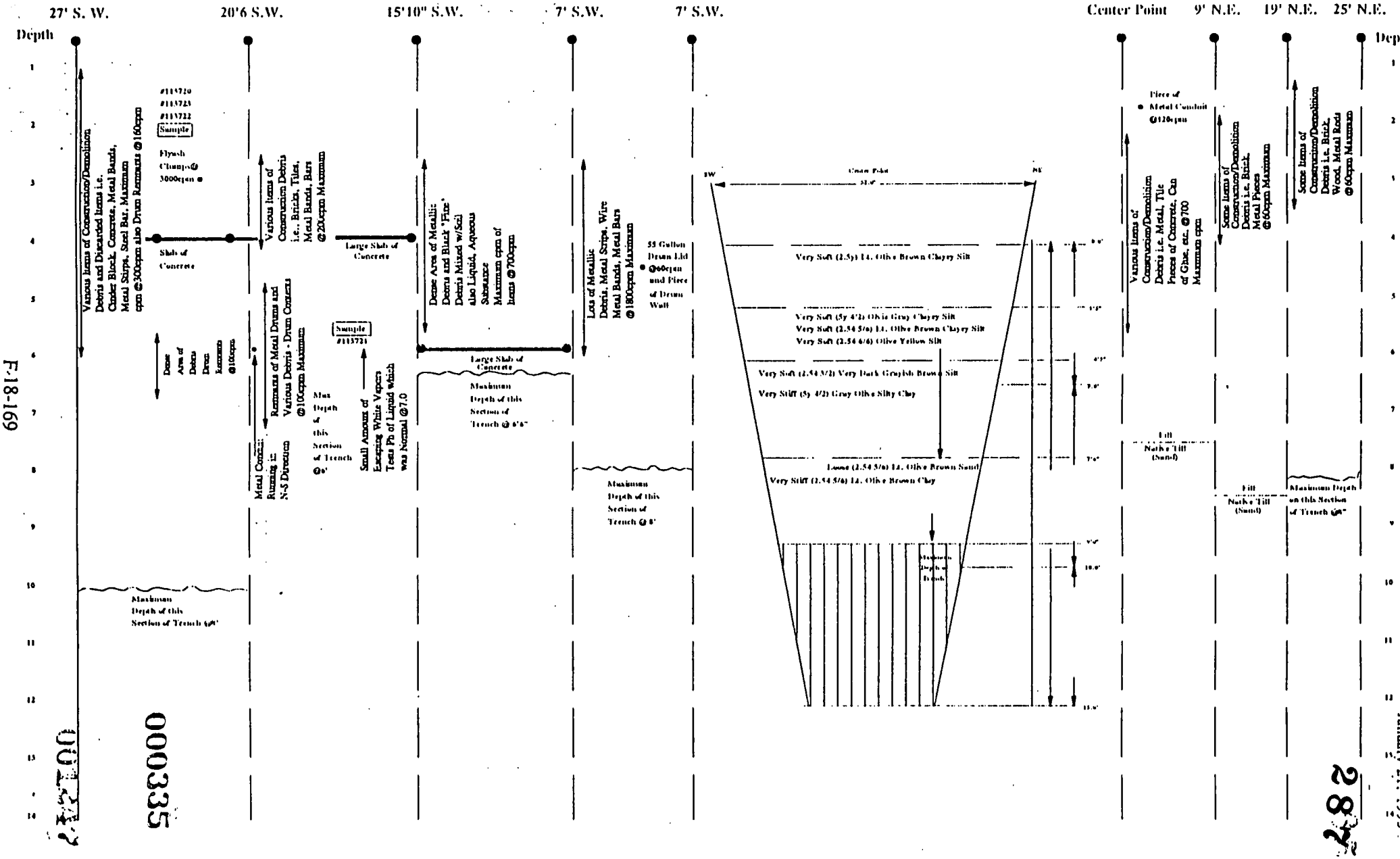


Horizontal Sample Interval Boundary

Max Beta-Gamma: 400cpm
Max M. T.: 0ppm

000334

TABLE F-18B
(Continued)
SOUTH FIELD TRENCHING LOG 4

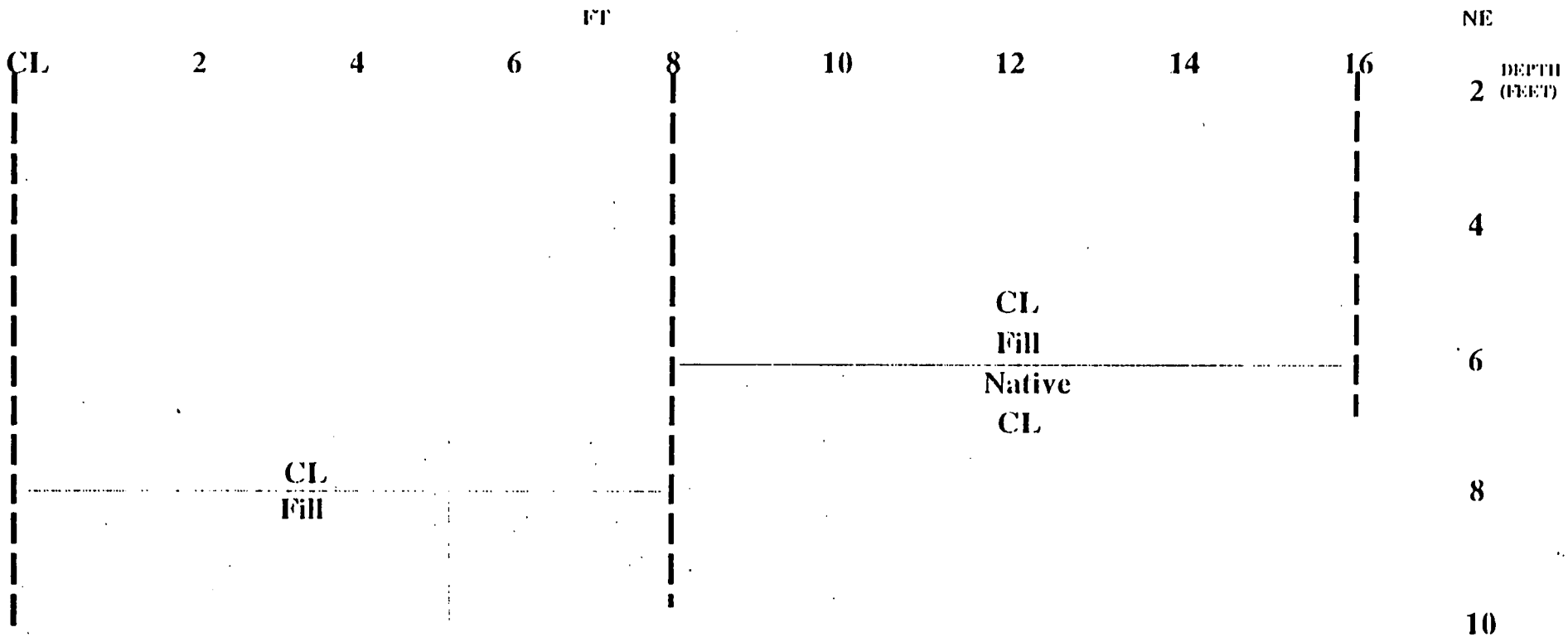


F-18-169

000335

287

TABLE F-18B
(Continued)
SOUTH FIELD TRENCHING LOG 5

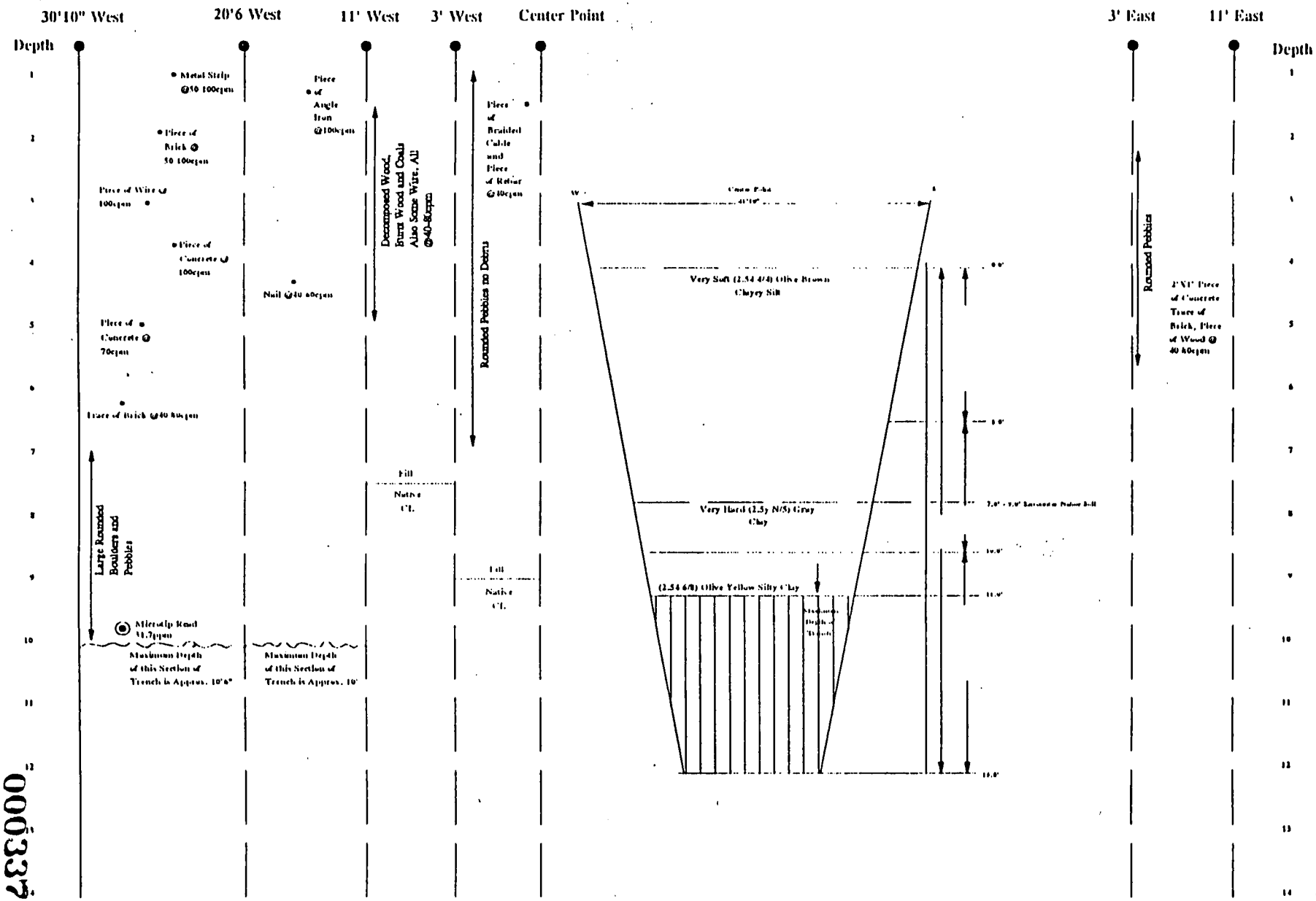


Horizontal Sample Interval Boundary

Max Beta-Gamma: 220cpm
Max M. T.: 0.7ppm

000336
002230

TABLE F-18B
(Continued)
SOUTH FIELD TRENCHING LOG 6



F-18-171

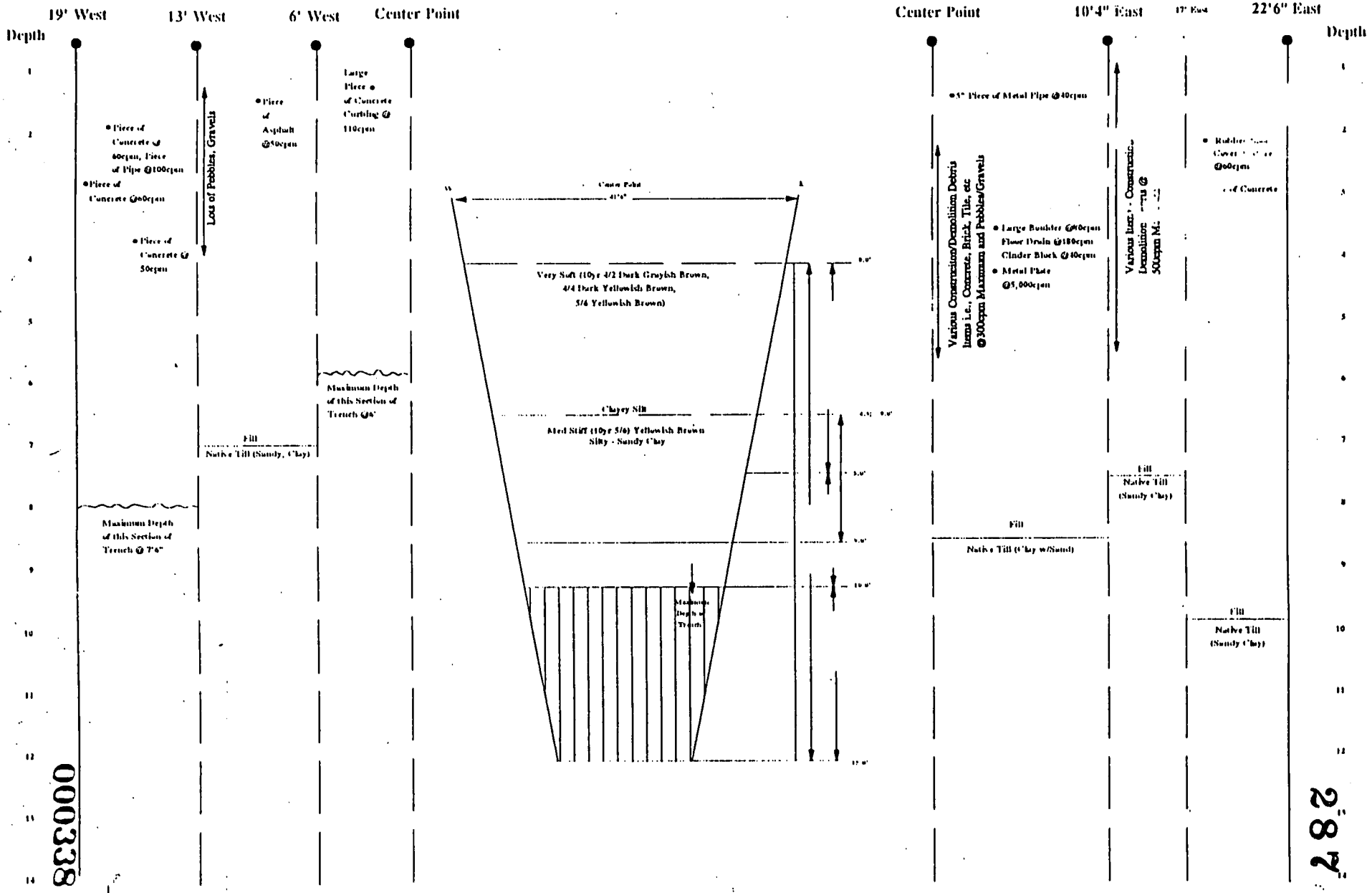
000337

FEMP-OU02-6 FINAL
January 21, 1995

287

TABLE F-18B
(Continued)

SOUTH FIELD TRENCHING LOG 7

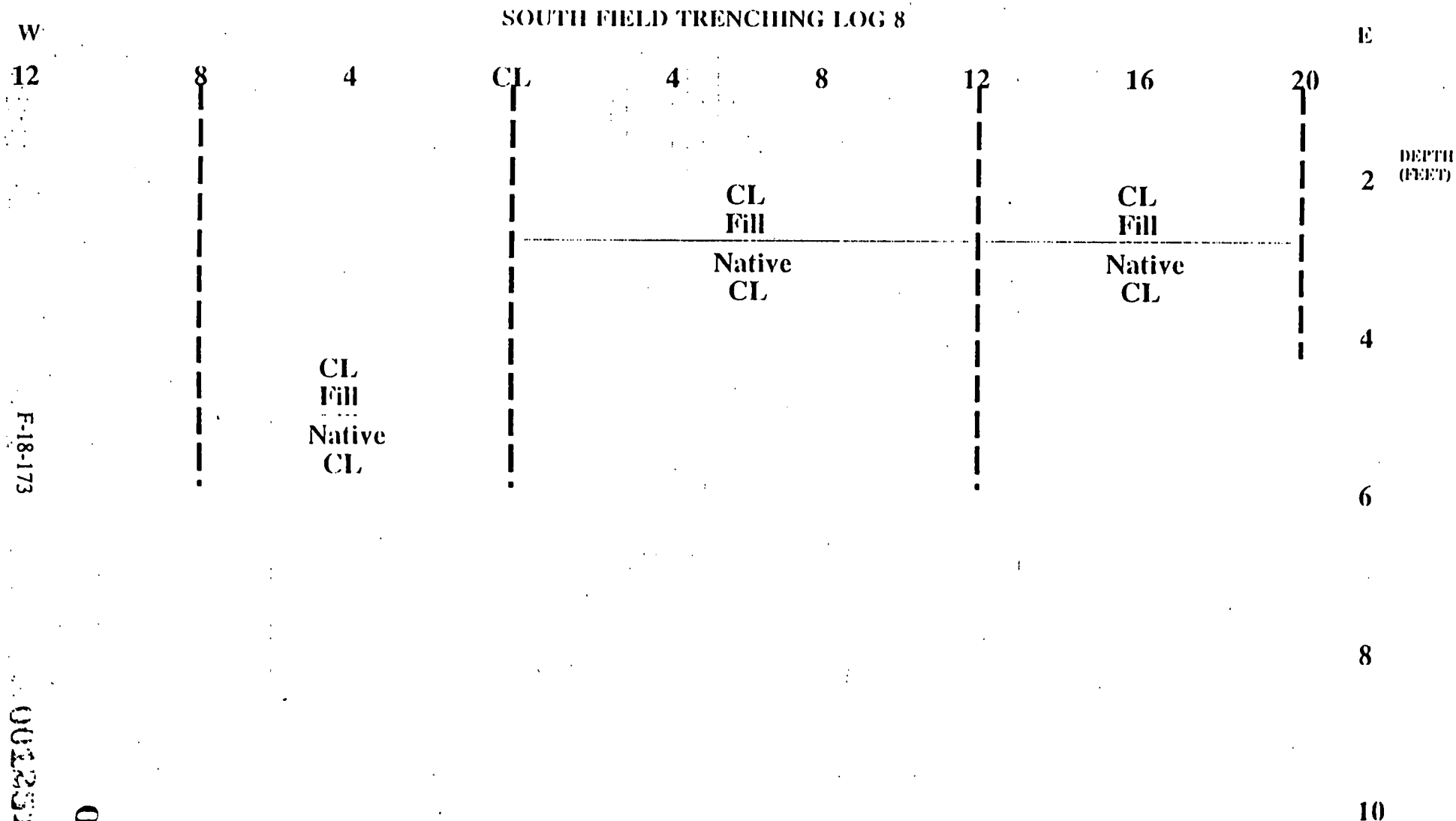


F-18-172

000338

287

TABLE F-18B
(Continued)
SOUTH FIELD TRENCHING LOG 8



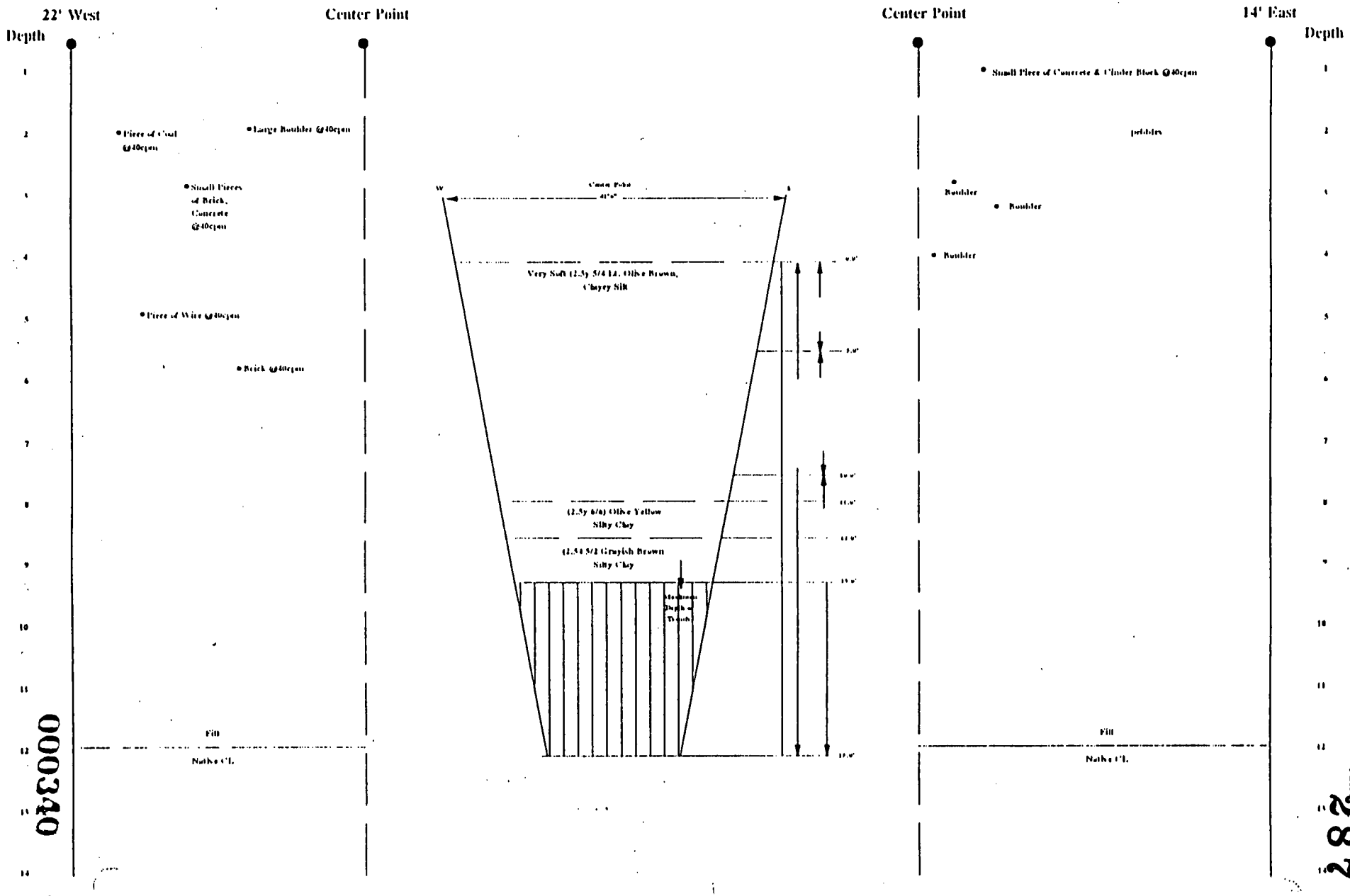
Horizontal Sample Interval Boundary

Max Beta-Gamma: 600cpm
Max M. T.: 4.8ppm

000339

TABLE F-18B
(Continued)

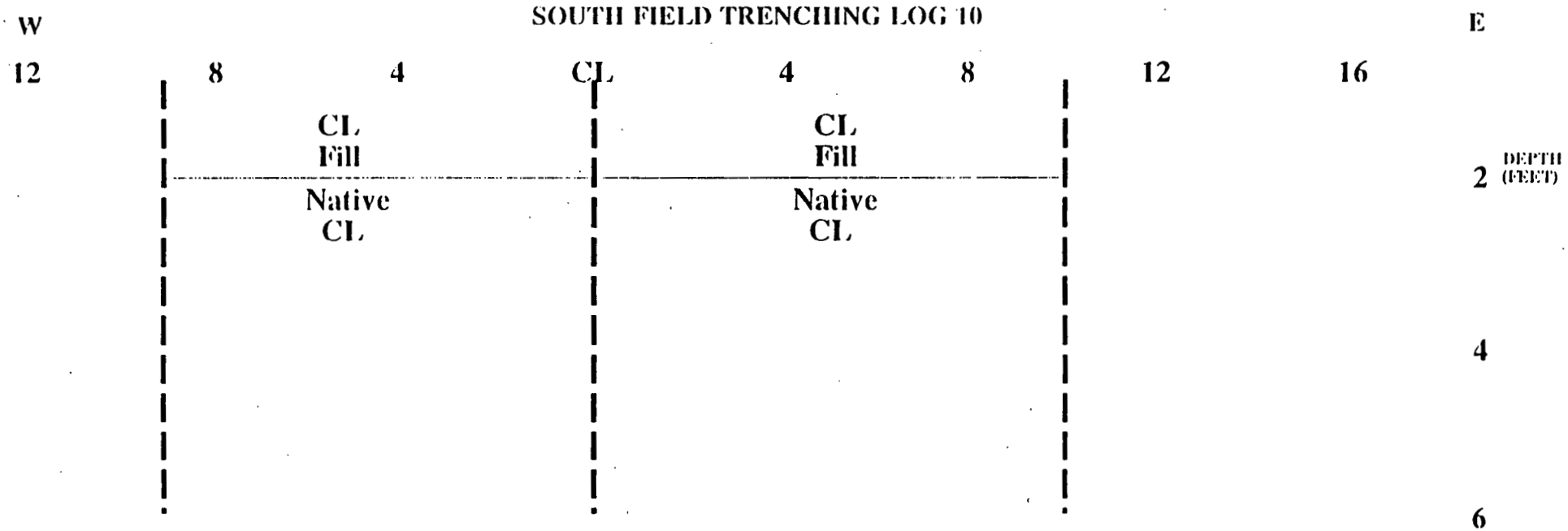
SOUTH FIELD TRENCHING LOG 9



000340

TABLE F-18B
(Continued)

SOUTH FIELD TRENCHING LOG 10



Horizontal Sample Interval Boundary

Max Beta-Gamma: 4,600cpm

Max M. T.: 0ppm

000341
0012453
287

APPENDIX C

PO-154 SHALLOW BORING FIELD LOGS AND GEOTECHNICAL LOGGING REPORTS

Project No: PO-154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-SB-91	Drilling Method: Geoprobe	Date Started: 09/28/95
Coordinates: N 478,131 E 1,378,972	Geologist: D. Melancon	Date Completed: 09/28/95
Ground Surface Elevation: 575.9 ft above MSL	GWL/DATE:	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. *Colors identified using Munsell Color Chart. Consistency based on Standard* Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Clayey silt with scattered gravel, olive brown, stiff to very stiff, fill (ML), roots to 2 inches	409997	0 - 0.5	B	NA	6	OC
		409998	0.5 - 1.0	B	NA	6	OC
		409999	1.0 - 1.5	B	NA	6	OC
0.6	Silty sand, black, some gravel, (fly ash) loose to medium dense, SM	410000	1.5 - 10.0	B	NA	102	MC, GS, SG, AL, CON_{85}, CU_{85}, SP
	Final boring depth = 10.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

FEMP
LITHOLOGIC LOG

CONTROL NO: 200310G25B91-003

Page 1 of 1

PROJECT NAME: Geotechnical Investigation Borrow Areas / OU2 Waste Areas

PROJECT NUMBER: 20.03.10

BORING NUMBER: G2-SB-91

COORDINATES: Refer to survey Report ~~NA~~ JC 4-10-96

RELATED FAL NOs.: 200310G25B91-001 ~~NA~~ JC 4-10-96

SURFACE ELEVATION: Refer to Survey Report ~~NA~~ JC 4-10-96

GROUNDWATER LEVEL: NA | DATE: NA | TIME: NA

DATE STARTED: 9/28/95

GEOLOGIST: D. Melancon

GROUNDWATER LEVEL: NA | DATE: NA | TIME: NA

DATE COMPLETED: 9/28/95

WATER USED DURING DRILLING: NA

DRILLING CONTRACTOR: Farmco

DRILLING EQUIPMENT: Geoprobe

DRILLER/HELPER: M Grob

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1318 9/28/95 410000	NA		Cavie silt with some sand - pan gravel to lean clay w/ pea Gravel 2.5Y 3/3 olive Brown Stiff to very Stiff		1.5 to 2.5	Root to 1" Hair Roots to 2"
	1320 9/28/95 410000	NA		Silty Sand Black w/ some Gravel Loose to medium dense			3.5' Recovery on 1st ~~Sample~~ Sample Tube
1	1322 9/28/95 410000	NA					
2							
3							
4	1350 9/28/95						3.5' Recovery on 2nd Sample Tube
5	410000						
6							
	1352 Jar			Fly ash			
7	410000						3.0' Recovery on 3rd Sample tube
8							
9							
10							

INSTRUMENT	BACKGROUND	DATE	TIME
PID	NA		
ALPHA			
BETA/GAMMA			

NOTES: NA

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

ILLUS\MISC\GEOTECH\LITHO LOG.EPS

JC 4-11-96

Project No: PO-154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-SB-92	Drilling Method: Geoprobe w/augers	Date Started: 09/28/95
Coordinates: N 477,991 E 1,378,999	Geologist: D. Melancon	Date Completed: 09/28/95
Ground Surface Elevation: 574.8 ft above MSL	GWL/DATE:	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Silt with clay and some gravel, olive brown, very stiff, fill (ML), roots to 3 inches	409993	0 - 0.5	B	NA	6	OC
0.5	Silty sand with gravel up to 1 inch in diameter, (fly ash) black, loose to medium dense, fill, SM	409994	0.5 - 1.0	B	NA	6	OC
		409995	1.0 - 1.5	B	NA	6	OC
		409996	1.5 - 10.0	B	NA	102	MC, GS, AL, $CON_{.85}$, $CU_{.85}$, SP, rel. dens.
	Final boring depth = 10.0 ft.						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

FEMP
LITHOLOGIC LOG

CONTROL NO: 200310625B92-003

Page 1 of 1

PROJECT NAME: Geotechnical Investigation Borrow Areas / OU2 Waste Areas

PROJECT NUMBER: 20.03.10

BORING NUMBER: 62-SB-92

COORDINATES: Refer to Survey Report ~~NA~~ JC 4-10-96

RELATED FAL NOs.: JC 4-10-96 ~~NA~~ 200310625B92-001

SURFACE ELEVATION: Refer to Survey Report ~~NA~~ JC 4-10-96

GROUNDWATER LEVEL: NA | DATE: NA | TIME: NA | DATE STARTED: 9/28/95

GEOLOGIST: D. Melancon

GROUNDWATER LEVEL: NA | DATE: NA | TIME: NA | DATE COMPLETED: 9/28/95

WATER USED DURING DRILLING: NA

DRILLING CONTRACTOR: Fenco

DRILLING EQUIPMENT: Geoprobe

DRILLER/HELPER: M. Grob

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	0850 9/28/95 409992	NA		Silt with clay + sand Gravel 1" 2.5Y 4/3 olive Brown very stiff		3.0	Topsoil Roots 3"
0.5	0852 9/28/95 409994	NA		Silty sand w/ Gravel 1" Black loose-medium dense			3.5 ft of A Recovery 1.5'-5' A/B Screen 0855 410858
1	0854 9/28/95 409995	NA					
2							
3							
4							
5	0930 9/28/95 409996			Fly ash			
6	Jar 932 409996						
7							5'-10' A/B Screen 0933 410859
8							
9							
10							

INSTRUMENT	BACKGROUND	DATE	TIME
PID		NA	
ALPHA			
BETA/GAMMA			

NOTES: NA

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS\MISC\GEOTECH\UTHO LOG.EPS

JN 4-11-96

Project No: PO-154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-SB-93	Drilling Method: Geoprobe w/augers	Date Started: 09/27/95
Coordinates: N 478,066 E 1,379,058	Geologist: R. Nicks/D. Melancon	Date Completed: 09/27/95
Ground Surface Elevation: 568.0 ft above MSL	GWL/DATE:	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay with sand and some gravel to 1 inch in diameter, very dark grayish brown, stiff, moist fill (CL), roots to 3 inches, hair rootlets to 1 foot	409987	0.0 - 0.5	B	NA	6	OC
		409988	0.5 - 1.0	B	NA	6	OC
		409990	1.0 - 1.5	B	NA	6	OC
0.8	Silty sand with gravel (fly ash) to 1/2 inch in diameter, medium density, (SM)						
4.0	Lean clay with trace sand, light olive brown, stiff to very stiff, fill, CL	409991	1.5 - 7.0	B	NA	66	MC, GS, SG, AL, CON_{r85}, SP, CU_{r85}
	Having more gravel to 7.0 feet, up to 1/2 inch in diameter, becoming very hard at 9.5 feet	409992	7.0 - 10.0	B	NA	36	MC,GS
	Final boring depth = 10.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

FEMP LITHOLOGIC LOG

CONTROL NO: 20031005225893-003

Page 1 of 1

PROJECT NAME: Geotechnical Investigation Borrow Areas / OU2 Waste Areas

PROJECT NUMBER: 20.03.10

BORING NUMBER: G2-SB-93

COORDINATES: See Survey Report

RELATED FAL NOs.: 20031002258 93-001 thru 015 DMS 4-10-96

SURFACE ELEVATION: See Survey Report

GROUNDWATER LEVEL: N/A DATE: 4-10-96 TIME: DMS

DATE STARTED: 9/27/95

GEOLOGIST: R. Nicks, D. McDonald

GROUNDWATER LEVEL: N/A DATE: 4-10-96 TIME: DMS

DATE COMPLETED: 9/27/95

WATER USED DURING DRILLING: None

DRILLING CONTRACTOR: FERMCO

DRILLING EQUIPMENT: Geoprobe

DRILLER/HELPER: M. Gross, M. Arnett

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1430 9/27/95 409989	NA		Lean Clay with Sand some Gravel 1.5" 10YR 3/2 very dark Grayish Brown stiff, moist			Root to 3" Hair Root to 1"
	1432 9/27/95 409990	NA					
1	1435 9/27/95 409990	NA		Coarse Grain		1.5	
				Fly ash Crumbly Sand with Gravel 5" + some silt medium dence			
2						2.5	
3							
4	1508 9/27/95 409991			Lean Clay with trace of Sand 2.5Y 5/4 Light olive Brown 1.5-2.75 consistancy stiff to very stiff		1.5 / 2.75	
5	Glass Jar						
6	1510 9/27/95 409991						
7				Lean Sand Clay w/Gravel medium stiff 2.5Y4/4 olive moist to wet at 7.5 Brown		.75	
8							
	1425 9/27/95 409992		DIM	Sandy Clayic silt with Gravel .5" 2.5Y 5/4 Light olive Brown			
9							
10				Till Hard to very Hard Cayic silt with Gravel 1" 2.5Y 4/2 dark Gray Brown moist			

Fill

INSTRUMENT	BACKGROUND	DATE	TIME
PID	N/A		
ALPHA		4-10-96	
BETA/GAMMA			

NOTES: N/A for instrument means Not Available
N/A for Groundwater Level means Not Known
A/B SCREEN COLLECTED FROM 1.5'-5.0' ON 9-27-95 AT 1436 CUSTOMER # 410860 ON 4-10-96
A/B SCREEN COLLECTED FROM 5.0'-10.0' ON 9-27-95 AT 1426 CUSTOMER # 410861 ON 4-10-96

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

ILLUS/MISC/GEOTECH/LITHO LOG.EPS

4/93

4-11-96

Project No: PO-154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-SB-94	Drilling Method: Geoprobe w/augers	Date Started: 09/26/95
Coordinates: N 477,778 E 1,379,051	Geologist: R. Nicks	Date Completed: 09/27/95
Ground Surface Elevation: 567.5 ft above MSL	GWL/DATE:	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay with sand, mottled light olive brown with dark gray brown, very stiff, moist, scattered gravel, fill (CL)	409983	0 - 0.5	B	NA	6	OC
		409984	0.5 - 1.0	B	NA	6	OC
1.2	Silty sand with gravel (fly ash), black, with pockets of lean clay to 3 inches in diameter, SM	409985	1.0 - 1.5	B	NA	6	OC
		409987	1.5 - 7.0	B	NA	66	MC, GS, SG, AL, CON_{85}, SP
		409986	7.0 - 10.0	B	NA	36	GS,MC
	Final boring depth = 10.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

CONTROL NO: 200310G25B94-002 3KC

FEMP
LITHOLOGIC LOG

Page 1 of 1

*PROJECT NAME: GEOTECHNICAL INVESTIGATION BORROW AREAS/OU2 WASTE UNITS			PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-94	COORDINATES: SEE SURVEY REPORT	RELATED FAL NOs.: 200310G25B94-001 + 2	
SURFACE ELEVATION: SEE SURVEY REPORT	GROUNDWATER LEVEL: N/K	DATE: N/K	TIME: N/K	DATE STARTED: 9/26/95
GEOLOGIST: R. Nicks	GROUNDWATER LEVEL: N/K	DATE: N/K	TIME: N/K	DATE COMPLETED: 9/27/95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FERMCO	DRILLING EQUIPMENT: GEOPROBE/AUGER	DRILLER/HELPER: M. GROOB,	

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	409983 9/26/95 1350	NA	60"	LEAN CLAY w/sand - mottled gy gy lt.olive bra v.stiff, moist - scattered gravel to 1/2" 10YR 4/2 dk.gr. bra	CL	4.25	upper 6" sand locally
1	1357 9/26/95 409984	NA	6"				
	1358 9/26/95 409985	NA	6"	FLYASH black w/pockets of silty clay to 3"		20 in clay <0.5 in Ash	← silt clay pockets 1'2" - 1'6"
2							
3							
4	1121 409989 9/26/95 409987	NA		FILL			
5							
6							
7							
8	1045 9/27/95 409986	NA	CUTTINGS				← ≈8ft. when released drill rod from head, the rod bring dropped about 2 ft. - 3ft.
9							
10							

INSTRUMENT	BACKGROUND	DATE	TIME
PID			
ALPHA			
BETA/GAMMA			

NOTES: N/A - NOT APPLICABLE AW 4-10-96
A/B SCREEN COLLECTED FROM 1.5' - 5.0' CUSTOMER
- 410862 on 9/26/95 AT 1359 AW 4-10-96
A/B SCREEN COLLECTED FROM 5.0' - 10.0' CUSTOMER
- 410863 ON 9/27/95 AT 1046 AW 4-10-96

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*FLL/SMB/C/GEOTECH/LITHO LOG EPS

4/95

JN 4-11-96

ect No: PO-154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-SB-95	Drilling Method: Geoprobe w/augers	Date Started: 09/21/95
Coordinates: N 478,187 E 1,379,111	Geologist: K. Ernst/J. Erjavec	Date Completed: 09/21/95
Ground Surface Elevation: 569.5	GWL/DATE:	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay and topsoil, dark olive brown mottled with yellowish brown and yellowish brown moist (CL)	409895	0 - 0.5	B	NA	6	OC
		409896	0.5 - 1.0	B	NA	6	OC
		409897	1.0 - 1.5	B	NA	6	OC
1.3	Lean clay with silt, light greenish gray mottled with yellowish brown, moist, very stiff to hard CL	409898	1.5 - 5.0	B	NA	42	MC, GS, AL, SP, P,
		409899	5.0 - 10.0	B	NA	60	MC, GS, AL
4.1	Clayey sand, light olive brown, moist to wet, trace gravel up to 1/4 inch in diameter (SC)						
5.0	Sandy lean clay, light olive brown, moist to wet, hard to very hard, CL						
5.5	Lean clay, greenish gray, moist, medium stiff to stiff, some sand and gravel, CL						
8.9	Silt, greenish gray, some sand, wet, trace gravel (ML)						
	Final boring depth = 10.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

CONTROL NO: 200310G2SB95-003

FEMP LITHOLOGIC LOG

PROJECT NAME: Geotechnical Inv. Borrow Areas \ OU2 Waste Units			PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-95	COORDINATES: See Survey report	RELATED FAL NOs.: 200310G2SB95-002	
SURFACE ELEVATION: See Survey report	GROUNDWATER LEVEL: *3 ~5' BG surface	DATE: 9/21/95	TIME: 1233	DATE STARTED: 9-21-95
GEOLOGIST: K. Ernst / J. Erjavec	GROUNDWATER LEVEL: N/K	DATE: N/K	TIME: N/K	DATE COMPLETED: 9/21/95
WATER USED DURING DRILLING: * N/A	DRILLING CONTRACTOR: FERMCO	DRILLING EQUIPMENT: Geoprobe Van w/ Augers	DRILLER HELPER: B. Neyer / J. Capannari	

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0	10:50 9-21-95 * 409895	N/A	6"	Dark olive brown (2.5Y-3/3) clay & topsoil, moist, low plasticity, 2" cobble, root material	CL	N/A	
1	12:34 9-21-95 * 409896		6"	Light brownish gray (2.5Y-6/2) clay mottled with yellowish brown clay (10YR-5/6), moist, low plasticity	CL	N/A	Hole #1 PID=16 Hole #2 PID=60
	12:54 9-21-95 * 409897		6"	Light yellowish brown (2.5Y-6/4) & yellowish brown (10YR-5/6) clay with silt, moist, stiff (est).	CL	N/A	Hole #1 1st to 15"
2	11:00 9-21-95 * 409898 (10-gal can)		42"	Light brownish gray (2.5Y-6/2) mottled with yellowish brown (10YR-5/6) clay with silt. Moist, very stiff to very hard, low plasticity.	CL	20-50	4-10-96 Hole #2 2nd to 36" Hole #1 2nd to 36"
3							
4				Light olive brown clayey sand (2.5Y-5/4), moist to wet, trace gravel (granule sized 2-4mm), well sorted, poorly graded. fg to vfg grain size	SC SC (#2)		49"
5	BROWN GRAY INTERFACE 4-10-96				CL	20-50	Hole #2 2nd to 36"
6				Light olive brown sandy clay, moist hard, low plasticity, hard to very hard. (2.5Y-5/6)	CL	20-30	Hole #1 3rd to 77"
7	Brown GRAY INTERFACE Hole #2 12:05 401899 9/21/95		~42"	Greenish gray (10Y-5/1) clay, moist, med stiff to stiff, low plasticity to med plasticity, some sand throughout. Some gravel, angular to subangular to subrounded, (granule to pebble sized)		*-see note	4-10-96 Hole #2 3rd to 36"
8							*-2 Hole #2 2nd to 36"
9		~8'10"		Starting to — Greenish gray (10Y-5/1) silt, wet, some sand, trace gravel.	ML		
10							

INSTRUMENT	BACKGROUND	DATE	TIME
PID	0.0 ppm	9-21-95	0955
ALPHA	NA		
BETA/GAMMA	60 cpm	9-21-95	0955

NOTES: N/A = Not Applicable
* 4th push - unable to retrieve sample from sampler-shoot offset 6" to alley
*-2 - Drilling pushed to 10', because of heaving sand in boring, likely lost some of this sample. Estimated 8'10" for starting to gray silt.

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

ILLUSMISCGEOTECHUTHO LOG EPS

* N/A = NOT Applicable

*3 - Slough from sand filled hole to ~5.0' BG Surface. Water present in sand at that depth.

JN 4-11-96

ect No: PO-154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-SB-96	Drilling Method: Geoprobe w/augers	Date Started: 09/25/95
Coordinates: N 478,071 E 1,379,395	Engineer: J. Dunlap	Date Completed: 09/25/95
Ground Surface Elevation: 576.0 ft above MSL	GWL/DATE: 10.1 ft+BGS 9/25/95	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = *Split-spoon Sample* ST = *Shelby Tube Sample*

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay with topsoil, dark yellowish brown, moist, medium stiff, fine roots, fill (CL)	409900	0 - 0.5	B	NA	6	OC
		409901	0.5 - 1.0	B	NA	6	OC
	Topsoil stops at 1.0 foot and becomes very stiff; roots stop at 3.5 feet	409902	1.0 - 1.5	B	NA	6	OC
		409903	1.5 - 7.0	B	NA	42	MC, GS, AL, SP, P,
4.3	Lean clay with sand, yellowish brown mottled with light gray, moist, stiff, fill, CL	409904	7.0 - 10.0	B	NA	60	MC, GS, AL, SP, P,
4.9	Silty sand, yellowish brown, moist, medium dense, fill (SM)						
5.2	Silty lean clay, yellowish brown, moist, *medium stiff to stiff, fill CL*						
7.2	Lean clay, greenish gray with silt, wet, medium stiff CL						
8.3	Silty sand, strong brown to brownish yellow, moist to wet, heavy iron staining, dense (SM)						
	Final boring depth = 10.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

FEMP LITHOLOGIC LOG

CONTROL NO: 200310G2SB96-003

Page 1 of 1

PROJECT NAME: Geotechnical Investigation Borrow Areas / OU2 Waste Units			PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-96	COORDINATES: See Survey report	RELATED FAL NOs.: 200310G2SB96-002 thru 013	
SURFACE ELEVATION: See Survey report	GROUNDWATER LEVEL: 10.1 Ft BGS	DATE: 9-25-95	TIME: 14:05	DATE STARTED: 9-25-95
GEOLOGIST: Engineer J. Dunlap	GROUNDWATER LEVEL: N/A 4-10-96	DATE:	TIME:	DATE COMPLETED: 9-25-95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FERMCO	DRILLING EQUIPMENT: Geoprobe / Little Beaver" Hyd. Auger	DRILLER/HELPER: W. Neyer / D. Smith / K. Reynolds	

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
.25	1328 9-25-95 409900	N/A	6" / 6"	Lean Clay (10YR 3/6) Dk Yellowish Brown, w/Roots, Moist, Med. Plasticity, Med. Stiff	CL	.75	Large Roots in 2nd Core Sample
.5				Lean Clay (10YR 3/6) Dk. Yellowish Brown, moist, w/Fine Roots, Stiff, Crosscut Black Nodules, Fill	CL	1.75	
	1320 9-25-95 409901		6" / 6"	~~Lean Clay (10YR 4/6) Dk Yellow~~ SAA			
1.0							
	1323 9-25-95 409902		6" / 6"	Lean Clay (10YR 4/6) Dk Yellowish Brown, Moist, Very Stiff, w/ Black Nodules, w/ Fine Roots Fill	CL	2.25	
1.5	1345			SAA			
2.0 2.2							
	9-25-95						
3.0							Fine Roots Stop @ ~ 3.5 ft
4.0 4.3				Lean Clay w/Sand (10YR 5/6) Yellowish Brown, Mottled w/ Light Gray, Moist, Stiff, Fill	CL	1.75	
4.9	409903						
5.0 5.2				Silty Fine Sand Moist (10YR 5/6) Yellowish Brown, Med. Dense, Fill	SM		Density Estimated
				Silty Lean Clay w/ Sand (10YR 4/6) Dk. Yellowish Brown, Moist, Stiff, Fill	CL	2.0	
5.8 6.0	1406 9-25-95			Silty Lean Clay (10YR 5/6) Yellowish Brown, Wet, Med. Stiff, w/Iron Staining, Fill	CL	1.0	
7.0 7.2				Lean Clay (10YR 5/1) Greenish Gray w/ Silt, Wet, Med Stiff, ~~Fill~~	CL	.8	
8.0 8.3				Silty Sand (7.5YR 5/8) Strong Brown, Wet, Heavy Iron Staining, Sand Is Fine, Dense	SM		Density Estimated
9.0							
9.6 9.9	409904			Silty Sand (10YR 6/8) Brownish Yellow, Moist, Turning Grayish Brown (10YR 5/2) @ 9.9 ft, Dense	SM		Bottom Of Boring @ 9.9 ft Density Estimated

INSTRUMENT	BACKGROUND	DATE	TIME
PID	2.0	9-25-95	1303
ALPHA			
BETA/GAMMA	70	9-25-95	1303

NOTES: N/A - Not Applicable
Description From Geoprobe Macrocores, Samples From Cores & Auger Cuttings
SAA - Same As Above
BGS - Below Ground Surface

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUSMSC/GEOTECH/LITHO LOG EPS

4/11/96

✓ α Borrowing sample #409913 taken at 5' → 10' depth @ 1406

Project No: PO-154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-SB-97A	Drilling Method: Geoprobe	Date Started: 09/26/95
Coordinates: N 477,837 E 1,379,272	Engineer: J. Dunlap	Date Completed: 09/26/95
Ground Surface Elevation: 572.4 ft above MSL	GWL/DATE: None 9/26/95	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay with sand and gravel, dark yellowish brown, moist, stiff to very stiff, with roots and black nodules, some limestone, concrete and bricks (CL)	409909	0 - 0.5	B	NA	6	OC
		409910	0.5 - 1.0	B	NA	6	OC
		409911	1.0 - 1.5	B	NA	6	OC
	Limestone and concrete pieces up to 1.5 inches	409912	1.5 - 10.0	B	NA	102	MC, GS, AL, CON_{r85}, UU_{r85}, CU_{r85}, SP
5.6	Lean clay with silt and gravel, yellowish brown, moist, stiff, fill, gravel up to 3/4 inch in diameter CL						
7.4	Lean clay with gravel, dark grayish brown, moist to wet, soft to medium stiff, black organic matter, fill CL Gravel stops at 8.3 feet, becoming olive at 9.2 feet						
	Final boring depth = 10.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

CONTROL NO: 200310G2SB97A-004

FEMP
LITHOLOGIC LOG

287

*PROJECT NAME: Geotechnical Investigation Borrow Areas/OU2 Waste Units	PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-97A	COORDINATES: Refer to Survey Report
RELATED FAL NOs.: 200310G2SB97A-002	
SURFACE ELEVATION: Refer to Survey Report	GROUNDWATER LEVEL: None; DATE: 9-26-95; TIME: 1500
DATE STARTED: 9-26-95	~~GEOLOGIST~~ Engineer: J. Dunlap
GROUNDWATER LEVEL: NK; DATE: NK; TIME: NK	DATE COMPLETED: 9-26-95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FERMCO
DRILLING EQUIPMENT: Geoprobe/ "Little Beaver" Hyd. Auger	DRILLER/HELPER: W. Nayer / K. Reynolds

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.3	1355 9-26-95 409909	N/A	6"/6"	Lean Clay w/Sand & Gravel (Up to 3/8" Dia, Subangular) (10YR 4/4) Dk. Yellowish Brown, moist, Stiff, w/Roots, Top Soil, Gray Limestone & Concrete	CL	1.75	Sample From Geoprobe Core
0.5	~~1357 9-26-95~~ 409910		6"/6"	Lean Clay w/Gravel (Up to 1/2", Subangular) (10YR 4/6) Dk. Yellowish Brown, moist, Very Stiff, w/Black Nodules, Fill, w/Fine Roots, Some Sand (Fine)	CL	2.75	Sample From Geoprobe Core
1.0	1358 9-26-95 409911		6"/6"	@1.4ft 1" Piece Limestone, Surrounded By Thin Lens Of Black Fly Ash (~1 to 2" Thick)			Sample From Geoprobe Core
1.5	1455 9-26-95			@2.2ft 1.25" Piece Limestone			
2.0							
3.0	409912 1455 1.5'-10'			Fragments Of Brick Beginning @ 3.0ft			Sample Composite Of Geoprobe Core + Auger Cuttings
4.0							
5.0							
5.6 ~~5.4~~ 6.0				Lean Clay w/Silt & Gravel (Up To 3/4" Dia, Angular to Subangular) (10YR 5/6) Yellowish Brown, moist, Stiff, Fill, Mottled w/Gray	CL	1.25	
7.0							
7.4 ~~7.6~~ 8.0				Lean Clay (~~10YR~~ 2.5Y 3/1) Very Dark Gray, moist, Stiff, Fill	CL	1.5	
8.3				Lean Clay w/Gravel (Up to 3/4", Subangular) (2.5Y 4/2) Dk. Grayish Brown, moist, Soft to Med Stiff, Fill	CL	0.5	
9.0			Silty Lean	~~Lean Silty~~ Clay (2.5Y 3/2) Very Dark Grayish Brown, moist to wet, Soft to Med Stiff, ~~Fill~~ Fill, some Black Organic Matter	CL	0.5	
				Becoming (5Y 4/3) Olive At 9.2 ft			
10.0				End Of Boring 10.0 ft			

1'-1.5' A/B Screen

1.5'-7' A/B Screen

INSTRUMENT	BACKGROUND	DATE	TIME
PID	0.8	9-26-95	1344
ALPHA		NA	
BETA/GAMMA	50	~~1345~~ 9-26-95	1335

NOTES: N/A Not Applicable
Description From Geoprobe Macrocore
Samples From Macrocores + Auger Cuttings

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUSMS\CGEOTECH\LITHO LOG.EPS

000356

ct No: PO-154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-SB-98	Drilling Method: Geoprobe w/augers	Date Started: 09/25/95
Coordinates: N 477,973 E 1,379,636	Engineer: J. Dunlap	Date Completed: 09/25/95
Ground Surface Elevation: 572.3 ft above MSL	GWL/DATE: None 9/25/95	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. *Colors identified using Munsell Color Chart. Consistency based on Standard* Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, dark grayish brown, moist, medium stiff, with gravel up to 3/8 inch in diameter, with fine roots and topsoil, fill (CL)	409905	0 - 0.5	B	NA	6	OC
		409906	0.5 - 1.0	B	NA	6	OC
0.8	Silty gravel up to 1-1/4 inches in diameter, grayish brown, moist, loose to medium dense (GM)	409907	1.0 - 1.5	B	NA	6	OC
		409908	1.5 - 10.0	B	NA	102	MC, GS, AL, SP, P,
1.5	Sandy lean clay with gravel up to 1-1/2 inches in diameter, brown to light olive brown, moist, very stiff, fill, CL Having no gravel and less sand below 2.5 feet						
4.4	Fat clay with silt, yellowish brown, moist, stiff, (CH), thin silty sand seam at 5.3 feet						
5.5	Silty lean clay with sand, yellowish brown occasionally mottled with gray, medium stiff to very stiff, CL Becoming wet below 8.8 feet						
	Final boring depth = 10.5 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

CONTROL NO: 200310G23B98-003

FEMP
LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation Barrow Areas / OU2 Waste Units					PROJECT NUMBER: 20.03.10
BORING NUMBER: GZ-SB-98	COORDINATES: See Survey Report	RELATED FAL NOs: 200310G23B98-001 thru 014			
SURFACE ELEVATION: See Survey Report	GROUNDWATER LEVEL: None	DATE: 9-25-95	TIME: 1600	DATE STARTED: 9-25-95	
~~GEOLOGIST~~: Engineer J. Dunlap	GROUNDWATER LEVEL: N/K Oms 4-10-96	DATE: N/K	TIME: N/K	DATE COMPLETED: 9-25-95	
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FERMCO	DRILLING EQUIPMENT: Geoprobe / "Little Beaver" Hyd. Auger	DRILLER/HELPER: W. Neyer / D. Smith / K. Reynolds		

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
.5	1509 9-25-95 409905	N/A	6"/6"	Lean Clay (10YR 4/2) Dk. Grayish Brown, Moist, Med. Stiff, w/Gravel (Up to 3/8" Dia. Subangular), w/ Fine Roots, Top Soil	CL	1.0	
0.8	1515 9-25-95 409906	—	6"/6"	Silty Gravel (Up to 1 1/4" Dia, Sub Angular to Subrounded) Moist, Loose to Med. Dense, ~~Moist~~	GM		Density Is Estimated
1.0	1517 9-25-95 409907		6"/6"	(10YR 5/2) Grayish Brown, w/ Sand, Fill			Some of Aggregate Is Very Porous, Small Piece Of Green Mat'l In Aggregate
1.5				Sandy Lean Clay (10YR 5/3) Brown, w/Gravel (Sub Angular up to 1.5" Dia) Moist, Very Stiff, Fill Becoming Mottled w/ Gray (10YR 6/1) @ 2.0 ft	CL	3.75	
2.0							
3.0				Lean Clay (2.5Y 5/4) Lt. Olive Brown, Moist, Very Stiff, Mottled w/ (2.5Y 6/1) Gray, w/ Occasional Coarse Angular Sand, Becoming Less Mottled w/ Depth	CL	3.0	
4.0							
4.4				Fat Clay w/ Silt (10YR 5/6) Yellowish Brown, Moist, Stiff, Occasional Coarse Angular Sand	CL	2.0	
5.0				@ 5.2 ft Becomes Soft			
5.3				Thin Silty Sand Layer @ 5.3 ft to 5.5 ft, Moist	SM	0.3	
				Silty Lean Clay w/ Sand (10YR 5/6) Yellowish Brown, Moist, Med. Stiff	CL	.75	
6.0				Becoming Very Stiff @ 6.4 ft		2.5	
7.0	1602 9-25-95			Becoming Mottled w/ Gray Around 7.2 ft			
8.0	409908			Becoming Yellowish Brown Only Again @ 8.0 ft			
9.0				Becoming More Wet @ 8.8 ft + Med. Stiff To The Bottom Of The MacroCore		1.5	
100							

INSTRUMENT	BACKGROUND	DATE	TIME
PID	0.4	9-25-95	1510
ALPHA	N/A	Oms 4-10-96	
BETA/GAMMA	110	9-25-95	1510

NOTES: N/A Not Applicable
Description From Geoprobe MacroCore
Samples From Macrocore + Auger Cuttings
Bottom of Core @ 10.5'
SAA - Same As Above
Augered Hole Finished @ 10.1' Below Ground Surface

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS/MISC/GEOTECH/LITHO LOG.EPS

JN 4-11-96

200310G2SB98-004

FEMP
LITHOLOGIC LOG

PROJECT NAME:	PROJECT NUMBER:	BORING NUMBER:
Geotechnical Investigation Borrow Areas/OU2 Waste Units	20.03.10	G2-SB-98

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
10.0				SAA			
10.5				Bottom Of Macro Core			

NOTES: Very Difficult Augering From 1.0 To 1.7 ft

JK 4-11-96

Project No: PO-154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-SB-99	Drilling Method: Geoprobe w/augers	Date Started: 09/27/95
Coordinates: N 477,807 E 1,379,552	Engineer: J. Dunlap	Date Completed: 09/27/95
Ground Surface Elevation: 577.9 ft above MSL	GWL/DATE: None 9/27/95	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, brown to brownish yellow, roots, moist, medium stiff, fill, occasional black nodules, fill (CL)	409920	0 - 0.5	B	NA	6	OC
		409921	0.5 - 1.0	B	NA	6	OC
	Some gravel beginning at 0.5 feet up to 3/4 inch in diameter	409922	1.0 - 1.5	B	NA	6	OC
	Broken concrete 2.1 to 2.5 feet	409923	1.5 - 5.0	B	NA	42	MC, GS, SG, AL, CON_{r85}, CU_{r85}, SP
		409924	5.0 - 10.0	B	NA	60	MC, GS, AL, SP, P,
2.5	Lean clay with sand, light yellowish brown mottled with dark yellowish brown, moist, very hard, becoming only dark yellowish brown at 3.1 feet CL Becoming medium stiff to stiff at 6.3 feet						
7.5	Silty lean clay, yellowish brown, moist, stiff CL Iron staining beginning at 8.4 feet						
	Final boring depth = 10.3 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

FEMP LITHOLOGIC LOG

CONTROL NO: 200310G2SB99-003

Page 1 of 2

PROJECT NAME: Geotechnical Investigation Borrow Areas / OU2 Waste Vaults			PROJECT NUMBER: 20.03 10
BORING NUMBER: G2 SB-99	COORDINATES: Refer to Survey Report	RELATED FAL NOs.: 200310G2SB99-002	
SURFACE ELEVATION: Refer to Survey Report	GROUNDWATER LEVEL: None	DATE: 9-27-95 / TIME: 10:30	DATE STARTED: 9-27-95
GEOLOGIST: Engineer J. Dunlap	GROUNDWATER LEVEL: NK	DATE: NK / TIME: NK	DATE COMPLETED: 9-27-95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FERMCO	DRILLING EQUIPMENT: Geoprobe / "Little Beaver" Hyd. Auger	DRILLER/HELPER: W. Neyer / M. Arnett / K. Reynolds

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	0909 9-27-95 409920	N/A	6"/6"	Lean Clay (10YR 4/3) Brown, Moist, Med. Stiff, Fine Roots, Top Soil	CL	0.8	
0.5	0910 9-27-95 409921		6"/6"	Lean Clay w/Gravel (Up to 3/4" Diam, Angular to Sub-Angular) (10YR 4/6) Brownish Yellow, Occasional Black Nodules, w/ Roots, Fill	CL	2.8	
1.0	0912 9-27-95 409922		6"/6"				
1.5							
2.0 / 2.1				Concrete, Broken + Porous			Roots End @ 2.0 ft
3.0 / 3.1	1006 9-27-95			Lean Clay w/Sand (2.5Y 6/3) Lt. Yellowish Brown, Mottled w/ DK. Yellowish Brown, Moist, Very Hard Becoming DK. Yellowish Brown @ 3.1 ft	CL	>>4.0	Hard Augering @ 3.3 ft (Limestone Fragments) ~~Hard Drilling~~ 9.0
4.0	409923 1.5-5' 1006						
5.0							
5.4				5.4 ft Becoming Stiff		1.5	
6.0							
6.3				Sandy Lean Clay (2.5Y 6/3) Lt. Yellowish Brown, Moist (Wet from 6.5 to 6.9 ft), Mottled w/ DK. Yellowish Brown, Med Stiff, ~~Trace Sand~~ 9.0	CL	0.75	
7.0				Becoming Stiff @ 7.3 ft		1.5	
8.0	1025 9-27-95			Silty Lean Clay (10YR 5/6) Yellowish Brown, Moist, Stiff Becoming Mottled w/ Gray @ 8.0 ft Some Iron Staining Beginning @ 8.4 ft	CL	1.5	
9.0	409924 5'-10' 1025			Iron Staining Becoming Heavier @ 9.0 ft To Bottom of Bore Hole And Becomes Very Stiff		3.0	
10.0							

INSTRUMENT	BACKGROUND	DATE	TIME
PID	4.9	9-27-95	0852
ALPHA		NA	
BETA/GAMMA	60	9-27-95	0855

NOTES: N/A - Not Applicable
Description From Geologic Macro Core
Sample: A Composite Of Macro Core & Auger Cuttings
Bottom Of Core @ 10.3 ft Below Ground Surface (BGS)
SAA - Same As Above
Augered To 10.1 ft (BGS)

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*LLUSMISC/GEOTECHLITHO LOG EPS D.D

0-0.5' 5.6
.5-1.0 5.1
1.0-1.5 5.1
1.5-5.0 5.4
5.0-10.0

4/95

200310G2SB99-0004

FEMP
LITHOLOGIC LOG

PROJECT NAME:	PROJECT NUMBER:	BORING NUMBER:
Geotechnical Investigation Borrow Areas/OU2 Waste Units	20.03.10	G2-SB-99

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
10.0				SAA			
10.3				End Of Boring 10.3 ft			

NOTES:

ILLUS\MISC\GEOTECH\LITHO LOG-PG 2.EPS

JK 4-11-96

...ect No: PO-154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-SB-100	Drilling Method: Geoprobe w/augers	Date Started: 09/28/95
Coordinates: N 477,307 E 1,379,382	Engineer: J. Dunlap	Date Completed: 09/28/95
Ground Surface Elevation: 577.4 ft above MSL	GWL/DATE:	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay with sand and gravel up to 1/2 inch in diameter, dark yellowish brown, fine roots, moist, trace brick or clay tile, medium stiff, fill (CL)	409935	0 - 0.5	B	NA	6	OC
		409936	0.5 - 1.0	B	NA	6	OC
1.0	Lean clay with gravel to 3/4 inch in diameter, very dark grayish brown, moist, stiff, pieces of limestone up to 4 inches in diameter, angular, fill CL Limestone stops at 4.0 feet	409937	1.0 - 1.5	B	NA	6	OC
		409938	1.5 - 10.0	B	NA	102	MC, GS, SG, AL, CON_{r85}, UU_{r85}, SP
5.0	Silty lean clay, dark yellowish brown mottled with light olive brown, moist, trace sand, stiff, occasional subgounded gravel to 1.5 inches in diameter, trace concrete, fill, trace brick, CL Metal wire at 7.0 feet						
7.5	Sandy lean clay, olive brown to olive, moist, medium stiff, trace iron slag or bottom ash, trace wood, fill CL						
	Final boring depth = 10.1 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

FEMP LITHOLOGIC LOG

CONTROL NO: 200310G2SB100-002

Page 1 of 1

PROJECT NAME: Geotechnical Investigation Borrow Areas/OU2 Waste Units			PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-100	COORDINATES: See Survey Report	RELATED FAL NOs.: 200310G2SB100-001 thru 012	
SURFACE ELEVATION: See Survey report	GROUNDWATER LEVEL: None	DATE: 9-28-95	TIME: 1355	DATE STARTED: 9-28-95
GEOLOGIST: Engineer J. Dunlap	GROUNDWATER LEVEL: TK/K	DATE:	TIME:	DATE COMPLETED: 9-28-95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FERMCO	DRILLING EQUIPMENT: "Little Beaver" Hyd. Auger	DRILLER/HELPER: W Neyer / D. Smith	

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors Identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
.5	1316 9-28-95 409935	N/A	N/A	Lean Clay w/Sand & Gravel (Up to 1/2" Dia, Subangular) (10YR 4/4) Dk. Yellowish Brown, Fine Roots, Moist, Trace Red Drainage Tile, Top Soil, Med. Stiff	CL	N/A	Consistency Estimated
1.0	1319 9-28-95 409936		N/A			N/A	
1.5	1322 9-28-95 409937		N/A	Lean Clay w/Gravel (10YR 3/2) Very Dk. Grayish Brown, Gravel Subangular Up to 3/4" Dia, Moist, Stiff, Fill Pieces Of Limestone Up to 4" In Diam, Angular	CL	N/A	Consistency Estimated
2.0			N/A	SAQ		N/A	
3.0	1358 9-28-95 409938						
4.0				@ 4.0 ft + Limestone Pieces Stop			
5.0			N/A	Silty Lean Clay (10YR 4/6) Dk. Yellowish Brown, Mottled w/ Lt. Olive Brown, Moist, Trace Sand, Stiff, Occasional Subrounded Gravel Up To 1.5" Dia, Trace Concrete, Fill @ 5.0 ft	CL	N/A	Consistency Estimated
6.0				Trace Red Brick or Tile @ 6.5 ft			
7.0				Having More Gravel @ 6.8 ft + (Subrounded to Subangular, Up to 2" Dia), Trace Metal Wire @ 7.0 ft			
7.5				Sandy Lean Clay (2.5Y 4/3) Olive Brown, Moist, Med Stiff, Occasional Black Nodules, Trace Black Brass Material (Fly ash or Iron Slag?) Fill	CL	N/A	Consistency Estimated
8.0				Becoming (5Y 4/4) Olive w/ Trace Wood @ 8.0 ft			
9.0				Becoming Mottled w/ Greenish Gray @ 9.0 ft Having more Plasticity			
10.0				Bottom Of Boring 10.1 ft			

INSTRUMENT	BACKGROUND	DATE	TIME
PID	0.6	9-28-95	1312
ALPHA			
BETA/GAMMA			

NOTES: N/A - Not Applicable
Description From Auger Cuttings
Samples From Auger Cuttings
No Consistency Measurements Taken, Because Can't Use Penetrometer On Cuttings
Boring Offset 6" North by Northeast

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*LL/SVR/ECG/GEOTECH/LITHO LOG.EPS

LB Screening Smpls. #409939 (1.3' → 1.3') @ 1400 hrs & #409940 (9' → 9') @ 1402 hrs

JN 4-11-96

...ct No: PO-154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-SB-101	Drilling Method: Geoprobe w/augers	Date Started: 09/27/95
Coordinates: N 477,703 E 1,379,805	Engineer: J. Dunlap	Date Completed: 09/27/95
Ground Surface Elevation: 568.0 ft above MSL	GWL/DATE: None 9/27/95	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay with gravel up to 2 inches in diameter and rounded to subangular, brown, moist, stiff, fine roots, fill (CL)	409927	0 - 0.5	B	NA	6	OC
		409928	0.5 - 1.0	B	NA	6	OC
		409929	1.0 - 1.5	B	NA	6	OC
1.5	Lean clay with trace sand, dark yellowish brown, moist, very stiff, mottled with gray, occasional black nodules, fine roots CL Roots stop at 2.5 feet Becoming hard at 3.6 feet	409930	1.5 - 10.0	B	NA	102	MC, GS, AL, P,, SP
...3	Lean clay, light olive brown, mottled with gray, moist, hard, occasional iron staining and black nodules, CL Few gravel beginning at 7.5 feet up to 1/2 inch in diameter, subrounded						
9.5	Fat clay with silt, greenish gray, moist to wet, very stiff (CH)						
	Final boring depth = 10.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

4-1-96

FEMP
LITHOLOGIC LOG

CONTROL NO: 200310G2SB101-003

PROJECT NAME: Geotechnical Investigation Borrow Areas / OU2 Waste Piles			PROJECT NUMBER: 20.03 10
BORING NUMBER: G2-SB-101	COORDINATES: SEE Survey map	RELATED FAL NOs.: 200310G2SB101-002	
SURFACE ELEVATION: SEE Survey map	GROUNDWATER LEVEL: None	DATE: 9 27 95	TIME: 1510	DATE STARTED: 9-27-95
GEOLOGIST: Engineer J. Dunlap	GROUNDWATER LEVEL: N/K	DATE: N/K	TIME: N/K	DATE COMPLETED: 9-27-95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FERMCO	DRILLING EQUIPMENT: Geoprobe/ "Little Beaver" Hyd. Auger	DRILLER/HELPER: ~~[illegible]~~ W. Neyer / K. Reynolds	

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
.5	1305 9-27-95 409927	N/A	6"/6"	Lean Clay, Trace Gravel (Up to 3/8" Dia, Angular) (10YR 4/3) Brown, Moist, Stiff, w/ Fine Roots, Top Soil	CL	1.25	1-6" Macrocore 2-6" 1" Dia. Cores
1.0	1306 9-27-95 409928		6"/6"	Becoming w/ Gravel (Up to 1" Dia, Subangular to Subrounded) @ 0.6ft			1-6" Macrocore 2-6" -1" Dia. Cores
1.5	1307 9-27-95 409929		6"/6"	Large Rounded Gravel Up to 2" Dia @ .8 ~~[illegible]~~ 4-10-96			1-6" Macrocore 2-6" -1" Dia. Cores
2.0				Lean Clay, Trace Sand (10YR 4/6) DK. Yellowish Brown, Moist, Very Stiff, Mottled w/ Gray, Occasional Black Nodules, Trace Fine Roots	CL	4.0	
3.0				Roots Stop @ 2.5'			
3.3				Becoming Stiff @ 3.3 ft		1.8	
3.7				Becoming Hard @ 3.6 ft		4.5	
4.0							
5.0							
5.8 6.0	1307 9-27-95			Lean Clay (2.5Y 5/6) Lt. Olive Brown Mottled w/ Gray, Moist, Hard, Occasional Iron Staining + Black Nodules	CL	4.5	
7.0	409930			@ 7.5ft Few Gravel (Up to 1/2" Dia, Subrounded)			@ 7.2ft Begin 1" Core
8.0							
9.0				Fat Clay w/ Silt (10Y 5/1) Greenish Gray, Moist to wet, Very Stiff Bottom Of Geoprobe Core @ 10.0ft	CH	3.0	

INSTRUMENT	BACKGROUND	DATE	TIME
PID	1.6	9-27-95	1305
ALPHA	N/A		
BETA/GAMMA	60	9-27-95	1303

NOTES: N/A - Not Applicable
Descriptions From MacroCore to 7.2ft + From 1" Core to BOTTOM Of Cored Hole
Samples From MacroCore + Auger Cuttings
Boring Offset 2 Ft. West

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

ILLUSTRATOR/GEOTECHLITHO LOG.EPS

JK 4-11-96

ct No: PO-154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-SB-102	Drilling Method: Geoprobe w/augers	Date Started: 09/27/95
Coordinates: N 477,451 E 1,379,655	Engineer: J. Dunlap	Date Completed: 09/28/95
Ground Surface Elevation: 576.1 ft above MSL	GWL/DATE: None 9/28/95	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay with sand and gravel up to 1 inch in diameter and subangular to subrounded, yellowish brown, dry, very hard, fill, fine roots, (CL)	409931	0 - 0.5	B	NA	6	OC
		409932	0.5 - 1.0	B	NA	6	OC
		409933	1.0 - 1.5	B	NA	6	OC
	Becoming moist and stiff at 1.5 feet	409934	1.5 - 10.0	B	NA	102	MC, GS, AL, SP, P,
1.7	Lean clay with sand and gravel up to 1 inch in diameter and subangular, dark grayish brown, moist, fine roots, hard, occasional black nodules, fill, GC Roots stop at 5.0 feet						
.4	Sandy lean clay, olive brown, moist, hard, trace gravel up to 1 inch in diameter, mottled with yellow brown, occasional black nodules and iron staining, some broken pieces of limestone, fill, GC						
8.0	Fat clay with silt and sand, dark gray, moist, medium stiff, trace round gravel up to 1/2 inch in diameter, trace wood and black nodules, fill (CH)						
	Final boring depth = 10.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

FEMP
LITHOLOGIC LOG

CONTROL NO: 20031062SB102-0003

Page 1 of 1

PROJECT NAME: Geotechnical Investigation Borrow Areas / OU2 Waste Units					PROJECT NUMBER: 20.03.10
BORING NUMBER: G2 SB 102	COORDINATES: See Survey Reports	RELATED FAL NO.: 2003106 2SB102-001 Line C13			
SURFACE ELEVATION: See Survey Report	GROUNDWATER LEVEL: None	DATE: 9-28-95	TIME: 10:48	DATE STARTED: 9-27-95	
GEOLOGIST: Engineer Sims + Dan J Dunlap	GROUNDWATER LEVEL: None	DATE: N/A	TIME: N/A	DATE COMPLETED: 9-28-95	
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FERMCO	DRILLING EQUIPMENT: Geoprobe / "Little Brewer" Hyd Auger		DRILLER/HELPER: W. Neyer / D. Smith / K. Reynolds	

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0	1615 409931	N/A	6"	Lean Clay w/Sand & Gravel (Up to 1" Dia, Sub Angular to Sub Rounded) (10 YR 5/4) Yellowish Brown, Dry, Very Hard, w/Fine Roots, Top Soil	CL	>4.5	Sample Combination Of Geoprobe Core & Auger Cuttings
5	1616 409932		6"				Sample Combination Of Geoprobe Core & Auger Cuttings
10	1617 409933		6"				Sample Combination Of Geoprobe Core & Auger Cuttings
15				Becoming Moist @ 1.5ft & Stiff		2.0	
1.7							
2.0				Lean Clay w/Sand & Gravel (Up to 1" Dia, Sub Angular) (10YR 4/2) Dk. Grayish Brown, moist, Fine Roots, Hard, Occasional Black Nodules, Fill	CL	4.25	Difficult Augering to 8.0 ft Due To Large Amounts of Gravel & Rock. The Difficulty Was Due To Large Pieces Of Gravel From 0-5.0 ft BGS Binding Up Between Auger & Wall Of Borehole
3.0							
4.0							
4.8	0945						
5.0	1045 9-28-95			Sandy Lean Clay (2.5 Y 4/3) Olive Brown, Moist, Hard, Trace Gravel (Up To 1", Sub Rounded), Mottled w/ Yellowish Brown, Trace Iron Staining, Occasional Black Nodules, Occasional Broken Pieces Of Limestone, Fill	CL	4.25	Fine Roots Stop @ 5.0 ft
5.4	409934						
6.0				Becoming Very Stiff @ 6.5ft		3.5	
7.0							
8.0				Fat Clay w/Silt & Sand (5Y 4/1) Dark Gray, Moist, Mod Stiff, Trace Round Gravel (Up to 1/2" Dia), Trace Wood, Fill, Some black Nodules.	CH	0.7	
9.0				Becoming Mottled w/ olive Brown @ 9.5ft			
10.0				End Of Core 10.0 ft			Very Tip Of Last Core Has Brown Silt On It

INSTRUMENT	BACKGROUND	DATE	TIME
PID	N/A	OMS	
ALPHA	N/A		
BETA/GAMMA	40	9-27-95	1610

NOTES: N/A - Not Applicable
Description From 1" Geoprobe Cores
Samples From 1" Dia Geoprobe Cores & Auger Cuttings
Augered Boring To ~~10.0~~ 10.14
BGS Below Ground Surface

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

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4-11-96 α β screening samples 1634 hrs #409935 (4.5'→5') & #409936 (8'-8.5') 1647 hrs

4-11-96

Project No: PO-154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-SB-103	Drilling Method: Little Beaver Hyd. Auger	Date Started: 09/06/95
Coordinates: N 477,226 E 1,379,824	Engineer: K. Ernst	Date Completed: 09/06/95
Ground Surface Elevation: 572.8 ft above MSL	GWL/DATE: Dry 9/6/95	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. *Colors identified using Munsell Color Chart. Consistency based on Standard* Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Silty sand (ash), black, coal fragments (1/4 inch to 3/8 inch), dry, no plasticity, SM	409805	0 - 0.5	B	NA	NA	OC
		409806	0.5 - 1.0	B	NA	NA	OC
		409807	1.0 - 1.5	B	NA	NA	OC
		409808	1.5 - 10.0	B	NA	NA	MC, GS, SG, AL, CON_{r85}, UU_{r85}, SP, Rel. Density
	Final boring depth = 10.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

FEMP
LITHOLOGIC LOG

CONTROL NO: 2003 10G2SB03-003

Page 1 of 1

PROJECT NAME: Geotechnical Investigation Borrow Areas/OU2 Waste Units					PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-103	COORDINATES: See Survey Report	RELATED FAL NOs.: 2C0310G2SB103-001 thru C/2			
SURFACE ELEVATION: See Survey Report	GROUNDWATER LEVEL: Dry	DATE: 6 Sep 95	TIME: 1015	DATE STARTED: 6 Sept 95	
GEOLOGIST: Engineer: K. Ernst	GROUNDWATER LEVEL: N/A	DATE:	TIME:	DATE COMPLETED: 6 Sept 95	
WATER USED DURING DRILLING: None	DRILLING CONTRACTOR: FERMCO	DRILLING EQUIPMENT: Gilmle Beaver Hyd. Pwr. Auger		DRILLER/HELPER: B. Nayer/K. Reynolds	

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.0	0947, 9-6-95, 409805	N/A	N/A	Silty Ash, Black (7.5YR 2.5/1), Some coal fragments (1/4" to 3/8" typical), dry, no plasticity.	SM	N/A	Ground surface PID = 8.0 ppm B,G = 90 cpm @ 0941
	0950, 9-6-95, 409806						
1.0	~~0953, 9-6-95~~ 1012, 409807						
	1003, 9-6-95, 409808						- Augered up piece of plastic 6" (garbage bag material) @ ~18" down
2.0							
3.0							
	(10-gal can of black ash material; 1.5-10')						
4.0				SAA			Very easy augering 0 to 4'
5.0							very easy augering 4-7.5' & 7.5-10'
6.0							1010: Missed 1-1.5 Sample -- offset auger 6" east of 10' 12" hole to collect 1-1.5' sample. Material description is the same as for 10' hole. 1" piece of plastic seen (garbage bag, black)
7.0							
8.0							
9.0							
10.0				Bottom of Boring = 10'			

INSTRUMENT	BACKGROUND	DATE	TIME
PID	6.6 ppm	6 Sep 95	0940
ALPHA	-	-	-
BETA/GAMMA	50 cpm	6 Sep 95	0938

NOTES: Visual Description is from Auger Cuttings. Samples are auger cuttings.
SAA = Same as Above
4" diameter auger
N/A = Not Applicable

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

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Project No: PO-154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-SB-104	Drilling Method: Little Beaver Hyd. Auger	Date Started: 09/05/95
Coordinates: N 477,301 E 1,380,091	Engineer: K. Ernst/J. Dunlap	Date Completed: 09/05/95
Ground Surface Elevation: 588.6 ft above MSL	GWL/DATE: None 9/5/95	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Silty sand (ash), black, with porous slag gravel up to 1 inch in diameter, some coal, dry, no plasticity, SM	409801	0 - 0.5	B	NA	NA	OC
		409802	0.5 - 1.0	B	NA	NA	OC
	Gravel decreases with depth	409803	1.0 - 1.5	B	NA	NA	OC
		409804	1.5 - 10.0	B	NA	NA	MC, GS, SG, AL, P,, SP, Rel. Density
	Final boring depth = 10.0 feet						
	*Note: USCS Symbols in parentheses indicate visual classification Coordinates are NAD 1927						

FEMP
LITHOLOGIC LOG

CONTROL NO: 200310G2SB104-004

Page 1 of 1

PROJECT NAME: Geotechnical Investigation Borrow Areas/OU2 Waste Units

PROJECT NUMBER: 20.03.10

BORING NUMBER: G2-SB-104

COORDINATES: See Survey Report

RELATED FAL NOs.: 200310G2SB104-001 thru 013

SURFACE ELEVATION: See Survey Report

GROUNDWATER LEVEL: None — DATE: 9/5/95 — TIME: 14:15

DATE STARTED: 9/5/95

GEOLOGIST: Engineer J. Dunlap / K. Ernst

GROUNDWATER LEVEL: N/A — DATE: — TIME:

DATE COMPLETED: 9/5/95

WATER USED DURING DRILLING: None

DRILLING CONTRACTOR: FERMCO

DRILLING EQUIPMENT: Hand Auger

DRILLER/HELPER: B. Neyer / D. Smith

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.0	13:49; 9/5/95, 409801	N/A	6"	Silty Ash (2.5/N) Black with Porous Slag/Gravel, some Coal, No Plasticity, Up To 1" Subangular Gravel, Dry	SM		Some Small Roots To ~8"
.5	13:49; 9/5/95, 409802	N/A	6"				
1.0	13:51; 9/5/95, 409803	N/A	6"				Note for Lab: Some Plant Matter In 1.5-10' sample That Was Accidentally Placed In Bucket. Plant From The Surface Vegetation
1.5				Decreasing Gravel w/Depth			
2.0							
3.0							
4.0							
5.0				0-6" PID 5.7 BG 50 cpm 6"-12" PID 5.9 12"-18" PID 9.4 1.5'-10' PID 10.2			
6.0	14:10; 9/5/95, 409804 (10-gal can) (1.5-10')						
7.0							
8.0							
9.0							
10.0				Bottom Of Boring 10.0'			

INSTRUMENT	BACKGROUND	DATE	TIME
PID			
ALPHA			
BETA/GAMMA			

NOTES: Visual Descriptions are of auger cuttings. Samples are auger cuttings.

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

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ect No: PO-154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-SB-105*	Drilling Method: Geoprobe w/augers	Date Started: 09/26/95
Coordinates:	Geologist: R. Nicks/D. Melancon	Date Completed: 09/26/95
Ground Surface Elevation:	GWL/DATE:	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [ASTM Symbol]	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
	Composite sample of auger cuttings between 0 and 1.5 feet from Borings G2-BS-91 through G2-SB-94	409982	0 - 1.5	B	NA	NA	CON_{85}, SP
	*Administrative identification only; not actually a shallow boring location.						

FEMP
LITHOLOGIC LOG

CONTROL NO:

Page 1 of 1

PROJECT NAME: Geotechnical Investigation Borrow Areas/OU2 Waste Units			PROJECT NUMBER: 20 03 10
BORING NUMBER: G2-SB-105	COORDINATES: N/A	RELATED FAL NOs.:	
SURFACE ELEVATION:	GROUNDWATER LEVEL:	DATE:	TIME:	DATE STARTED: 9/26/95
GEOLOGIST: R. Nicks / Melancon	GROUNDWATER LEVEL:	DATE:	TIME:	DATE COMPLETED: 9/28/95
WATER USED DURING DRILLING:	DRILLING CONTRACTOR: FERMCO	DRILLING EQUIPMENT: GEOPROBE	DRILLER/HELPER: GROB	

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				G2-SB-105 is not actually a separate borehole but rather a composite bulk sample from ~~G2-SB-~~ the 0.0-1.5 ft interval from borings G2-SB-91 through G2-SB-94.			

INSTRUMENT	BACKGROUND	DATE	TIME
PID			
ALPHA			
BETA/GAMMA			

NOTES:

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

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ct No: PO-154	Project Title: Geotechnical Investigation OU2 Waste Units	
Boring No. G2-SB-106*	Drilling Method: Geoprobe w/augers	Date Started: 09/25/95
Coordinates:	Engineer:	Date Completed: 09/25/95
Ground Surface Elevation:	GWL/DATE: None 9/28/95	Page 1 of 1

Notes: Samples collected per ASTM D 1586 and ASTM D 1587. Colors identified using Munsell Color Chart. Consistency based on Standard Penetration Resistance Value. Screening readings are in units above background levels. Soils visual description per ASTM D 2488 and soil classification per ASTM D 2487. Soil descriptions interpreted from field logs and laboratory results.
SS = Split-spoon Sample ST = Shelby Tube Sample

Depth (ft)	Description [ASTM Symbol]	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
	Composite sample of auger cuttings between 0 and 1.5 feet from Borings G2-BS-96, G2-SB-99, G2-SB-100, and G2-SB-102	409915	0 - 1.5	B	NA	NA	CON_{r85}, SP
	*Administrative identification only; not actually a shallow boring location.						

FEMP
LITHOLOGIC LOG

CONTROL NO:

Page 1 of 1

PROJECT NAME: Geotechnical Investigation Borrow Areas/OU2 Waste Units			PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-106	COORDINATES:	RELATED FAL NOs.:	
SURFACE ELEVATION:	GROUNDWATER LEVEL: None	DATE: 9-28-95	TIME:	DATE STARTED: 9-25-95
GEOLOGIST: Engineer J. Duilap	GROUNDWATER LEVEL:	DATE:	TIME:	DATE COMPLETED: 9-28-95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FERMCO	DRILLING EQUIPMENT: Geoprobe/ "Little Beaver" Hyd. Auger	DRILLER/HELPER: W. Neyer/ D. Smith / K. Reynolds

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	9-28-95 409915			This Boring Is Actually A Composite Of Auger Cuttings From G2-SB-96, G2-SB-99, G2-SB-100 And G2-SB-102 From Depths Of 0.0 to 1.5ft Below The Ground Surface.			

INSTRUMENT	BACKGROUND	DATE	TIME
PID			
ALPHA			
BETA/GAMMA			

NOTES: N/A - Not Applicable

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

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APPENDIX D

MODAL DIAMETER TESTS

FIELD PROCEDURE FOR DETERMINATION OF MODAL DIAMETER TESTING*

1. Expose each soil sample as received from the field to air at room temperature until dried thoroughly, but no more than seven (7) days. Lightly break up the aggregations in a mortar with a rubber-covered pestle **(DO NOT GRIND SAMPLE)**. Remove any rocks larger than about 1 cm in average physical diameter.

2. Prepare a nest of sieves with the following openings: 4 mm, 2 mm, 1 mm, 0.5 mm, and 0.25 mm. Place a collector pan below the bottom sieve (0.25 mm opening). Determine the mass of each sieve and the pan prior to preparing the nest of sieves.

3. Determine the original mass of the sample.

4. Pour the sample into the top sieve (4 mm opening), and place a lid on the top.

5. Rotate the covered sieve/pan unit by hand using broad sweeping arm motions in the horizontal plane. Complete 20 rotations at a speed just necessary to achieve some relative horizontal motion between the sieve and the particles.

6. Determine the mass of each fraction. The sum of the masses retained on all the sieves used should equal closely the original mass of the quantity sieved.

Note: Use a balance sensitive to at least 0.01 g for determining the mass of each sieve, pan, and sample fraction.

* Adapted from a field procedure published in the EPA document (EPA/600/8-85/002), "Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites" (page 23).

MODAL DIAMETER TESTING

Sample Number: 200194632
Customer Number: 410300
Batch Number: Sieve-95-060

Material: Soil

Boring No:	G2-164
Sample No:	410300
Sample Depth:	2.0-6.0 ft

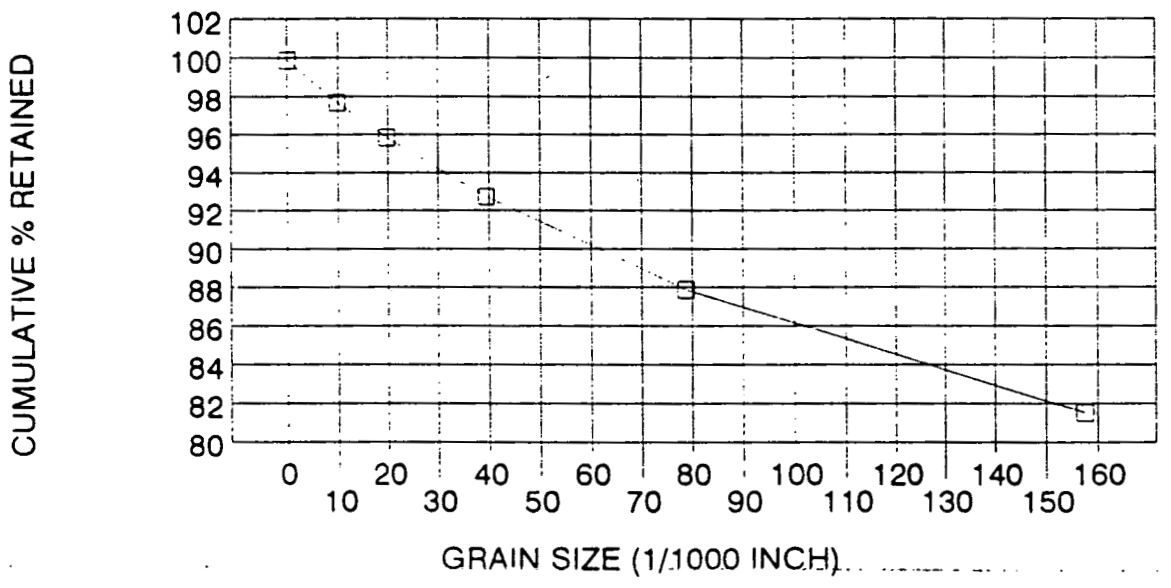
Sample Weight: 1726.88 grams

Balance Calibration: Actual 300.00 Measured 300.00 grams

Actual 10.00 Measured 10.00 grams

Sieve Number	Weight (g) Retained	% Retained	Cumulative % Retained	Grain Size 1/1000 inch	Comments
4 mm	1407.74	81.52	81.52	157.5	
2 mm	109.54	6.34	87.86	78.7	
1 mm	84.24	4.88	92.74	39.4	
0.5mm	53.52	3.10	95.84	19.7	
0.25 mm	31.69	1.84	97.67	9.8	
Pan	37.51	2.17	99.85	---	

SIEVE ANALYSIS
200194632



Grain Size Retained			Name	Date
40%	157.5	Analyzed By:	H.J.VOLK	12/28/95
50%	157.5	Checked By:	DBeagle	12-29-95
90%	61	Approved By:	DBeagle	12-29-95

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MODAL DIAMETER TESTING

Sample Number: 200194633
Customer Number: 410303
Batch Number: Sieve-95-060

Material: Soil

Boring No:	G2-164
Sample No:	410303
Sample Depth:	6.0-10.0 ft

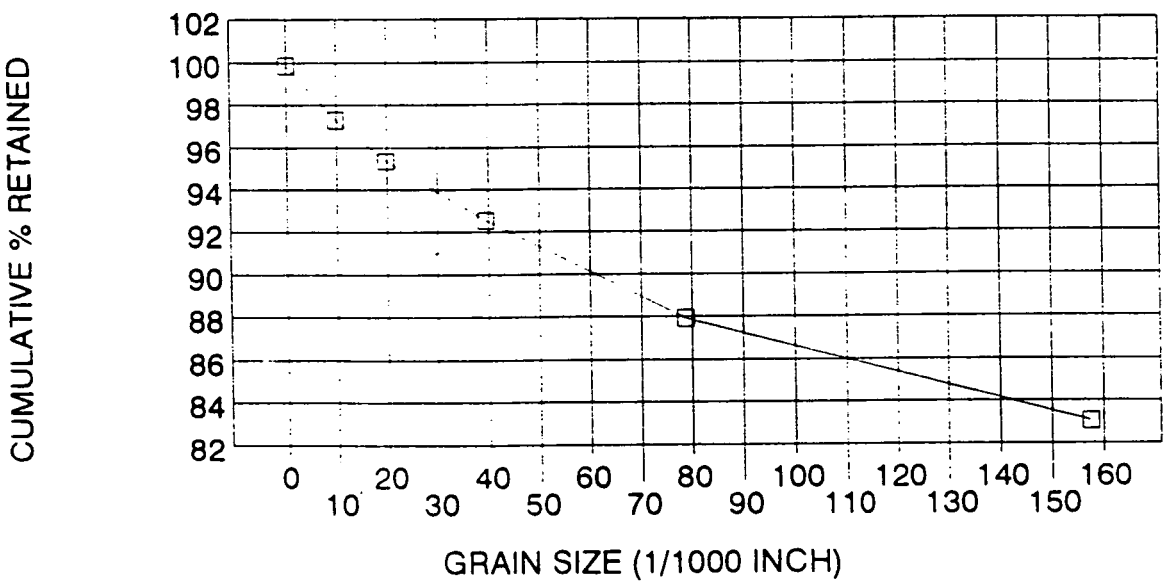
Sample Weight: 1707.39 grams

Balance Calibration: Actual 300.00 Measured 300.00 grams

Actual 10.00 Measured 10.00 grams

Sieve Number	Weight (g) Retained	% Retained	Cumulative % Retained	Grain Size 1/1000 inch	Comments
4 mm	1418.29	83.07	83.07	157.5	
2 mm	83.07	4.87	87.93	78.7	
1 mm	78.15	4.58	92.51	39.4	
0.5mm	48.51	2.84	95.35	19.7	
0.25 mm	33.43	1.96	97.31	9.8	
Pan	43.58	2.55	99.86	---	

SIEVE ANALYSIS
200194633



Grain Size Retained			Name	Date
40%	>157.5	Analyzed By:	H.J.VOLK	12/28/95
50%	>157.5	Checked By:	[illegible]	12-29-95
90%	61	Approved By:	[illegible]	12-29-95

File: G:EPM\SIEVE8

000380

MODAL DIAMETER TESTING

Sample Number: 200194634
Customer Number: 410305
Batch Number: Sieve-95-060

Material: Soil

Boring No:	G2-164
Sample No:	410305
Sample Depth:	10.0-14.0 ft

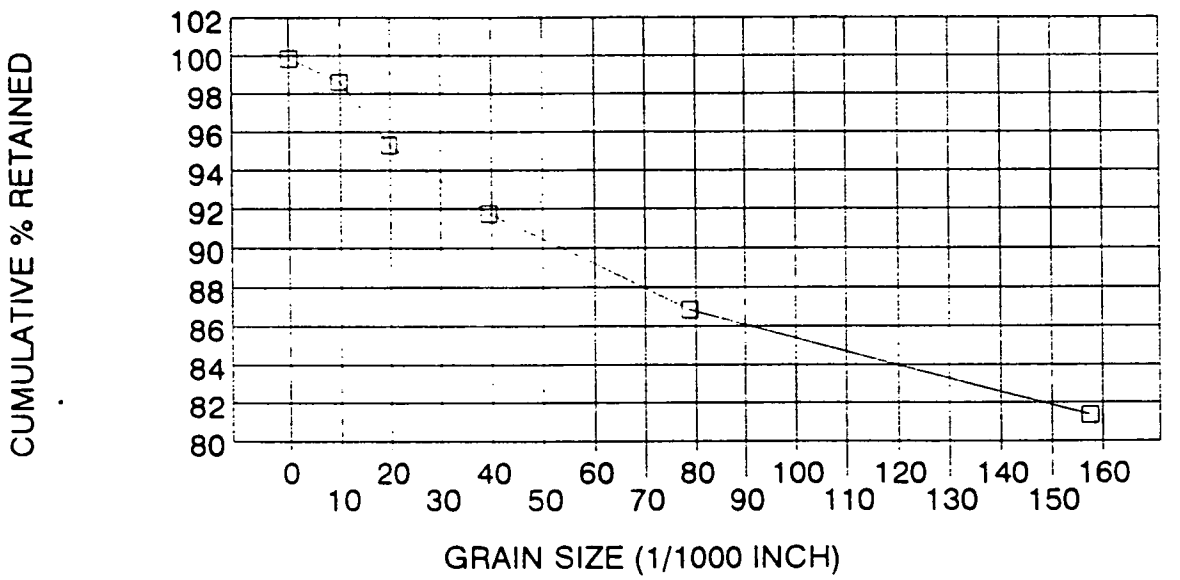
Sample Weight: 1713.46 grams

Balance Calibration: Actual 300.00 Measured 300.00 grams

Actual 10.00 Measured 10.00 grams

Sieve Number	Weight (g) Retained	% Retained	Cumulative % Retained	Grain Size 1/1000 inch	Comments
4 mm	1394.17	81.37	81.37	157.5	
2 mm	94.17	5.50	86.86	78.7	
1 mm	83.79	4.89	91.75	39.4	
0.5mm	61.35	3.58	95.33	19.7	
0.25 mm	56.07	3.27	98.60	9.8	
Pan	20.75	1.21	99.82	---	

SIEVE ANALYSIS
200194634



Grain Size Retained			Name	Date
40%	7157.5	Analyzed By:	H.J.VOLK	12/28/95
50%	7157.5	Checked By:	[illegible]	12-29-95
90%	53	Approved By:	[illegible]	12-29-95

File: G:EPMSIEVE8

MODAL DIAMETER TESTING

Sample Number: 200194635
Customer Number: 410555
Batch Number: Sieve–95– 060

Material: Soil

Boring No:	G2-169
Sample No:	410355
Sample Depth:	2.0-6.0 ft

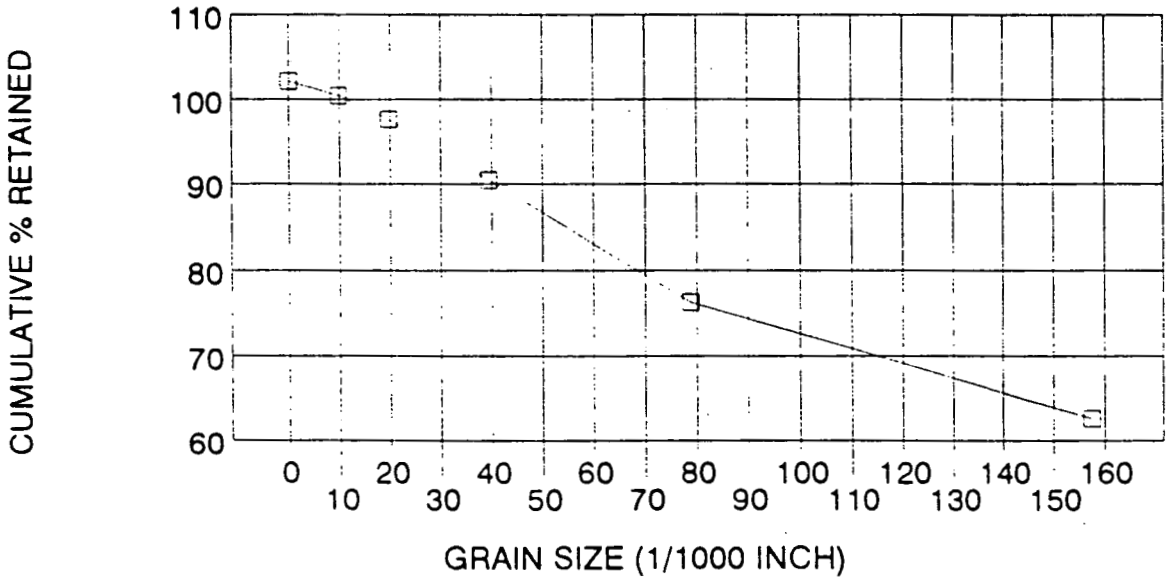
Sample Weight: 1646.17 grams

Balance Calibration: Actual 300.00 Measured 300.00 grams

Actual 10.00 Measured 10.00 grams

Sieve Number	Weight (g) Retained	% Retained	Cumulative % Retained	Grain Size 1/1000 inch	Comments
4 mm	1029.35	62.53	62.53	157.5	
2 mm	226.88	13.78	76.31	78.7	
1 mm	232.59	14.13	90.44	39.4	
0.5mm	118.61	7.21	97.65	19.7	
0.25 mm	46.58	2.83	100.48	9.8	
Pan	27.70	1.68	102.16	---	

SIEVE ANALYSIS
200194635



Grain Size Retained			Name	Date
40%	>157.5	Analyzed By:	H.J.VOLK	12/28/95
50%	>157.5	Checked By:	[illegible]	12-29-95
90%	41	Approved By:	[illegible]	12-29-95

File: G:\EPM\SIEVE8

000382

MODAL DIAMETER TESTING

Sample Number: 200194636
Customer Number: 410556
Batch Number: Sieve-95-060

Material: Soil

Boring No:	G2-169
Sample No:	410356
Sample Depth:	6.0-10.0 ft

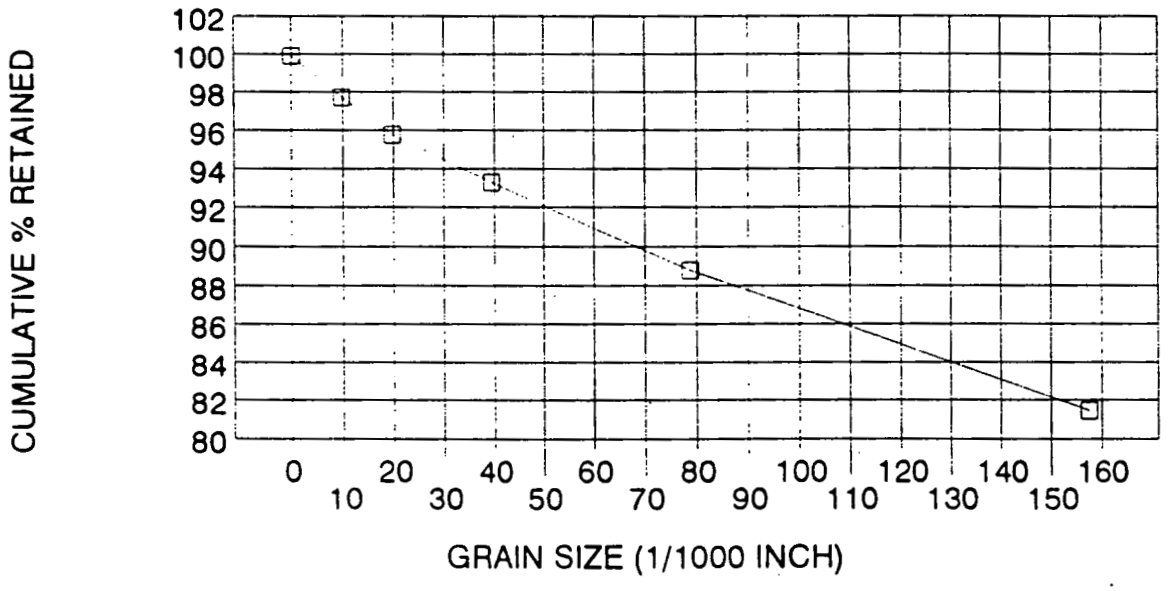
Sample Weight: 1547.25 grams

Balance Calibration: Actual 300.00 Measured 300.00 grams

Actual 10.00 Measured 10.00 grams

Sieve Number	Weight (g) Retained	% Retained	Cumulative % Retained	Grain Size 1/1000 inch	Comments
4 mm	1260.54	81.47	81.47	157.5	
2 mm	112.91	7.30	88.77	78.7	
1 mm	69.95	4.52	93.29	39.4	
0.5mm	38.49	2.49	95.78	19.7	
0.25 mm	29.94	1.94	97.71	9.8	
Pan	33.63	2.17	99.88	---	

SIEVE ANALYSIS
200194636



Grain Size Retained			Name	Date
40%	157.5	Analyzed By:	H.J.VOLK	12/28/95
50%	157.5	Checked By:	[illegible]	12-29-95
90%	68	Approved By:	[illegible]	12-29-95

File: G:EPMSIEVE8

MODAL DIAMETER TESTING

Sample Number: 200194637
Customer Number: 410557
Batch Number: Sieve-95-060

Material: Soil

Boring No:	G2-169
Sample No:	410367
Sample Depth:	10.0-14.0 ft

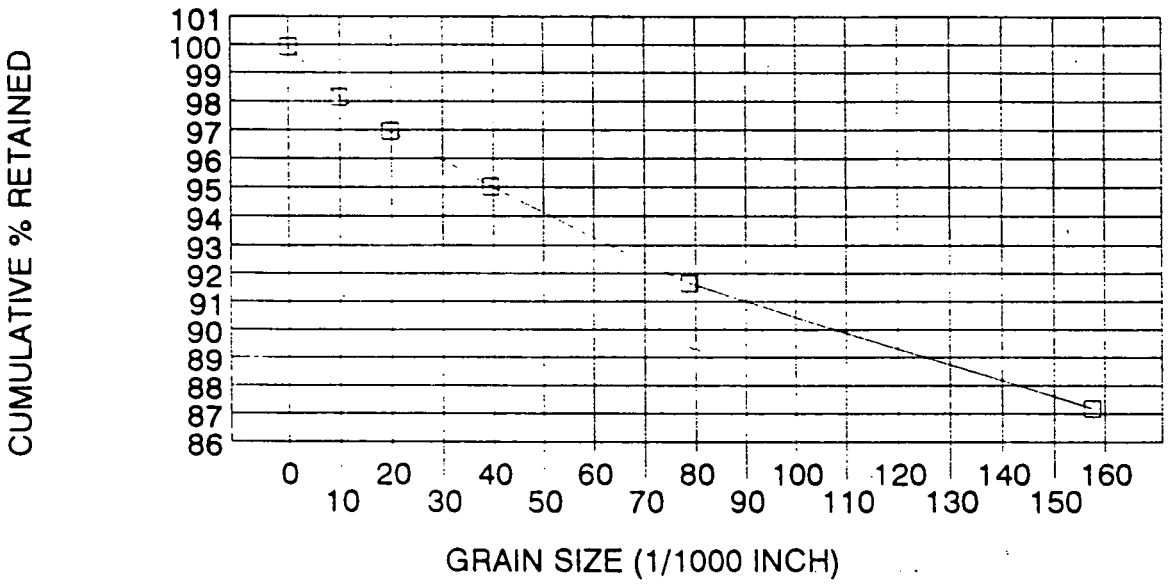
Sample Weight: 1598.05 grams

Balance Calibration: Actual 300.00 Measured 300.00 grams

Actual 10.00 Measured 10.00 grams

Sieve Number	Weight (g) Retained	% Retained	Cumulative % Retained	Grain Size 1/1000 inch	Comments
4 mm	1393.10	87.17	87.17	157.5	
2 mm	71.61	4.48	91.66	78.7	
1 mm	53.61	3.35	95.01	39.4	
0.5mm	31.17	1.95	96.96	19.7	
0.25 mm	19.23	1.20	98.16	9.8	
Pan	28.21	1.77	99.93	---	

SIEVE ANALYSIS
200194637



Grain Size Retained			Name	Date
40%	157.5	Analyzed By:	H.J.VOLK	12/28/95
50%	157.5	Checked By:	B Bright	12-29-95
90%	108	Approved By:	BB Bright	12-29-95

File: G:\EPM\SIEVE8

000381

APPENDIX E

COMPACTION CURVES

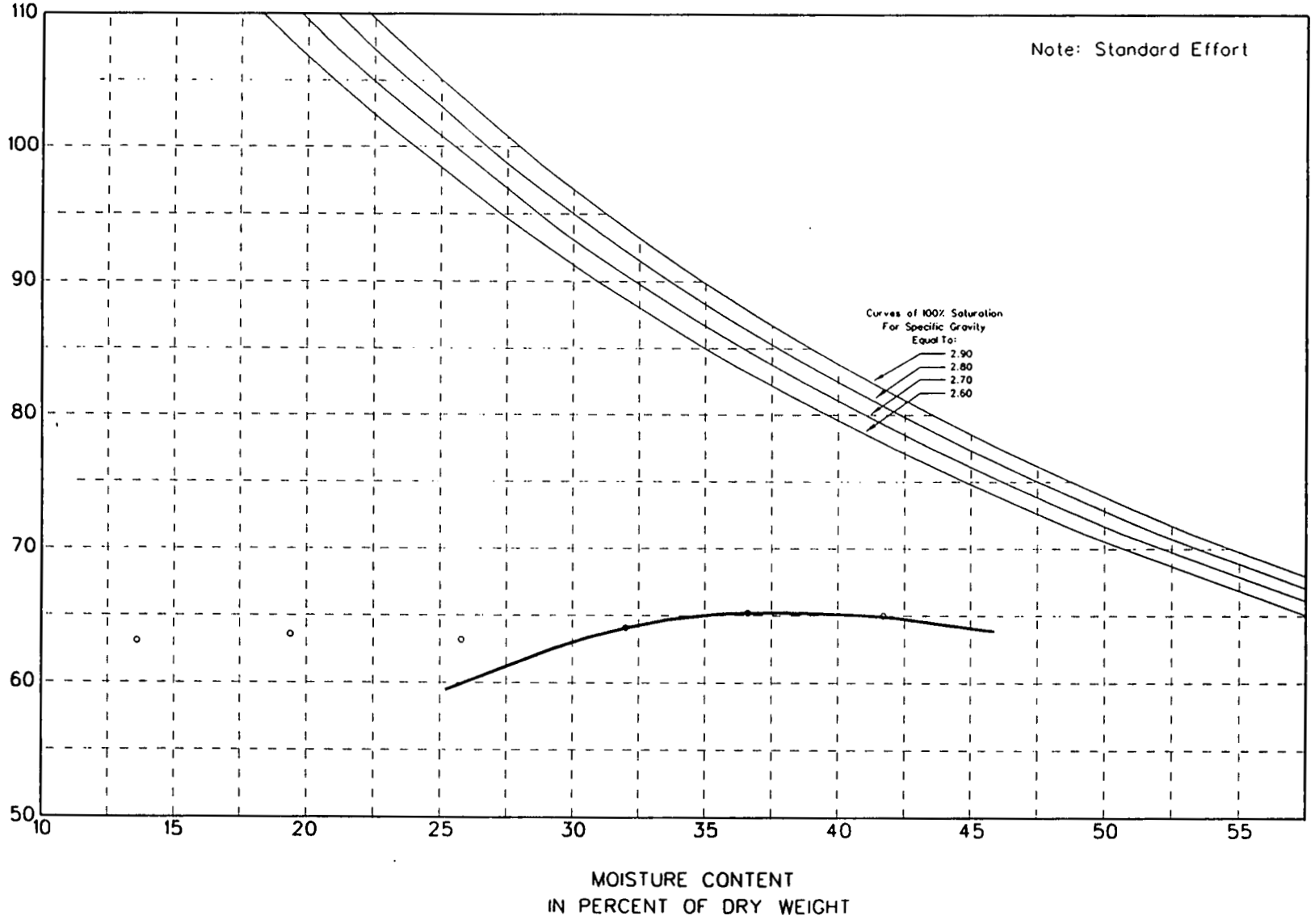
Boring: G2-SB-91 Sample Number: 410000 Depth: 1.5-10.0 ft

Description: Ash (Black Silty Sand) [SM]

Optimum Moisture Content: 38.5% Maximum Dry Density: 65.3 lbs/ft^3

Specific Gravity: 2.24 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/24/95



FILE:/USR/REF2/OU2/PO154/DGN/BMP/410000C.DGN (SKX04156)

000386

287

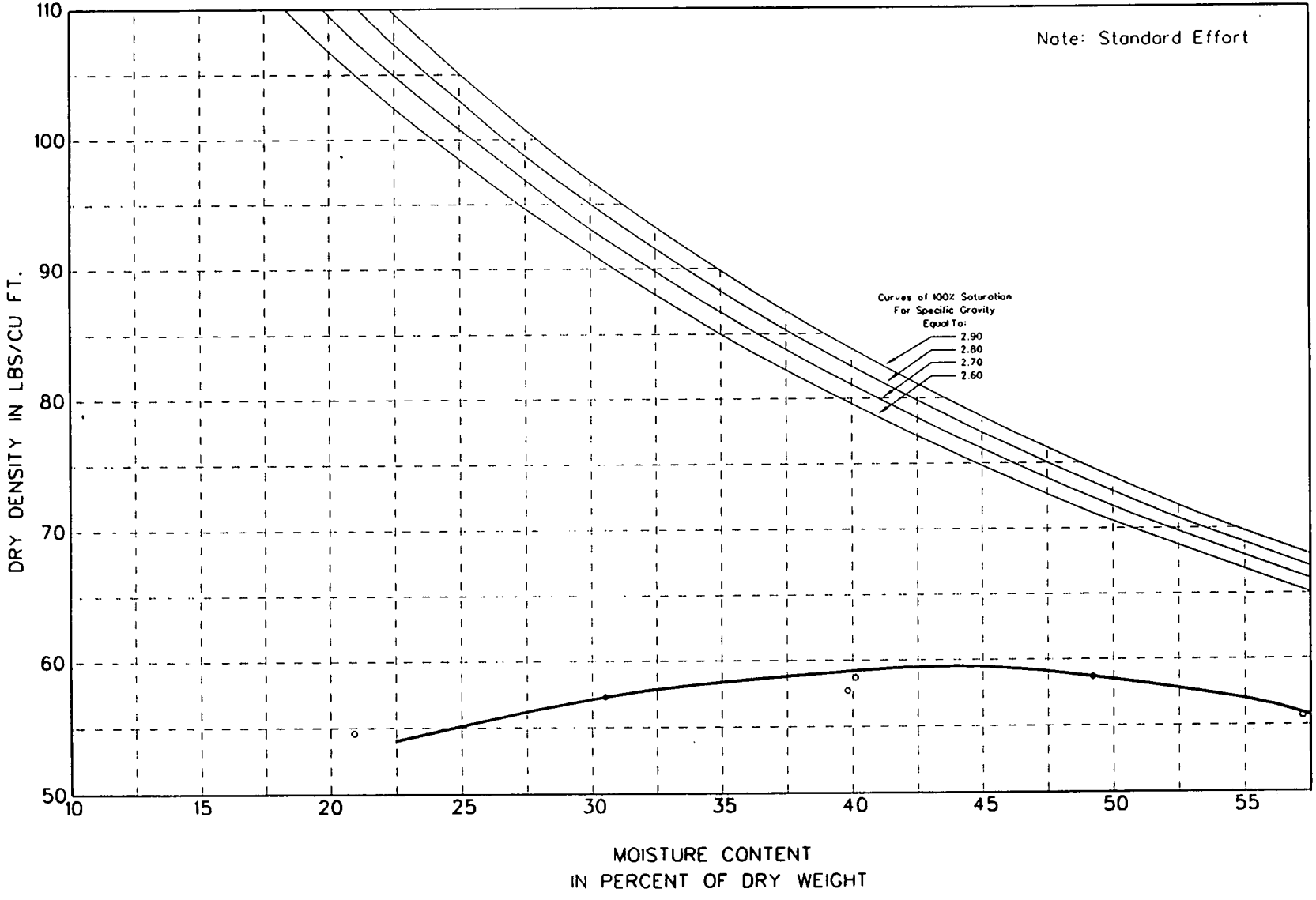
Boring: G2-SB-92 Sample Number: 409996 Depth: 1.5-10.0 ft

Description: Ash (Black Silty Sand) [SM]

Optimum Moisture Content: 45.2% Maximum Dry Density: 59.0 lbs/ft^3

Specific Gravity: 2.23 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/22/95



FILE:/USR/REF2/OU2/PO154/DGN/BMP/409996C.DGN (SKX04155)

000387

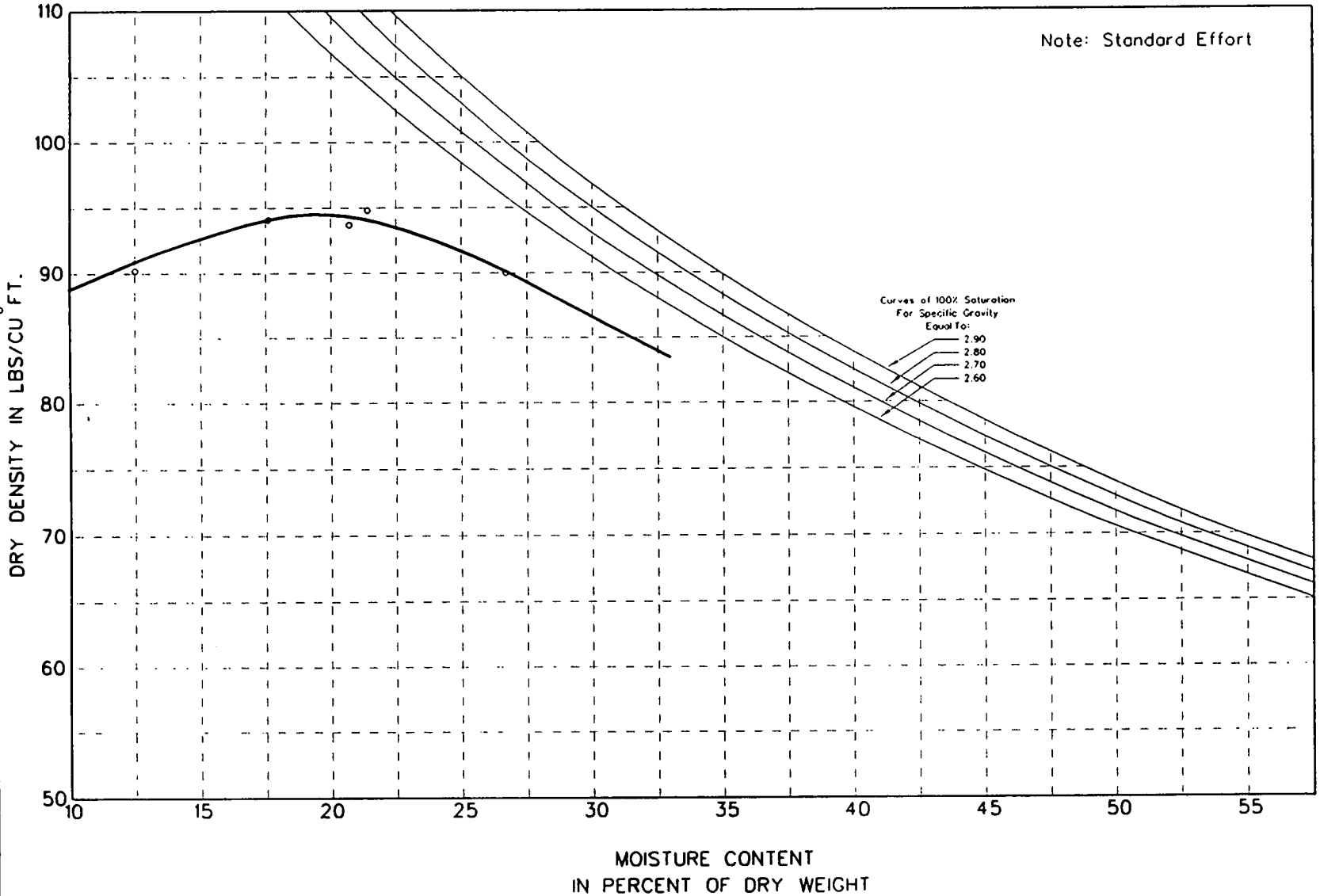
Boring: G2-SB-91,92,93,94 Sample Number: 409982 Depth: 0.0-1.5 ft

Description: Black Ash and Clay (Visual)

Optimum Moisture Content: 19.5% Maximum Dry Density: 94.7 lbs/ft^3

Specific Gravity: 2.50 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/24/95



FILE:/USR/REF2/QU2/PO154/PO154/DGN/BMP/409982C.DGN (SKIX04152)

000388

287

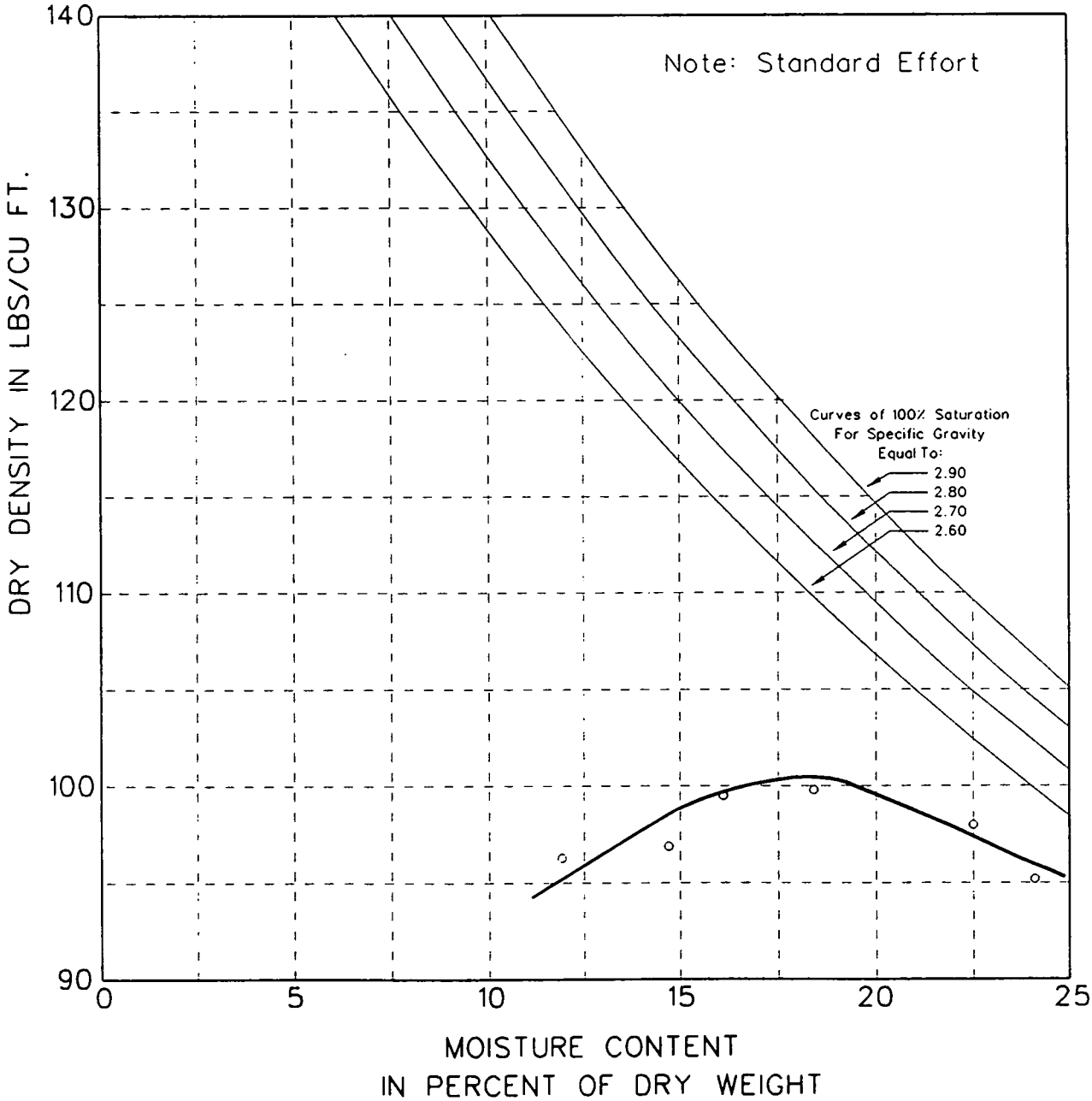
Boring: G2-SB-93 Sample Number: 409991 Depth: 1.5-7.0 ft

Description: Light Olive Brown Lean Clay with Sand (Fill) [CL]

Optimum Moisture Content: 18.2% Maximum Dry Density: 100.5 lbs/ft^3

Specific Gravity: 2.58 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/24/95



FILE:/USR/REF2/0U2/P0154/P0154/DGN/BMP/409999C.DGN (SK:104154)

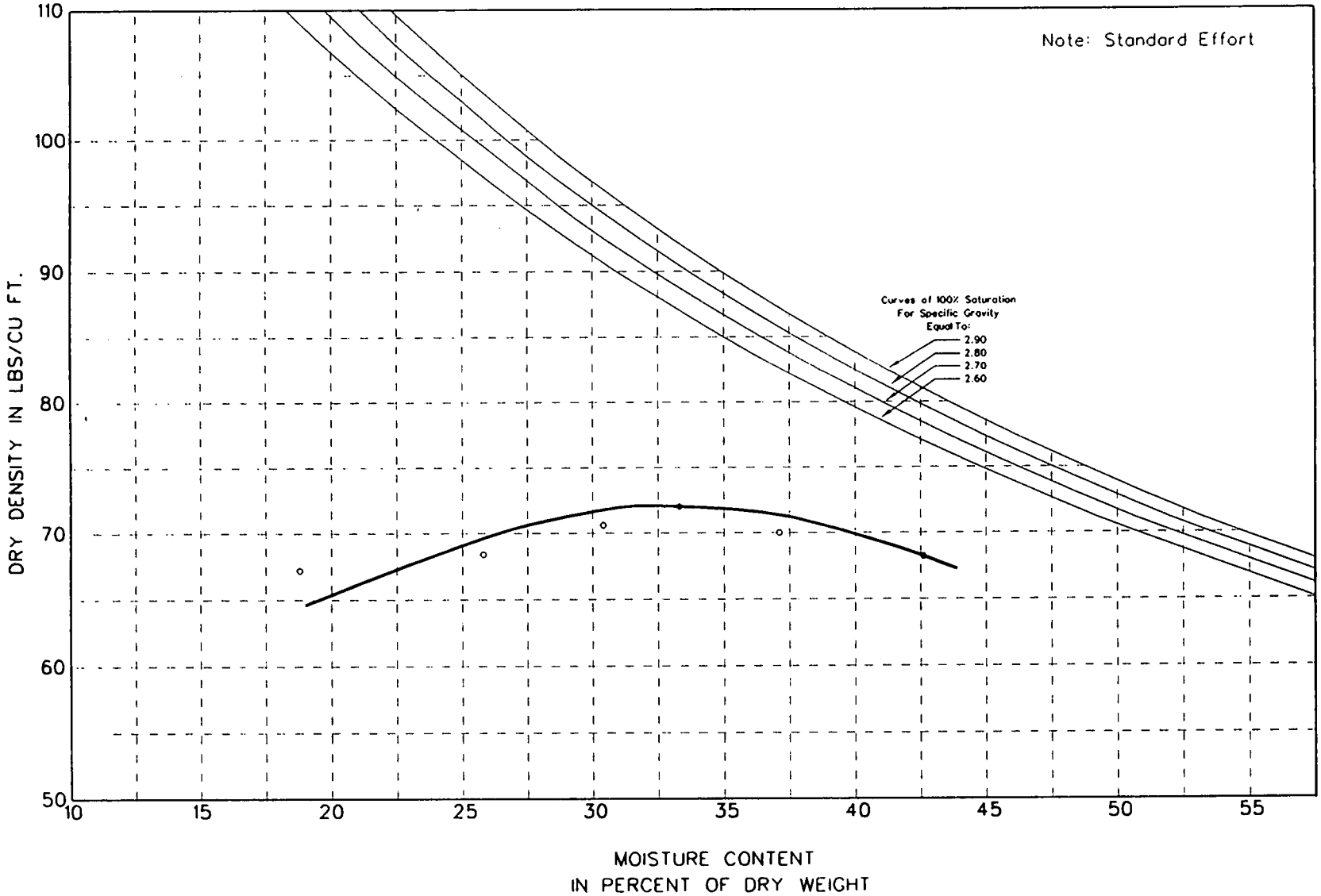
Boring: G2-SB-94 Sample Number: 409987 Depth: 1.5-7.0 ft

Description: Ash (Black Silty Sand with Gravel) [SM]

Optimum Moisture Content: 33.3% Maximum Dry Density: 72.0 lbs/ft^3

Specific Gravity: 2.24 Compaction Method: ASTM D 698 Method B

Lab: Advanced Terra Testing, Inc. Date Tested: 10/20/95



FILE:/USR/REF2/OU2/PO154/PO154/DGN/BMP/409987C.DGN (SKX04153)

000390

1 287

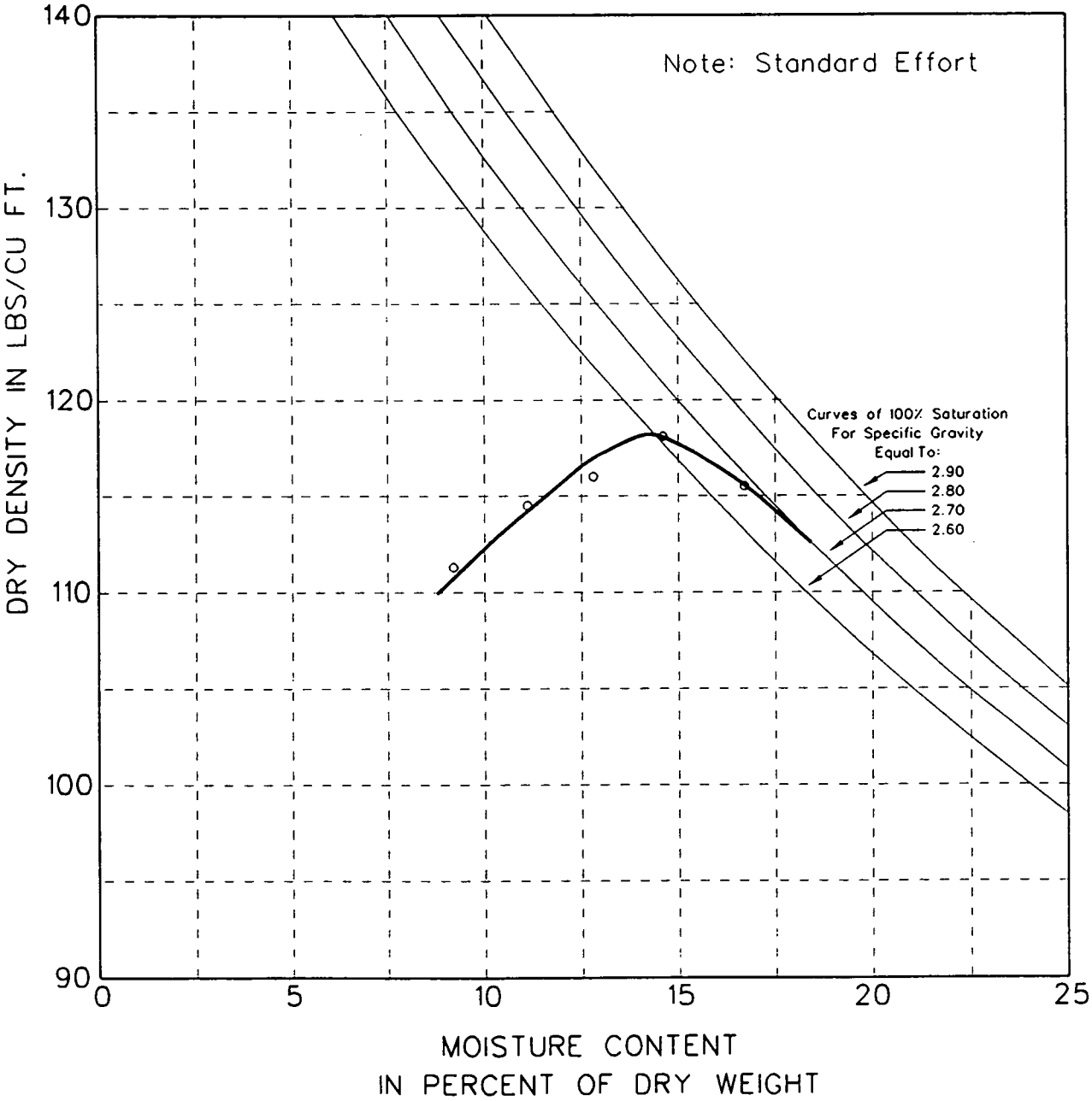
Boring: G2-SB-95 Sample Number: 409898 Depth: 1.5-5.0 ft

Description: Light Brownish Gray Lean Clay [CL]

Optimum Moisture Content: 14.3% Maximum Dry Density: 118.2 lbs/ft^3

Specific Gravity: 2.74 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/05/95



FILE:/USR/REF2/OU2/P0154/P0154/DGN/BMP/409898C.DGN (SKX04141)

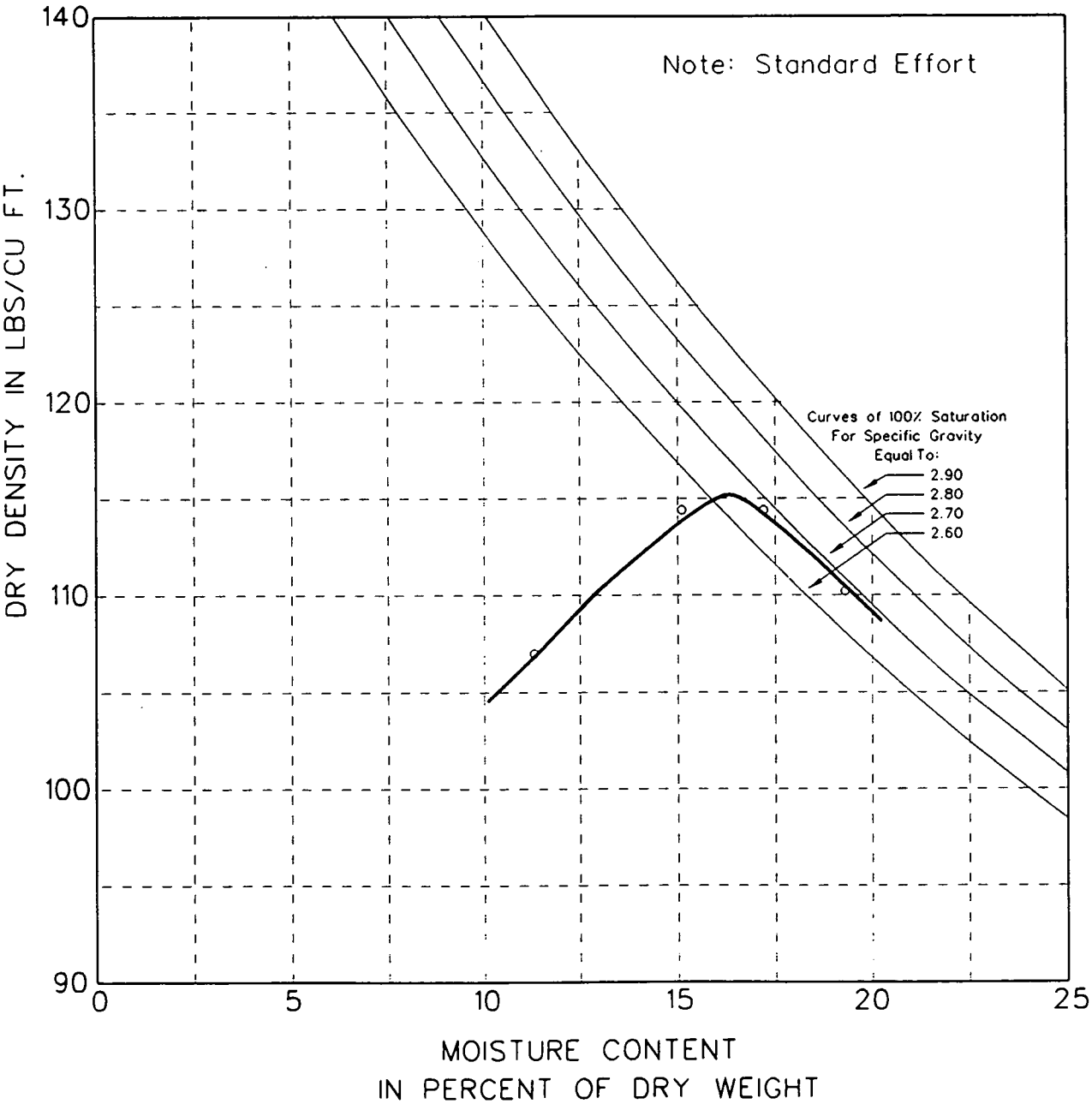
Boring: G2-SB-96 Sample Number: 409903 Depth: 1.5-5.0 ft

Description: Dark Yellowish Brown Lean Clay (Fill) [CL]

Optimum Moisture Content: 16.3% Maximum Dry Density: 115.2 lbs/ft^3

Specific Gravity: 2.75 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/05/95



FILE:/USR/REF2/002/P0154/DGN/BMP/409903C.DGN (SKK04142)

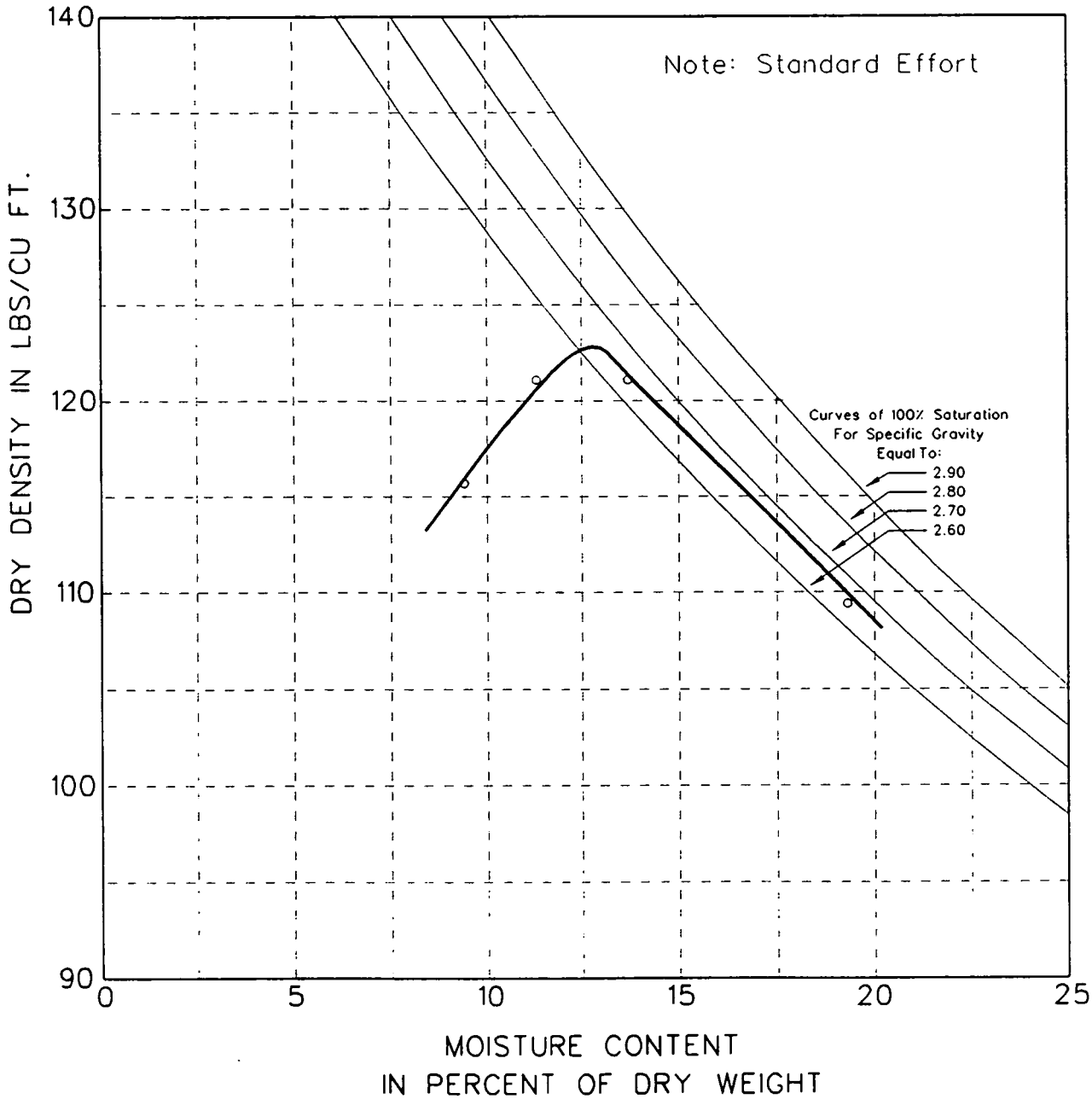
Boring: G2-SB-96 Sample Number: 409904 Depth: 5.0-10.0 ft

Description: Dark Yellowish Brown Lean Clay (Fill) [CL]

Optimum Moisture Content: 12.8% Maximum Dry Density: 122.8 lbs/ft^3

Specific Gravity: 2.72 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/05/95



FILE:/USR/REF2/002/P0154/DGN/BMP/409904C.DGN (SK:X0414.3)

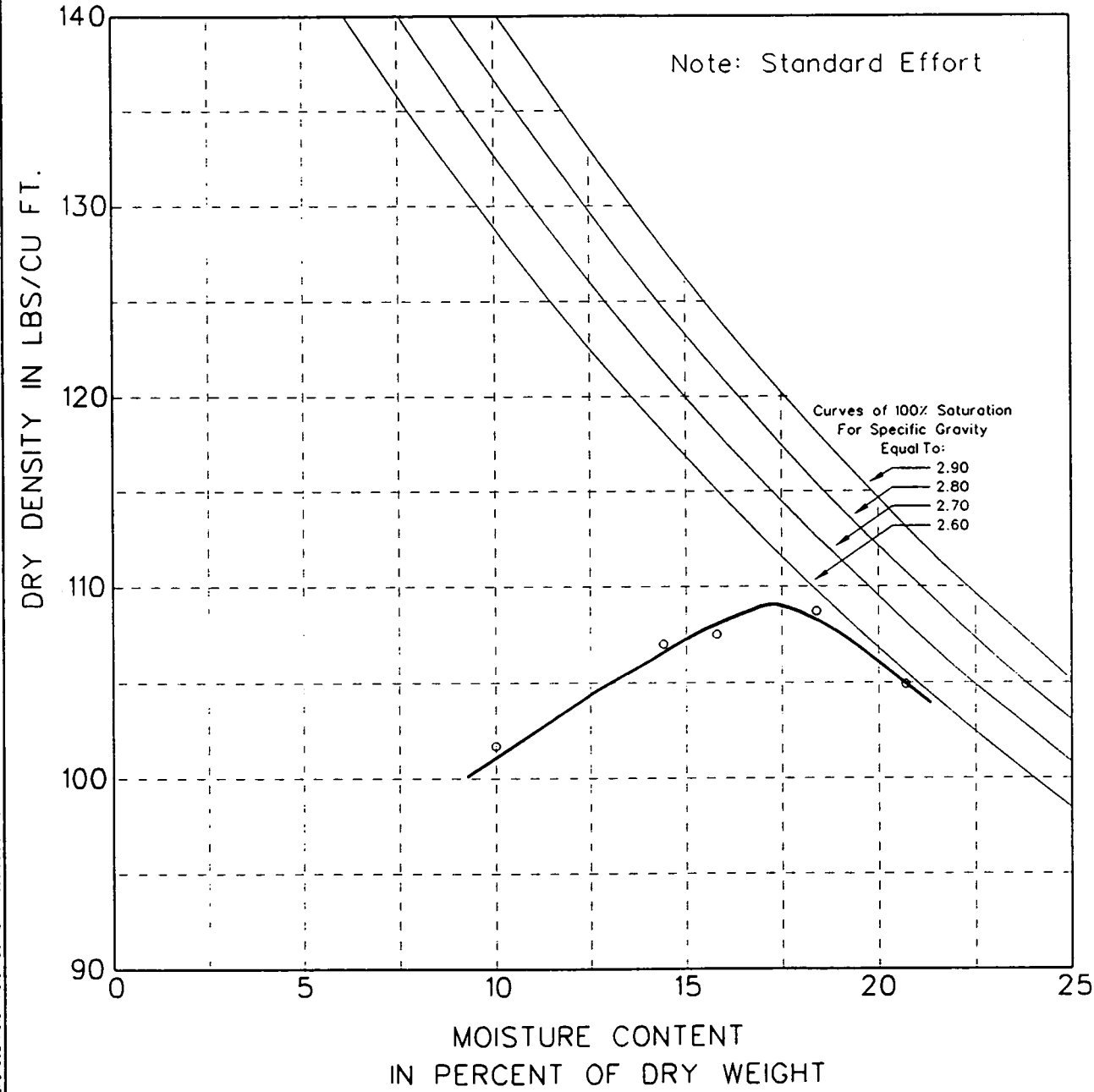
Boring: G2-SB-96 -99-100-102 Sample Number: 409915 Depth: 0.0-1.5 ft

Description: Yellowish Brown Lean Clay (Visual)

Optimum Moisture Content: 17.2% Maximum Dry Density: 109.0 lbs/ft^3

Specific Gravity: 2.77 Compaction Method: ASTM D-698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/05/95



REF:/USR/REF2/002/P0154/DGN/BMP/409915C.DGN (SKX04146)

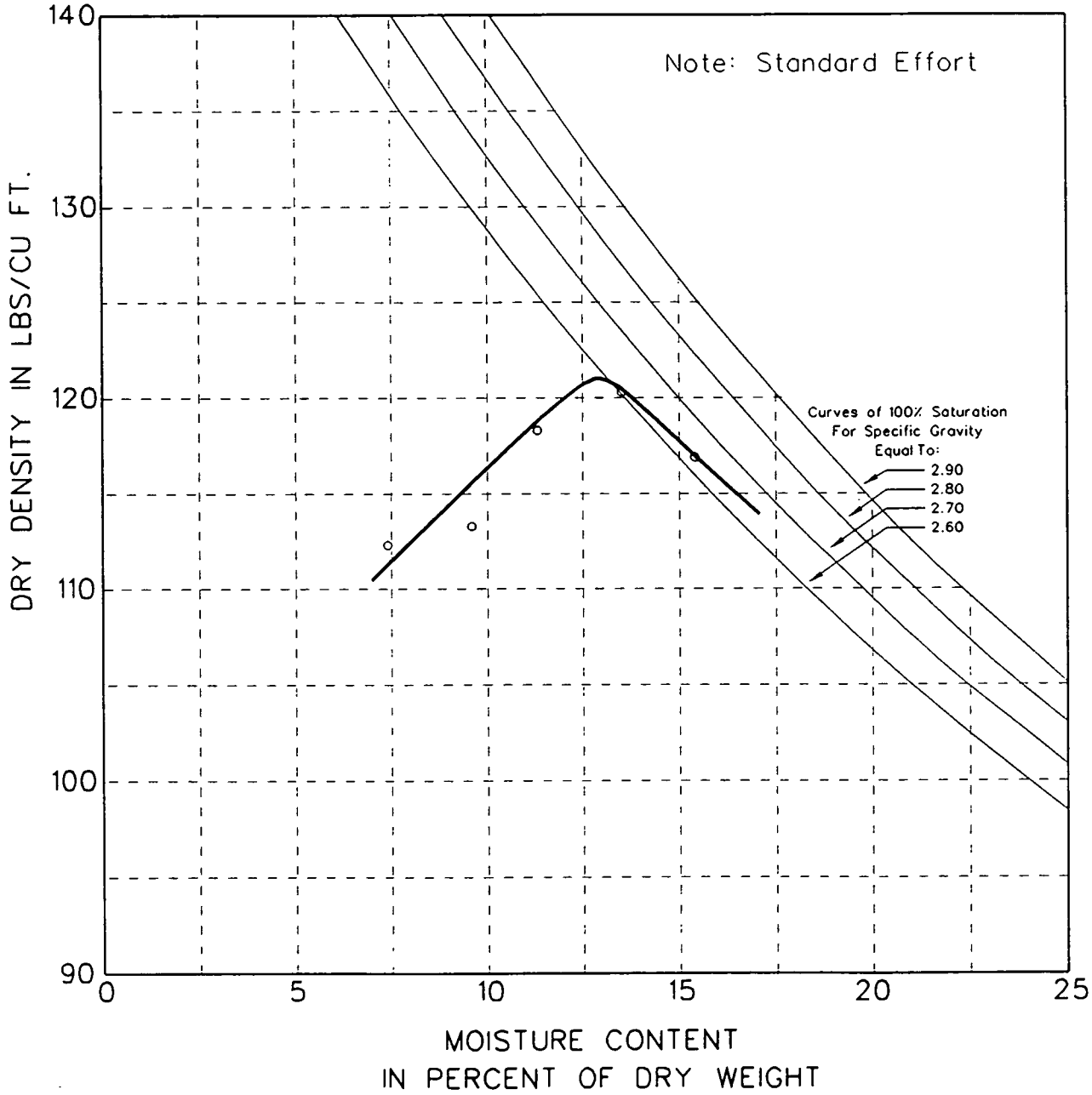
Boring: G2-SB-97A Sample Number: 409912 Depth: 1.5-10.0 ft

Description: Dark Yellowish Brown Sandy Lean Clay (Fill) [CL]

Optimum Moisture Content: 12.9% Maximum Dry Density: 121.0 lbs/ft^3

Specific Gravity: 2.70 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/05/95



USR/REF2/OU2/P0154/DGN/BMP/409912C.DGN (SRX04145)

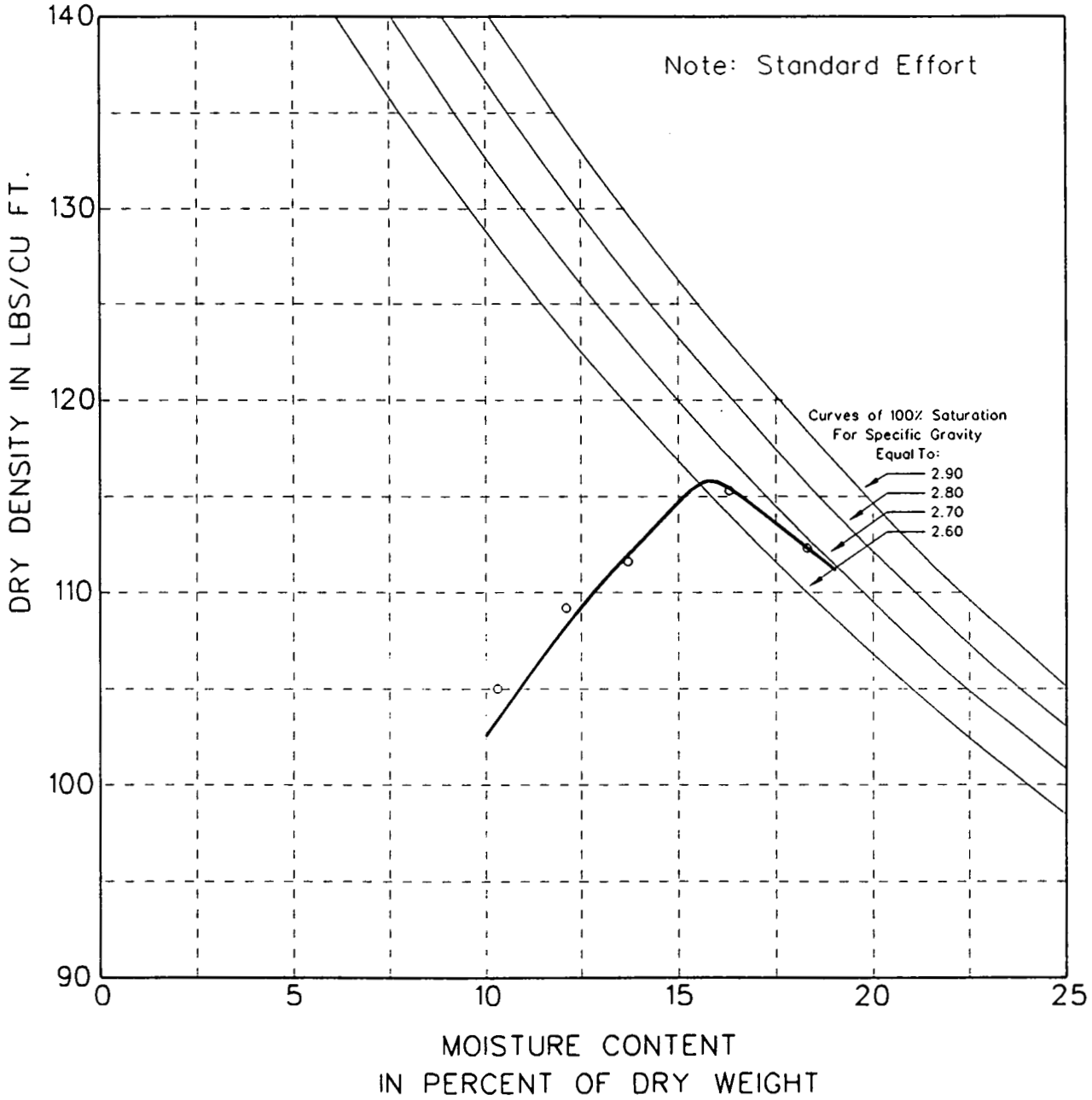
Boring: G2-SB-98 Sample Number: 409908 Depth: 1.5-10.0 ft

Description: Yellowish Brown Lean Clay [CL]

Optimum Moisture Content: 15.8% Maximum Dry Density: 115.8 lbs/ft^3

Specific Gravity: 2.75 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/05/95



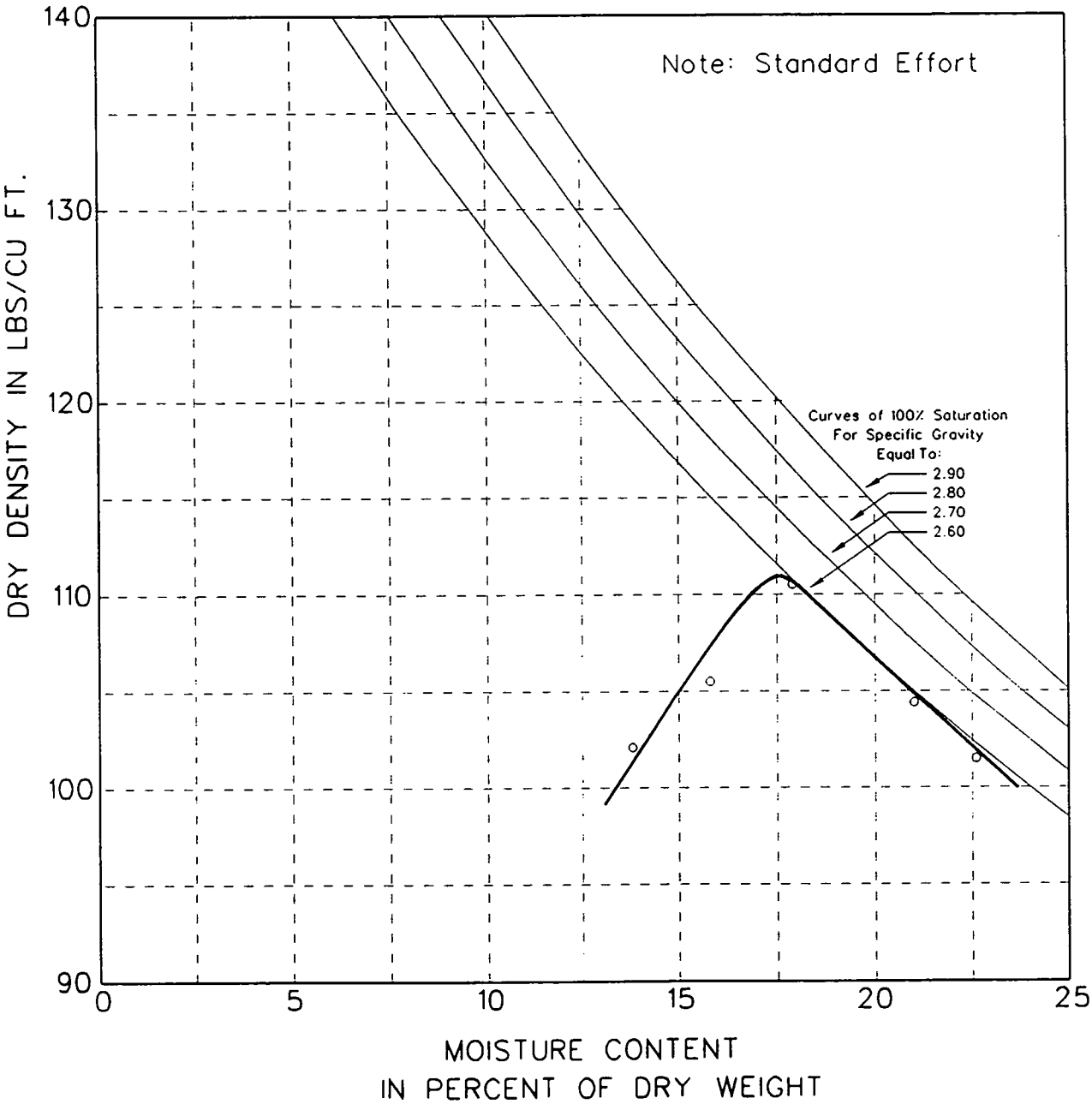
Boring: G2-SB-99 Sample Number: 409923 Depth: 1.5-5.0 ft

Description: Light Yellowish Brown Lean Clay with Gravel (Fill) [CL]

Optimum Moisture Content: 17.5% Maximum Dry Density: 110.8 lbs/ft^3

Specific Gravity: 2.67 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/05/95



FILE:/USR/REF2/QUC/PC154/PD154/DGN/BMP/409923C.DGN (SK:K04147)

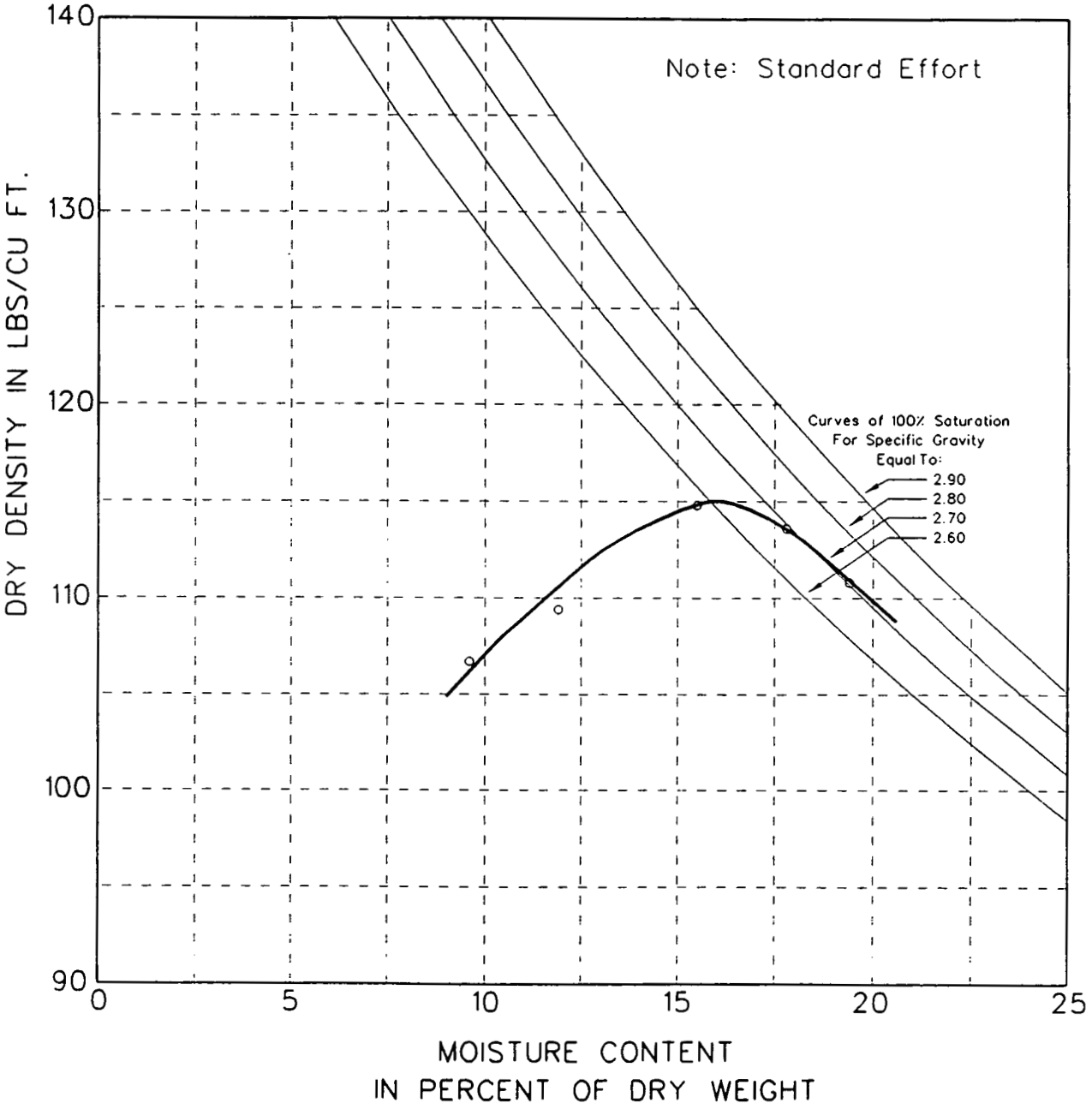
Boring: G2-SB-99 Sample Number: 409924 Depth: 5.0-10.0 ft

Description: Yellowish Brown Lean Clay [CL]

Optimum Moisture Content: 16.0% Maximum Dry Density: 115.0 lbs/ft^3

Specific Gravity: 2.81 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/05/95



FILE:/USR/REF2/OU2/PO154/DGN/BMP/409924C.DGN (SKX04148)

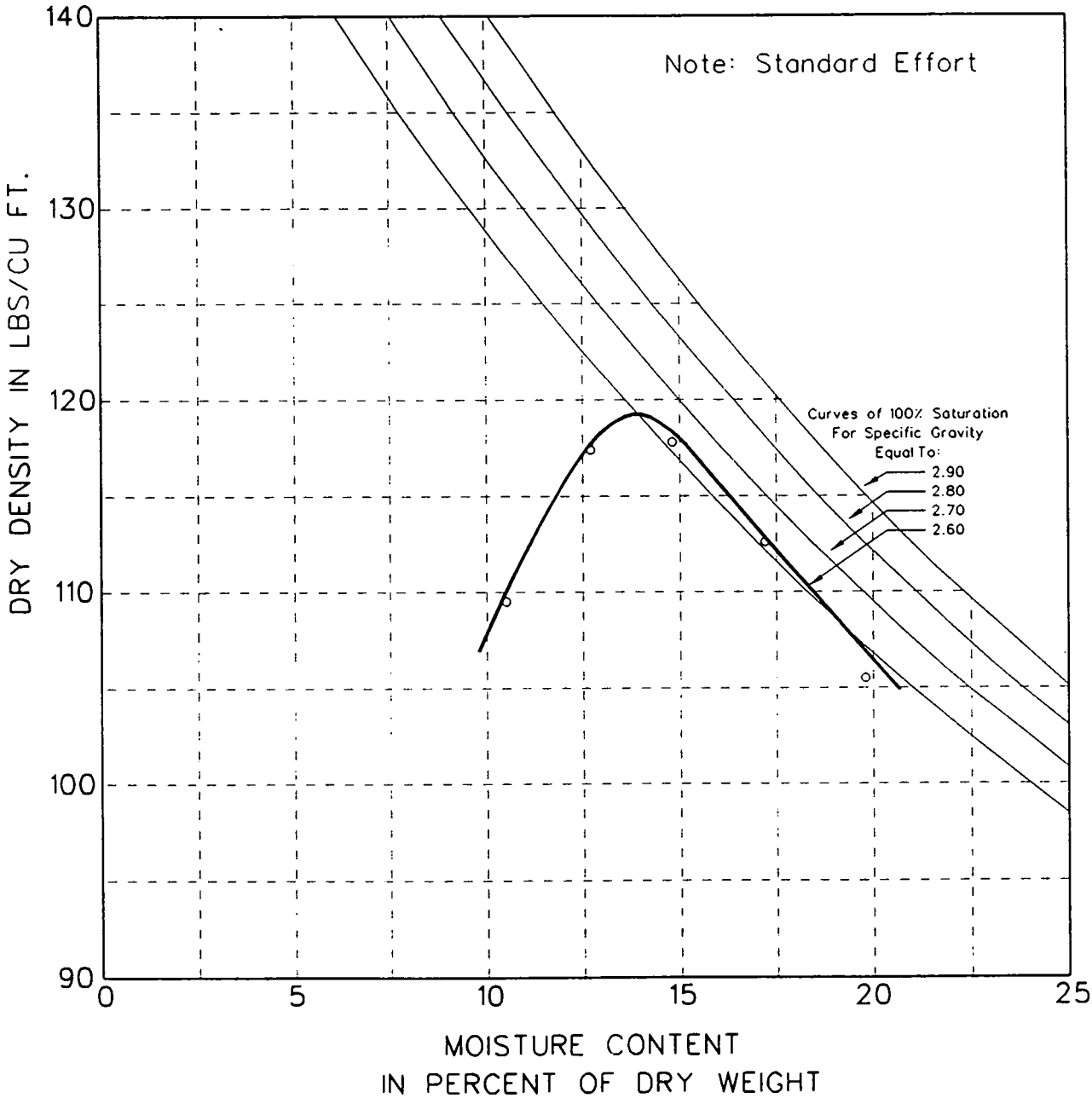
Boring: G2-SB-100 Sample Number: 409938 Depth: 1.5-10.0 ft

Description: Dark Grayish Brown Gravelly Lean Clay w. Sand (Fill) [CL]

Optimum Moisture Content: 13.8% Maximum Dry Density: 119.0 lbs/ft^3

Specific Gravity: 2.73 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/05/95



FILE /USR/REF2/OU2/PO154/DGN/BMP/409938C.DGN (5k:X0415)

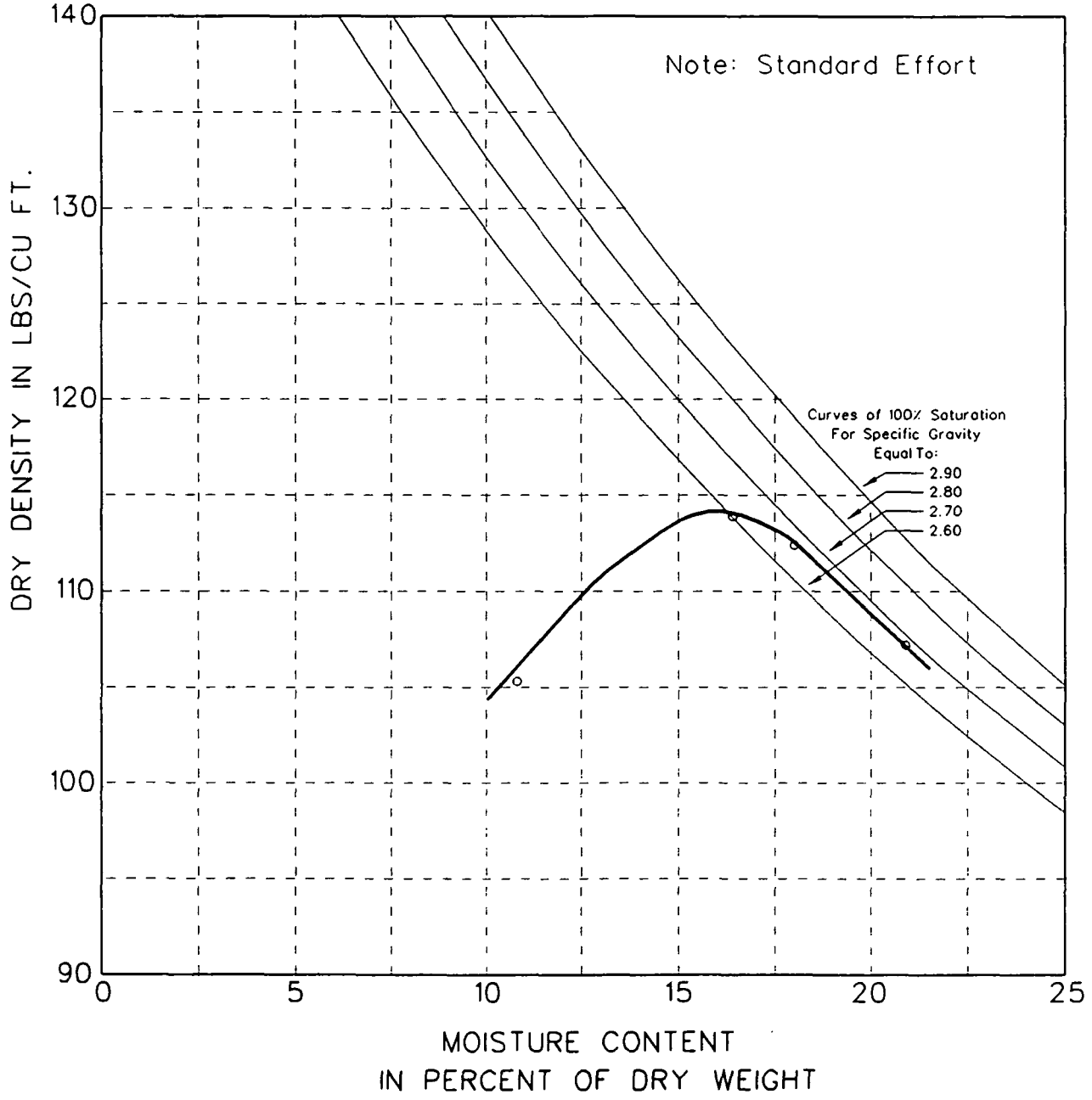
Boring: G2-SB-101 Sample Number: 409930 Depth: 1.5-10.0 ft

Description: Light Olive Brown Lean Clay [CL]

Optimum Moisture Content: 16.0% Maximum Dry Density: 114.0 lbs/ft^3

Specific Gravity: 2.76 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/05/95



FILE:/USR/REF2/OUC/P0154/DGN/BMP/409930C.DGN (SK\04149)

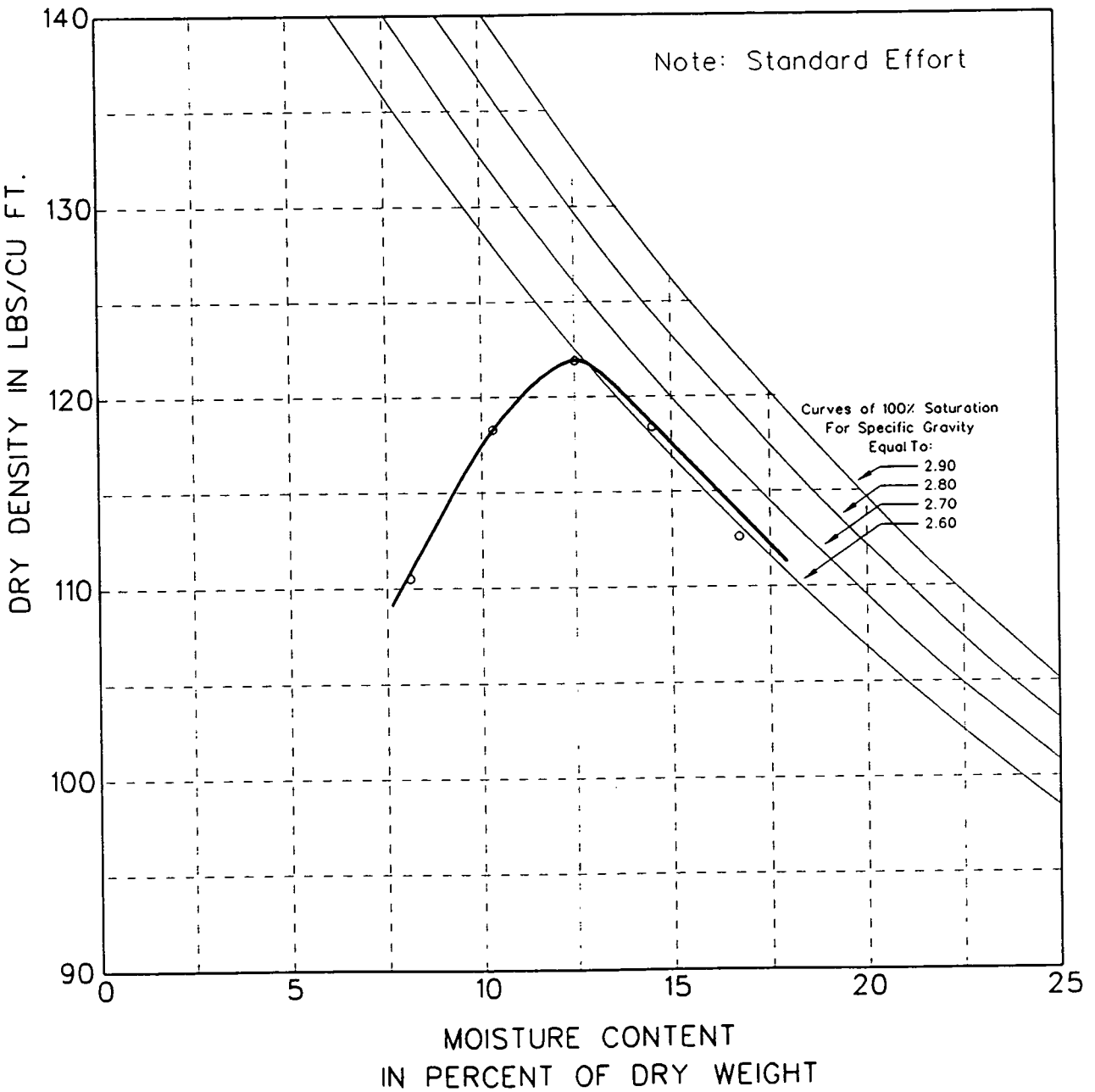
Boring: G2-SB-102 Sample Number: 409934 Depth: 1.5-10.0 ft

Description: Dark Grayish Brown Clayey Gravel with Sand (Fill) [GC]

Optimum Moisture Content: 12.5% Maximum Dry Density: 121.9 lbs/ft^3

Specific Gravity: 2.70 Compaction Method: ASTM D 698 Method B

Lab: Advanced Terra Testing, Inc. Date Tested: 10/05/95



FILE:/USR/REF2/002/P0154/P0154/DGN/BMP/409934C.DGN (SK:X04150)

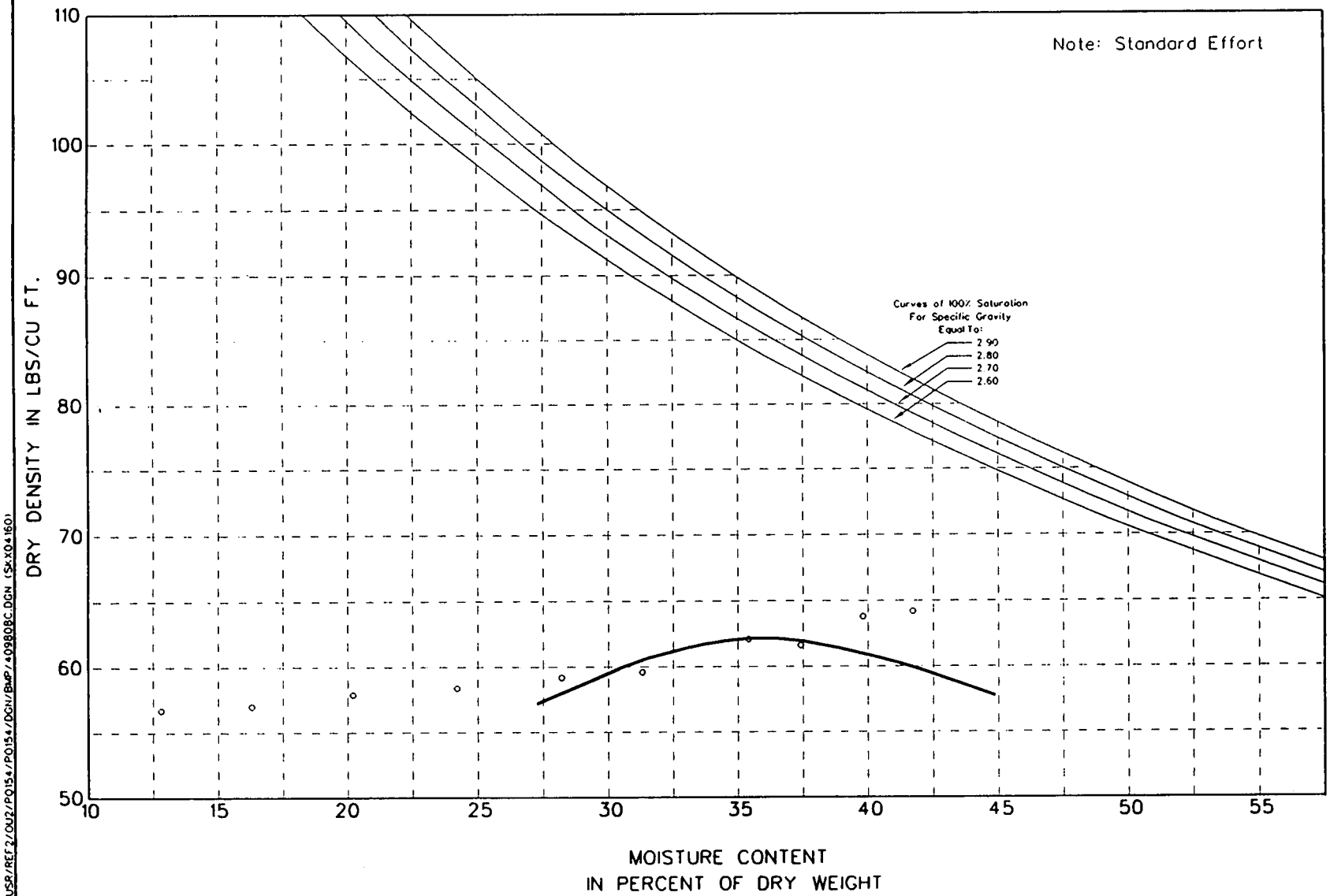
Boring: G2-SB-103 Sample Number: 409808 Depth: 1.5-10.0 ft

Description: Ash (Black Silty Sand) [SM]

Optimum Moisture Content: 35.9% Maximum Dry Density: 62.0 lbs/ft^3

Specific Gravity: 2.24 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 9/25/95



FILE:/USR/REF2/OU2/P0154/DGN/BMP/409808C.DGN (SKX04160)

000402

287

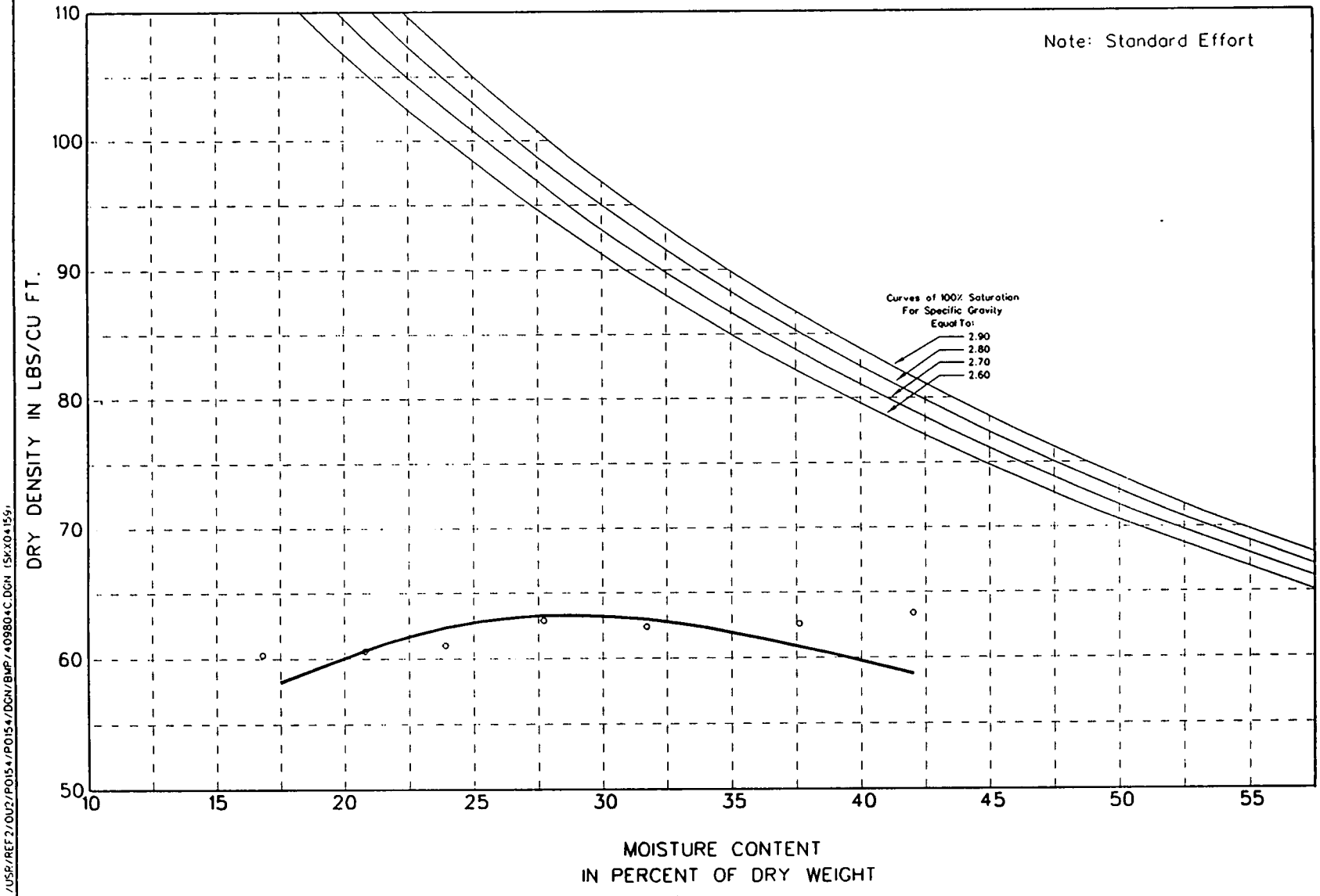
Boring: G2-SB-104 Sample Number: 409804 Depth: 1.5-10.0 ft

Description: Ash (Black Silty Sand) [SM]

Optimum Moisture Content: 28.8% Maximum Dry Density: 63.0 lbs/ft^3

Specific Gravity: 2.19 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 9/26/95



FILE /USR/REF2/OU2/P0154/P0154/DGN/BMP/409804C.DGN (SKX04159)

000403

287

APPENDIX F

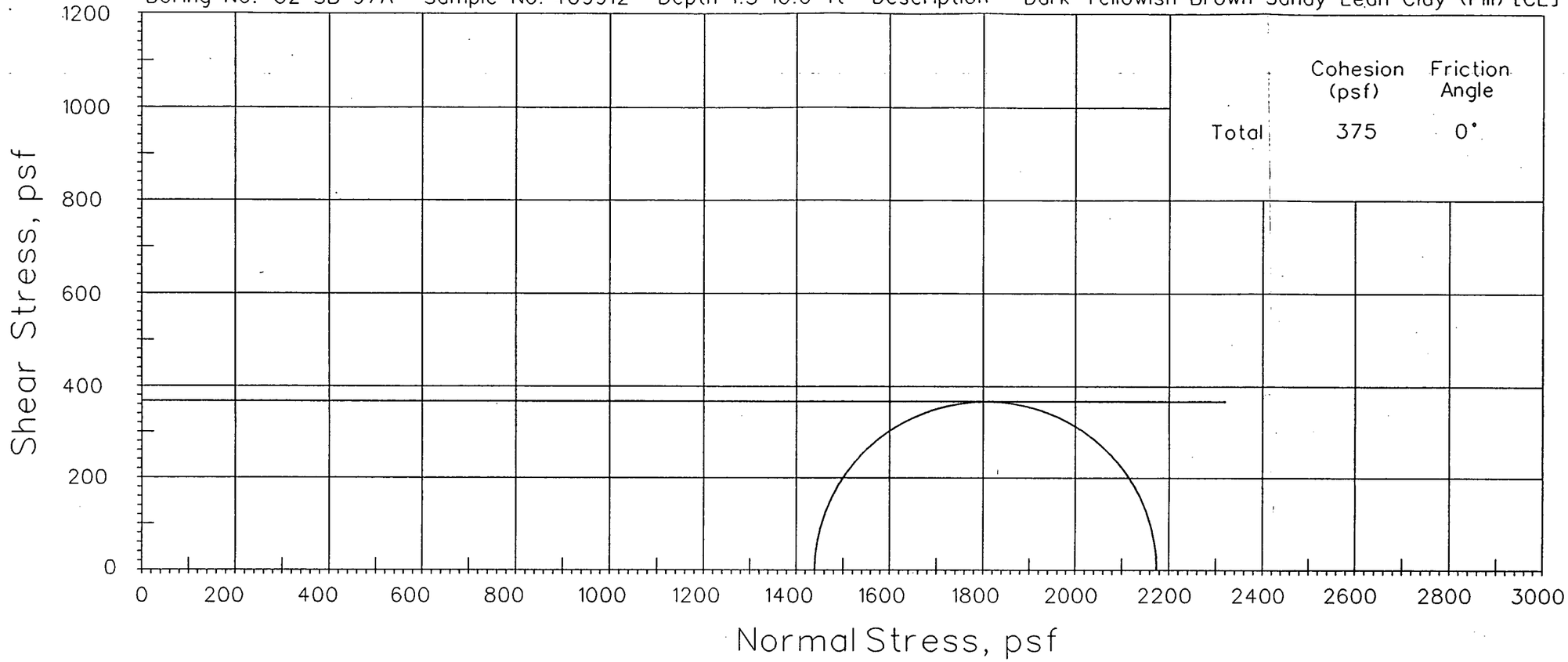
MOHR CIRCLES

UU TRIAXIAL COMPRESSION TESTS - REMOLDED 85 PERCENT MDD

AT OR NEAR OPTIMUM MOISTURE CONTENT (ASTM D 698)

Triaxial Compression Test Report

Boring No. G2-SB-97A Sample No. 409912 Depth 1.5-10.0 ft Description - Dark Yellowish Brown Sandy Lean Clay (Fill) [CL]



Type of Test: UU_{r85} - Single Point Sample Type: Remolded Failure Criteria: Maximum Deviator Stress

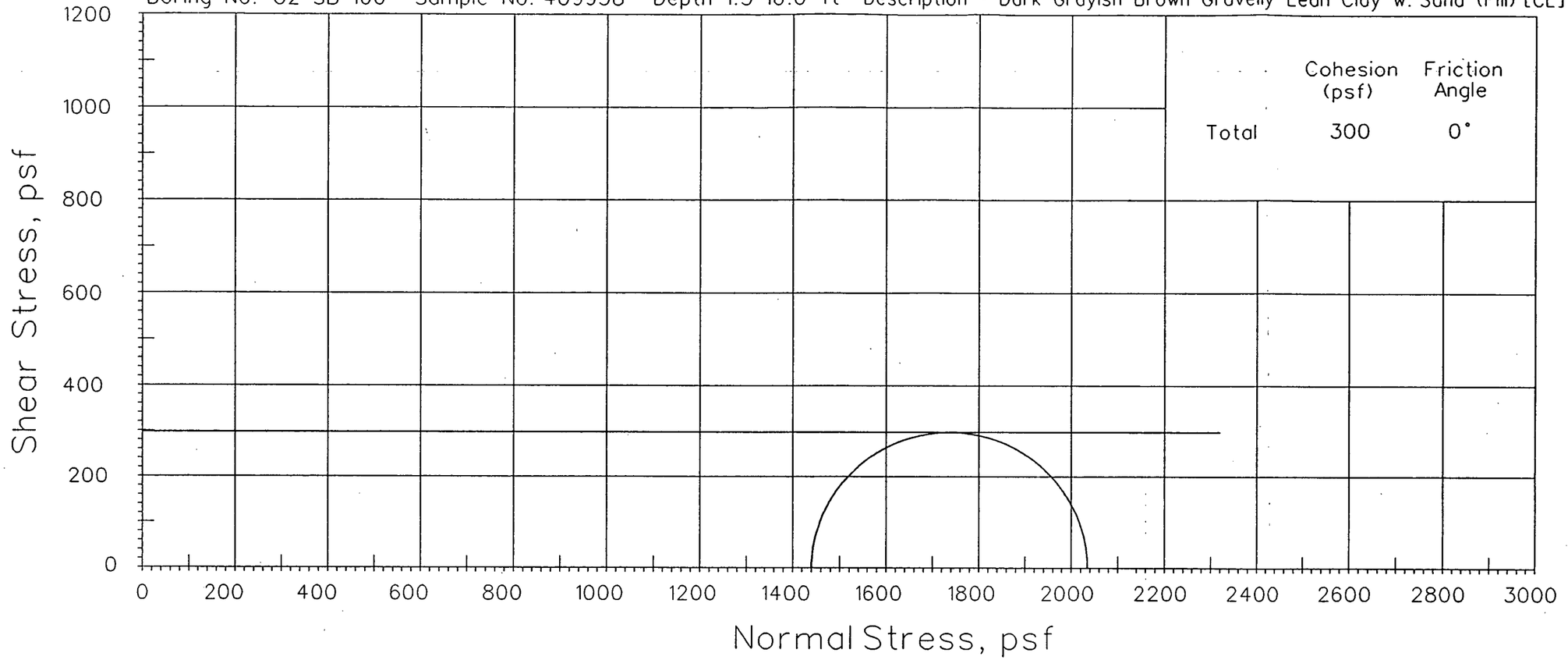
Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Delta Pore Pressure (psf)	Total Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-SB-97A	1.5-10.0	409912	12.5	22.3	116.9	103.9	0.25	735	N/A	1440	2175	1.51

1. Saturated Test.
2. N/A = Not Applicable

CAD FILE: /USR/REF2/OU2/P0154/P0154/DGN/409912MO.DGN (SKX04087)

Triaxial Compression Test Report

Boring No. G2-SB-100 Sample No. 409938 Depth 1.5-10.0 ft Description - Dark Grayish Brown Gravelly Lean Clay w. Sand (Fill) [CL]



Type of Test: UU_{r85} - Single Point Sample Type: Remolded Failure Criteria: Max. Deviator Stress

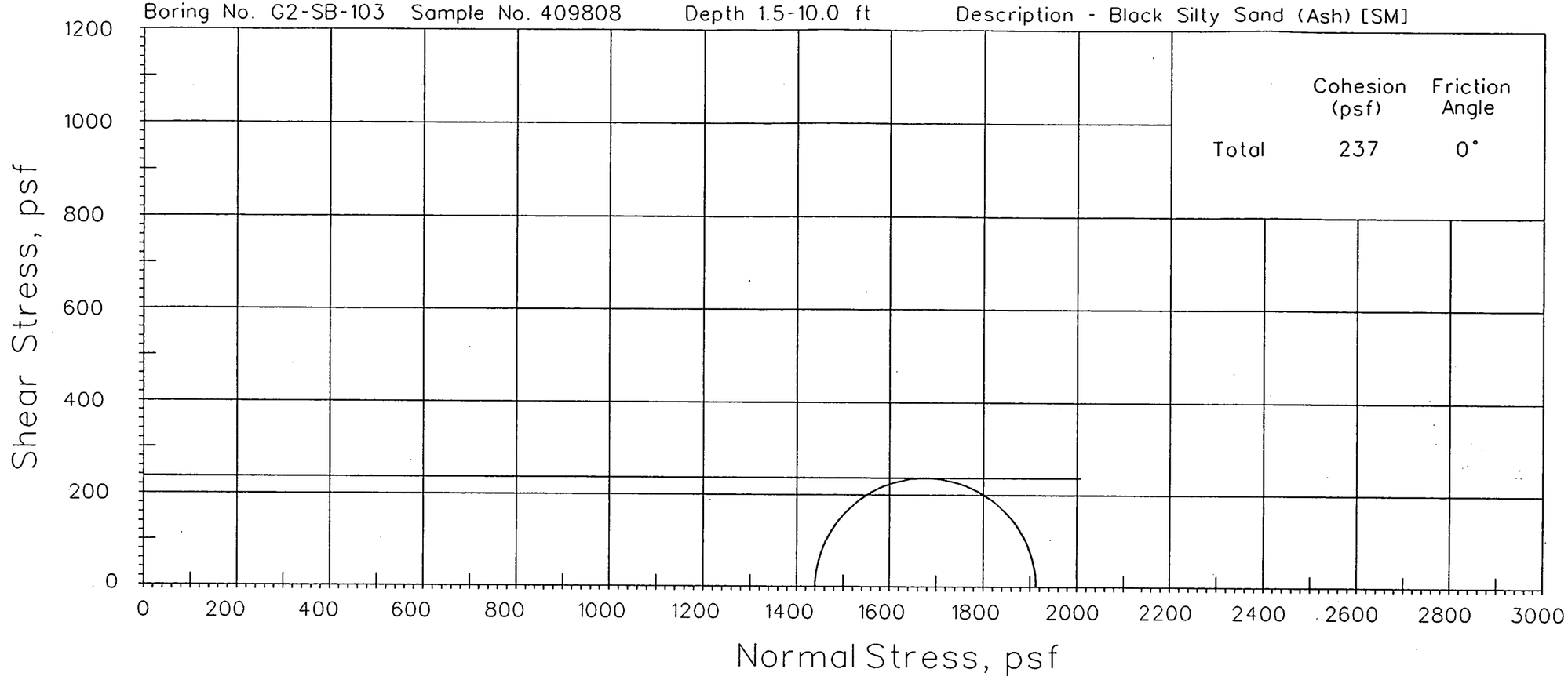
Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Delta Pore Pressure (psf)	Total Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-SB-100	1.5-10.0	409938	13.6	22.6	115.9	102.0	0.34	595	N/A	1440	2035	1.41

1. Saturated Test.
2. N/A = Not Applicable

CAD FILE: /USR/REF2/OU2/P0154/P0154/DGN/409938MO.DGN (SKX04088)

Triaxial Compression Test Report

Boring No. G2-SB-103 Sample No. 409808 Depth 1.5-10.0 ft Description - Black Silty Sand (Ash) [SM]



Type of Test: UU_{r85} Single Point Sample Type: Remolded Failure Criteria: Maximum Deviator Stress

Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Delta Pore Pressure (psf)	Total Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-SB-103	1.5-10.0	409808	24.5	72.4	61.1	49.1	0.50	473	N/A	1440	1913	1.33

1. Saturated Test.
2. Standard Proctor Compaction Data for G2-SB-103, #409808: MDD=62.0 pcf, OMC=35.9%
3. N/A = Not Applicable

CAD FILE: /USR/REF2/OU2/P0154/P0154/DGN/409808MO.DGN (SKX04030)

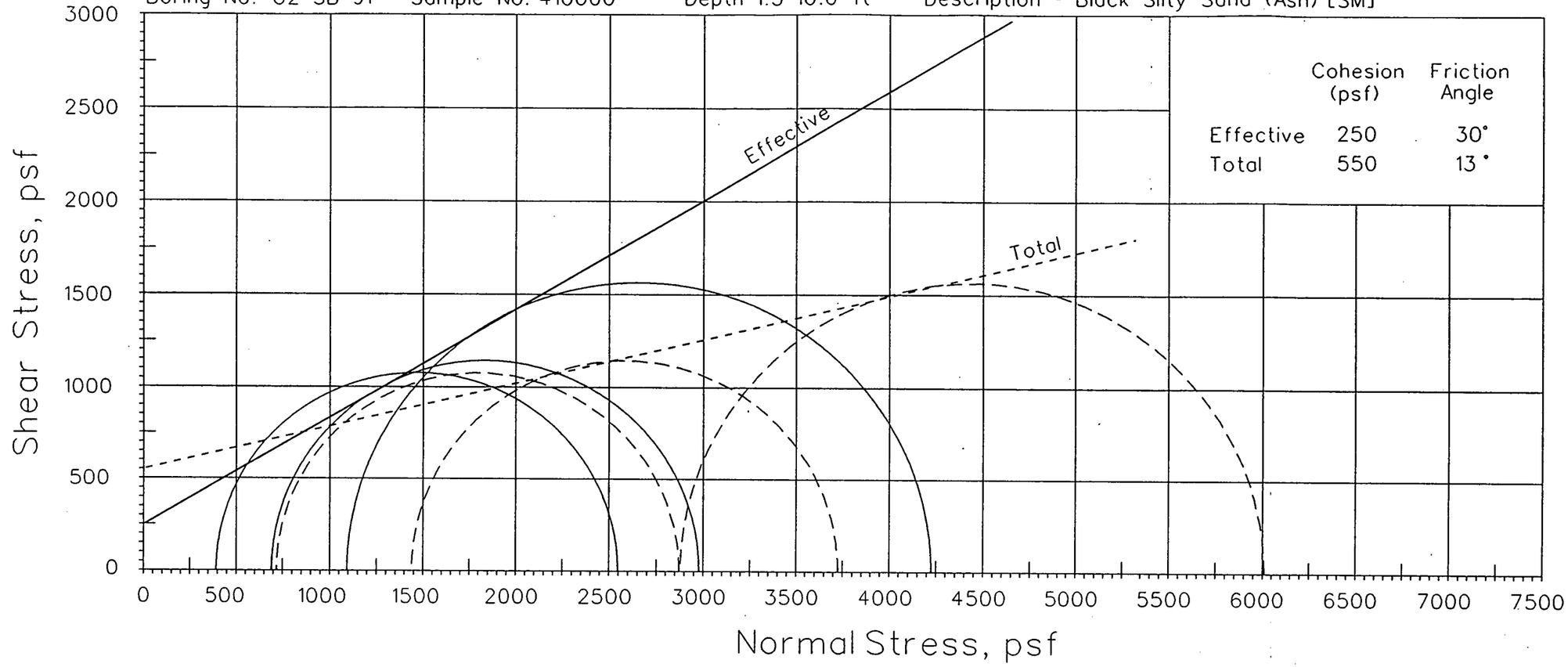
CAD FILE: SKX04030.DGN

CU TRIAXIAL COMPRESSION TESTS - REMOLDED 85 PERCENT MDD

AT OR NEAR OPTIMUM MOISTURE CONTENT (ASTM D 698)

Triaxial Compression Test Report

Boring No. G2-SB-91 Sample No. 410000 Depth 1.5-10.0 ft Description - Black Silty Sand (Ash) [SM]



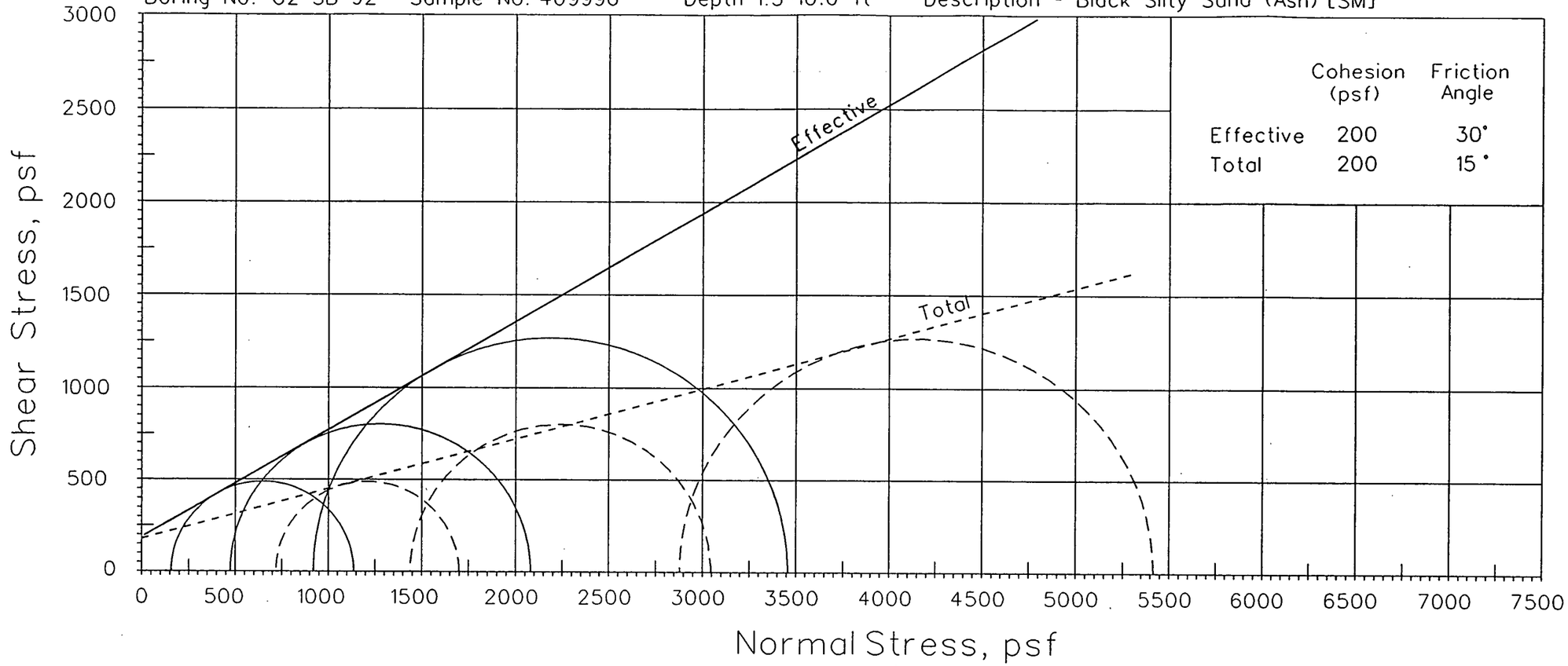
Type of Test: CU w/pp -CU_{r85} Sample Type: Remolded Failure Criteria: Maximum Deviator Stress

Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Delta Pore Pressure (psf)	Effective Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-SB-91	1.5-10.0	A	29.7	62.5	70.8	54.6	2.49	3131	1786	1094	4225	3.86
		B	30.1	64.3	71.3	54.8	1.50	2287	749	691	2978	4.31
		C	29.3	73.0	70.9	54.9	1.99	2154	327	393	2547	6.48

CAD FILE: /USR/REF2/OU2/P0154/P0154/DGN/410000MO.DGN (SKX04089)

Triaxial Compression Test Report

Boring No. G2-SB-92 Sample No. 409996 Depth 1.5-10.0 ft Description - Black Silty Sand (Ash) [SM]



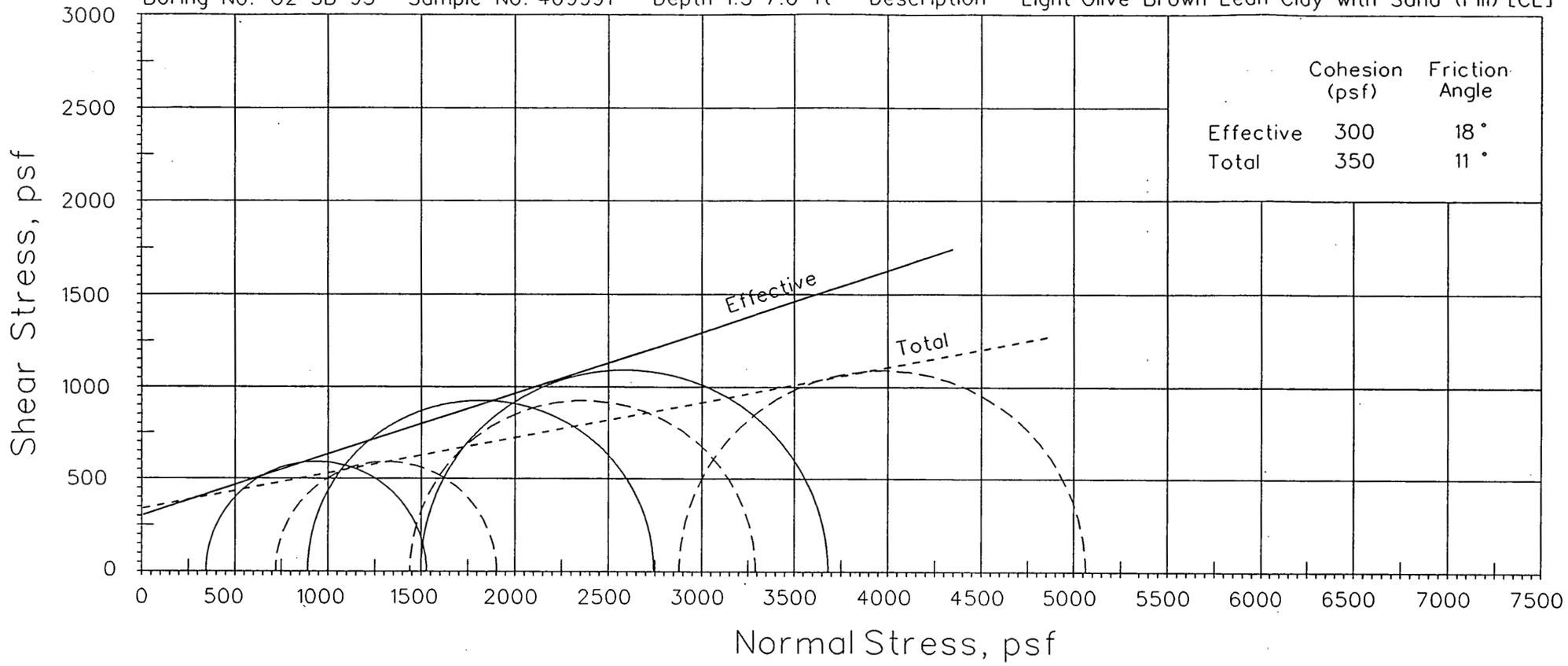
Type of Test: CU w/pp -CU_{r85} Sample Type: Remolded Failure Criteria: Maximum Deviator Stress

Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Delta Pore Pressure (psf)	Effective Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-SB-92	1.5-10.0	A	30.4	72.8	64.4	49.4	2.51	2537	1958	922	3459	3.75
		B	29.9	75.7	64.7	49.8	2.63	1607	965	475	2082	4.38
		C	30.3	76.6	65.4	50.2	6.72	980	562	158	1138	7.19

CAD FILE: /USR/REF2/OU2/P0154/P0154/DGN/409996MO.DGN (SKX04090)

Triaxial Compression Test Report

Boring No. G2-SB-93 Sample No. 409991 Depth 1.5-7.0 ft Description - Light Olive Brown Lean Clay with Sand (Fill) [CL]



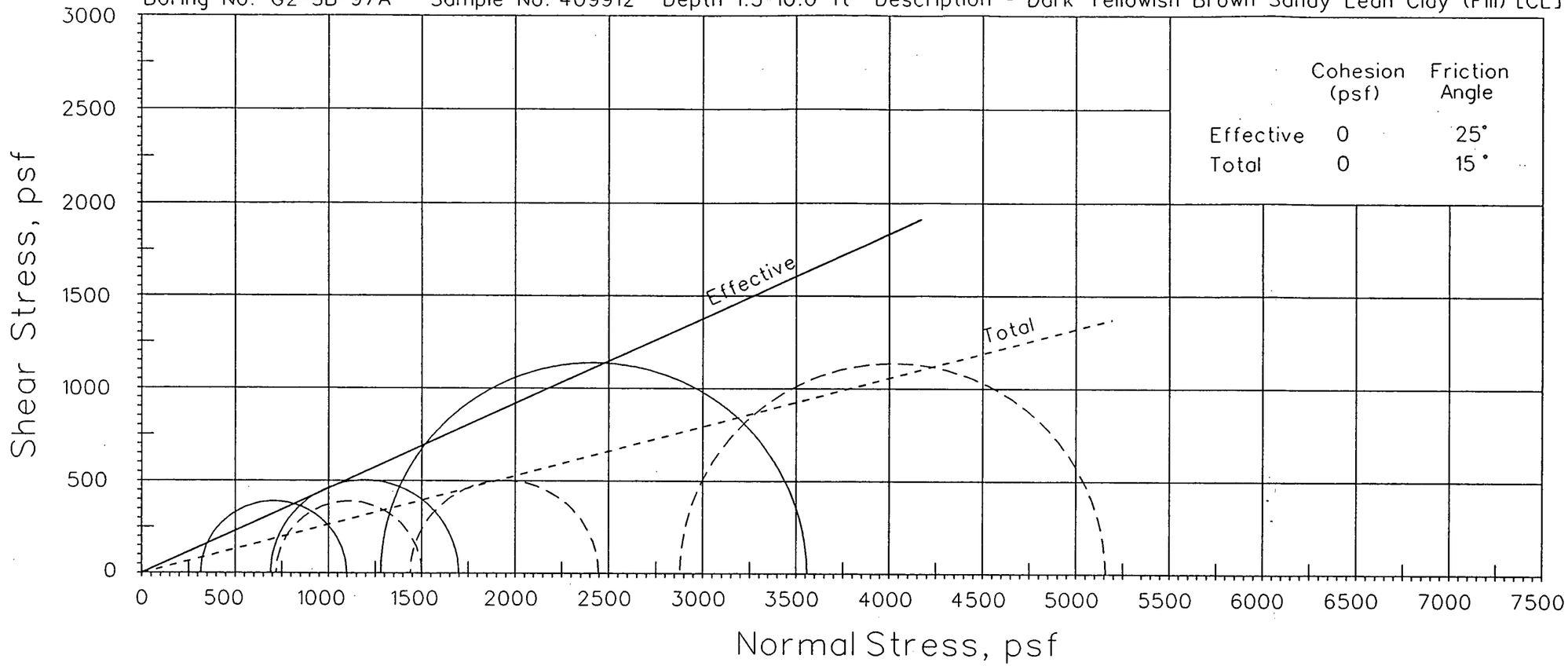
Type of Test: CU w/pp -CU_{r85} Sample Type: Remolded Failure Criteria: Maximum Deviator Stress

Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Delta Pore Pressure (psf)	Effective Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-SB-93	1.5-7.0	A	18.8	31.6	101.0	85.0	0.67	2184	1382	1498	3682	2.46
		B	18.9	32.9	100.3	84.4	0.40	1852	547	893	2745	3.07
		C	18.7	34.0	101.4	85.4	0.40	1185	374	346	1530	4.43

CAD FILE: /USR/REF2/OU2/PO154/PO154/DGN/409991MO.DGN (SKX04091)

Triaxial Compression Test Report

Boring No. G2-SB-97A Sample No. 409912 Depth 1.5-10.0 ft Description - Dark Yellowish Brown Sandy Lean Clay (Fill) [CL]



Type of Test: CU w/pp -CU_{r85} Sample Type: Remolded Failure Criteria: Maximum Deviator Stress

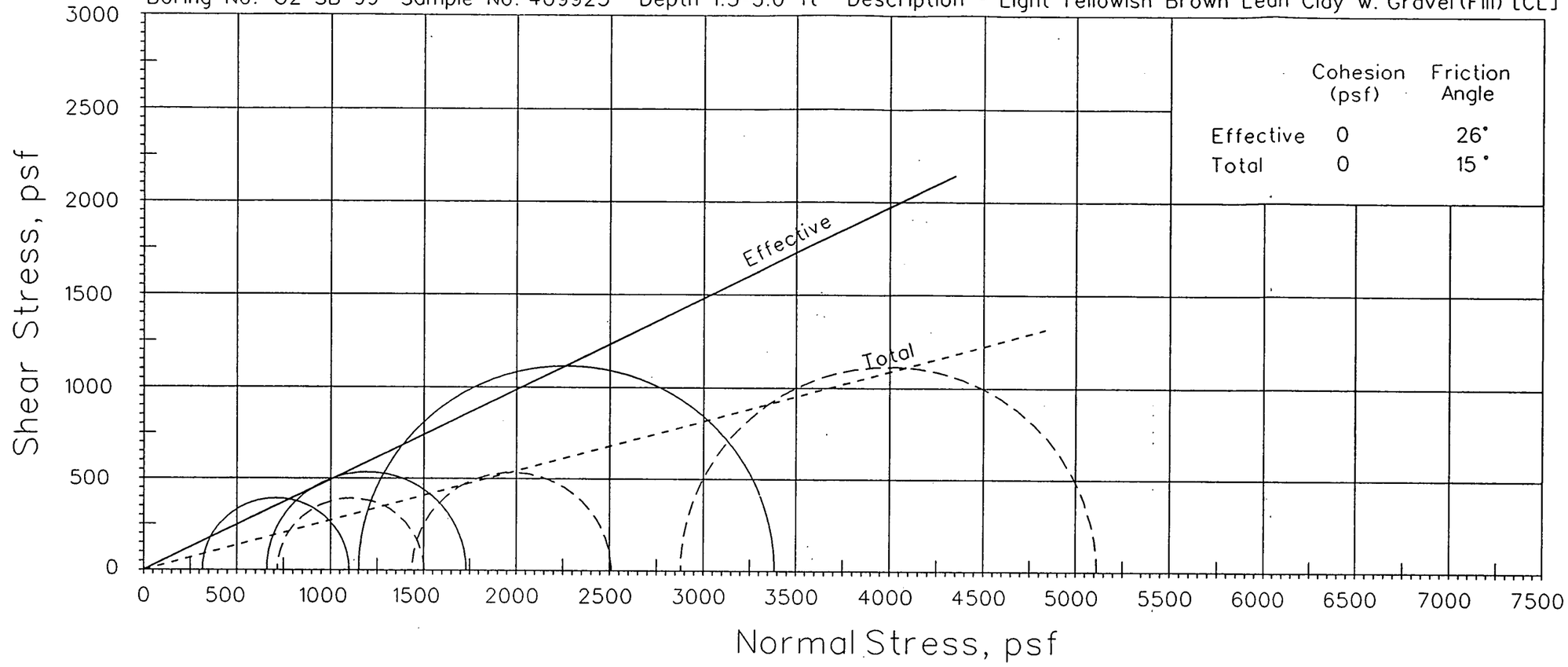
Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Delta Pore Pressure (psf)	Effective Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-SB-97A	1.5-10.0	A	12.9	18.5	116.7	103.4	1.02	2278	1598	1282	3559	2.78
		B	12.7	20.7	116.3	103.2	0.72	1006	749	691	1698	2.46
		C	12.7	22.7	116.8	103.6	0.72	781	403	317	1098	3.47

1. Saturated Test.

CAD FILE: /USR/REF2/OU2/PO154/PO154/DGN/409912A_MO.DGN (SKX04092)

Triaxial Compression Test Report

Boring No. G2-SB-99 Sample No. 409923 Depth 1.5-5.0 ft Description - Light Yellowish Brown Lean Clay w. Gravel (Fill) [CL]



Type of Test: CU w/pp -CU_{r85} Sample Type: Remolded Failure Criteria: Maximum Deviator Stress

Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Delta Pore Pressure (psf)	Effective Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-SB-99	1.5-5.0	A	17.2	22.5	110.2	94.0	1.72	2234	1728	1152	3386	2.94
		B	17.3	25.1	110.8	94.5	0.61	1070	778	662	1732	2.62
		C	17.6	27.8	110.8	94.2	0.61	783	403	317	1100	3.47

CAD FILE: /USR/REF2/OU2/P0154/P0154/DGN/409923MO.DGN (SKX04093)

APPENDIX G

TYPICAL ENGINEERING PROPERTIES OF FLY ASH

GEOTECHNICAL PRACTICE FOR WASTE DISPOSAL '87

Proceedings of a Specialty Conference sponsored by the Geotechnical Engineering Division of the American Society of Civil Engineers

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(6) Langfelder, L. J., Chen, C. F., and Justice, J. A., "Air Permeability of Compacted Clay Soils", J. Soil Mech. and Found. Div., ASCE, 94 (SM5), 1968, pp. 981-1003.
(7) Malone, P. G. and Larson, R. J., "Scientific Basis of Hazardous Waste Immobilization", Hazardous and Industrial Solid Waste Testing; Second Symposium, ASTM STP 805, R. A. Conway and W. P. Gulledge, eds., 1983, pp. 168-177.
(8) Manca, P. P., Massacci, G., Massidda, L., and Rossi, G., "Stabilization of Mill Tailings for Mining Backfill with Portland Cement and Fly Ash", Trans. Inst. Mining and Metallurgy, Vol. 93, 1984 pp. A48-A55.
(9) Martin, J. P., Koerner, R. M., Felser, A. J. and Davis, K. J., "Load Bearing Properties and Durability of Stabilized Waste at an Industrial Site Reclamation", Proc. 38th Can. Geotech. Conf., Edmonton, Alta, 1985, pp. 375-380.
(10) Maskarinec, M. P. and Brown, D. K., "Batch and Column Extraction Cloumn Procedures for Organics in Solid Wastes", Hazardous And Industrial Solid Waste Testing; Second Symposium, ASTM STP 805, R. A. Conway and W. P. Gulledge, eds., 1983, pp. 141-151.
(11) Morgan, D. S., Novoa, J. I. and Halff, A. H., "Oil Sludge Solidification Using Cement Kiln Dust", J. Env. Eng. Div., ASCE 110 (EE5), 1984, pp. 935-949.
(12) Poon, C. S., Clark, A. I., Peters, C. J. and Perry, R., "Mechanisms of Metal Fixation and Leaching by Cement Based Fixation Processes", Waste Management & Research, Vol. 3, 1985, pp. 127-142.
(13) Shen, T. T. and Tofflemire, T. J., "Air Pollution Aspects of Land Disposal of Toxic Wastes", J. Env. Eng. Div., ASCE 106, 1980, pp. 211-226.
(14) Smith, C. L. and Frost, D. J., "Secure Land Filling with Pozzolanic Cementing", Proc. 1st Ann. Hazardous Waste Mgmt, Phila., Pa., 1983, pp. 153-160.
(15) Thibodeaux, L. J., "Estimating the Rate of Air Emissions from Hazardous Waste Landfills", J. Hazardous Materials, Vol. 4, 1981, pp. 235-244.
(16) U. S. EPA/U. S. Army Waterways Exp. Sta., "Survey of Solidification/ Stabilization Technology for Hazardous and Industrial Wastes", EPA-600/2-79-056, 1979, 161 p.
(17) Veyera, G. E. and Martin, J. P., "Composition, Density and Fabric Effects of Bulky Waste Capillary Retention Characteristics", Role of the Unsaturated Zone in Radioactive and Hazardous Waste Disposal, J. W. Mercer, P. S. C. Rao and I. W. Marine, eds., Ann Arbor Science, Ann Arbor, MI, 1983.
(18) Winterkorn, H. T., "Soil Stabilization" Found. Eng. Handbook, Van Nostrand Reinhold, H. F. Winterkorn and H. Y. Fang, eds., 1975, 161 p.
(19) Yen, B. C. and Scanlon, S., "Sanitary Landfill Settlement Rates", J. Geotech. Eng. Div., ASCE 101 (GT5), 1975, pp. 475-487.

THE TYPICAL ENGINEERING PROPERTIES OF FLY ASH

By Robert J. McLaren,[1] M. ASCE and A.M. DiGioia, Jr.,[2] F. ASCE

Abstract: Knowledge of key physical and engineering properties of coal fly ash is needed in the planning, design, and construction of both disposal and utilization projects. While considerable data concerning the properties of fly ash has been generated, it is not easily accessible. Engineers working with fly ash are faced with not having information on what values and range of values are typical for physical and engineering properties.

To provide a better understanding of the typical values and range of values for key fly ash physical and engineering properties, a data base of values was compiled from published and unpublished sources. Data on 131 Class F fly ash samples and 26 Class C fly ash samples were included. The data base was analyzed to determine typical values and the range of values for key physical and engineering parameters.

This paper presents the typical values. In some cases the typical values appear unusual. These anomolies are noted but are not explained. Also included is a review of the published literature used in compiling the data base. The values presented are useful for conceptual design and planning of projects using fly ash. The ranges of typical values are useful in screening other fly ash data to determine whether the values are likely to be unusual.

Introduction

Fly ash is the unburned residue resulting from the combustion of coal in utility and industrial boilers. It is composed of the noncombustible mineral matter in the coal and of any carbon remaining due to incomplete combustion. Generally, about 80 percent of the uncombusted material is carried from the boiler by stack gases as fly ash and is collected by the air pollution control equipment. Fly ash is a fine, silt-size material consisting largely of spherical, sometimes hollow, glassy particles.

In 1985 approximately 50 million tons of fly ash were produced by the electric utility industry in the United States. An additional

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000417

282

000418

5 to 10 million tons are estimated to have been produced by commercial and industrial boilers. Coal fly ash is the fourth largest mineral produced in the country.

About 20 percent of the fly ash produced is used as a construction material. Fly ash is a pozzolan and a considerable amount is used as a concrete additive. It is also used in combination with lime, portland cement and aggregate as road base, grout, and as a backfill. Fly ash is also useful as a soil amendment for land reclamation and for subgrade stabilization. Large volumes have also been used as structural fill.

In spite of its useful properties, over 70 percent of the fly ash produced in the United States in 1985 was placed in storage or disposal sites. It is estimated that over a billion tons have been stockpiled. Stockpiled fly ash is deposited in one of two ways. Fly ash is often sluiced to ponds where it is allowed to settle. This method of handling is termed wet disposal. Wet disposal has been the most common disposal method in the past. However, due to environmental concerns and other factors, wet disposal is becoming less common.

The alternate method of handling fly ash is to add sufficient water to moisten it so that it can be handled like soil. This procedure is termed conditioning. Placement of conditioned fly ash as fill in stockpiles is referred to as dry disposal.

There are two general types of fly ash. Class F fly ash is produced by burning bituminous or anthracite coal. Class C fly ash is produced by burning subbituminous coal or lignite. The American Society for Testing and Materials has standards for Class F and C fly-ash when it is used in concrete. However, the terms Class C and F are also generally applied in describing fly ash based on the type of coal, regardless of whether the ash meets ASTM standards for use in concrete. A significant amount of fly ash does not comply with the standards for use in concrete.

Class F fly ash is the most common. It has pozzolanic properties but is not appreciably self-cementing. Because of the geographic distribution of coal types, Class F fly ash is principally produced in the eastern United States.

Although less common, the production of Class C fly ash has increased substantially in recent years along with the use of subbituminous coal and lignite. Most Class C fly ash is produced in the western United States. Class C fly ash is self-cementing due to the presence of lime or other chemical compounds.

The handling, use, and disposal of large volumes of fly ash are formidable engineering problems. This paper focuses on those physical and engineering properties of particular interest to engineers dealing with these problems. Knowledge of the chemical properties of fly ash is also of interest to those concerned with the environmental effects of the handling and disposal of fly ash. However, this paper does not

discuss the chemical properties of fly ash except as they relate to physical and engineering properties.

State of Knowledge

Although fly ash has been produced in large quantities for decades, the amount of published and unpublished information available on its properties is relatively small. Much of the work that has been done with fly ash has been limited to a single fly ash source for a specific project. As such, the information developed is not of general interest and is seldom published. Other studies dealing with fly ash from several sources are of general interest and have been published. However, due to budget and time constraints most of these studies are limited to fly ash from only a few sources. In either case, most studies deal with only those properties pertinent to the specific scope of a particular program. Thus, the data that is available often is incomplete or limited.

In many other cases data is available only on fly ash that has been mixed with other materials for utilization or disposal. These materials include portland cement, lime, soil, aggregate and FGD sludge. In many of these cases data on the ash alone was not determined or presented. Other data is available on fly ash from British or other foreign sources. Because of differences in geology and testing procedures, the direct applicability of this data to U.S. cases is sometimes questioned.

All of these factors contribute to the fact that the available information on the properties of fly ash is limited. This situation makes both conceptual design and evaluation of test results difficult. In many cases design engineering with fly ash proceeds as though the fly ash were a totally new material rather than one that is very common.

Published Data

Over a thousand articles, papers and reports have been published in the last 20 years dealing with one aspect or another of fly ash handling, utilization or disposal. While most of these works do not contain significant data on the physical and engineering properties of fly ash, there are some notable exceptions.

One study collected and tested fly ash samples from all of the major power plants in Kentucky (Rose et al. 1982). A total of 25 samples from 18 separate plants were included in the study. Grain size analyses, specific gravity and compaction characteristics were determined in order to inventory ash properties for potential by-product utilization.

A total of 13 separate sources in Pennsylvania, Ohio, West Virginia and other states were sampled and tested as part of a study of using fly ash to stabilize coal refuse for use as roadbase (Anderson et al 1982). Samples were tested for grain size, specific gravity, compaction characteristics and other properties.

Samples of 5 Michigan fly ashes were tested for compaction characteristics, permeability, shear strength and compressibility (Gray and Lin 1972). Two Illinois fly ashes were tested for compaction characteristics, compressibility, shear strength and grain size in a study of an ash disposal pond (Cunningham et al 1977). Data on four fly ashes from two Wisconsin power plants were collected and published in another study (Sikes 1973).

In a study of stabilized fly ash road base for the National Ash Association, the compaction behavior of 6 fly ash samples from the eastern U.S. were determined (GAI Consultants 1976). Another study sampled and tested 10 separate sources of Class C fly ash (Bahor et al. 1981). Specific gravity, grain size distributions, permeabilities, shear strengths and compaction characteristics were determined. The purpose of this study was to establish a limited data base of Class C fly ash properties. The physical and engineering properties of several other Class C fly ashes were determined in conjunction with utilization projects (Joshi 1978). Class C fly ashes from both the western U.S. and Canada were included in this work.

Other data on physical and engineering properties of interest for a limited number of samples were published by several investigators. Appendix I contains 12 other references in addition to those cited above.

Data Base

Using data from the above cited published sources, a data base was compiled with data from 86 separate samples. The data base was expanded by including additional data that was unpublished. This data was obtained from the files of utilities and consultants. An additional 71 samples were added in this way. The total data base included data on 157 samples from 98 separate power plants in the U.S. and Canada. The samples were divided into two groups. Those which had only minor amounts of lime and had no significant hardening properties were classified as Class F. The remaining samples which were obtained from plants burning subbituminous coal or lignite, or which had self-hardening properties, were classified as Class C.

A total of 131 samples representing 74 different plants were included in the data base for Class F fly ash. The sources were primarily from the eastern and midwestern U.S. Fewer samples were available for Class C fly ash. A total of 26 samples were included from 24 separate sources.

The data base was analyzed to determine the distribution of values for key parameters of interest to geotechnical engineers. The parameters evaluated included specific gravity, grain size, compaction characteristics, permeability, shear strength and compressibility. The distributions, the means, and the standard deviations were determined for these parameters. The coefficient of variation, the standard deviation as a percentage of the mean, was also determined. Other characteristics of particular interest were also noted.

Specific Gravity

Specific gravity is one parameter that is frequently determined in analyzing fly ash for chemical properties and for use as an additive in concrete. It was therefore commonly reported for samples included in the data base. It is also of interest in understanding the engineering properties of fly ash.

A total of 98 samples of Class F ash had specific gravity values available. The mean value was 2.40 and the distribution of values is shown in Figure 1. The coefficient of variation was 6.0% and the standard deviation 0.15. For Class C fly ash, the specific gravity of 17 samples were available. The mean value was 2.5, the coefficient of variation 6.8% and the standard deviation was 0.17. The specific gravity of fly ash is less than most soils, which range from about 2.6 to 2.8. Therefore fly ash fills tend to be less dense than those constructed of natural soils. This reduction in density can be an advantage in some applications where fly ash is used as a structural fill.

Grain Size Distribution

The grain size distribution of fly ash provides considerable insight into its properties and behavior. Fly ash is typically a relatively uniform, silt-sized material. Grain size data were available for 98 samples of Class F fly ash. The mean coefficient of uniformity of these samples was 5.94. The standard deviation was 3.6, and the coefficient of variation 60.8%. The distribution of values is shown on Figure 2.

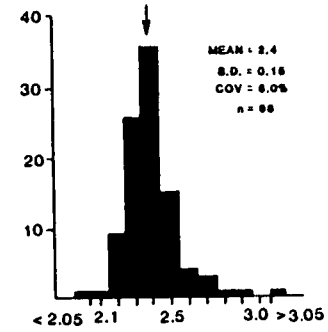

FIG. 1 - Distribution of Values for Specific Gravity of Class F Fly Ash

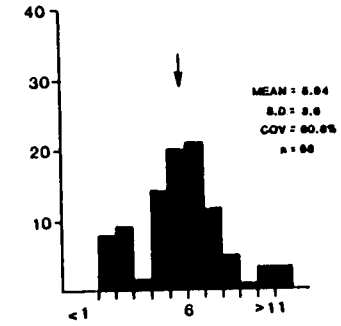

FIG. 2 - Distribution of Values for Coefficient of Uniformity of Class F Fly Ash

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287

Figure 3 shows the distribution of typical values for the grain size of Class F fly ash. The D85, D50 and D15 size distributions are shown. The mean value, and the range of values plus or minus one standard deviation are also shown. There were 84 samples available for each of these values. Table 1 presents the mean, standard deviation and coefficient of variation for the D85, D50 and D15 particle sizes.

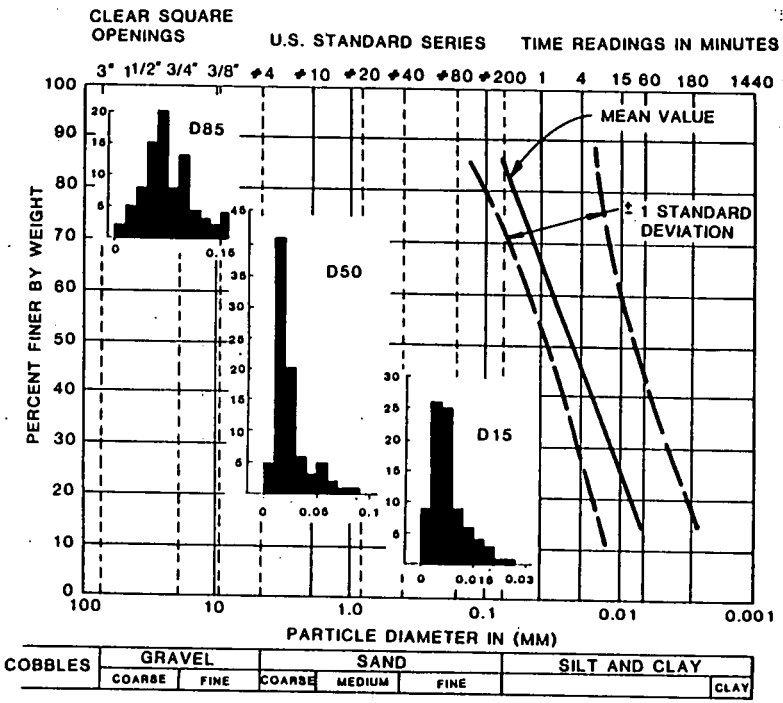

FIG. 3 - Distribution of Typical Values for the Grain Size of Class F Fly Ash

Grain size data for 17 Class C samples were reviewed. The sizes were similar to those for Class F ash. The coefficient of uniformity for samples available had a mean value of 7.19. The standard deviation was 3.8 and the coefficient of variation 52.9%. Information on the values for D85, D50 and D15 particle sizes is presented on Table 1.

TABLE 1. - Summary of Grain Size Analyses for Fly Ash

Grain Size in millimeters (1)	Mean Value (2)	Standard Deviation (3)	Coefficient of Variation (4)	Number of Samples (5)
(a) Class F Fly Ash				
D 85	0.079	0.063	80.0%	84
D 50	0.023	0.015	66.9%	84
D15	0.0075	0.0048	64.8%	84
(b) Class C Fly Ash				
D 85	0.063	0.020	31.7%	17
D 50	0.022	0.011	50.0%	17
D 15	0.0084	0.0082	97.6%	17

As shown above, fly ash is a relatively fine, uniform material. In sampling ash that has been stockpiled in fills and particularly in ponds it is not unusual to obtain samples that are substantially more coarse than the typical values cited above. This situation usually results from bottom ash being mixed with the fly ash or, in the case of ponds, from particle segregation during deposition in the pond.

Compaction Behavior

The compaction behavior of fly ash, as determined by the maximum dry density and optimum moisture content, was the test most commonly made on the samples located. Compaction test results were located for a total of 113 Class F samples and 25 Class C samples. Due to the large volumes of ash placed as compacted fill in dry disposal sites and its use as structural fill this is not surprising.

Most of the samples located were tested by either Modified or Standard Proctor methods. In a few cases some other procedure was used, or the test method was not available. Initially all of the results were compared, regardless of the test procedure used.

For the 113 Class F samples, the mean maximum dry density was 83.4 pounds per cubic foot. The standard deviation of the maximum dry density values was 13.0 pounds per cubic foot for a coefficient of variation of 15.6%. The corresponding optimum moisture contents for 110 of the samples were available. The mean value was 25.3%, and the standard deviation was 10.2%. The coefficient of variation of optimum moisture content values was 40.1%. The distribution of values for maximum dry density and optimum moisture contents for Class F fly ash are shown on Figures 4 and 5.

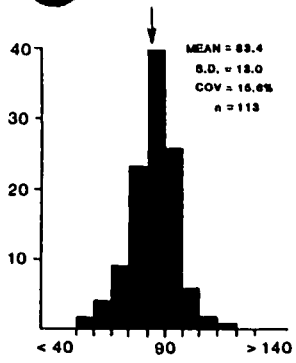

FIG. 4 - Distribution of Typical Values of Maximum Dry Density for Class F Fly Ash

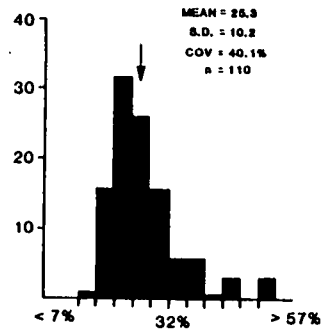

FIG. 5 - Distribution of Typical Values of Optimum Moisture for Class F Fly Ash

Perhaps a better way to look at the range of typical values is a plot of maximum dry density versus optimum moisture content for the samples available. Figure 6 shows this relationship for 110 samples. Most of the values fall within a relatively narrow band. As expected, the maximum dry density is inversely proportional to the optimum moisture content.

For the 25 Class C samples, the mean maximum dry density was 94.0 pounds per cubic foot with a standard deviation and coefficient of variation of 13.5 pounds per cubic foot and 14.4%, respectively. The optimum moisture content mean value was 19.8% with a standard deviation and coefficient of variation of 7.7% and 38.9%, respectively.

To determine the effect of the compaction test method, the Class F samples were separated by test type. Standard Proctor methods were used for 66 samples. The mean maximum dry density was 85.2 pounds per cubic foot foot and the mean optimum moisture content was 24.2%. For samples tested using Modified Proctor methods, the mean maximum dry density was 81.3 pounds per cubic foot and the mean optimum moisture content was 26.6%. There were 43 Modified Proctor samples included.

The reason that the mean value of maximum dry density for Standard Proctor samples is higher than that for Modified Proctor was not determined. Plots of maximum dry density versus optimum moisture content are denoted by test type on Figure 6. The plots appear to coincide rather than be parallel lines as might be expected if there were a consistent difference in the results of the two test methods. Therefore it is likely that the difference in mean values for maximum dry density is a result of the limited available data and is not real.

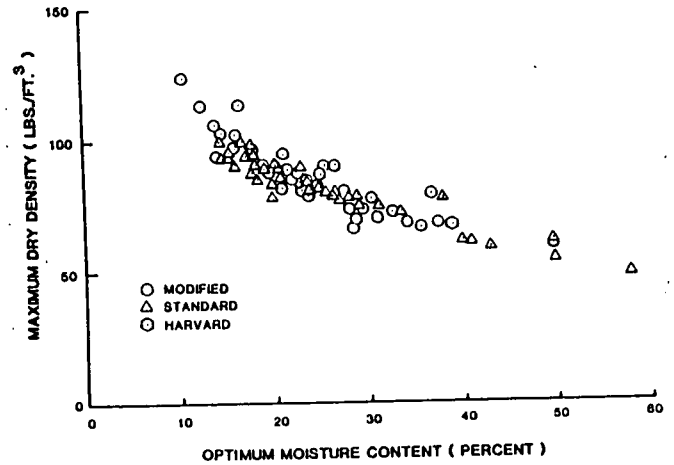

FIG. 6 - Maximum Dry Density Versus Optimum Moisture Content for Class F Fly Ash

While the dry density and compaction behavior is of interest in testing and quality control, the wet density is needed in conceptual design of fly ash fills. Calculation of settlement, bearing capacity and slope stability are all determined using wet density values. The mean value of wet density for 110 Class F samples was 103.4 pounds per cubic foot. The standard deviation was 10.1 pounds per cubic foot and the coefficient of variation 9.7%. The distribution of values for Class F fly ash are shown on Figure 7.

For Class C fly ash, 25 samples were evaluated. The mean maximum wet density was 111.7 pounds per cubic foot. The standard deviation was 10.3 pounds per cubic foot and the coefficient of variation 9.2%. Modified, Standard and other compaction procedures were included in determining wet density values for both classes of fly ash.

Permeability

Permeability values for 41 Class F samples were located. Since permeability values are often compared on an order of magnitude basis, the base 10 logarithms of the permeability values for the samples were compared. For example, the base 10 logarithm of a permeability of 1.0×10^{-5} cm/sec is -5.00, and that of 1.0×10^{-6} cm/sec is -6.00. The distribution of values is shown on Figure 8. The mean value of the 41 samples was -4.88. This value is equivalent to a permeability of 1.32×10^{-5} cm/sec. The standard deviation of the logarithmic values was 0.46, about 1/2 an order of magnitude. The coefficient of variation of the logarithmic values was 9.5%.

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000422

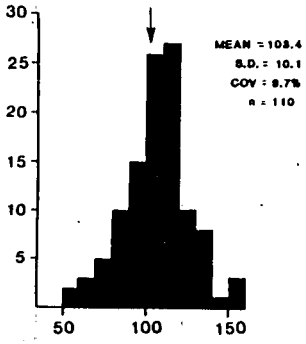


FIG. 7 - Distribution of Values for Maximum Wet Density for Class F Fly Ash

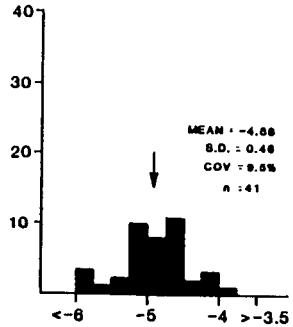


FIG. 8 - Distribution of Values for Log(10) of Permeability of Class F Fly Ash

For Class C fly ash samples, 10 permeability test results were located. The mean value of the logarithmic values was -4.95, equivalent to a permeability of 1.13×10^{-5} cm/sec. The standard deviation of the logarithmic values was 0.60 and the coefficient of variation was 12.1%.

The data base was analyzed in order to see if any effect of compaction on permeability could be determined. The results for undisturbed Class F samples obtained from ponds or poorly compacted fills were compared to those for the entire data base. The mean of the logarithm of the permeability for 10 undisturbed Class F samples was -4.73, equivalent to a permeability of 1.8×10^{-5} cm/sec. This value represents an increase on permeability of 40% over that obtained for the entire data base. However, it is not significantly greater on an order of magnitude basis.

For Class C fly ash, reductions in permeability occur if the material is exposed to moisture and allowed to cure. This phenomenon has been observed for several of the samples included in the data base (Bahor et al. 1981; Gray and Lin 1972). Reductions in permeability of an order of magnitude have been observed for some Class C fly ashes.

Shear Strength

The shear strength of Class F fly ash is primarily the result of internal friction. Class F fly ash is non-cohesive and while it may appear to be cohesive in a partially saturated state, this effect is completely lost when the material is either dried or saturated. In contrast to this behavior, Class C fly ash can develop considerable cohesive shear strength due to cementitious reactions. This cohesion is the dominant shear strength of Class C fly ashes.

Shear strength test results were located for 51 Class F fly ash samples. Test procedures were primarily direct shear or consolidated drained triaxial tests. The friction angle and, in many cases, cohesion values were reported. The cohesion results ranged from zero to a few hundred pounds per square foot. For the purposes of this analysis the cohesion values were considered to be due to apparent cohesion, particle interlocking or other factors and were not considered. The mean value for friction angle was 34.0 degrees. The standard deviation was 3.3 degrees and the coefficient of variation was 9.8%. The distribution of values is shown on Figure 9.

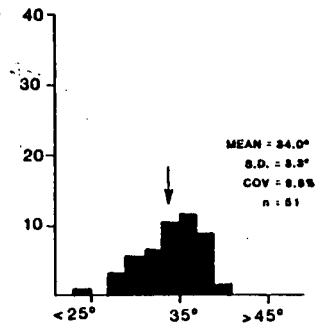


FIG. 9 - Distribution of Values for Friction Angle for Class F Fly Ash

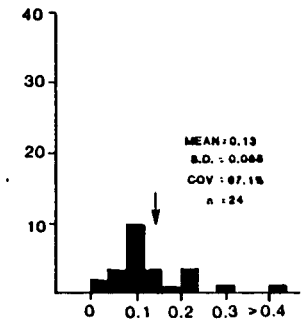


FIG. 10 - Distribution of Values for Compression Index for Class F Fly Ash

Samples from ash ponds and poorly compacted fills were evaluated separately in order to determine if any effect of sample compaction was evident in the data base. There were 12 samples of Class F fly ash that were uncompacted or poorly compacted. The mean friction angle for these samples was 32.8 degrees, slightly less than that of the entire data base. Previous tests have shown that the shear strength of fly ash from a single source is dependent upon the degree of compaction (DiGioia and Nuzzo 1972). The relatively small decrease in shear strength observed for lower density samples in the data base is believed to be due to the fact that fly ash is easily compacted with only moderate effort. Thus, even poorly compacted fills are relatively dense.

Class C fly ashes may gain considerable cohesive strength when exposed to moisture and allowed to cure. There is considerable variation among the fly ashes included in the data base. Test results indicate that cohesion may range up to several hundred pounds per square inch for some Class C fly ashes (Bahor et al. 1981; Chae and Snyder 1977; Gray and Lin 1972; Joshi 1978).

Compressibility

Compression index, Cc, values were determined for 24 of the Class F samples in the data base. The mean value was 0.13 with a standard deviation of 0.088, and a coefficient of variation of 67.1%. The distribution of values is shown on Figure 10.

Ten of the samples for which compressibility data were available were Shelby tube samples from ponded ash or poorly compacted fills. These samples were compared to the entire data base to determine if any difference due to compaction was evident. The mean value for Cc for the uncompacted samples was 0.16, about 25% greater than that for the total data base.

Little data is available on the compressibility of Class C fly ash. Tests on stabilized and Class C fly ashes (Gray and Lin 1972) have demonstrated that the compressiblity of these materials is reduced as the material cures.

The compressibility of actual fly ash fills is not well understood, but the limited data that is available show that they are less compressible than indicated by the Cc values determined in laboratory tests (Cragg 1985; Leonards and Bailey 1982; Seals et al. 1977). In those cases where fly ash has been used as structural fill, the general performance has been excellent.

Summary

A data base of key physical and engineering properties was assembled to assess the typical values and range of values of fly ash from U.S. and Canadian sources. Table 2 presents a summary of the data for Class F fly ash. Table 3 summarizes the data for Class C fly ash.

A review of the data shows that fly ash is a relatively uniform, silt-sized material with a specific gravity slightly lower than most natural soils. Compaction of fly ash is moisture dependent, but the range of optimum moisture contents is greater than that of natural silts and silty clays. The maximum dry and wet densities of compacted fly ash are somewhat less than typical values for natural soils. This property makes it useful in light-weight structural fills.

Class F fly ash has moderate frictional shear strength when drained and Class C fly ash can develop significant cohesive strength when moistened and cured. Class F fly ash has a low permeability, but is not impervious. Class C fly ash has similar permeability to Class F fly ash and will become less permeable when moistened and allowed to cure. Laboratory tests on Class F fly ash indicate that it is a moderately compressible material. Limited field data indicate that fly ash is less compressible than suggested by laboratory tests.

The data presented show that the typical values for most of the parameters investigated are within a relatively narrow range of values. The typical values determined and the range of values should

be useful to geotechnical engineers for conceptual design and for evaluating specific test results to determine if those results are representative or may be suspect. However, actual properties of a particular fly ash may vary considerably from those typical values due to changes in fuel, combustion processes and equipment, contamination with other materials, segregation in handling or other factors. Therefore for actual design purposes there is no substitute for data on the actual fly ash being used.

TABLE 2. - Summary of Results for Class F Fly Ash

Property (1)	Mean Value (2)	Standard Deviation (3)	Coefficient of Variation	Comments (5)
Specific Gravity	2.4	0.15	6.0%	
Coefficient of Uniformity	5.49	3.6	60.8%	Also See Table 1
Maximum Dry Density in pounds per cubic foot	83.4	13.0	15.6%	Also See Figure 6
Optimum Moisture Content - %	25.3	10.2	40.1%	Also See Figure 6
Maximum Wet Density in pounds per cubic foot	103.4	10.1	9.7%	
Log (10) of Permeability	-4.88	0.46	9.5%	Mean Value Equals 1.32×10^{-5} cm/sec
Effective Friction Angle in degrees	34.0	3.3	9.8%	
Compression Index	0.13	0.088	67.1%	

TABLE 3. Summary of Results for Class C Fly Ash

Property (1)	Mean Value (2)	Standard Deviation (3)	Coefficient of Variation	Comments (5)
Specific Gravity	2.5	0.17	6.8%	
Coefficient of Uniformity	7.19	3.8	52.9%	Also See Table 1
Maximum Dry Density in pounds per cubic foot	94.0	13.5	14.4%	
Optimum Moisture Content - %	19.8	7.7	38.9%	
Maximum Wet Density in pounds per cubic foot	111.7	10.3	9.2%	
Log (10) of Permeability	-4.95	0.60	12.1%	Mean Value Equals 1.13×10^{-5} cm/sec

Appendix I.- References

Anderson, R.B., DiGioia, A.M. Jr., and Head, W.J.(1982). "Coal Refuse - Fly Ash Mixtures as Base-Course Material," presented at the Sixth International Ash Utilization Symposium, Reno, Nevada, DPE/METC/82-52 V1, 137-163.

Bahor, M.P., et al. (1981). "Coal Ash Disposal Manual, Second Edition," Electric Power Research Institute Report CS2049.

Chae, Y.S.,and Snyder, J.L. (1977). "Vibratory Compaction of Fly Ash," presented at the ASCE Specialty Conference on Geotechnical Practice for Disposal of Solid Waste Materials, Ann Arbor, Michigan, 41-62.

Cragg, C. (1985). "Fly Ash Speeds Bridge Construction," presented at the Seventh International Ash Utilization Symposium, Orlando, Florida, DOE/METC-85/6018 V2, 487-501.

Cunningham, J.A., Lukas, R.G., and Anderson, T.C. (1977). "Impoundment of Fly Ash and Slag - A Case Study," presented at the ASCE Specialty Conference on Geotechnical Practice for Disposal of Solid Waste Materials, Ann Arbor, Michigan, 227-245.

DiGioia, A.M. Jr., and Nuzzo, W.L. (1972). "Fly Ash as Structural Fill," J. of Power Div., ASCE, 98(1), 77-92.

GAI Consultants, Inc. (1976). "Guide for the Design and Construction of Cement-Stabilized Fly Ash Pavements," National Ash Association, Washington D.C.

Gray, D.H., and Lin, Y.K. (1972). "Engineering Properties of Compacted Fly Ash," J. of the Soil Mechanics and Foundation Div., ASCE, 98(4), 361-380.

Head, H.J., and Seals, R.K. (1979). "Design and Construction of Experimental Haul Road and Parking Lot Facilities Utilizing Power Plant Ash," presented at the Fifth International Ash Utilization Symposium, Atlanta, Georgia, METC/SP-79/10 V2, 679-693.

Joshi, R.C. (1978). "Structural Fills Using Fly Ash," presented at the Ash Management Conference, Texas A&M University, College Station, Texas.

Kinder, D.L. and Morrison, R.E. (1979). "An Engineering Approach for Using Fly Ash in a Structural Fill," presented at the Fifth International Ash Utilization Symposium, Atlanta, Georgia METC/SP-70/10 V2, 713-724.

Lamb, D.W., Herrmann, W., and Pizzella, J. (1976). "Fly Ash as Construction Material for Water Retaining Structures," presented at the Fourth International Ash Utilization Symposium, St. Louis, Missouri, MERC/SP-76/4, 369-379.

Leonards, G.A., and Bailey, B. (1982). "Use of Pulverized Coal Ash as Structural Fill," Journal of Geotechnical Division, ASCE, 108(4), 517-531.

Ng, S.Y. (1979). "Experience with Geotechnical Methods for Design of Fly Ash Embankments and Structural Fills," presented at the Fifth International Ash Utilization Symposium, Atlanta, Georgia, METC/SP-79/10 V2, 725-747.

Rose, J.L., Chiang, L., and Lowe, J.A. (1982). "An Engineering Evaluation of Blended Coal By-Product Materials for Stabilized Base and Highway Construction Applications," presented at the Sixth International Utilization Symposium, Reno, Nevada, DOE/METC/82-52 V1, 314-357.

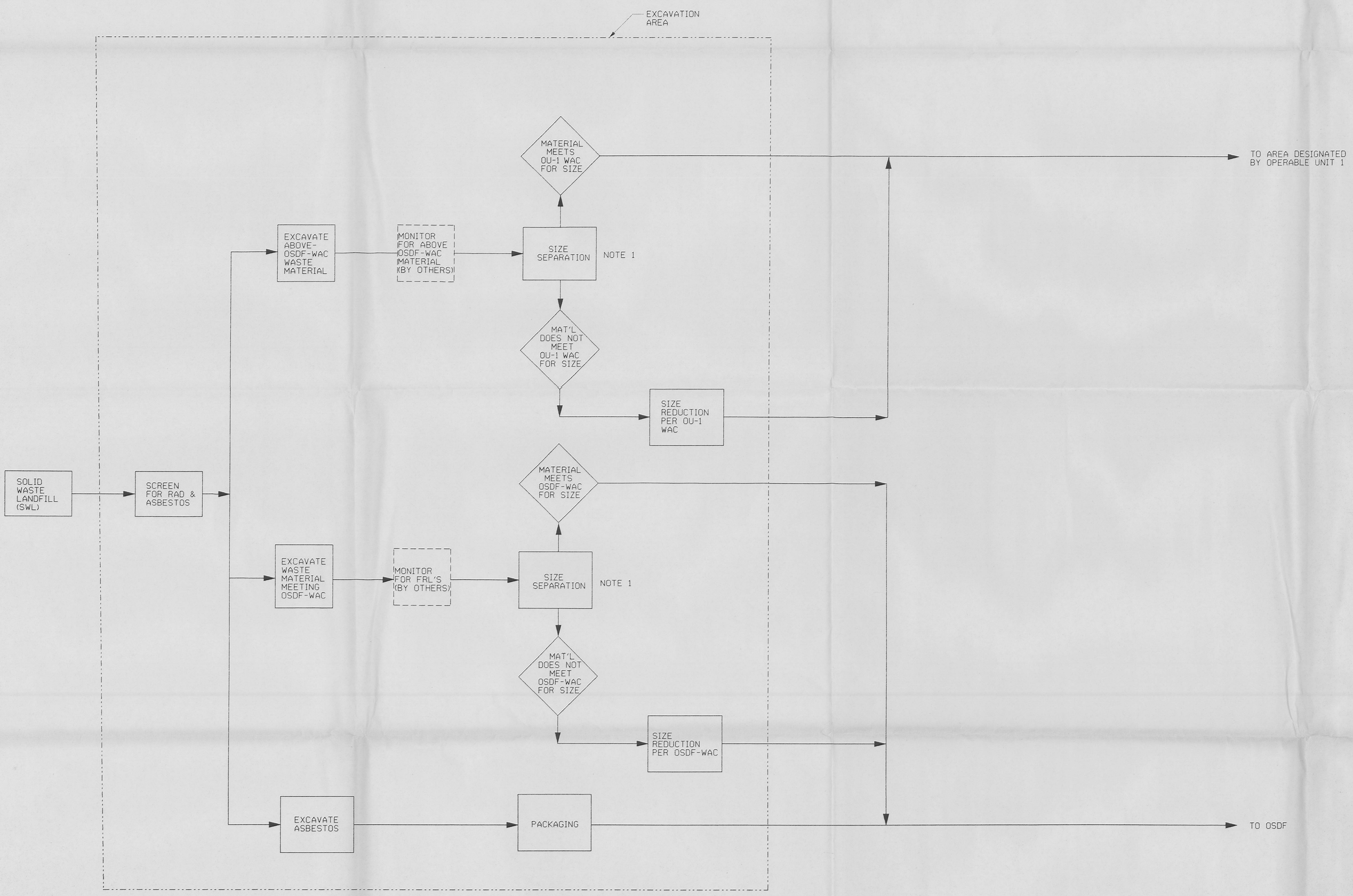
Santhanam, C.J., and Ullrich, C.R. (1979). "Characterization of Flue Gas Cleaning (FGC) Wastes from Coal Combustion," presented at the Fifth International Ash Utilization Symposium, Atlanta, Georgia, METC/SP-79/10 V1, 405-447.

Seals, R.K., Moulton, L.K., and Kinder, D.L. (1977). "In Situ Testing of a Compacted Fly Ash Fill," presented at the ASCE Specialty Conference on Geotechnical Practice for Disposal of Solid Waste Materials, Ann Arbor, Michigan, 493-516.

Sikes, P.G., and Kolbeck, H.J. (1973). "Disposal and Uses of Power Plant Ash in Urban Area," Journal of Power Division, ASCE, 99(1), 217-234.

Srinivasan, C., Beckwith, G.H., and Burke, H.H. (1977). "Geotechnical Investigations of Power Plant Wastes," presented at the ASCE Specialty Conference on Geotechnical Practice for Disposal of Solid Waste Materials, Ann Arbor, Michigan, 169-187.

Thorton, S.I., Parker, D.G., and Yang, S.N. (1979). "Delayed Compaction of High Calcium Fly Ash Stabilized Soil," presented at the Fifth International Ash Utilization Symposium, Atlanta, Georgia, METC/SP-79/10 V2, 748-757.



NOTES

1. VISUAL SIZE SEPARATION WILL BE PERFORMED DURING EXCAVATION.

LEGEND:

OSDF	= ON SITE DISPOSAL FACILITY
WAC	= WASTE ACCEPTANCE CRITERIA
FRL'S	= FINAL REMEDIATION LEVELS

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

EDC

DRAWING TITLE
MATERIALS HANDLING
PROCESS FLOW DIAGRAM
SOLID WASTE LANDFILL

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
NH TERRY	3-12-96			D. O'KEEF	03/20/96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NTS	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20600

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/P0165		WBS 00-90701	92X-5900-M-00327	M0001	B

287

443

PIPING SYMBOLS

- GATE VALVE
- GLOBE VALVE
- BALL VALVE
- PLUG VALVE
- BUTTERFLY VALVE/DAMPER
- STOP CHECK
- NEEDLE VALVE
- CHECK VALVE
- SLIDING GATE VALVE
- BALL CHECK VALVE
- BACKFLOW PREVENTER
- DIAPHRAGM VALVE
- PINCH VALVE
- 3 WAY VALVE
- 3 WAY BALL VALVE
- 3 WAY PLUG VALVE
- ANGLE GATE VALVE
- ANGLE GLOBE VALVE
- FOOT VALVE
- HUB DRAIN OR FUNNEL
- DIAPHRAGM OPERATOR
- DIAPHRAGM W/ POSITIONER
- PISTON OPERATOR
- SAFETY RELIEF VALVE
- SOLENOID OPERATOR
- SELF-CONTAINED BACK PRESSURE REGULATING VALVE
- 2-WAY SOLENOID VALVE
- 3-WAY SOLENOID VALVE INDICATES DEENERGIZED SECONDARY
- 4-WAY SOLENOID VALVE
- VALVE WITH OPERATOR (VALVE TYPE UNDEFINED)
- STEAM TRAP
- HOSE QUICK COUPLING
- UNION
- DRAIN LEG
- EXPANSION JOINT
- HANDWHEEL
- EJECTOR
- STRAINER (Y TYPE)
- STRAINER (SINGLE BASKET)
- STRAINER (DOUBLE BASKET)
- STRAINER (CONE TYPE)
- STRAINER (SUCTION TYPE)
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER
- ORIFICE
- VENTURI TUBE
- SIPHON TUBE
- THERMOWELL
- FLOW DIRECTION
- WELDED CONNECTION
- FLANGED CONNECTION
- PIPE CAP
- TIE/IN MARK
- PRIMARY
- SECONDARY
- EXISTING PIPING OR EQUIPMENT
- PACKAGED SYSTEM
- MATERIAL CODE BREAK
- INSULATION CODE BREAK
- PULSATION DAMPENER
- AIR FILTER
- FILTER LUBRICATOR REGULATOR
- AIR OPERATED DIAPHRAGM PUMP
- HORIZONTAL CENTRIFUGAL PUMP
- VERTICAL CENTRIFUGAL PUMP
- SUMP PUMP
- CHEMICAL METERING PUMP
- AGITATOR (MIXER)

INSTRUMENT SYMBOLS

- ELECTRICAL BINARY SIGNAL
- PNEUMATIC BINARY SIGNAL
- ELECTROMAGNETIC OR SONIC SIGNAL (GUIDED)
- ELECTROMAGNETIC OR SONIC SIGNAL (NON-GUIDED)
- IA — INSTRUMENT/PLANT AIR SUPPLY
- ELECTRICAL SIGNAL
- CAPILLARY
- HYDRAULIC SIGNAL LINE
- PNEUMATIC OR VACUUM SIGNAL LINE
- INTERLOCK
- DIAPHRAGM SEAL
- ROTAMETER
- SIGHT GLASS
- LOCAL MOUNTED INSTRUMENT
- FRONT OF PANEL MOUNTED INSTRUMENT
- FRONT OF PANEL MOUNTED INSTRUMENT AUXILLIARY LOCATION
- REAR OF PANEL MOUNTED INSTRUMENT
- REAR OF PANEL MOUNTED INSTRUMENT AUXILLIARY LOCATION
- DIGITAL LOGIC OPERATOR INTERFACE AUXILIARY LOCATION
- DIGITAL LOGIC OPERATOR INTERFACE
- SHARED CONTROL AUXILIARY LOCATION
- SHARED DISPLAY COMPUTER CONTROL AND OPERATOR INTERFACE
- AIR VENT FILTER
- MAGNETIC FLOW METER
- POSITIVE DISPLACEMENT FLOW METER
- EQUIPMENT NUMBER

FY 102 A
- LETTERS OF IDENTIFICATION
- SPECIAL DESIGNATION
- INSTRUMENT TAG NUMBER

TYPICAL CALL OUT

ABBREVIATIONS

BTU	BRITISH THERMAL UNIT
CU FT	CUBIC FEET
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
KW	KILOWATT
LB/HR	POUNDS PER HOUR
SCFM	STD. CUBIC FT/MINUTE
NO	NORMALLY OPEN
NC	NORMALLY CLOSED
FO	FAIL OPEN
FC	FAIL CLOSED
AO	AIR TO OPEN
AC	AIR TO CLOSE
IA	INSTRUMENT AIR
ET	ELECTRIC TRACED AND INSULATED
ST	STEAM TRACED AND INSULATED
EF	EXHAUST FAN
GV	GRAVITY VENTILATOR
UH	UNIT HEATER
RED	REDUCER
ECC	ECCENTRIC
TBD	TO BE DETERMINED
TF	TOP FLAT
TYP	TYPICAL
MATL	MATERIAL
MED	MEDIUM
CO	CARBON MONOXIDE
RH	RELATIVE HUMIDITY
CFM	CUBIC FEET/MINUTE
SF	SOUTH FIELD
IFA	INACTIVE FLYASH PILE
COMH	CLEAN OUT MANHOLE
HDPE	HIGH DENSITY POLYETHYLENE
CS	CARBON STEEL
AWWT	ADVANCED WASTEWATER TREATMENT
SWL	SOLID WASTE LANDFILL

SINGLE LINE AIR DUCT SYMBOLS

- FAN WITH INLET VANES AND BACKDRAFT DAMPER
- BACKDRAFT DAMPER
- MOTORIZED DAMPER
- MANUAL VOLUME DAMPER

INSTRUMENTATION SPECIAL DESIGNATIONS

DESIGNATION	FUNCTION/ABBREVATION
Σ/N OR AVG	AVERAGING
± OR BI	BIAS
1:1,1:3,2:1 (TYP)	BOOST,GAIN OR ATTENUATE (INPUT:OUTPUT)
△ OR DIF	DIFFERENTIAL
÷ OR DIV	DIVIDE
√‾ OR SQ.RT.	EXTRACT SQUARE ROOT
X OR MUL	MULTIPLY
N	RAISE TO POWER
REV	REVERSING
Σ OR SUM	SUMMING
L	LOW
LL	LOW LOW
H	HIGH
HH	HIGH HIGH
HL	HIGH LOW
∫	INTEGRATE (TIME INTEGRAL)
%	PROPORTIONAL
Y	UNDETERMINED COMPUTING RELAY
HOA	HAND-OFF-AUTO
∓	EXISTING INSTRUMENT TO BE RELOCATED
I/P	CURRENT TO PNEUMATIC TRANSDUCER
RUN	RUNNING
OA	OFF-AUTO
OCA	OPEN-CLOSE-AUTO
I/O	INPUT / OUTPUT
✳	EXISTING INSTRUMENT
UD	UP/DOWN
EW	EAST/WEST
I/I	CURRENT TO CURRENT

PIPING SPECIFICATIONS

FLOWING MEDIUM	MED CODE	MATL CODE
BACK WASH	BW	T
CHILLED WATER	CHS, CHR	A
CHLORINE	CL	B1
CONDENSATE	LC	W, T
CONDENSER WATER	CWS, CWR	A
COOLING WATER	WS, WR	A
DRAIN	DR	A, T
THICKENER OVERFLOW	TO	T
FILTRATE EFFLUENT	FT	A
FLOCCULANT	FL	A
FLUSH WATER	FW	T
FORCE MAIN	FM	M
INSTRUMENT AIR	IA	T
OFF-GAS	OG	T
NITRIC ACID	AN	T1
PERCHED GND WATER	PGW	B
PHOSPHORIC ACID	PAPH	T1
PLANT AIR	PA	W
POLISHED WATER	PW	A
POTABLE WATER	DW	W, B, B3
PROCESS WATER	TW	A
PROCESS WASTEWATER	CE	A
RAW WATER	RW	A
RECYCLE WATER	RC	T, B2
SCRUBBER RECYCLE	RSL	T
SLURRY	SL	T
SODIUM CARBONATE	SC	A
SODIUM HYDROXIDE	NA	T
SODIUM SILICATE	SS	A
STORM WATER	ST	A, B4
SULFURIC ACID	SB	T1
SUMP DISCHARGE	SU	T
VACUUM	V	A
VENTILATION AIR	VE	T
WASTE WATER	WW	W, B4, A

EXAMPLE:

CE-2"-A-100-ET

- MEDIUM CODE
- NOMINAL PIPE SIZE
- MATERIAL CODE
- LINE NUMBER
- HEAT TRACING AND INSULATION

A - A53,GR. A, SEAMLESS STEEL PIPE
B - PVC
B1 - PVDF
B2 - PVDF, 100 PSI
B3 - CPVC
B4 - HDPE
L - FIBERGLASS REINFORCED PLASTIC
M - DUCTILE IRON
T - 304L, STAINLESS STEEL PIPE
T1 - 316L, STAINLESS STEEL PIPE
W - A53,GR. A, GALVANIZED STEEL PIPE

LETTERS OF INSTRUMENT IDENTIFICATION

LETTER	FIRST LETTER	2ND LETTER	3RD OR 4TH LETTER
	MEASURED OR INITIATING VARIABLE	MODIFIER	READ OUT OR PASSIVE FUNCTION
A	ANALYSIS	ALARM	ALARM
B	BURNER FLAME	----	----
C	CAMERA	CONTROLLER	CONTROLLER
D	DENSITY	DIFFERENTIAL	----
E	VOLTAGE	ELEMENT	ELEMENT
F	FLOW RATE	RATIO (FRACTION)	----
G	GAGING (DIM)	VIEWING DEVICE	GLASS
H	HAND (MANUAL)	----	HIGH
I	CURRENT (ELECT)	INDICATE	INDICATE
J	POWER	SCAN	----
K	TIME	----	----
L	LEVEL	LIGHT	LOW
M	MOIST OR HUMIDITY	----	----
N	----	----	----
O	OBSERVATION	----	ORIFICE
P	PRESSURE OR VACUUM	----	POINT (TEST)
Q	QUANTITY OR EVENT	TOTALIZER	----
R	RADIOACTIVITY	RECORDER	----
S	SPEED OR FREQUENCY	SAFETY/SWITCH	SWITCH
T	TEMPERATURE	TRANSMITTER	TRANSMITTER
U	USER'S GUIDE	----	MULTIFUNCTION
V	VISCOSITY	----	VENT, VALVE
W	WEIGHT OR FORCE	WELL	----
X	UNCLASSIFIED	----	UNCLASSIFIED
Y	RELAY	RELAY	----
Z	POSITION	----	----

NOTES

287

REF DWG NO.	DRAWING TITLE
92X-5900-X-00314	DRAWING INDEX

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

EDG

DRAWING TITLE
MECHANICAL PROCESS
PIPING AND INSTRUMENTATION DIAGRAM
SYMBOLS AND LEGEND SHEET - SWL

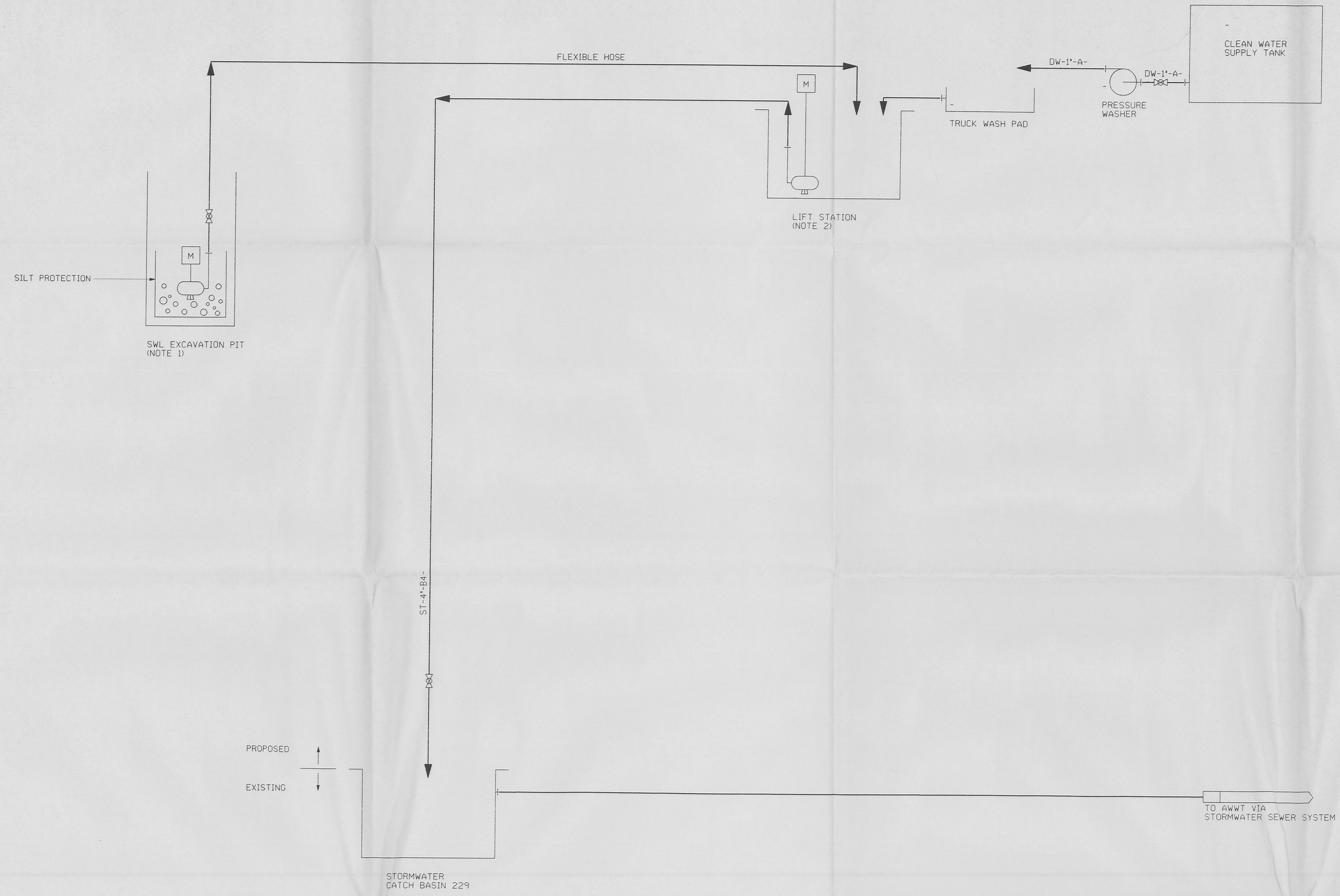
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
P. A. WILSON	3/4/96			K. D. MORRIS	3/25/96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	N/A DATE	20600

444

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/P0165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-N-00332	N0001	B



NOTES

1. PUMPS AND HOSES TO BE SIZED AND PROVIDED BY SUBCONTRACTOR.
2. SUBCONTRACTOR TO DESIGN AND PROVIDE LEVEL CONTROL AND LEVEL ALARMS.

REF DWG NO.	DRAWING TITLE
92X-5900-X-00314	DRAWING INDEX
92X-5900-N-00332	SYMBOLS AND LEGEND SHEET

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
MECHANICAL PROCESS
PIPING AND INSTRUMENTATION DIAGRAM
WASTEWATER COLLECTION AND TRANSFER - SWL

EDC

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
P. A. WILSON	3/1/96			K. D. MORRIS	3/25/96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20600

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/PO165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-N-00294	N0002	B

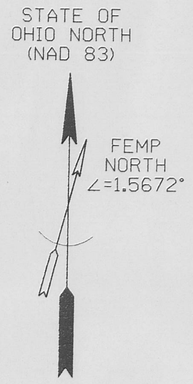
287

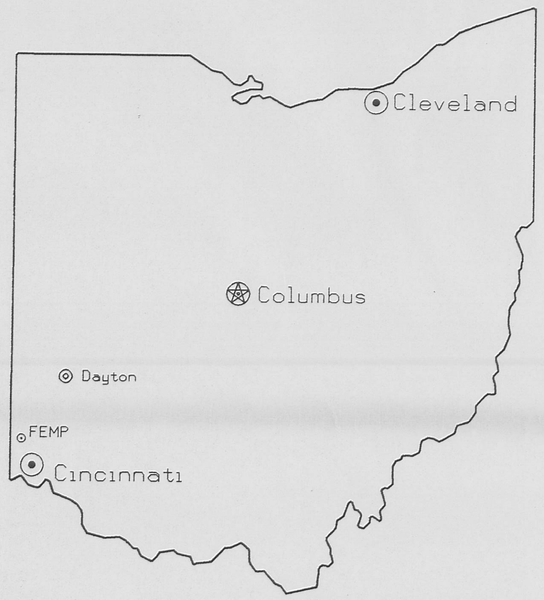
445

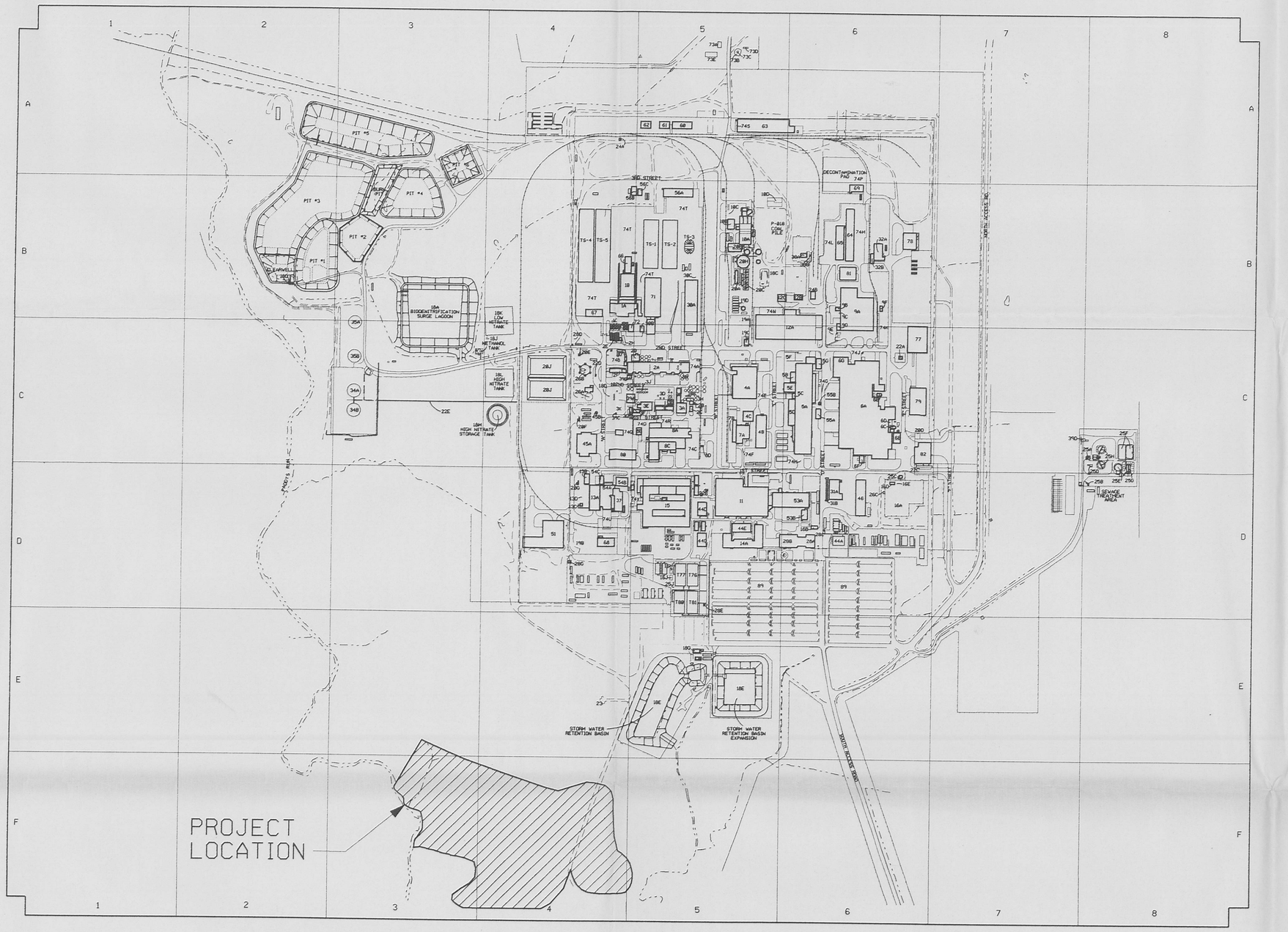
UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

WASTE UNITS REMEDIATION

OPERABLE UNIT 2 - SOUTHERN WASTE UNITS







PARSONS

The Ralph M. Parsons Company * Parsons Main, Inc. * Engineering-Science, Inc.

ARCHITECTS - ENGINEERS
CINCINNATI, OHIO

NOTES

287

REF DWG NO.	DRAWING TITLE
92X-5900-X-00320	DRAWING INDEX
92X-5900-X-00321	LEGEND AND SYMBOLS

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
PROJECT TITLE SHEET
SOUTHERN WASTE UNITS

EDC

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	03/11/96			E. KUBRIN	03/24/96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20400

446

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/PO165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-X-00319	X0001	B

INDEX OF DRAWINGS

INDEX CODE NO.	DRAWING NO.	SHEET NO.	REVISION NO.	DRAWING TITLE	REMARKS
	92X-5900-X-00319	X0001	B	PROJECT TITLE SHEET	
	92X-5900-X-00320	X0002	B	DRAWING INDEX	
	92X-5900-X-00321	X0003	B	LEGEND AND SYMBOLS	
	92X-5900-G-00281	G0001	B	CIVIL - MASTER SITE/UTILITY PLAN	
	92X-5900-G-00282	G0002	B	CIVIL - PREPARATORY SITE/GRADING PLAN	
	92X-5900-G-00283	G0003	B	CIVIL - SITE/GRADING/UTILITY PLAN - WHEEL WASH AREA	
	92X-5900-G-00284	G0004	B	CIVIL - SITE/GRADING/UTILITY PLAN - SUPPORT AREA	
	92X-5900-G-00285	G0005	B	CIVIL - ABOVE WAC EXCAVATION PLAN	
	92X-5900-G-00286	G0006	B	CIVIL - FINAL REMEDIATION LEVEL ELEVATION PLAN	
	92X-5900-G-00333	G0007	A	CIVIL - FINAL GRADING PLAN	
	92X-5900-G-00287	G0008	B	CIVIL - CROSS SECTIONS - SHEET 1 OF 9	
	92X-5900-G-00288	G0009	B	CIVIL - CROSS SECTIONS - SHEET 2 OF 9	
	92X-5900-G-00289	G0010		CIVIL - CROSS SECTIONS - SHEET 3 OF 9	TO BE INCLUDED AT 90% SUBMITTAL
	92X-5900-G-00298	G0011		CIVIL - CROSS SECTIONS - SHEET 4 OF 9	TO BE INCLUDED AT 90% SUBMITTAL
	92X-5900-G-00299	G0012		CIVIL - CROSS SECTIONS - SHEET 5 OF 9	TO BE INCLUDED AT 90% SUBMITTAL
	92X-5900-G-00300	G0013		CIVIL - CROSS SECTIONS - SHEET 6 OF 9	TO BE INCLUDED AT 90% SUBMITTAL
	92X-5900-G-00301	G0014		CIVIL - CROSS SECTIONS - SHEET 7 OF 9	TO BE INCLUDED AT 90% SUBMITTAL
	92X-5900-G-00302	G0015		CIVIL - CROSS SECTIONS - SHEET 8 OF 9	TO BE INCLUDED AT 90% SUBMITTAL
	92X-5900-G-00303	G0016		CIVIL - CROSS SECTIONS - SHEET 9 OF 9	TO BE INCLUDED AT 90% SUBMITTAL
	92X-5900-G-00304	G0017		CIVIL - PLAN AND PROFILES - SHEET 1 OF 3	TO BE INCLUDED AT 90% SUBMITTAL
	92X-5900-G-00305	G0018		CIVIL - PLAN AND PROFILES - SHEET 2 OF 3	TO BE INCLUDED AT 90% SUBMITTAL
	92X-5900-G-00306	G0019		CIVIL - PLAN AND PROFILES - SHEET 3 OF 3	TO BE INCLUDED AT 90% SUBMITTAL
	92X-5900-G-00307	G0020		CIVIL - DETAIL SHEET - SHEET 1 OF 3	TO BE INCLUDED AT 90% SUBMITTAL
	92X-5900-G-00308	G0021		CIVIL - DETAIL SHEET - SHEET 2 OF 3	TO BE INCLUDED AT 90% SUBMITTAL
	92X-5900-G-00309	G0022		CIVIL - DETAIL SHEET - SHEET 3 OF 3	TO BE INCLUDED AT 90% SUBMITTAL
	92X-5900-G-00310	G0023		CIVIL - ENLARGEMENTS/DETAILS - SEDIMENT CONTROL - SHEET 1 OF 2	TO BE INCLUDED AT 90% SUBMITTAL
	92X-5900-G-00311	G0024		CIVIL - ENLARGEMENTS/DETAILS - SEDIMENT CONTROL - SHEET 2 OF 2	TO BE INCLUDED AT 90% SUBMITTAL
	90X-5900-G-00312	G0025		CIVIL - ENLARGEMENTS/DETAILS - WASH PAD	TO BE INCLUDED AT 90% SUBMITTAL
	92X-5900-P-00297	P0001		MECHANICAL UTILITIES - DECON TRAILER PLUMBING PLAN	TO BE INCLUDED AT 90% SUBMITTAL
	92X-5900-M-00329	M0003	B	MATERIALS HANDLING - PROCESS FLOW DIAGRAM	
	92X-5900-N-00295	N0001	B	MECHANICAL PROCESS - PIPING AND INSTRUMENTATION DIAGRAM - SYMBOLS AND LEGEND SHEET	
	92X-5900-N-00290	N0002	B	MECHANICAL PROCESS - PIPING AND INSTRUMENTATION DIAGRAM - BASIN WASTEWATER COLLECTION AND TRANSFER	
	92X-5900-N-00291	N0003	B	MECHANICAL PROCESS - PIPING AND INSTRUMENTATION DIAGRAM - EQUIPMENT DECON FACILITIES	
	LATER	P0002		PIPING PLAN	TO BE INCLUDED AT 90% SUBMITTAL
	LATER	P0003		PIPING SECTIONS AND DETAILS	TO BE INCLUDED AT 90% SUBMITTAL

NOTES

287

REF DWG NO.	DRAWING TITLE
92X-5900-X-00319	PROJECT TITLE SHEET
92X-5900-X-00321	LEGEND AND SYMBOLS

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
EDC

DRAWING INDEX
SOUTHERN WASTE UNITS

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	03/11/96			E. KUBRIN	03/24/96

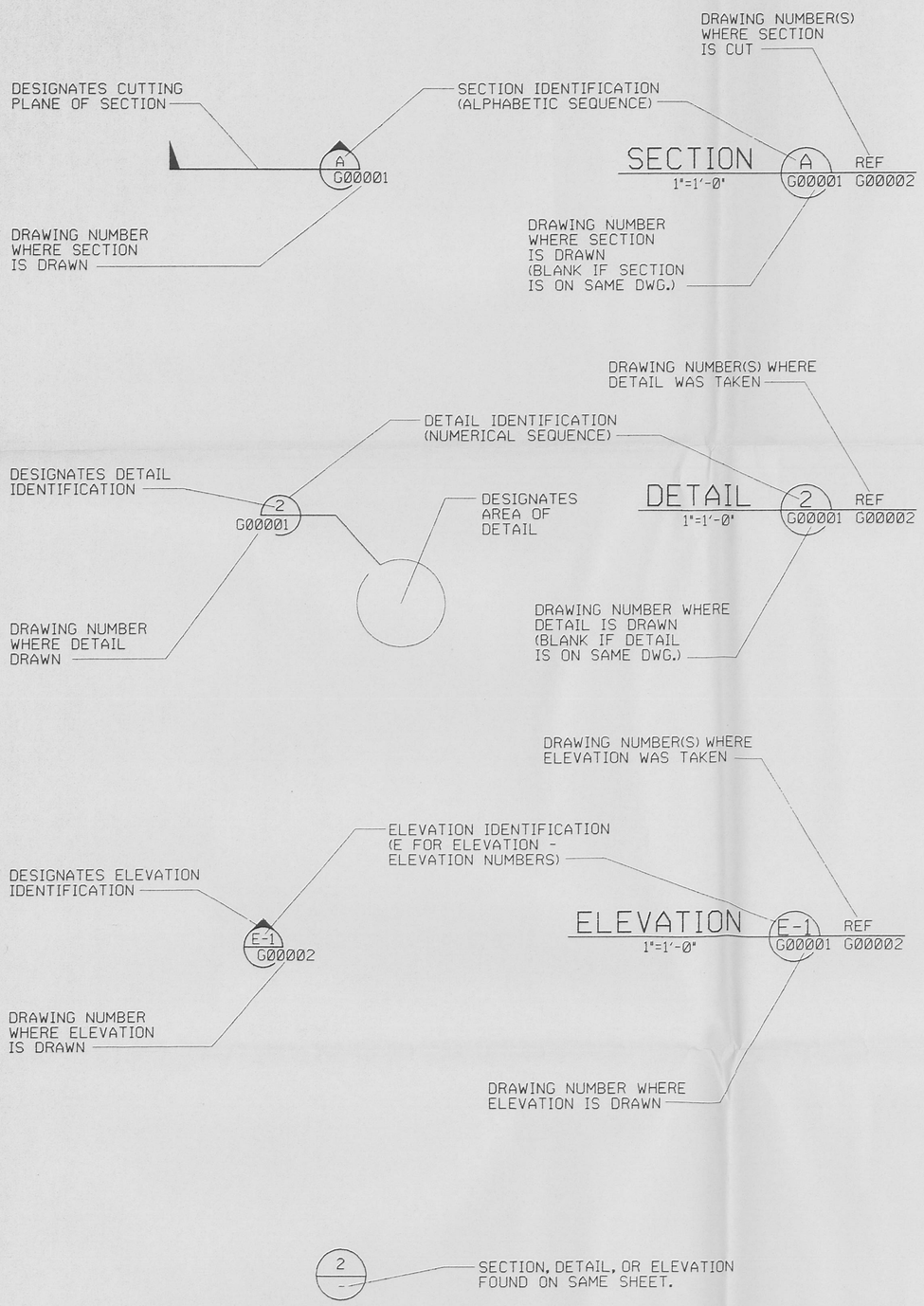
PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20400

447

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/P0165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-X-00320	X0002	B

GENERAL LEGEND



NOTE:

ABBREVIATED DRAWING NUMBERS WILL BE USED FOR ALL SECTIONS, DETAILS, ELEVATIONS, AND WITHIN NOTES AND CALL OUTS IN THE BODY OF THE DRAWING.

FOR EXAMPLE: 95X-5900-G-00002 = DRAWING NUMBER
G00002 = ABBREVIATED DRAWING NUMBER

DIMENSIONING:

DIMENSIONS AND/OR ELEVATIONS MARKED THUS (+/-) SHALL BE VERIFIED IN THE FIELD BY CONTRACTOR.

USE DIMENSIONS AS SHOWN. DO NOT SCALE.

NTS (NOT TO SCALE) IS SHOWN ONLY WHERE DIMENSION IS OBVIOUSLY OUT OF SCALE.

ABBREVIATIONS

BSL	BIODENITRIFICATION SURGE LAGOON
OSDF	ON-SITE DISPOSAL FACILITY
FRL	FINAL REMEDIATION LEVEL
SWM	STORMWATER MANAGEMENT
TYP	TYPICAL
WAC	WASTE ACCEPTANCE CRITERIA
WW	WASTE WATER LINE

CONSTRUCTION (BY OTHERS)

- CONTOUR - MAJOR & MINOR
- UTILITIES
- BUILDING/TRAILER/PAD
- ROADWAY/SIDEWALK

UTILITY SYMBOLS

EXISTING		PROPOSED
----- ST -----	STORM SEWER	ST
----- SN -----	SANITARY SEWER	SN
----- FG -----	FUEL GAS	FG
----- DW -----	DRINKING WATER	DW
----- FQ1 -----	FIRE PROTECTION	FQ1
----- LS -----	LIVE STEAM	LS
----- WS -----	WATER SUPPLY	WS
----- WR -----	COOLING WATER RETURN	WR
----- TW -----	PROCESS WATER	TW
----- CE -----	CONTAMINATE WATER	CE
----- FT -----	FILTRATE OR EFFLUENT	FT
----- DF -----	DEIONIZED FEED	DF
----- PW -----	DEIONIZED WATER	PW
----- BR -----	BRINE	BR
----- RW -----	RAW WATER	RW
----- A -----	ALARM	A
----- CN -----	STEAM CONDENSATE	CN
----- VE -----	VENT LINES	VE
----- SD -----	SUB-SURFACE DRAINAGE	SD
----- SL -----	SUMP LIQUOR	SL
----- E -----	ELECTRICAL	E
----- OE -◇--	OVERHEAD ELECTRICAL	OE —◆—
----- T -----	TELEPHONE	T
----- G -----	ELECTRIC GROUND	G
----- PA -----	PLANT AIR	PA
----- SA -----	INSTRUMENT AIR SUPPLY	SA
	ABANDONED	

BALLOON LEGEND

- PIV — POST INDICATOR VALVE
- SMH — SANITARY MANHOLE
- EMH — ELECTRICAL MANHOLE
- TMH — TELEPHONE MANHOLE
- CB — STORM SEWER CATCH BASIN
- HFH — HIGH PRESSURE FIRE HYDRANT
- LFH — LOW PRESSURE FIRE HYDRANT

GRADING SYMBOLS

EXISTING		PROPOSED
X 584.9	SPOT ELEVATION	X 589.4
584	CONTOUR - MINOR	584
585	CONTOUR - MAJOR	585
(TOE)	SLOPE INDICATOR	(TOE)

SYMBOLS LEGEND

EXISTING		PROPOSED
	POST INDICATOR VALVE (PIV)	
	FIRE HYDRANT (FH)	
	MANHOLE (MH)	S OR D
	CATCH BASIN (CB)	D
	LIGHT POLE	
	ELECTRICAL MANHOLE	E
	TELEPHONE MANHOLE	T
	VALVE BOX	
1313	MONITORING WELL	
	SURFACE DRAINAGE FLOW	
	POWER POLE	
	GRAVEL ROADWAY/DRIVEWAY	
	ASPHALT ROADWAY/DRIVEWAY	
	CONCRETE PAD/ ROADWAY/DRIVEWAY	
	BUILDING/TRAILER	
	FENCE	
	TREE LINE	
	DECIDUOUS TREE	
	CONIFEROUS TREE	
	CENTERLINE DRAINAGE DITCH	
	RIVER/CREEK	
	TO BE REMOVED	
	SILT FENCE	
	ELECTRICAL TRANSFORMER	T
	TRANSMISSION TOWER	
	HEADWALL	OR
BM	BENCH MARK	
—xx——xx—	CONSTRUCTION/WIND BARRIER FENCE	—xx——xx—
	SIGN	
	BOLLARD/GUARD POST	
PB	ELECTRICAL PULL BOX	
	SURVEY CONTROL POINT	
	ROAD CENTERLINE OR BASELINE	
	PIPE BEND	OR
	PIPE TEE	
	THRUST BLOCK	
	REDUCER	
W OR U	UNKNOWN	
	STRAW BALE SILT BARRIER	
	FENCE GATE	
	APPROXIMATE ELEVATION OF GROUNDWATER	
	BATTERY LIMIT	
	SEDIMENT TRAP	
	CLEARING LIMIT	
	LIMIT OF FRL EXCAVATION	

NOTES

REF DWG NO.	DRAWING TITLE
92X-5900-X-00319	PROJECT TITLE SHEET
92X-5900-X-00320	DRAWING INDEX

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
LEGEND AND SYMBOLS
SOUTHERN WASTE UNITS

EDC

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	03/11/96			E. KUBRIN	03/24/96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20400

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
0U2/P0165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-X-00321	X0003	B

448

287

449

NOTES

287

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   EXISTING SITE DATA SOURCE (IN PLANT FILES)
   PARSONS TOPOGRAPHY, 1992
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   FEMP OU-2 REMEDIAL INVESTIGATION REPORT, 1995;
   AND FEASIBILITY REPORT, 1995
2. OU-5 SOUTH FIELD EXTRACTION SYSTEM IS TO BE ACCOMPLISHED BY OTHERS AND SHOULD NOT BE DISTURBED.
3. EFFLUENT DISCHARGE LINE TO BE ABLE TO DISCHARGE INTO EITHER EAST OR WEST STORMWATER RETENTION BASIN (SWRB).
4. CLEANOUTS (CO) ON STORMWATER DISCHARGE LINE TO BE SPACED NO GREATER THAN 400 FEET.
5. RECTANGULAR SHAPES INDICATE LIMITS OF DRAWINGS TO REFERENCE.
6. EFFLUENT IS COLLECTED RUNOFF THAT HAS POTENTIAL FOR HAVING CONTACTED DISTURBED WASTE. THIS WATER SHALL BE COLLECTED AT EXCAVATION AND CONVEYED TO TREATMENT.
7. ALL EQUIPMENT DECONTAMINATION IS TO OCCUR AT THE OSDF.

REF DWG NO.	DRAWING TITLE
92X-5900-X-00320	DRAWING INDEX
92X-5900-X-00321	LEGEND AND SYMBOLS
92X-5900-G-00282	PREPARATORY SITE/GRADING AND DRAINAGE PLAN
92X-5900-G-00283	SITE/GRADING/UTILITY PLAN - WHEEL WASH AREA
92X-5900-G-00284	SITE/GRADING/UTILITY PLAN - SUPPORT AREA
92X-5900-G-00285	ABOVE WAC EXCAVATION PLAN
92X-5900-G-00286	FINAL REMEDIATION LEVEL EXCAVATION PLAN

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
CIVIL
MASTER SITE/UTILITY PLAN
SOUTHERN WASTE UNITS

EDC

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	02/28/96			E. KUBRIN	03/24/96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=100'	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	N/A DATE	20400

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/P0165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-G-00281	G0001	B

NOTES

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   EXISTING SITE DATA SOURCE (IN PLANT FILES)
   PARSONS TOPOGRAPHY, 1992
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   FEMP OU-2 REMEDIAL INVESTIGATION REPORT, 1995; AND FEASIBILITY STUDY REPORT, 1995

2. INSTALL SEDIMENT/EROSION CONTROL MEASURES PRIOR TO WASTE MATERIAL EXCAVATION.

3. ALL MONITORING WELLS IN THE WORK ZONE SHALL BE ABANDONED BY FERMCO PRIOR TO STARTING CONSTRUCTION.

4. AREA IN VICINITY OF SEDIMENT TRAP 2 HAS RECENTLY BEEN REGRADED. CONTOURS SHOWN MAY DIFFER FROM ACTUAL FIELD CONDITIONS. SUBCONTRACTOR TO VERIFY CONTOURS IN THIS AREA PRIOR TO BID.

REF DWG NO.	DRAWING TITLE
92X-5900-X-00320	DRAWING INDEX
92X-5900-X-00321	LEGEND AND SYMBOLS
92X-5900-G-00284	SITE/GRADING/UTILITY PLAN - SUPPORT AREA
92X-5900-G-00283	SITE/GRADING/UTILITY PLAN - WHEEL WASH AREA
92X-5900-G-00288	CROSS SECTION - SHEET 2 OF 9

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNIT REMEDIATION

DRAWING TITLE
CIVIL
PREPARATORY SITE/GRADING PLAN
SOUTHERN WASTE UNITS

EDC

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	02/28/96			E. KUBRIN	03/24/96
PLANT/BLDG. NO.		FLOOR		SCALE 1"=50'	CLASS
SUBMITTED FOR APPROVAL		FERMCO CRU APPROVAL N/A		FERMCO PROJECT NO. 20400	

A-E DATE | DATE

DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
	WBS 1.1.1.1.2.3.6 00-90701	92X-5900-G-00282	G0002	B

PREPARED UNDER PARSONS PROJECT ORDER NUMBER
OU2/PO165

450

451

NOTES

287

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   EXISTING SITE DATA SOURCE (IN PLANT FILES)
   PARSONS TOPOGRAPHY, 1992
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   FEMP OU-2 REMEDIAL INVESTIGATION REPORT, 1995;
   AND FEASIBILITY STUDY REPORT, 1995

2. TIE WHEEL WASH DISCHARGE LINE INTO THE EXISTING SEEPAGE COLLECTION SYSTEM LIFT STATION. PROVIDE A VISUAL ALARM FOR HIGH WATER ELEVATION IN LIFT STATION (AT PUMP CUTOFF LEVEL FOR HIGH FLOW). VALVE AT WHEEL WASH IS TO REMAIN IN "NORMALLY CLOSED" POSITION AND IS TO BE OPENED ONLY WHEN ALARM AT LIFT STATION IS NOT ACTIVATED.

3. CONSTRUCTION OF WHEEL WASH PAD AND ASSOCIATED FACILITIES SHALL BE PART OF THE INITIAL SITE PREPARATION AND SHALL BE OPERATIONAL PRIOR TO ANY EXCAVATION OF WASTE MATERIAL AREA.

4. EXISTING RAD CONTROL BOUNDARIES WITHIN THE INACTIVE FLYASH PILE AND SOUTH FIELD AREAS WILL BE REMOVED AS NEW BOUNDARIES ARE ESTABLISHED FOR THE ENTIRE WORK AREA.

REF DWG NO.	DRAWING TITLE
92X-5900-X-00320	DRAWING INDEX
92X-5900-X-00321	LEGEND AND SYMBOLS
92X-5900-G-00282	PREPARATORY SITE/GRADING AND DRAINAGE PLAN
92X-5900-G-00284	SITE/GRADING/UTILITY PLAN - SUPPORT AREA
92X-5900-G-00285	ABOVE WAC EXCAVATION PLAN

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
CIVIL
SITE/GRADING/UTILITY PLAN-WHEEL WASH AREA
SOUTHERN WASTE UNITS

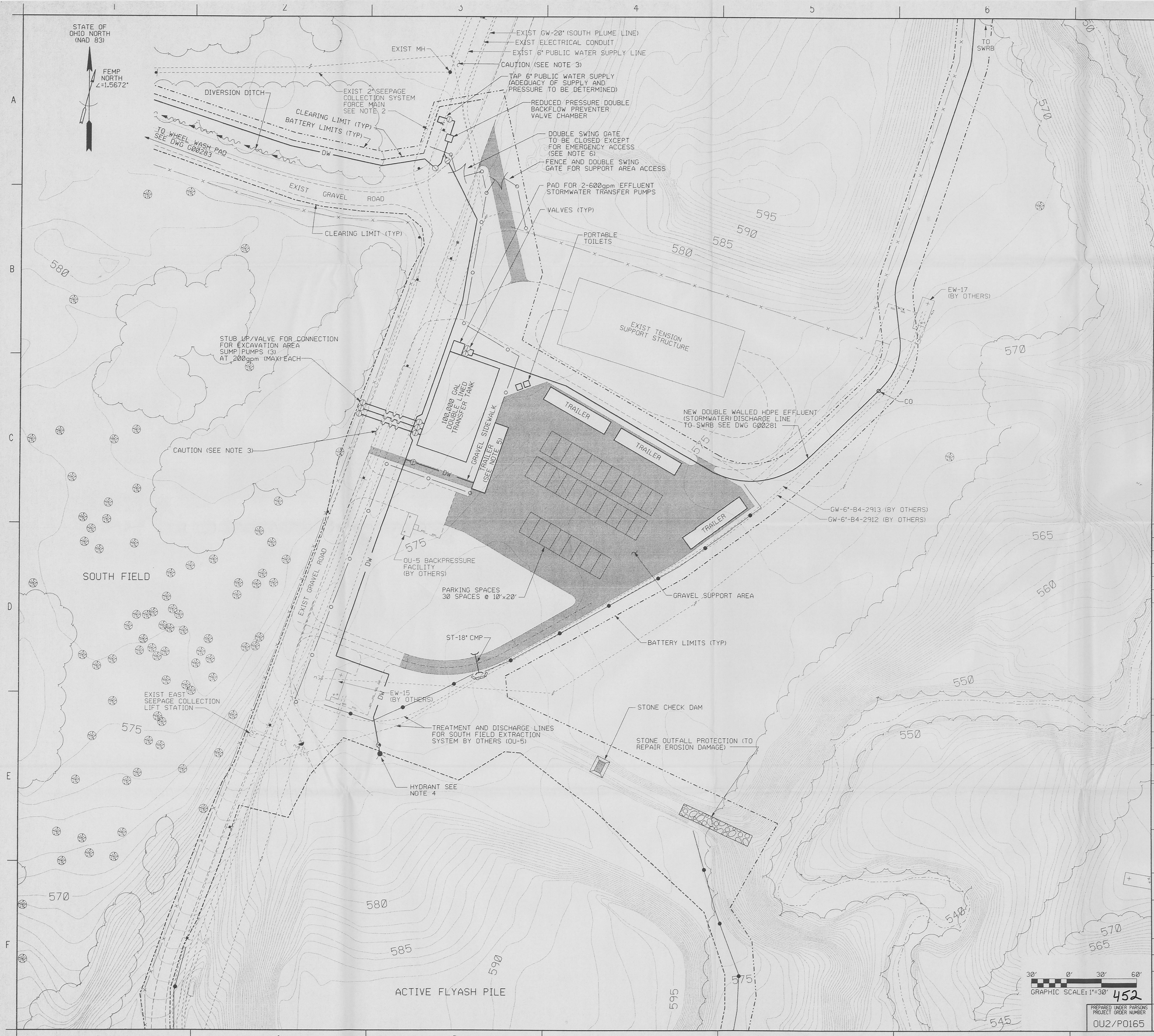
EDC

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	02/28/96			E. KUBRIN	03/24/96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=30'	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20400

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/PO165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-G-00283	G0003	B



NOTES

287

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   EXISTING SITE DATA SOURCE (IN PLANT FILES)
   PARSONS TOPOGRAPHY, 1992
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   FEMP OU-2 REMEDIAL INVESTIGATION REPORT, 1995;
   AND FEASIBILITY STUDY REPORT

2. EXISTING SEEPAGE COLLECTION SYSTEM FORCE MAIN IS DOUBLE WALLED WITH 2" HDPE SDR11 CARRIER PIPE AND 4" HDPE SDR17 CONTAINMENT PIPE.

3. EXISTING GAS LINE (FG) NOT SHOWN. FG LINE FOLLOWS PUBLIC WATER SUPPLY AND IS MARKED IN FIELD BY WITNESS POSTS. EXERCISE ALL PRECAUTIONS TO LOCATE FG WHEN EXCAVATING IN THIS AREA.

4. HYDRANT FOR DUST CONTROL WATER SUPPLY ONLY.

5. SANITARY WATER IS TO BE COLLECTED (IN TANK UNDER TRAILERS) AND LATER REMOVED AND PROPERLY DISPOSED OF.

6. DOUBLE SWING GATE AND ROADWAY MUST REMAIN CLEAR AT ALL TIMES FOR EMERGENCY VEHICLE ACCESS INTO PROJECT AREA.

REF DWG NO.	DRAWING TITLE
92X-5900-X-00320	DRAWING INDEX
92X-5900-X-00321	LEGEND AND SYMBOLS
92X-5900-G-00281	MASTER SITE/UTILITY PLAN
92X-5900-G-00283	SITE/GRADING/UTILITY PLAN - WHEEL WASH AREA

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

EDC

DRAWING TITLE
CIVIL
SITE/GRADING/UTILITY PLAN-SUPPORT AREA
SOUTHERN WASTE UNITS

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
D.R. FOX	02/28/96			E. KUBRIN	03/24/96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=30'	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	N/A DATE	20400

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/P0165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-G-00284	G0004	B

453

NOTES

287

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   EXISTING SITE DATA SOURCE (IN PLANT FILES)
   PARSONS TOPOGRAPHY, 1992
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   FEMP OU-2 REMEDIAL INVESTIGATION REPORT, 1995;
   AND FEASIBILITY STUDY REPORT, 1995

2. APPROXIMATE EDGE OF STAGE 1 EXCAVATION. PROVIDE BERM TO MINIMIZE STORMWATER RUN ON INTO EXCAVATION ALONG PERIMETER.

3. RAMPS/EXCAVATIONS FOR EGRESS/ACCESS TO EXCAVATION BOTTOMS ARE NOT SHOWN AND ARE TO BE FIELD DETERMINED. PERIMETER OF EXCAVATION AND EGRESS RAMPS ARE TO BE PROPERLY SLOPED. BERMS AND SUMPS ARE TO BE PROVIDED TO PREVENT STORM WATER RUN ON INTO EXCAVATION AND TO COLLECT STORMWATER EFFLUENT FOR TREATMENT.

4. SOIL EXCAVATION FROM THIS AREA WILL BE SEGREGATED AND DISPOSED OF IN ACCORDANCE WITH FEMP WASTE PROGRAMS MANAGEMENT REQUIREMENTS. THIS AREA CONTAINS APPROXIMATELY 365 CY OF LEAD CONTAMINATED SOIL.

REF DWG NO.	DRAWING TITLE
92X-5900-X-00320	DRAWING INDEX
92X-5900-X-00321	LEGEND AND SYMBOLS
92X-5900-G-00282	PREPARATORY SITE/GRADING PLAN
92X-5900-G-00284	SITE/GRADING/UTILITY PLAN - SUPPORT AREA

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

EDC

DRAWING TITLE
CIVIL
ABOVE WAC EXCAVATION PLAN
SOUTHERN WASTE UNITS

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	02/28/96			E. KUBRIN	03/24/96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=50'	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20400

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/PO165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-G-00285	G0005	B

NOTES

287

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   EXISTING SITE DATA SOURCE (IN PLANT FILES)
   PARSONS TOPOGRAPHY, 1992
   FEMP CADD GRID/UTILITY/GEOTECHNICAL/CONTAMINATE MODELS AND DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   FEMP OU-2 REMEDIAL INVESTIGATION REPORT, 1995; AND FEASIBILITY STUDY REPORT, 1995

2. ACCESS AND SEDIMENT CONTROL SHALL BE INSTALLED PRIOR TO ANY OTHER WORK.

3. RAMPS/EXCAVATIONS FOR EGRESS/ACCESS TO FRL BOTTOMS ARE NOT SHOWN AND ARE TO BE FIELD DETERMINED. PERIMETER OF EXCAVATION AND EGRESS RAMPS ARE TO BE PROPERLY SLOPED, BERMS AND SUMPS PROVIDED TO PREVENT STORM WATER RUN ON INTO EXCAVATION AND TO COLLECT STORMWATER EFFLUENT FOR TREATMENT.

REF DWG NO.	DRAWING TITLE
92X-5900-X-00320	DRAWING INDEX
92X-5900-X-00321	LEGEND AND SYMBOLS
92X-5900-G-00283	SITE/GRADING/UTILITY PLAN - WHEEL WASH AREA
92X-5900-G-00284	SITE/GRADING/UTILITY PLAN - SUPPORT AREA
92X-5900-G-00287	CROSS SECTION - SHEET 1 OF 9
92X-5900-G-00288	CROSS SECTION - SHEET 2 OF 9

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
CIVIL
FINAL REMEDIATION LEVEL ELEVATION PLAN
SOUTHERN WASTE UNITS

EDC

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	02/28/96			E. KUBRIN	03/24/96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=50'	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20400

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/PO165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-G-00286	G0006	B

NOTES

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   EXISTING SITE DATA SOURCE (IN PLANT FILES)
   PARSONS TOPOGRAPHY, 1992
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   FEMP OU-2 REMEDIAL INVESTIGATION REPORT, 1995;
   AND FEASIBILITY STUDY REPORT, 1995

2. FINAL GRADING BASED ON A COMPOSITE OF 1952 TOPOGRAPY (PROVIDED AT 5' CONTOUR INTERVAL), RI/FS DATA (PROVIDED AT 2' CONTOUR INTERVAL) AND FINAL REMEDIATION LEVEL MODEL CONTOURS (PROVIDED AT 2' CONTOUR INTERVAL). FINAL GRADING TO PROVIDE POSITIVE DRAINAGE.

REF DWG NO.	DRAWING TITLE
92X-5900-X-00320	DRAWING INDEX
92X-5900-X-00321	LEGEND AND SYMBOLS

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
A	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
CIVIL
FINAL GRADING PLAN
SOUTHERN WASTE UNITS

EDC

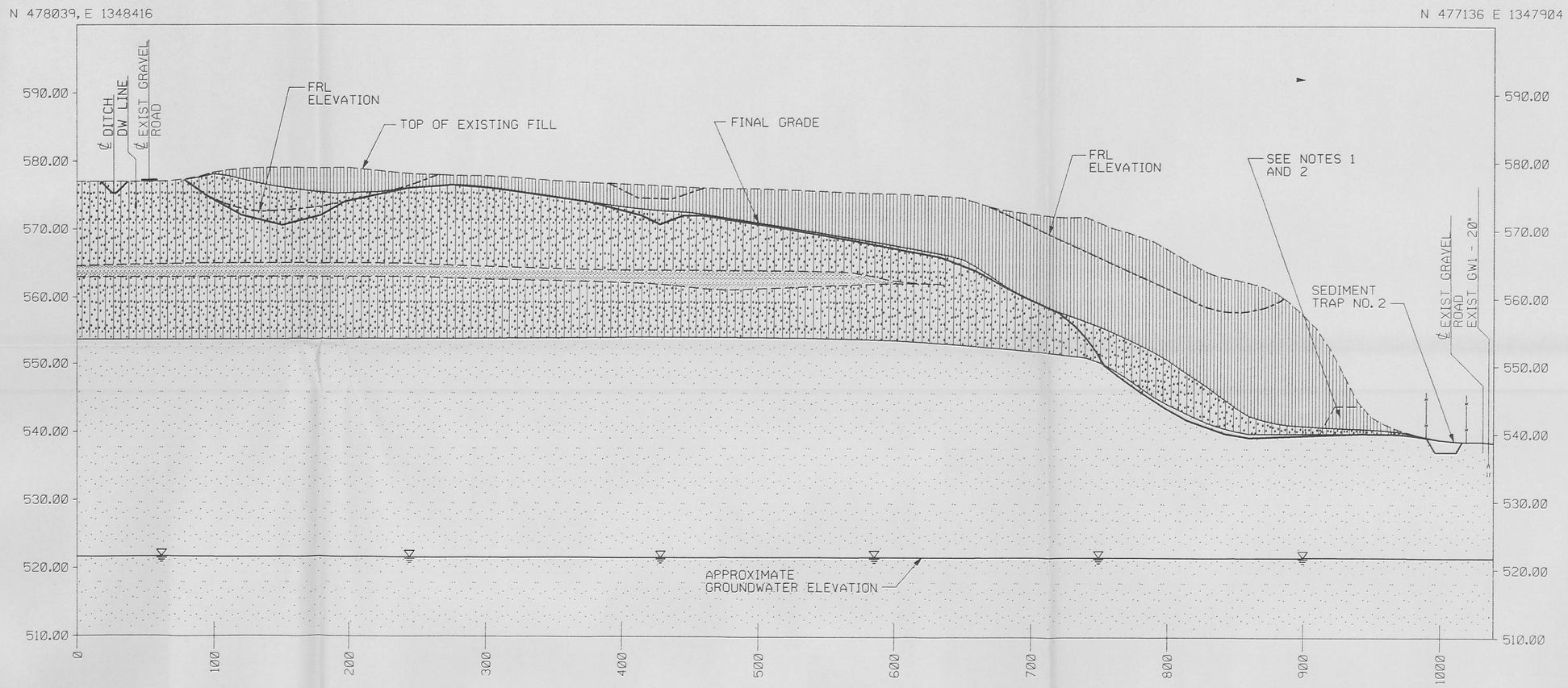
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	02/28/96				

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=50'	

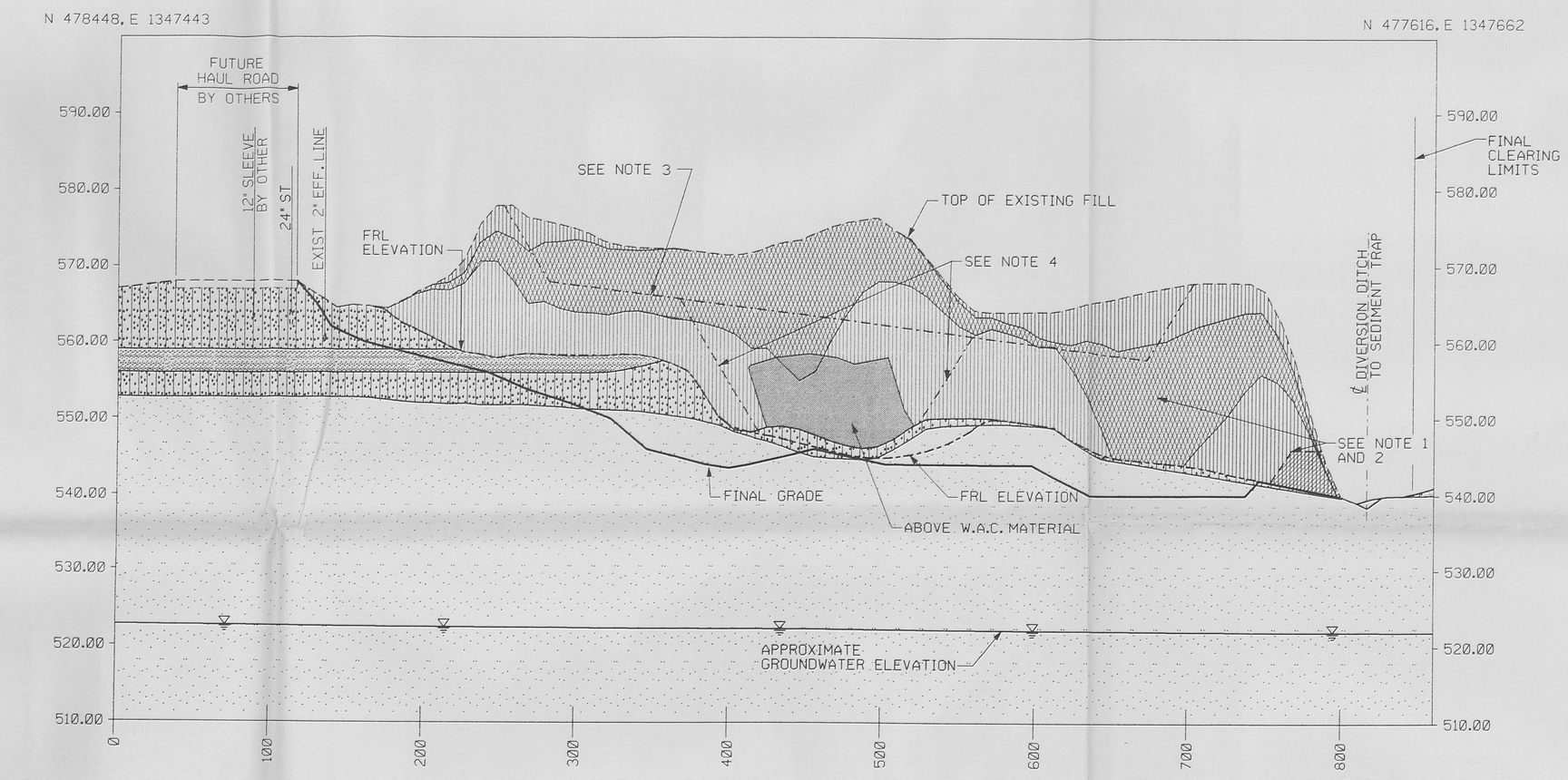
SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20400

DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
PREPARED UNDER PARSONS PROJECT ORDER NUMBER OU2/P0165	WBS 1.1.1.1.2.3.6 00-90701	92X-5900-G-00333	G0007	A

455



SECTION (A) REF G00287 G00286
SCALE: HOR 1"=50'
VER 1"=10'



SECTION (B) REF G00287 G00286
SCALE: HOR 1"=50'
VER 1"=10'

NOTES

287

1. BERM FOR RUNOFF CONTAINMENT TO BE MAINTAINED INTACT UNTIL LAST STAGE OF EXCAVATION IN EACH RESPECTIVE AREA. TOP OF BERM SHALL BE ELEVATION 546 OR HIGHER.
2. STORAGE VOLUME TO BE ADEQUATE TO CONTAIN 10-YR, 24-HR STORM OVER EACH RESPECTIVE CATCHMENT AREA. FIELD TO DETERMINE ADEQUATE BERM SPACING AND GRADING NECESSARY. FOR TYPICAL RUNOFF CONTROL SECTION SEE DRAWING 92X-5900-G-00288.
3. APPROXIMATE EDGE OF INITIAL EXCAVATION FOR STAGE 1.
4. APPROXIMATE EDGE OF EXCAVATION FOR REMOVAL OF ABOVE WAC MATERIAL.
5. TEMPORARY BERM TO DIVERT "CLEAN" RUNOFF AWAY FROM WORKING AREA. PROPER GRADING TO PREVENT STORMWATER RUNON AND TO COLLECT RUNOFF IS NECESSARY (TO BE FIELD DETERMINED). SEE TYPICAL SECTION DRAWING 92X-5900-G-00288.
6. CROSS SECTION INFORMATION TAKEN FROM FEMP REMEDIAL INVESTIGATION REPORT, 1995; AND FEASIBILITY STUDY REPORT, 1995.

LEGEND:

- SAND/GRAVEL
- GLACIAL OVERBURDEN/TILL
- GREAT MIAMI AQUIFER
- FILL/DEBRIS
- ASH
- ABOVE WAC MATERIAL

REF DWG NO.	DRAWING TITLE
92X-5900-X-00320	DRAWING INDEX
92X-5900-X-00321	LEGEND AND SYMBOLS
92X-5900-G-00286	FINAL EXCAVATION
92X-5900-G-00288	CROSS SECTION - SHEET 2 OF 9

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
CIVIL
CROSS SECTIONS - SHEET 1 OF 9
SOUTHERN WASTE UNITS

EDC

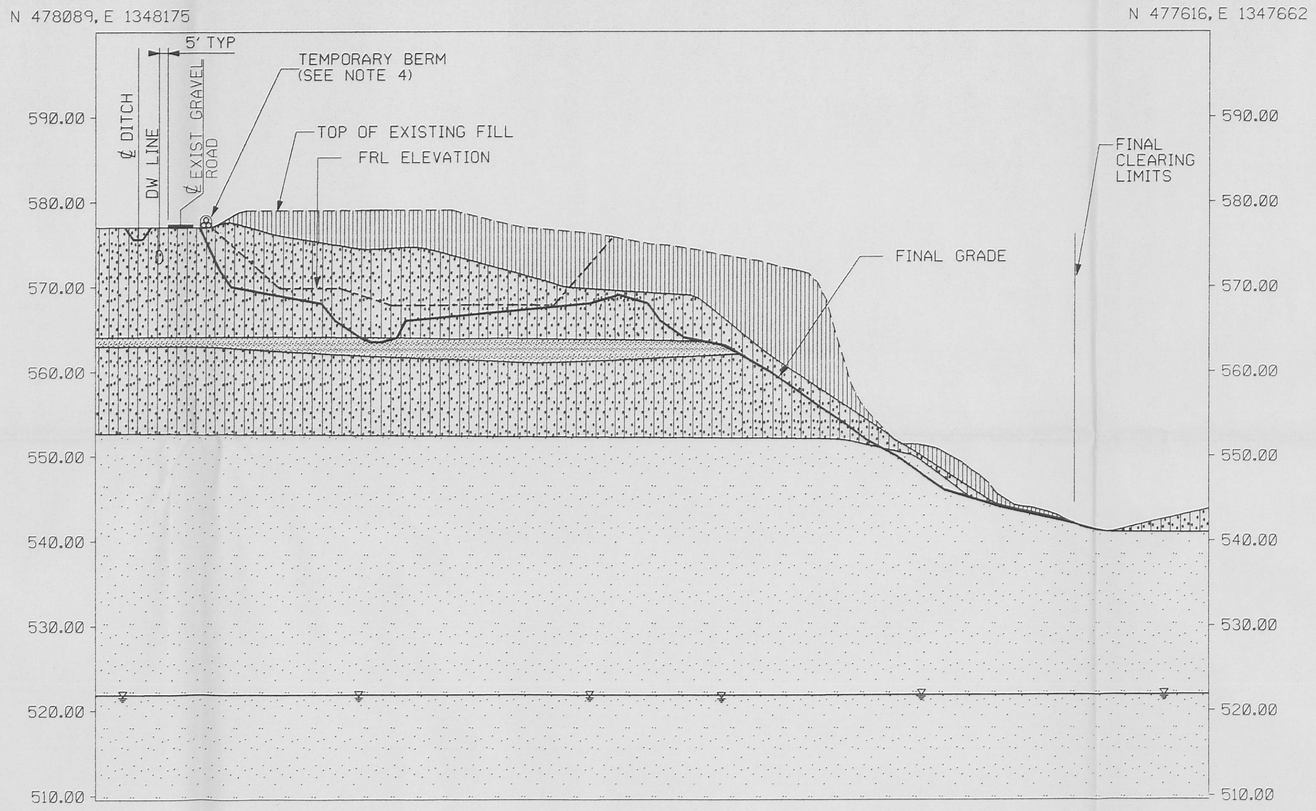
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
D.R. FOX	03/08/96			E. KUBRIN	03/24/96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		AS SHOWN	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20400

456

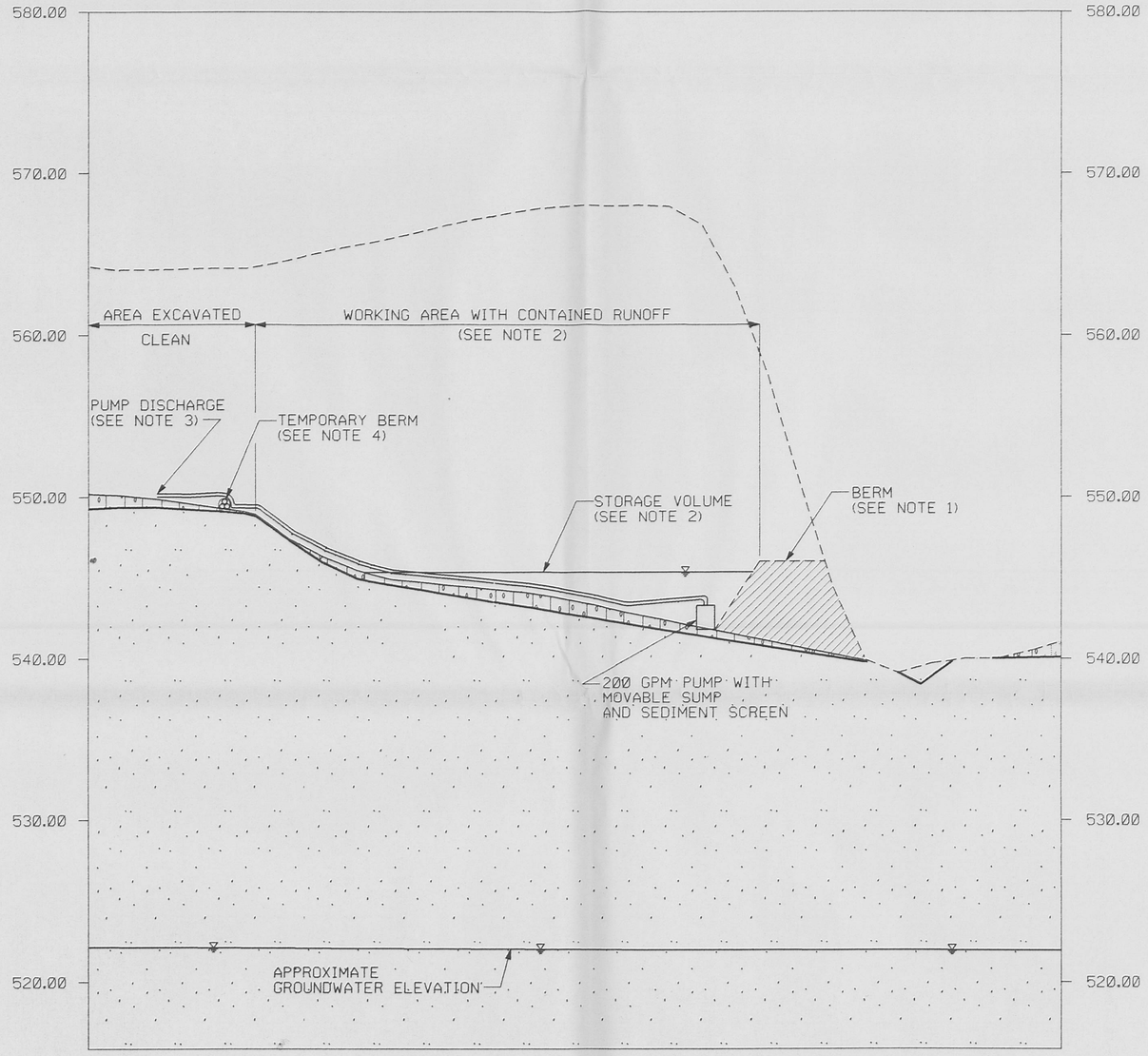
PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/P0165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-G-00287	G0008	B



SECTION C

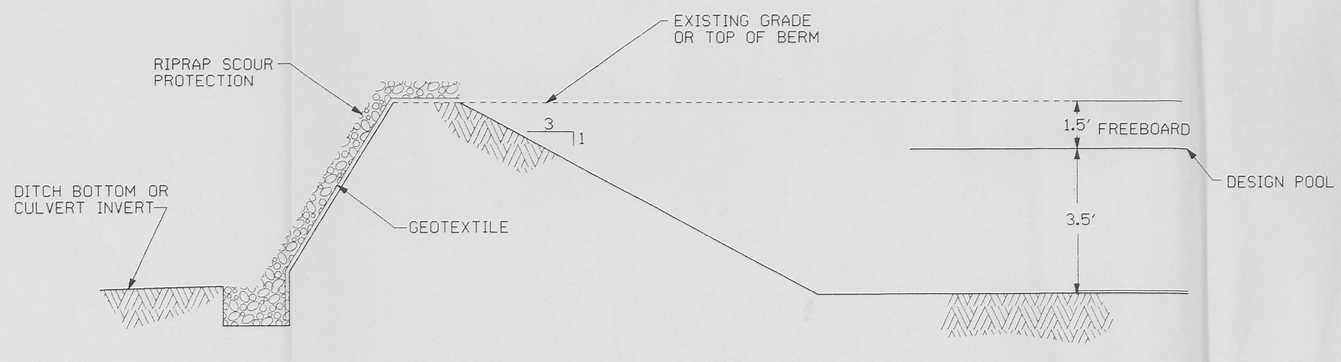
REF G00288 G00286

SCALE: HOR 1"=50'
VER 1"=10'



TYPICAL EXCAVATION RUNOFF CONTROL SECTION

SCALE: HOR 1"=25'
VER 1"=5'



TYPICAL SEDIMENT TRAP OUTLET DETAIL

NOT TO SCALE

NOTES

1. BERM FOR RUNOFF CONTAINMENT TO BE MAINTAINED INTACT UNTIL LAST STAGE OF EXCAVATION IN EACH RESPECTIVE AREA. TOP OF BERM SHALL BE ELEVATION 546 OR HIGHER.
2. STORAGE VOLUME TO BE ADEQUATE TO CONTAIN 10-YR, 24-HR STORM OVER EACH RESPECTIVE CATCHMENT AREA, ADEQUATE BERM SPACING AND GRADING TO BE FIELD DETERMINED.
3. PUMP DISCHARGE LINE TO TRANSFER TANK SHALL HAVE SECONDARY CONTAINMENT WITHIN "CLEAN" AREA.
4. TEMPORARY BERM TO DIVERT, "CLEAN" RUNOFF AWAY FROM WORKING AREA. PROPER GRADING TO PREVENT STORMWATER RUNON AND TO COLLECT RUNOFF IS NECESSARY. (TO BE FIELD DETERMINED)
5. CROSS SECTION INFORMATION TAKEN FROM FEMP REMEDIAL INVESTIGATION REPORT, 1995; AND FEASIBILITY STUDY REPORT, 1995.

LEGEND:

- FILL / DEBRIS
- SAND/GRAVEL
- GLACIAL OVERBURDEN/TILL
- GREAT MIAMI AQUIFER

REF DWG NO.	DRAWING TITLE
92X-5900-X-00320	DRAWING INDEX
92X-5900-X-00321	LEGEND AND SYMBOLS

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERMCO INITIALS AND DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A
A	ISSUED FOR 30% DESIGN REVIEW		N/A

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNIT REMEDIATION

DRAWING TITLE
CIVIL
CROSS SECTIONS - SHEET 2 OF 9
SOUTHERN WASTE UNITS

EDC

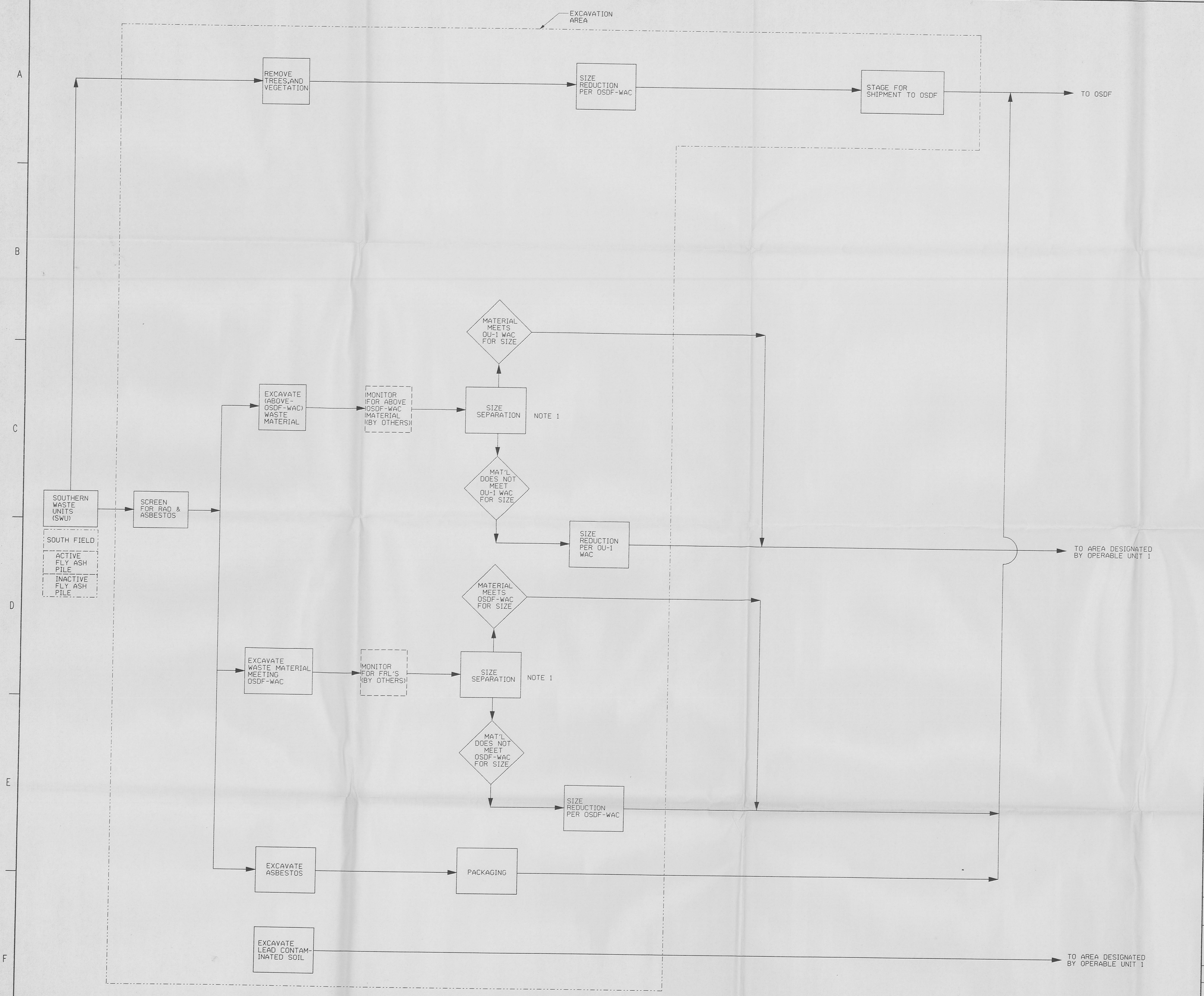
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
D.R. FOX	03/18/96			E. KUBRIN	03/24/96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		AS NOTED	

SUBMITTED FOR APPROVAL (A-E DATE)	FERMCO CRU APPROVAL (DATE)	FERMCO PROJECT NO.
	N/A	20400

457

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/P0165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-G-00288	G0009	B



NOTES

1. VISUAL SIZE SEPARATION WILL BE PERFORMED DURING EXCAVATION.

LEGEND:

OSDF	= ON SITE DISPOSAL FACILITY
WAC	= WASTE ACCEPTANCE CRITERIA
FRL'S	= FINAL REMEDIATION LEVELS

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
MATERIALS HANDLING PROCESS FLOW DIAGRAM
INACTIVE FLYASH/SOUTH FIELD/ACTIVE FLYASH

EDC

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
NH TERRY	3-12-96			D. O'KEEF	03/20/96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NTS	

SUBMITTED FOR APPROVAL — A-E — DATE
FERMCO CRU APPROVAL — DATE
FERMCO PROJECT NO. 20400

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
458 OU2/P0165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-M-00329	M0003	B

287

PIPING SYMBOLS

- GATE VALVE
- GLOBE VALVE
- BALL VALVE
- PLUG VALVE
- BUTTERFLY VALVE/DAMPER
- STOP CHECK
- NEEDLE VALVE
- CHECK VALVE
- SLIDING GATE VALVE
- BALL CHECK VALVE
- BACKFLOW PREVENTER
- DIAPHRAGM VALVE
- PINCH VALVE
- 3 WAY VALVE
- 3 WAY BALL VALVE
- 3 WAY PLUG VALVE
- ANGLE GATE VALVE
- ANGLE GLOBE VALVE
- FOOT VALVE
- HUB DRAIN OR FUNNEL
- DIAPHRAGM OPERATOR
- DIAPHRAGM W/ POSITIONER
- PISTON OPERATOR
- SAFETY RELIEF VALVE
- SOLENOID OPERATOR
- SELF-CONTAINED BACK PRESSURE REGULATING VALVE
- 2-WAY SOLENOID VALVE
- 3-WAY SOLENOID VALVE INDICATES DEENERGIZED SECONDARY
- 4-WAY SOLENOID VALVE
- VALVE WITH OPERATOR (VALVE TYPE UNDEFINED)
- STEAM TRAP
- HOSE QUICK COUPLING
- UNION
- DRAIN LEG
- EXPANSION JOINT
- HANDWHEEL
- EJECTOR
- STRAINER (Y TYPE)
- STRAINER (SINGLE BASKET)
- STRAINER (DOUBLE BASKET)
- STRAINER (CONE TYPE)
- STRAINER (SUCTION TYPE)
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER
- ORIFICE
- VENTURI TUBE
- SIPHON TUBE
- THERMOWELL
- FLOW DIRECTION
- WELDED CONNECTION
- FLANGED CONNECTION
- PIPE CAP
- TIE/IN MARK
- PRIMARY
- SECONDARY
- EXISTING PIPING OR EQUIPMENT
- PACKAGED SYSTEM
- MATERIAL CODE BREAK
- INSULATION CODE BREAK
- PULSATION DAMPENER
- AIR FILTER
- FILTER LUBRICATOR REGULATOR
- AIR OPERATED DIAPHRAGM PUMP
- HORIZONTAL CENTRIFUGAL PUMP
- VERTICAL CENTRIFUGAL PUMP
- SUMP PUMP
- CHEMICAL METERING PUMP
- AGITATOR (MIXER)

ABBREVIATIONS

BTU	BRITISH THERMAL UNIT
CU FT	CUBIC FEET
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
KW	KILOWATT
LB/HR	POUNDS PER HOUR
SCFM	STD. CUBIC FT/MINUTE
NO	NORMALLY OPEN
NC	NORMALLY CLOSED
FO	FAIL OPEN
FC	FAIL CLOSED
AO	AIR TO OPEN
AC	AIR TO CLOSE
IA	INSTRUMENT AIR
ET	ELECTRIC TRACED AND INSULATED
ST	STEAM TRACED AND INSULATED
EF	EXHAUST FAN
GV	GRAVITY VENTILATOR
UH	UNIT HEATER
RED	REDUCER
ECC	ECCENTRIC
TBD	TO BE DETERMINED
TF	TOP FLAT
TYP	TYPICAL
MATL	MATERIAL
MED	MEDIUM
CO	CARBON MONOXIDE
RH	RELATIVE HUMIDITY
CFM	CUBIC FEET/MINUTE
SF	SOUTH FIELD
IFA	INACTIVE FLYASH PILE
COMH	CLEAN OUT MANHOLE
HDPE	HIGH DENSITY POLYETHYLENE
CS	CARBON STEEL
AWWT	ADVANCED WASTEWATER TREATMENT
SWRB	STORMWATER RETENTION BASIN
SWU	SOUTHERN WASTE UNITS

INSTRUMENTATION SPECIAL DESIGNATIONS

DESIGNATION	FUNCTION/ABBREVATION
Σ/N OR AVG	AVERAGING
± OR BI	BIAS
1:1,1:3,2:1 (TYP)	BOOST,GAIN OR ATTENUATE (INPUT:OUTPUT)
△ OR DIF	DIFFERENTIAL
÷ OR DIV	DIVIDE
√ OR SQ.RT.	EXTRACT SQUARE ROOT
X OR MUL	MULTIPLY
N	RAISE TO POWER
REV	REVERSING
Σ OR SUM	SUMMING
L	LOW
LL	LOW LOW
H	HIGH
HH	HIGH HIGH
HL	HIGH LOW
∫	INTEGRATE (TIME INTEGRAL)
%	PROPORTIONAL
Y	UNDETERMINED COMPUTING RELAY
HOA	HAND-OFF-AUTO
⊼	EXISTING INSTRUMENT TO BE RELOCATED
I/P	CURRENT TO PNEUMATIC TRANSDUCER
RUN	RUNNING
OA	OFF-AUTO
OCA	OPEN-CLOSE-AUTO
I/O	INPUT / OUTPUT
✳	EXISTING INSTRUMENT
UD	UP/DOWN
EW	EAST/WEST
I/I	CURRENT TO CURRENT

PIPING SPECIFICATIONS

FLOWING MEDIUM	MED CODE	MATL CODE
BACK WASH	BW	T
CHILLED WATER	CHS, CHR	A
CHLORINE	CL	B1
CONDENSATE	LC	W, T
CONDENSER WATER	CWS, CWR	A
COOLING WATER	WS, WR	A
DRAIN	DR	A, T
THICKENER OVERFLOW	TO	T
FILTRATE EFFLUENT	FT	A
FLOCCULANT	FL	A
FLUSH WATER	FW	T
FORCE MAIN	FM	M
INSTRUMENT AIR	IA	T
OFF-GAS	OG	T
NITRIC ACID	AN	T1
PERCHED GND WATER	PGW	B
PHOSPHORIC ACID	PAPH	T1
PLANT AIR	PA	W
POLISHED WATER	PW	A
POTABLE WATER	DW	W, B, B3, C
PROCESS WATER	TW	A
PROCESS WASTEWATER	CE	A
RAW WATER	RW	A
RECYCLE WATER	RC	T, B2
SCRUBBER RECYCLE	RSL	T
SLURRY	SL	T
SODIUM CARBONATE	SC	A
SODIUM HYDROXIDE	NA	T
SODIUM SILICATE	SS	A
STORM WATER	ST	A, B4
SULFURIC ACID	SB	T1
SUMP DISCHARGE	SU	T
VACUUM	V	A
VENTILATION AIR	VE	T
WASTE WATER	WW	W, B4, A

EXAMPLE:

CE-4"/8"-A-100-ET

- MEDIUM CODE
- NOMINAL CARRIER PIPE SIZE
- NOMINAL CONTAINMENT PIPE SIZE
- MATERIAL CODE
- LINE NUMBER
- HEAT TRACING AND INSULATION

A - A53,GR. A, SEAMLESS STEEL PIPE
B - PVC
B1 - PVDF
B2 - PVDF, 100 PSI
B3 - CPVC
B4 - HDPE
C - CLASS 150, COPPER TUBING
L - FIBERGLASS REINFORCED PLASTIC
M - DUCTILE IRON
T - 304L, STAINLESS STEEL PIPE
T1 - 316L, STAINLESS STEEL PIPE
W - A53,GR. A, GALVANIZED STEEL PIPE

SINGLE LINE AIR DUCT SYMBOLS

- FAN WITH INLET VANES AND BACKDRAFT DAMPER
- BACKDRAFT DAMPER
- MOTORIZED DAMPER
- MANUAL VOLUME DAMPER

INSTRUMENT SYMBOLS

- ELECTRICAL BINARY SIGNAL
- PNEUMATIC BINARY SIGNAL
- ELECTROMAGNETIC OR SONIC SIGNAL (GUIDED)
- ELECTROMAGNETIC OR SONIC SIGNAL (NON-GUIDED)
- IA — INSTRUMENT/PLANT AIR SUPPLY
- ELECTRICAL SIGNAL
- CAPILLARY
- HYDRAULIC SIGNAL LINE
- PNEUMATIC OR VACUUM SIGNAL LINE
- I — INTERLOCK
- DIAPHRAGM SEAL
- FI — ROTAMETER
- FI — SIGHT GLASS
- LOCAL MOUNTED INSTRUMENT
- FRONT OF PANEL MOUNTED INSTRUMENT
- FRONT OF PANEL MOUNTED INSTRUMENT AUXILLIARY LOCATION
- REAR OF PANEL MOUNTED INSTRUMENT
- REAR OF PANEL MOUNTED INSTRUMENT AUXILLIARY LOCATION
- DIGITAL LOGIC OPERATOR INTERFACE AUXILIARY LOCATION
- DIGITAL LOGIC OPERATOR INTERFACE
- SHARED CONTROL AUXILIARY LOCATION
- SHARED DISPLAY COMPUTER CONTROL AND OPERATOR INTERFACE
- F — AIR VENT FILTER
- M — MAGNETIC FLOW METER
- POSITIVE DISPLACEMENT FLOW METER
- A### — EQUIPMENT NUMBER

FY 102 A
- LETTERS OF IDENTIFICATION
- SPECIAL DESIGNATION
- INSTRUMENT TAG NUMBER

TYPICAL CALL OUT

LETTERS OF INSTRUMENT IDENTIFICATION

LETTER	FIRST LETTER	2ND LETTER	3RD OR 4TH LETTER
	MEASURED OR INITIATING VARIABLE	MODIFIER	READ OUT OR PASSIVE FUNCTION
A	ANALYSIS	ALARM	ALARM
B	BURNER FLAME	----	----
C	CAMERA	CONTROLLER	CONTROLLER
D	DENSITY	DIFFERENTIAL	----
E	VOLTAGE	ELEMENT	ELEMENT
F	FLOW RATE	RATIO (FRACTION)	----
G	GAGING (DIM)	VIEWING DEVICE	GLASS
H	HAND (MANUAL)	----	HIGH
I	CURRENT (ELECT)	INDICATE	INDICATE
J	POWER	SCAN	----
K	TIME	----	----
L	LEVEL	LIGHT	LOW
M	MOIST OR HUMIDITY	----	----
N	----	----	----
O	OBSERVATION	----	ORIFICE
P	PRESSURE OR VACUUM	----	POINT (TEST)
Q	QUANTITY OR EVENT	TOTALIZER	----
R	RADIOACTIVITY	RECORDER	----
S	SPEED OR FREQUENCY	SAFETY/SWITCH	SWITCH
T	TEMPERATURE	TRANSMITTER	TRANSMITTER
U	USER'S GUIDE	----	MULTIFUNCTION
V	VISCOSITY	----	VENT, VALVE
W	WEIGHT OR FORCE	WELL	----
X	UNCLASSIFIED	----	UNCLASSIFIED
Y	RELAY	RELAY	----
Z	POSITION	----	----

NOTES

REF DWG NO.	DRAWING TITLE
92X-5900-X-00320	DRAWING INDEX

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
MECHANICAL PROCESS
PIPING AND INSTRUMENTATION DIAGRAM
SYMBOLS AND LEGEND SHEET - SWU

EDC

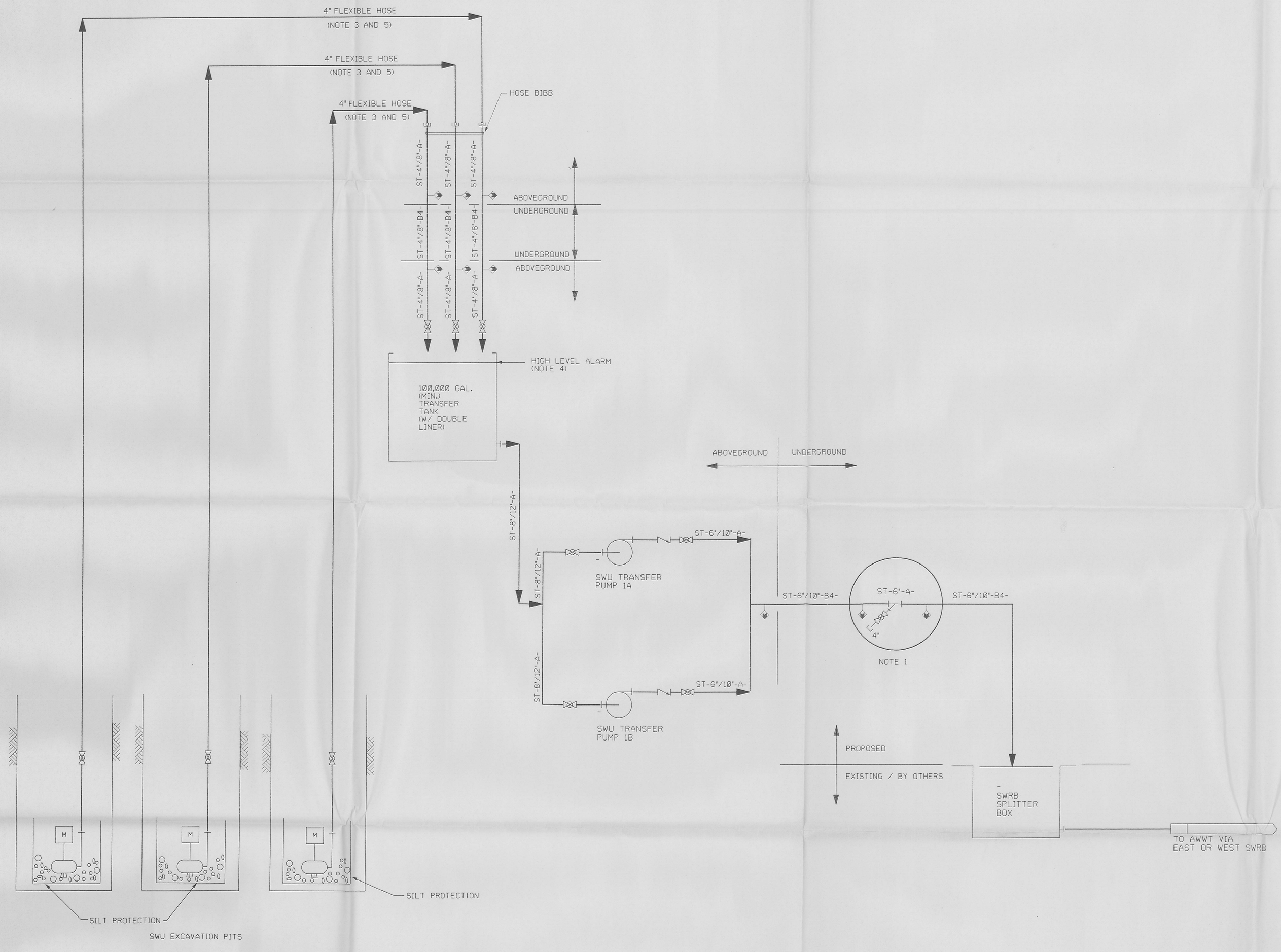
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
P. A. WILSON	3/4/96			K. D. MORRIS	3/25/96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20400

459

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/PO165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-N-00295	N0001	B



NOTES

1. TYPICAL DETAIL FOR MANHOLE CLEANOUT. THERE ARE 3 HDPE CLEANOUT MANHOLES IN THE UNDERGROUND LINE TO SWRB. SEE CIVIL DRAWING 92X-5900-G-LATER FOR LOCATION AND DETAILS OF MANHOLES.
2. TRANSFER TANK FRAME WORK TO BE PROVIDED BY FERMCO.
3. SECONDARY CONTAINMENT IS REQUIRED IN AREAS WHERE THE HOSE CROSSES "CLEAN" AREAS.
4. SUBCONTRACTOR TO DESIGN AND PROVIDE LEVEL CONTROL AND LEVEL ALARMS.
5. PUMPS AND HOSES TO BE SIZED AND PROVIDED BY SUBCONTRACTOR.

REF DWG NO.	DRAWING TITLE
92X-5900-X-00320	DRAWING INDEX
92X-5900-N-00295	SYMBOLS AND LEGEND SHEET

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
MECHANICAL PROCESS
PIPING AND INSTRUMENTATION DIAGRAM
WASTEWATER COLLECTION AND TRANSFER - SWU

EDC

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
P. A. WILSON	3/4/96			K. D. MORRIS	3/25/96

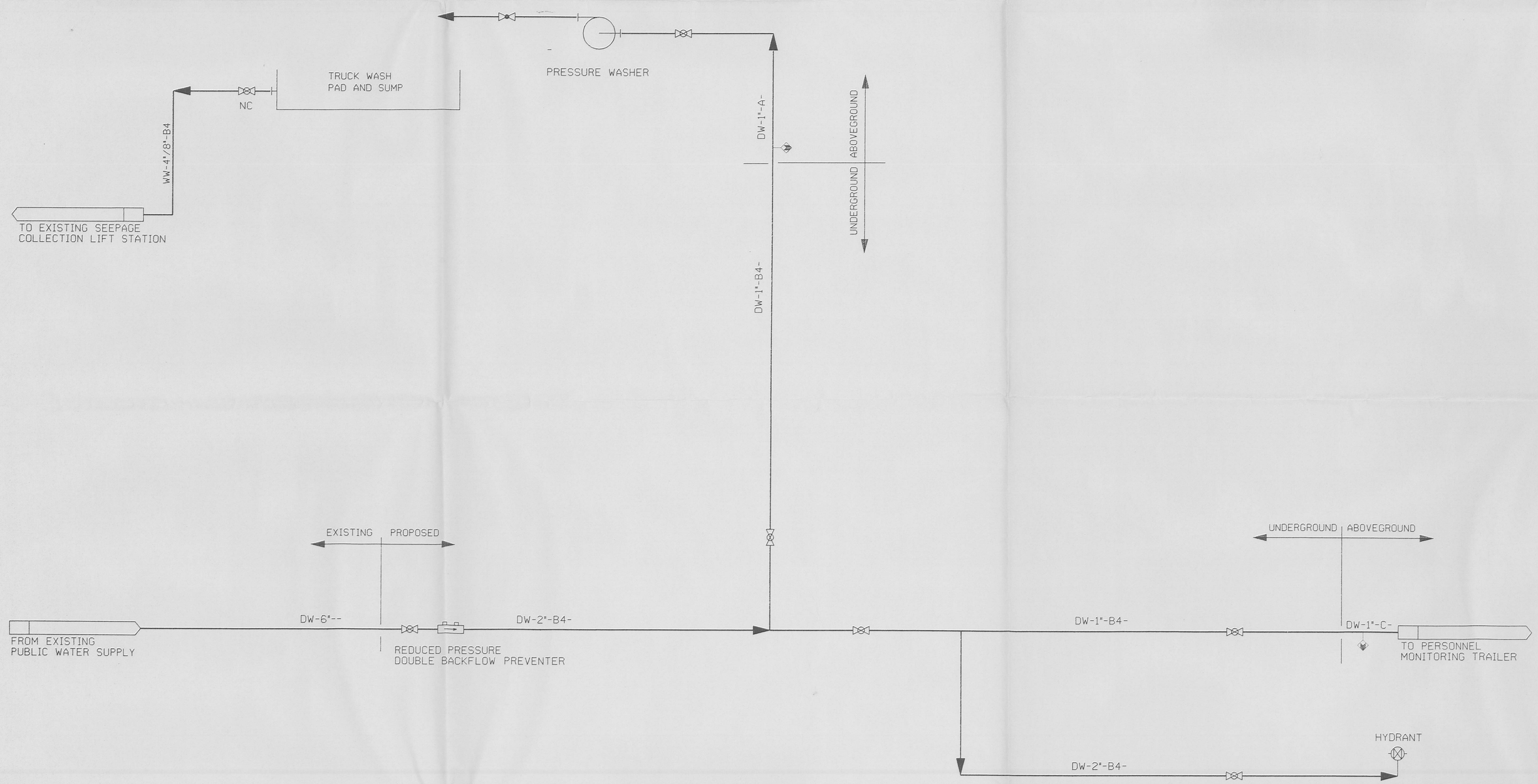
PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20400

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/PO165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-N-00290	N0002	B

287

460



NOTES

287

REF DWG NO.	DRAWING TITLE
92X-5900-X-00320	DRAWING INDEX
92X-5900-N-00295	SYMBOLS AND LEGEND SHEET

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

EDC

DRAWING TITLE
MECHANICAL PROCESS
PIPING AND INSTRUMENTATION DIAGRAM
EQUIPMENT DECON FACILITIES - SWU

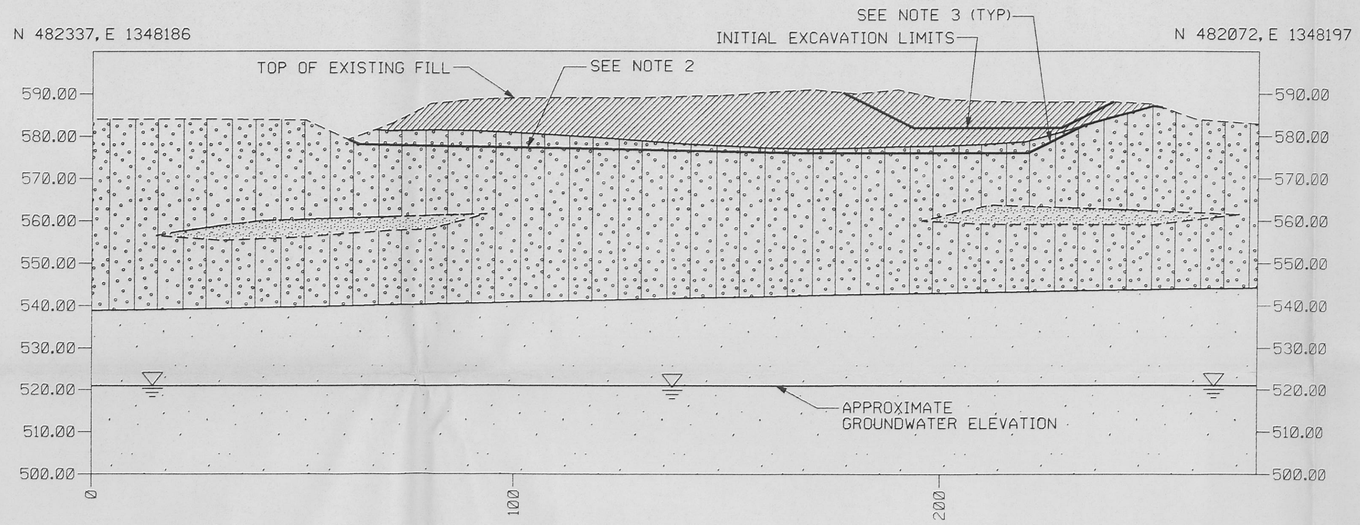
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
P. A. WILSON	3/1/96			K. D. MORRIS	3/25/96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS

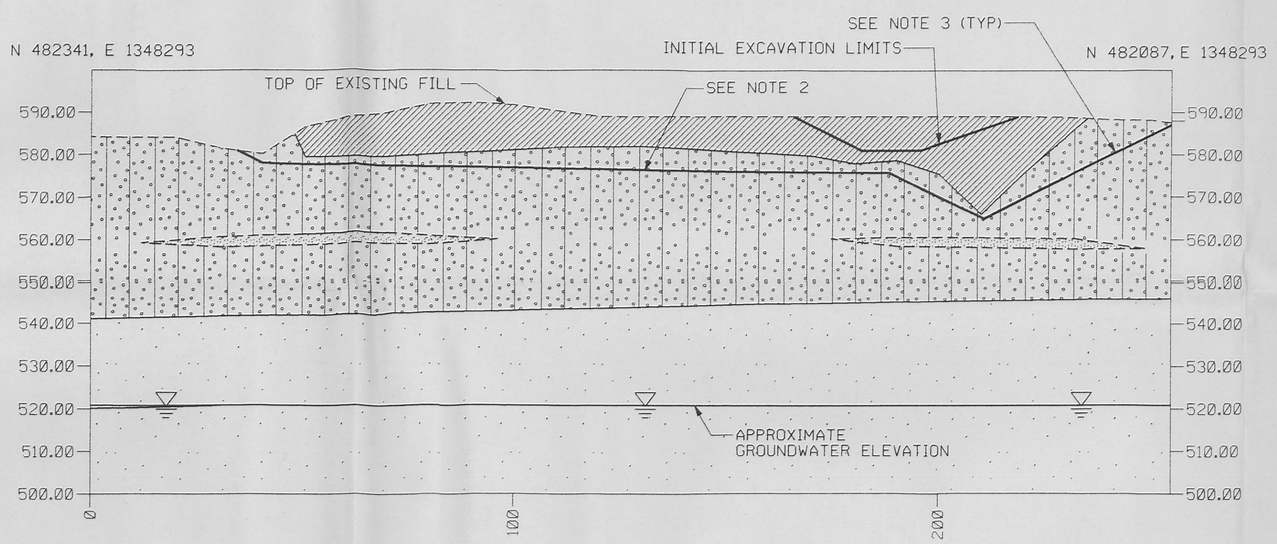
SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20400

461

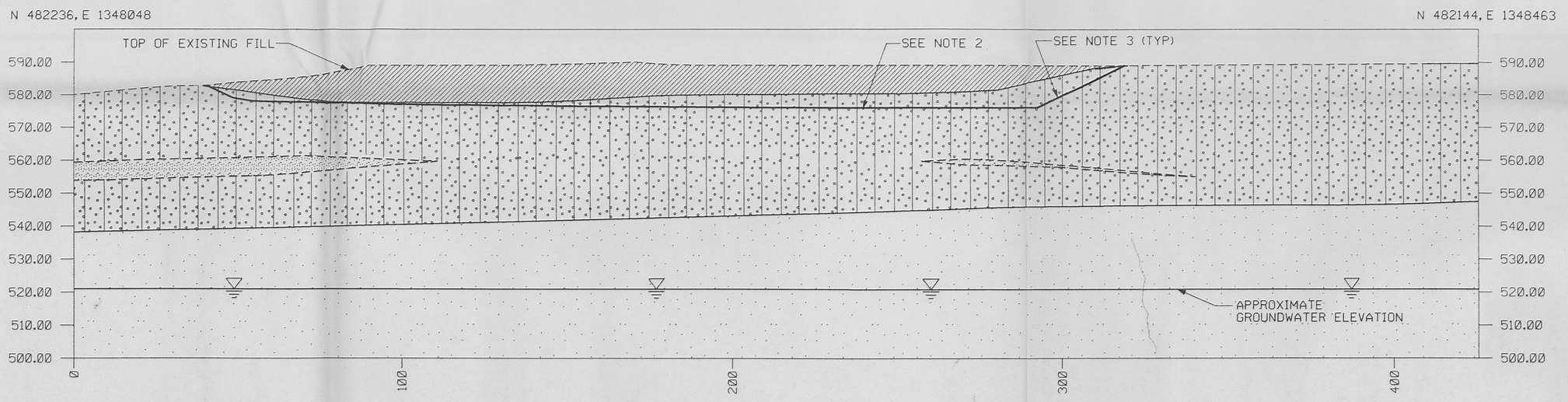
PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/P0165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-N-00291	N0003	B



SECTION (A) REF G00270 G00268 G00269
SCALE: HOR 1"=20' VER 1"=20'



SECTION (B) REF G00270 G00268 G00269
SCALE: HOR 1"=20' VER 1"=20'



SECTION (C) REF G00270 G00269
SCALE: HOR 1"=20' VER 1"=20'

NOTES

287

1. THE CROSS SECTIONS SHOWN ARE BASED UPON CROSS SECTIONS PRESENTED IN THE FEMP OU-2 FEASIBILITY STUDY REPORT, 1995. THE CROSS SECTIONS IN THIS REPORT WERE DEVELOPED FROM INVESTIGATIVE BORINGS AND A THREE DIMENSIONAL MODEL. THE INTERPRETATIONS SHOWN ARE APPROXIMATE. ACTUAL FIELD CONDITIONS MAY VARY.

2. THE EXCAVATION LIMITS DEPICTED ARE BASED UPON THE PROPOSED EXCAVATION PLAN ON DRAWING 92X-5900-G-00276. THE ACTUAL EXCAVATION LIMITS AND GRADING PLAN MAY VARY DEPENDING ON ACTUAL FIELD DETERMINED LOCATION OF THE FINAL REMEDIATION LIMITS.

3. DURING THE EXCAVATION PHASE, CUT SLOPES SHALL NOT EXCEED A MAXIMUM SLOPE OF 1H:1V UNLESS SLOPE STABILITY REQUIRES A FLATTER SLOPE. UPON COMPLETION OF WASTE EXCAVATION AND CERTIFICATION, CUT SLOPES WILL BE TRIMMED TO A SLOPE OF 2H:1V.

LEGEND:

- FILL/DEBRIS
- SAND/GRAVEL
- GLACIAL OVERBURDEN/TILL
- GREAT MIAMI AQUIFER

REF DWG NO.	DRAWING TITLE
92X-5900-X-00314	DRAWING INDEX
92X-5900-X-00315	LEGEND AND SYMBOLS
92X-5900-G-00268	ABOVE WAC/INITIAL EXCAVATION PLAN
92X-5900-G-00269	FINAL EXCAVATION PLAN

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
CIVIL
CROSS SECTIONS
SOLID WASTE LANDFILL

EDC

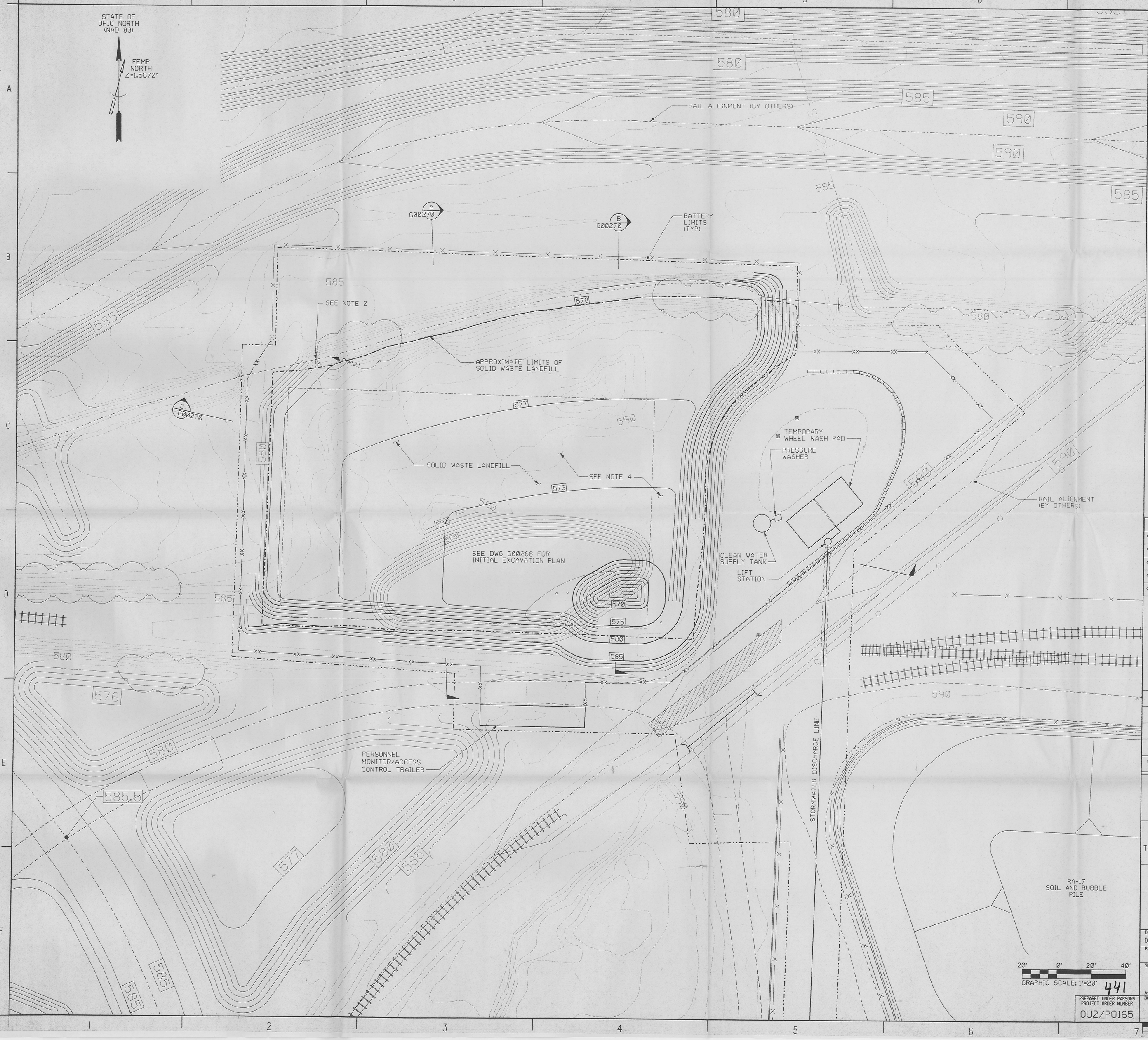
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
D.R. FOX	03/15/96			F. PARTON	3-21-96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		AS SHOWN	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20600

442

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/PO165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-G-00270	G0005	B



NOTES

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   EXISTING SITE DATA SOURCE (IN PLANT FILES)
   PARSONS TOPOGRAPHY, 1992
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   FEMP OU-2 REMEDIAL INVESTIGATION REPORT, 1995; AND FEASIBILITY STUDY REPORT, 1995.

2. SEE NOTE 3 ON DRAWING 92X-5900-G-00267 AND NOTE 4 ON DRAWING 92X-5900-G-00268 FOR STORMWATER CONTROL NOTES DURING EXCAVATION. AFTER EXCAVATION HAS BEEN COMPLETED AND CERTIFICATION OBTAINED, DEWATERING PUMPS CAN BE REMOVED. THE PLUG ON THE OUTFLOWING CULVERT SHALL BE REMOVED TO ALLOW DRAINAGE FROM THE AREA.

3. DURING THE EXCAVATION PHASE CUT SLOPES SHALL NOT EXCEED A MAXIMUM OF 1H:1V UNLESS SLOPE STABILITY REQUIRES A FLATTER SLOPE. UPON COMPLETION OF WASTE EXCAVATION AND CERTIFICATION, CUT SLOPES WILL BE TRIMMED TO A SLOPE OF 2H:1V. TRIMMED SOIL CUT FROM THE SLOPES SHALL BE USED TO FILL IN LOW AREAS TO PROMOTE POSITIVE DRAINAGE.

4. THE EXCAVATION CONTOURS ARE BASED UPON APPROXIMATE WASTE LIMITS. THE ACTUAL EXCAVATION LIMITS MAY VARY AND WILL DEPEND ON ACTUAL CONDITIONS REVEALED DURING CONSTRUCTION. THE FINAL EXCAVATION GRADES SHALL PROMOTE POSITIVE DRAINAGE TO THE DEPRESSION.

5. THE DISTURBED AREAS SHALL BE VEGETATIVELY STABILIZED. THE AREA SHALL BE RECONFIGURED IN THE FUTURE UNDER THE SITEWIDE FINAL REMEDIATION GRADING TO PROVIDE DRAINAGE.

6. ACCESS/EGRESS INTO THE SOLID WASTE LANDFILL EXCAVATION SHALL BE DETERMINED IN THE FIELD BY THE SUBCONTRACTOR.

REF DWG NO.	DRAWING TITLE
92X-5900-X-00314	DRAWING INDEX
92X-5900-X-00315	LEGEND AND SYMBOLS
92X-5900-G-00267	UTILITY/PREPARATORY SITE/DRAINAGE CONTROL PLAN
92X-5900-G-00268	ABOVE WAC/INITIAL EXCAVATION PLAN
92X-5900-G-00270	CROSS SECTIONS

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
CIVIL
FINAL EXCAVATION PLAN
SOLID WASTE LANDFILL

EDC

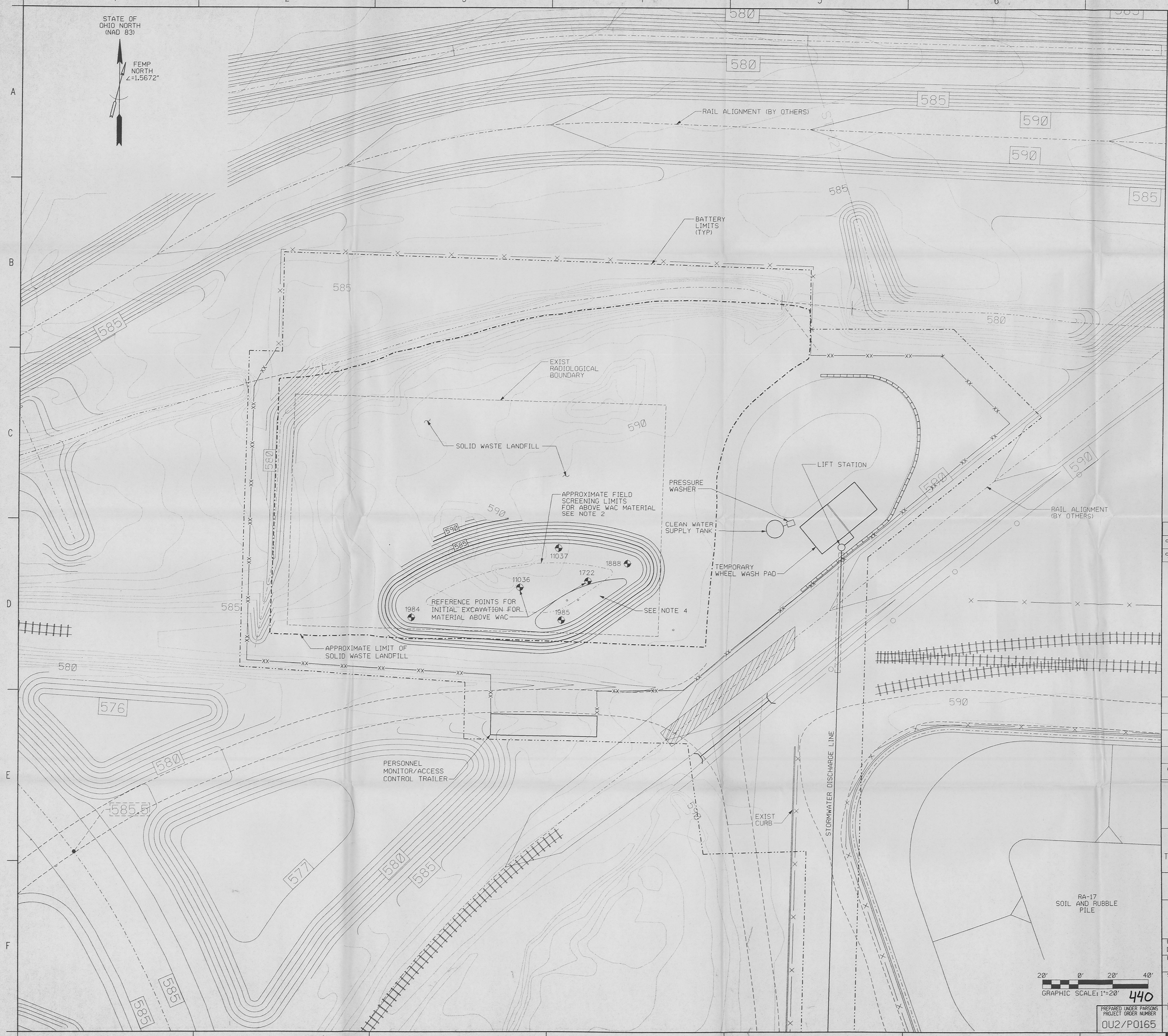
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
D.R. FOX	2-22-96			F. PARTON	3-21-96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=20'	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
	N/A	20600

A-E DOE PROJECT NO.	DATE	FEMP PROJECT NO.	DATE	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
		WBS 1.1.1.1.2.3.6 00-90701		92X-5900-G-00269	G0004	B

PREPARED UNDER PARSONS PROJECT ORDER NUMBER
OU2/PO165



NOTES

287

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   EXISTING SITE DATA SOURCE (IN PLANT FILES)
   PARSONS TOPOGRAPHY, 1992
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   FEMP OU-2 REMEDIAL INVESTIGATION REPORT, 1995; AND FEASIBILITY STUDY REPORT, 1995

2. THE LIMIT OF MATERIAL EXCEEDING WAC IS APPROXIMATE. THE ACTUAL LIMITS MAY VARY AND WILL DEPEND UPON FIELD SCREENING. WASTE MATERIAL SHALL BE EXCAVATED RADIALLY FROM REFERENCE POINTS INDICATED ON THE PLAN. ALL EXCAVATED SOIL WILL BE SCREENED BY A FERMCO RAD TECHNICIAN. ALL EXCAVATED MATERIALS ABOVE THE WAC WILL BE SEGREGATED AND TRANSPORTED TO AREA DESIGNATED BY FERMCO (OU-1). EXCAVATED MATERIALS MEETING OSDF WASTE ACCEPTANCE CRITERIA WILL BE DISPOSED OF IN THE OSDF.

3. SOME MATERIAL, SUCH AS ASBESTOS, SHALL BE HANDLED SEPARATELY PRIOR TO LEAVING THE SOLID WASTE LANDFILL.

4. INSTALL TEMPORARY DEWATERING PUMPS. MAINTAIN EXCAVATION AREAS FREE OF STANDING WATER. AFTER EXCAVATION BEGINS PUMP WATER TO THE STORMWATER DISCHARGE PIPELINE. ALL PUMPING SHALL BE COORDINATED WITH FERMCO.

5. CUT SLOPES SHALL NOT EXCEED A MAXIMUM SLOPE OF 1H:1V UNLESS SLOPE STABILITY REQUIRES FLATTER SLOPES.

REF DWG NO.	DRAWING TITLE
92X-5900-X-00314	DRAWING INDEX
92X-5900-X-00315	LEGEND AND SYMBOLS

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

EDC

DRAWING TITLE
CIVIL
ABOVE WAC/INITIAL EXCAVATION
SOLID WASTE LANDFILL

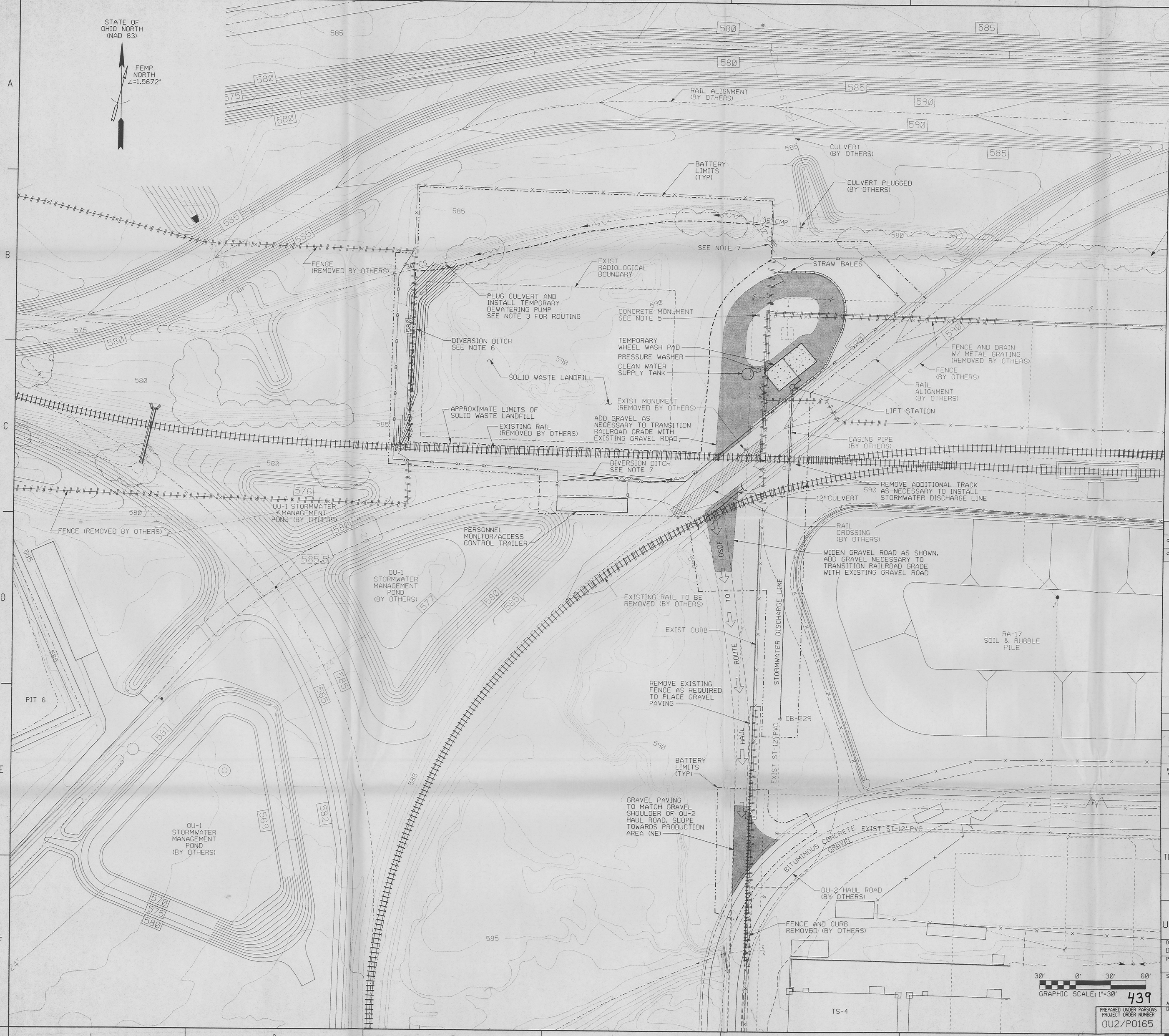
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
D.R. FOX	2-22-96			F. PARTON	3-12-96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=20'	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20600

DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
	WBS 1.1.1.1.2.3.6 00-90701	92X-5900-G-00268	G0003	B

PREPARED UNDER PARSONS PROJECT ORDER NUMBER
OU2/P0165



439

PREPARED UNDER PARSONS PROJECT ORDER NUMBER OU2/PO165

NOTES

287

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   EXISTING SITE DATA SOURCE (IN PLANT FILES)
   PARSONS TOPOGRAPHY, 1992
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   FEMP OU-2 REMEDIAL INVESTIGATION REPORT, 1995; AND FEASIBILITY STUDY REPORT, 1995
2. SEED ALL EARTHEN BERMS AND DISTURBED AREAS WITH QUICK GERMINATING SEED MIX.
3. INSTALL TEMPORARY DEWATERING PUMPS. MAINTAIN BERMED AREAS FREE OF STANDING WATER. PRIOR TO EXCAVATION, PUMP COLLECTED WATER TO THE DOWNSTREAM DITCH. AFTER EXCAVATION BEGINS, NON-CONTAMINATED WATER WILL BE PUMPED TO THE DOWNSTREAM DITCH AND CONTAMINATED SURFACE WATER TO THE STORMWATER DISCHARGE LINE. ALL PUMPING SHALL BE COORDINATED WITH FERMCO.
4. ALL MONITORING WELLS IN THE WORK ZONE SHALL BE ABANDONED BY FERMCO PRIOR TO STARTING CONSTRUCTION.
5. PROTECT EXISTING MONUMENTS AND APPURTENANCES FROM DAMAGE.
6. ALL SOILS EXCAVATED TO CONSTRUCT NEW DRAINAGE FACILITIES WILL BE MANAGED AS CONTAMINATED MATERIAL.
7. THE EXISTING 12 INCH CMP CULVERT (FROM FORMER SCALE HOUSE) IS CURRENTLY PLUGGED. REMOVE SECTIONS OF CULVERT EXPOSED DURING CONSTRUCTION.

REF DWG NO.	DRAWING TITLE
92X-5900-X-00314	DRAWING INDEX
92X-5900-X-00315	LEGEND AND SYMBOLS

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

EDC

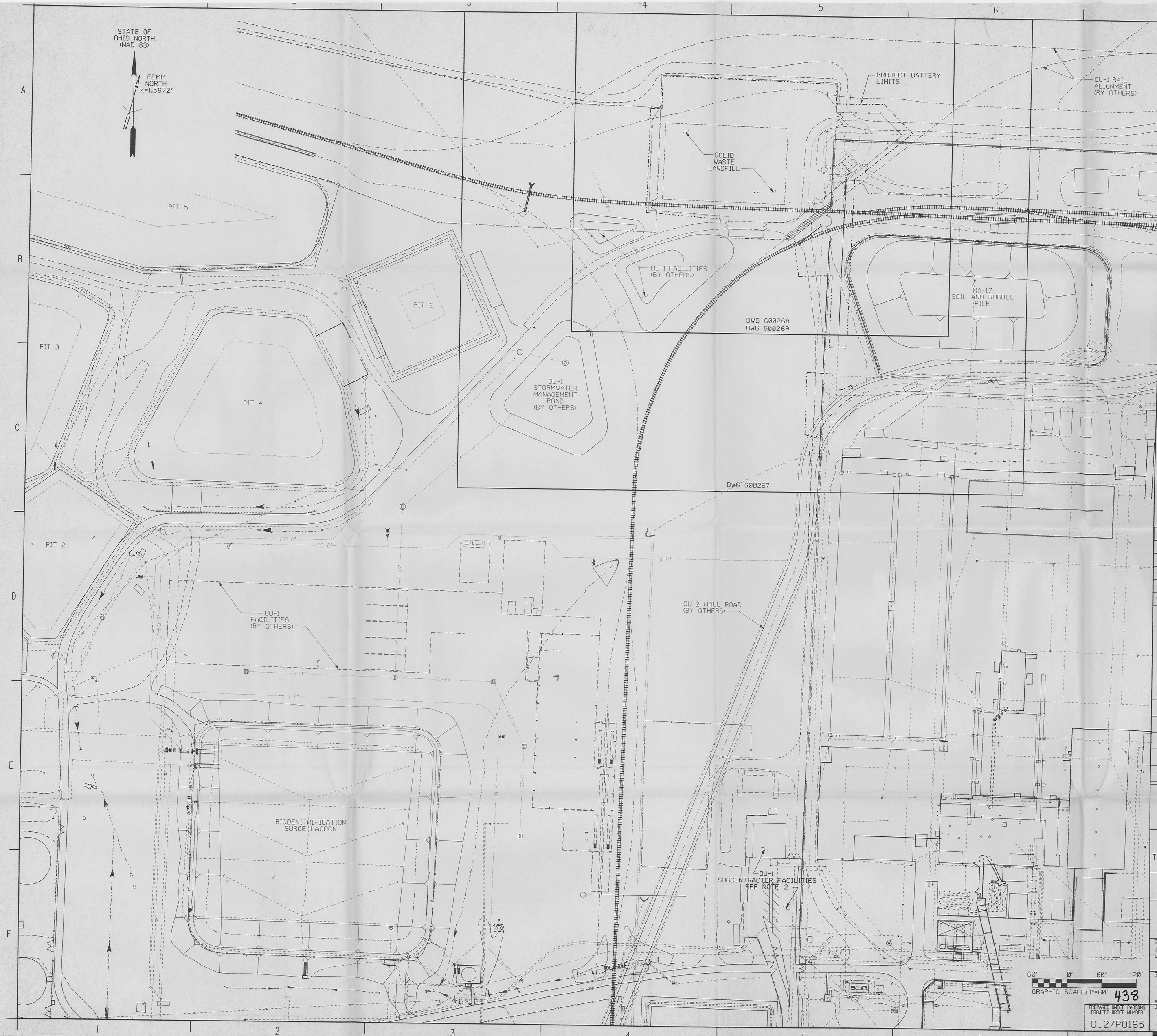
DRAWING TITLE
CIVIL
UTILITY/PREPARATORY SITE/DRAINAGE CONTROL PLAN
SOLID WASTE LANDFILL

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
D.R. FOX	2-22-96			F. PARTON	3-21-96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=30'	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	N/A DATE	20600

DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
	WBS 1.1.1.1.2.3.6 00-90701	92X-5900-G-00267	G0002	B



438

NOTES

287

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   EXISTING SITE DATA SOURCE (IN PLANT FILES)
   PARSONS TOPOGRAPHY, 1992
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   FEMP OU-2 REMEDIAL INVESTIGATION REPORT, 1995; AND FEASIBILITY STUDY REPORT, 1995

2. THE SUBCONTRACTOR SHALL USE EXISTING OU-1 FACILITIES FOR PERSONNEL CLEAN UP AND RADIOLOGICAL CONTROL.

REF DWG NO.	DRAWING TITLE
92X-5900-X-00314	DRAWING INDEX
92X-5900-X-00315	LEGEND AND SYMBOLS
92X-5900-G-00267	UTILITY/PREPARATORY SITE/DRAINAGE CONTROL PLAN
92X-5900-G-00268	ABOVE WAC/INITIAL EXCAVATION PLAN
92X-5900-G-00269	FINAL EXCAVATION PLAN

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
CIVIL
MASTER SITE/UTILITY PLAN
SOLID WASTE LANDFILL

EDC

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
D.R. FOX	2-22-96			F. PARTON	3-25-96

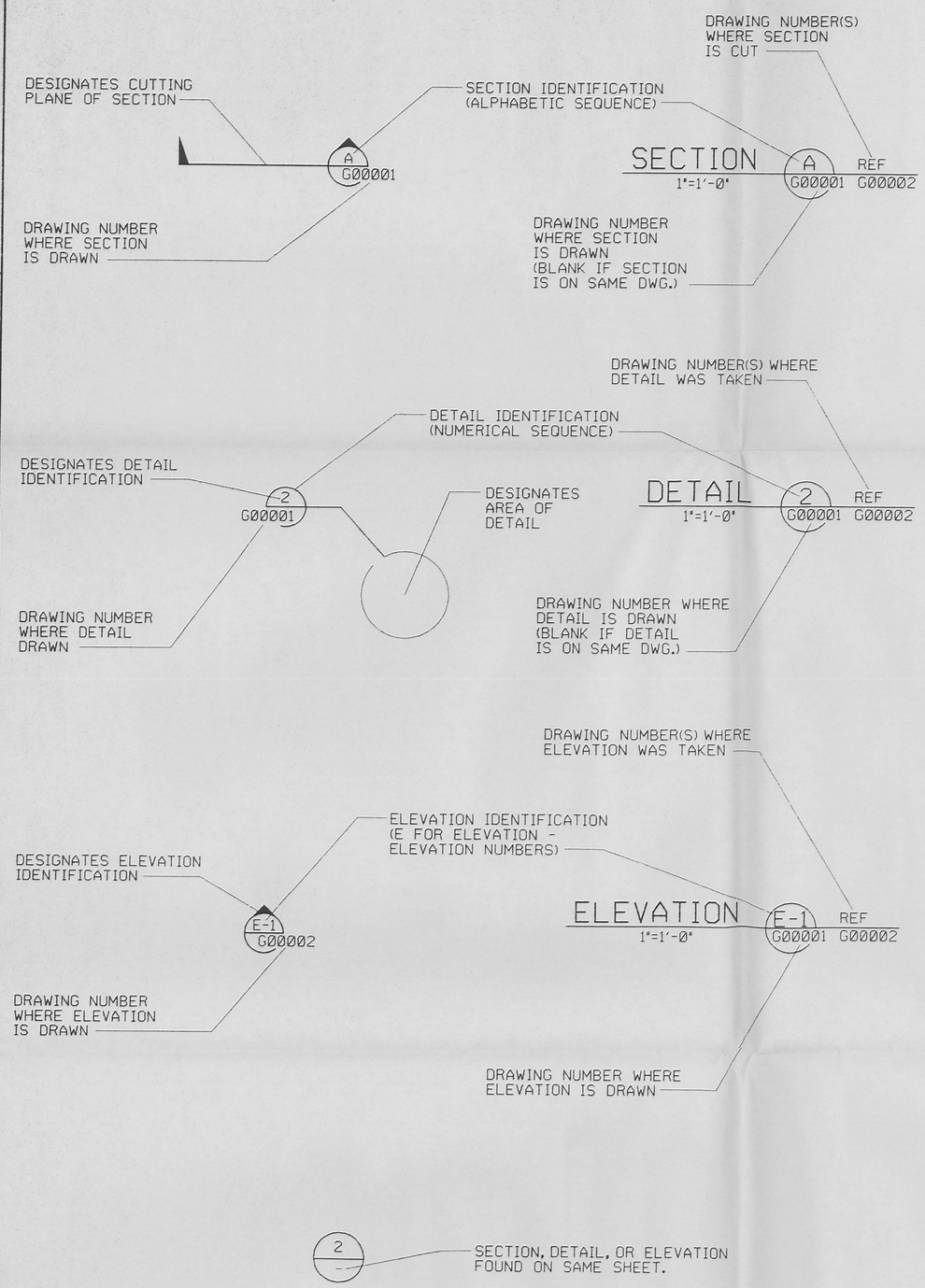
PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=60'	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	N/A DATE	20600

DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
	WBS 1.1.1.1.2.3.6 00-90701	92X-5900-G-00293	G0001	B

PREPARED UNDER PARSONS PROJECT ORDER NUMBER
OU2/P0165

GENERAL LEGEND



NOTE:

ABBREVIATED DRAWING NUMBERS WILL BE USED FOR ALL SECTIONS, DETAILS, ELEVATIONS, AND WITHIN NOTES AND CALL OUTS IN THE BODY OF THE DRAWING.

FOR EXAMPLE; 95X-5900-G-00002 = DRAWING NUMBER
G00002 = ABBREVIATED DRAWING NUMBER

DIMENSIONING:

DIMENSIONS AND/OR ELEVATIONS MARKED THUS (+/-) SHALL BE VERIFIED IN THE FIELD BY CONTRACTOR.

USE DIMENSIONS AS SHOWN, DO NOT SCALE.

NTS (NOT TO SCALE) IS SHOWN ONLY WHERE DIMENSION IS OBVIOUSLY OUT OF SCALE.

ABBREVIATIONS

BSL	BIODENITRIFICATION SURGE LAGOON
OSDF	ON-SITE DISPOSAL FACILITY
FRL	FINAL REMEDIATION LEVEL
SWM	STORMWATER MANAGEMENT
WAC	WASTE ACCEPTANCE CRITERIA

CONSTRUCTION (BY OTHERS)

- CONTOUR - MAJOR & MINOR
- UTILITIES
- BUILDING/TRAILER/PAD
- ROADWAY/SIDEWALK

UTILITY SYMBOLS

EXISTING		PROPOSED
----- ST -----	STORM SEWER	ST
----- SN -----	SANITARY SEWER	SN
----- FG -----	FUEL GAS	FG
----- DW -----	DRINKING WATER	DW
----- FQ1 -----	FIRE PROTECTION	FQ1
----- LS -----	LIVE STEAM	LS
----- WS -----	WATER SUPPLY	WS
----- WR -----	COOLING WATER RETURN	WR
----- TW -----	PROCESS WATER	TW
----- CE -----	CONTAMINATE WATER	CE
----- FT -----	FILTRATE OR EFFLUENT	FT
----- DF -----	DEIONIZED FEED	DF
----- PW -----	DEIONIZED WATER	PW
----- BR -----	BRINE	BR
----- RW -----	RAW WATER	RW
----- A -----	ALARM	A
----- CN -----	STEAM CONDENSATE	CN
----- VE -----	VENT LINES	VE
----- SD -----	SUB-SURFACE DRAINAGE	SD
----- SL -----	SUMP LIQUOR	SL
----- E -----	ELECTRICAL	E
----- OE -◇-	OVERHEAD ELECTRICAL	OE —◆—
----- T -----	TELEPHONE	T
----- G -----	ELECTRIC GROUND	G
----- PA -----	PLANT AIR	PA
----- SA -----	INSTRUMENT AIR SUPPLY	SA
	ABANDONED	

BALLOON LEGEND

PIV	POST INDICATOR VALVE
SMH	SANITARY MANHOLE
EMH	ELECTRICAL MANHOLE
TMH	TELEPHONE MANHOLE
CB	STORM SEWER CATCH BASIN
HFH	HIGH PRESSURE FIRE HYDRANT
LFH	LOW PRESSURE FIRE HYDRANT

GRADING SYMBOLS

EXISTING		PROPOSED
X 584.9	SPOT ELEVATION	X 589.4
584	CONTOUR - MINOR	584
585	CONTOUR - MAJOR	585
(TOE)	SLOPE INDICATOR	(TOE)

SYMBOLS LEGEND

EXISTING		PROPOSED
	POST INDICATOR VALVE (PIV)	
	FIRE HYDRANT (FH)	
	MANHOLE (MH)	S OR D
	CATCH BASIN (CB)	D
	LIGHT POLE	
	PIPE SUPPORT	
	ELECTRICAL MANHOLE	E
	TELEPHONE MANHOLE	T
	STREET WASHERS	
	VALVE BOX	
1313	TEST BORING	
	SURFACE DRAINAGE FLOW	
	POWER POLE	
	GRAVEL ROADWAY/DRIVEWAY	
	ASPHALT ROADWAY/DRIVEWAY	
	CONCRETE PAD/ ROADWAY/DRIVEWAY	
	BUILDING/TRAILER	
	RAILROAD TRACK	
	FENCE	
	TREE LINE	
	DECIDUOUS TREE	
	CONIFEROUS TREE	
	CENTERLINE DRAINAGE DITCH	
	RIVER/CREEK	
	TO BE REMOVED	
	SILT FENCE	
	ELECTRICAL TRANSFORMER	T
	TRANSMISSION TOWER	
	HEADWALL	OR
BM	BENCH MARK	
xx xx	CONSTRUCTION/WIND BARRIER FENCE	xx xx
	SIGN	
	BOLLARD/GUARD POST	
PB	ELECTRICAL PULL BOX	
	SURVEY CONTROL POINT	
	ROAD CENTERLINE OR BASELINE	
	PIPE BEND	OR
	PIPE TEE	
	THRUST BLOCK	
	REDUCER	
W OR U	UNKNOWN	
	STRAW BALE SILT BARRIER	
	FENCE GATE	
	APPROXIMATE ELEVATION OF GROUNDWATER	
	BATTERY LIMIT	

NOTES

287

REF DWG NO.	DRAWING TITLE
92X-5900-X-00313	PROJECT TITLE SHEET
92X-5900-X-00314	DRAWING INDEX

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
LEGEND AND SYMBOLS
SOLID WASTE LANDFILL

EDC

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	03/11/96			F. PARTON	3-21-96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20600

437

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/P0165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-X-00315	X0003	B

INDEX OF DRAWINGS

INDEX CODE NO.	DRAWING NO.	SHEET NO.	REVISION NO.	DRAWING TITLE	REMARKS
	92X-5900-X-00313	X0001	B	PROJECT TITLE SHEET	
	92X-5900-X-00314	X0002	B	DRAWING INDEX	
	92X-5900-X-00315	X0003	B	LEGEND AND SYMBOLS	
	92X-5900-G-00293	G0001	B	CIVIL - MASTER SITE/UTILITY PLAN	
	92X-5900-G-00267	G0002	B	CIVIL - UTILITY/PREPARATORY SITE/DRAINAGE CONTROL PLAN	
	92X-5900-G-00268	G0003	B	CIVIL - ABOVE WAC/INITIAL EXCAVATION PLAN	
	92X-5900-G-00269	G0004	B	CIVIL - FINAL EXCAVATION PLAN	
	92X-5900-G-00270	G0005	B	CIVIL - CROSS SECTIONS	
	92X-5900-G-00271	G0006		CIVIL - DETAIL SHEET - SHEET 1 OF 2	TO BE INCLUDED AT 90% SUBMITTAL
	92X-5900-G-00272	G0007		CIVIL - DETAIL SHEET - SHEET 2 OF 2	TO BE INCLUDED AT 90% SUBMITTAL
	92X-5900-M-00327	M0001	B	MATERIAL HANDLING - PROCESS FLOW DIAGRAM	
	92X-5900-N-00332	N0001	B	MECHANICAL PROCESS - PIPING AND INSTRUMENTATION DIAGRAM - SYMBOLS AND LEGEND SHEET	
	92X-5900-N-00294	N0002	B	MECHANICAL PROCESS - PIPING AND INSTRUMENTATION DIAGRAM - WASTEWATER COLLECTION AND TRANSFER	
	LATER	P0001		PIPING PLAN	TO BE INCLUDED AT 90% SUBMITTAL
	LATER	P0002		PIPING SECTIONS AND DETAILS	TO BE INCLUDED AT 90% SUBMITTAL

NOTES

287

REF DWG NO.	DRAWING TITLE
92X-5900-X-00313	PROJECT TITLE SHEET
92X-5900-X-00315	LEGEND AND SYMBOLS

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
DRAWING INDEX
SOLID WASTE LANDFILL

EDC

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	03/11/96			F. PARTON	3-21-96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20600

436

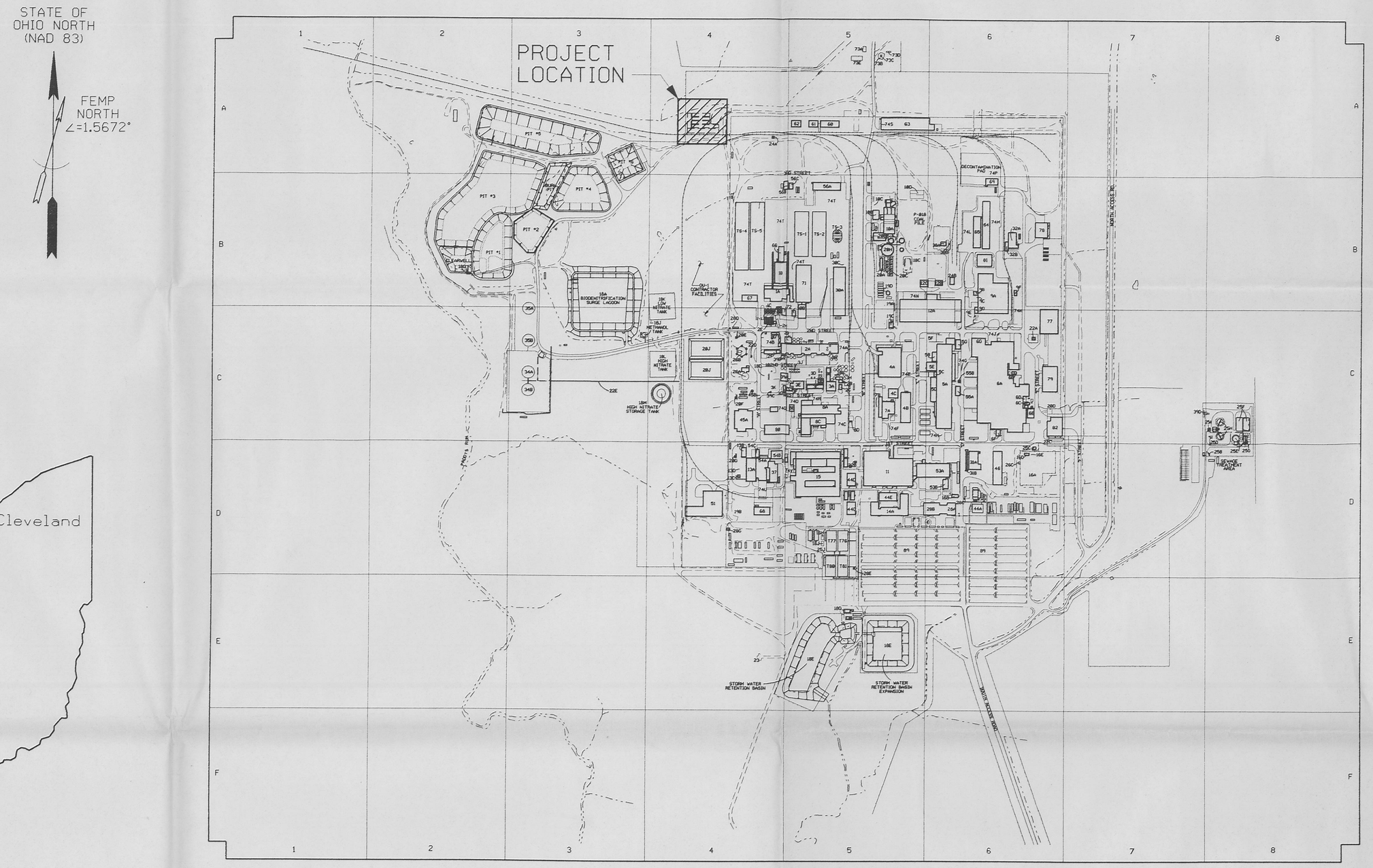
PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/P0165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-X-00314	X0002	B

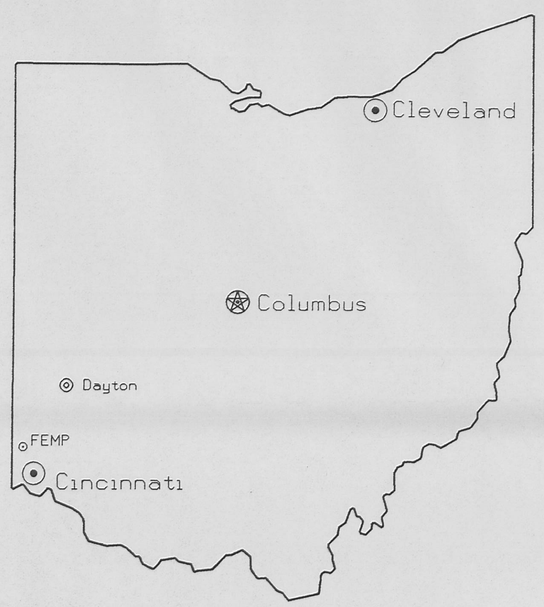
UNITED STATES DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

WASTE UNITS REMEDIATION

OPERABLE UNIT 2 - SOLID WASTE LANDFILL





PARSONS

The Ralph M. Parsons Company * Parsons Main, Inc. * Engineering-Science, Inc.

ARCHITECTS - ENGINEERS
CINCINNATI, OHIO

NOTES

287

REF DWG NO.	DRAWING TITLE
92X-5900-X-00314	DRAWING INDEX
92X-5900-X-00315	LEGEND AND SYMBOLS

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
PROJECT TITLE SHEET
SOLID WASTE LANDFILL

EDC

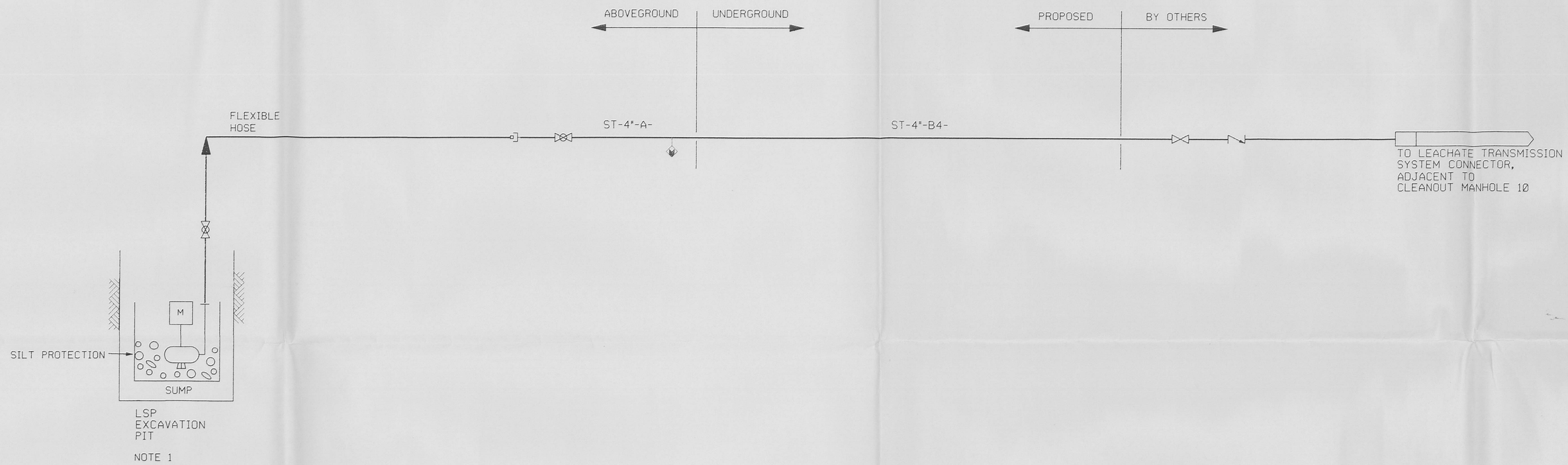
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	03/11/96			F. PARTON	3-21-96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20600

435

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/P0165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-X-00313	X0001	B



NOTES

1. PUMPS AND HOSES TO BE SIZED AND PROVIDED BY SUBCONTRACTOR.

REF DWG NO.	DRAWING TITLE
92X-5900-X-00317	DRAWING INDEX
92X-5900-N-00331	SYMBOLS AND LEGEND SHEET

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
MECHANICAL PROCESS
PIPING AND INSTRUMENTATION DIAGRAM
WASTEWATER COLLECTION AND TRANSFER - LSP

EDC

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
P.A. WILSON	3/1/96			K. D. MORRIS	3/25/96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20500
	N/A	

434

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/P0165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-N-00292	N0002	B

287

PIPING SYMBOLS

- GATE VALVE
- GLOBE VALVE
- BALL VALVE
- PLUG VALVE
- BUTTERFLY VALVE/DAMPER
- STOP CHECK
- NEEDLE VALVE
- CHECK VALVE
- SLIDING GATE VALVE
- BALL CHECK VALVE
- BACKFLOW PREVENTER
- DIAPHRAGM VALVE
- PINCH VALVE
- 3 WAY VALVE
- 3 WAY BALL VALVE
- 3 WAY PLUG VALVE
- ANGLE GATE VALVE
- ANGLE GLOBE VALVE
- FOOT VALVE
- HUB DRAIN OR FUNNEL
- DIAPHRAGM OPERATOR
- DIAPHRAGM W/ POSITIONER
- PISTON OPERATOR
- SAFETY RELIEF VALVE
- SOLENOID OPERATOR
- SELF-CONTAINED BACK PRESSURE REGULATING VALVE
- 2-WAY SOLENOID VALVE
- 3-WAY SOLENOID VALVE INDICATES DEENERGIZED SECONDARY
- 4-WAY SOLENOID VALVE
- VALVE WITH OPERATOR (VALVE TYPE UNDEFINED)
- STEAM TRAP
- HOSE QUICK COUPLING
- UNION
- DRAIN LEG
- EXPANSION JOINT
- HANDWHEEL
- EJECTOR
- STRAINER (Y TYPE)
- STRAINER (SINGLE BASKET)
- STRAINER (DOUBLE BASKET)
- STRAINER (CONE TYPE)
- STRAINER (SUCTION TYPE)
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER
- ORIFICE
- VENTURI TUBE
- SIPHON TUBE
- THERMOWELL
- FLOW DIRECTION
- WELDED CONNECTION
- FLANGED CONNECTION
- PIPE CAP
- TIE/IN MARK
- PRIMARY
- SECONDARY
- EXISTING PIPING OR EQUIPMENT
- PACKAGED SYSTEM
- MATERIAL CODE BREAK
- INSULATION CODE BREAK
- PULSATION DAMPENER
- AIR FILTER
- FILTER LUBRICATOR REGULATOR
- AIR OPERATED DIAPHRAGM PUMP
- HORIZONTAL CENTRIFUGAL PUMP
- VERTICAL CENTRIFUGAL PUMP
- SUMP PUMP
- CHEMICAL METERING PUMP
- AGITATOR (MIXER)

SINGLE LINE AIR DUCT SYMBOLS

- FAN WITH INLET VANES AND BACKDRAFT DAMPER
- BACKDRAFT DAMPER
- MOTORIZED DAMPER
- MANUAL VOLUME DAMPER

INSTRUMENT SYMBOLS

- ELECTRICAL BINARY SIGNAL
- PNEUMATIC BINARY SIGNAL
- ELECTROMAGNETIC OR SONIC SIGNAL (GUIDED)
- ELECTROMAGNETIC OR SONIC SIGNAL (NON-GUIDED)
- IA — INSTRUMENT/PLANT AIR SUPPLY
- ELECTRICAL SIGNAL
- CAPILLARY
- HYDRAULIC SIGNAL LINE
- PNEUMATIC OR VACUUM SIGNAL LINE
- I — INTERLOCK
- DIAPHRAGM SEAL
- FI — ROTAMETER
- FI — SIGHT GLASS
- LOCAL MOUNTED INSTRUMENT
- FRONT OF PANEL MOUNTED INSTRUMENT
- FRONT OF PANEL MOUNTED INSTRUMENT AUXILLIARY LOCATION
- REAR OF PANEL MOUNTED INSTRUMENT
- REAR OF PANEL MOUNTED INSTRUMENT AUXILLIARY LOCATION
- DIGITAL LOGIC OPERATOR INTERFACE AUXILIARY LOCATION
- DIGITAL LOGIC OPERATOR INTERFACE
- SHARED CONTROL AUXILIARY LOCATION
- SHARED DISPLAY COMPUTER CONTROL AND OPERATOR INTERFACE
- F — AIR VENT FILTER
- M — MAGNETIC FLOW METER
- POSITIVE DISPLACEMENT FLOW METER
- A*** — EQUIPMENT NUMBER

FY 102 A
- LETTERS OF IDENTIFICATION
- SPECIAL DESIGNATION
- INSTRUMENT TAG NUMBER

TYPICAL CALL OUT

ABBREVIATIONS

BTU	BRITISH THERMAL UNIT
CU FT	CUBIC FEET
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
KW	KILOWATT
LB/HR	POUNDS PER HOUR
SCFM	STD. CUBIC FT/MINUTE
NO	NORMALLY OPEN
NC	NORMALLY CLOSED
FO	FAIL OPEN
FC	FAIL CLOSED
AO	AIR TO OPEN
AC	AIR TO CLOSE
IA	INSTRUMENT AIR
ET	ELECTRIC TRACED AND INSULATED
ST	STEAM TRACED AND INSULATED
EF	EXHAUST FAN
GV	GRAVITY VENTILATOR
UH	UNIT HEATER
RED	REDUCER
ECC	ECCENTRIC
TBD	TO BE DETERMINED
TF	TOP FLAT
TYP	TYPICAL
MATL	MATERIAL
MED	MEDIUM
CO	CARBON MONOXIDE
RH	RELATIVE HUMIDITY
CFM	CUBIC FEET/MINUTE
SF	SOUTH FIELD
IFA	INACTIVE FLYASH PILE
COMH	CLEAN OUT MANHOLE
HDPE	HIGH DENSITY POLYETHYLENE
CS	CARBON STEEL
LSP	LIME SLUDGE POND

INSTRUMENTATION SPECIAL DESIGNATIONS

DESIGNATION	FUNCTION/ABBREVATION
Σ/N OR AVG	AVERAGING
± OR BI	BIAS
1:1,1:3,2:1 (TYP)	BOOST,GAIN OR ATTENUATE (INPUT:OUTPUT)
△ OR DIF	DIFFERENTIAL
÷ OR DIV	DIVIDE
√‾ OR SQ.RT.	EXTRACT SQUARE ROOT
X OR MUL	MULTIPLY
N	RAISE TO POWER
REV	REVERSING
Σ OR SUM	SUMMING
L	LOW
LL	LOW LOW
H	HIGH
HH	HIGH HIGH
HL	HIGH LOW
∫	INTEGRATE (TIME INTEGRAL)
%	PROPORTIONAL
Y	UNDETERMINED COMPUTING RELAY
HOA	HAND-OFF-AUTO
∓	EXISTING INSTRUMENT TO BE RELOCATED
I/P	CURRENT TO PNEUMATIC TRANSDUCER
RUN	RUNNING
OA	OFF-AUTO
OCA	OPEN-CLOSE-AUTO
I/O	INPUT / OUTPUT
*	EXISTING INSTRUMENT
UD	UP/DOWN
EW	EAST/WEST
I/I	CURRENT TO CURRENT

PIPING SPECIFICATIONS

FLOWING MEDIUM	MED CODE	MATL CODE
BACK WASH	BW	T
CHILLED WATER	CHS, CHR	A
CHLORINE	CL	B1
CONDENSATE	LC	W, T
CONDENSER WATER	CWS, CWR	A
COOLING WATER	WS, WR	A
DRAIN	DR	A , T
THICKENER OVERFLOW	TO	T
FILTRATE EFFLUENT	FT	A
FLOCCULANT	FL	A
FLUSH WATER	FW	T
FORCE MAIN	FM	M
INSTRUMENT AIR	IA	T
OFF-GAS	OG	T
NITRIC ACID	AN	T1
PERCHED GND WATER	PGW	B
PHOSPHORIC ACID	PAPH	T1
PLANT AIR	PA	W
POLISHED WATER	PW	A
POTABLE WATER	DW	W, B, B3
PROCESS WATER	TW	A
PROCESS WASTEWATER	CE	A
RAW WATER	RW	A
RECYCLE WATER	RC	T, B2
SCRUBBER RECYCLE	RSL	T
SLURRY	SL	T
SODIUM CARBONATE	SC	A
SODIUM HYDROXIDE	NA	T
SODIUM SILICATE	SS	A
STORM WATER	ST	A, B4
SULFURIC ACID	SB	T1
SUMP DISCHARGE	SU	T
VACUUM	V	A
VENTILATION AIR	VE	T
WASTE WATER	WW	W, B4 ,A

EXAMPLE:

CE-2"-A-100-ET

- MEDIUM CODE
- NOMINAL PIPE SIZE
- MATERIAL CODE
- LINE NUMBER
- HEAT TRACING AND INSULATION

A - A53,GR. A, SEAMLESS STEEL PIPE
B - PVC
B1 - PVDF
B2 - PVDF, 100 PSI
B3 - CPVC
B4 - HDPE
L - FIBERGLASS REINFORCED PLASTIC
M - DUCTILE IRON
T - 304L, STAINLESS STEEL PIPE
T1 - 316L, STAINLESS STEEL PIPE
W - A53,GR. A, GALVANIZED STEEL PIPE

LETTERS OF INSTRUMENT IDENTIFICATION

LETTER	FIRST LETTER	2ND LETTER	3RD OR 4TH LETTER
	MEASURED OR INITIATING VARIABLE	MODIFIER	READ OUT OR PASSIVE FUNCTION
A	ANALYSIS	ALARM	ALARM
B	BURNER FLAME	----	----
C	CAMERA	CONTROLLER	CONTROLLER
D	DENSITY	DIFFERENTIAL	----
E	VOLTAGE	ELEMENT	ELEMENT
F	FLOW RATE	RATIO (FRACTION)	----
G	GAGING (DIM)	VIEWING DEVICE	GLASS
H	HAND (MANUAL)	----	HIGH
I	CURRENT (ELECT)	INDICATE	INDICATE
J	POWER	SCAN	----
K	TIME	----	----
L	LEVEL	LIGHT	LOW
M	MOIST OR HUMIDITY	----	----
N	----	----	----
O	OBSERVATION	----	ORIFICE
P	PRESSURE OR VACUUM	----	POINT (TEST)
Q	QUANTITY OR EVENT	TOTALIZER	----
R	RADIOACTIVITY	RECORDER	----
S	SPEED OR FREQUENCY	SAFETY/SWITCH	SWITCH
T	TEMPERATURE	TRANSMITTER	TRANSMITTER
U	USER'S GUIDE	----	MULTIFUNCTION
V	VISCOSITY	----	VENT, VALVE
W	WEIGHT OR FORCE	WELL	----
X	UNCLASSIFIED	----	UNCLASSIFIED
Y	RELAY	RELAY	----
Z	POSITION	----	----

NOTES

287

REF DWG NO.	DRAWING TITLE
92X-5900-X-00317	DRAWING INDEX

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
MECHANICAL PROCESS
PIPING AND INSTRUMENTATION DIAGRAM
SYMBOLS AND LEGEND SHEET - LSP

EDC

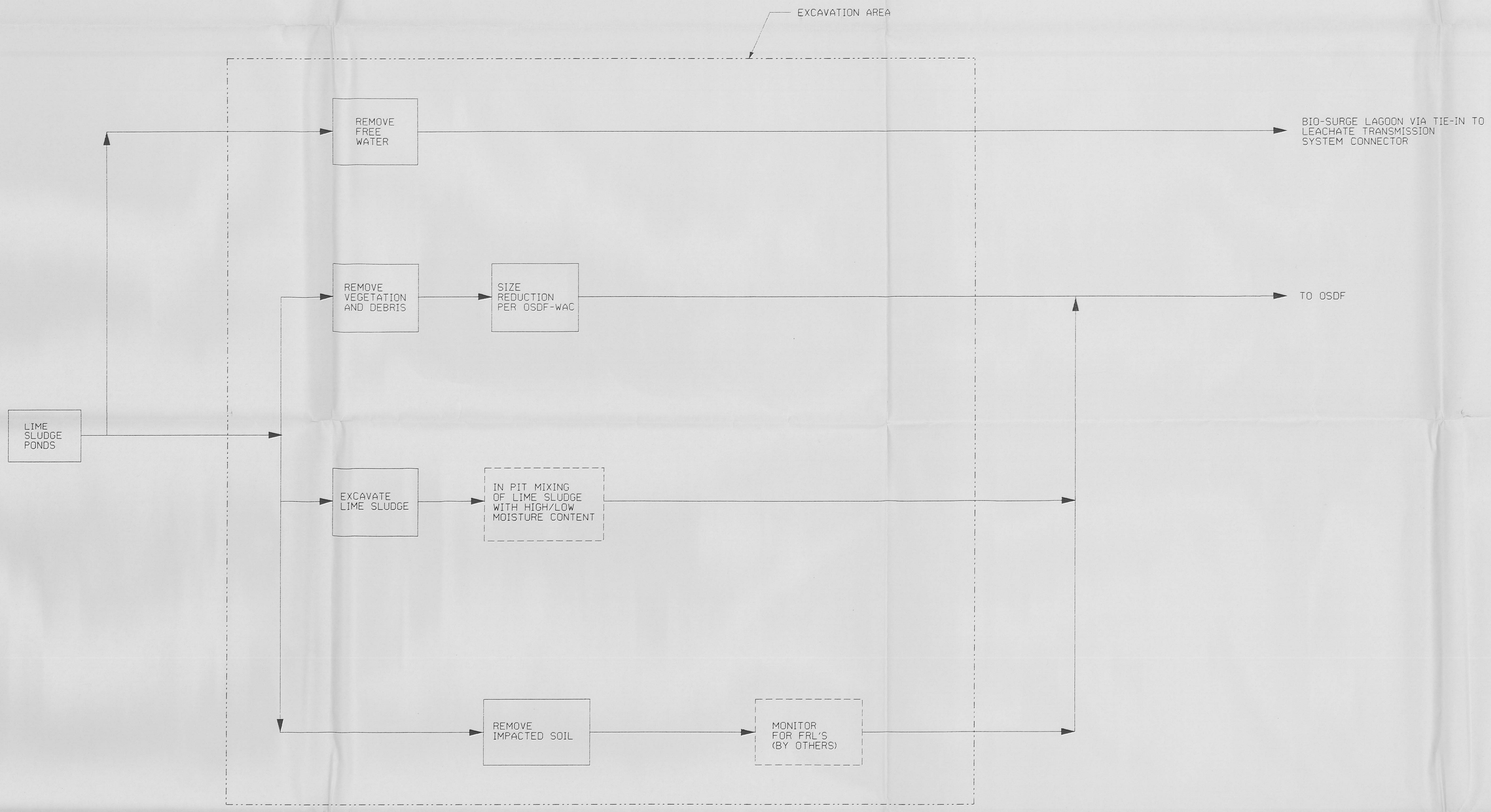
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
P. A. WILSON	3/4/96			K. D. MORRIS	3/25/96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	N/A DATE	20500

433

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/PO165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-N-00331	N0001	B



NOTES

287

LEGEND:

OSDF	= ON SITE DISPOSAL FACILITY
WAC	= WASTE ACCEPTANCE CRITERIA
FRL'S	= FINAL REMEDIATION LEVELS

PRELIMINARY

NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY

PARSONS

THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.

CINCINNATI, OHIO

PROJECT NAME

WASTE UNITS REMEDIATION

DRAWING TITLE

MATERIALS HANDLING
PROCESS FLOW DIAGRAM
LIME SLUDGE PONDS

EDC

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
NH TERRY	3-12-96			D. O'KEEF	03/20/96

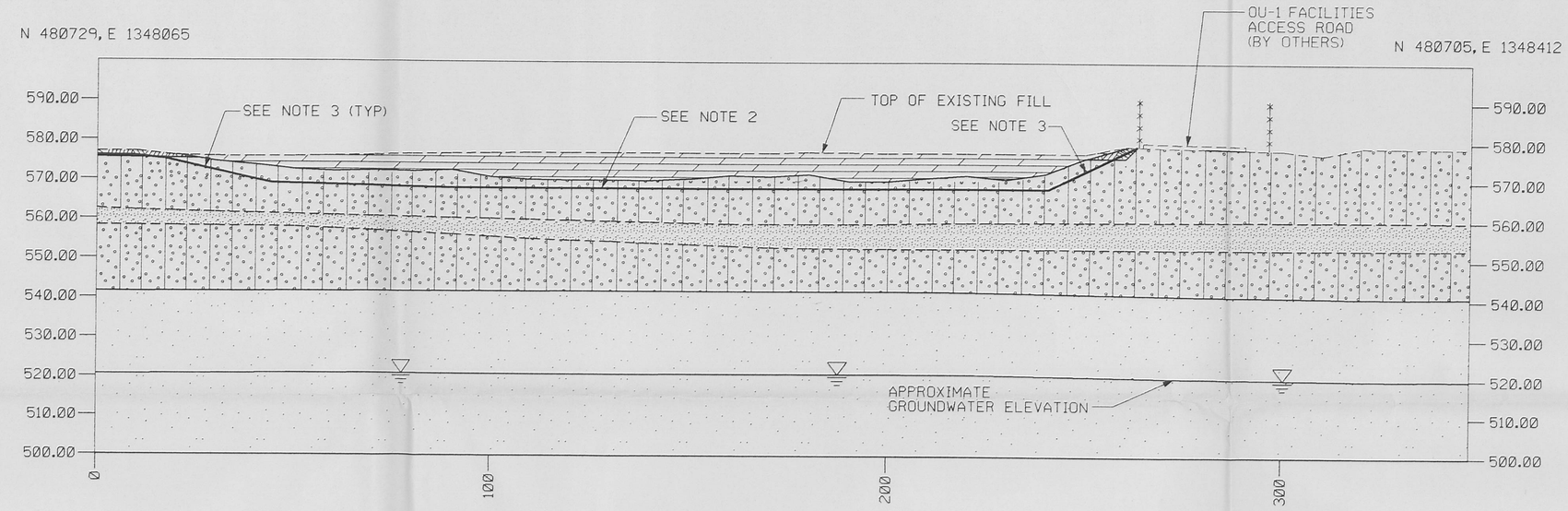
PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20500

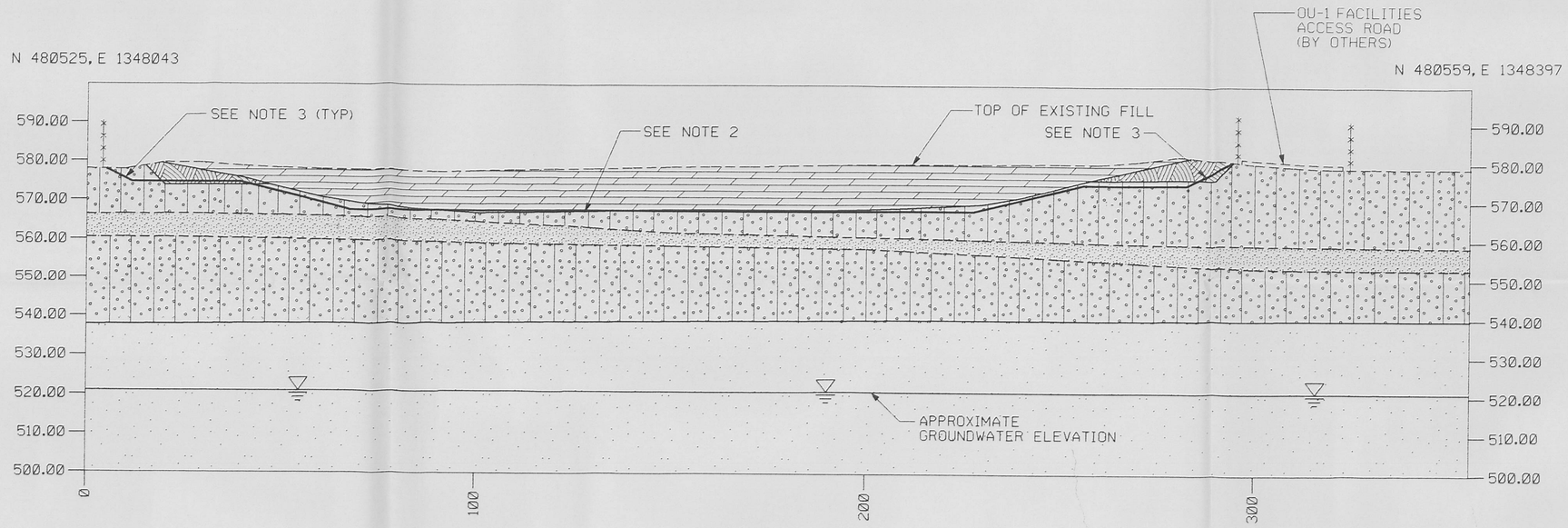
432

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/P0165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-M-00328	M0002	B

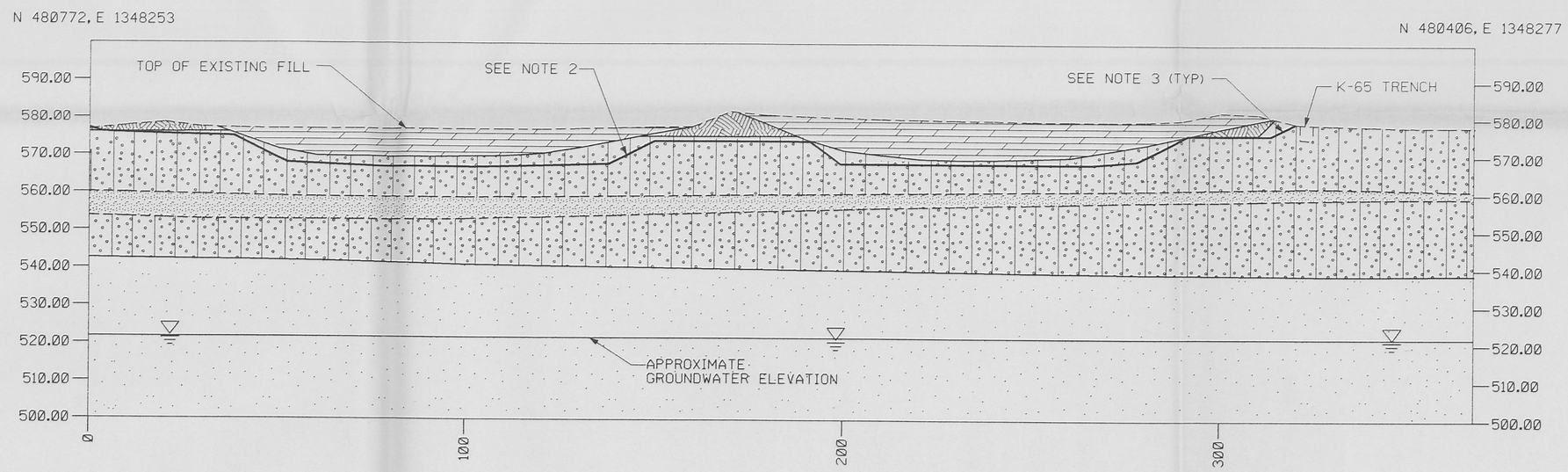
R92m00328.m po165@ws425. Wed May 22 14:09:42 CDT 1996



SECTION A REF G00277 G00276
SCALE: HOR 1"=20' VER 1"=20'



SECTION B REF G00277 G00276
SCALE: HOR 1"=20' VER 1"=20'



SECTION C REF G00277 G00276
SCALE: HOR 1"=20' VER 1"=20'

NOTES 287

1. THE CROSS SECTIONS SHOWN ARE BASED UPON CROSS SECTIONS PRESENTED IN THE FEMP OU-2 FEASIBILITY STUDY REPORT, 1995. THE CROSS SECTIONS IN THIS REPORT WERE DEVELOPED FROM INVESTIGATIVE BORING DATA AND A THREE DIMENSIONAL MODEL. THE INTERPRETATIONS SHOWN ARE APPROXIMATE. ACTUAL FIELD CONDITIONS MAY VARY.
2. THE EXCAVATION LIMITS DEPICTED ARE BASED UPON THE PROPOSED EXCAVATION PLAN ON DRAWING 92X-5900-G-00276. ACTUAL EXCAVATION LIMITS AND GRADING PLAN MAY VARY DEPENDING ON ACTUAL FIELD DETERMINED LOCATION OF THE FINAL REMEDIATION LIMITS.
3. MAXIMUM SLOPE SHALL BE 2 HORIZONTAL TO 1 VERTICAL UNLESS SLOPE STABILITY REQUIRES A FLATTER SLOPE OR AS DIRECTED BY FERMCO.

LEGEND:

- BERM
- LIME SLUDGE
- SAND/GRAVEL
- GLACIAL OVERBURDEN/TILL
- GREAT MIAMI AQUIFER

REF DWG NO.	DRAWING TITLE
92X-5900-X-00317	DRAWING INDEX
92X-5900-X-00318	LEGEND AND SYMBOLS
92X-5900-G-00276	FINAL EXCAVATION

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
CIVIL
CROSS SECTIONS
LIME SLUDGE PONDS

EDC

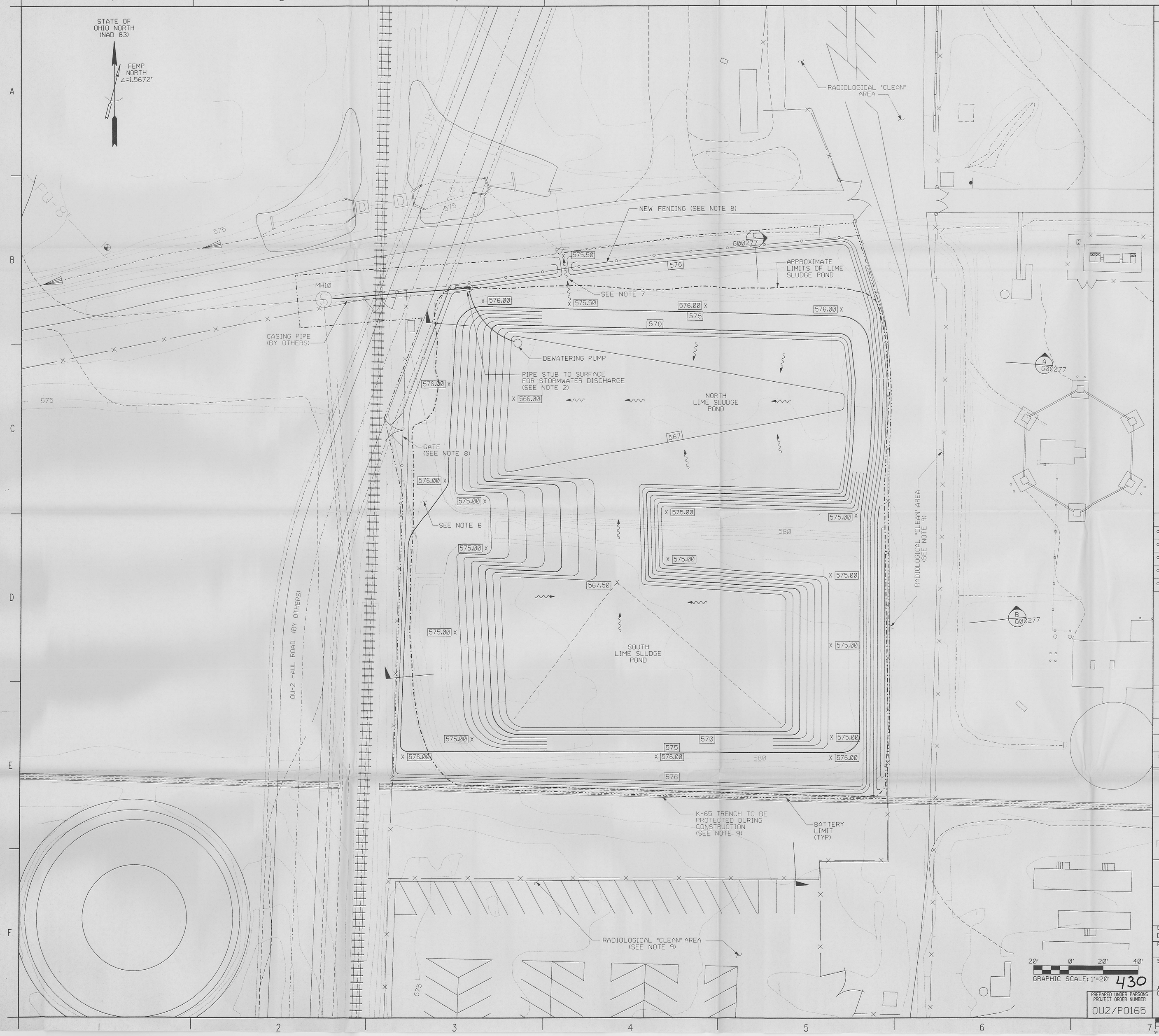
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
D.R. FOX	03/08/96			F. PARTON	03/21/96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		AS SHOWN	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20500

431

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/P0165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-G-00277	G0004	B



NOTES

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW:

   EXISTING SITE DATA SOURCE (IN PLANT FILES)
   PARSONS TOPOGRAPHY, 1995
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   FEMP OU-2 REMEDIAL INVESTIGATION REPORT, 1995; AND FEASIBILITY STUDY REPORT, 1995.

2. INSTALL TEMPORARY DEWATERING PUMPS. DURING CONSTRUCTION AND PRIOR TO CERTIFICATION, MAINTAIN EXCAVATION AREAS FREE OF STANDING WATER. ALL PUMPED WATERS WILL BE DISCHARGED THROUGH THE STORMWATER TRANSMISSION LINE. DEWATERING PUMPS ARE NOT REQUIRED AFTER CERTIFICATION OF CLOSURE.

3. CUT SLOPES SHALL NOT EXCEED A MAXIMUM SLOPE OF 2H:1V UNLESS SLOPE STABILITY REQUIRES A FLATTER SLOPE OR AS DIRECTED BY FERMCO.

4. THE EXCAVATION CONTOURS ARE BASED UPON APPROXIMATE WASTE LIMITS. THE ACTUAL WASTE LIMITS MAY VARY AND WILL DEPEND UPON ACTUAL CONDITIONS REVEALED DURING CONSTRUCTION.

5. TRANSPORT TRUCKS HAULING EXCAVATED MATERIAL SHALL NOT ENTER THE EXCAVATION. LOADOUT OF TRANSPORT TRUCKS WILL ONLY BE ALLOWED ON THE GRAVEL LOADOUT AREA. NO TRANSPORT TRUCKS WILL BE ALLOWED TO LEAVE THE LOADOUT AREA WITH FREE WATER LEAKING FROM THE DUMP BODY.

6. FINAL CONTOURS ADJACENT TO THE HAUL ROAD WILL BE DEPENDENT UPON AS-BUILT CONDITIONS OF THE CONSTRUCTED HAUL ROAD. THE TRANSITION TO THE HAUL ROAD MAY REQUIRE FIELD ADJUSTMENT ACCORDINGLY.

7. THE DISTURBED AREAS SHALL BE VEGETATIVELY STABILIZED. AFTER EXCAVATION HAS BEEN COMPLETED. AFTER CERTIFICATION STANDING WATER SHALL BE ALLOWED TO ACCUMULATE TO ELEVATION 575.50 FEET. THE AREA SHALL BE RECONFIGURED IN THE FUTURE UNDER THE SITEWIDE FINAL REMEDIATION GRADING TO PROVIDE POSITIVE DRAINAGE.

8. INSTALL THE BALANCE OF FENCING AND GATE AFTER CERTIFICATION OF THE AREA.

9. THE SUBCONTRACTOR SHALL PROTECT ALL EXISTING FACILITIES, APPURTENANCES, AND PAVED ROADWAYS AND FENCING IN RADIOLOGICAL "CLEAN" AREAS FROM DAMAGE DURING CONSTRUCTION. CONTAMINATED CONSTRUCTION EQUIPMENT ARE EXCLUDED FORM RADIOLOGIC "CLEAN" AREAS.

REF DWG NO.	DRAWING TITLE
92X-5900-X-00317	DRAWING INDEX
92X-5900-X-00318	LEGEND AND SYMBOLS
92X-5900-G-00277	CROSS SECTIONS
92X-5900-G-00274	PREPARATORY SITE/DRAINAGE CONTROL PLAN
92X-5900-G-00296	SITE/UTILITY PLAN

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
CIVIL
FINAL EXCAVATION PLAN
LIME SLUDGE PONDS

EDC

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
D.R. FOX	2-23-96			F. PARTON	3-21-96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=20'	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
	N/A	20500

A-E DATE	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-G-00276	G0003	B

PREPARED UNDER PARSONS PROJECT ORDER NUMBER: OU2/P0165

287

430

429

NOTES

287

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   EXISTING SITE DATA SOURCE (IN PLANT FILES)
   PARSONS TOPOGRAPHY, 1992
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   FEMP OU-2 REMEDIAL INVESTIGATION REPORT, 1995; AND FEASIBILITY STUDY REPORT, 1995
2. SEED ALL EARTHEN BERMS AND DISTURBED AREAS WITH TEMPORARY SEED MIX.
3. INSTALL TEMPORARY DEWATERING PUMPS. MAINTAIN BERMED AREAS FREE OF STANDING WATER. PRIOR TO AND DURING EXCAVATION, PUMP COLLECTED WATER TO THE STORMWATER TRANSMISSION LINE.
4. GRADE PREPARATION ADJACENT TO THE HAUL ROAD WILL BE DEPENDENT ON AS-BUILT CONTOURS ALONG THE CONSTRUCTED HAUL ROAD. THE TRANSITION TO THE HAUL ROAD MAY REQUIRE FIELD ADJUSTMENT ACCORDINGLY.
5. ALL MONITORING WELLS IN THE WORK ZONE WILL BE ABANDONED BY FERMCO PRIOR TO CONSTRUCTION.
6. THE SUBCONTRACTOR SHALL PROTECT ALL EXISTING FACILITIES, APPURTENANCES, AND PAVED ROADWAYS AND FENCING IN RADIOLOGICAL "CLEAN" AREAS FROM DAMAGE DURING CONSTRUCTION. CONTAMINATED CONSTRUCTION EQUIPMENT ARE EXCLUDED FROM RADIOLOGICAL "CLEAN" AREAS.
7. INSTALL FENCING AS SHOWN PRIOR TO EXCAVATION ACTIVITIES, EXCEPT FOR A PORTION OF FENCE AND GATE ADJACENT TO THE ACCESS RAMP/LOADOUT AREA. THE BALANCE OF THE FENCE AND GATE WILL BE INSTALLED AFTER CERTIFICATION OF THE AREA.

REF DWG NO.	DRAWING TITLE
92X-5900-X-00317	DRAWING INDEX
92X-5900-X-00318	LEGEND AND SYMBOLS

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
CIVIL
PREPARATORY SITE/DRAINAGE CONTROL PLAN
LIME SLUDGE PONDS

EDC

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
D.R. FOX	2-23-96			F. PARTON	3-21-96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=20'	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20500

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/P0165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-G-00274	G0002	B

428

NOTES

287

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   EXISTING SITE DATA SOURCE (IN PLANT FILES)
   PARSONS TOPOGRAPHY, 1992
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   FEMP OU-2 REMEDIAL INVESTIGATION REPORT, AND FEASIBILITY STUDY REPORT, 1995

2. THE SUBCONTRACTOR WILL USE EXISTING OU-1 FACILITIES FOR PERSONNEL CLEAN-UP AND RADIOLOGIC CONTROL.

REF DWG NO.	DRAWING TITLE
92X-5900-X-00317	DRAWING INDEX
92X-5900-X-00318	LEGEND AND SYMBOLS
92X-5900-G-00274	PREPARATORY SITE/DRAINAGE CONTROL
92X-5900-G-00276	FINAL EXCAVATION

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
CIVIL
SITE/UTILITY PLAN
LIME SLUDGE PONDS

EDC

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
D.R. FOX	2-23-96			F. PARTON	3-21-96

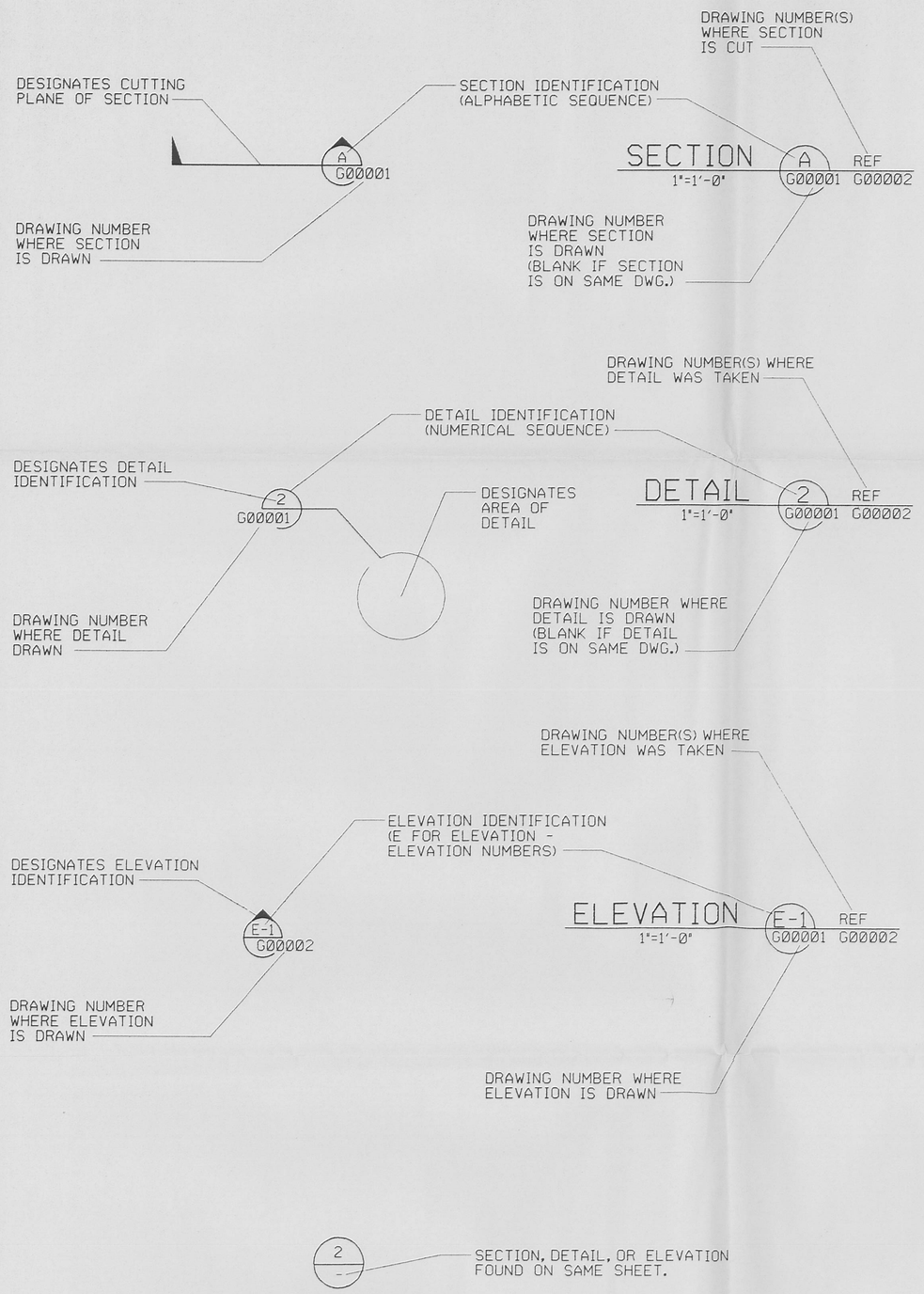
PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=40'	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	N/A DATE	20500

DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
	WBS 1.1.1.1.2.3.6 00-90701	92X-5900-G-00296	G0001	B

PREPARED UNDER PARSONS PROJECT ORDER NUMBER
OU2/P0165

GENERAL LEGEND



NOTE:

ABBREVIATED DRAWING NUMBERS WILL BE USED FOR ALL SECTIONS, DETAILS, ELEVATIONS, AND WITHIN NOTES AND CALL OUTS IN THE BODY OF THE DRAWING.

FOR EXAMPLE; 95X-5900-G-00002 = DRAWING NUMBER
G00002 = ABBREVIATED DRAWING NUMBER

DIMENSIONING:

DIMENSIONS AND/OR ELEVATIONS MARKED THUS (+/-) SHALL BE VERIFIED IN THE FIELD BY CONTRACTOR.

USE DIMENSIONS AS SHOWN, DO NOT SCALE.

NTS (NOT TO SCALE) IS SHOWN ONLY WHERE DIMENSION IS OBVIOUSLY OUT OF SCALE.

ABBREVIATIONS

BSL	BIODENITRIFICATION SURGE LAGOON
OSDF	ON-SITE DISPOSAL FACILITY
FRL	FINAL REMEDIATION LEVEL
SWM	STORMWATER MANAGEMENT
WAC	WASTE ACCEPTANCE CRITERIA

CONSTRUCTION (BY OTHERS)

- CONTOUR - MAJOR & MINOR
- UTILITIES
- BUILDING/TRAILER/PAD
- ROADWAY/SIDEWALK

UTILITY SYMBOLS

EXISTING		PROPOSED
----- ST -----	STORM SEWER	——— ST ———
----- SN -----	SANITARY SEWER	——— SN ———
----- FG -----	FUEL GAS	——— FG ———
----- DW -----	DRINKING WATER	——— DW ———
----- FQ1 -----	FIRE PROTECTION	——— FQ1 ———
----- LS -----	LIVE STEAM	——— LS ———
----- WS -----	WATER SUPPLY	——— WS ———
----- WR -----	COOLING WATER RETURN	——— WR ———
----- TW -----	PROCESS WATER	——— TW ———
----- CE -----	CONTAMINATE WATER	——— CE ———
----- FT -----	FILTRATE OR EFFLUENT	——— FT ———
----- DF -----	DEIONIZED FEED	——— DF ———
----- PW -----	DEIONIZED WATER	——— PW ———
----- BR -----	BRINE	——— BR ———
----- RW -----	RAW WATER	——— RW ———
----- A -----	ALARM	——— A ———
----- CN -----	STEAM CONDENSATE	——— CN ———
----- VE -----	VENT LINES	——— VE ———
----- SD -----	SUB-SURFACE DRAINAGE	——— SD ———
----- SL -----	SUMP LIQUOR	——— SL ———
----- E -----	ELECTRICAL	——— E ———
----- OE -◇--	OVERHEAD ELECTRICAL	——— OE —◆—
----- T -----	TELEPHONE	——— T ———
----- G -----	ELECTRIC GROUND	——— G ———
----- PA -----	PLANT AIR	——— PA ———
----- SA -----	INSTRUMENT AIR SUPPLY	——— SA ———
	ABANDONED	

BALLOON LEGEND

- PIV — POST INDICATOR VALVE
- SMH — SANITARY MANHOLE
- EMH — ELECTRICAL MANHOLE
- TMH — TELEPHONE MANHOLE
- CB — STORM SEWER CATCH BASIN
- HFH — HIGH PRESSURE FIRE HYDRANT
- LFH — LOW PRESSURE FIRE HYDRANT

GRADING SYMBOLS

EXISTING		PROPOSED
X 584.9	SPOT ELEVATION	X 589.4
584	CONTOUR - MINOR	584
585	CONTOUR - MAJOR	585
(TOE)	SLOPE INDICATOR	(TOE)

SYMBOLS LEGEND

EXISTING		PROPOSED
	POST INDICATOR VALVE (PIV)	
	FIRE HYDRANT (FH)	
	MANHOLE (MH)	S OR D
	CATCH BASIN (CB)	D
	LIGHT POLE	
	PIPE SUPPORT	
	ELECTRICAL MANHOLE	E
	TELEPHONE MANHOLE	T
	STREET WASHERS	
	VALVE BOX	
1313	TEST BORING	
	SURFACE DRAINAGE FLOW	
	POWER POLE	
	GRAVEL ROADWAY/DRIVEWAY	
	ASPHALT ROADWAY/DRIVEWAY	
	CONCRETE PAD/ ROADWAY/DRIVEWAY	
	BUILDING/TRAILER	
	RAILROAD TRACK	
	FENCE	
	TREE LINE	
	DECIDUOUS TREE	
	CONIFEROUS TREE	
	CENTERLINE DRAINAGE DITCH	
	RIVER/CREEK	
	TO BE REMOVED	
	SILT FENCE	
	ELECTRICAL TRANSFORMER	T
	TRANSMISSION TOWER	
	HEADWALL	— OR
BM	BENCH MARK	
—xx—xx—	CONSTRUCTION/WIND BARRIER FENCE	—xx—xx—
	SIGN	
	BOLLARD/GUARD POST	
PB	ELECTRICAL PULL BOX	
	SURVEY CONTROL POINT	
	ROAD CENTERLINE OR BASELINE	
	PIPE BEND	OR
	PIPE TEE	
	THRUST BLOCK	
	REDUCER	
W OR U	UNKNOWN	
	STRAW BALE SILT BARRIER	
	FENCE GATE	
	APPROXIMATE ELEVATION OF GROUNDWATER	
	BATTERY LIMIT	

NOTES

287

REF DWG NO.	DRAWING TITLE
92X-5900-X-00316	PROJECT TITLE SHEET
92X-5900-X-00317	DRAWING INDEX

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
LEGEND AND SYMBOLS EDC
LIME SLUDGE PONDS

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	03/11/96			F.PARTON	3-21-96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20500

427

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/P0165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-X-00318	X0003	B

0" 1" 2"

INDEX OF DRAWINGS

INDEX CODE NO.	DRAWING NO.	SHEET NO.	REVISION NO.	DRAWING TITLE	REMARKS
	92X-5900-X-00316	X0001	B	PROJECT TITLE SHEET	
	92X-5900-X-00317	X0002	B	DRAWING INDEX	
	92X-5900-X-00318	X0003	B	LEGEND AND SYMBOLS	
	92X-5900-G-00296	G0001	B	CIVIL - SITE/UTILITY PLAN	
	92X-5900-G-00274	G0002	B	CIVIL - PREPARATORY SITE/DRAINAGE CONTROL PLAN	
	92X-5900-G-00276	G0003	B	CIVIL - FINAL EXCAVATION PLAN	
	92X-5900-G-00277	G0004	B	CIVIL - CROSS SECTIONS	
	92X-5900-G-00279	G0005		CIVIL - DETAIL SHEET - SHEET 1 OF 2	TO BE INCLUDED AT 90% SUBMITTAL
	92X-5900-G-00280	G0006		CIVIL - DETAIL SHEET - SHEET 2 OF 2	TO BE INCLUDED AT 90% SUBMITTAL
	92X-5900-M-00328	M0002	B	MATERIALS HANDLING - PROCESS FLOW DIAGRAM	
	92X-5900-N-00331	N0001	B	MECHANICAL PROCESS - PIPING AND INSTRUMENTATION DIAGRAM - SYMBOLS AND LEGEND SHEET	
	92X 5900-N-00292	N0002	B	MECHANICAL PROCESS - PIPING AND INSTRUMENTATION DIAGRAM - WASTEWATER COLLECTION AND TRANSFER	

NOTES

287

REF DWG NO.	DRAWING TITLE
92X-5900-X-00316	PROJECT TITLE SHEET
92X-5900-X-00318	LEGEND AND SYMBOLS

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
A	ISSUED FOR 30% DESIGN REVIEW		N/A	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

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THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
DRAWING INDEX
LIME SLUDGE PONDS

EDC

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	03/11/96			F.PARTON	3-21-96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	FERMCO PROJECT NO.
A-E DATE	DATE	20500

426

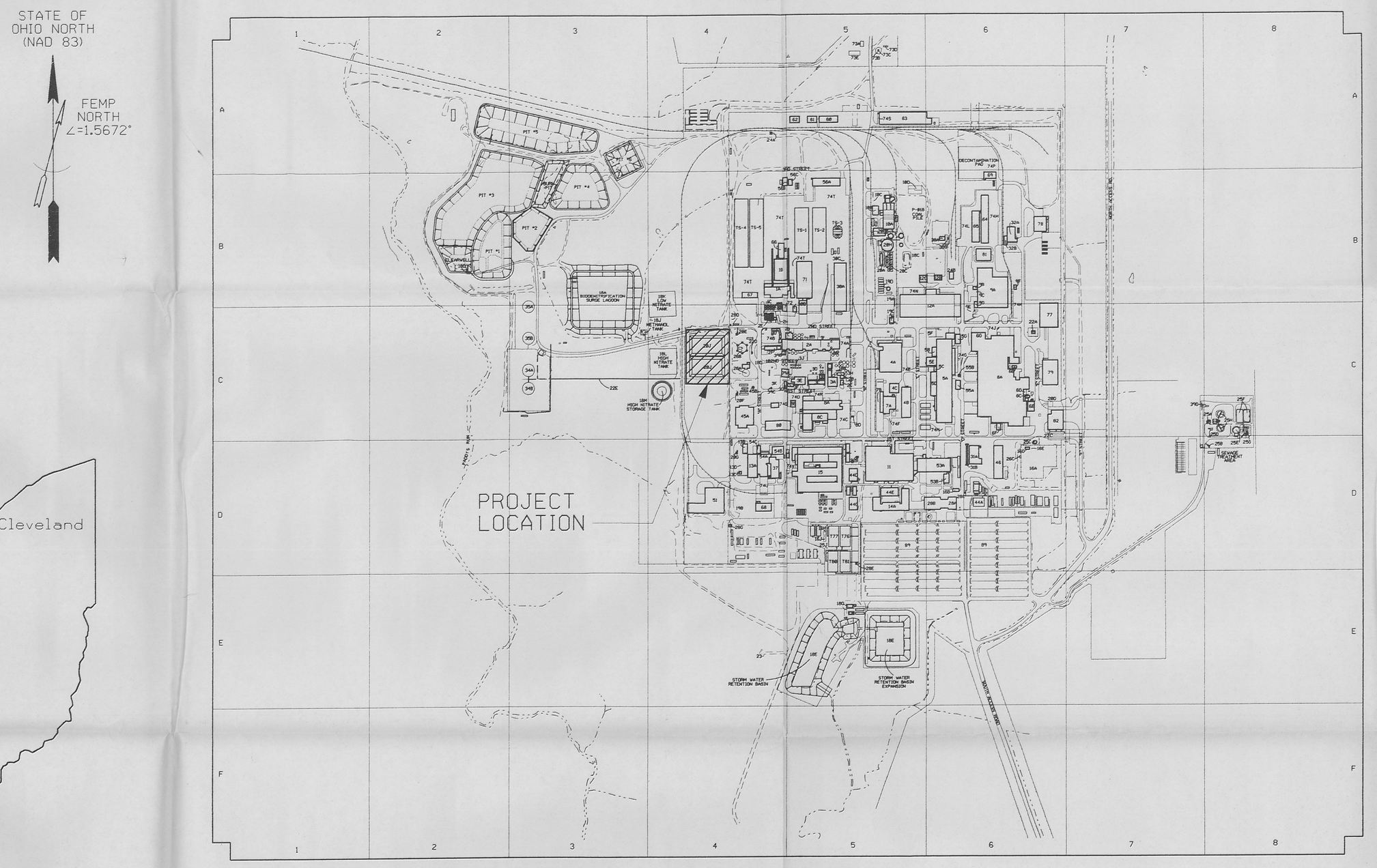
PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/P0165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-X-00317	X0002	B

UNITED STATES DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

WASTE UNITS REMEDIATION

OPERABLE UNIT 2 - LIME SLUDGE PONDS



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ARCHITECTS - ENGINEERS
CINCINNATI, OHIO

NOTES

287

REF DWG NO.	DRAWING TITLE
92X-5900-X-00317	DRAWING INDEX
92X-5900-X-00318	LEGEND AND SYMBOLS

PRELIMINARY
NOT FOR CONSTRUCTION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
B	ISSUED FOR 30% EPA DESIGN REVIEW		N/A	
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INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

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CINCINNATI, OHIO

PROJECT NAME
WASTE UNITS REMEDIATION

DRAWING TITLE
PROJECT TITLE SHEET
LIME SLUDGE PONDS

EDC

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	03/11/96			F.PARTON	3-21-96
PLANT/BLDG. NO.		FLOOR		SCALE: NONE	CLASS
SUBMITTED FOR APPROVAL		FERMCO CRU APPROVAL: N/A		FERMCO PROJECT NO.: 20500	
A-E	DATE		DATE		

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
OU2/PO165		WBS 1.1.1.1.2.3.6 00-90701	92X-5900-X-00316	X0001	B

425