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GEOTECHNICAL DATA AND EVALUATION REPORT FOR EAST AND SOUTH FIELD BORROW AREAS - OPERABLE UNIT 2, PROJECT ORDER 154, JUNE 1996 - REVISION 0

07/19/96

DOE-1146-96
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REPORT

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Department of Energy

Ohio Field Office
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JUL 19 1996

DOE-1146-96

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Ohio Environmental Protection Agency
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Dayton, Ohio 45402-2911

Dear Mr. Saric and Mr. Schneider:

TRANSMITTAL OF GEOTECHNICAL REPORTS (ON-SITE BORROW AREAS AND OFF-SITE MATERIAL SOURCES)

Enclosed to this letter are two reports: "Off-Site Borrow Materials Geotechnical Evaluation Report" and "Geotechnical Data and Evaluation Report for East and South Field Borrow Areas." These reports have been prepared to evaluate engineering and geotechnical data on materials used to construct the On-Site Disposal Facility (OSDF) and are intended for your reference and use.

If you have any questions, please contact Rod Warner at (513) 648-3156.

Sincerely,

Johnny Reising

Johnny W. Reising
Fernald Remedial Action
Project Manager

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Enclosures: As Stated

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EDC

Geotechnical Data and Evaluation Report for East and South Field Borrow Areas

Operable Unit 2
Project Order 154

June 1996
Revision 0

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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Geotechnical Data and Evaluation Report for East and South Field Borrow Areas

Operable Unit 2
Project Order 154

June 1996
Revision 0

Environmental Remedial Action Project
Fernald Environmental Management Project
Fernald, Ohio
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Geotechnical Data and Evaluation Report for East and South Field Borrow Areas

CONTENTS

SECTION

1.0 Introduction 1-1
- 1.1 Scope and Objectives 1-1
- 1.2 Organization of Report 1-4

2.0 Background 2-1
- 2.1 Volume and Locations of Soil Borrow Material 2-1
- 2.2 East Field Borrow Area Intermediate Design Excavation 2-2
- 2.3 Prior Geotechnical Investigations 2-2
- 2.4 Subsurface Conditions 2-8

3.0 Field and Geotechnical Testing Program 3-1
- 3.1 Soil Test Borings 3-1
- 3.2 Shallow Borings 3-2
- 3.3 Geotechnical Laboratory Testing 3-4

4.0 Laboratory Test Results 4-1
- 4.1 Index/Classification Tests 4-1
- 4.2 Compaction Tests 4-15
- 4.3 Consolidation Tests 4-24
- 4.4 Strength Tests 4-24
- 4.5 Laboratory Permeability Tests 4-30

5.0 Evaluation, Analyses, and Recommendations 5-1
- 5.1 Borrow Materials Evaluation 5-1
- 5.2 Slope Stability Analyses 5-26
- 5.3 Geotechnical Monitoring and Testing 5-32
- 5.4 Site Restoration 5-32

6.0 References 6-1

000005

CONTENTS (Continued)

APPENDICES

A Boring Coordinates and Elevations

B Geotechnical Test Boring Field Logs and Geotechnical Logging Reports

C Shallow Boring Field Logs and Geotechnical Logging Reports

D Modal Diameter Tests

E Compaction Curves

F Mohr Circles

G Leachate Permeant Test Results

H Compaction and Remolded Permeability Data from Prior Investigation of Disposal Facility Footprint Area

000006

LIST OF ILLUSTRATIONS

FIGURES

1-1 Location of On-Site Disposal Facility, Borrow Areas, and OU-2 Subunits
1-2 Location and Topographic Map of East and South Field Borrow Areas

2-1 Intermediate Design Post-Excavation Topography for Proposed East Field Borrow Area
2-2 Geologic Cross Sections at East Field Borrow Area
2-3 Location Map for Geotechnical Test Boring and Cone Penetrometer Soundings at East and South Field Borrow Areas
2-4 Geologic Cross Sections at South Field Borrow Area

4-1 Plasticity Chart, East Field Borrow Area, Brown and Gray Fine-grained Till Samples
4-2 Plasticity Chart, East Field Borrow Area, Brown Fine-grained Till Samples
4-3 Plasticity Chart, East Field Borrow Area, Gray Fine-grained Till Samples
4-4 Plasticity Chart, East Field Borrow Area, Brown Fine-grained Till Samples, Depth 0 - 5 feet
4-5 Plasticity Chart, East Field Borrow Area, Brown Fine-grained Till Samples, Depth 5 - 10 feet
4-6 Plasticity Chart, East Field Borrow Area, Brown Fine-grained Till Samples, Depth 10 - 15 feet
4-7 Plasticity Chart, South Field Borrow Area, Fine-grained Samples
4-8 Plasticity Chart, South Field Borrow Area, Fine-grained Samples, Depth 0 - 5 feet
4-9 Plasticity Chart, South Field Borrow Area, Fine-grained Samples, Depth 5 - 12 feet
4-10 Compaction Curves, Brown Till, East Field Borrow Area
4-11 Compaction Curves, Gray Till, East Field Borrow Area
4-12 Compaction Curves, South Field Borrow Area
4-13 Summary of EFBA Brown Till Five-Point Remolded Permeability Test - Sample No. 409815
4-14 Summary of EFBA Brown Till Five-Point Remolded Permeability Test - Sample No. 409819
4-15 Summary of EFBA Brown Till Five-Point Remolded Permeability Test - Sample No. 409824
4-16 Summary of EFBA Brown Till Five-Point Remolded Permeability Test - Sample No. 409839
4-17 Summary of EFBA Brown Till Five-Point Remolded Permeability Test - Sample No. 409844
4-18 Summary of EFBA Brown Till Five-Point Remolded Permeability Test - Sample No. 409858
4-19 Summary of EFBA Brown Till Five-Point Remolded Permeability Test - Sample No. 409865
4-20 Summary of EFBA Brown Till Five-Point Remolded Permeability Test - Sample No. 409873
4-21 Summary of EFBA Brown Till Five-Point Remolded Permeability Test Results
4-22 Summary of SFBA Remolded Permeability Test Results

LIST OF ILLUSTRATIONS (Continued)

FIGURES (Continued)

5-1 Acceptable Permeability Zone Concept
5-2 Compaction Curves, Brown Till, 0 - 5 Feet, East Field Borrow Area and Disposal Facility Footprint
5-3 Compaction Curves, Brown Till, 5 - 10 Feet, East Field Borrow Area and Disposal Facility Footprint
5-4 Compaction Curves, Gray Till, East Field Borrow Area and Disposal Facility Footprint
5-5 Laboratory Hydraulic Conductivity vs. Relative Compaction for Various Molding Water Contents
5-6 Approximate Estimate of APZ; Brown Till Upper Horizon (0 - 5 feet bgs)
5-7 Approximate Estimate of APZ; Brown Till Lower Horizon (5 - 10 feet bgs)
5-8 In Situ Moisture Content and Optimum Moisture Content Versus Depth for the EFBA Soil Samples
5-9 In Situ Moisture Content and Optimum Moisture Content Versus Depth for the SFBA Soil Samples
5-10 Map Showing Section Lines and Test Borings Used for Slope Stability Analyses
5-11 Cross-Section X-X' with Slope Stability Geometry
5-12 Cross-Section Y-Y' with Slope Stability Geometry

TABLES

2-1 Summary of Geotechnical Testing for Prior Investigations of the East Field Borrow Area

3-1 Summary of Geotechnical Laboratory Program
3-2 Undisturbed Sample Test Conditions, Strength Tests
3-3 Remolded Specimen Test Conditions, Consolidation and Strength Tests
3-4 Remolded Specimen Test Conditions, Permeability Tests
3-5 Standard Proctor Maximum Dry Density and OMC Criteria for Remolded Tests of Material from Tube Samples

4-1 Geotechnical Laboratory Test Data Source Code Cross-Reference
4-2 Summary of Index Properties, Disturbed and Undisturbed Samples
4-3 Summary of Unit Weight and Percent Saturation, Undisturbed Samples
4-4 Summary of Organic Content Tests
4-5 Summary of Chloride and Sulfate Concentrations
4-6 Summary of Index Properties and Standard Compaction Tests of Bulk Samples
4-7 Summary of Index Properties and Modified Compaction Tests of Bulk Samples

000008

LIST OF ILLUSTRATIONS (Continued)

TABLES (Continued)

4-8 Summary of Consolidation Tests, Undisturbed Samples

4-9 Summary of Consolidation Tests, Remolded Specimens

4-10 Summary of Mohr Circle Constructions from Consolidated, Undrained Triaxial Compression Tests, Undisturbed Samples

4-11 Summary of Mohr Circle Constructions from Unconsolidated, Undrained Triaxial Compression Tests, Undisturbed Samples

4-12 Summary of Mohr Circle Constructions from Consolidated, Undrained Triaxial Compression Tests, Remolded Specimens

4-13 Summary of Mohr Circle Constructions from Unconsolidated, Undrained Triaxial Compression Tests, Remolded Specimens

4-14 Summary of Prior Laboratory Permeability Results, Undisturbed Samples, East Field Borrow Area

4-15 Summary of Prior Laboratory Permeability Results for Test Specimens Compacted Using Standard Proctor Compactive Effort, East Field Borrow Area

4-16 Summary of Prior Laboratory Permeability Results for Test Specimens Compacted Using Modified Proctor Compactive Effort, East Field Borrow Area

4-17 Summary of PO-154 Remolded Laboratory Permeability Tests, East Field Borrow Area

4-18 Summary of Leachate Characteristics used for Laboratory Permeability Tests, Remolded Specimens, and Comparison with K_d Study Data

4-19 Summary of PO-154 Remolded Laboratory Permeability Tests, South Field Borrow Area

5-1 Applicable or Relevant and Appropriate Requirements for Compacted Clay Liner and Cap Materials, FEMP On-Site Disposal Facility

5-2 Average and Standard Deviation of Geotechnical Properties for the EFBA by Depth with ARARs

5-3 Average and Standard Deviation of Geotechnical Properties for the SFBA by Depth with ARARs

5-4 Soil Property Values Used in Analyses of EFBA Temporary Slopes

5-5 Results of Slope Stability Analyses

LIST OF ACRONYMS AND ABBREVIATIONS

APZ	Acceptable Permeability Zone
ARAR	Applicable or Relevant and Appropriate Requirements
ATT	Advanced Terra Testing, Inc.
bgs	below ground surface
cm	centimeters
CU	Consolidated, Undrained
EFBA	East Field Borrow Area
FEMP	Fernald Environmental Management Project
FERMCO	Fernald Environmental Restoration Management Corporation
FOS	Factor of Safety
GMA	Great Miami Aquifer
GSTP	Geotechnical Sampling and Testing Plan
LSP	Lime Sludge Ponds
MDD	Maximum Dry Density
mm	millimeters
OMC	Optimum Moisture Content
OSDF	On-Site Disposal Facility
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PO	Project Order
psi	pounds per square inch
ROD	Record of Decision
sec	second
SFBA	South Field Borrow Area
SWL	Solid Waste Landfill
US EPA	United States Environmental Protection Agency
USCS	Unified Soils Classification System
UU	Unconsolidated, Undrained

000010

SECTION 1

INTRODUCTION

This report summarizes the results of geotechnical testing and analysis performed on samples from proposed on-site soil borrow areas at the Fernald Environmental Management Project (FEMP), Fernald, Ohio. The borrow material will be used for construction of an on-site waste disposal facility (an aboveground waste containment structure with a soil/geosynthetic liner and cover). Figure 1-1 shows the locations of the proposed On-Site Disposal Facility (OSDF), East Field Borrow Area (EFBA), South Field Borrow Area (SFBA), and Operable Unit 2 (OU-2) subunits (waste units). Figure 1-2 shows the topography of the proposed borrow areas. The geotechnical investigation was performed to characterize and define the geotechnical properties of clay material available from on-site borrow areas for use as part of the liner and cover materials and for potential use as construction fill for berms, waste unit backfill, etc.; and to evaluate material performance relative to preliminary recommendations for excavation, grading, and site restoration. The report summarizes the data from geotechnical field and laboratory tests, and provides recommendations based on analyses 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 investigation at the EFBA and SFBA. 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 specific geotechnical recommendations

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

1) Borrow materials
2) Slope stability

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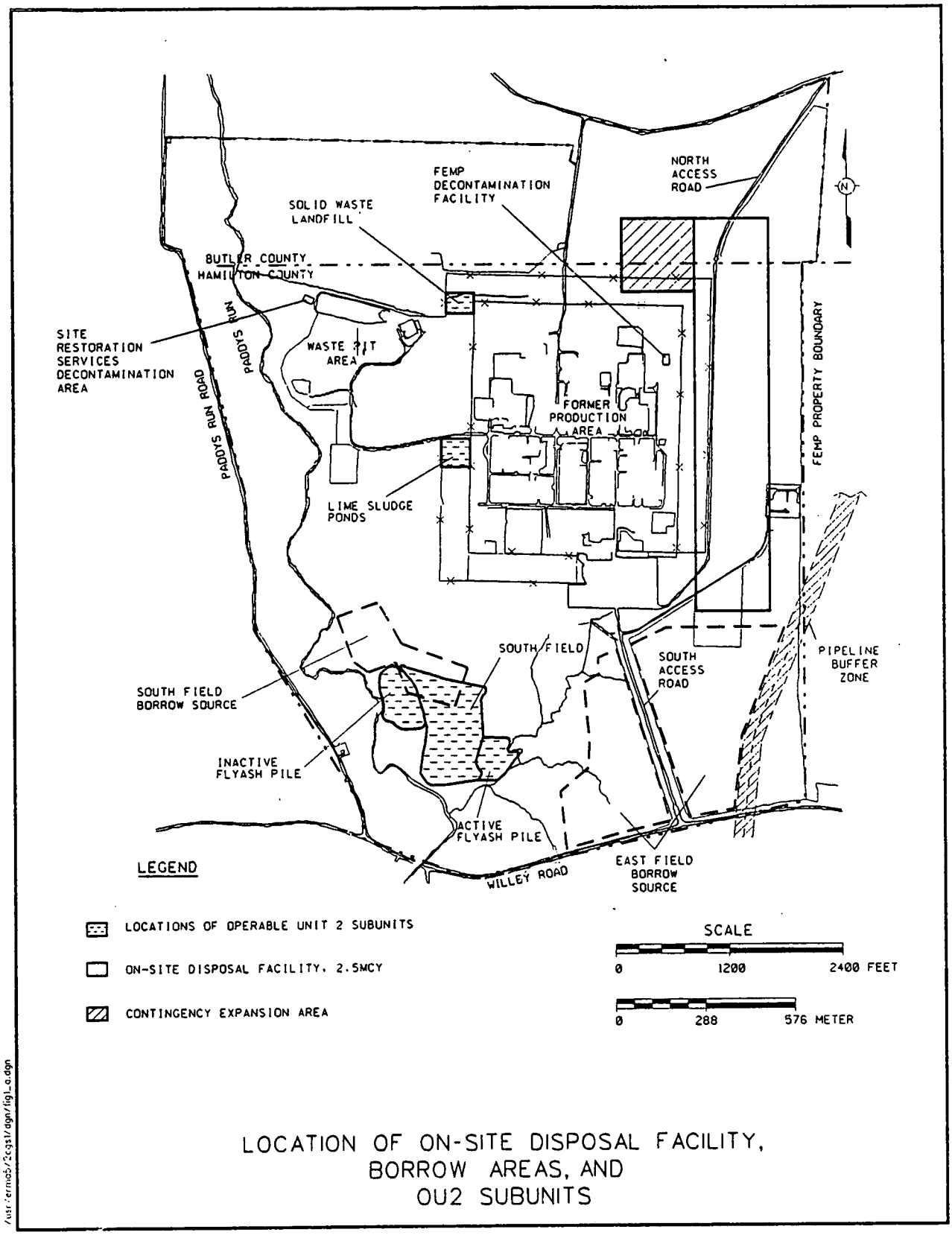

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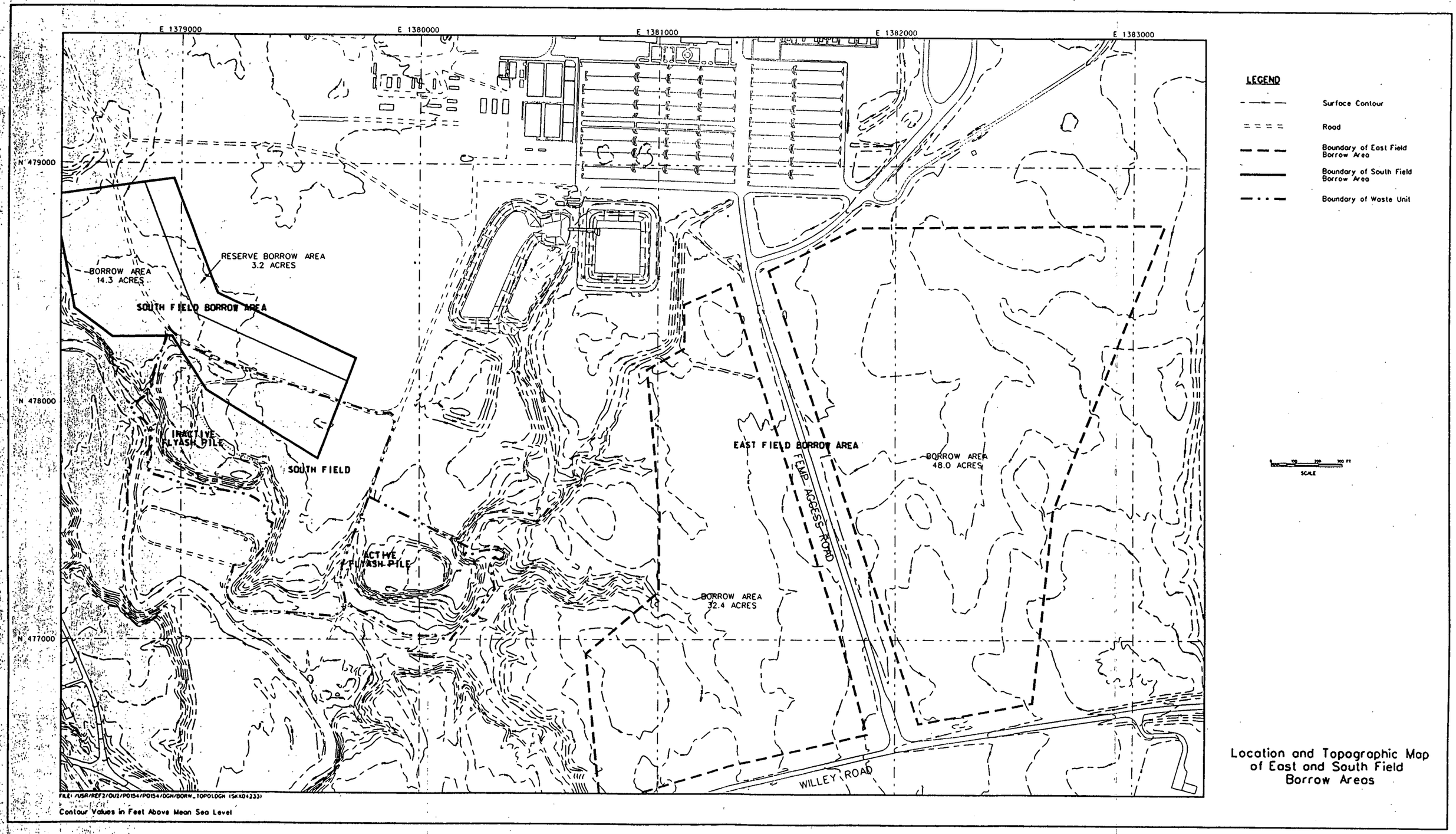
Figure 1-1 - Location of On-Site Disposal Facility, Borrow Areas, and OU-2 Subunits



Location and Topographic Map of East and South Field Borrow Areas

Figure 1-2 - Location and Topographic Map of East and South Field Borrow Areas

3) Geotechnical monitoring and testing
4) Site restoration

1.2 Organization of Report

This report is divided into five sections. Section 1 provides an introduction and outlines the scope and objectives of the report. Section 2 provides background information regarding the proposed locations and estimated volume of on-site soil borrow material, the proposed EFBA intermediate design excavation case, prior geotechnical investigations at the EFBA, and the general subsurface conditions at the proposed borrow area sites. Section 3 summarizes the geotechnical field and laboratory test program implemented under PO-154. 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 based on the data summarized in Section 4, and contains specific geotechnical recommendations.

SECTION 2

BACKGROUND

This section provides background information regarding the volume of borrow soils required for construction of the OSDF and considerations regarding the selection of EFBA and SFBA sites for geotechnical investigation. The proposed excavation case for the EFBA site is presented to provide a basis for the geotechnical evaluation and slope stability analyses presented in Section 5. Additionally, a summary of prior geotechnical investigations and subsurface conditions at the EFBA is provided.

2.1 Volume and Locations of Soil Borrow Material

In support of the design and construction of the OSDF, geotechnical and engineering data on soils from the potential on-site borrow sources are required.

Based on intermediate design estimates, approximately 904,000 cubic yards of clay, soil, and select backfill will be needed for construction of the OSDF. Of this volume, approximately 294,300 cubic yards of clay within the footprint of the disposal facility will be excavated for liner construction; however, an additional estimated 606,600 cubic yards of soil is needed for construction of other components of the facility. In addition, approximately 60,000 cubic yards of soil will be needed for use as backfill at the Solid Waste Landfill (SWL), and Lime Sludge Ponds (LSP) after materials therein have been removed for disposal.

The EFBA has been identified by FERMCO as the primary on-site location for the clay borrow area. Selection of the EFBA as the primary potential borrow area considered the proximity to the OSDF, availability of large volumes of non-contaminated clays, availability of existing geotechnical data, ability to convert existing roads to haul roads, and drainage (FERMCO 1995).

The SFBA has been identified by FERMCO as a secondary, or contingent, clay borrow area. The SFBA is estimated to potentially provide 220,000 cubic yards of usable soils (including a 50,000 cubic yard reserve volume) located adjacent to and underneath the Inactive Flyash Pile and South Field Waste Units. Clay material from this area would be used for construction of the OSDF cap and/or berms in the event that additional waste is designated for on-site disposal resulting in the need for construction of contingency cells described in current plans. Selection of the SFBA as a potential borrow area considered its proximity to the LSP, SWL, and OU-1 Waste Pits; availability of large volumes of non-contaminated clay; some geotechnical data in the vicinity; that the east terrace face adjacent to Paddys Run would be excavated leaving a similar landscape; and that the bottom of the excavation would be above the 100- and 500-year flood plains (FERMCO 1995).

2.2 East Field Borrow Area Intermediate Design Excavation

Figure 2-1 shows the proposed excavation contours at the EFBA from the intermediate design currently in progress. Figure 2-2 illustrates cross sections for this excavation. The estimated quantity of soil that can be obtained from this excavation is roughly 618,000 cubic yards.

2.3 Prior Geotechnical Investigations

Prior geotechnical investigations at the EFBA were conducted in 1991 and 1992 (DOE 1993) as part of the Fernald Remedial Investigation/Feasibility Study, in 1993 and 1994 for a pre-design geotechnical investigation for a proposed OU-2 only disposal cell (PARSONS 1994a and 1994b), and in 1994 and 1995 as part of pre-design and design investigations for the sitewide OSDF (DOE 1995 and PARSONS 1995b). Table 2-1 summarizes the boring and cone penetrometer locations, testing performed, and reference documents for these prior geotechnical investigations of the EFBA. Figure 2-3 shows the locations of test borings and cone penetrometer tests from the prior investigations, as well as the geotechnical test borings and shallow borings completed during the PO-154 investigation.

Geotechnical data from these prior investigations along with the data collected during the PO-154 investigation provide the geotechnical basis for the evaluation and analyses presented in Section 5. Specific laboratory test data from these prior investigations are included with the PO-154 data in the laboratory test data summary tables found in Section 4. Geotechnical laboratory test data from the PO-154 testing provided the data for evaluation of the SFBA site.

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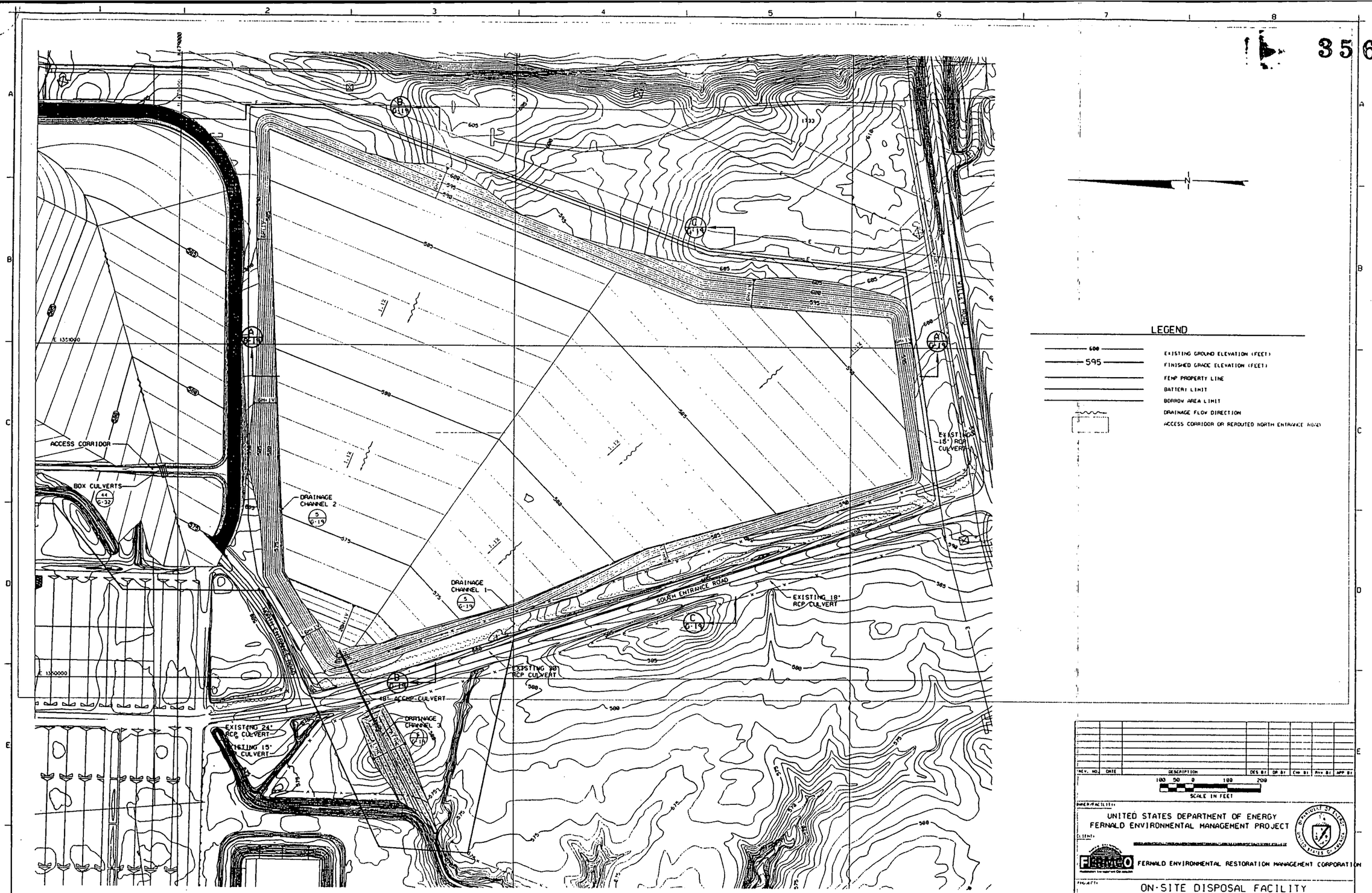

Figure 2-1 - Intermediate Design Post-Excavation Topography for Proposed East Field Borrow Area

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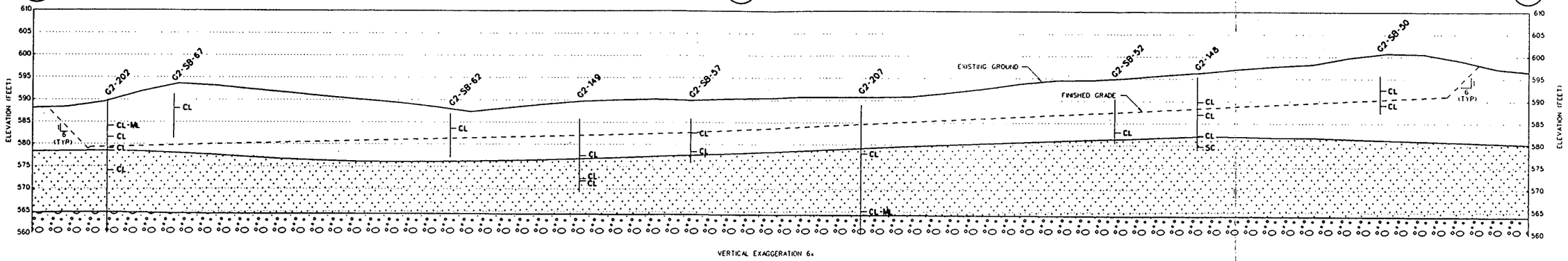
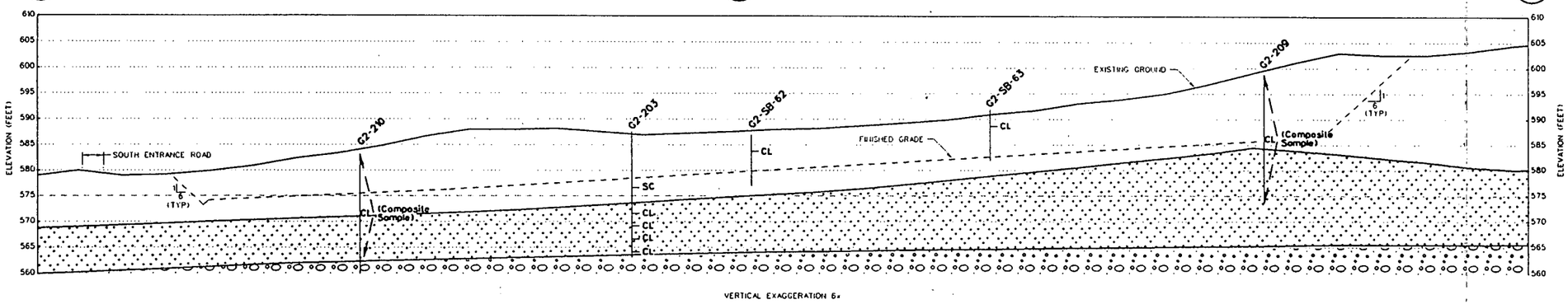
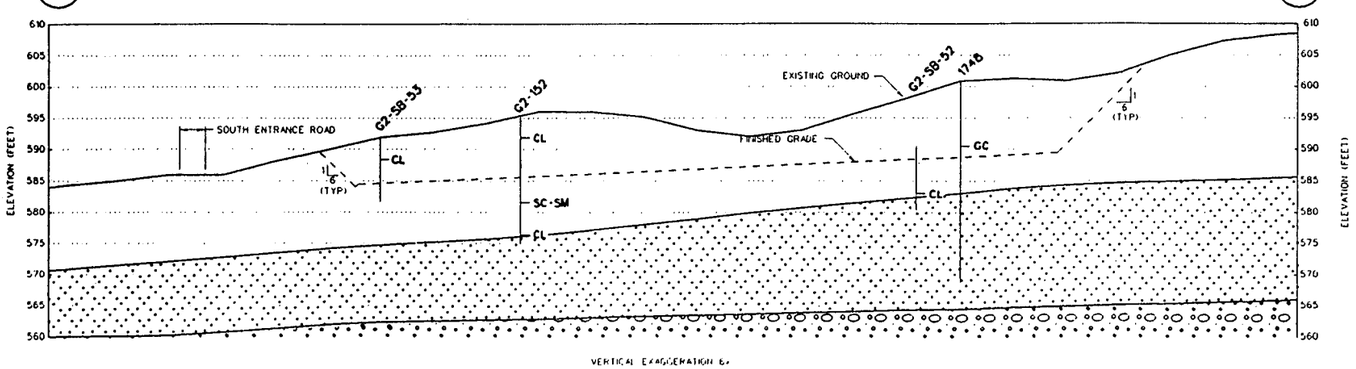
Section A Looking East



Section B Looking North



Section C Looking North



Explanation:

Brown Till - predominantly silt/clay (CL) mixtures with localized pockets of CH and ML, some clayey and silty sand and scattered gravel. Typically stiff to very stiff and moist. Some local sand lenses.

Gray Till - predominantly sandy clay (CL) with pockets of sand (SW), clayey sand (SC) and scattered gravel. Typically very stiff to locally hard and moist. Scattered sand lenses.

Great Miami Aquifer
Sand/gravel mixtures, very dense to hard.

G2-SB-62
CL
SC
Geotechnical boring showing number identifier, depth drilled and USCS soil classification from laboratory testing.

Finished grade after excavation

SCALE

Notes:
1) Graphic depiction of geologic interpretation provided by FERMCO. Patterns have been added to assist in distinguishing among units.
2) Location of sections shown on Figure 2-1.
3) Borings are projected into section planes. Geologic contacts may not be coincident with those in the boring logs.

Figure 2-2 - Geologic Cross Sections at East Field Borrow Area

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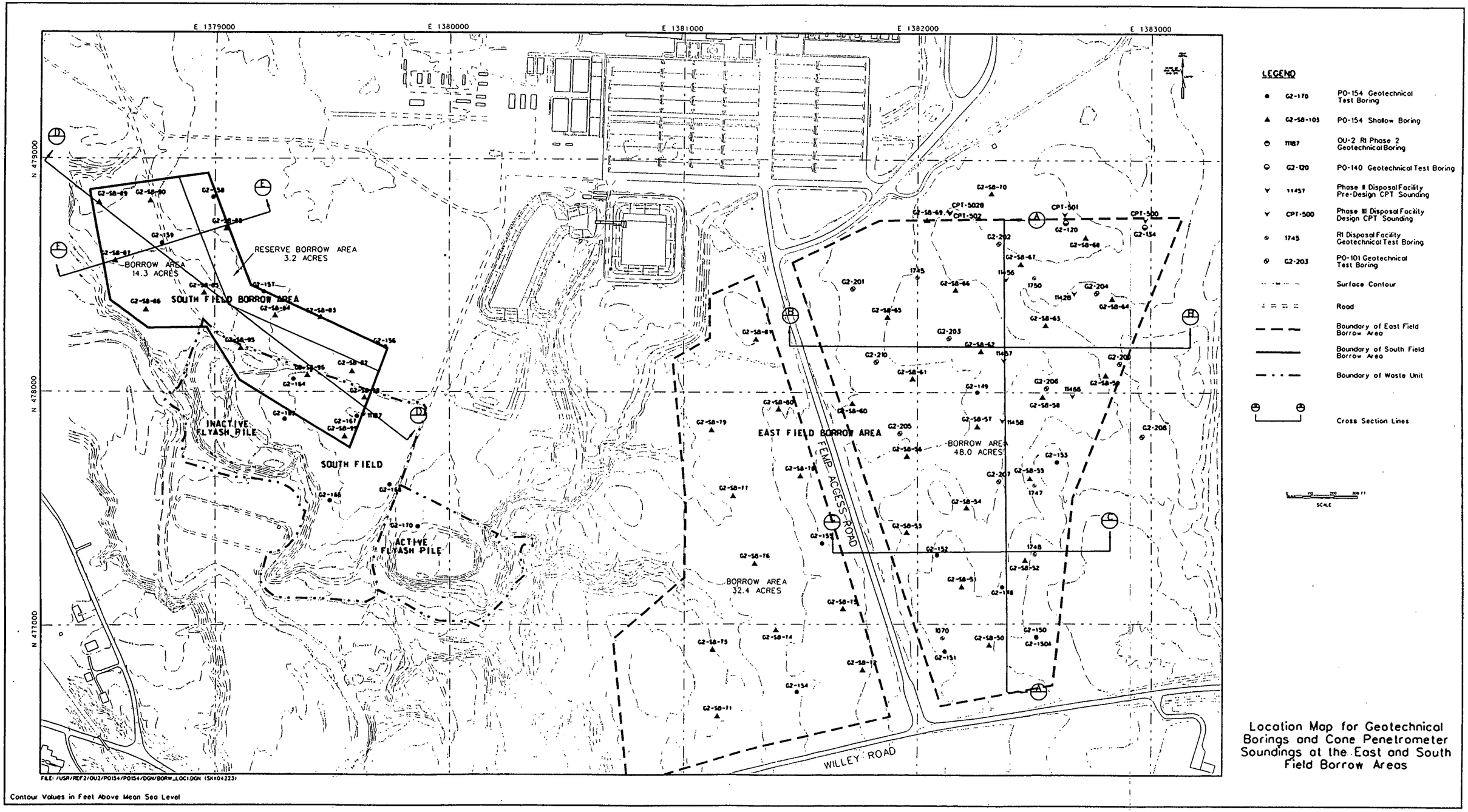


Figure 2-3 - Location Map for Geotechnical Test Boring and Cone Penetration Soundings at East and South Field Borrow Areas

000019

Table 2-1 - Summary of Geotechnical Testing for Prior Investigations of the East Field Borrow Area (Continued)

Boring or CPT Test Location	Summary of Testing	Reference
Geotechnical Test Borings G2-120 and G2-134	Standard penetration tests Moisture content Specific Gravity Unit Weight Atterberg Limits Grain-size Consolidation (remolded) Strength (UU) (undist) Strength (UU) (remolded)	(PARSONS 1995b)
CPT Test Locations 11428, 11456, 11458, 11466, 11468,	Cone Penetrometer Tests	(DOE 1995)
CPT Test Locations G2-CPT-500 (11664), G2-CPT-501 (11663), G2-CPT-502 (11662)	Cone Penetrometer Tests	(PARSONS 1995b)

Notes:

See Section 6 for reference list
CU - Consolidated Undrained Triaxial Compression Test
UU - Unconsolidated Undrained Triaxial Compression Test
undist - undisturbed sample
remolded - remolded specimens

000021

356

2.4 Subsurface Conditions

Subsurface materials throughout the FEMP site generally can be placed into five major categories:

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

Although all of these materials are relatively common throughout the FEMP site, it is typical to find some combination of these materials 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. For purposes of this evaluation, the following general descriptions broadly address each of the five 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 EFBA and the SFBA.

2.4.1 Generalized Material Type Descriptions

1) 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 are typically clayey, moist, and have a wide range of consistencies and thickness.

2) 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 from 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.

3) 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.

4) 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.

5) 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.

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 silts 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 Great Miami Aquifer (GMA).

In the general area of the SFBA, and adjacent to the west side of the south access road, there is noticeably more stratified material than typically observed elsewhere in the proposed borrow areas (e.g.,

the East Field). The alternating silts and clays with laminae of fine sand, and the generally mottled coloring of the mixed brown and gray clays of the till deposits has resulted in gradational contacts between strata within the till deposits and between those of the till and GMA.

Directly below the till are sands and gravels of the GMA. Borings G2-163, G2-166, G2-168, G2-170, and G2-171 (drilled as part of another study, see Figure 2-3) 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.

2.4.3 East Field

The EFBA is a pasture with gently rolling topography and is approximately divided in two by the northwest-southeast trending South Access Road. For the PO-154 investigation boring numbers G2-148 through G2-155 were drilled in the East Field to depths ranging from 13.8 feet to 29.0 feet. Boring numbers G2-SB-50 through G2-SB-81 are generally referred to as "shallow borings" and were typically 10.0 feet or less in depth. Materials encountered consisted entirely of till and associated glacio-fluvial deposits. Figure 2-2 shows geologic cross-sections at EFBA. The geologic interpretation is from a three-dimensional (3-D) model provided by FERMCO. The USCS symbols shown are from laboratory test data. Brown till is present below topsoil to the depths shown in Figure 2-2. Below the Brown Till, the Gray Till overlies the sands and gravels at the GMA.

Within the predominantly fine-grained till materials are deposits having a wide range of grain sizes. Based on the drilling program cobbles, although present, are rare whereas mixtures of sand and gravel with various percentages of silt and clay are common but not readily predictable because of their apparent lack of clearly defined continuity.

Where visual classifications in the field identify a fine-grained component to coarse-grained deposits, the coarse-grained deposits tend to be classified as moist. Coarse-grained materials lacking a visually identified fine-grained component are classified typically as wet, and likely to be affected by highly variable, seasonally fluctuating, perched water conditions.

2.4.4 South Field

The SFBA is predominantly planted pine woods with the southeast corner having been cleared and used as an area for localized disposal of construction rubble and ash. For the PO-154 investigation boring numbers G2-156 through G2-159 and boring numbers G2-SB-82 through G2-SB-90 were drilled in the SFBA. Borings G2-156 through G2-159 were drilled to a depth of 20 feet. The shallow borings ranged from 7.2 feet to 10.2 feet deep. Borings G2-164 and G2-167 as well as G2-SB-95, 96, 98, and 99 were also drilled in the SFBA and are reported in the *South Field and Fly Ash Piles Geotechnical Report* (PARSONS 1996). Boundaries of the SFBA and the South Field Waste Units area overlap somewhat.

Figure 2-4 shows geologic cross-sections at the SFBA. The GMA elevation came from a 3-D model provided by FERMCO. Interpretation of subsurface conditions of the glacial overburden above the GMA are from PO-154 boring logs. The USCS symbols shown are from laboratory test data.

Borings G2-156 through G2-158 are along the northeast side of the designated SFBA; G2-159 is in the north central portion of the SFBA (See Figure 2-3).

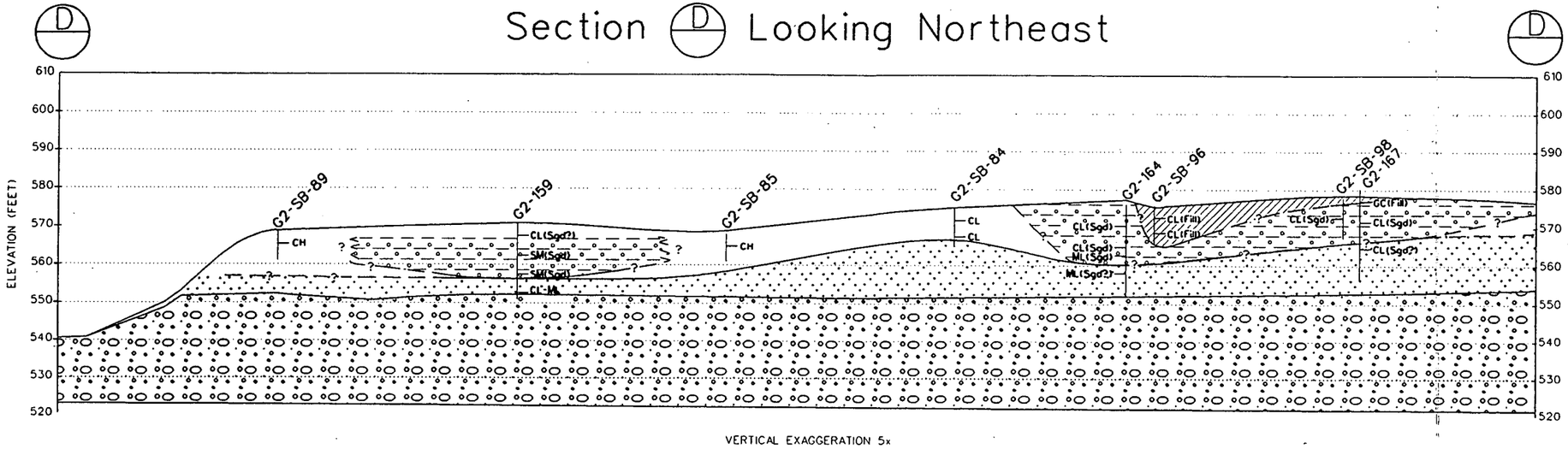
Boring G2-156 encountered Brown Till as Lean Clay, typically stiff to very stiff, and moist to a depth of about 9 feet where the material graded into a gray and gray green till, also moist and very stiff. Below about 15 feet the materials became more sandy as a Sandy Lean Clay with Gravel. Boring G2-157 intercepted Brown Till in the form of Lean Clay to a depth of about 6 feet where the clay color became mottled and began to transition to the underlying greenish gray Clay-Gray Till. At this location an increasing amount of silt was clearly present below about 10 feet. Boring G2-158 in the northeast corner of the SFBA, although displaying near-surface Fat Clay to a depth of about 4 feet, showed the highly plastic material was underlain by Lean Clay and Silty Sand. Near the north central portion of the SFBA in Boring G2-159 the materials consisted mainly of Silt and Silt/Sand mixtures above the Gray Till with Silty Clay and Clayey Silt becoming predominant below about 18 feet.

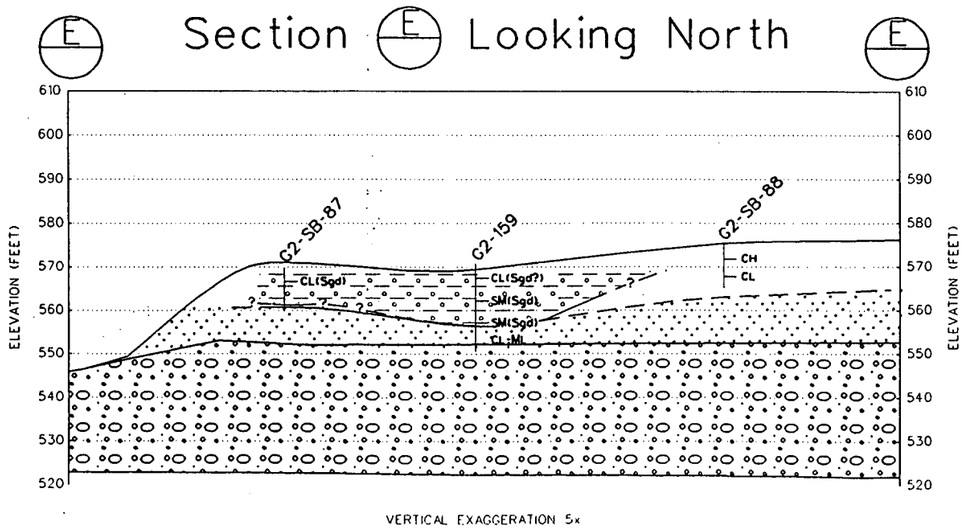
Shallow borings G2-SB-82, 83, and 84 along the north side of the southeast portion of the area, display predominantly Lean Clay with interbeds of Silt up to about 1 foot in thickness. Of the three borings, only G2-SB-84 intercepted the Gray Till which was present in that boring at about 8 feet. The other two borings ended in Brown Till at a depth of 10 feet.

Near the center and west central portion of the SFBA, in borings G2-SB-85 and 86, Fat Clays were found to a depth of about 5 feet. At that depth the material graded into Lean Clay with Sand interbeds up to about 2 feet thick in G2-SB-86. Of these two borings, only G2-SB-86 encountered the Gray Till, and that was at a depth of about 9 feet.

In the northern portion of the SFBA Borings G2-SB-88 and 89 display similar profiles; Fat Clay from about 1.5 feet to 5 feet underlain by Lean Clay-all in the Brown Till. Borings G2-SB-87 and 90 are also similar to one another but unlike G2-SB-88 and 89 in that the former displayed a profile of alternating layers of Silt and Sand with interbeds of Lean Clay.

Of all of the borings drilled, Borings G2-SB-87 and G2-SB-90 are the most representative of the Stratified Glacial Deposits. Although interbedded features are present to varying degrees in the East Field and South Field areas, nowhere else but in these two borings is the thinly laminated nature of the Sands, Silts, and Clays so well demonstrated and preserved. G2-SB-90 clearly demonstrates thinly laminated structures that have been deformed from their originally horizontal depositional orientation.





Explanation:

Fill - predominantly a mixture of other material types found across the FEMP site.

Brown Till - predominantly silt/clay (CL) mixtures with localized pockets of CH and ML, some clayey and silty sand and scattered gravel. Typically stiff to very stiff and moist. Some local sand lenses.

Stratified Glacial Deposits - predominantly a mottled mixture of brown and gray till deposits, including zones of well sorted materials. Deposits typically higher in silt and sand content and lower in gravel content than other glacial deposits at the site.

Gray Till - predominantly sandy clay (CL) with pockets of sand (SW), clayey sand (SC) and scattered gravel. Typically very stiff to locally hard and moist. Scattered sand lenses.

Great Miami Aquifer
Sand/gravel mixtures, very dense to hard.

G2-SB-62
CL
SC

Geotechnical boring showing number identifier, depth drilled and USCS soil classification from laboratory testing.

0 100 200FT
SCALE

Notes:
1) Graphic depiction of geologic interpretation by PARSONS Patterns have been added to assist in distinguishing among units.
2) Location of sections shown on Figure 2-1.
3) Borings are projected into section planes. Geologic contacts may not be coincident with those in the boring logs.

Figure 2-4 - Geologic Cross Sections at South Field Borrow Area

FILE: /USR/REF2/OU2/PO154/PO154/DGN/SFBA_SEC1.DGN (SKX04373)

sfba_sec1.m po154erma@ws415. Tue Jun 11 08:34:09 CDT 1996

SECTION 3

FIELD AND GEOTECHNICAL 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 1995), as revised by Field Change Notice/Variance documents. Fifteen geotechnical test borings and 41 shallow borings were advanced at the EFBA and SFBA during September 1995. Geotechnical laboratory testing was performed by Advanced Terra Testing, Inc. (ATT), Lakewood, Colorado; Accu-Labs Research Inc., Golden, Colorado (chloride and sulfate tests); and FERMCO (modal diameter tests) during September 1995 through January 1996. The laboratory data sheets from this testing are compiled in a geotechnical laboratory data report entitled *East and South Field Borrow Areas Geotechnical Investigation Geotechnical Laboratory Data Report* (SAIC 1996a), with the exception of geotechnical test data from borings G2-164, G2-167, G2-SB-95, G2-SB-96, G2-SB-98, and G2-SB-99 which are found in *Fly Ash Piles and South Field Waste Units Geotechnical Investigation Geotechnical Laboratory Data Report* (SAIC 1996b). Geotechnical field and laboratory activities were conducted following the guidelines of the *Sitewide CERCLA Quality Assurance Project Plan* (DOE 1994). 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

Fifteen geotechnical test borings (G2-148 through G2-159, G2-164, G2-167) were advanced by FERMCO's drilling subcontractor, Alliance Environmental, Inc., at the locations shown on Figure 2-3. 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, hollow-stem augers to depths ranging from 13.8 to 25 feet. For SFBA boring G2-167 an 8-1/4-inch ID, hollow-stem auger was used as temporary casing in zones of shallow subsurface contamination. This boring was 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 were 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.

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. Samples were collected following the sample plan described in the Geotechnical Sampling and Testing Plan (GSTP) (FERMCO 1995). Variations in the GSTP due to conditions encountered in the field were documented on Field Change Notice/Variance documents provided to FERMCO.

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

Forty-five shallow borings (G2-SB-50 through G2-SB-90, G2-SB-95, G2-SB-96, G2-SB-98, and G2-SB-99) were conducted at the EFBA and SFBA sites. The shallow boring depths ranged from approximately 5 to 10 feet. Figure 2-3 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 van-mounted Geoprobe core samplers and augers, a hydraulic power auger, and hand sampling equipment. 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.

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.

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]	185[2]
ASTM D 4318	Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils [AL]	145
ASTM D 422	Test Method for Particle-Size Analysis of Soils [GS]	109
ASTM D 854	Test Method for Specific Gravity of Soils [SG]	110[3]
ASTM D 2974	Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils [OC]	94
ASTM D 698	Test Method for Laboratory Compaction of Soil Using Standard Effort [SP]	32
ASTM D 5084	Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (two-stage test at 2 and 5 psi effective confining pressures, for five pre-test density/moisture conditions) [P_{r5}]	10
ASTM D 5084	Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (two-stage test at 2 and 5 psi effective confining pressures) [P_r]	13
ASTM D 5084	Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (single-stage test at 5 psi effective confining pressures using FEMP supplied leachate as permeant) [P_{rl}]	10
ASTM D 4767	Test Method for Consolidated-Undrained Triaxial Compression Test on Cohesive Soils (undisturbed samples) [CU] [4]	3
ASTM D 4767	Test Method for Consolidated-Undrained Triaxial Compression Test on Cohesive Soils (remolded specimen at 85 percent relative compaction) [CU_{r85}] [4]	1
ASTM D 2850	Test Method for Unconsolidated, Undrained Compressive Strength of Cohesive Soils (single-point tests of undisturbed samples) [UU]	5

Table 3-1 - Summary of Geotechnical Laboratory Program (Continued)

Test Method	Title	Number Performed
ASTM D 2850	Test Method for Unconsolidated, Undrained Compressive Strength of Cohesive Soils (two-point tests of remolded specimens at 90 percent relative compaction) [UU_{r90}]	6
ASTM D 2435	Test Method for One-Dimensional Consolidation Properties of Soils (remolded specimens at 85 percent relative compaction) [CON_{r85}]	1
EPA 9038	Sulfate (turbidimetric method) [CL]	25
EPA 9251	Chloride (ferricyanide method) [SU]	25
EPA/600/8-85/002 (pg. 23)	Modal Diameter Test	23

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 Consolidated, undrained (CU) triaxial compression tests (with pore pressure measurements)

3.3 Geotechnical Laboratory Testing

Geotechnical laboratory testing of soil samples was performed by ATT. The laboratory testing program was directed toward classification of the in situ and remolded soils, and determination of their 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.

Triaxial compression tests were performed on relatively undisturbed samples from Shelby tubes and Denison core barrels. Table 3-2 summarizes the test conditions for the undisturbed samples.

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Consolidation and triaxial compression strength tests were performed on test specimens remolded from materials from bulk samples. Table 3-3 summarizes the test conditions for remolded specimens. Target 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 were determined from Standard Proctor compaction tests of material from the bulk samples.

Permeability tests were performed on test specimens remolded from materials from bulk and Shelby tube samples. Table 3-4 summarizes the test conditions for the remolded specimens. Target MDDs and OMCs for remolding of the test specimens from large volume bulk samples (5-10 gallon containers) of auger cuttings were determined from Standard Proctor compaction tests of material from the bulk samples. Some of the two-stage permeability tests designated by GSTP test code "P_r" were also performed on material from Shelby tube samples. For these specific tests, the target MDD and OMC for remolding were based on standard compaction test data for FEMP soils obtained during the Disposal Facility Pre-Design Investigation (PARSONS 1995c). Table 3-5 summarizes the MDD and OMC data that the geotechnical laboratory used as target values for remolding specimens obtained from the Shelby tube samples.

Permeability tests of remolded specimens using a site-specific leachate permeant were performed by ATT personnel at the FEMP on-site laboratory. Chloride and sulfate tests were performed by Accu-Labs Research, Inc., at Golden, Colorado.

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

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Table 3-2 - Undisturbed Sample Test Conditions, Strength Tests

	Triaxial Compression, Unconsolidated, Undrained (TX-UU), In Situ (ASTM D 2850)	**Triaxial Compression, Consolidated, Undrained w/Pore Pressure (TX-CUw/pp), In situ (ASTM D 4767)**
GSTP Test Code	UU	CU
Confining Pressure	Existing overburden pressure at sample depth (used 1 psi per foot of depth) Tests performed at saturated condition	<u>If sample depth was 5 to 15 feet:</u> 1st Specimen: 5 psi 2nd Specimen: 10 psi 3rd Specimen: 20 psi <u>If sample depth was greater than 15 feet</u>: 1st Specimen: 10 psi 2nd Specimen: 20 psi 3rd Specimen: 40 psi

Notes:

UU = Unconsolidated, undrained triaxial compression, ASTM D 2850, undisturbed sample.

CU = Consolidated undrained triaxial compression with pore pressure measurements, ASTM D 4767, undisturbed sample. Three samples to be used at three different confining pressures. If three samples were not available, a staged test was performed on one sample.

Table 3-3 - Remolded Specimen Test Conditions, Consolidation and Strength Tests

	Consolidation Test, Remolded, 85 percent r.c., (ASTM D 2435)	Triaxial Compression Test, Unconsolidated, Undrained, (TX-UU), Remolded, 90 percent r.c., (ASTM D 2850)	Triaxial Compression Test, Consolidated, Undrained, (TX-CUw/pp), Remolded, 85 percent r.c., (ASTM D 4767)
GSTP Test Code	CON_{r85}	UU_{r90}	CU_{r85}
Target Remolding Requirements	Dry Density: 85 percent of the Standard Proctor Maximum Dry Density Moisture Content: at or near optimum	Dry Density: 90 percent of the Standard Proctor Maximum Dry Density Moisture Content: at or near optimum	Dry Density: 85 percent of the Standard Proctor Maximum Dry Density Moisture Content: at or near optimum
Confining Pressure		First Specimen: 10 psi Second Specimen: 20 psi Perform test at saturated condition	5 psi 10 psi 20 psi
Consolidation Test Conditions	at saturated condition		
Standard Compaction Data to Use for Remolding Specimens	Used max. dry density and OMC from Standard Compaction Test of material from same bulk sample	Used max. dry density and OMC from Standard Compaction Test of material from same bulk sample	Used max. dry density and OMC from Standard Compaction Test of material from same bulk sample

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_{r90} = Unconsolidated, undrained triaxial compression, ASTM D 2850, remolded sample with 90 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 tested at three different confining pressures. If three samples were not available, a staged test was performed on one sample.

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

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Table 3-4 - Remolded Specimen Test Conditions, Permeability Tests

	Moisture/Density	Triaxial Permeability, Two-stage, Remolded, 97 percent r.c., (ASTM D 5084)	Triaxial Permeability with FEMP Leachate, Remolded, 97 percent r.c., (ASTM D 5084)
GSTP Test Code	P_{r5}	P_r	P_{rl}
Target Remolding Requirements	Test 1: 100 % r.c. @ OMC Test 2: 97 % r.c. @ +2% wet of OMC Test 3: 99 % r.c. @ +2% wet of OMC Test 4: 95 % r.c. @ +4% wet of OMC Test 5: 97 % r.c. @ +4% wet of OMC (see Note 2)	Minimum Dry Density: 97 percent of the maximum Standard Proctor Dry Density Moisture Content: at or near 4 percent wet of optimum (see Note 2)	Minimum Dry Density: 97 percent of the maximum Standard Proctor Dry Density Moisture Content: at or near 4 percent wet of optimum (see Note 2)
Effective Confining Pressure	Stage 1: 2 psi Stage 2: 5 psi	Stage 1: 2 psi Stage 2: 5 psi	5 psi
Permeant	Water	Water	FEMP Leachate
Head Pressure	2 psi	2 psi	2 psi

Table 3-4 - Remolded Specimen Test Conditions, Permeability Tests (Continued)

	Moisture/Density	Triaxial Permeability, Two-stage, Remolded, 97 percent r.c., (ASTM D 5084)	Triaxial Permeability with FEMP Leachate, 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	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 samples) use Table 3-5 for max. dry density and OMC.	Use max. dry density and OMC from Standard Compaction Test of Material from same bulk sample

Notes:

1. Explanation of Abbreviations/GSTP Test Codes:

P_{r5} = Five, Two-stage Permeability tests, ASTM D 5084, remolded sample with compactions and moisture contents in accordance with ASTM D 698 as shown:

Test	Percent of OMC	Percent of Standard Proctor Density (MDD)
1	+0	100
2	+2	97
3	+2	99
4	+4	95
5	+4	97

P_r = Two-stage Permeability, ASTM D 5084, remolded sample with 97 percent relative compaction at moisture content wet 4 percent above optimum (in accordance with ASTM D 698) with effective confining pressures of 2 psi and 5 psi.

P_{r1} = Permeability, ASTM D 5084, remolded sample with 97 percent relative compaction at moisture content wet 4 percent above optimum (in accordance with ASTM D 698) with effective confining pressure of 5 psi. This test shall be performed with leachate provided by FERMCO.

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

OMC = Optimum Moisture Content

MDD = Maximum Dry Density

2. If the target compaction density cannot be achieved due to high saturation, the test specimen was compacted to the maximum density reasonably achievable at that water content. If the density of the specified remolded criteria of 97 percent relative compaction at 4 percent wet of optimum dropped below 95.5 percent relative compaction, then the test specimen was remolded to the maximum achievable density using a moisture content of only 3 percent wet of optimum.

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Table 3-5 - Standard Proctor Maximum Dry Density and OMC Criteria for Remolded Tests of Material from Tube Samples

Material	Approximate Sample Depth (feet)	Standard Proctor Maximum Dry Density (pcf)	Standard Proctor 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

Notes:

1. This table applies to remolded tests of material from Shelby tubes, Denison tubes or split-barrel samplers where compaction test data were 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. 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 number, MDD and OMC the affected samples are listed below.

Boring	Sample No.	Depth (feet)	MDD (pcf)	OMC (%)
G2-157	410142	10 - 12	125.0	11.3
G2-158	410150	10 - 12	123.0	12.6

SECTION 4

LABORATORY TEST RESULTS

This section summarizes the results of the geotechnical laboratory testing of samples collected at the EFBA and SFBA during the PO-154 field investigation. These data are presented in a series of tables that incorporate the sample's identification number, as well as the sample's color, Unified Soil Classification System (USCS) group symbol, and USCS group name. Additionally, for completeness, laboratory testing data from prior investigations at the EFBA are summarized in these tables. The "Data Source" for the specific geotechnical laboratory data is presented on each table. Table 4-1 provides a cross reference for data source codes listed on the summary tables.

Table 4-1 - Geotechnical Laboratory Test Data Source Code Cross-Reference

Data Source Code on Data Summary Table	Reference Document (see Section 6)
Nutting	(DOE 1993)
PO 101	(PARSONS 1994a, b)
PO 140	(PARSONS 1995b)
PO 154	Data from PO-154 Geotechnical Investigation

4.1 Index/Classification Tests

For the PO-154 investigation, 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 and other strength, consolidation, and permeability 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 4-2 presents a summary of the moisture content test results along with the liquid limit, plastic limit, plasticity index, grain size, and specific gravity of the materials tested. Also shown in the table are these properties from tests performed during prior investigations. Figures 4-1 through 4-6 present a series of plasticity charts for the fine-grained till samples tested from the EFBA. Figures 4-7 though 4-9 provide a similar presentation for the fine-grained samples tested from the SFBA.

Table 4-2 - Summary of Index Properties, Disturbed and Undisturbed Samples

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 Dimension 2" (% retained)	Gravel Dimension 3/4" (% retained)	Grain Size Gravel (%)	Grain Size Sand (%)	Grain Size Silt and Clay (%) (3)	Grain Size Clay (0.002 mm) (%)	Specific Gravity	Data Source
EFBA	G2-SB-50	409811	Bulk	1.5	5.0	Dark Yellowish Brown	Brown Till	Lean Clay with Sand	CL	13.5	34.5	14.9	19.6	0.0	0.0	4.1	17.0	78.9	26.0	2.75	PO 154
EFBA	G2-SB-50	409812	Bulk	5.0	8.4	Dark Yellowish Brown	Brown Till	Lean Clay with Sand	CL	13.2	34.8	15.5	19.3	0.0	0.0	8.5	20.8	70.7	26.1	2.69	PO 154
EFBA	G2-SB-51	411164	Bulk	1.5	5.0	Brown	Brown Till	Lean Clay with Sand	CL	16.5	43.6	16.1	27.5	0.0	0.0	1.6	18.1	80.3	30.4	2.78	PO 154
EFBA	G2-SB-51	411165	Bulk	5.0	10.0	Yellowish Brown	Brown Till	Sandy Lean Clay with Gravel	CL	12.9	23.6	13.5	10.1	0.0	9.3	15.5	30.2	54.3	14.4	2.70	PO 154
EFBA	G2-SB-52	410003	Bulk	1.5	5.0	Light Olive Brown	Brown Till	Lean Clay with Gravel (V)	NT	13.3	29.2	15.0	14.2	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-52	410004	Bulk	5.0	10.0	Light Olive Brown	Brown Till	Lean Clay with Sand	CL	17.8	35.1	16.0	19.1	0.0	0.0	2.3	23.1	74.6	25.4	2.79	PO 154
EFBA	G2-SB-53	409815	Bulk	1.5	5.0	Yellowish Brown	Brown Till	Lean Clay	CL	17.4	43.9	16.8	27.1	0.0	1.1	4.8	8.6	86.6	29.8	2.72	PO 154
EFBA	G2-SB-53	409816	Bulk	5.0	10.0	Yellowish Brown	Brown Till	Lean Clay with Sand and Gravel (V)	NT	22.3	25.7	14.6	11.0	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-54	410007	Bulk	1.5	5.0	Light Olive Brown	Brown Till	Lean Clay with Sand	CL	15.6	31.8	16.1	15.6	0.0	0.0	2.6	21.3	76.1	22.8	2.78	PO 154
EFBA	G2-SB-54	410008	Bulk	5.0	10.0	Light Olive Brown	Brown Till	Lean Clay with Sand and Gravel (V)	NT	15.9	25.7	15.7	10.0	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-55	409831	Bulk	1.5	5.0	Brownish Yellow	Brown Till	Sandy Lean Clay	CL	13.2	25.3	14.6	10.7	0.0	2.9	8.3	29.9	61.8	17.3	2.80	PO 154
EFBA	G2-SB-55	409832	Bulk	5.0	10.0	Yellowish Brown	Brown Till	Lean Clay with Sand and Gravel (V)	NT	14.6	24.0	14.7	9.3	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-56	410011	Bulk	1.5	5.0	Dark Yellowish Brown	Brown Till	Lean Clay	CL	19.5	43.8	17.6	26.2	0.0	0.0	0.4	9.1	90.5	33.2	2.77	PO 154
EFBA	G2-SB-56	410012	Bulk	5.0	10.0	Light Olive Brown	Brown Till	Lean Clay with Sand (V)	NT	13.6	30.6	15.5	15.1	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-57	409823	Bulk	1.5	5.0	Dark Yellowish Brown	Brown Till	Lean Clay	CL	20.5	40.9	19.6	21.4	0.0	0.0	0.3	5.7	94.0	32.7	2.69	PO 154
EFBA	G2-SB-57	409824	Bulk	5.0	10.0	Yellowish Brown	Brown Till	Sandy Lean Clay with Gravel	CL	14.3	31.0	15.8	15.2	4.0	10.6	17.3	19.5	63.2	22.5	2.76	PO 154
EFBA	G2-SB-58	410015	Bulk	1.5	5.0	Light Olive Brown	Brown Till	Lean Clay with Sand	CL	13.9	35.7	16.3	19.4	0.0	3.9	8.4	16.3	75.3	24.9	2.77	PO 154
EFBA	G2-SB-58	410016	Bulk	5.0	10.0	Light Olive Brown	Brown Till	Lean Clay with Gravel (V)	NT	13.9	28.1	16.1	11.9	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-59	409819	Bulk	1.5	5.0	Dark Yellowish Brown	Brown Till	Lean Clay with Sand	CL	17.2	37.0	16.7	20.3	3.8	7.1	9.5	10.9	79.6	26.8	2.69	PO 154
EFBA	G2-SB-59	409820	Bulk	5.0	10.0	Yellowish Brown	Brown Till	Sandy Lean Clay with Gravel (V)	NT	14.4	28.9	16.8	12.2	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-60	410019	Bulk	1.5	5.0	Olive Brown	Brown Till	Lean Clay with Sand	CL	22.5	37.3	18.6	18.7	0.0	0.0	2.7	15.3	82.0	25.7	2.71	PO 154
EFBA	G2-SB-60	410020	Bulk	5.0	10.0	Olive Brown	Brown Till	Lean Clay with Gravel (V)	NT	15.9	28.5	15.3	13.2	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-61	409827	Bulk	1.5	5.0	Dark Yelowish Brown	Brown Till	Lean Clay with Sand	CL	20.5	44.9	16.8	28.2	0.0	3.7	7.5	9.5	83.0	36.2	2.75	PO 154
EFBA	G2-SB-61	409828	Bulk	5.0	10.0	Dark Yelowish Brown	Brown Till	Sandy Sity Clay with Gravel (V)	NT	14.5	23.0	14.2	8.8	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-62	410023	Bulk	1.5	5.0	Olive Brown	Brown Till	Sandy Lean Clay	CL	14.8	38.2	15.9	22.3	0.0	2.7	10.7	19.7	69.6	23.4	2.82	PO 154
EFBA	G2-SB-62	410024	Bulk	5.0	10.0	Light Olive Brown	Brown Till	Sandy Lean Clay with Gravel (V)	NT	13.8	27.8	15.6	12.2	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-63	410027	Bulk	1.5	5.0	Light Olive Brown	Brown Till	Sandy Lean Clay	CL	15.5	39.3	16.3	23.0	0.0	1.4	6.0	24.6	69.4	25.4	2.77	PO 154
EFBA	G2-SB-63	410028	Bulk	5.0	10.0	Light Olive Brown	Brown Till	Sandy Lean Clay (V)	NT	14.7	24.3	12.8	11.6	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-64	409835	Bulk	1.5	5.0	Light Olive Brown	Brown Till	Lean Clay with Sand	CL	14.8	29.2	15.6	13.6	0.0	0.0	0.4	19.0	80.6	24.8	2.79	PO 154
EFBA	G2-SB-64	409836	Bulk	5.0	10.0	Light Olive Brown	Brown Till	Lean Clay with Gravel (V)	NT	14.2	28.5	14.3	14.1	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-65	410031	Bulk	1.5	5.0	Dark Yelowish Brown	Brown Till	Lean Clay with Sand	CL	21.9	43.1	16.0	27.1	0.0	0.0	4.8	23.1	72.1	27.6	2.77	PO 154
EFBA	G2-SB-65	410032	Bulk	5.0	10.0	Light Olive Brown	Brown Till	Lean Clay with Gravel (V)	NT	14.3	21.1	13.2	7.9	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-66	409839	Bulk	1.5	5.0	Yellowish Brown	Brown Till	Lean Clay with Sand	CL	15.5	34.2	16.0	18.2	0.0	0.0	3.5	16.3	80.2	26.3	2.68	PO 154
EFBA	G2-SB-66	409840	Bulk	5.0	10.0	Yellowish Brown	Brown Till	Lean Clay with Sand (V)	NT	16.3	26.1	14.8	11.2	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-67	410035	Bulk	1.5	5.0	Dark Yellowish Brown	Brown Till	Lean Clay with Sand	CL	15.3	39.3	17.6	21.7	0.0	2.1	8.7	18.6	72.7	28.0	2.75	PO 154
EFBA	G2-SB-67	410036	Bulk	5.0	10.0	Light Olive Brown	Brown Till	Lean Clay with Sand (V)	NT	13.2	30.3	15.1	15.2	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-68	409843	Bulk	1.5	5.0	Dark Yellowish Brown	Brown Till	Lean Clay	CL	24.7	46.1	16.1	30.0	0.0	0.0	0.8	12.3	86.9	32.8	2.69	PO 154
EFBA	G2-SB-68	409844	Bulk	5.0	10.0	Dark Yellowish Brown	Brown Till	Lean Clay with Sand	CL	15.3	39.9	16.3	23.6	0.0	1.3	4.9	18.8	76.3	27.0	2.83	PO 154
EFBA	G2-SB-69	410039	Bulk	1.5	5.0	Dark Yellowish Brown	Brown Till	Lean Clay with Sand	CL	14.7	40.3	17.0	23.3	0.0	0.0	2.4	21.1	76.5	26.6	2.77	PO 154
EFBA	G2-SB-69	410040	Bulk	5.0	10.0	Light Olive Brown	Brown Till	Lean Clay with Sand (V)	NT	14.5	29.8	15.3	14.6	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-70	409847	Bulk	1.5	5.0	Yellowish Brown	Brown Till	Lean Clay with Sand	CL	21.8	43.9	18.6	25.3	0.0	0.0	2.3	12.7	85.0	32.6	2.71	PO 154
EFBA	G2-SB-70	409848	Bulk	5.0	10.0	Brown	Brown Till	Lean Clay with Sand (V)	NT	27.8	49.1	17.0	32.1	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-71	410043	Bulk	1.5	5.0	Yellowish Brown	Brown Till	Lean Clay	CL	21.9	46.7	18.0	28.7	0.0	0.0	0.0	5.2	94.8	30.9	2.74	PO 154
EFBA	G2-SB-71	410044	Bulk	5.0	10.0	Light Olive Brown	Brown Till	Lean Clay with Sand (V)	NT	19.3	24.1	15.3	8.7	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-72	409851	Bulk	1.5	5.0	Light Olive Brown	Brown Till	Lean Clay	CL	20.6	47.2	17.3	29.9	0.0	0.0	0.3	9.4	90.3	31.8	2.72	PO 154
EFBA	G2-SB-72	409852	Bulk	5.0	10.0	Light Olive Brown	Brown Till	Lean Clay with Sand	CL	25.0	40.8	17.3	23.6	0.0	0.0	2.4	17.2	80.4	32.1	2.73	PO 154
EFBA	G2-SB-73	409855	Bulk	1.5	6.0	Dark Yellowish Brown	Brown Till	Lean Clay with Sand	CL	24.0	34.1	15.6	18.6	0.0	0.0	0.0	22.9	77.1	19.8	2.80	PO 154
EFBA	G2-SB-74	409858	Bulk	1.5	5.0	Light Olive Brown	Brown Till	Lean Clay with Sand	CL	17.4	42.1	16.4	25.7	0.0	0.0	2.3	21.0	76.7	30.7	2.76	PO 154
EFBA	G2-SB-74	409859	Bulk	5.0	10.0	Light Olive Brown	Brown Till	Lean Clay with Sand (V)	NT	13.6	29.8	15.0	14.9	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-75	410047	Bulk	1.5	5.0	Dark Yellowish Brown	Brown Till	Lean Clay with Sand	CL	13.4	34.5	15.9	18.6	0.0	0.0	5.2	22.6	72.2	26.4	2.80	PO 154
EFBA	G2-SB-75	410048	Bulk	5.0	10.0	Yellowish Brown	Brown Till	Lean Clay with Sand (V)	NT	13.3	30.6	17.9	12.8	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-76	409862	Bulk	1.5	6.0	Olive Brown	Brown Till	Lean Clay	CL	21.5	39.8	17.5	22.3	0.0	0.0	0.5	4.8	94.7	34.3	2.70	PO 154
EFBA	G2-SB-77	410051	Bulk	1.5	6.0	Yellowish Brown	Brown Till	Lean Clay	CL	16.4	33.4	16.4	17.0	0.0	0.0	2.4	12.0	85.6	21.3	2.81	PO 154
EFBA	G2-SB-78	409865	Bulk	1.5	5.0	Yellowish Brown	Brown Till	Lean Clay with Sand	CL	22.3	40.0	16.3	23.7	0.0	0.0	1.2	18.6	80.2	26.0	2.63	PO 154
EFBA	G2-SB-78	409866	Bulk	5.0	10.0	Yellowish Brown	Brown Till	Lean Clay with Sand, Sand (V)	NT	16.8	24.0	14.2	9.8	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-79	410054	Bulk	1.5	5.0	Light Olive Brown	Brown Till	Lean Clay with Sand	CL	14.4	33.9	16.0	17.9	0.0	2.1	4.0	21.2	74.8	22.5	2.76	PO 154
EFBA	G2-SB-79	410055	Bulk	5.0	10.0	Dark Yellowish Brown	Brown Till	Sand (V)	NT	18.0	NP	NP	NP	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-80	409869	Bulk	1.5	5.0	Dark Yellowish Brown	Brown Till	Sandy Lean Clay	CL	22.0	27.2	15.2	12.0	0.0	0.0	4.6	26.7	68.7	21.3	2.70	PO 154
EFBA	G2-SB-80	409870	Bulk	5.0	10.0	Yellowish Brown	Brown Till	Sandy Lean Clay, Clayey Sand (V)	NT	13.6	20.8	13.4	7.5	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-SB-81	409873	Bulk	1.5	5.0	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	13.3	23.4	14.1	9.3	0.0	0.0	1.5	32.8	65.7	17.3	2.75	PO 154
EFBA	G2-SB-81	409874	Bulk	5.0	10.0	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	11.3	21.0	13.2	7.7	0.0	0.0	8.9	34.7	56.4	13.2	2.78	PO 154
SFBA	G2-SB-82	409877	Bulk	1.5	5.0	Pale Brown	Brown Till	Lean Clay	CL	22.7	45.9	15.8	30.1	0.0	0.0	0.0	9.4	90.6	34.2	2.70	PO 154
SFBA	G2-SB-82	409878	Bulk	5.0	10.0	Yellowish Brown	Brown Till	Lean Clay	CL	21.2	30.2	15.7	14.5	0.0	0.0	0.2	5.9	93.9	25.9	2.78	PO 154
SFBA	G2-SB-83	410058	Bulk	1.5	5.0	Yellowish Brown	Brown Till	Lean Clay	CL	17.6	36.1	17.0	19.1	0.0	0.0	0.0	5.3	94.7	27.4	2.79	PO 154
SFBA	G2-SB-83	410059	Bulk	5.0	10.0	Light Olive Brown	Brown Till	Silt (V)	NT	22.8	19.6	17.5	2.1	NT	NT	NT	NT	NT	NT	NT	PO 154
SFBA	G2-SB-84	409881	Bulk	1.5	5.0	Brownish Yellow	Brown Till	Lean Clay	CL	20.4	27.8	15.5	12.3	0.0	0.0	0.0	4.0	96.0	23.9	2.74	PO 154
SFBA	G2-SB-84	409882	Bulk	5.0	10.0	Yellowish Brown	Brown Till	Lean Clay	CL	23.0	26.0	16.1	9.8	0.0	0.0	0.0	2.8	97.2	24.0	2.77	PO 154
SFBA	G2-SB-85	410062	Bulk	1.5	5.0	Light Olive Brown	Brown Till	Fat Clay with Sand	CH	21.1	51.5	16.0	35.6	0.0	4.3	5.7	20.5	73.8	32.8	2.77	PO 154
SFBA	G2-SB-85	410063	Bulk	5.0	7.2	Dark Yellowish Brown	Brown Till	Lean Clay with Sand (V)	NT	12.4	27.2	14.3	12.8	NT	NT	NT	NT	NT	NT	NT	PO 154
SFBA	G2-SB-86	409885	Bulk	1.5	5.0	Yellowish Brown	Brown Till	Fat Clay	CH	22.6	52.3	19.1	33.2	0.0	0.0	0.0	8.9	91.1	34.2	2.74	PO 154
SFBA	G2-SB-86	409886	Bulk	5.0	10.0	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	17.4	25.5	16.1	9.4	0.0	2.8	7.2	31.7	61.1	19.2	2.78	PO 154
SFBA	G2-SB-87	410066	Bulk	1.5	5.0	Dark Yellowish Brown	Stratified Glacial Deposits	Lean Clay	CL	14.0	33.8	17.1	16.7	0.0	0.0	0.0	13.4	86.6	25.5	2.78	PO 154
SFBA	G2-SB-87	410067	Bulk	5.0	10.0	Light Olive Brown	Stratified Glacial Deposits	Silt, Lean Clay, Sand (V)	NT	21.0	23.8	16.8	7.0	NT	NT	NT	NT	NT	NT	NT	PO 154
SFBA	G2-SB-88	409889	Bulk	1.5	5.0	Light Olive Brown	Brown Till	Fat Clay	CH	24.0	54.4	19.7	34.8	0.0	0.0	0.0	1.0	99.0	46.6	2.73	PO 154
SFBA	G2-SB-88	409890	Bulk	5.0	10.0	Light Olive Brown	Brown Till	Lean Clay	CL	24.0	23.6	15.4	8.2	0.0	0.0	0.3	5.9	93.8	20.4	2.77	PO 154

Table 4-2 - Summary of Index Properties, Disturbed and Undisturbed 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)	Gravel Dimension 2" (% retained)	Gravel Dimension 3/4" (% retained)	Grain Size Gravel (%)	Grain Size Sand (%)	Grain Size Silt and Clay (%) (3)	Grain Size Clay (0.002 mm) (%)	Specific Gravity	Data Source
SFBA	G2-SB-89	410070	Bulk	1.5	5.0	Light Yellowish Brown	Brown Till	Fat Clay	CH	22.9	61.5	18.8	42.7	0.0	0.0	0.1	7.6	92.3	38.9	2.73	PO 154
SFBA	G2-SB-89	410071	Bulk	5.0	7.8	Dark Yellowish Brown	Brown Till	Lean Clay, Clayey Silt (V)	NT	13.3	31.8	16.2	15.6	NT	NT	NT	NT	NT	NT	NT	PO 154
SFBA	G2-SB-90	409893	Bulk	1.5	5.0	Dark Yellowish Brown	Stratified Glacial Deposits	Lean Clay with Sand	CL	15.0	37.9	16.2	21.7	0.0	0.0	0.1	19.6	80.3	31.3	2.77	PO 154
SFBA	G2-SB-90	409894	Bulk	5.0	10.0	Yellowish Brown	Stratified Glacial Deposits	Sandy Silt	ML	13.7	19.9	16.7	3.2	0.0	0.0	11.5	27.4	61.1	8.6	2.72	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	0.0	0.0	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	0.0	0.0	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	0.0	0.0	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	0.0	0.0	0.1	11.8	88.1	25.9	2.72	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	0.0	0.0	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	0.0	0.0	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	0.0	0.0	1.5	5.0	93.5	32.7	2.81	PO 154
EFBA	G2-148	410571	SS	2.5	4.0	Yellowish Brown	Brown Till	Lean Clay (V)	NT	22.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-148	410572	SS	5.0	6.5	Yellowish Brown	Brown Till	Lean Clay	CL	17.4	30.9	16.1	14.8	0.0	0.0	0.4	8.4	91.2	26.0	2.75	PO 154
EFBA	G2-148	410573	DEN	7.5	9.5	Yellowish Brown	Brown Till	Lean Clay with Sand	CL	18.2	28.7	15.3	13.5	0.0	0.0	4.8	21.6	73.6	22.7	2.75	PO 154
EFBA	G2-148	410575	SS	12.5	14.0	Dark Gray	Gray Till	Clayey Sand (V)	NT	10.8	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-148	410576	SS	15.0	16.5	Dark Gray	Gray Till	Clayey Sand	SC	9.8	19.1	11.4	7.7	0.0	0.0	2.7	49.8	47.5	15.0	2.71	PO 154
EFBA	G2-148	410577	Bulk	11.0	16.5	Dark Gray	Gray Till	Lean Clay with Sand	CL	16.6	30.0	13.5	16.5	0.0	0.0	3.6	23.2	73.2	26.0	2.69	PO 154
EFBA	G2-149	410521	SS	2.5	4.0	Yellowish Brown	Brown Till	Lean Clay with Sand (V)	NT	13.9	27.8	15.1	12.7	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-149	410522	SS	5.0	6.5	Yellowish Brown	Brown Till	Lean Clay with Sand (V)	NT	11.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-149	410523	SS	7.5	9.0	Olive Brown	Brown Till	Sandy Lean Clay	CL	13.3	28.9	14.8	14.0	0.0	5.8	11.4	24.1	64.5	21.4	2.74	PO 154
EFBA	G2-149	410524	SS	10.0	12.0	Dark Grayish Brown	Brown Till	Sandy Lean Clay (V)	NT	13.1	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-149	410525	SS	12.5	14.0	Dark Gray	Gray Till	Sandy Lean Clay	CL	13.8	28.5	13.8	14.7	0.0	3.8	8.5	24.9	66.6	21.1	2.77	PO 154
EFBA	G2-149	410526	SS	15.0	16.5	Dark Gray	Gray Till	Sandy Lean Clay (V)	NT	10.8	19.4	14.0	5.5	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-149	410527&410528	Bulk	11.5	16.5	Dark Gray	Gray Till	Sandy Lean Clay	CL	12.2	27.8	13.3	14.5	0.0	0.0	5.3	25.3	69.4	24.9	2.70	PO 154
EFBA	G2-150	410251	SS	2.5	4.0	Dark Yellowish Brown	Brown Till	Lean Clay	CL	24.5	48.3	18.0	30.3	0.0	0.0	0.0	3.7	96.3	29.2	2.62	PO 154
EFBA	G2-150	410252	SS	5.0	6.5	Dark Yellowish Brown	Brown Till	Lean Clay (V)	NT	14.1	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-150	410253	SS	7.5	9.0	Brown	Brown Till	Sandy Lean Clay	CL	11.4	28.0	13.7	14.3	0.0	2.7	8.3	25.0	66.7	25.3	2.74	PO 154
EFBA	G2-150A	410254	ST	10.0	12.0	Dark Greenish Gray	Gray Till	Sandy Lean Clay with Gravel	CL	12.7	27.9	13.8	14.2	4.1	6.2	15.4	21.5	63.1	23.3	2.78	PO 154
EFBA	G2-150A	410255	Bulk	13.0	15.0	Gray	Gray Till	Sandy Lean Clay	CL	15.3	26.4	13.8	12.6	0.0	7.6	13.9	21.7	64.4	19.5	2.72	PO 154
EFBA	G2-150A	410256	DEN	15.0	17.0	Gray	Gray Till	Sandy Lean Clay	CL	14.7	23.5	12.1	11.4	0.0	0.0	5.4	33.5	61.1	19.5	2.65	PO 154
EFBA	G2-150A	410257	SS	17.5	19.0	Gray	Gray Till	Silty, Clayey Sand with Gravel	SC-SM	11.4	14.6	10.2	4.5	0.0	2.0	17.6	63.0	19.4	4.6	2.75	PO 154
EFBA	G2-150A	410258	SS	20.0	21.5	Greenish Gray	Gray Till	Lean Clay with Sand (V)	NT	16.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-150A	410259	SS	23.5	25.0	Greenish Gray	Gray Till	Sandy Lean Clay	CL	14.7	21.4	12.4	9.0	0.0	0.0	7.2	41.6	51.2	13.3	2.77	PO 154
EFBA	G2-151	410264	SS	2.5	4.0	Light Olive Brown	Brown Till	Lean Clay (V)	NT	14.6	19.8	11.9	7.8	NT	NT	NT	NT	NT	NT	2.71	PO 154
EFBA	G2-151	410265	SS	5.0	6.5	Dark Yellowish Brown	Brown Till	Silty, Clayey Sand	SC-SM	11.7	16.5	12.0	4.5	0.0	3.1	10.0	52.7	37.3	8.1	2.77	PO 154
EFBA	G2-151	410267	ST	7.5	9.5	Olive Brown	Brown Till	Lean Clay with Sand	CL	16.8	24.0	14.3	9.7	0.0	0.0	2.2	14.0	83.8	18.4	2.71	PO 154
EFBA	G2-151	410269	DEN	10.0	12.0	Dark Greenish Gray	Gray Till	Lean Clay	CL	20.0	24.5	15.5	9.0	0.0	0.0	0.0	5.7	94.3	21.0	2.71	PO 154
EFBA	G2-151	410270	SS	12.5	14.0	Dark Greenish Gray	Gray Till	Sandy Lean Clay (V)	NT	16.2	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-151	410272	SS	15.0	16.5	Dark Greenish Gray	Gray Till	Sandy Lean Clay	CL	15.0	27.2	13.9	13.4	0.0	4.2	8.9	24.1	67.0	21.2	2.68	PO 154
EFBA	G2-151	410273	SS	18.5	20.0	Dark Greenish Gray	Gray Till	Sandy Lean Clay (V)	NT	14.8	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-152	410276	SS	2.5	4.0	Light Olive Brown	Brown Till	Lean Clay with Sand	CL	10.9	44.9	16.1	28.8	0.0	0.0	1.5	14.7	83.8	32.3	2.73	PO 154
EFBA	G2-152	410277	SS	5.0	6.5	Light Olive Brown	Brown Till	Lean Clay with Sand (V)	NT	15.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-152	410279	ST	7.0	9.0	Light Olive Brown	Brown Till	Lean Clay with Sand (V)	NT	13.6	24.6	14.4	10.2	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-152	410281	SS	10.0	11.5	Olive Brown	Brown Till	Sandy Lean Clay (V)	NT	10.9	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-152	410282	ST	12.5	14.5	Olive Brown	Brown Till	Silty, Clayey Sand with Gravel	SC-SM	11.5	16.3	12.0	4.3	4.6	14.5	22.6	32.4	45.0	12.0	2.73	PO 154
EFBA	G2-152	410284	SS	15.0	16.5	Dark Greenish Gray	Gray Till	Sandy Lean Clay (V)	NT	10.4	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-152	410285	SS	18.5	20.0	Dark Greenish Gray	Gray Till	Sandy Lean Clay	CL	14.9	23.0	12.1	10.8	0.0	0.0	9.0	32.4	58.6	15.3	2.73	PO 154
EFBA	G2-153	410286	SS	2.5	4.0	Light Olive Brown	Brown Till	Lean Clay with Sand (V)	NT	13.9	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-153	410287	ST	5.0	7.0	Light Olive Brown	Brown Till	Sandy Lean Clay	CL	13.1	23.9	14.5	9.5	0.0	1.2	8.8	28.1	63.1	17.4	2.74	PO 154
EFBA	G2-153	410289	SS	7.5	9.0	Light Olive Brown	Brown Till	Sandy Lean Clay (V)	NT	14.2	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-153	410291	SS	10.0	11.5	Light Olive Brown	Brown Till	Sandy Lean Clay	CL	14.4	23.3	13.8	9.6	0.0	2.0	4.6	25.4	70.0	18.8	2.71	PO 154
EFBA	G2-153	410292	SS	12.5	14.0	Dark Greenish Gray	Gray Till	Sandy Lean Clay (V)	NT	10.1	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-153	410294	SS	15.0	16.5	Dark Greenish Gray	Gray Till	Sandy Lean Clay (V)	NT	13.6	26.2	13.6	12.6	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-153	410295	ST	18.0	20.0	Dark Greenish Gray	Gray Till	Sandy Lean Clay	CL	9.0	25.0	14.4	10.6	0.0	1.8	7.9	23.0	69.1	22.0	2.71	PO 154
EFBA	G2-154	410168	SS	2.5	4.0	Yellowish Brown	Brown Till	Lean Clay with Sand (V)	NT	20.7	46.2	17.6	28.6	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-154	410169	SS	5.0	6.5	Light Yellowish Brown	Brown Till	Lean Clay with Sand (V)	NT	14.6	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-154	410170	SS	7.5	9.0	Light Yellowish Brown	Brown Till	Lean Clay with Sand (V)	NT	11.9	29.3	16.0	13.3	NT	NT	NT	NT	NT	NT		PO 154
EFBA	G2-154	410171	ST	10.0	12.0	Brown / Greenish Gray	Gray Till	Sandy Lean Clay	CL	11.4	26.6	15.6	11.1	5.0	8.3	11.5	26.3	62.2	18.7	2.72	PO 154
EFBA	G2-155	410173	SS	2.5	4.0	Light Olive Brown	Brown Till	Lean Clay with Sand (V)	NT	15.2	34.5	15.8	18.6	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-155	410174	SS	5.0	6.5	Pale Yellow	Brown Till	Lean Clay with Sand (V)	NT	14.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-155	410175	ST	7.5	9.5	Light Olive Brown	Brown Till	Sandy Lean Clay	CL	12.2	30.6	15.3	15.3	0.0	0.0	8.3	23.9	67.8	25.2	2.73	PO 154
EFBA	G2-155	410177	SS	10.0	11.5	Greenish Gray	Gray Till	Sandy Lean Clay (V)	NT	12.4	22.7	12.9	9.8	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-155	410178	SS	12.5	14.0	Greenish Gray	Gray Till	Sandy Lean Clay (V)	NT	11.1	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
EFBA	G2-155	410179	SS	14.5	16.0	Greenish Gray	Gray Till	Sandy Lean Clay	CL	12.5	25.5	14.5	11.0	0.0	2.8	7.7	26.5	65.8	20.4	2.75	PO 154
SFBA	G2-156	410128	SS	2.5	4.0	Brown	Brown Till	Lean Clay (V)	NT	22.3	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SFBA	G2-156	410129	ST	5.0	7.0	Light Yellowish Brown	Brown Till	Lean Clay	CL	22.7	30.5	16.0	14.5	0.0	0.0	0.0	1.0	99.0	28.6	2.73	PO 154
SFBA	G2-156	410131	ST	7.5	9.5	Yellowish Brown	Brown Till	Lean Clay	CL	24.6	32.4	16.3	16.1	0.0	0.0	0.0	1.8	98.2	32.3	2.72	PO 154
SFBA	G2-156	410133	SS	10.0	10.8	Greenish Gray	Gray Till	Lean Clay	CL	20.3	31.7	17.7	14.0	0.0	0.0	0.1	4.8	95.1	33.6	2.75	PO 154
SFBA	G2-156	410135	SS	12.5	14.0	Greenish Gray	Gray Till	Lean Clay (V)	NT	23.1	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SFBA	G2-156	410136	SS	15.5	16.5	Grayish Brown	Gray Till	Sandy Lean Clay	CL	12.3	20.1	12.5	7.6	0.0	0.0	4.8	28.1	67.1	16.3	2.78	PO 154
SFBA	G2-156	410137	SS	18.5	20.0	Greenish Gray	Gray Till	Sandy Lean Clay (V)	NT	13.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SFBA	G2-157	410138	SS	2.5	4.0	Light Olive Brown	Brown Till	Lean Clay (V)	NT	17.4	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SFBA	G2-157	410139	SS	5.0	6.5	Light Olive Brown	Brown Till	Lean Clay	CL	21.7	26.2	17.3	8.9	0.0	0.0	0.2	3.8	96.0	17.8	2.76	PO 154
SFBA	G2-157	410140	ST	7.5	9.5	Greenish Gray	Gray Till	Lean Clay	CL	23.5	24.9	16.2	8.7	0.0	0.0	0.0	0.5	99.5	23.7	2.69	PO 154
SFBA	G2-157	410142	ST	10.0	12.0	Greenish Gray	Gray Till	Silty Clay	CL-ML	22.0	21.5	16.5	5.1	0.0	0.0	0.0	0.3	99.7	14.9	2.75	PO 154

Table 4-2 - Summary of Index Properties, Disturbed and Undisturbed 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)	Gravel Dimension 2" (% retained)	Gravel Dimension 3/4" (% retained)	Grain Size Gravel (%)	Grain Size Sand (%)	Grain Size Silt and Clay (%) (3)	Grain Size Clay (0.002 mm) (%)	Specific Gravity	Data Source
SFBA	G2-157	410144	SS	12.5	14.0	Greenish Gray	Gray Till	Silty Clay, Silt (V)	NT	21.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SFBA	G2-157	410145	SS	15.0	16.5	Dark Greenish Gray	Gray Till	Silt with Sand	ML	19.8	NP	NP	NP	0.0	0.0	0.8	25.5	73.7	8.4	2.75	PO 154
SFBA	G2-157	410146	SS	18.5	20.0	Greenish Gray	Gray Till	Silty Clay, Sand (V)	NT	15.3	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SFBA	G2-158	410147	SS	2.5	4.0	Light Olive Brown	Brown Till	Fat Clay	CH	24.5	53.7	19.1	34.6	0.0	0.0	0.0	2.3	97.7	40.1	2.65	PO 154
SFBA	G2-158	410148	SS	5.0	6.5	Light Olive Brown	Brown Till	Lean Clay (V)	NT	23.6	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SFBA	G2-158	410150	ST	10.0	12.0	Light Olive Brown	Brown Till	Lean Clay	CL	20.6	25.6	15.5	10.2	0.0	0.0	0.0	4.4	95.6	29.7	2.71	PO 154
SFBA	G2-158	410152	SS	12.5	14.0	Brownish Yellow	Brown Till	Silty Sand with Gravel	SM	13.6	NP	NP	NP	0.0	0.0	19.2	66.3	14.5	3.4	2.81	PO 154
SFBA	G2-158	410153	SS	15.0	16.5	Greenish Gray	Gray Till	Silty Clay with Sand (V)	NT	11.2	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SFBA	G2-158	410154	SS	18.5	20.0	Greenish Gray	Gray Till	Silty Sand	SM	11.9	13.0	11.6	1.4	0.0	0.0	12.3	52.2	35.5	7.1	2.77	PO 154
SFBA	G2-159	410158	SS	2.5	4.0	Light Olive Brown	Stratified Glacial Deposits	Sandy Lean Clay	CL	21.4	32.4	15.5	16.9	0.0	0.0	0.1	32.8	67.1	27.0	2.65	PO 154
SFBA	G2-159	410159	SS	5.0	6.5	Light Olive Brown	Stratified Glacial Deposits	Lean Clay (V)	NT	19.8	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SFBA	G2-159	410160	SS	7.5	9.0	Light Olive Brown	Stratified Glacial Deposits	Silty Sand	SM	10.6	NP	NP	NP	0.0	0.0	7.4	54.5	38.1	6.6	2.79	PO 154
SFBA	G2-159	410161	SS	10.0	11.5	Light Olive Brown	Stratified Glacial Deposits	Silty Sand (V)	NT	15.4	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SFBA	G2-159	410162	SS	12.5	14.0	Light Olive Brown	Stratified Glacial Deposits	Silty Sand with Gravel	SM	11.2	NP	NP	NP	0.0	2.1	36.9	49.6	13.5	1.8	2.79	PO 154
SFBA	G2-159	410163	SS	15.0	16.5	Gray	Gray Till	Sandy Silt (V)	NT	17.1	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 154
SFBA	G2-159	410164	SS	18.5	20.0	Dark Greenish Gray	Gray Till	Sandy Silty Clay	CL-ML	12.1	16.9	12.5	4.4	0.0	0.0	7.6	34.8	57.6	12.5	2.78	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	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	0.0	0.0	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	ERR	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	0.0	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	0.0	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	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	0.0	0.0	3.1	46.8	50.1	9.9	2.76	PO 154
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	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	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	0.0	21.1	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	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	0.0	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	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	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	0.0	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	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	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	NT	NT	PO 154
EFBA	1070	3622	CJ	2.0	7.5	Brownish Yellow	Brown Till	Sandy Silt	ML	NT	NP	NP	NP	0.0	0.0	4.0	37.0	59.0	10.0	2.75	Nutting
EFBA	1745	3250	ST	6.0	9.0	Brown	Brown Till	Silty Clay with Sand	CL-ML	17.9	21.0	15.0	6.0	0.0	0.0	0.0	15.0	85.0	20.0	2.80	Nutting
EFBA	1745	1755	SS	9.0	13.0	Yellowish Brown	Brown Till	Lean Clay with Sand	CL	17.5	25.0	17.0	8.0	0.0	0.0	0.0	15.0	85.0	23.0	2.85	Nutting
EFBA	1745	1756	SS	9.0	13.0	Olive	Brown Till	Lean Clay with Sand	CL	19.9	26.0	16.0	10.0	0.0	0.0	5.0	21.0	74.0	22.0	2.82	Nutting
EFBA	1747	1493	SS	2.0	5.5	Olive Yellow	Brown Till	Sandy Lean Clay	CL	9.3	22.0	14.0	8.0	0.0	0.0	7.0	29.0	64.0	17.0	2.82	Nutting
EFBA	1747	1494	SS	2.0	5.5	Olive Yellow	Brown Till	Sandy Silty Clay	CL-ML	9.1	18.0	14.0	4.0	0.0	0.0	11.0	39.0	50.0	9.0	2.78	Nutting
EFBA	1747	1495	SS	2.0	5.5	Olive Yellow	Brown Till	Sandy Silty Clay	CL-ML	9.2	19.0	13.0	6.0	0.0	0.0	12.0	43.0	55.0	9.0	2.78	Nutting
EFBA	1747	1496	SS	5.5	9.0	Yellowish Brown	Brown Till	Silty Sand with Gravel	SM	11.5	NP	NP	NP	0.0	0.0	15.0	48.0	37.0	4.0	2.81	Nutting
EFBA	1747	1497	SS	5.5	9.0	Yellowish Brown	Brown Till	Sandy Silt	ML	12.5	NP	NP	NP	0.0	0.0	11.0	30.0	59.0	9.0	2.81	Nutting
EFBA	1747	1498	SS	5.5	9.0	Yellowish Brown	Brown Till	Sandy Silt with Gravel	ML	13.1	NP	NP	NP	0.0	0.0	22.0	24.0	54.0	8.0	2.80	Nutting
EFBA	1747	1499	SS	19.0	21.5	Gray	Gray Till	Sandy Lean Clay	CL	12.6	26.0	15.0	11.0	0.0	0.0	10.0	28.0	62.0	17.0	2.79	Nutting
EFBA	1747	1500	SS	12.0	21.5	Gray	Gray Till	Sandy Lean Clay	CL	12.9	23.0	14.0	9.0	0.0	0.0	12.0	30.0	58.0	13.0	2.79	Nutting
EFBA	1747	3252	ST	12.0	14.5	Gray and Brown	Gray Till	Gravelly Lean Clay with Sand	CL		24.0	15.0	9.0	0.0	0.0	26.0	24.0	50.0	23.0	2.74	Nutting
EFBA	1748	3251	ST	9.0	12.0	Brown and Gray	Brown Till	Clayey Gravel with Sand	GC		25.0	15.0	10.0	0.0	21.0	34.0	25.0	41.0	22.0	2.79	Nutting
EFBA	1749	2497	SS	4.0	8.0	Light Yellowish Brown	Brown Till	Sandy Lean Clay	CL	24.9	33.0	20.0	13.0	0.0	0.0	10.0	24.0	66.0	20.0	2.80	Nutting
EFBA	1749	2498	SS	4.0	8.0	Light Yellowish Brown	Brown Till	Lean Clay with Sand	CL	25.6	37.0	20.0	17.0	0.0	0.0	0.0	17.0	83.0	28.0	2.77	Nutting
EFBA	1749	2499	SS	4.0	8.0	Light Yellowish Brown	Brown Till	Sandy Lean Clay	CL	12.4	31.0	19.0	12.0	0.0	0.0	7.0	27.0	66.0	24.0	2.80	Nutting
EFBA	1749	2500	SS	17.0	19.0	Gray	GrayTill	Sandy Silty Clay	CL-ML	13.9	22.0	15.0	7.0	0.0	0.0	7.0	32.0	61.0	19.0	2.80	Nutting
EFBA	1749	2501	SS	17.0	19.0	Gray	GrayTill	Sandy Silty Clay	CL-ML	13.2	22.0	15.0	7.0	0.0	0.0	6.0	34.0	60.0	17.0	2.79	Nutting
EFBA	1749	2502	SS	17.0	19.0	Gray	GrayTill	Sandy Lean Clay	CL	13.0	23.0	15.0	8.0	0.0	0.0	8.0	31.0	61.0	18.0	2.78	Nutting
EFBA	1749	2503	SS	22.0	28.0	Gray	GrayTill	Sandy Lean Clay	CL	14.1	24.0	16.0	8.0	0.0	0.0	6.0	30.0	64.0	19.0	2.75	Nutting
EFBA	1749	2504	SS	22.0	28.0	Gray	GrayTill	Sandy Lean Clay	CL	14.1	25.0	16.0	9.0	0.0	0.0	6.0	30.0	64.0	19.0	2.80	Nutting
EFBA	1749	2505	SS	22.0	28.0	Gray	GrayTill	Sandy Lean Clay	CL	14.3	25.0	16.0	9.0	0.0	0.0	10.0	30.0	60.0	18.0	2.78	Nutting
EFBA	1750	2506	SS	4.0	8.0	Light Olive Brown	Brown Till	Silty Clay with Sand	CL-ML	15.9	23.0	16.0	7.0	0.0	0.0	0.0	26.0	74.0	18.0	2.84	Nutting
EFBA	1750	2507	SS	4.0	8.0	Light Olive Brown	Brown Till	Lean Clay with Sand	CL	13.4	31.0	19.0	12.0	0.0	3.0	13.0	16.0	71.0	22.0	2.80	Nutting
EFBA	1750	2508	SS	4.0	8.0	Light Olive Brown	Brown Till	Sandy Lean Clay	CL	15.9	24.0	16.0	8.0	0.0	0.0	1.0	32.0	67.0	17.0	2.80	Nutting
EFBA	1750	2509	SS	24.0	28.0	Gray	GrayTill	Sandy Lean Clay	CL	13.9	25.0	15.0	10.0	0.0	5.0	14.0	30.0	55.0	18.0	2.81	Nutting
EFBA	1750	2510	SS	24.0	28.0	Gray	GrayTill	Sandy Lean Clay	CL	14.2	23.0	14.0	9.0	0.0	7.0	12.0	33.0	55.0	16.0	2.79	Nutting
EFBA	1750	2511	SS	24.0	28.0	Gray	GrayTill	Sandy Lean Clay	CL	14.4	23.0	15.0	8.0	0.0	0.0	5.0	36.0	59.0	17.0	2.77	Nutting
EFBA	G2-201	G2-201 / 2	ST	2.5	4.5	Yellowish Brown	Brown Till	Lean Clay	CL	19.0	49.0	18.0	31.0	0.0	0.0	0.0	3.0	97.0	32.6	2.70	PO 101
EFBA	G2-201	G2-201 / 4	ST	7.5	9.5	Yellowish Brown	Brown Till	Lean Clay	CL	16.0	30.0	17.0	13.0	0.0	0.0	2.0	10.0	88.0	28.0	2.73	PO 101
EFBA	G2-201	G2-201 / 7	SS	15.0	17.0	Gray	Gray Till	Sandy Lean Clay (V)	NT	13.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 101
EFBA	G2-201	G2-201 / 9	SS	20.0	22.0	Gray	Gray Till	Sandy Lean Clay (V)	NT	14.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 101
EFBA	G2-201	G2-201 / 10	ST	22.5	24.5	Gray	Gray Till	Sandy Lean Clay	CL	13.0	24.0	14.0	10.0	0.0	0.0	8.0	29.0	63.0	27.7	2.75	PO 101
EFBA	G2-202	G2-202 / 1	SS	0.0	2.0	Brown	Brown Till	Sandy Lean Clay (V)	NT	25.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 101
EFBA	G2-202	G2-202 / 3	SS	5.0	7.0	Yellowish Brown	Brown Till	Sandy Silty Clay	CL-ML	13.0	20.0	14.0	6.0	0.0	0.0	10.0	29.0	61.0	11.4	2.85	PO 101
EFBA	G2-202	G2-202 / 4	ST	7.5	9.5	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	14.0	27.0	15.0	12.0	0.0	2.0	10.0	25.0	65.0	18.0	2.81	PO 101
EFBA	G2-202	G2-202 / 5	SS	10.0	12.0	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	12.0	25.0	14.0	11.0	0.0	0.0	7.0	24.0	69.0	15.8	2.84	PO 101
EFBA	G2-202	G2-202 / 7	SS	15.0	17.0	Gray	Gray Till	Sandy Lean Clay	CL	14.0	25.0	14.0	11.0	0.0	0.0	10.0	25.0	65.0	18.9	2.81	PO 101
EFBA	G2-202	G2-202 / 9	SS	20.0	22.0	Gray	Gray Till	Silty Gravel with Sand (V)	NT	NT	NT	NT	NT	0.0	18.0	40.0	38.0	22.0	3.0	2.80	PO 101
EFBA	G2-203	G2-203 / 5	SS	10.0	12.0	Yellowish Brown	Brown Till	Clayey Sand with Gravel	SC	8.0	21.0	13.0	8.0	0.0	10.0	18.0	41.0	41.0	10.7	2.74	PO 101

Table 4-2 - Summary of Index Properties, Disturbed and Undisturbed 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)	Gravel Dimension 2" (% retained)	Gravel Dimension 3/4" (% retained)	Grain Size Gravel (%)	Grain Size Sand (%)	Grain Size Silt and Clay (%) (3)	Grain Size Clay (0.002 mm) (%)	Specific Gravity	Data Source
EFBA	G2-203	G2-203 / 7	SS	15.0	17.0	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	17.0	28.0	16.0	12.0	0.0	3.0	7.0	27.0	66.0	20.9	2.76	PO 101
EFBA	G2-203	G2-203 / 8	ST	17.5	19.5	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	17.0	27.0	16.0	11.0	0.0	0.0	7.0	31.0	62.0	21.7	2.74	PO 101
EFBA	G2-203	G2-203 / 9	SS	20.0	22.0	Gray	Gray Till	Sandy Lean Clay	CL	12.0	21.0	13.0	8.0	0.0	0.0	5.0	35.0	60.0	15.0	2.77	PO 101
EFBA	G2-203	G2-203 / 10	ST	22.5	24.5	Gray	Gray Till	Sandy Lean Clay	CL	14.0	23.0	14.0	9.0	0.0	1.3	7.0	28.0	65.0	18.0	2.79	PO 101
EFBA	G2-204	G2-204 / 1	SS	0.0	2.0	Brown	Brown Till	Sandy Lean Clay (V)	NT	19.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 101
EFBA	G2-204	G2-204 / 4	ST	7.5	9.5	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	14.0	27.0	15.0	12.0	0.0	0.0	6.0	26.0	68.0	18.2	2.74	PO 101
EFBA	G2-204	G2-204 / 6	ST	12.5	14.5	Gray	Gray Till	Lean Clay with Sand	CL	13.0	24.0	14.0	10.0	0.0	0.0	4.0	25.0	71.0	18.2	2.76	PO 101
EFBA	G2-204	G2-204 / 7	SS	15.0	17.0	Gray	Gray Till	Sandy Lean Clay	CL	10.0	25.0	14.0	11.0	0.0	0.0	4.0	26.0	70.0	18.0	2.74	PO 101
EFBA	G2-204	G2-204 / 8	ST	17.5	19.5	Gray	Gray Till	Silty Sand	SM	9.0	13.0	12.0	1.0	0.0	0.0	8.0	51.0	41.0	5.7	2.78	PO 101
EFBA	G2-204	G2-204 / 9	SS	20.0	22.0	Gray	Gray Till	Sandy Lean Clay (V)	NT	12.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 101
EFBA	G2-204	G2-204 / 10	ST	22.5	24.5	Gray	Gray Till	Sandy Lean Clay	CL	12.0	24.0	14.0	10.0	0.0	1.8	7.0	29.0	64.0	18.4	2.78	PO 101
EFBA	G2-205	G2-205 / 2	ST	2.5	4.5	Yellowish Brown	Brown Till	Lean Clay	CL	11.0	41.0	23.0	18.0	0.0	0.0	1.0	12.0	87.0	28.5	2.68	PO 101
EFBA	G2-205	G2-205 / 3	SS	5.0	7.0	Yellowish Brown	Brown Till	Lean Clay (V)	NT	12.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 101
EFBA	G2-205	G2-205 / 5	SS	10.0	12.0	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	14.0	28.0	16.0	12.0	0.0	0.0	10.0	25.0	65.0	19.8	2.79	PO 101
EFBA	G2-205	G2-205 / 8	ST	17.5	19.5	Gray	Gray Till	Sandy Lean Clay	CL	13.0	23.0	14.0	9.0	0.0	9.6	16.0	27.0	57.0	17.8	2.77	PO 101
EFBA	G2-206	G2-206 / 1	SS	0.0	2.0	Grayish Brown	Brown Till	Lean Clay with Sand (V)	NT	20.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 101
EFBA	G2-206	G2-206 / 2	ST	2.5	4.5	Yellowish Brown	Brown Till	Lean Clay with Sand	CL	11.0	35.0	17.0	18.0	0.0	0.0	5.0	19.0	76.0	24.0	2.76	PO 101
EFBA	G2-206	G2-206 / 3	SS	5.0	7.0	Yellowish Brown	Brown Till	Lean Clay with Sand (V)	NT	13.0	NT	NT	NT	0.0	3.0	10.0	18.0	72.0	25.0	2.76	PO 101
EFBA	G2-206	G2-206 / 4	ST	7.5	9.5	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	14.0	28.0	15.0	13.0	0.0	0.0	9.0	23.0	68.0	21.3	2.75	PO 101
EFBA	G2-206	G2-206 / 5	SS	10.0	12.0	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	14.0	26.0	15.0	11.0	0.0	0.0	8.0	28.0	64.0	19.1	2.76	PO 101
EFBA	G2-206	G2-206 / 6	ST	12.5	14.5	Yellowish Brown	Brown Till	Lean Clay with Sand (V)	NT	12.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 101
EFBA	G2-206	G2-206 / 7	SS	15.0	17.0	Gray	Gray Till	Sandy Lean Clay	CL	12.0	22.0	13.0	9.0	0.0	0.0	6.0	33.0	61.0	15.0	2.73	PO 101
EFBA	G2-206	G2-206 / 8	ST	17.5	19.5	Gray	Gray Till	Silty Sand (V)	NT	13.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 101
EFBA	G2-206	G2-206 / 10	ST	22.5	24.5	Gray	Gray Till	Sandy Lean Clay	CL	13.0	25.0	15.0	10.0	0.0	0.0	7.0	28.0	65.0	22.2	2.73	PO 101
EFBA	G2-207	G2-207 / 1	SS	0.0	2.0	Brown	Brown Till	Sandy Lean Clay (V)	NT	25.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	PO 101
EFBA	G2-207	G2-207 / 5	SS	10.0	12.0	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	13.0	26.0	16.0	10.0	0.0	0.0	6.0	27.0	67.0	19.6	2.83	PO 101
EFBA	G2-207	G2-207 / 11	SS	25.0	27.0	Gray	Gray Till	Sandy Silty Clay	CL-ML	14.0	19.0	13.0	6.0	0.0	4.1	16.0	32.0	52.0	10.2	2.81	PO 101
EFBA	G2-209	Bulk	Bulk	0.0	25.0	Brown and Gray	Br and Gr Till	Sandy Lean Clay	CL	6.0	28.0	13.0	15.0	0.0	0.0	3.0	27.0	70.0	23.0	2.80	PO 101
EFBA	G2-210	Bulk	Bulk	0.0	25.0	Brown and Gray	Br and Gr Till	Lean Clay with Sand	CL	7.0	28.0	14.0	14.0	0.0	0.0	3.0	22.0	75.0	23.4	2.76	PO 101
EFBA	G2-201-204	Bulk	Bulk	0.0	24.5	Brown and Gray	Br and Gr Till	Lean Clay with Sand	CL	NT	27.0	15.0	12.0	0.0	0.0	3.0	25.0	72.0	20.0	2.79	PO 101
EFBA	G2-205-208 (5)	Bulk	Bulk	0.0	24.5	Brown and Gray	Br and Gr Till	Lean Clay with Sand	CL	NT	27.0	14.0	13.0	0.0	0.0	3.0	27.0	70.0	20.0	2.81	PO 101
EFBA	G2-120	405124	ST	5.0	7.0	Olive Brown	Brown Till	Sandy Lean Clay	CL	16.6	30.7	15.7	15.0	0.0	0.0	8.3	25.0	66.7	25.0	2.71	PO 140
EFBA	G2-134	405140	DEN	12.0	14.0	Dark Greenish Gray	Gray Till	Sandy Lean Clay	CL	13.7	24.6	13.5	11.1	0.0	3.1	7.8	30.6	61.6	16.0	2.72	PO 140

Notes

1. On-Site Location:
   - EFBA — East Field Borrow Area
   - SFBA — South Field Borrow Area
   - SF/SFBA — South Field (Waste Unit) / South Field Borrow Area
2. Sample Type:
   - Bulk — Bulk Sample
   - CJ — Combined Jar
   - DEN — Denison Sample
   - SS — Split Spoon Sample
   - ST — Shelby Tube Sample (ASTM D 1587)
3. Silt and Clay: Minus #200 seive material
4. NP - Reported as non-plastic from laboratory plasticity test (ASTM D 4318)
   NT - Not Tested

(5) Boring G2-208 is located approximately 200 feet east of EFBA boundary

6. USCS Group Name (V) Visual Classification; not classified from laboratory test data
7. Data Source:
   - Nutting — H.C. Nutting Technical Report 5.1A, Engineering Evaluation Report for On-Site Disposal, U.S. DOE Fernald Field Office, June 1993 (H.C. Nutting Laboratory Data).
   - PO 101 — On-Site Disposal Cell Pre-Design Activities Engineering Report, PARSONS Project Order 101, April 1994.
   - PO 140 — Geotechnical Investigation On-Site Disposal Facility, Soil Investigation Data Report, PARSONS Project Order 140, December 1995.
   - PO 154 — East and South Field Borrow Areas Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, March, 1996 ("EFBA" and "SFBA" On-Site Locations).
     Flyash Piles and South Field Waste Units Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, February, 1996 ("SF/SFBA" On-Site Locations).
8. See Section 5 for statistical summary of index properties data.

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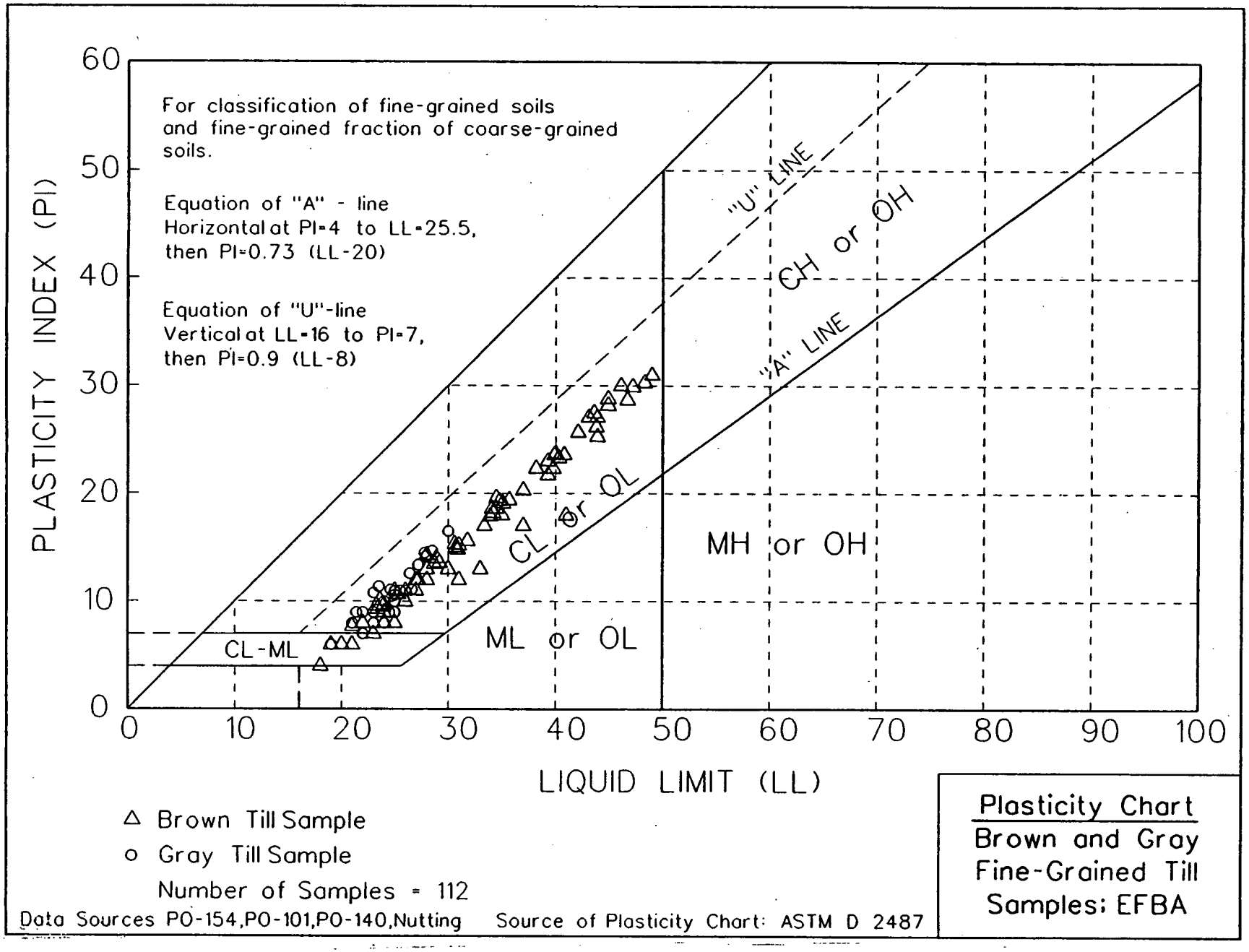

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Figure 4-1 - Plasticity Chart, East Field Borrow Area, Brown and Gray Fine-grained Till Samples

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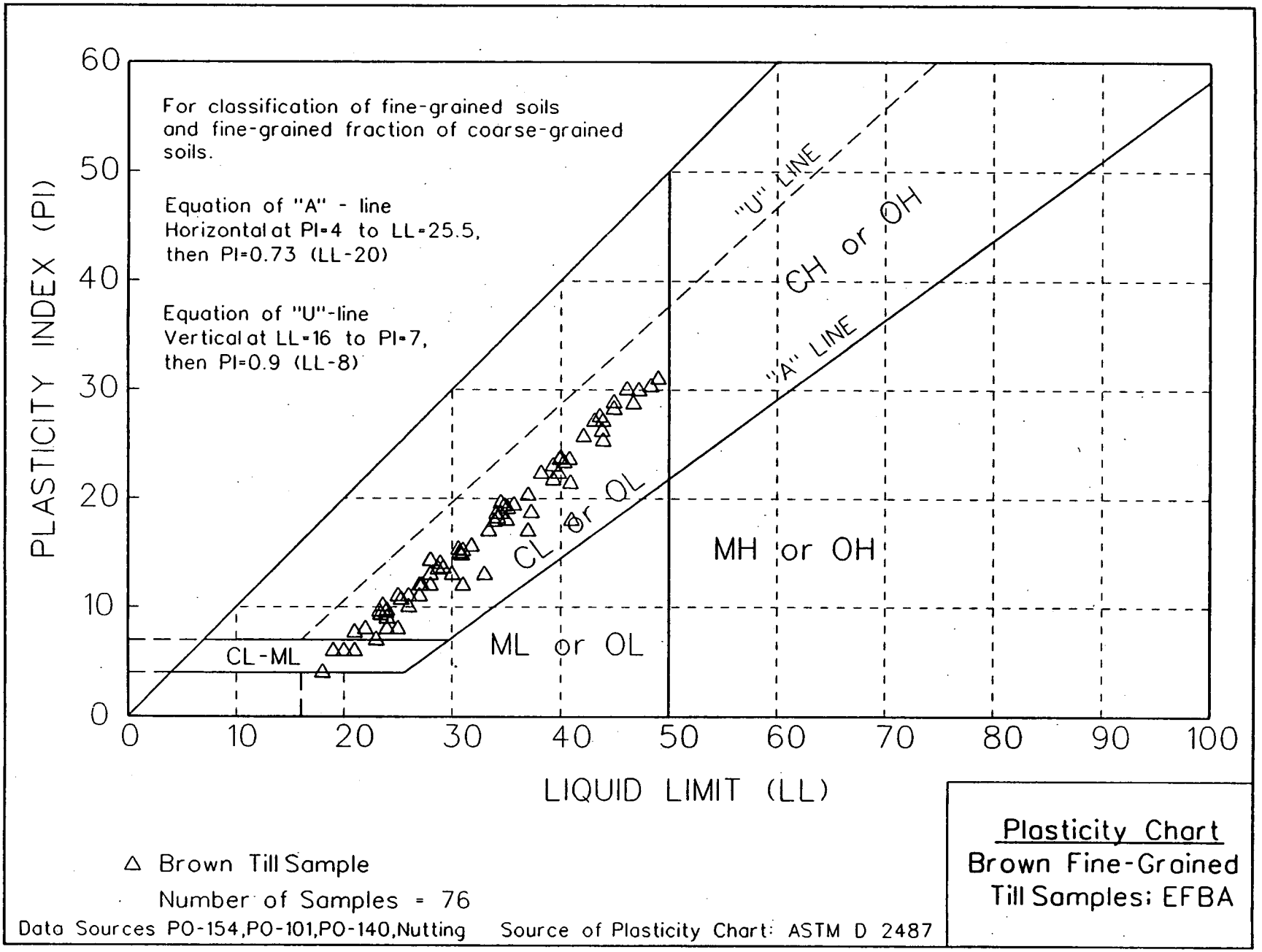

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Figure 4-2 - Plasticity Chart, East Field Borrow Area, Brown Fine-grained Till Samples

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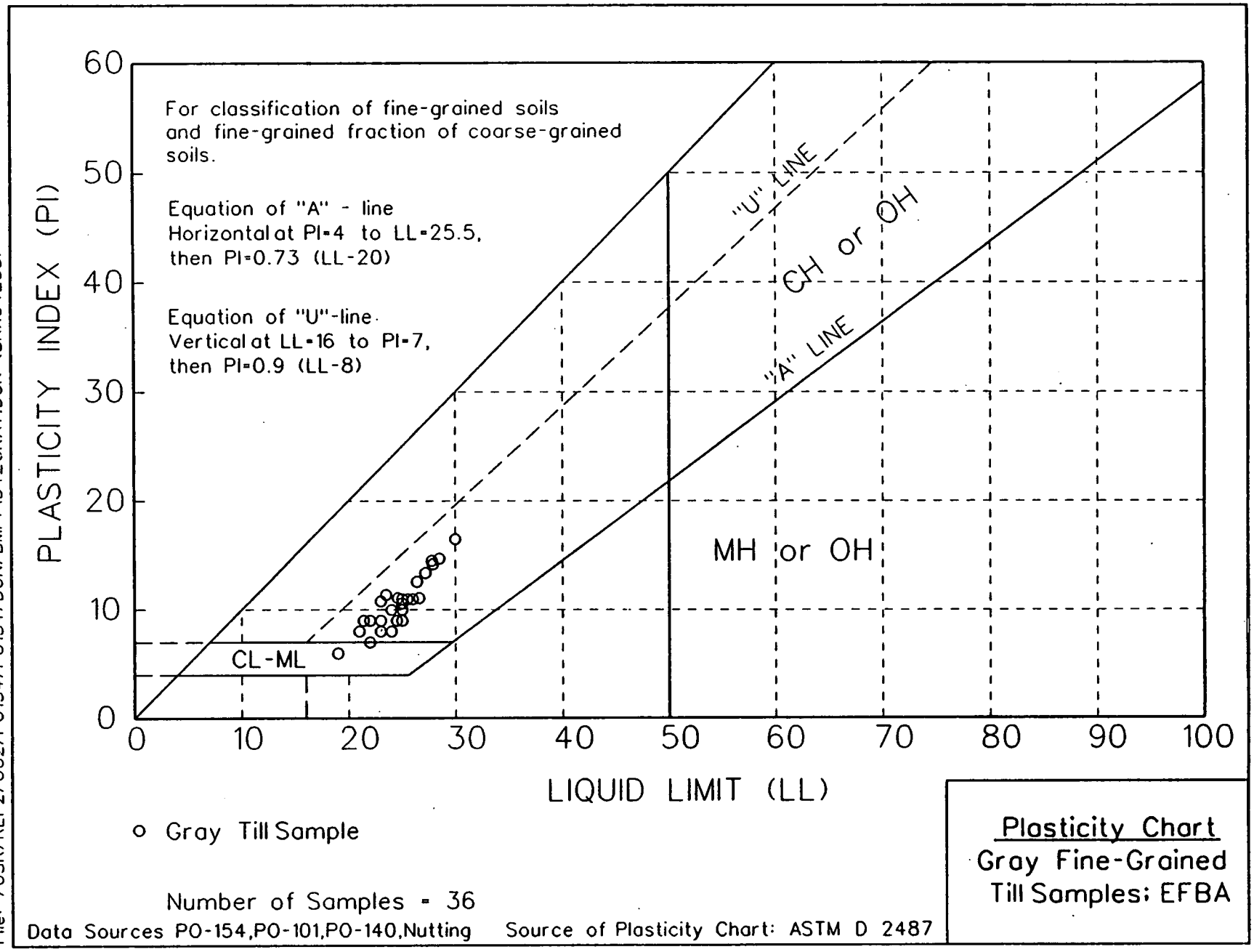

Figure 4-3 - Plasticity Chart, East Field Borrow Area, Gray Fine-grained Till Samples

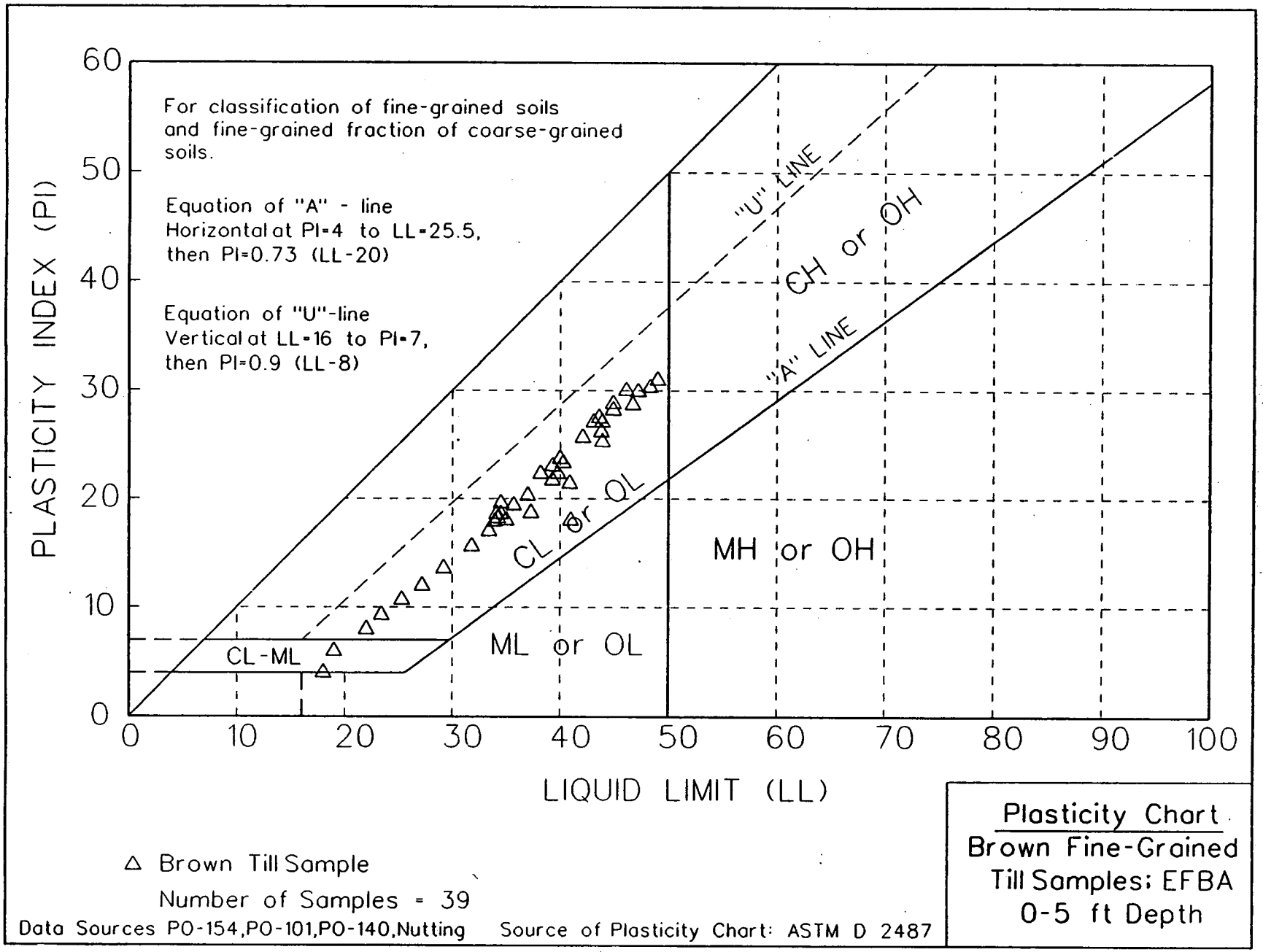

Figure 4-4 - Plasticity Chart, East Field Borrow Area, Brown Fine-grained Till Samples, Depth 0 - 5 feet

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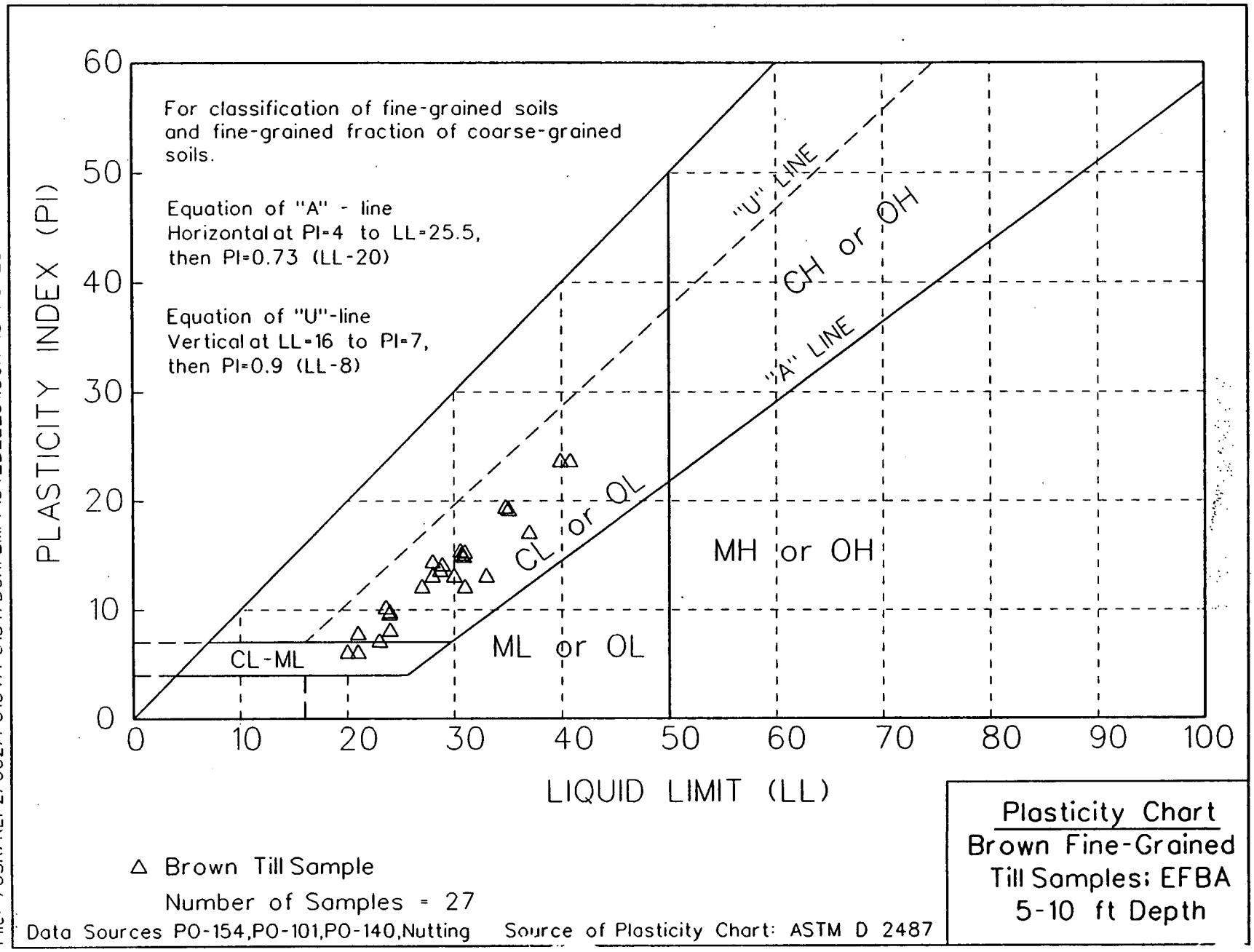

Figure 4-5 - Plasticity Chart, East Field Borrow Area, Brown Fine-grained Till Samples, Depth 5 - 10 feet

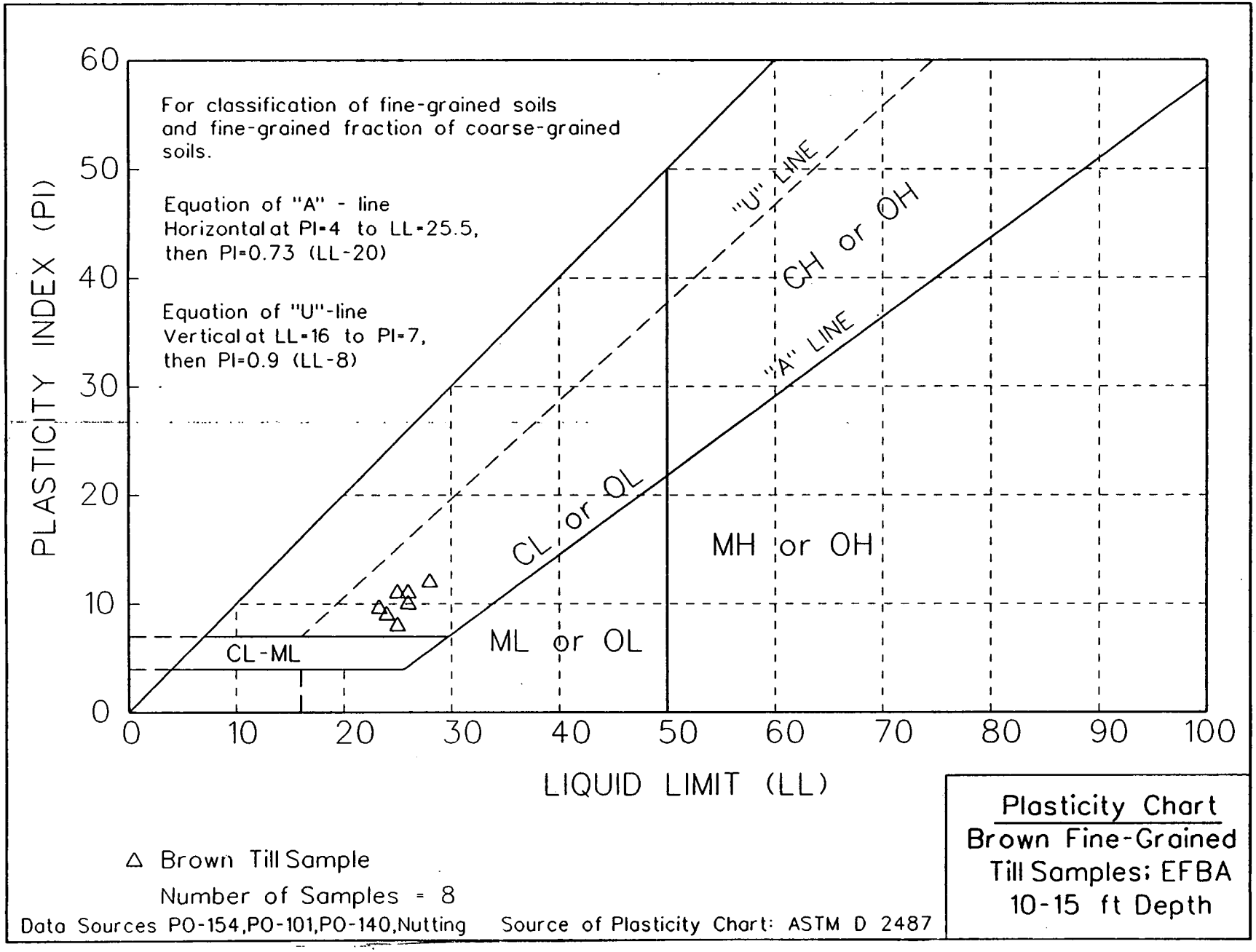

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Figure 4-6 - Plasticity Chart, East Field Borrow Area, Brown Fine-grained Till Samples, Depth 10 - 15 feet

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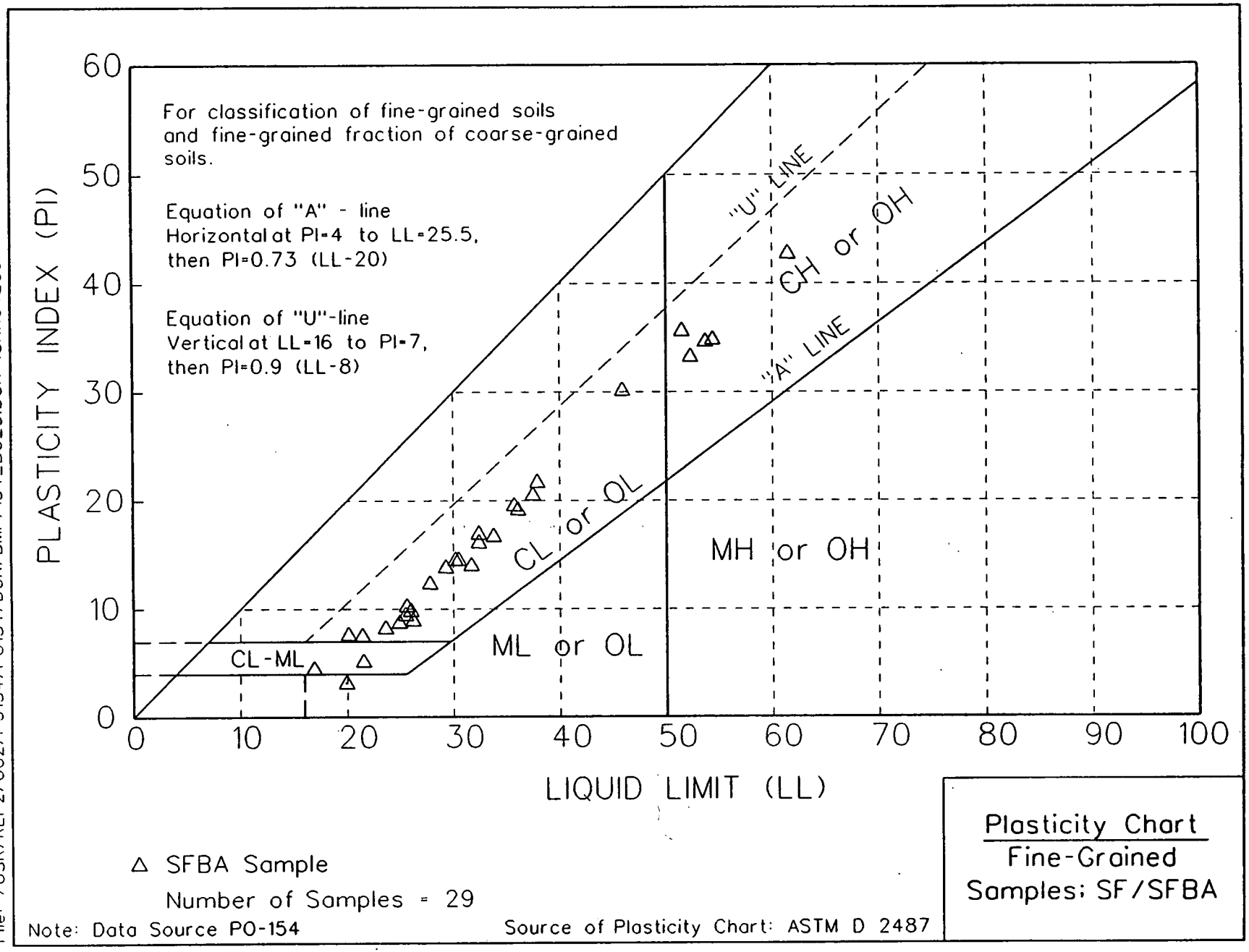

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Figure 4-7 - Plasticity Chart, South Field Borrow Area, Fine-grained Samples

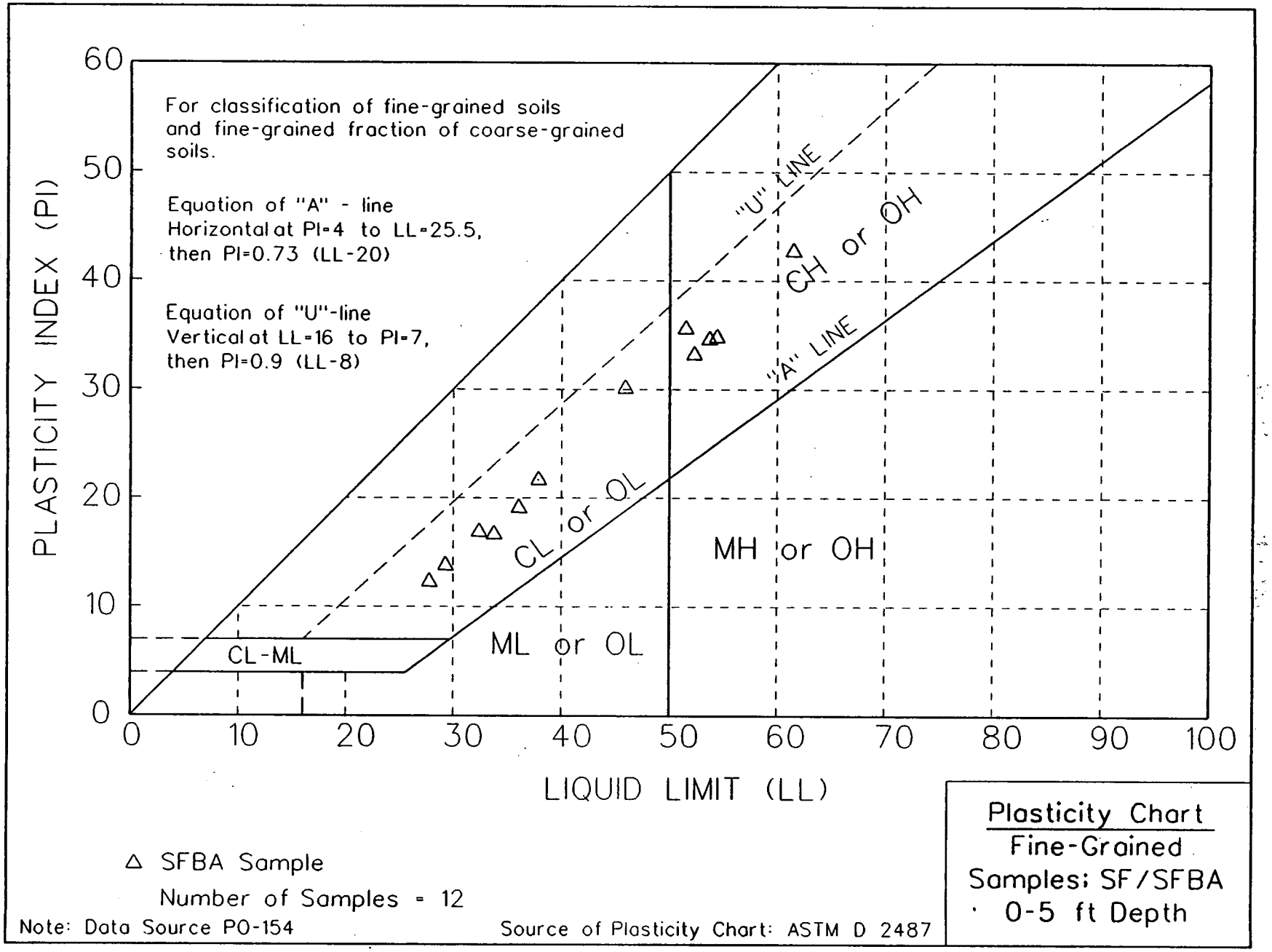

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Figure 4-8 - Plasticity Chart, South Field Borrow Area, Fine-grained Samples, Depth 0 - 5 feet

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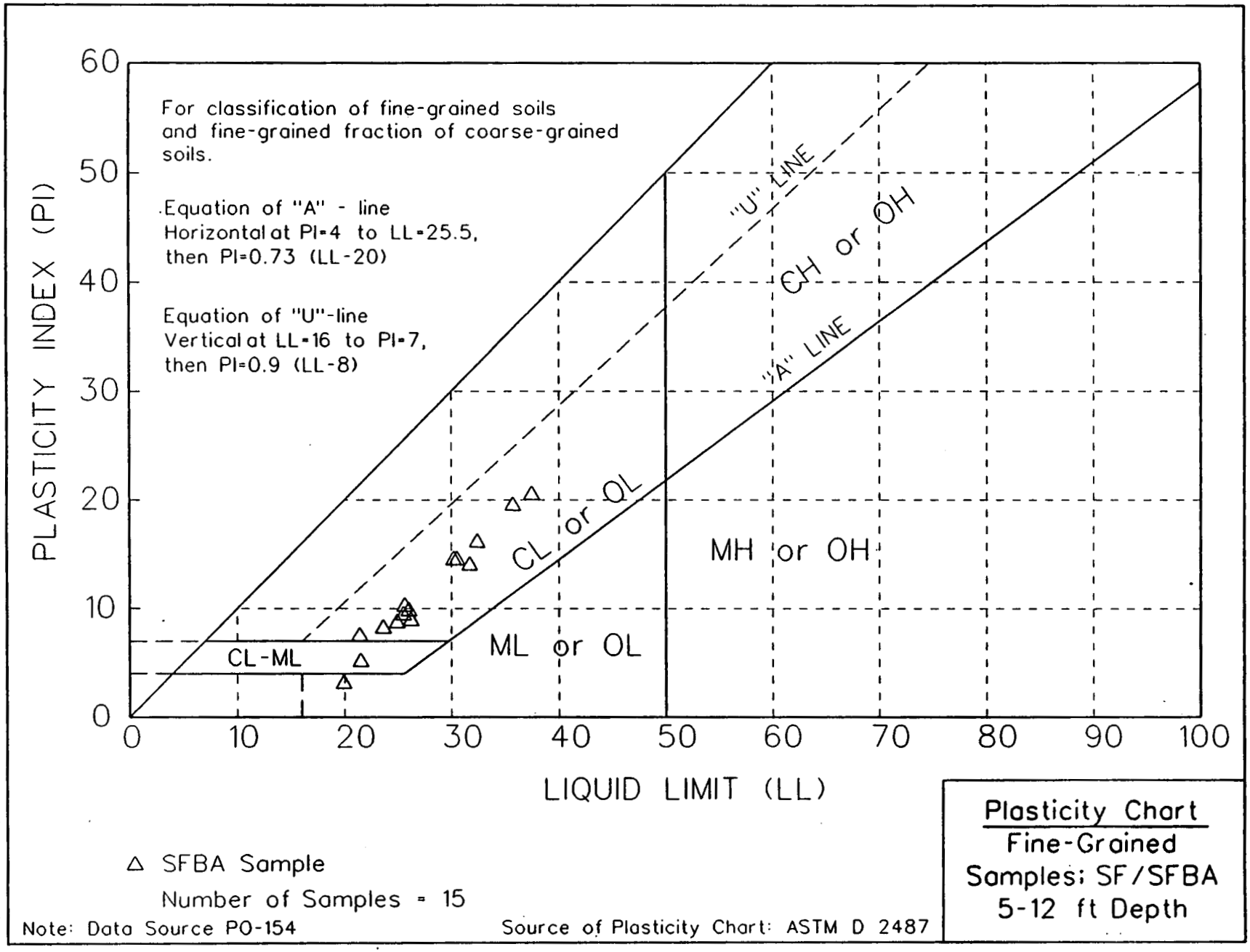

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Figure 4-9 - Plasticity Chart, South Field Borrow Area, Fine-grained Samples, Depth 5 - 12 feet

Table 4-3 summarizes the natural unit weight of soils at the EFBA and SFBA. These data come from measurements on undisturbed samples taken during the PO-154 investigation and prior investigations.

During the PO-154 investigation, samples of topsoil were collected at various boring locations for organic content tests (ASTM D 2974). Table 4-4 contains the results of the these tests. Soil samples were also tested for chloride and sulfate concentrations to provide data for designers to evaluate potential reactivity of soils with underground concrete structures. Table 4-5 summarizes these test results.

Modal particle diameter tests were performed on soil samples to provide data for air modeling. The tests were performed by FERMCO at the on-site laboratory as part of the PO-154 investigation. The procedure used for the modal diameter tests was adapted from a field procedure presented in the United States Environmental Protection Agency (US 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 collected during the PO-154 field investigation from shallow borings/excavations to provide information to evaluate the compaction characteristics of the soils, and to determine the maximum dry density and the optimum moisture content of the soils 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 4-6 summarizes the optimum moisture contents and maximum dry densities from Standard Proctor compaction tests on bulk samples tested during the PO-154 investigation. Also listed on the table are Standard Proctor compaction tests results from the prior PO-101 investigation at the EFBA. Table 4-7 contains the results of a modified Proctor compaction test from the prior PO-101 investigation at the EFBA. Appendix E contains compaction curves for the samples tested.

Figure 4-10 presents the family of Standard Proctor compaction curves for the Brown Till from the EFBA tested for the PO-154 investigation. These soils come from depths of about 1.5 to 10 feet. Figure 4-11 shows the results of Standard Proctor compaction tests for two samples from the EFBA of the Gray Till taken near the brown till/gray till interface. Figure 4-12 presents compaction curves for samples from the SFBA. The figures show the range of expected optimum moisture contents and maximum dry densities for the shallow soils. In general, the samples with higher sand contents (i.e., the sandy clays) had higher achievable MDDs at lower optimum moisture contents than the soils with less sand (i.e., the lean clays and lean clays with sand). This variability is an important consideration when developing moisture-density-permeability specifications for critical compacted clay barriers.

Table 4-3 - Summary of Unit Weight and Percent Saturation, Undisturbed Samples

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	Specimen ID	Test Type	Moisture Content Specimen (%)	Moisture Content Average (%)	Wet Density Specimen (pcf)	Wet Density Average (pcf)	Dry Density Specimen (pcf)	Dry Density Average (pcf)	Percent Saturation Specimen (%)	Percent Saturation Average (%)	Specific Gravity	Data Source
EFBA	G2-148	410573	DEN	7.5	9.5	Yellowish Brown	Brown Till	Lean Clay with Sand	CL	410573A Stage 1	CU-Stg	18.2		135.7		114.8		100		2.75	PO 154
EFBA	G2-150A	410256	DEN	15.0	17.0	Gray	Gray Till	Sandy Lean Clay	CL	410256 A	UU	14.7		142.7		124.4		100		2.85	PO 154
EFBA	G2-152	410282	ST	12.5	14.5	Olive Brown	Brown Till	Silty, Clayey Sand with Gravel	SC-SM	410282A Stage 1	CU-Stg	11.5		146.3		131.2		100		2.73	PO 154
EFBA	G2-153	410287	ST	5.0	7.0	Light Olive Brown	Brown Till	Sandy Lean Clay	CL	410287	UU	13.1		143.6		127.0		100		2.74	PO 154
EFBA	G2-154	410171	ST	10.0	12.0	Brown / Greenish Gray	Gray Till	Sandy Lean Clay	CL	410171 B	UU	11.4		142.5		128.0		96		2.72	PO 154
EFBA	G2-155	410175	ST	7.5	9.5	Light Olive Brown	Brown Till	Sandy Lean Clay	CL	410175 A	UU	12.2		143.5		127.8		100		2.73	PO 154
SFBA	G2-156	410131	ST	7.5	9.5	Yellowish Brown	Brown Till	Lean Clay	CL	410131 A	CU	21.6		132.3		108.8		100		2.72	PO 154
										410131 B	CU	23.1		130.9		106.4		100		2.72	PO 154
										410131 C	CU	24.6		128.7		103.3		100		2.72	PO 154
													23.1		130.6		106.2		100		Average
SFBA	G2-157	410140	ST	7.5	9.5	Greenish Gray	Gray Till	Lean Clay	CL	410140	UU	23.5		133.0		107.7		100		2.69	PO 154
EFBA	1745	3250	ST	6.0	9.0	Yellowish Brown	Brown Till	Silty Clay with Sand	CL-ML		CU	17.9		138.3		117.3		100		2.80	Nutting
											CU	14.4		140.8		123.1		100		2.80	Nutting
											CU	14.1		143.4		125.7		100		2.80	Nutting
											CON_s	15.8		134.3		116.0		87		2.80	Nutting
											P_c	15.1		131.0		113.8		86		2.80	Nutting
													15.5		137.6		119.2		95		Average
EFBA	1748	3251	ST	9.0	12.0	Brown	Brown Till	Clayey Gravel with Sand	GC		CU	9.7		143.6		134.9		100		2.79	Nutting
											CU	11.2		146.2		131.5		100		2.79	Nutting
											CU	12.0		144.6		129.1		100		2.79	Nutting
											CON_s	11.1		136.8		123.1		75		2.79	Nutting
											P_c	11.1		142.4		128.2		96		2.79	Nutting
													11.0		142.7		129.4		94		Average
EFBA	1747	3252	ST	12.0	14.5	Yellowish Brown	Gray Till	Clayey Gravel with Sand	GC		CU	13.4		142.2		125.4		100		2.74	Nutting
											CU	13.6		143.5		126.3		100		2.74	Nutting
											CU	12.4		143.9		128.0		100		2.74	Nutting
											CON_s	13.7		134.5		118.3		84		2.74	Nutting
											P_c	21.4		138.8		114.3		100		2.74	Nutting
													14.9		140.6		122.5		97		Average
EFBA	G2-201	G2-201 / 4	ST	7.5	9.5	Yellowish Brown	Brown Till	Lean Clay	CL	4A	UW	15.5		136.5		118.2		98		2.73	PO 101
EFBA	G2-201	G2-201 / 2	ST	2.5	4.5	Dark Yellowish Brown	Brown Till	Lean Clay	CL	2A	CU	20.4		130.2		108.5		99		2.70	PO 101
										2B	CU	17.7		120.9		102.8		75		2.70	PO 101
										2C	CU	18.2		119.4		101.1		74		2.70	PO 101
													18.8		123.5		104.1		83		Average
EFBA	G2-201	G2-201 / 10	ST	22.5	24.5	Dark Gray	Gray Till	Sandy Lean Clay	CL	10A	CU	12.6		143.7		127.6		100		2.75	PO 101
										10B	CU	13.0		143.4		126.9		100		2.75	PO 101
										10C	CU	13.8		142.4		125.2		100		2.75	PO 101
													13.1		143.2		126.6		100		Average
EFBA	G2-202	G2-202 / 4	ST	7.5	9.5	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	4A	CU	14.2		139.6		122.3		98		2.81	PO 101
										4B	CU	14.1		142.4		124.8		92		2.81	PO 101
													14.2		141.0		123.6		95		Average
EFBA	G2-203	G2-203 / 8	ST	17.5	19.5	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	8B	P	16.7		136.6		118.8		100		2.74	PO 101
EFBA	G2-203	G2-203 / 10	ST	22.5	24.5	Dark Gray	Gray Till	Sandy Lean Clay	CL	10A	CON_s	14.0		139.5		122.4		93		2.79	PO 101
EFBA	G2-204	G2-204 / 4	ST	7.5	9.5	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	4A	CON_s	14.2		139.2		122.0		96		2.74	PO 101
EFBA	G2-204	G2-204 / 6	ST	12.5	14.5	Dark Gray	Gray Till	Lean Clay with Sand	CL	6C	CU	12.5		142.9		127.0		100		2.76	PO 101
										6B	CU	12.9		144.0		127.6		100		2.76	PO 101
										6A	CU	12.7		145.9		129.5		97		2.76	PO 101
													12.7		144.3		128.0		99		Average
EFBA	G2-204	G2-204 / 10	ST	22.5	24.5	Dark Gray	Gray Till	Sandy Lean Clay	CL	10B	P	12.1		144.3		128.7		96		2.78	PO 101
EFBA	G2-205	G2-205 / 2	ST	2.5	4.5	Dark Yellowish Brown	Brown Till	Lean Clay	CL	2B	P	11.3		138.3		124.2		87		2.68	PO 101
EFBA	G2-205	G2-205 / 8	ST	17.5	19.5	Dark Gray	Gray Till	Sandy Lean Clay	CL	8A	CU	12.6		144.4		128.2		100		2.77	PO 101
										8B	CU	13.0		143.1		126.6		99		2.77	PO 101
										8C	CU	12.2		143.3		127.7		95		2.77	PO 101
													12.6		143.6		127.5		98		Average
EFBA	G2-206	G2-206 / 2	ST	2.5	4.5	Yellowish Brown	Brown Till	Lean Clay with Sand	CL	2A	CON_s	11.4		122.8		110.2		56		2.76	PO 101
EFBA	G2-206	G2-206 / 4	ST	7.5	9.5	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	4A	P	13.7		138.5		121.8		92		2.75	PO 101
EFBA	G2-206	G2-206 / 6	ST	12.5	14.5	Yellowish Brown	Brown Till	Lean Clay with Sand	CL	6A	UW	11.5		146.0		130.9		100		2.76	PO 101
EFBA	G2-206	G2-206 / 10	ST	22.5	24.5	Dark Gray	Gray Till	Sandy Lean Clay	CL	10A	CU	12.7		144.4		128.1		100		2.73	PO 101
EFBA	G2-134	405140	DEN	12.0	14.0	Dark Greenish Gray	Gray Till	Sandy Lean Clay	CL	405140A	UU	12.6		143.7		127.6		100		2.72	PO 140

Notes:

1. On-Site Location:
   - EFBA East Field Borrow Area
   - SFBA South Field Borrow Area
2. Sample Type:
   - ST Shelby Tube Sample (ASTM D 1587)
   - DEN Denison Core Barrrel Sample
3. Test Type:
   - CON_s Consolidation with time readings, (ASTM D 2435), specimen at saturated conditions
   - CU Triaxial Shear, Consolidated, Undrained with Pore Pressure Measurements (ASTM D 4767), Three Points
   - CU-Stg Triaxial Shear, Consolidated, Undrained with Pore Pressure Measurements (ASTM D 4767), Staged Test
   - P Triaxial, Back-Pressure, Permeability (ASTM D 5084)
   - P_c Rigid Wall, Constant Head Permeability (ASTM D 2434)
   - UU Triaxial Shear, Unconsolidated, Undrained ASTM D 2850
   - UW Unit Weight (ASTM D 2937)
4. Data Source:
   - Nutting H.C. Nutting Technical Report 5.1A, Engineering Evaluation Report for On-Site Disposal, U.S. DOE Fernald Field Office, June 1993 (H.C. Nutting Laboratory Data).
   - PO 101 On-Site Disposal Cell Pre-Design Activities Engineering Report, PARSONS Project Order 101, April 1994.
   - PO 140 Geotechnical Investigation On-Site Disposal Facility, Soil Investigation Data Report, PARSONS Project Order 140, December 1995.
   - PO 154 East and South Field Borrow Areas Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, March, 1996.

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Table 4-4 - 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
EFBA	G2-SB-50	409809	Bulk	0.5	1.0	14.9	3.1	PO 154
EFBA	G2-SB-50	409810	Bulk	1.0	1.5	34.1	0.8	PO 154
EFBA	G2-SB-51	411162	Bulk	0.5	1.0	20.4	2.6	PO 154
EFBA	G2-SB-51	411163	Bulk	1.0	1.5	20.9	2.9	PO 154
EFBA	G2-SB-52	410001	Bulk	0.5	1.0	24.2	2.7	PO 154
EFBA	G2-SB-52	410002	Bulk	1.0	1.5	24.1	2.3	PO 154
EFBA	G2-SB-53	409813	Bulk	0.5	1.0	14.9	3.0	PO 154
EFBA	G2-SB-53	409814	Bulk	1.0	1.5	21.0	2.5	PO 154
EFBA	G2-SB-54	410005	Bulk	0.5	1.0	11.9	2.5	PO 154
EFBA	G2-SB-54	410006	Bulk	1.0	1.5	13.0	2.6	PO 154
EFBA	G2-SB-55	409829	Bulk	0.5	1.0	14.6	2.8	PO 154
EFBA	G2-SB-55	409830	Bulk	1.0	1.5	18.6	3.2	PO 154
EFBA	G2-SB-56	410009	Bulk	0.5	1.0	21.4	2.5	PO 154
EFBA	G2-SB-56	410010	Bulk	1.0	1.5	21.0	2.4	PO 154
EFBA	G2-SB-57	409821	Bulk	0.5	1.0	15.9	2.8	PO 154
EFBA	G2-SB-57	409822	Bulk	1.0	1.5	18.7	2.6	PO 154
EFBA	G2-SB-58	410013	Bulk	0.5	1.0	21.5	2.3	PO 154
EFBA	G2-SB-58	410014	Bulk	1.0	1.5	24.3	3.0	PO 154
EFBA	G2-SB-59	409817	Bulk	0.5	1.0	19.3	2.3	PO 154
EFBA	G2-SB-59	409818	Bulk	1.0	1.5	23.9	2.8	PO 154
EFBA	G2-SB-60	410017	Bulk	0.5	1.0	22.4	2.0	PO 154
EFBA	G2-SB-60	410018	Bulk	1.0	1.5	19.9	2.4	PO 154
EFBA	G2-SB-61	409825	Bulk	0.5	1.0	16.8	2.7	PO 154
EFBA	G2-SB-61	409826	Bulk	1.0	1.5	20.8	2.8	PO 154
EFBA	G2-SB-62	410021	Bulk	0.5	1.0	18.5	2.6	PO 154
EFBA	G2-SB-62	410022	Bulk	1.0	1.5	20.8	2.4	PO 154
EFBA	G2-SB-63	410025	Bulk	0.5	1.0	21.1	2.5	PO 154
EFBA	G2-SB-63	410026	Bulk	1.0	1.5	22.8	2.3	PO 154
EFBA	G2-SB-64	409833	Bulk	0.5	1.0	15.5	2.4	PO 154
EFBA	G2-SB-64	409834	Bulk	1.0	1.5	21.6	2.7	PO 154
EFBA	G2-SB-65	410029	Bulk	0.5	1.0	21.0	2.4	PO 154
EFBA	G2-SB-65	410030	Bulk	1.0	1.5	22.4	2.4	PO 154
EFBA	G2-SB-66	409837	Bulk	0.5	1.0	11.7	2.7	PO 154
EFBA	G2-SB-66	409838	Bulk	1.0	1.5	19.8	2.7	PO 154
EFBA	G2-SB-67	410033	Bulk	0.5	1.0	18.6	2.4	PO 154
EFBA	G2-SB-67	410034	Bulk	1.0	1.5	19.6	2.9	PO 154
EFBA	G2-SB-68	409841	Bulk	0.5	1.0	23.1	3.6	PO 154
EFBA	G2-SB-68	409842	Bulk	1.0	1.5	29.3	4.7	PO 154
EFBA	G2-SB-69	410037	Bulk	0.5	1.0	13.9	2.0	PO 154
EFBA	G2-SB-69	410038	Bulk	1.0	1.5	18.1	2.2	PO 154
EFBA	G2-SB-70	409845	Bulk	0.5	1.0	18.4	1.8	PO 154
EFBA	G2-SB-70	409846	Bulk	1.0	1.5	17.5	1.4	PO 154
EFBA	G2-SB-71	410041	Bulk	0.5	1.0	16.1	2.3	PO 154
EFBA	G2-SB-71	410042	Bulk	1.0	1.5	20.5	2.3	PO 154
EFBA	G2-SB-72	409849	Bulk	0.5	1.0	23.8	4.0	PO 154
EFBA	G2-SB-72	409850	Bulk	1.0	1.5	22.0	3.6	PO 154
EFBA	G2-SB-73	409853	Bulk	0.5	1.0	21.5	2.8	PO 154
EFBA	G2-SB-73	409854	Bulk	1.0	1.5	21.6	2.2	PO 154
EFBA	G2-SB-74	409856	Bulk	0.5	1.0	22.3	2.4	PO 154
EFBA	G2-SB-74	409857	Bulk	1.0	1.5	21.7	1.9	PO 154
EFBA	G2-SB-75	410045	Bulk	0.5	1.0	20.7	2.7	PO 154
EFBA	G2-SB-75	410046	Bulk	1.0	1.5	23.1	2.8	PO 154
EFBA	G2-SB-76	409860	Bulk	0.5	1.0	19.4	2.3	PO 154
EFBA	G2-SB-76	409861	Bulk	1.0	1.5	22.5	2.6	PO 154
EFBA	G2-SB-77	410049	Bulk	0.5	1.0	16.8	2.6	PO 154
EFBA	G2-SB-77	410050	Bulk	1.0	1.5	20.2	1.8	PO 154
EFBA	G2-SB-78	409863	Bulk	0.5	1.0	18.2	2.7	PO 154
EFBA	G2-SB-78	409864	Bulk	1.0	1.5	20.1	1.9	PO 154
EFBA	G2-SB-79	410052	Bulk	0.5	1.0	21.2	4.0	PO 154
EFBA	G2-SB-79	410053	Bulk	1.0	1.5	18.3	2.4	PO 154
EFBA	G2-SB-80	409867	Bulk	0.5	1.0	16.3	2.0	PO 154
EFBA	G2-SB-80	409868	Bulk	1.0	1.5	18.0	1.7	PO 154
EFBA	G2-SB-81	409871	Bulk	0.5	1.0	16.8	2.6	PO 154
EFBA	G2-SB-81	409872	Bulk	1.0	1.5	15.8	1.9	PO 154
SFBA	G2-SB-82	409875	Bulk	0.5	1.0	9.3	2.6	PO 154
SFBA	G2-SB-82	409876	Bulk	1.0	1.5	12.3	1.7	PO 154
SFBA	G2-SB-83	410056	Bulk	0.5	1.0	17.4	2.3	PO 154
SFBA	G2-SB-83	410057	Bulk	1.0	1.5	20.4	2.2	PO 154
SFBA	G2-SB-84	409879	Bulk	0.5	1.0	20.6	1.6	PO 154
SFBA	G2-SB-84	409880	Bulk	1.0	1.5	19.9	2.2	PO 154
SFBA	G2-SB-85	410060	Bulk	0.5	1.0	20.9	2.8	PO 154
SFBA	G2-SB-85	410061	Bulk	1.0	1.5	26.3	2.4	PO 154
SFBA	G2-SB-86	409883	Bulk	0.5	1.0	17.5	1.8	PO 154
SFBA	G2-SB-86	409884	Bulk	1.0	1.5	20.9	1.5	PO 154
SFBA	G2-SB-87	410064	Bulk	0.5	1.0	25.3	2.5	PO 154
SFBA	G2-SB-87	410065	Bulk	1.0	1.5	26.2	2.3	PO 154
SFBA	G2-SB-88	409887	Bulk	0.5	1.0	23.0	2.3	PO 154
SFBA	G2-SB-88	409888	Bulk	1.0	1.5	24.5	2.5	PO 154
SFBA	G2-SB-89	410068	Bulk	0.5	1.0	14.2	1.0	PO 154
SFBA	G2-SB-89	410069	Bulk	1.0	1.5	18.7	1.1	PO 154
SFBA	G2-SB-90	409891	Bulk	0.5	1.0	16.7	2.2	PO 154
SFBA	G2-SB-90	409892	Bulk	1.0	1.5	18.5	2.0	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/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

Notes:

1. On-Site Location: EFBA East Field Borrow Area; SFBA South Field Borrow Area; SF/SFBA South Field (Waste Unit) / South Field Borrow Area
2. Sample Type: Bulk Bulk Sample
3. Total organic content determined by ASTM D 2974.
4. Data Source: PO 154 East and South Field Borrow Areas Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, March, 1996, ("EFBA" and "SFBA" On-Site Locations). Flyash Piles and South Field Waste Units Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, February, 1996 ("SF/SFBA" On-Site Locations).

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359

Table 4-5 - Summary of Chloride and Sulfate Concentrations

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	Chloride (mg/kg Dry)	Sulfate (mg/kg Dry)	Data Source
EFBA	G2-SB-50	409811	Bulk	1.5	5.0	Dark Yellowish Brown	Brown Till	Lean Clay with Sand	CL	15	79	PO 154
EFBA	G2-SB-53	409815	Bulk	1.5	5.0	Yellowish Brown	Brown Till	Lean Clay	CL	35	42	PO 154
EFBA	G2-SB-55	409832	Bulk	5.0	10.0	Yellowish Brown	Brown Till	Lean Clay with Sand and Gravel (V)	NT	28	35	PO 154
EFBA	G2-SB-57	409823	Bulk	1.5	5.0	Dark Yellowish Brown	Brown Till	Lean Clay	CL	12	62	PO 154
EFBA	G2-SB-61	409828	Bulk	5.0	10.0	Dark Yelowish Brown	Brown Till	Sandy Sity Clay with Gravel (V)	NT	27	46	PO 154
EFBA	G2-SB-64	409835	Bulk	1.5	5.0	Light Olive Brown	Brown Till	Lean Clay with Sand	CL	13	77	PO 154
EFBA	G2-SB-65	410032	Bulk	5.0	10.0	Light Olive Brown	Brown Till	Lean Clay with Gravel (V)	NT	20	22	PO 154
EFBA	G2-SB-67	410035	Bulk	1.5	5.0	Dark Yellowish Brown	Brown Till	Lean Clay with Sand	CL	11	28	PO 154
EFBA	G2-SB-69	410039	Bulk	1.5	5.0	Dark Yellowish Brown	Brown Till	Lean Clay with Sand	CL	20	43	PO 154
EFBA	G2-SB-71	410043	Bulk	1.5	5.0	Yellowish Brown	Brown Till	Lean Clay	CL	< 6	38	PO 154
EFBA	G2-SB-72	409851	Bulk	1.5	5.0	Light Olive Brown	Brown Till	Lean Clay	CL	34	35	PO 154
EFBA	G2-SB-73	409855	Bulk	1.5	6.0	Dark Yellowish Brown	Brown Till	Lean Clay with Sand	CL	6	39	PO 154
EFBA	G2-SB-75	410047	Bulk	1.5	5.0	Dark Yellowish Brown	Brown Till	Lean Clay with Sand	CL	19	38	PO 154
EFBA	G2-SB-77	410051	Bulk	1.5	6.0	Yellowish Brown	Brown Till	Lean Clay	CL	10	48	PO 154
EFBA	G2-SB-79	410054	Bulk	1.5	5.0	Light Olive Brown	Brown Till	Lean Clay with Sand	CL	8	37	PO 154
EFBA	G2-SB-81	409873	Bulk	1.5	5.0	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	16	< 20	PO 154
SFBA	G2-SB-82	409878	Bulk	5.0	10.0	Yellowish Brown	Brown Till	Lean Clay	CL	8	25	PO 154
SFBA	G2-SB-83	410058	Bulk	1.5	5.0	Yellowish Brown	Brown Till	Lean Clay	CL	6	23	PO 154
SFBA	G2-SB-84	409882	Bulk	5.0	10.0	Yellowish Brown	Brown Till	Lean Clay	CL	8	160	PO 154
SFBA	G2-SB-85	410062	Bulk	1.5	5.0	Light Olive Brown	Brown Till	Fat Clay with Sand	CH	8	67	PO 154
SFBA	G2-SB-86	409886	Bulk	5.0	10.0	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	26	45	PO 154
SFBA	G2-SB-87	410067	Bulk	5.0	10.0	Light Olive Brown	Stratified Glacial Deposits	Silt, Lean Clay, Sand (V)	NT	20	230	PO 154
SFBA	G2-SB-88	409889	Bulk	1.5	5.0	Light Olive Brown	Brown Till	Fat Clay	CH	< 6	62	PO 154
SFBA	G2-SB-89	410070	Bulk	1.5	5.0	Light Yellowish Brown	Brown Till	Fat Clay	CH	< 6	56	PO 154
SFBA	G2-SB-90	409893	Bulk	1.5	5.0	Dark Yellowish Brown	Stratified Glacial Deposits	Lean Clay with Sand	CL	12	26	PO 154

Notes:

1. On-Site Location: EFBA East Field Borrow Area
   SFBA South Field Borrow Area
2. Chloride concentrations determined by EPA 9251
3. Sulfate concentrations determined by EPA 9038
4. USCS Group Name (V) Visual Classification; not classified from laboratory test data
5. Data Source: PO 154 East and South Field Borrow Areas Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, March, 1996.

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Table 4-6 - Summary of Index Properties and 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
EFBA	G2-SB-50	409811	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	13.5	34.5	14.9	19.6	4.1	17.0	78.9	26.0	2.75	Standard	16.3	114.0	PO 154
EFBA	G2-SB-50	409812	Bulk	5.0	8.4	Brown Till	Lean Clay with Sand	CL	13.2	34.8	15.5	19.3	8.5	20.8	70.7	26.1	2.69	Standard	14.3	119.8	PO 154
EFBA	G2-SB-51	411165	Bulk	5.0	10.0	Brown Till	Sandy Lean Clay with Gravel	CL	12.9	23.6	13.5	10.1	15.5	30.2	54.3	14.4	2.70	Standard	11.6	126.1	PO 154
EFBA	G2-SB-53	409815	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	17.4	43.9	16.8	27.1	4.8	8.6	86.6	29.8	2.72	Standard	16.2	112.8	PO 154
EFBA	G2-SB-55	409831	Bulk	1.5	5.0	Brown Till	Sandy Lean Clay	CL	13.2	25.3	14.6	10.7	8.3	29.9	61.8	17.3	2.80	Standard	12.8	124.0	PO 154
EFBA	G2-SB-57	409823	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	20.5	40.9	19.6	21.4	0.3	5.7	94.0	32.7	2.69	Standard	18.8	109.7	PO 154
EFBA	G2-SB-57	409824	Bulk	5.0	10.0	Brown Till	Sandy Lean Clay with Gravel	CL	14.3	31.0	15.8	15.2	17.3	19.5	63.2	22.5	2.76	Standard	12.8	121.5	PO 154
EFBA	G2-SB-59	409819	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	17.2	37.0	16.7	20.3	9.5	10.9	79.6	26.8	2.69	Standard	16.4	116.5	PO 154
EFBA	G2-SB-61	409827	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	20.5	44.9	16.8	28.2	7.5	9.5	83.0	36.2	2.75	Standard	17.8	108.8	PO 154
EFBA	G2-SB-64	409835	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	14.8	29.2	15.6	13.6	0.4	19.0	80.6	24.8	2.79	Standard	14.3	118.1	PO 154
EFBA	G2-SB-66	409839	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	15.5	34.2	16.0	18.2	3.5	16.3	80.2	26.3	2.68	Standard	15.7	117.5	PO 154
EFBA	G2-SB-68	409843	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	24.7	46.1	16.1	30.0	0.8	12.3	86.9	32.8	2.69	Standard	19.0	109.9	PO 154
EFBA	G2-SB-68	409844	Bulk	5.0	10.0	Brown Till	Lean Clay with Sand	CL	15.3	39.9	16.3	23.6	4.9	18.8	76.3	27.0	2.83	Standard	15.0	116.3	PO 154
EFBA	G2-SB-70	409847	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	21.8	43.9	18.6	25.3	2.3	12.7	85.0	32.6	2.71	Standard	19.6	106.5	PO 154
EFBA	G2-SB-72	409852	Bulk	5.0	10.0	Brown Till	Lean Clay with Sand	CL	25.0	40.8	17.3	23.6	2.4	17.2	80.4	32.1	2.73	Standard	16.3	115.0	PO 154
EFBA	G2-SB-73	409855	Bulk	1.5	6.0	Brown Till	Lean Clay with Sand	CL	24.0	34.1	15.6	18.6	0.0	22.9	77.1	19.8	2.80	Standard	14.5	119.0	PO 154
EFBA	G2-SB-74	409858	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	17.4	42.1	16.4	25.7	2.3	21.0	76.7	30.7	2.76	Standard	17.2	114.0	PO 154
EFBA	G2-SB-76	409862	Bulk	1.5	6.0	Brown Till	Lean Clay	CL	21.5	39.8	17.5	22.3	0.5	4.8	94.7	34.3	2.70	Standard	17.2	110.7	PO 154
EFBA	G2-SB-78	409865	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	22.3	40.0	16.3	23.7	1.2	18.6	80.2	26.0	2.63	Standard	16.4	114.7	PO 154
EFBA	G2-SB-80	409869	Bulk	1.5	5.0	Brown Till	Sandy Lean Clay	CL	22.0	27.2	15.2	12.0	4.6	26.7	68.7	21.3	2.70	Standard	14.1	118.4	PO 154
EFBA	G2-SB-81	409873	Bulk	1.5	5.0	Brown Till	Sandy Lean Clay	CL	13.3	23.4	14.1	9.3	1.5	32.8	65.7	17.3	2.75	Standard	12.3	124.0	PO 154
SFBA	G2-SB-82	409878	Bulk	5.0	10.0	Brown Till	Lean Clay	CL	21.2	30.2	15.7	14.5	0.2	5.9	93.9	25.9	2.78	Standard	15.2	117.0	PO 154
SFBA	G2-SB-84	409882	Bulk	5.0	10.0	Brown Till	Lean Clay	CL	23.0	26.0	16.1	9.8	0.0	2.8	97.2	24.0	2.77	Standard	13.4	120.2	PO 154
SFBA	G2-SB-86	409886	Bulk	5.0	10.0	Brown Till	Sandy Lean Clay	CL	17.4	25.5	16.1	9.4	7.2	31.7	61.1	19.2	2.78	Standard	13.7	120.6	PO 154
SFBA	G2-SB-88	409890	Bulk	5.0	10.0	Brown Till	Lean Clay	CL	24.0	23.6	15.4	8.2	0.3	5.9	93.8	20.4	2.77	Standard	13.8	118.9	PO 154
SFBA	G2-SB-90	409894	Bulk	5.0	10.0	Stratified Glacial Deposits	Sandy Silt	ML	13.7	19.9	16.7	3.2	11.5	27.4	61.1	8.6	2.72	Standard	12.8	120.9	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/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
EFBA	G2-148	410577	Bulk	11.0	16.5	Gray Till	Lean Clay with Sand	CL	16.6	30.0	13.5	16.5	3.6	23.2	73.2	26.0	2.69	Standard	12.7	123.4	PO 154
EFBA	G2-149	410527&410528	Bulk	11.5	16.5	Gray Till	Sandy Lean Clay	CL	12.2	27.8	13.3	14.5	5.3	25.3	69.4	24.9	2.70	Standard	12.2	125.0	PO 154
EFBA	G2-209	G2-209 / Bulk	Bulk	0.0	25.0	Br and Gr Till	Sandy Lean Clay	CL	NT	27.7	13.2	14.5	3.0	27.0	70.0	23.4	2.80	Standard	12.3	122.3	PO 101
EFBA	G2-210	G2-210 / Bulk	Bulk	0.0	25.0	Br and Gr Till	Lean Clay with Sand	CL	NT	27.6	14.1	13.5	3.0	22.0	75.0	20.0	2.76	Standard	12.4	122.3	PO 101
EFBA	G2-201-204	G2-201-204	Bulk	0.0	24.5	Br and Gr Till	Lean Clay with Sand	CL	NT	27.0	15.0	12.0	3.0	25.0	72.0	20.0	2.79	Standard	12.0	122.7	PO 101
EFBA	G2-205-208	G2-205-208	Bulk	0.0	24.5	Br and Gr Till	Sandy Lean Clay	CL	NT	27.0	14.0	13.0	3.0	27.0	70.0	25.0	2.81	Standard	12.3	122.5	PO 101

Notes:

1. On-Site Location:
   - EFBA — East Field Borrow Area
   - SFBA — South Field Borrow Area
   - 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. Boring G2-208 is located approximately 200 feet east of EFBA boundary
5. Data Source:
   - PO 101 — On-Site Disposal Cell Pre-Design Activities Engineering Report, PARSONS Project Order 101, April 1994.
   - PO 154 — East and South Field Borrow Areas Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, March, 1996 ("EFBA" and "SFBA" On-Site Locations).
     Flyash Piles and South Field Waste Units Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, February, 1996 ("SF/SFBA" On-Site Locations).
6. See Section 5 for statistical summary of compaction data.

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Table 4-7 - Summary of Index Properties and Modified 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 (%)	Grain Size Sand (%)	Grain Size Silt and Clay (%)	Grain Size Clay (.002mm) (%)	Specific Gravity	Compaction Method	Opt. Moisture Content (%)	Maximum Dry Density (pcf)	Data Source
EFBA	G2-209	G2-209 / Bulk	Bulk	0.0	25.0	Br and Gr Till	Lean Clay with Sand	CL	NT	27.7	13.2	14.5	3.0	27.0	70.0	23.0	2.80	Modified	10.3	133.6	PO 101

Notes:

1. Sample Type: Bulk — Bulk sample
2. Compaction Method: Modified — Modified Proctor Compactive Effort (ASTM D 1557)
3. NT — Not Tested
4. Data Source: PO 101 — On-Site Disposal Cell Pre-Design Activities Engineering Supplemental Report, PARSONS Project Order 101, July 1994.

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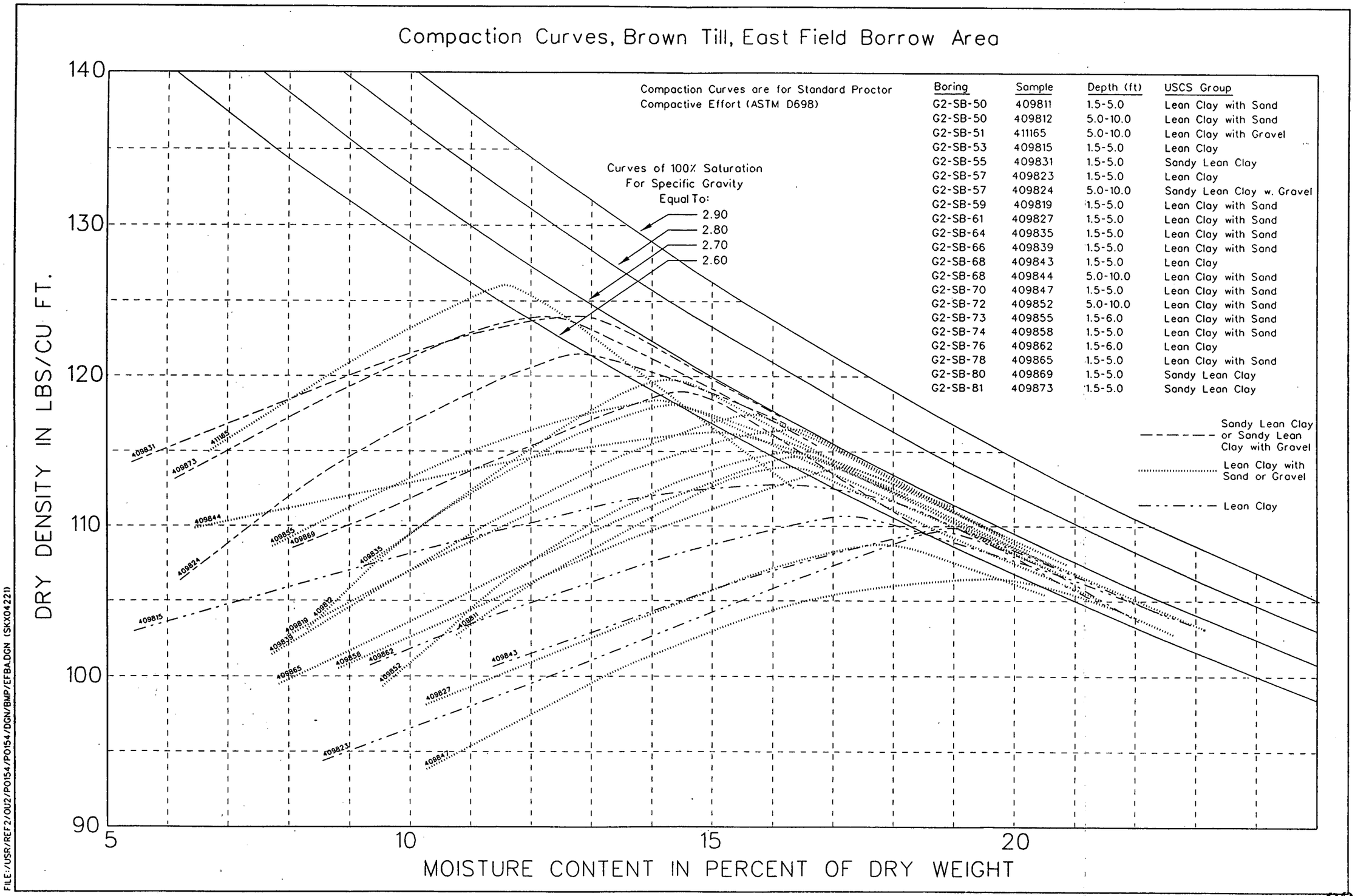

Boring	Sample	Depth (ft)	USCS Group
G2-SB-50	409811	1.5-5.0	Lean Clay with Sand
G2-SB-50	409812	5.0-10.0	Lean Clay with Sand
G2-SB-51	411165	5.0-10.0	Lean Clay with Gravel
G2-SB-53	409815	1.5-5.0	Lean Clay
G2-SB-55	409831	1.5-5.0	Sandy Lean Clay
G2-SB-57	409823	1.5-5.0	Lean Clay
G2-SB-57	409824	5.0-10.0	Sandy Lean Clay w. Gravel
G2-SB-59	409819	1.5-5.0	Lean Clay with Sand
G2-SB-61	409827	1.5-5.0	Lean Clay with Sand
G2-SB-64	409835	1.5-5.0	Lean Clay with Sand
G2-SB-66	409839	1.5-5.0	Lean Clay with Sand
G2-SB-68	409843	1.5-5.0	Lean Clay
G2-SB-68	409844	5.0-10.0	Lean Clay with Sand
G2-SB-70	409847	1.5-5.0	Lean Clay with Sand
G2-SB-72	409852	5.0-10.0	Lean Clay with Sand
G2-SB-73	409855	1.5-6.0	Lean Clay with Sand
G2-SB-74	409858	1.5-5.0	Lean Clay with Sand
G2-SB-76	409862	1.5-6.0	Lean Clay
G2-SB-78	409865	1.5-5.0	Lean Clay with Sand
G2-SB-80	409869	1.5-5.0	Sandy Lean Clay
G2-SB-81	409873	1.5-5.0	Sandy Lean Clay

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Figure 4-10 - Compaction Curves, Brown Till, East Field Borrow Area

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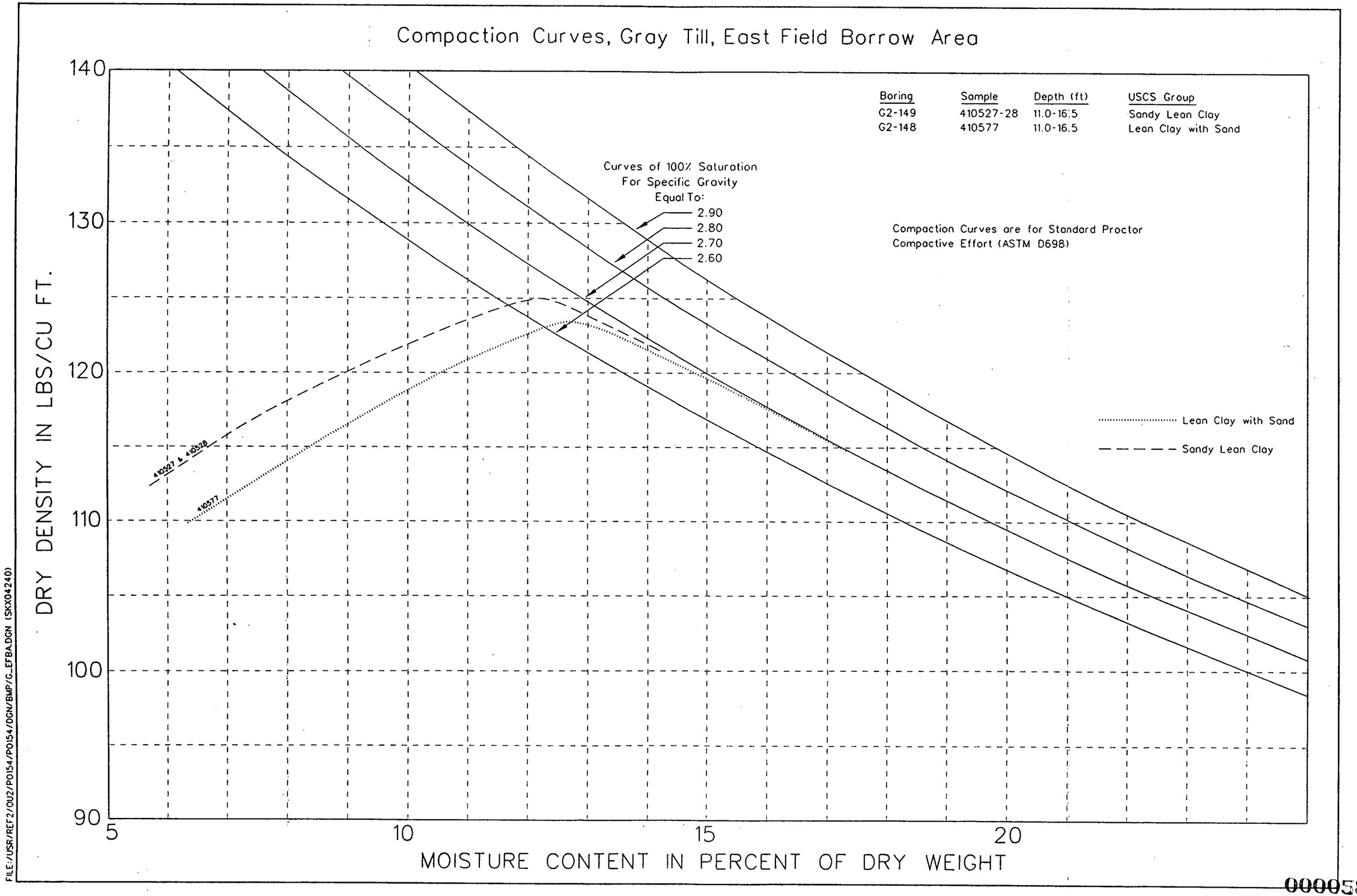

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Figure 4-11 - Compaction Curves, Gray Till, East Field Borrow Area

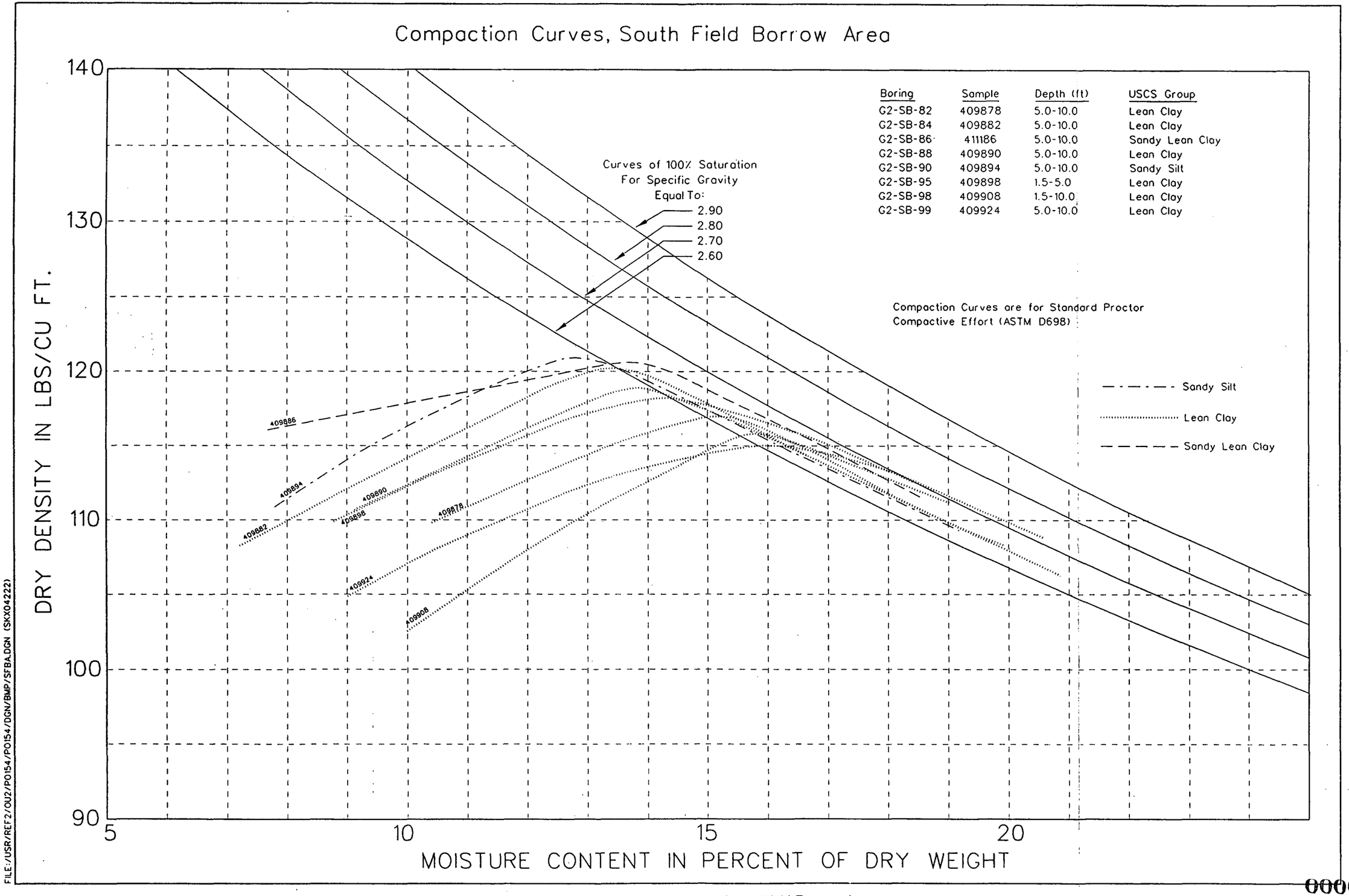

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Figure 4-12 - Compaction Curves, South Field Borrow Area

4.3 Consolidation Tests

Consolidation testing of undisturbed samples was conducted during prior PO-101 investigation of the EFBA. Table 4-8 summarizes the results.

For the PO-154 investigation, consolidation tests (ASTM D 2435) were performed on remolded specimens of soil. Materials for remolding came from bulk samples collected from shallow borings. The MDD and OMC for remolding were based on the results of standard compaction tests performed on material from the bulk sample. Table 4-9 summarizes the results of the tests. Taylor's square root of time method was used to establish time-rate of consolidation data that are reported in Table 4-9. The samples collected from the EFBA were tested at 95 percent relative compaction at a moisture content wet of optimum to provide consolidation data for evaluation of settlement of liner/berm materials placed under similar conditions. Table 4-9 also shows results of a consolidation test performed on material from the SFBA, representing conditions of about 85 percent relative compaction at optimum moisture conditions.

4.4 Strength Tests

Two types of laboratory triaxial compression strength tests were conducted on soils from the EFBA and SFBA. 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.

4.4.1 Strength Tests of Undisturbed Samples

Consolidated, undrained triaxial compression tests with pore pressure measurements (ASTM D 4767) were performed on undisturbed samples from the EFBA. Table 4-10 summarizes the friction angles and cohesion intercepts determined from Mohr circle construction prepared using test results. These results are from the PO-154 investigation, and prior investigations. Unconsolidated, undrained triaxial compression tests (ASTM D 2850) were also performed on undisturbed samples from the EFBA and SFBA collected during the PO-154 investigation. Table 4-11 summarizes the cohesion from friction angle equal zero analyses of test results. Additionally, test results from location G2-134 along the northern perimeter of the EFBA from the disposal facility design investigation (PO-140) are included in the table. The undisturbed test results from G2-134, when compared to the test results of the same soil material remolded to 85 percent and 95 percent relative compaction (see Table 4-12), illustrate the reduction in strength experienced by the till following remolding.

Table 4-8 - Summary of Consolidation Tests, Undisturbed Samples

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	Initial Moisture Content (%)	Wet Density (pcf)	Dry Density (pcf)	Percent Saturation (%)	Coefficient of Consolidation (Cv) Square inch/minute, @ t90 Loading 0.8 (tsf)	1.6 (tsf)	3.2 (tsf)	6.4 (tsf)	Average Overburden Pressure (psf)	Maximum Past Pressure (psf)	Initial Void Ratio	Compression Index (Cc)	Recompression Index (Cr)	Overconsolidation Ratio (OCR)	Data Source
EFBA	1745	3250	ST	6.0	9.0	Brown	Brown Till	Silty Clay with Sand	CL-ML	CONs	15.8	134.3	116.0	87	(3) 0.039	(3) 0.044	(3) 0.041	(3) 0.044	1010	5167	0.51	0.115	0.017	5.1	Nutting
EFBA	1748	3251	ST	9.0	12.0	Brown and Gray	Brown Till	Clayey Gravel with Sand	GC	CONs	11.1	136.8	123.1	75	(3) 0.051	(3) 0.063	(3) 0.048	(3) 0.024	1414	5167	0.41	0.134	0.030	3.7	Nutting
EFBA	1747	3252	ST	12.0	14.5	Gray and Brown	Gray Till	Gravelly Lean Clay with Sand	CL	CONs	13.7	134.5	118.3	84	(3) 0.037	(3) 0.049	(3) 0.027	(3) 0.018	1785	5500	0.45	0.142	0.026	3.1	Nutting
EFBA	G2-203	203/10A	ST	22.5	24.5	Dark Gray	Gray Till	Sandy Lean Clay	CL	CONs	14.0	139.5	122.4	93	0.131	0.145	0.135	0.160	3332	3950	0.23	0.078	0.028	1.2	PO 101
EFBA	G2-204	204/4A	ST	7.5	9.5	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	CONs	14.2	139.2	122.0	96	0.150	0.183	0.181	0.146	1184	4898	0.40	0.084	0.023	1.7	PO 101
EFBA	G2-206	206/2A	ST	2.5	4.5	Yellowish Brown	Brown Till	Lean Clay with Sand	CL	CONs	11.4	122.8	110.2	56	0.212	0.217	0.208	0.197	429	1514	0.56	0.141	0.038	3.5	PO 101

Notes:

1. Sample Type: ST Shelby Tube Sample (ASTM D 1587)
2. Test Type: CONs Consolidation with time readings. ASTM D 2435, undisturbed specimen at saturated conditions
3. Cv values are t50 values with loadings of 2, 4, 6, and 8 tsf respectively
4. Data Source: PO 101 On-Site Disposal Cell Pre-Design Activities Engineering Report, PARSONS Project Order 101, April 1994.
   Nutting H.C. Nutting Technical Report 5.1A, Engineering Evaluation Report for On-Site Disposal, U.S. DOE Fernald Field Office, June 1993 (H.C. Nutting Laboratory Data).

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Table 4-9 - 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	Initial 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
EFBA	G2-SB-55	409831	Bulk	1.5	5.0	Brownish Yellow	Brown Till	Sandy Lean Clay	CL	CONr	15.9	137.1	118.3	93	2.80	0.032	0.050	0.091	0.046	0.48	0.116	0.015	PO 154
EFBA	G2-SB-59	409819	Bulk	1.5	5.0	Dark Yellowish Brown	Brown Till	Lean Clay with Sand	CL	CONr	20.0	132.8	110.7	100	2.69	0.137	0.114	0.114	0.072	0.52	0.162	0.036	PO 154
EFBA	G2-SB-74	409858	Bulk	1.5	5.0	Light Olive Brown	Brown Till	Lean Clay with Sand	CL	CONr	20.3	131.0	108.9	96	2.76	(4) 0.054	0.066	0.021	0.004	0.58	0.183	0.037	PO 154
EFBA	G2-SB-81	409873	Bulk	1.5	5.0	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	CONr	15.3	136.5	118.4	94	2.75	0.038	0.032	0.038	0.047	0.45	0.129	0.011	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	2.67	0.153	0.143	0.110	0.068	0.76	0.230	0.031	PO 154
EFBA	G2-120	405124	ST	5.0	7.0	Olive Brown	Brown Till	Sandy Lean Clay	CL	$CONr_{85}$	13.3	115.1	101.6	54	2.71	0.073	0.047	0.046	0.056	0.67	0.666	0.007	PO 140

Notes:

1. On-Site Location: EFBA East Field Borrow Area
   SF/SFBA South Field (Waste Unit) / South Field Borrow Area

2. Sample Type: Bulk Bulk Sample

3. Test Type: CONr Consolidation with time readings. ASTM D2435, remolded specimen with 95 percent relative compaction at moisture content wet of optimum in accordance with ASTM D698
   $CONr_{85}$ Consolidation with time readings. ASTM D2435, remolded specimen with 85 percent relative compaction at optimum moisture content in accordance with ASTM D698

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

5. Data Source: PO 140 Geotechnical Investigation On-Site Disposal Facility, Soil Investigation Data Report, PARSONS Project Order 140, December 1995.
   PO 154 East and South Field Borrow Areas Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, March, 1996 ("EFBA" and "SFBA" On-Site Locations).

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Table 4-10 - Summary of Mohr Circle Constructions from Consolidated, Undrained Triaxial Compression Tests, Undisturbed Samples

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	Effective Cohesion (psf)	Effective Friction Angle (degrees)	Total Cohesion (psf)	Total Friction Angle (degrees)	Data Source
EFBA	G2-148	410573	DEN	7.5	9.5	Yellowish Brown	Brown Till	Lean Clay with Sand	CL	CU-Stg	100	31	100	25	PO 154
EFBA	G2-152	410282	ST	12.5	14.5	Olive Brown	Brown Till	Silty, Clayey Sand with Gravel	SC-SM	CU-Stg	150	34	125	32	PO 154
SFBA	G2-156	410131	ST	7.5	9.5	Yellowish Brown	Brown Till	Lean Clay	CL	CU	250	31	400	21	PO 154
EFBA	1745	3250	ST	6.0	9.0	Brown	Brown Till	Silty Clay with Sand	CL-ML	CU	900	29	350	24	Nutting
EFBA	1747	3252	ST	12.0	14.5	Gray and Brown	Gray Till	Gravelly Lean Clay with Sand	CL	CU	400	34	400	20	Nutting
EFBA	1748	3251	ST	9.0	12.0	Brown and Gray	Brown Till	Clayey Gravel with Sand	GC	CU	0	42	0	26	Nutting
EFBA	G2-201	G2-201 / 2	ST	2.5	4.5	Yellowish Brown	Brown Till	Lean Clay	CL	CU	500	24	300	22	PO 101
EFBA	G2-201	G2-201 / 10	ST	22.5	24.5	Gray	Gray Till	Sandy Lean Clay	CL	CU	400	28	250	24	PO 101
EFBA	G2-202	G2-202 / 4	ST	7.5	9.5	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	CU	200	26	450	15	PO 101
EFBA	G2-204	G2-204 / 6	ST	12.5	14.5	Gray	Gray Till	Lean Clay with Sand	CL	CU	450	27	600	20	PO 101
EFBA	G2-205	G2-205 / 8	ST	17.5	19.5	Gray	Gray Till	Sandy Lean Clay	CL	CU	200	32	300	23	PO 101
EFBA	G2-206	G2-206 / 10	ST	22.5	24.5	Gray	Gray Till	Sandy Lean Clay	CL	CU	250	31	200	26	PO 101

Notes:

1. On-Site Location:
   - EFBA — East Field Borrow Area
   - SFBA — South Field Borrow Area
2. Sample Type:
   - Bulk — Bulk Sample
   - ST — Shelby Tube Sample (ASTM D 1587)
3. Test Type:
   - CU — Triaxial Shear, Consolidated, Undrained with Pore Pressure Measurements (ASTM D 4767)
   - CU-Stg — Staged test on one test specimen
4. Data Source:
   - Nutting — H.C. Nutting Technical Report 5.1A, Engineering Evaluation Report for On-Site Disposal, U.S. DOE Fernald Field Office, June 1993 (H.C. Nutting Laboratory Data).
   - PO 101 — On-Site Disposal Cell Pre-Design Activities Engineering Report, PARSONS Project Order 101, April 1994.
   - PO 154 — East and South Field Borrow Areas Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, March, 1996.

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Table 4-11 - Summary of Mohr Circle Constructions from Unconsolidated, Undrained Triaxial Compression Tests, Undisturbed Samples

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	Percent Saturation	Data Source
EFBA	G2-150A	410256	DEN	15.0	17.0	Gray	Gray Till	Sandy Lean Clay	CL	UU	2448	638	0	Saturated	100	PO 154
EFBA	G2-153	410287	ST	5.0	7.0	Light Olive Brown	Brown Till	Sandy Lean Clay	CL	UU	1008	2507	0	Saturated	100	PO 154
EFBA	G2-154	410171	ST	10.0	12.0	Brown / Greenish Gray	Gray Till	Sandy Lean Clay	CL	UU	1728	2021	0	Saturated	96	PO 154
EFBA	G2-155	410175	ST	7.5	9.5	Light Olive Brown	Brown Till	Sandy Lean Clay	CL	UU	1368	2375	0	Saturated	100	PO 154
SFBA	G2-157	410140	ST	7.5	9.5	Greenish Gray	Gray Till	Lean Clay	CL	UU	1368	1839	0	Saturated	100	PO 154
EFBA	G2-134	405140	DEN	12.0	14.0	Dark Greenish Gray	Gray Till	Sandy Lean Clay	CL	UU	2016	1557	0	Saturated	98	PO 140

Notes:

1. On-Site Location: EFBA East Field Borrow Area; SFBA South Field Borrow Area
2. Sample Type: DEN Denison Sample; ST Shelby Tube Sample
3. Test Type: UU Unconsolidated, Undrained Triaxial Compression, ASTM D 2850, undisturbed specimen, single point test
4. Data Source: PO 140 Disposal Facility Geotechnical Investigation, PARSONS Project Order 140, December 1995, Rev 0.; PO 154 East and South Field Borrow Areas Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, March, 1996.

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Table 4-12 - 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
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
EFBA	G2-209	G2-209 / Bulk	Bulk	0.0	25.0	Br and Gr Till	Sandy Lean Clay	CL	Standard	12.3	122.3	$CU_{r\text{-}opt}$	12.1	117.1	150	25	100	15	PO 101
EFBA	G2-210	G2-210 / Bulk	Bulk	0.0	25.0	Br and Gr Till	Lean Clay with Sand	CL	Standard	12.4	122.3	$CU_{r\text{-}opt}$	12.0	118.4	300	21	250	13	PO 101

Notes:

1. On-Site Location:
   - 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:
   - $CU_{r\text{-}opt}$ — Triaxial Shear, Consolidated, Undrained with Pore Pressure Measurements (ASTM D 4767), 95 percent relative compaction at moisture content at or near optimum in accordance with ASTM D 698
   - 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 101 — On-Site Disposal Cell Pre-Design Activities Engineering Report, PARSONS Project Order 101, April 1994.
   - PO 154 — East and South Field Borrow Areas Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, March, 1996 ("EFBA" and "SFBA" On-Site Locations).
     Flyash Piles and South Field Waste Units Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, February, 1996 ("SF/SFBA" On-Site Locations).

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Appendix F contains the Mohr circle constructions for the undisturbed CU and UU tests.

4.4.2 Strength Tests of Remolded Samples

Consolidated, undrained triaxial compression strength tests (ASTM D 4767) were performed on two bulk samples from the EFBA as part of the prior PO-101 investigation. Table 4-12 lists the results. These samples were remolded to target conditions of 95 percent MDD at or near OMC based on standard compactive effort. Additionally, a remolded consolidated, undrained test was performed on a sample of fill material from SFBA shallow boring G2-SB-99 that was remolded to 85 percent MDD at or near OMC. Table 4-12 contains the results of this test. Appendix F contains the Mohr circle constructions.

Unconsolidated, undrained triaxial compression strength tests (ASTM D 2850) were performed on remolded test specimens of material from the EFBA. For the PO-154 investigation, the test specimens were remolded at the laboratory to minimum target dry densities of 90 percent MDD, at or near OMC. Table 4-13 summarizes the cohesion intercepts evaluated from the test results. Additionally, prior testing results from location G2-134 along the northern perimeter of the EFBA are presented in the table. These strength tests were performed on specimens remolded to 95 percent and 85 percent relative compaction based on standard compactive effort. Appendix F contains the Mohr circle constructions.

4.5 Laboratory Permeability Tests

This subsection summarizes the results of laboratory permeability tests of soil materials from the EFBA and SFBA. The testing concentrated on the permeability characteristics of remolded brown till. The test results are summarized individually for the EFBA and SFBA. Existing laboratory permeability data from prior investigations of the EFBA are also summarized.

4.5.1 East Field Borrow Area Permeability Test Results

Results from laboratory permeability tests of undisturbed and remolded soils from the EFBA are summarized below.

Laboratory Permeability Test Data from Prior Investigation

Laboratory permeability tests were performed on undisturbed samples collected at the EFBA during the PO-101 investigation (PARSONS 1994a). The results of these tests are summarized in Table 4-14. These tests provide data regarding the laboratory permeability of the in situ brown till.

Additionally, as part of the PO-101 investigation, remolded permeability tests were conducted in April and May 1994 (PARSONS 1994b). Table 4-15 summarizes the results of these prior permeability tests in which samples were remolded based on Standard Proctor compaction data. As part of the testing, laboratory tests were performed on a composite sample of brown and gray clay from 0 to 25 feet

Table 4-13 - 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
EFBA	G2-SB-59	409819	Bulk	1.5	5.0	Dark Yellowish Brown	Brown Till	Lean Clay with Sand	CL	UU_{r90}	Note 4	728	0	Saturated	PO 154
EFBA	G2-SB-66	409839	Bulk	1.5	5.0	Yellowish Brown	Brown Till	Lean Clay with Sand	CL	UU_{r90}	Note 4	505	0	Saturated	PO 154
EFBA	G2-SB-68	409844	Bulk	5.0	10.0	Dark Yellowish Brown	Brown Till	Lean Clay with Sand	CL	UU_{r90}	Note 4	293	0	Saturated	PO 154
EFBA	G2-SB-74	409858	Bulk	1.5	5.0	Light Olive Brown	Brown Till	Lean Clay with Sand	CL	UU_{r90}	Note 4	589	0	Saturated	PO 154
EFBA	G2-SB-81	409873	Bulk	1.5	5.0	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	UU_{r90}	Note 4	321	0	Saturated	PO 154
EFBA	G2-148	410577	Bulk	11.0	16.5	Dark Gray	Gray Till	Lean Clay with Sand	CL	UU_{r90}	Note 4	373	0	Saturated	PO 154
EFBA	G2-149	410527&410528	Bulk	11.5	16.5	Dark Gray	Gray Till	Sandy Lean Clay	CL	UU_{r90}	Note 4	643	0	Saturated	PO 154
EFBA	G2-134	405140	DEN	12.0	14.0	Dark Greenish Gray	Gray Till	Sandy Lean Clay	CL	UU_r	2016	647	0	Saturated	PO 140
EFBA	G2-134	405140	DEN	12.0	14.0	Dark Greenish Gray	Gray Till	Sandy Lean Clay	CL	UU_{r85}	2016	188	0	Saturated	PO 140

Notes:

1. On-Site Location: EFBA East Field Borrow Area

2. Sample Type: Bulk Bulk Sample

3. Test Type:
   - UU_r Unconsolidated, Undrained Triaxial Compression, ASTM D 2850, remolded specimen with 95 percent relative compaction at moisture content wet of optimum
   - UU_{r90} Unconsolidated, Undrained Triaxial Compression, ASTM D 2850, remolded specimen with 90 percent relative compaction at or near optimum moisture content
   - UU_{r85} Unconsolidated, Undrained Triaxial Compression, ASTM D 2850, remolded specimen with 85 percent relative compaction at or near optimum moisture content

4. Two-point tests performed at confining pressures of 1440 psf and 2880 psf

5. Data Source:
   - PO 140 Geotechnical Investigation On-Site Disposal Facility Soil Investigation Data Report, PARSONS Project Order 140, December 1995.
   - PO 154 East and South Field Borrow Areas Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, March, 1996.

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Table 4-14 Summary of Prior Laboratory Permeability Results, Undisturbed Samples, East Field Borrow Area

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	Specimen ID	Test Type	Moisture Content (%)	Wet Density (pcf)	Dry Density (pcf)	Coeff. of Perm. (last 4 determinations) k1 (cm/sec)	k2 (cm/sec)	k3 (cm/sec)	k4 (cm/sec)	Average Coeff. of Permeability (cm/sec)	Percent Saturation (%)	Confining Pressure (psf)	Data Source
EFBA	G2-203	G2-203 / 8	ST	17.5	19.5	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	8 B	P	16.7	138.6	118.8	1.6E-08	1.6E-08	1.5E-08	1.6E-08	1.6E-08	100	2275	PO 101
EFBA	G2-204	G2-204 / 10	ST	22.5	24.5	Gray	Gray Till	Sandy Lean Clay	CL	10 B	P	12.1	144.3	128.7	8.3E-09	6.2E-09	6.3E-09	6.3E-09	6.8E-09	96	2825	PO 101
EFBA	G2-205	G2-205 / 2	ST	2.5	4.5	Yellowish Brown	Brown Till	Lean Clay	CL	2 B	P	11.3	138.3	124.2	7.4E-08	7.4E-08	7.3E-08	7.8E-08	7.5E-08	87	576	PO 101
EFBA	G2-206	G2-206 / 4	ST	7.5	9.5	Yellowish Brown	Brown Till	Sandy Lean Clay	CL	4 A	P	13.7	138.5	121.8	9.2E-09	9.5E-09	9.3E-09	9.4E-09	9.4E-09	92	1235	PO 101

Notes:

1. Sample Type: ST Shelby Tube Sample (ASTM D 1587)
2. Test Type: P Triaxial, Back-Pressure Permeability (ASTM D 5084)
3. Confining Pressure: Approximately 1 psi per foot of bottom sample depth was used to calculate the appropriate confining pressure.
4. Data Source: PO 101 On-Site Disposal Cell Pre-Design Activities Engineering Report, PARSONS Project Order 101, April 1994.

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Table 4-15 - Summary of Prior Laboratory Permeability Results for Test Specimens Compacted Using Standard Proctor Compactive Effort, East Field Borrow Area

Boring No./ Sample No.	Depth (feet)	Specimen[1] Identification	Effective Confining Pressure (psf)	Target Remolding Criteria[2]	Pre-Test Moisture Content (%)	Pre-Test Dry Density (pcf)	Percent Relative Compaction[6]	Percent Wet of OMC	Coefficient of Permeability (cm/sec)[5]
G2-210/Bulk	0-25	bulk	1440 (10 psi)	Compacted to 95 percent Standard Proctor max. dry density	11.8	116.5	95.3	-0.6	2.2×10^{-6}
G2-210/Bulk	0-25	120 pcf @ 12.4%	720 (5 psi)	Compacted at or near optimum moisture content[3] and dry density within a band about ± 4 pcf from compaction curve dry density	12.0	120.0	98.1	-0.4	1.9×10^{-6}
G2-210/Bulk	0-25	118 pcf @ 14.4%	720 (5 psi)	Compacted 2 percent wet of optimum moisture content[4] and dry density within a band about ± 4 pcf from compaction curve dry density	13.8	118.0	96.5	1.4	6.5×10^{-6}
G2-210/Bulk	0-25	112 pcf @ 17.4%	720 (5psi)	Compacted 5 percent wet of optimum moisture content[4] and dry density within a band about ± 4 pcf from compaction curve dry density	16.9	113.5	92.8	4.5	3.6×10^{-6}

Notes:

(1) Soil description and classification: Brown and gray Lean Clay with Sand (CL)

(2) Standard Proctor compaction data: Sample G2-210/Bulk: maximum dry density = 122.3 pcf, optimum moisture content = 12.4 percent

(3) Tolerance for moisture content: -0.5 percent, +1.5 percent

(4) Tolerance for moisture content: ±1.0 percent

(5) Average of last four coefficient of permeability determinations from the laboratory test

(6) Percent Relative Compaction = (Pre-Test Dry Density/Maximum Dry Density) x 100

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collected from Boring G2-210. Test specimens from Boring G2-210 were remolded using Standard Proctor compactive effort at target water contents of OMC, +2, and +5 percent wet of OMC. Data from these tests, though not conclusive, indicated that for samples remolded to densities corresponding to a standard compaction curve, the laboratory permeability (k) decreases from the [10^{-6} to 10^{-5} cm/sec] range at approximately OMC to an approximate [10^{-8} to 10^{-7} cm/sec] range at 5 percent wet of OMC (PARSONS 1994b).

These tests were performed at an effective confining pressure of 720 pounds per square foot (5 pounds per square inch [psi]) which approximately simulates the confining pressure at the top of the compacted clay layer of the proposed cap.

Also during the PO-101 investigation, remolded permeability tests on a composite sample (0 to 25 feet) of brown and gray till from Boring G2-209 provided some insight into the permeability characteristics of the clay remolded to higher densities. Table 4-16 presents the coefficients of permeability of the composite sandy clay sample (G2-209/Bulk) remolded at various densities based on a modified Proctor compaction test (PARSONS 1994b).

Laboratory Permeability Test Data from the PO-154 Investigation

Two-stage laboratory permeability tests (ASTM D 5084) were performed on remolded test specimens from bulk samples of brown till from the EFBA. A series of five tests were performed by ATT at Lakewood, Colorado. Each of the five tests had a specific target density and moisture condition for the remolded test specimen based on a Standard Proctor compaction test for the bulk sample. The target remold criteria were:

1) Test 1: 100 percent relative compaction at OMC
2) Test 2: 97 percent relative compaction at +2 percent wet of OMC
3) Test 3: 99 percent relative compaction at +2 percent wet of OMC
4) Test 4: 95 percent relative compaction at +4 percent wet of OMC
5) Test 5: 97 percent relative compaction at +4 percent wet of OMC

Each permeability test (i.e., Test 1, Test 2, etc.) of the same remolded test specimen was performed in two stages. In the first stage, an unconsolidated specimen was confined at 2 psi, saturated, and permeability measurements were taken. Upon completion of the first stage test, a second stage test of the consolidated specimen at an effective confining pressure of 5 psi was performed. This two stage approach was performed to provide data regarding the effect of confining pressure on the coefficient of permeability, and to allow for evaluation of future Test Pad permeability testing results with respect to Test Pad confining pressures less than that anticipated for the proposed OSDF cap. If the target compaction density could not be achieved due to high saturation, the laboratory was directed to compact the test specimen to the maximum density reasonably achievable at that water content. If the density of

Table 4-16 - Summary of Prior Laboratory Permeability Results for Test Specimens Compacted Using Modified Proctor Compactive Effort, East Field Borrow Area

Boring No./ Sample No.	Depth (feet)	Specimen[1][2]	Effective Confining Pressure (psf)	Target Remolding Criteria[3]	Pre-Test Moisture Content (%)	Pre-Test Dry Density (pcf)	Percent Relative Compaction[7]	Percent Wet of OMC	Coefficient of Permeability (cm/sec)[6]
G2-209/Bulk	0-25	3 at OMC	720 (5 psi)	Compacted at or near optimum moisture content[4] and dry density within a band about ± 4 pcf from compaction curve dry density	10.0	131.8	98.7	-0.3	2.5×10^{-8}
G2-209/Bulk	0-25	4 +2% OMC	720 (5 psi)	Compacted 2 percent wet of optimum moisture content[5] and dry density within a band about ± 4 pcf from compaction curve dry density	12.1	128.4	96.1	1.8	8.3×10^{-9}
G2-209/Bulk	0-25	5 @ +5% OMC	720 (5psi)	Compacted 5 percent wet of optimum moisture content[5] and dry density within a band about ± 4 pcf from compaction curve dry density	14.9	120.9	90.5	4.6	1.9×10^{-8}

Notes:

(1) Soil description and classification: Brown and gray Sandy Lean Clay (CL)

(2) Standard Proctor compaction data: Sample G2-209/Bulk: maximum dry density = 122.3 pcf, optimum moisture content = 12.3 percent

(3) Modified Proctor compaction data: Sample G2-209/Bulk: maximum dry density = 133.6 pcf, optimum moisture content = 10.3 percent

(4) Tolerance for moisture content: -0.5 percent, +1.5 percent

(5) Tolerance for moisture content: ±1.0 percent

(6) Average of last four coefficient of permeability determinations from the laboratory permeability test

(7) Percent Relative Compaction = (Pre-Test Dry Density/Maximum Dry Density) x 100

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359

specimens specified to be remolded at 97 percent relative compaction and 4 percent wet of OMC dropped below 95.5 percent relative compaction, then the test specimen was remolded to the maximum achievable density using a moisture content of only 3 percent wet of OMC.

Table 4-17 summarizes the results of the remolded laboratory permeability tests (GSTP Test Code P_{r5}) on 10 bulk samples (eight brown till, two gray till) from the EFBA. Table 4-17 also provides summary statistics for results of the EFBA tests. Figures 4-13 through 4-20 illustrate the results of each of the brown till bulk samples tested. The figures illustrate the tests that had laboratory permeabilities less than 1×10^{-7} cm/sec as circles. Triangles show the tests that exceeded 1×10^{-7} cm/sec maximum permeability. The two tests that did not achieve 1×10^{-7} cm/sec were clays remolded at 100 percent MDD at or near OMC. However, when remolded wet of optimum test specimens of the same soil consistently achieved laboratory permeabilities of less than 1×10^{-7} cm/sec. It should also be noted that, in general, results of Tests 3, 4, and 5 (99 percent MDD, +2 percent OMC; 95 percent MDD, +4 percent OMC; and 97 percent MDD, +4 percent OMC target criteria) plot above the Standard Proctor compaction curve, often near the theoretical Zero Air Voids curve (100 percent saturation), suggesting that achieving these target conditions in the field may require compaction using slightly greater than standard compactive effort. The laboratory often had difficulty remolding specimens to the 97 percent MDD at +4 percent pre-test criteria due to high sample saturation. Figure 4-21 shows all the brown till P_{r5} results on a single graphic.

Also shown on Table 4-17 are the results of permeability tests using FEMP site-specific leachate (GSTP Test Code P_{rl}) conducted by ATT personnel at the FEMP on-site laboratory. For the P_{rl} tests, single stage remolded laboratory permeability tests were performed on samples taken from the same bulk samples that underwent the P_{r5} testing. FERMCO provided the site-specific leachate for the P_{rl} tests. The target remold conditions for these tests were 97 percent relative compaction at 4 percent wet of OMC. The test results show no adverse changes in the laboratory coefficient of permeability due to the leachate. Table 4-18 summarizes the characteristics of the leachate used as the permeant for these tests, and provides a comparison of the permeant results with the perched groundwater results of the Distribution Coefficient (K_d) study performed as part of the Predesign Investigation (DOE 1995). The K_d study provided data for the development of an OSDF site-specific K_d. Appendix G contains a tabular summary of the radiological and chemical test results performed on the permeant by a FERMCO contract analytical laboratory. Further evaluation and discussion of the laboratory permeability test results are found in Subsection 5.1.

Table 4-17 Summary of PO-154 Remolded Laboratory Permeability Tests, East Field Borrow Area

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)	Test 1 - 100 % RC at OMC: Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)	Test 2 - 97% RC at +2% OMC: Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)	Test 3 - 99% RC at +2% OMC: Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)	Test 4 - 95% RC at +4% OMC: Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)	Test 5 - 97% RC at +4% OMC: Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)
EFBA	G2-SB-53	409815	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	16.2	112.8	P_d	288	15.4	114.1	-1	101	3.3E-08	17.4	110.4	1	98	6.4E-08	17.6	112.4	1	100	1.4E-08	19.5	108.0	3	96	3.0E-08	19.3	109.6	3	97	1.4E-08
EFBA	G2-SB-53	409815	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	-	-	P_d	720	-	-	-	-	2.3E-08	-	-	-	-	4.5E-08	-	-	-	-	1.3E-08	-	-	-	-	2.1E-08	-	-	-	-	1.1E-08
EFBA	G2-SB-57	409824	Bulk	5.0	10.0	Brown Till	Sandy Lean Clay with Gravel	CL	12.8	121.5	P_d	288	12.2	122.5	-1	101	6.9E-08	14.5	118.6	2	98	5.9E-08	14.4	120.6	2	99	2.0E-08	16.5	115.8	4	95	1.8E-08	16.4	116.5	4	96	1.7E-08
EFBA	G2-SB-57	409824	Bulk	5.0	10.0	Brown Till	Sandy Lean Clay with Gravel	CL	-	-	P_d	720	-	-	-	-	4.7E-08	-	-	-	-	4.8E-08	-	-	-	-	1.7E-08	-	-	-	-	1.4E-08	-	-	-	-	1.0E-08
EFBA	G2-SB-59	409819	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	16.4	116.5	P_d	288	15.7	116.9	-1	100	2.0E-08	17.9	113.1	1	97	1.1E-08	17.9	113.7	1	98	1.6E-08	19.9	110.7	4	95	4.3E-08	19.6	112.1	3	96	1.9E-08
EFBA	G2-SB-59	409819	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	-	-	P_d	720	-	-	-	-	1.6E-08	-	-	-	-	9.1E-09	-	-	-	-	1.4E-08	-	-	-	-	1.4E-08	-	-	-	-	1.6E-08
EFBA	G2-SB-66	409839	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	15.7	117.5	P_d	288	15.1	118.2	-1	101	3.5E-08	17.0	114.8	1	98	2.3E-08	17.0	116.7	1	99	1.4E-08	19.0	112.3	3	96	1.7E-08	18.7	113.3	3	96	2.3E-08
EFBA	G2-SB-66	409839	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	-	-	P_d	720	-	-	-	-	2.9E-08	-	-	-	-	2.0E-08	-	-	-	-	1.3E-08	-	-	-	-	1.6E-08	-	-	-	-	1.9E-08
EFBA	G2-SB-68	409844	Bulk	5.0	10.0	Brown Till	Lean Clay with Sand	CL	15.0	116.3	P_d	288	14.7	116.6	-0	100	1.5E-07	16.5	113.2	2	97	8.2E-08	16.6	115.2	2	99	2.2E-08	18.5	110.9	3.47	95	2.7E-08	18.5	111.7	4	96	1.6E-08
EFBA	G2-SB-68	409844	Bulk	5.0	10.0	Brown Till	Lean Clay with Sand	CL	-	-	P_d	720	-	-	-	-	1.3E-07	-	-	-	-	6.8E-08	-	-	-	-	1.9E-08	-	-	-	-	2.0E-08	-	-	-	-	1.3E-08
EFBA	G2-SB-74	409858	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	17.2	114.0	P_d	288	16.6	114.6	-1	101	2.0E-08	18.6	111.0	1	97	1.7E-08	18.6	112.7	1	99	8.1E-09	20.6	108.6	3	95	1.2E-08	20.3	110.4	3	97	9.6E-09
EFBA	G2-SB-74	409858	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	-	-	P_d	720	-	-	-	-	1.8E-08	-	-	-	-	1.3E-08	-	-	-	-	9.3E-09	-	-	-	-	1.2E-08	-	-	-	-	9.8E-09
EFBA	G2-SB-78	409865	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	16.4	114.7	P_d	288	16.1	114.8	-0	100	4.5E-08	18.0	111.4	2	97	2.9E-08	18.0	112.9	2	98	1.7E-08	19.9	109.0	3.49	95	3.0E-08	19.8	110.2	3	96	1.6E-08
EFBA	G2-SB-78	409865	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	-	-	P_d	720	-	-	-	-	3.4E-08	-	-	-	-	2.2E-08	-	-	-	-	1.4E-08	-	-	-	-	1.9E-08	-	-	-	-	1.7E-08
EFBA	G2-SB-81	409873	Bulk	1.5	5.0	Brown Till	Sandy Lean Clay	CL	12.3	124.0	P_d	288	11.8	125.1	-1	101	1.6E-07	13.7	121.3	1	98	3.8E-08	13.7	122.7	1	99	3.1E-08	15.5	119.0	3	96	3.6E-08	15.6	119.6	3	96	2.6E-08
EFBA	G2-SB-81	409873	Bulk	1.5	5.0	Brown Till	Sandy Lean Clay	CL	-	-	P_d	720	-	-	-	-	1.3E-07	-	-	-	-	3.4E-08	-	-	-	-	2.8E-08	-	-	-	-	3.0E-08	-	-	-	-	2.6E-08
EFBA	G2-148	410577	Bulk	11.0	16.5	Gray Till	Lean Clay with Sand	CL	12.7	123.4	P_d	288	11.9	124.8	-1	101	2.0E-07	14.5	119.9	2	97	2.4E-07	14.2	121.8	2	99	2.6E-08	16.0	117.6	3	95	3.3E-08	16.0	118.8	3	96	1.4E-08
EFBA	G2-148	410577	Bulk	11.0	16.5	Gray Till	Lean Clay with Sand	CL	-	-	P_d	720	-	-	-	-	1.9E-07	-	-	-	-	1.9E-07	-	-	-	-	2.2E-08	-	-	-	-	1.9E-08	-	-	-	-	1.1E-08
EFBA	G2-149	410527&410528	Bulk	11.5	16.5	Gray Till	Sandy Lean Clay	CL	12.2	125.0	P_d	288	11.8	126.1	-0	101	3.6E-08	13.5	122.4	1	98	8.6E-08	13.8	124.7	2	100	3.4E-08	15.5	119.2	3	95	2.7E-08	15.4	120.3	3	96	1.9E-08
EFBA	G2-149	410527&410528	Bulk	11.5	16.5	Gray Till	Sandy Lean Clay	CL	-	-	P_d	720	-	-	-	-	3.2E-08	-	-	-	-	7.9E-08	-	-	-	-	2.2E-08	-	-	-	-	2.0E-08	-	-	-	-	2.0E-08

Statistics - Brown Till, East Field Borrow Area (Pr_d Tests)

		Test 1 - 100 % RC at OMC: Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)	Test 2 - 97% RC at +2% OMC: Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)	Test 3 - 99% RC at +2% OMC: Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)	Test 4 - 95% RC at +4% OMC: Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)	Test 5 - 97% RC at +4% OMC: Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)
Brown Till CL 1.5'-10.0' c.p.=720 psf	Number	8	8			8	8	8			8	8	8			8	8	8			8	8	8			8
	Minimum	11.8	114.1			1.6E-08	13.7	110.4			9.1E-09	13.7	112.4			9.3E-09	15.5	108.0			1.2E-08	15.6	109.6			9.8E-09
	Maximum	16.6	125.1			1.3E-07	18.6	121.3			6.8E-08	18.6	122.7			2.8E-08	20.6	119.0			3.0E-08	20.3	119.6			2.6E-08
	Average	14.7	117.8			5.4E-08	16.7	114.2			3.2E-08	16.7	115.9			1.6E-08	18.7	111.8			1.8E-08	18.5	112.9			1.5E-08
	Std. Dev.	1.8	4.0			4.9E-08	1.7	3.9			2.0E-08	1.8	3.9			5.8E-09	1.8	3.8			5.5E-09	1.7	3.5			5.4E-09
Brown Till CL 1.5'-5.0' c.p.=720 psf	Number	6	6			6	6	6			6	6	6			6	6	6			6	6	6			6
	Minimum	11.8	114.1			1.6E-08	13.7	110.4			9.1E-09	13.7	112.4			9.3E-09	15.5	108.0			1.2E-08	15.6	109.6			9.8E-09
	Maximum	16.6	125.1			1.3E-07	18.6	121.3			4.5E-08	18.6	122.7			2.8E-08	20.6	119.0			3.0E-08	20.3	119.6			2.6E-08
	Average	15.1	117.3			4.2E-08	17.1	113.7			2.4E-08	17.1	115.2			1.5E-08	19.1	111.3			1.9E-08	18.9	112.5			1.6E-08
	Std. Dev.	1.7	4.1			4.4E-08	1.7	4.0			1.4E-08	1.8	4.0			6.6E-09	1.8	4.1			6.2E-09	1.7	3.7			5.8E-09
Brown Till CL 5.0'-10.0' c.p.=720 psf	Number	2	2			2	2	2			2	2	2			2	2	2			2	2	2			2
	Minimum	12.2	116.6			4.7E-08	14.5	113.2			4.8E-08	14.4	115.2			1.7E-08	16.5	110.9			1.4E-08	16.4	111.7			1.0E-08
	Maximum	14.7	122.5			1.3E-07	16.5	118.8			6.8E-08	16.6	120.6			1.9E-08	18.5	115.8			2.0E-08	18.5	116.5			1.3E-08
	Average	13.5	119.6			8.9E-08	15.5	115.9			5.8E-08	15.5	117.9			1.8E-08	17.5	113.4			1.7E-08	17.5	114.1			1.2E-08
	Std. Dev.	1.8	4.1			8.1E-08	1.4	3.8			1.4E-08	1.6	3.8			1.1E-09	1.4	3.5			4.1E-09	1.5	3.4			1.7E-09

Summary of Pri Laboratory Permeability Tests with FEMP Leachate, Remolded Specimens from East Field Borrow Area

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)	Test 1 - 100 % RC at OMC: Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)	Test 2 - 97% RC at +2% OMC: Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)	Test 3 - 99% RC at +2% OMC: Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)	Test 4 - 95% RC at +4% OMC: Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)	Test 5 - 97% RC at +4% OMC: Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)
EFBA	G2-SB-53	409815	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	16.2	112.8	P_d	720																19.7	108.1	4	96	5.4E-08					
EFBA	G2-SB-57	409824	Bulk	5.0	10.0	Brown Till	Sandy Lean Clay with Gravel	CL	12.8	121.5	P_d	720																15.6	118.5	3	98	5.5E-09					
EFBA	G2-SB-59	409819	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	16.4	116.5	P_d	720																18.9	112.1	2	98	8.8E-09					
EFBA	G2-SB-66	409839	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	15.7	117.5	P_d	720																17.6	113.1	2	96	9.8E-09					
EFBA	G2-SB-68	409844	Bulk	5.0	10.0	Brown Till	Lean Clay with Sand	CL	15.0	116.3	P_d	720																17.5	114.2	3	98	1.8E-08					
EFBA	G2-SB-74	409858	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	17.2	114.0	P_d	720																19.6	109.3	2	96	8.0E-09					
EFBA	G2-SB-78	409865	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	16.4	114.7	P_d	720																19.1	109.5	3	95	1.5E-08					
EFBA	G2-SB-81	409873	Bulk	1.5	5.0	Brown Till	Sandy Lean Clay	CL	12.3	124.0	P_d	720																17.3	118.4	5	95	5.2E-08					
EFBA	G2-148	410577	Bulk	11.0	16.5	Gray Till	Lean Clay with Sand	CL	12.7	123.4	P_d	720																16.1	118.3	3	96	1.2E-08					
EFBA	G2-149	410527&410528	Bulk	11.5	16.5	Gray Till	Sandy Lean Clay	CL	12.2	125.0	P_d	720																14.3	120.7	2	97	1.8E-08					

Statistics - Brown Till, East Field Borrow Area (Pri Tests)

		Test 1 - 100 % RC at OMC: Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)	Test 2 - 97% RC at +2% OMC: Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)	Test 3 - 99% RC at +2% OMC: Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)	Test 4 - 95% RC at +4% OMC: Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)	Test 5 - 97% RC at +4% OMC: Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of OMC	Percent Relative Comp.	Average Perm. (cm/sec)
Brown Till CL 1.5'-10.0' c.p.=720 psf	Number																8	8			8					
	Minimum																15.6	108.1			5.5E-09					
	Maximum																19.7	118.5			5.4E-08					
	Average																18.2	112.9			2.1E-08					
	Std. Dev.																1.4	4.0			2.0E-08					
Brown Till CL 1.5'-5.0' c.p.=720 psf	Number																6	6			6					
	Minimum																17.3	108.1			7.98E-09					
	Maximum																19.7	118.4			5.42E-08					
	Average																18.7	111.7			2.46E-08					
	Std. Dev.																1.0	3.8			2.22E-08					
Brown Till CL 5.0'-10.0' c.p.=720 psf	Number																2	2			2					
	Minimum																15.6	114.2			5.5E-09					
	Maximum																17.5	118.5			1.8E-08					
	Average																16.6	116.4			1.2E-08					
	Std. Dev.																1.4	3.1			8.8E-09					

Notes:

1. On-Site Location: EFBA East Field Borrow Area
2. Sample Type: Bulk Bulk sample
3. Compaction Method: MDD Maximum Dry Density as determined by Standard Proctor Compaction Tests
   OMC Optimum Moisture Content as determined by Standard Proctor Compaction Tests
   OMC and MDD shown are from Standard Proctor Compaction Tests (ASTM D 698)
4. Test Type: P_d Triaxial, Remolded, Back-Pressure Permeability, Two-Stage, with series of five target density/moisture conditions for soil from each bulk sample (ASTM D 5084)
   P_d Triaxial, Remolded, Back-Pressure Permeability with Leachate Permeant, Two-Stage (ASTM D 5084)
5. Target Remold Conditions: Test 1 100 % relative compaction at OMC
   Test 2 97 % relative compaction at +2% wet of OMC
   Test 3 99 % relative compaction at +2% wet of OMC
   Test 4 95 % relative compaction at +4% wet of OMC
   Test 5 97% relative compaction at +4% wet of OMC
6. Formulas: Relative Compaction = (Pretest Dry Density / Maximum Dry Density) x 100%
7. c.p. - Confining Pressure
8. Data Source: East and South Field Borrow Areas Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, March, 1998.

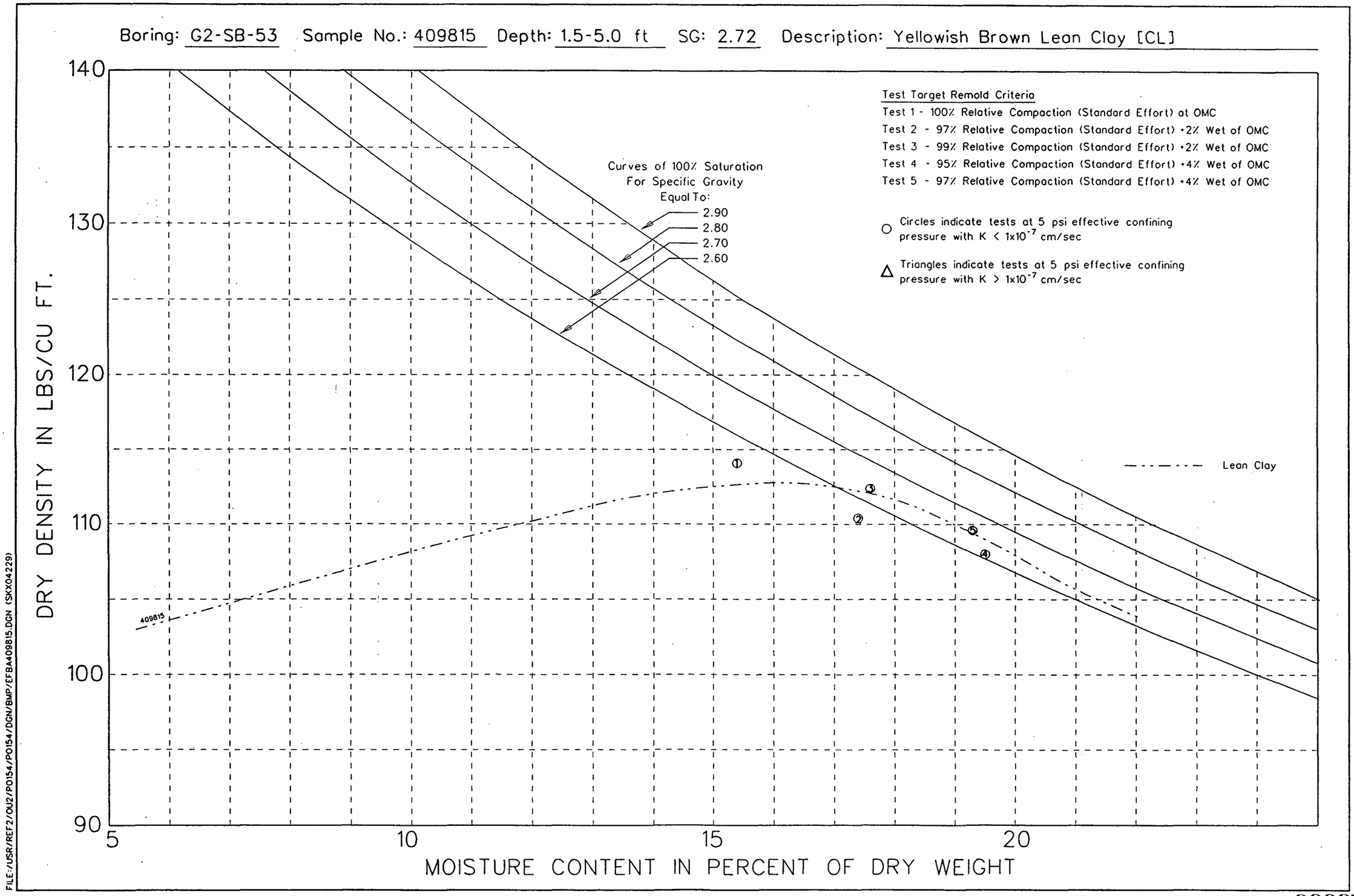
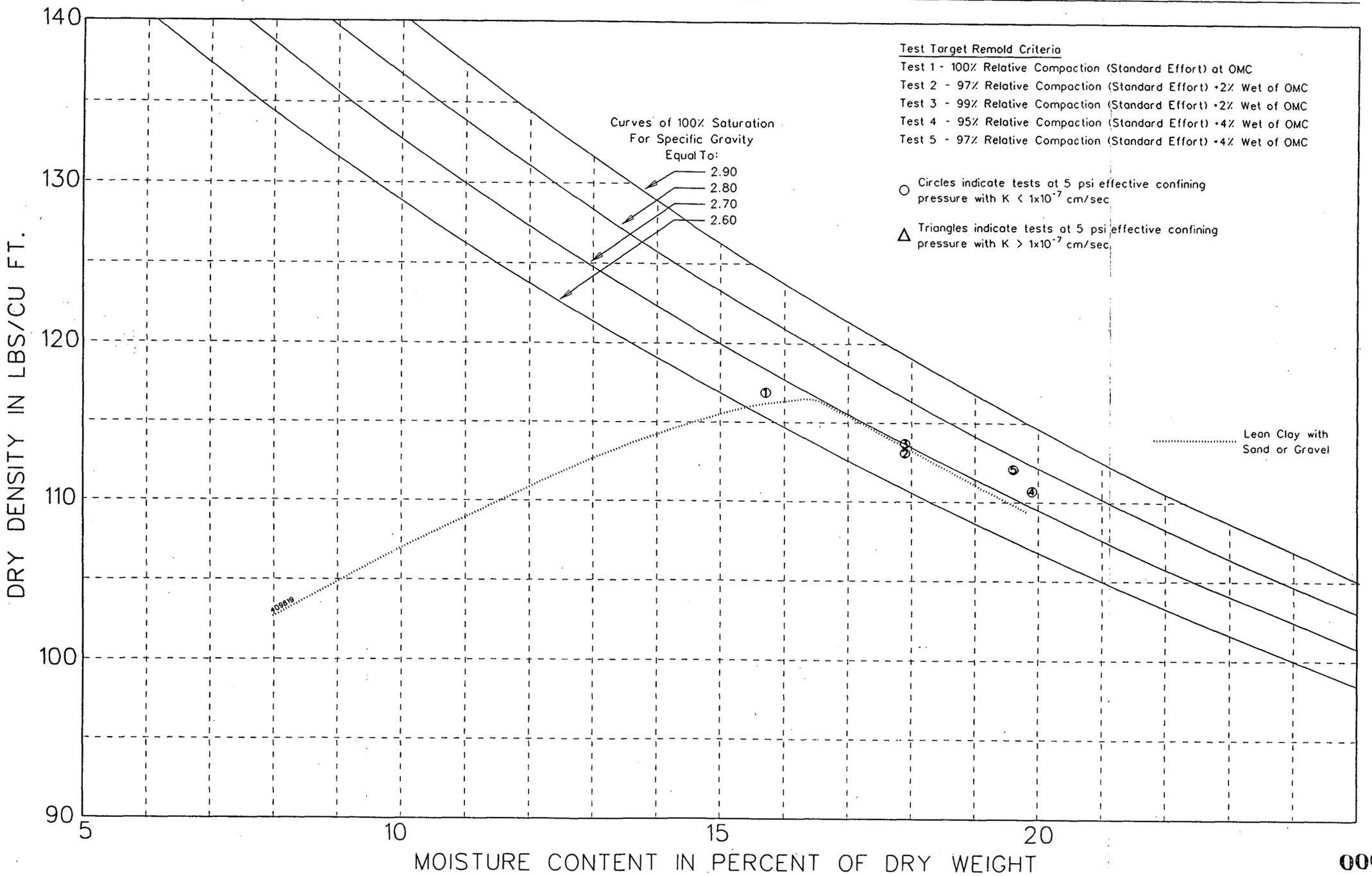


Figure 4-13 - Summary of EFBA Brown Till Five-Point Remolded Permeability Test - Sample No. 409815

Boring: G2-SB-59 Sample No.: 409819 Depth: 1.5-5.0 ft SG: 2.69 Description: Dark Yellowish Brown Lean Clay with Sand [CL]



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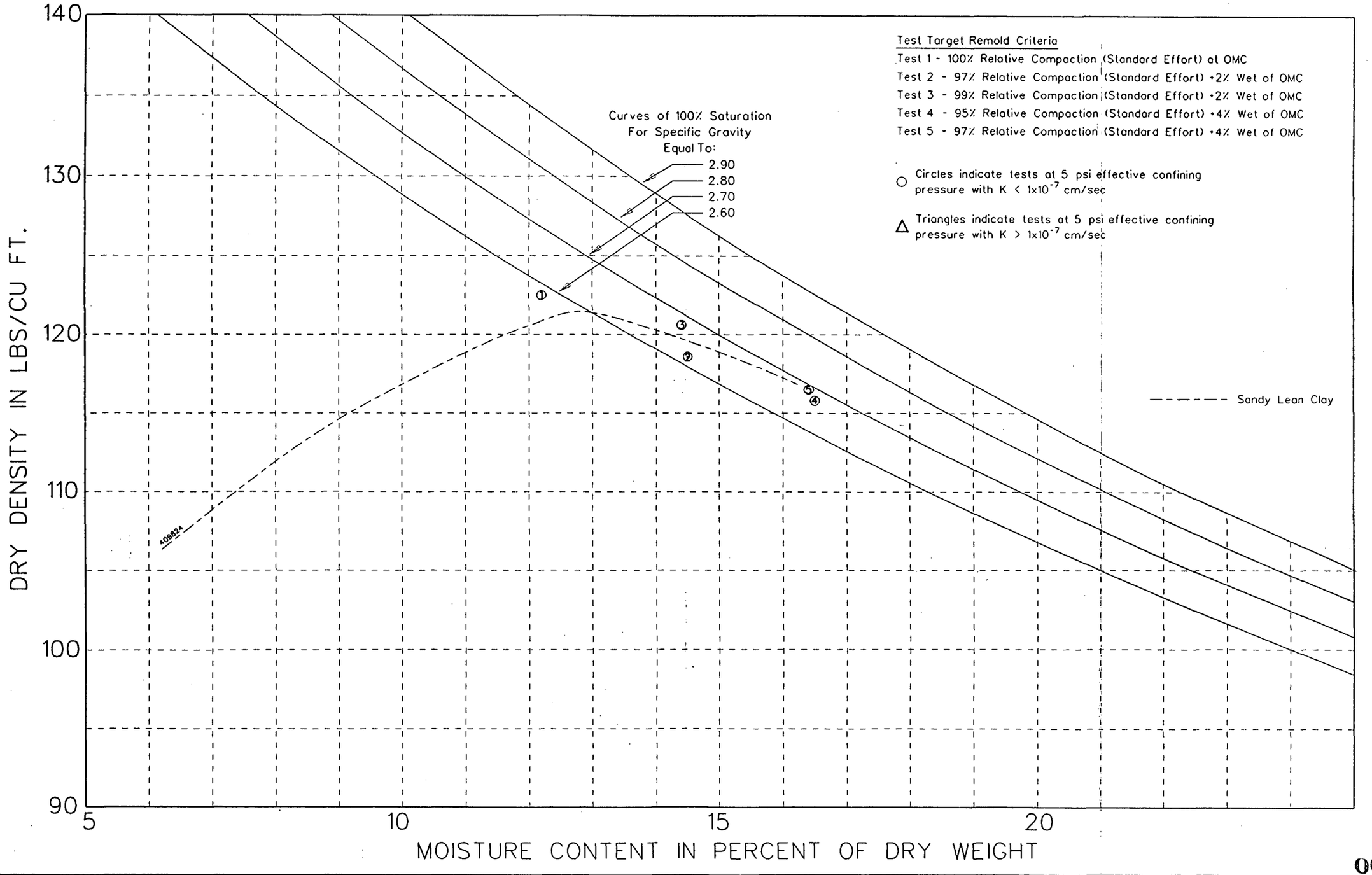
000075

Figure 4-14 - Summary of EFBA Brown Till Five-Point Remolded Permeability Test - Sample No. 409819

Boring: G2-SB-57 Sample No.: 409824 Depth: 5.0-10.0 ft SG: 2.76 Description: Yellowish Brown Sandy Lean Clay with Gravel [CL]



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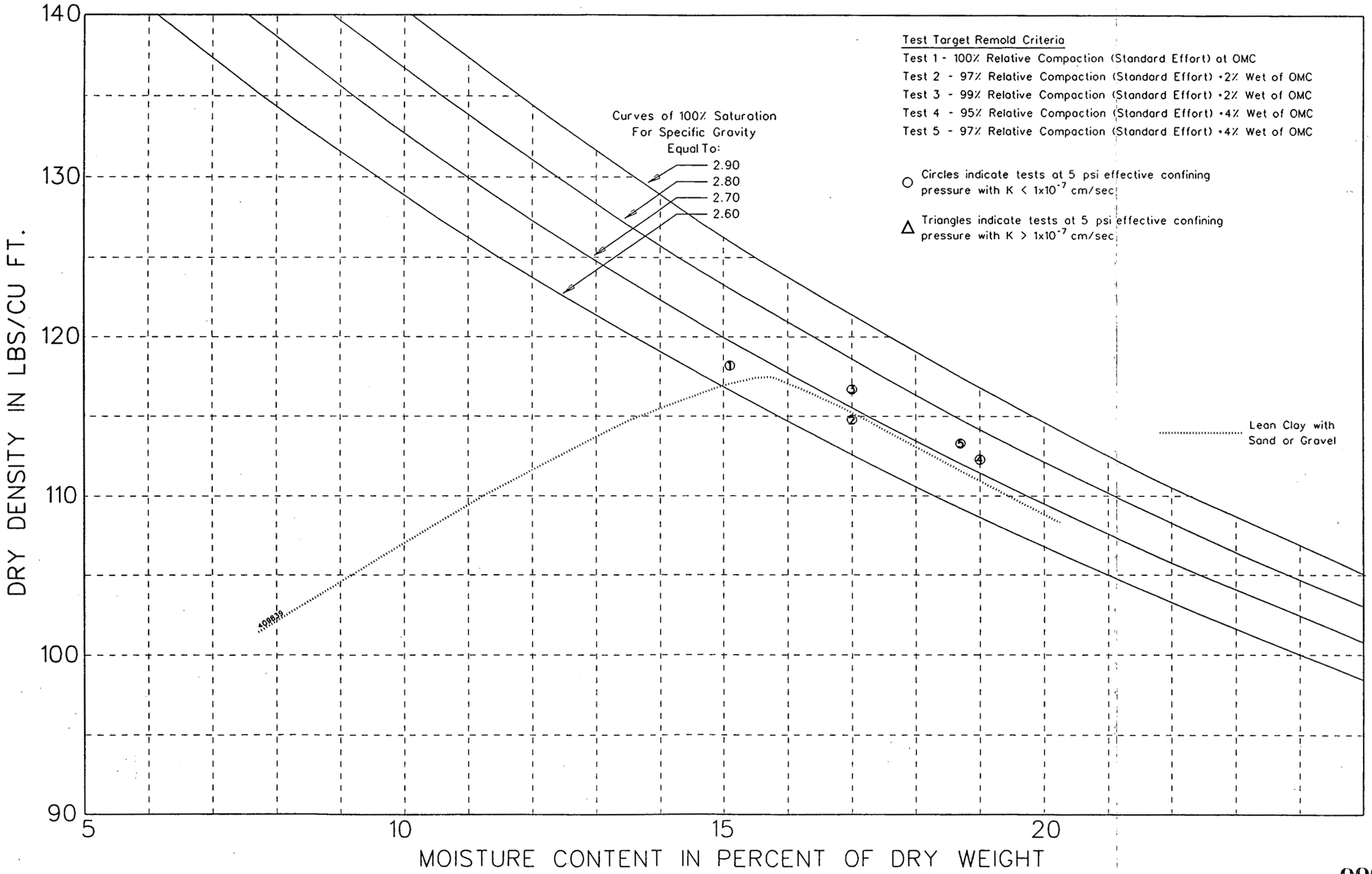
000076

Figure 4-15 - Summary of EFBA Brown Till Five-Point Remolded Permeability Test - Sample No. 409824

Boring: G2-SB-66 Sample No.: 409839 Depth: 1.5-5.0 ft SG: 2.68 Description: Yellowish Brown Lean Clay with Sand [CL]



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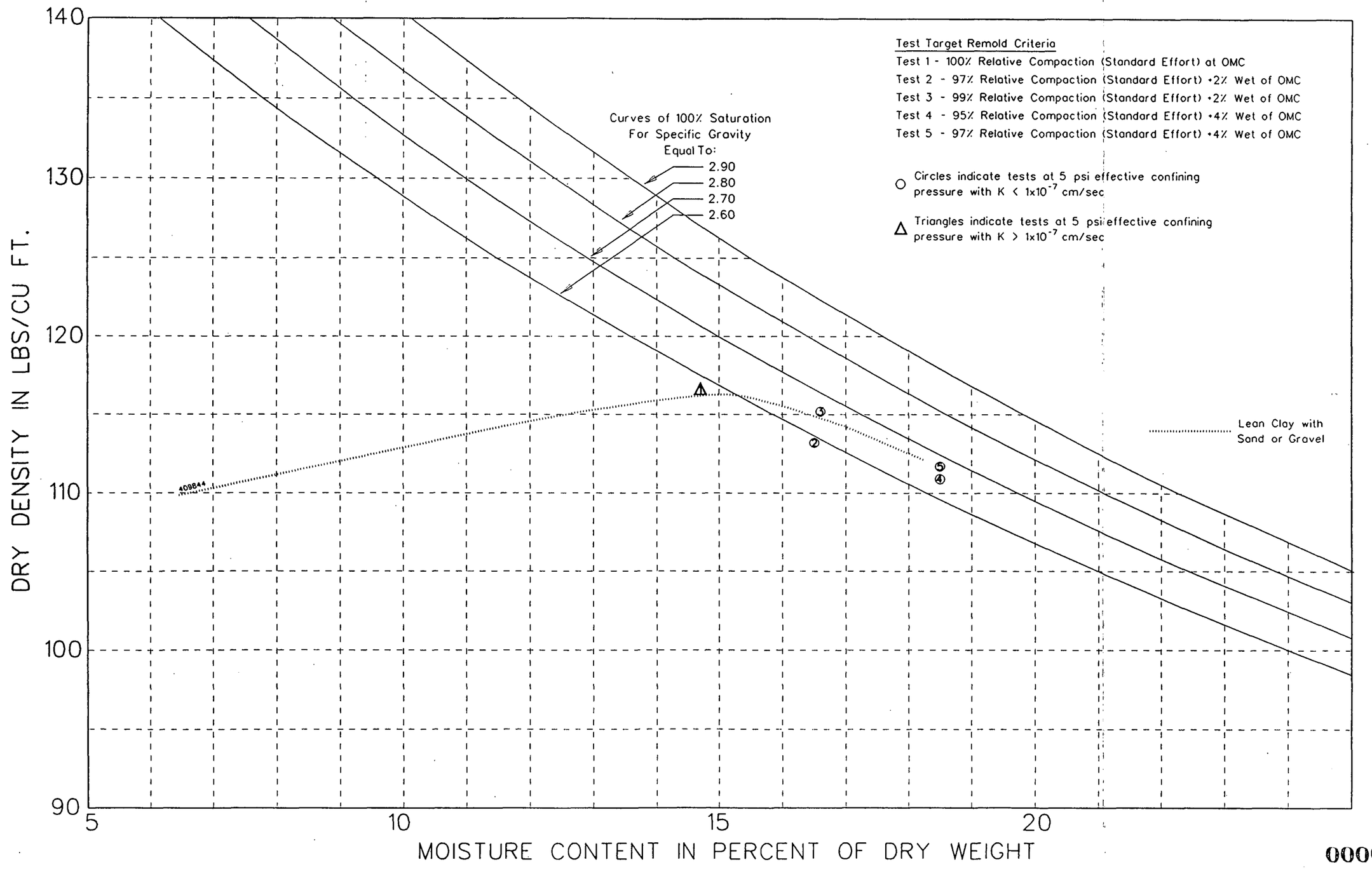
000077

Figure 4-16 - Summary of EFBA Brown Till Five-Point Remolded Permeability Test - Sample No. 409839

Boring: G2-SB-68 Sample No.: 409844 Depth: 5.0-10.0 ft SG: 2.83 Description: Dark Yellowish Brown Lean Clay w. Sand [CL]



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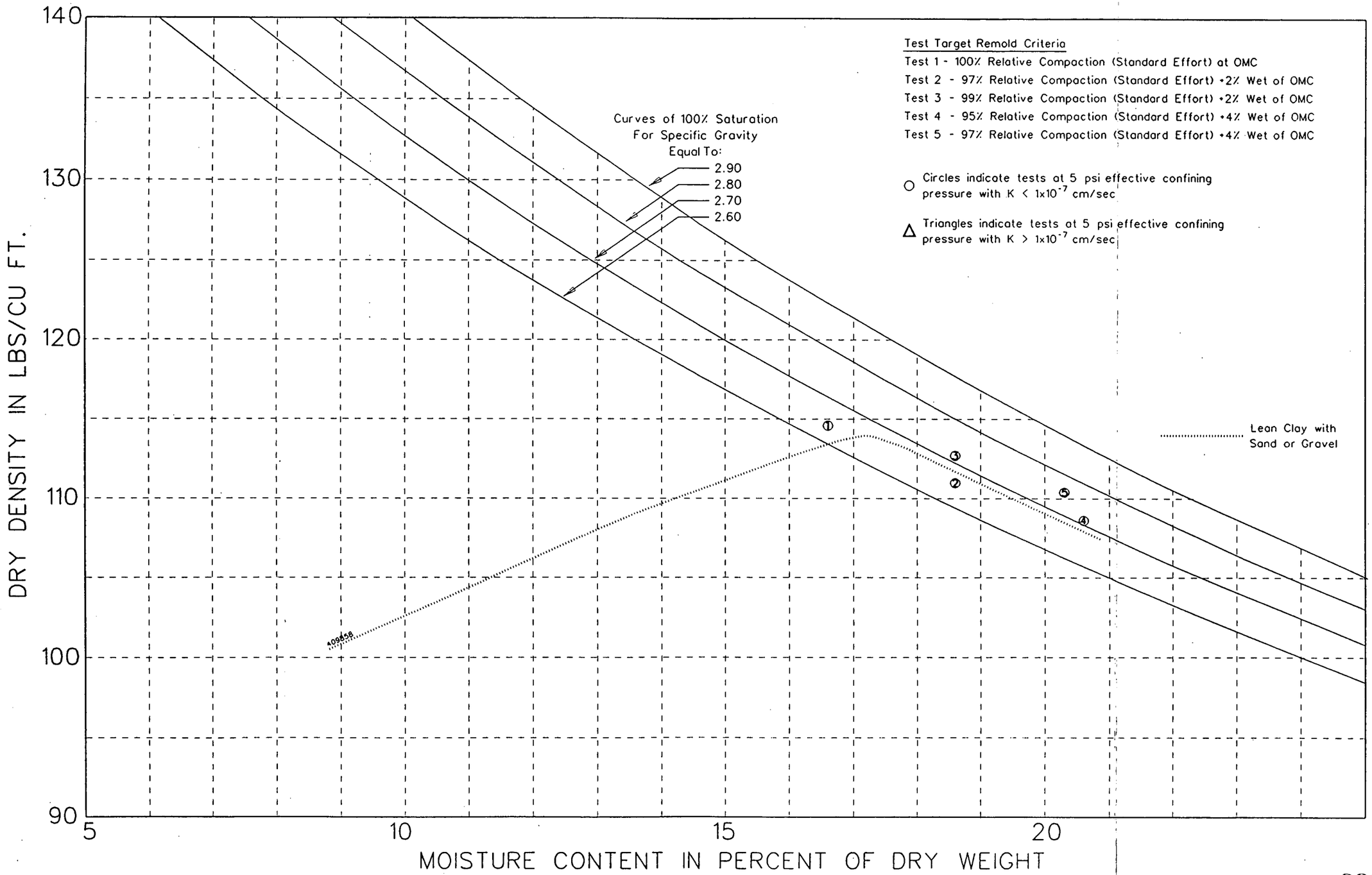
000078

Figure 4-17 - Summary of EFBA Brown Till Five-Point Remolded Permeability Test - Sample No. 409844

Boring: G2-SB-74 Sample No.: 409858 Depth: 1.5-5.0 ft SG: 2.76 Description: Light Olive Brown Lean Clay with Sand [CL]



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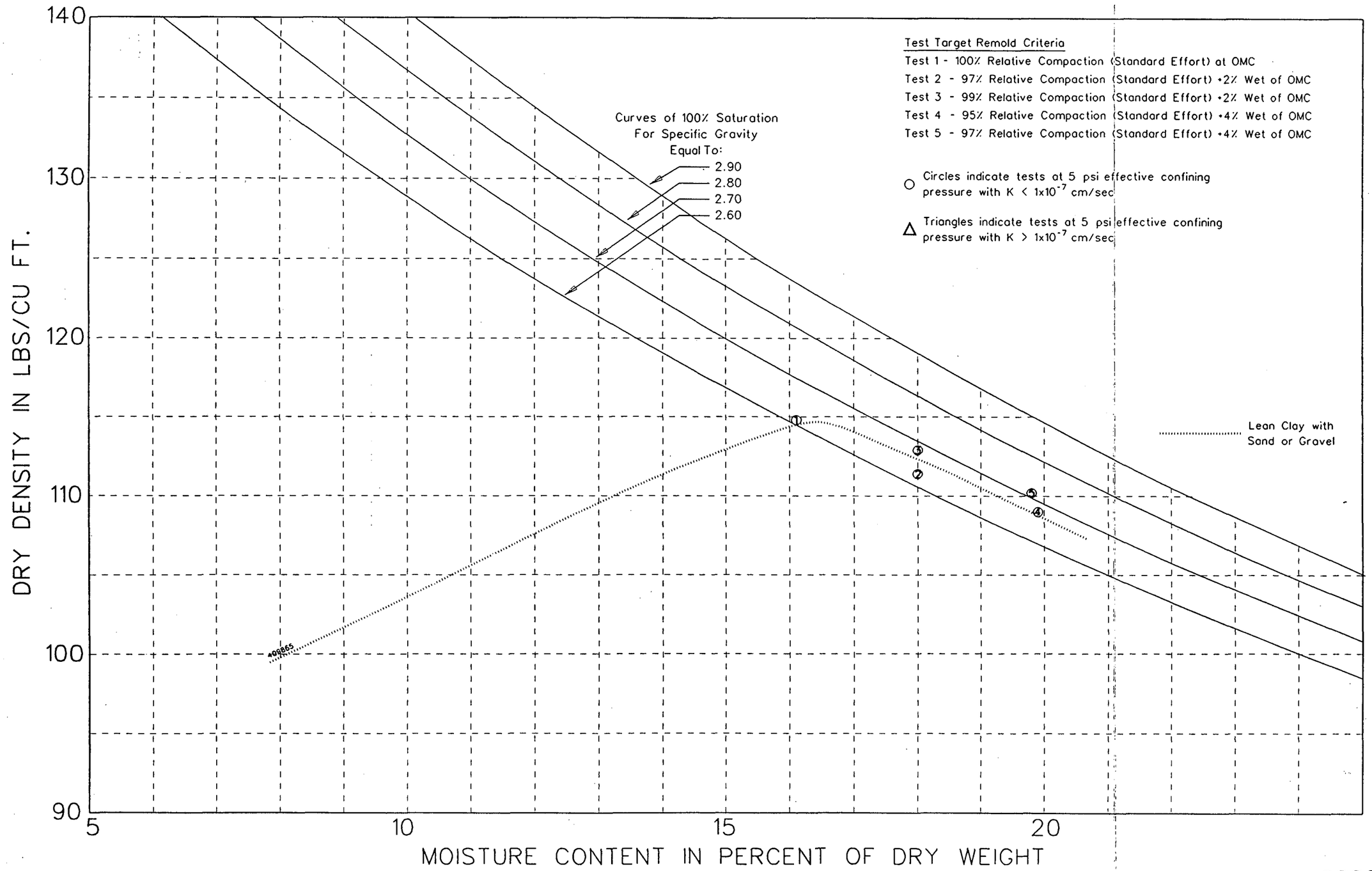
000079

Figure 4-18 - Summary of EFBA Brown Till Five-Point Remolded Permeability Test - Sample No. 409858

Boring: G2-SB-78 Sample No.: 409865 Depth: 1.5-5.0 ft SG: 2.63 Description: Yellowish Brown Lean Clay with Sand [CL]



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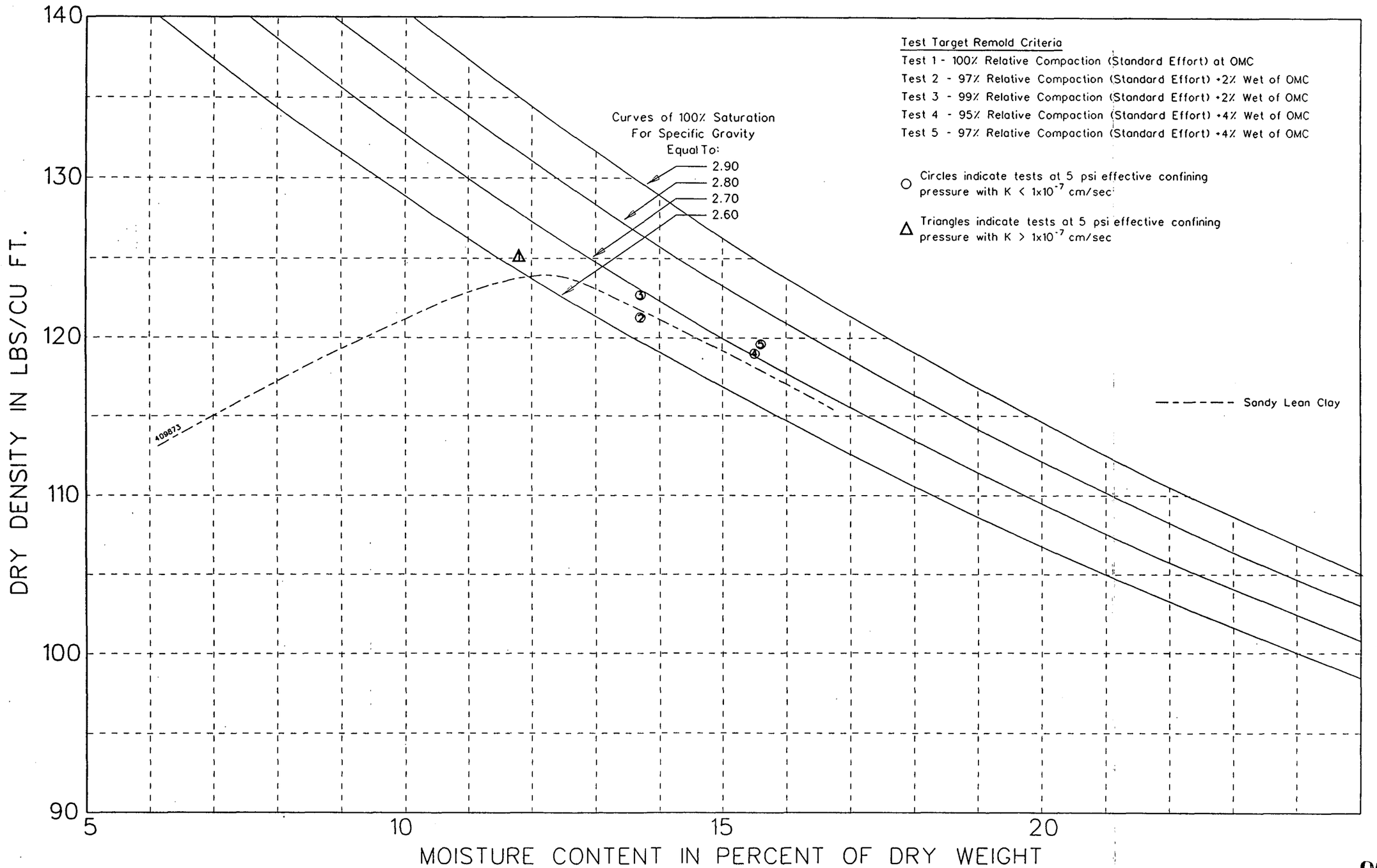
000080

Figure 4-19 - Summary of EFBA Brown Till Five-Point Remolded Permeability Test - Sample No. 409865

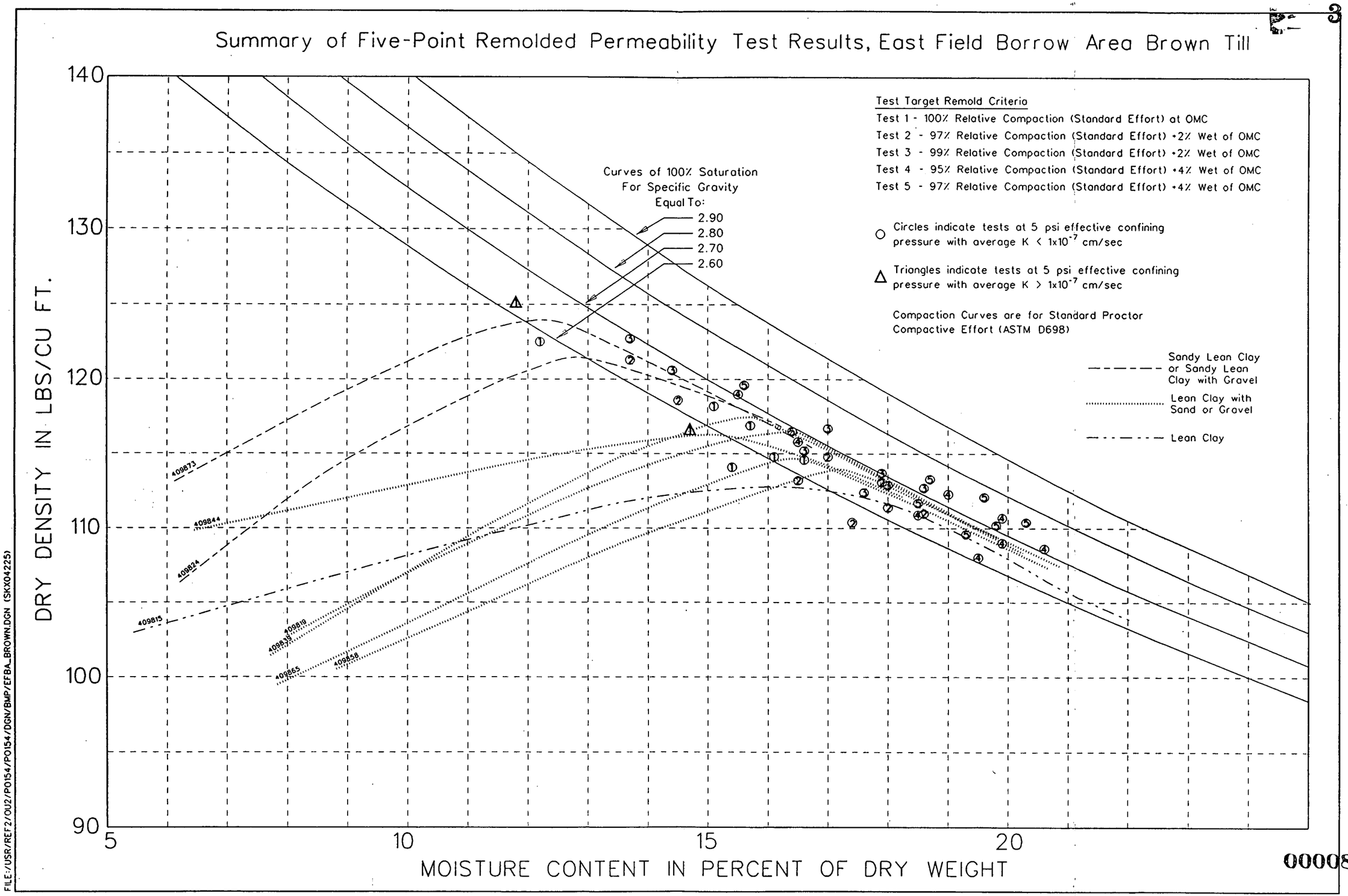
Boring: G2-SB-81 Sample No.: 409873 Depth: 1.5-5.0 ft SG: 2.75 Description: Yellowish Brown Sandy Lean Clay [CL]



FILE:/USR/REF2/OU2/PO154/PO154/DGN/BMP/EFBA409873.DGN (SKX04226)

000081

Figure 4-20 - Summary of EFBA Brown Till Five-Point Remolded Permeability Test - Sample No. 409873



000082

Figure 4-21 - Summary of EFBA Brown Till Five-Point Remolded Permeability Test Results

Table 4-18 - Summary of Leachate Characteristics used for Laboratory Permeability Tests, Remolded Specimens, and Comparison with K_d Study Data

	P_{rl} Laboratory Permeability Test Permeant		K_d Study		
	Result	**Qualifier**	**Result**	**Qualifier**	**Units**
Radionuclides					
Cesium-137	-0.379	U			pCi/L
Plutonium-238	0.003	U			pCi/L
Plutonium-239/240	-0.006	U			pCi/L
Radium-226	0.313	U			pCi/L
Radium-228	0.669	U			pCi/L
Strontium-90	-0.503	UJ			pCi/L
Technetium-99	127.6	J			pCi/L
Thorium-228	0.007	U			pCi/L
Thorium-230	0.034	U			pCi/L
Thorium-232	0.017	J			pCi/L
Thorium, total	0.211	U			µg/L
Uranium-234	827.14	J	850	J	pCi/L
Uranium-235/236	29.428	J	39	J	pCi/L
Uranium-238	1076.168	-	1100	-	pCi/L
Uranium, total	3240	-	3273	-	µg/L
Inorganics					
Aluminum	60.2	U			mg/L
Antimony	5.5	U			mg/L
Arsenic	2	U			mg/L
Barium	65.2	-			mg/L

Table 4-18 - Summary of Leachate Characteristics used for Laboratory Permeability Tests, Remolded Specimens, and Comparison with K_d Study Data (Continued)

	P_{rl} Laboratory Permeability Test Permeant		K_d Study		
	Result	**Qualifier**	**Result**	**Qualifier**	**Units**
Inorganics (cont'd)					
Beryllium	4	U			mg/L
Cadmium	4	U			mg/L
Calcium	96300	-			mg/L
Chromium	4	U			mg/L
Cobalt	14	U			mg/L
Copper	6	U			mg/L
Iron	392	UJ			mg/L
Lead	2.4	U			mg/L
Magnesium	51400	-			mg/L
Manganese	4	U			mg/L
Mercury	0.15	U			mg/L
Nickel	19	U			mg/L
Potassium	1550	-			mg/L
Selenium	11.6	UJ			mg/L
Silver	2.4	-			mg/L
Sodium	28700	-			mg/L
Thallium	2.2	U			mg/L
Vanadium	20	U			mg/L
Zinc	50.8	-			mg/L

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Table 4-18 - Summary of Leachate Characteristics used for Laboratory Permeability Tests, Remolded Specimens, and Comparison with K_d Study Data (Continued)

	P_{rl} Laboratory Permeability Test Permeant		K_d Study		
	Result	**Qualifier**	**Result**	**Qualifier**	**Units**
Water Quality					
TOX	19.7	UJ			µg/L
TOC	10.2	J			mg/L
Phenols	5	U			µg/L
Sulfides	1	U			mg/L
Alkalinity	324	-			mg/L
Sulfate	122	-			mg/L
Chloride	25.3	-			mg/L
Fluoride	0.78	-			mg/L
Conductivity	820	-			µMHOS/cm
Total Phosphates	139	UJ			µg/L
NO3/NO2-N	0.153	U			mg/L
Ammonia	0.03	U			mg/L
TKN	0.1	U			mg/L
TON	0.1	U			mg/L

000085

Table 4-18 - Summary of Leachate Characteristics used for Laboratory Permeability Tests, Remolded Specimens, and Comparison with K_d Study Data (Continued)

	P_{rl} Laboratory Permeability Test Permeant		K_d Study		
	Result	**Qualifier**	**Result**	**Qualifier**	**Units**
Semivolatiles					
Non-detect for all SVOC analytes					

Notes

1. The Predesign Investigation K_d Study (DOE 1995) used contaminated perched groundwater from monitoring wells in the development of an OSDF site-specific K_d. The permeant used for laboratory permeability testing was collected in the same manner as for the K_d Study water.

2. Abbreviations:
   K_d = Distribution Coefficient
   TOX = total organic halides
   TOC = total organic carbon
   NO3/NO2-N = nitrate/nitrate as nitrogen
   TKN = total kjeldahl nitrogen
   TON = total organic nitrogen

3. Qualifiers:
   J = estimated results
   U = non-detected
   UJ = non-detected estimate
   (-) = no data qualifier

000086

4.5.2 South Field Borrow Area Permeability Test Results

Two-stage laboratory permeability tests (ASTM D 5084) were performed on remolded test specimens from bulk samples of shallow soil from the SFBA collected during the PO-154 investigation. The target remold criteria for the test specimens was 97 percent relative compaction at +4 percent wet of OMC.

As with the P_{r5} tests, each permeability test of the same remolded test specimen was performed in two stages. In the first stage, an unconsolidated specimen was confined at 2 psi, saturated, and permeability measurements were taken. Upon completion of the first stage test, a second stage test of the consolidated specimen at an effective confining pressure of 5 psi was performed. If the target compaction density could not be achieved due to high saturation, the laboratory was directed to compact the test specimen to the maximum density reasonably achievable at that water content. If the density of specimens specified to be remolded at 97 percent relative compaction and 4 percent wet of OMC dropped below 95.5 percent relative compaction, then the test specimen was remolded to the maximum achievable density using a moisture content of only 3 percent wet of OMC. For tests of samples from Shelby tubes, where a compaction curve was not available, an MDD and OMC for remolding was assumed based on prior compaction data available for FEMP soils (see Table 3-5).

Table 4-19 summarizes the results of the remolded laboratory permeability tests (GSTP Test Code P_r) on samples from the SFBA. Figure 4-22 illustrates the SFBA test results. Table 4-19 also provides summary statistics for results of the SFBA tests. Further evaluation and discussion of the laboratory permeability test results are found in Subsection 5.1.

Table 4-19 Summary of PO-154 Remolded Laboratory Permeability Tests, South Field Borrow Area

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
SFBA	G2-SB-82	409878	Bulk	5.0	10.0	Brown Till	Lean Clay	CL	15.2	117.0	P_r	288	Standard	Note 5	18.8	112.8	4	96	2.3E-08	PO 154
SFBA	G2-SB-82	409878	Bulk	5.0	10.0	Brown Till	Lean Clay	CL	-	-	P_r	720	Standard	Note 5	-	-	-	-	2.1E-08	PO 154
SFBA	G2-SB-84	409882	Bulk	5.0	10.0	Brown Till	Lean Clay	CL	13.4	120.2	P_r	288	Standard	Note 5	17.3	114.9	4	96	6.1E-08	PO 154
SFBA	G2-SB-84	409882	Bulk	5.0	10.0	Brown Till	Lean Clay	CL	-	-	P_r	720	Standard	Note 5	-	-	-	-	6.2E-08	PO 154
SFBA	G2-SB-86	409886	Bulk	5.0	10.0	Brown Till	Sandy Lean Clay	CL	13.7	120.6	P_r	288	Standard	Note 5	16.5	116.3	3	96	5.2E-08	PO 154
SFBA	G2-SB-86	409886	Bulk	5.0	10.0	Brown Till	Sandy Lean Clay	CL	-	-	P_r	720	Standard	Note 5	-	-	-	-	4.6E-08	PO 154
SFBA	G2-SB-88	409890	Bulk	5.0	10.0	Brown Till	Lean Clay	CL	13.8	118.9	P_r	288	Standard	Note 5	17.6	113.8	4	96	8.1E-08	PO 154
SFBA	G2-SB-88	409890	Bulk	5.0	10.0	Brown Till	Lean Clay	CL	-	-	P_r	720	Standard	Note 5	-	-	-	-	8.1E-08	PO 154
SFBA	G2-SB-90	409894	Bulk	5.0	10.0	Stratified Glacial Deposits	Sandy Silt	ML	12.8	120.9	P_r	288	Standard	Note 5	16.4	116.5	4	96	1.2E-07	PO 154
SFBA	G2-SB-90	409894	Bulk	5.0	10.0	Stratified Glacial Deposits	Sandy Silt	ML	-	-	P_r	720	Standard	Note 5	-	-	-	-	1.0E-07	PO 154
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
SFBA	G2-156	410129	ST	5.0	7.0	Brown Till	Lean Clay	CL	(8) 14.5	(8) 118.0	P_r	288	Standard	Note 5	18.1	115.0	4	97	2.4E-08	PO 154
SFBA	G2-156	410129	ST	5.0	7.0	Brown Till	Lean Clay	CL	-	-	P_r	720	Standard	Note 5	-	-	-	-	2.0E-08	PO 154
SFBA	G2-157	410142	ST	10.0	12.0	Gray Till	Silty Clay	CL-ML	(8) 11.3	(8) 125.0	P_r	288	Standard	Note 5	15.2	119.6	4	96	4.8E-07	PO 154
SFBA	G2-157	410142	ST	10.0	12.0	Gray Till	Silty Clay	CL-ML	-	-	P_r	720	Standard	Note 5	-	-	-	-	4.2E-07	PO 154
SFBA	G2-158	410150	ST	10.0	12.0	Brown Till	Lean Clay	CL	(8) 12.6	(8) 123.0	P_r	288	Standard	Note 5	15.0	119.8	2	97	2.6E-08	PO 154
SFBA	G2-158	410150	ST	10.0	12.0	Brown Till	Lean Clay	CL	-	-	P_r	720	Standard	Note 5	-	-	-	-	2.1E-08	PO 154
SF/SFBA	G2-164	410302	ST	10.0	12.0	Stratified Glacial Deposits	Lean Clay	CL	(8) 11.3	(8) 125.0	P_r	288	Standard	Note 5	15.1	120.2	3.8	96.2	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/SFBA	G2-167	410329	ST	7.5	9.5	Stratified Glacial Deposits	Lean Clay	CL	(8) 12.6	(8) 123.0	P_r	288	Standard	Note 5	16.0	117.7	3.4	95.7	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

Statistics - 1.5-12 feet (excludes Fill)

		Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Average Perm. (cm/sec)
CL, ML, CL-ML 1.5'-12.0' c.p.=720 psf	Number	13	13	13
	Minimum	15.0	110.7	1.8E-08
	Maximum	19.5	120.2	4.2E-07
	Average	17.1	115.7	7.0E-08
	Std. Dev.	1.6	3.0	1.1E-07
CL 1.5'-5.0' c.p.=720 psf	Number	1	1	1
	Minimum	17.9	114.2	3.0E-08
	Maximum	17.9	114.2	3.0E-08
	Average	17.9	114.2	3.0E-08
	Std. Dev.	NA	NA	NA
CL, ML, CL-ML 5.0'-12.0' c.p.=720 psf	Number	12	12	12
	Minimum	15.0	110.7	1.8E-08
	Maximum	19.5	120.2	4.2E-07
	Average	17.1	115.8	7.4E-08
	Std. Dev.	1.6	3.1	1.1E-07

Statistics - CL, 1.5-12 feet (excludes Fill, CL-ML, and ML Samples)

		Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Average Perm. (cm/sec)
CL 1.5'-12.0' c.p.=720 psf	Number	11	11	11
	Minimum	15.0	110.7	1.8E-08
	Maximum	19.5	120.2	8.1E-08
	Average	17.4	115.2	3.6E-08
	Std. Dev.	1.6	3.0	2.1E-08
CL 1.5'-5.0' c.p.=720 psf	Number	1	1	1
	Minimum	17.9	114.2	3.0E-08
	Maximum	17.9	114.2	3.0E-08
	Average	17.9	114.2	3.0E-08
	Std. Dev.	NA	NA	NA
CL 5.0'-12.0' c.p.=720 psf	Number	10	10	10
	Minimum	15.0	110.7	1.8E-08
	Maximum	19.5	120.2	8.1E-08
	Average	17.3	115.3	3.6E-08
	Std. Dev.	1.7	3.2	2.2E-08

Notes:

1. On-Site Location: EFBA East Field Borrow Area; SFBA South Field Borrow Area; SF/SFBA South Field (Waste Unit) / South Field Borrow Area
2. Sample Type: Bulk Bulk 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. Average permeability is the average of the last four determinations from the test.
8. Assumed values for optimum moisture content and maximum dry density based on PO 132 compaction data.
9. c.p. - Confining Pressure
10. Data Source: PO 154 East and South Field Borrow Areas Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, March, 1996, ("EFBA" and "SFBA" On-Site Locations). Flyash Piles and South Field Waste Units Geotechnical Investigation, Geotechnical Laboratory Data Report, PARSONS Project Order 154, February, 1996 ("SF/SFBA" On-Site Locations).

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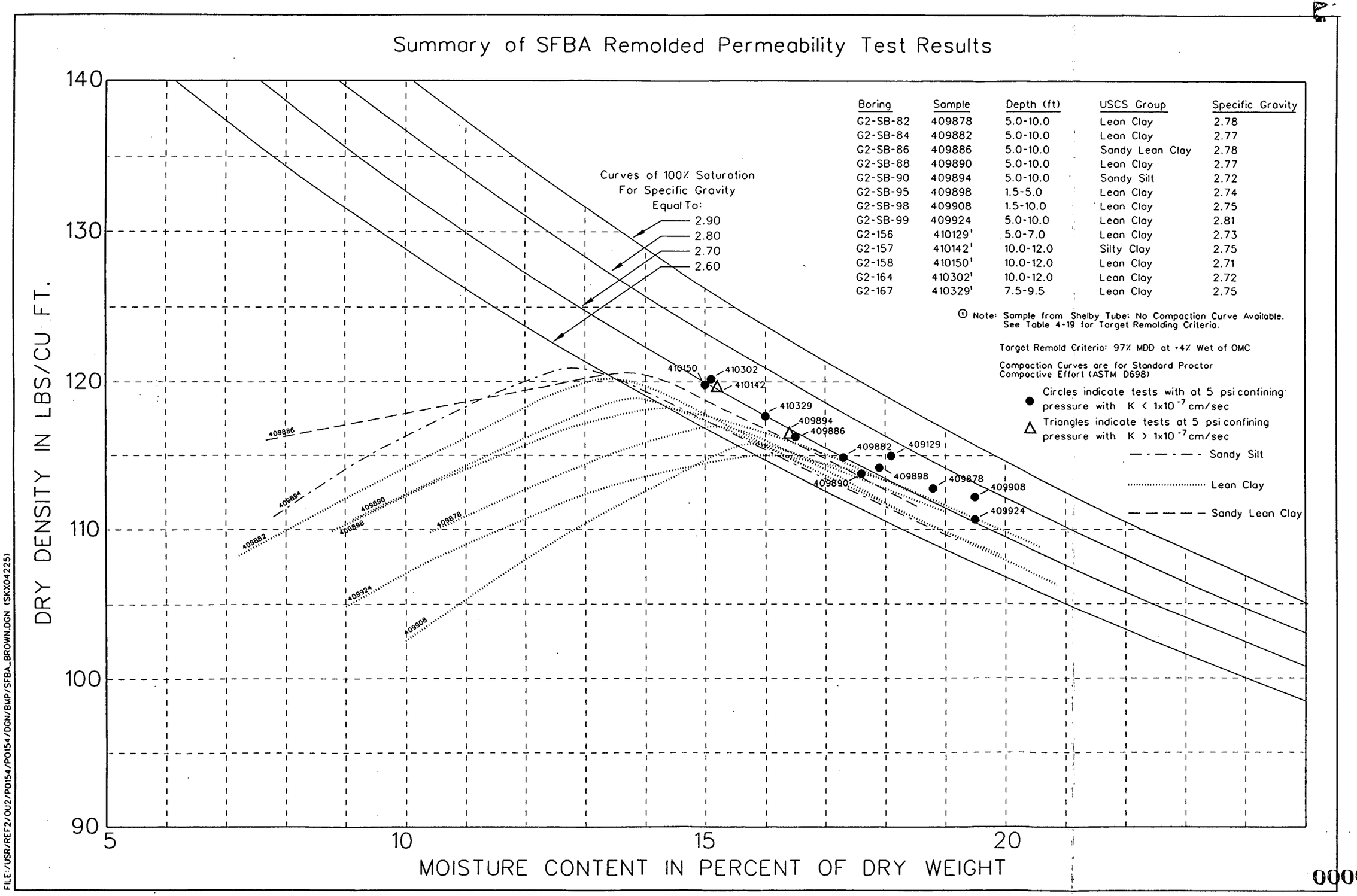

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000089

Figure 4-22 - Summary of SFBA Remolded Permeability Test Results

SECTION 5

EVALUATION, ANALYSES, AND RECOMMENDATIONS

This section presents evaluations and analyses performed in support of the borrow material investigation conducted in the EFBA and the SFBA. Based on these data, recommendations are made regarding the general suitability of the materials tested for use as landfill liner and cover, test pad design, geotechnical monitoring and testing, conceptual borrow excavation plans, and borrow site restoration.

The recommendations given in this section are based on the site-specific geotechnical data for the EFBA and the SFBA presented in Section 4, prior test data from the disposal facility footprint area, preliminary analysis of geotechnical data presented in the Test Pad Work Plan (Geosyntec 1996), and on supplemental technical data and methodologies, as presented in engineering literature and the citations defined in the final Record of Decision (ROD) for Remedial Actions at Operable Unit 2, dated May 1995. The geotechnical data are assumed to be representative of the conditions at the EFBA and the SFBA, though variations in properties of the excavated soils from these areas are expected.

5.1 Borrow Materials Evaluation

As described in Section 1 and shown in Figure 1-2, two potential borrow source areas were investigated for this report; the EFBA and the SFBA. The planned usage of the excavated materials from the borrow areas is for construction of the recompacted soil components of the bottom liner, cover, and berms, and for general construction fill for the proposed on-site disposal facility and reclamation of waste units.

This subsection discusses regulatory acceptance criteria for the borrow source materials and other soil properties that may impact the use of the borrow source materials for low-permeability barriers. It also summarizes and evaluates the geotechnical laboratory data from the two borrow source areas that are relevant to use of the materials in construction of the recompacted soil components of the OSDF.

5.1.1 Material Acceptance Criteria and Design/Construction Considerations

In accordance with the final ROD, the materials used for recompacted soil liners must meet certain Applicable or Relevant and Appropriate Requirements (ARARs) as identified in the Ohio Solid Waste Disposal Regulations, OAC 3745-27-08 (C)(1), (2), (3), (4), (5), (6), (7), and (9). The specific ARARs pertaining to material properties that the borrow source soils must meet are presented in Table 5-1. These specific ARARs include grain size and permeability requirements. The other ARARs presented in Table 5-1 pertain to specifications that must be met during construction (i.e., maximum clod size, loose lift thickness, placement moisture, and density requirements) and, therefore, are not relevant to this evaluation of the borrow source areas.

Table 5-1 - Applicable or Relevant and Appropriate Requirements
for Compacted Clay Liner and Cap Materials
FEMP On-Site Disposal Facility[1]

CITATION	REQUIREMENT
	Recompacted Soil Liner
Ohio Solid Waste Disposal Regulations OAC 3745-27-08 (C)(1)	The recompacted soil liner shall be: • constructed using loose lifts 8 in. thick with a maximum permeability of 1×10^{-7} cm/s. • constructed of a soil with a maximum clod size of 3 in. or half the lift thickness, whichever is greater. • constructed of soil with: - 100 percent of the particles having a maximum dimension not greater than 2 in. - not more than 10 percent of the particles, by weight, having a dimension greater than .75 in. - not less than 50 percent of the particles, by weight, passing through the 200-mesh sieve. - not less than 25 percent of the particles, by weight, having a maximum dimension not greater than 0.002 millimeters. • compacted to at least 95 percent of the maximum "Standard Proctor Density" using ASTM D 698 or at 90 percent of the maximum "Modified Proctor Density" using ASTM D 1557. • compacted at a moisture content at or wet of optimum. Alternatives for the above requirements may be used if it is demonstrated to the satisfaction of the Director that the materials and techniques will result in each lift having a maximum permeability of 1×10^{-7} cm/s. Additionally, the recompacted soil liner shall: • not be comprised of solid waste. • be constructed using the same number of passes and lift thickness, and the same or similar type and weight of compaction equipment established by testing. • constructed on a prepared surface that shall: - be free of debris, foreign material, and deleterious material; - be able to bear the weight of the landfill and its construction operations without causing or allowing a failure of the liner to occur through settling; and - not have any abrupt changes in grade that may result in damage to geosynthetics.
Ohio Solid Waste Disposal Regulations OAC 3745-27-08 (C)(15)	Cap System Recompacted Soil Barrier Layer[2] The recompacted soil barrier layer of the cap shall be: • a minimum of 18 inches thick and constructed in accordance with the specifications outlined above for construction of the recompacted soil liner for a landfill facility ((C)(1)(a) to (C)(1)(g) and (C)(1)(g) and (C)(1)(m) through (C)(1)(o) of OAC 3745-27-08) with the exception that the maximum permeability of the recompacted soil barrier shall be 1×10^{-6} cm/s; • be constructed of a soil with 100 percent of the particles having a maximum dimension not greater than 2 inches and with not more than 10 percent of the particles, by weight, having a dimension greater than 0.75 inches. • be compacted to at least 95 percent of the maximum "Standard Proctor Density" using ASTM D 698 or at least 90 percent of the maximum "Modified Proctor Density" using ASTM D 1557.

Notes:

(1) The following terminology is used: compacted clay liner = recompacted soil liner in Ohio Solid Waste Disposal Regulations; and compacted clay cap = cap system recompacted soil barrier layer of the Ohio regulations.

(2) More stringent criteria for clay cap thickness (24 inches) and maximum permeability (1×10^{-7} cm/s) have been adopted in the actual On-Site Disposal Facility design.

000091

Because of the purpose of recompacted soil liners as hydraulic barriers, the primary acceptance criteria of proposed materials are based on achievable hydraulic conductivity. As discussed in the Draft Test Pad Work Plan (Geosyntec 1996), the hydraulic conductivity requirement for the recompacted soil components of both the bottom liner and the cover systems is 1×10^{-7} cm/sec. The hydraulic conductivity of a given soil is impacted by several factors, including compactive effort and molding water content. Because of this, it is recommended that an acceptable permeability zone (APZ) be established for the proposed soil prior to initiation of construction of the liner components (US EPA 1993). The APZ for a given soil is established by evaluating the relationship between moisture content, dry density, and hydraulic conductivity. As shown in Figure 5-1, the boundaries of the APZ for a given soil typically are defined by the optimum moisture content and maximum dry density determined by compaction testing, lines of acceptable percent saturation, and a qualitative assessment of workability at varying moisture contents.

Other properties that may potentially impact the design and construction of recompacted soil liners include shear strength and swell/consolidation characteristics. The shear strength of the recompacted soils will impact the maximum slope angle at which the soils can be placed and considered stable in the long-term. Excessive swelling of the recompacted soil may affect the integrity of the liner systems.

5.1.2 Material Properties of East Field Borrow Area

The materials in the upper 15 feet (excluding topsoil) of the EFBA have properties that are indicative of soils that perform well in recompacted soil liner applications. Laboratory testing results suggest that though ARARs are not always met for grain size, the hydraulic conductivity requirements can be met with proper compaction, thereby minimizing the importance of the grain size criteria.

Based on laboratory permeability testing of compacted brown till samples from the EFBA, it is apparent that the hydraulic conductivity requirement of 1×10^{-7} cm/sec is readily achievable. All of the brown till samples that were compacted in the laboratory in the band ranging from a minimum of 97 percent of MDD at 2 percent to 4 percent over OMC to a minimum of 95 percent of MDD at 4 percent over OMC were measured to have laboratory permeabilities less than 1×10^{-7} cm/sec, which meets the ARAR specified in Table 5-1 (see Table 4-17). Comparing results of samples tested at effective confining pressures of 2 psi and 5 psi, it is apparent that increasing confining pressure slightly decreases the measured hydraulic conductivity, though for the soils tested, the hydraulic conductivity differences are minimal (less than a half-order of magnitude). Additionally, the soil samples tested with a site-specific leachate showed no adverse changes in hydraulic conductivity due to the leachate. Considering the APZ concept discussed in Subsection 5.1.1 and the results of the Proctor compaction testing, preliminary approximate APZs for two soil horizons within the brown till were developed from laboratory test data consistent with the approach described in Geosyntec 1996. This is due to the variability in soil characteristics with depth, which causes differences in optimum water contents, maximum dry densities, and permeabilities corresponding to varying compaction conditions. These APZs will assist the designer

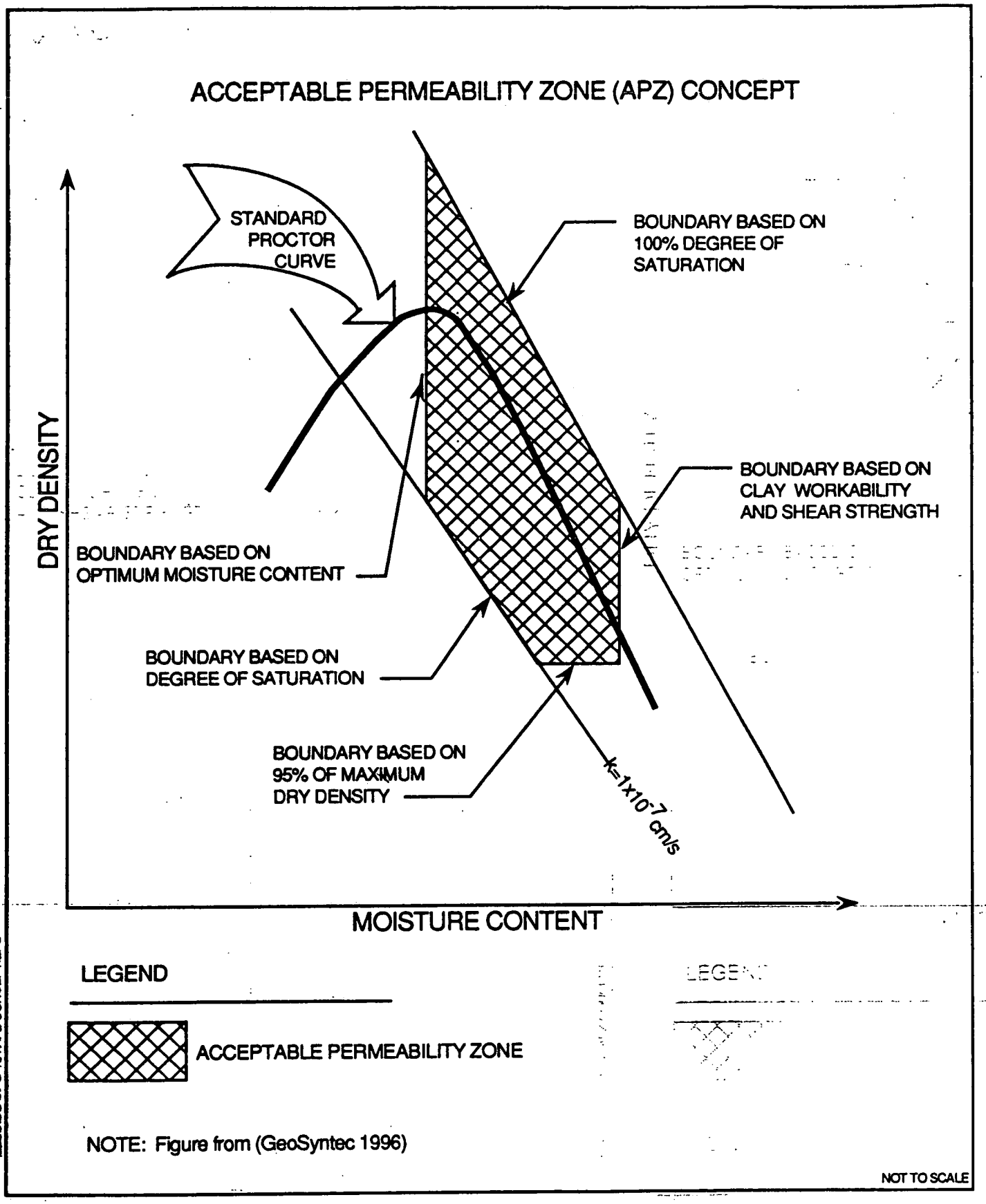

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Figure 5-1 - Acceptable Permeability Zone Concept

000093

in evaluating whether the variability in soil characteristics creates a significant shift in APZ for the brown till horizons.

The other ARARs relevant to material properties are based on grain size distributions of candidate materials. As presented on Table 5-2, the average values for grain sizes of 83 brown till samples tested show that ARARs are met for percent greater than 0.75 inches and for percent passing the No. 200 sieve. However, the average value of particles smaller than 0.002 mm for the 83 samples is approximately 23 percent, in contrast to the ARAR of greater than or equal to 25 percent. Out of the 83 samples tested, three samples were measured to have particles with dimensions greater than 2 inches. This contrasts with the ARAR for 100 percent of the particles with a maximum dimension of 2 inches. It should be noted that the sampling method used during the field sampling was not conducive to collection of particles greater than 2 inches, suggesting that the testing results may not correctly represent the quantity of particles greater than 2 inches within the upper 15 feet of the EFBA.

Table 5-2 - Average and Standard Deviation of Geotechnical Properties for the EFBA by Depth with ARARs

Geotechnical Property	0-15 Feet BGS		0-5 Feet BGS		5-10 Feet BGS		10-15 Feet BGS		ARAR
	Avg.	Std. Dev.	Avg.	Std. Dev.	Avg.	Std. Dev.	Avg.	Std. Dev.	
Percent Greater than 0.75 inches	1	3	1	2	1	3	4	7	≤10
Percent Passing No. 200 Sieve	73	14	78	11	68	12	65	17	≥50
Percent Smaller than 0.002 mm	23	7	26	7	20	7	19	4	≥25
Natural Moisture Content	18	4	19	4	15	3	13	2	NA
Optimum Moisture Content[1]	16	2	16	2	14	2	NA	NA	NA
Maximum Dry Density[1]	116	5	115	5	120	4	NA	NA	NA
Plasticity Index	17	7	21	6	13	5	7	4	NA
Activity[2]	1.0	NA	1.0	NA	0.9	NA	0.5	NA	NA

Notes:

1 As determined by Standard Proctor (ASTM D 698)

2 Calculated Using Average of Percent Soil Smaller than 0.002 mm and Average of Plasticity Index

NA Not Applicable

BGS Below Ground Surface

000094

Considering the shear strengths determined for recompacted brown till and preliminary stability analyses, significant problems associated with slope stability are not expected. As presented in Table G-10 of the Geotechnical Investigation Report for PO-140 (PARSONS 1995b) for similar soils from the area of the disposal facility footprint, the shear strength values determined for brown till remolded to approximately 95 percent of the measured (or estimated) dry density at water contents ranging from 1.3 percent to 3.7 percent above optimum water content typically are higher than the values used in the preliminary stability analyses, which resulted in adequate factors of safety against slope failure.

The average value of activity for the 83 samples tested from the EFBA is 1.0. The activity is the ratio between plasticity index and clay fraction. This value corresponds to soil with relatively low potential for swelling which corresponds to free swell of less than 1.5 percent using a chart presented in Holtz and Kovacs (1981). Based on this conclusion, the EFBA soils are not expected to undergo enough swelling to compromise the integrity of the liner systems.

To simplify data presentation for the EFBA, results of geotechnical testing are separated into depth intervals of 0 to 5.0 feet below ground surface (bgs), 5.0 to 10.0 feet bgs, and 10.0 feet to 15.0 feet bgs. These approximate depth intervals were also chosen to investigate potential differences in grain size characteristics, Atterberg limits, and results of compaction testing performed on samples from each interval. In general, the following trends are apparent with increasing depth; increasing fraction of coarse-grained particles, decreasing plasticity index, increasing maximum dry density, and decreasing optimum water content. This subsection discusses the material properties relevant to the acceptance criteria and other design/construction considerations for each of the depth intervals stated above.

EFBA Depth Interval 0 feet to 5.0 feet (Excluding Topsoil)

Table 5-2 presents average values and standard deviations for percentage of particle sizes for 40 brown till samples collected from 0 feet to 5 feet bgs of the EFBA. Comparing the ARARs to the average values for percent greater than 0.75 inches, percent passing the No. 200 sieve, and percent smaller than 0.002 mm, the materials appear to meet the requirements for grain size. It should be noted that one sample out of the 40 samples tested had particle(s) greater than 2 inches in diameter. The ARARs include the requirement for 100 percent of the particles having a maximum dimension not greater than 2 inches. In addition, to use the materials of this interval for recompacted soil liner applications, it will be necessary to separate out vegetation, roots, and other organic materials prior to placement. Based on field observations made during the investigations for PO-140 and this report, the roots extend down to approximately 1 to 2 feet bgs.

As shown on Table 5-2, the average natural water content for this depth interval is 19 percent. The average OMC, as determined from Standard Proctor compaction testing (ASTM D 698), is 16 percent, suggesting that the in situ soils are within the desired water content range for placement of a compacted clay liner (i.e., 2 percent to 4 percent greater than OMC).

The average activity for the materials from this depth interval is 1.0. Based on conclusions made in Holtz and Kovacs (1981), the soils from this interval have relatively low swell potential.

As summarized on Table 4-17, the laboratory permeability testing performed subsequent to the Standard Proctor compaction testing resulted in all brown till samples that were compacted in the band ranging from a minimum of 97 percent MDD at 2 percent to 4 percent over OMC to a minimum of 95 percent MDD at 4 percent over OMC passing the ARARs. Each of the samples compacted to the conditions described above were measured to have laboratory permeabilities less than 1×10^{-7} cm/sec. This suggests that the brown till from this depth interval are acceptable with respect to the ARARs regardless of the results of the grain size analyses.

EFBA Depth Interval 5.0 feet to 10.0 feet

Table 5-2 presents average values and standard deviations for percentage of particle sizes for 32 brown till samples collected from this depth interval of the EFBA. The materials appear to meet the requirements for grain size except for the percentage smaller than 0.002 mm. The average value of particles smaller than 0.002 mm is 20 percent, as opposed to the requirement of greater than or equal to 25 percent. In addition, one sample out of the 32 samples tested had particle(s) greater than 2 inches in diameter. The ARARs include the requirement for 100 percent of the particles having a maximum dimension not greater than 2 inches.

As shown on Table 5-2, the average natural water content for this depth interval is 15 percent. The average OMC, as determined from Standard Proctor compaction testing (ASTM D 698), is 14 percent, suggesting that a minimal amount of additional water will be required during construction to place the soils from this interval within the desired range for compacted clay liners (i.e., 2 percent to 4 percent over OMC).

The average activity for the materials from this depth interval is 0.9. Based on conclusions made in Holtz and Kovacs (1981), the soils from this interval have relatively low swell potential.

As summarized on Table 4-17, the laboratory permeability testing performed subsequent to the Standard Proctor compaction testing resulted in all brown till samples that were compacted in the band ranging from a minimum of 97 percent MDD at 2 percent to 4 percent over OMC to a minimum of 95 percent MDD at 4 percent over OMC passing the ARARs. Each of the samples compacted to the conditions described above were measured to have permeabilities less than 1×10^{-7} cm/sec. This suggests that the brown till from this depth interval are acceptable with respect to the ARARs regardless of the results of the grain size analyses.

EFBA Depth Interval 10.0 feet to 15.0 feet

Table 5-2 presents average values and standard deviations for percentage of particle sizes for 11 samples collected from this depth interval of the EFBA. The materials appear to meet the requirements for grain size except for the percentage smaller than 0.002 mm. The average value of particles smaller than 0.002 mm is 19 percent, as opposed to the requirement of greater than or equal to 25 percent. In addition, one sample out of the 11 samples tested had particle(s) greater than 2 inches in diameter. The ARARs include the requirement for 100 percent of the particles having a maximum dimension not greater than 2 inches.

As shown on Table 5-2, the average natural water content for this depth interval is 13 percent. The average optimum water content, as determined from Standard Proctor compaction testing (ASTM D 698) for the interval from 5 feet to 10 feet, is 14 percent, suggesting that a minimal amount of additional water will be required during construction.

The average activity for the materials from this depth interval is 0.5. Based on conclusions made in Holtz and Kovacs (1981), the soils from this interval have relatively low swell potential.

Laboratory permeability testing was not performed on brown till samples from this depth interval.

Comparison of EFBA and Disposal Facility Footprint Compaction Curves

Compaction test of soils within the proposed Disposal Facility footprint were conducted during prior investigations (PARSONS 1995b and 1995c). The footprint of the proposed disposal facility lies immediately north of the eastern portion of the EFBA (see Figure 1-1). Current plans are to use soils from within the footprint for construction of the liner, with additional soils required coming from on-site borrow areas. To allow for comparison of the compaction characteristics of soils from the EFBA and disposal facility footprint, three graphics have been prepared which show the compaction curves for three general depth intervals. Figure 5-2 shows the compaction curves for brown till from ground surface (excluding topsoil) to 5 feet depth. The figure shows the compaction curves for the EFBA (PO-154) soils and the disposal facility footprint soils (PO-132 and PO-140). Appendix H contains a tabular summary or the compaction test results from the disposal facility footprint and has a map showing sample locations. Figure 5-3 shows the compaction curves for brown till from 5 to 10 feet deep. Figure 5-4 shows compaction curves for gray till which lies below the brown till. These gray till compaction curves are from test of soils from depths of about 11 to 18 feet below the ground surface.

The figures illustrate that the till from the disposal facility footprint and the EFBA exhibit the same compaction characteristics. The characteristic behavior of increasing Maximum Dry Density (MDD) and decreasing Optimum Moisture Content (OMC) with depth is seen in the samples tested from both areas. This general trend can be attributed to the generally increasing sand content of the till with depth (Geosyntec 1996). The brown till from the two depth intervals (horizons) within the brown till, and the

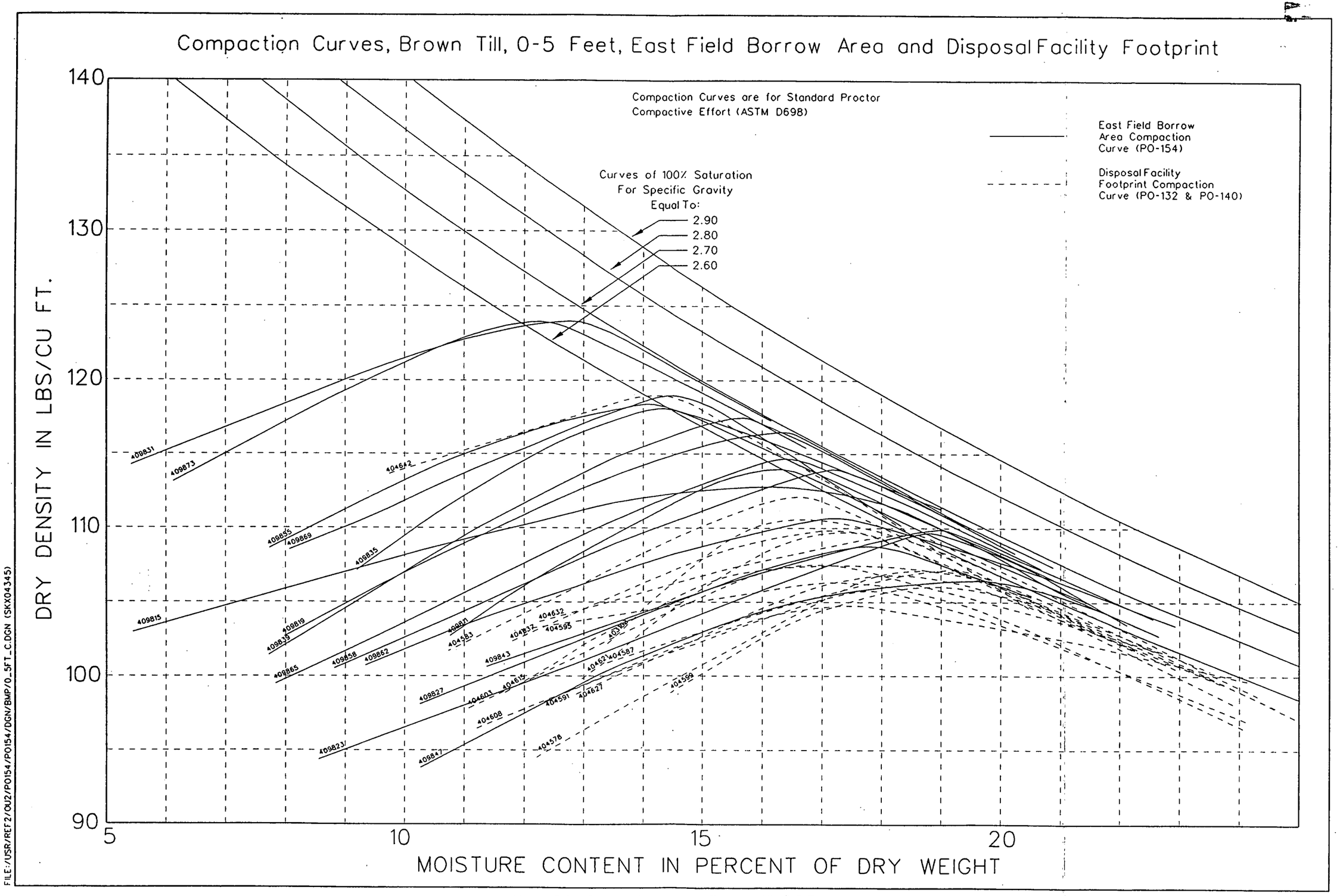

Figure 5-2 - Compaction Curves, Brown Till, 0-5 Feet, East Field Borrow Area and Disposal Facility Footprint

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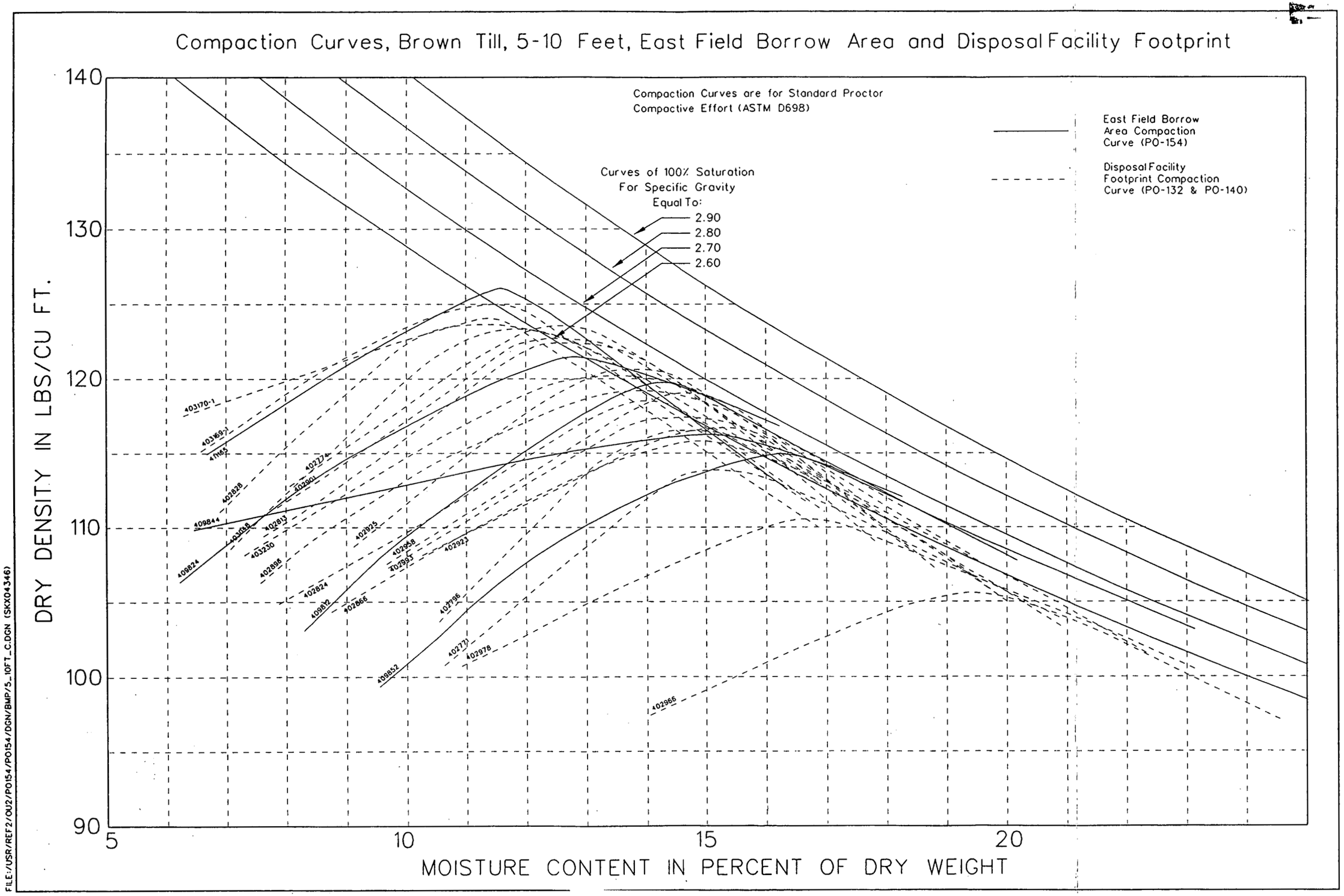

Figure 5-3 - Compaction Curves, Brown Till, 5-10 Feet, East Field Borrow Area and Disposal Facility Footprint

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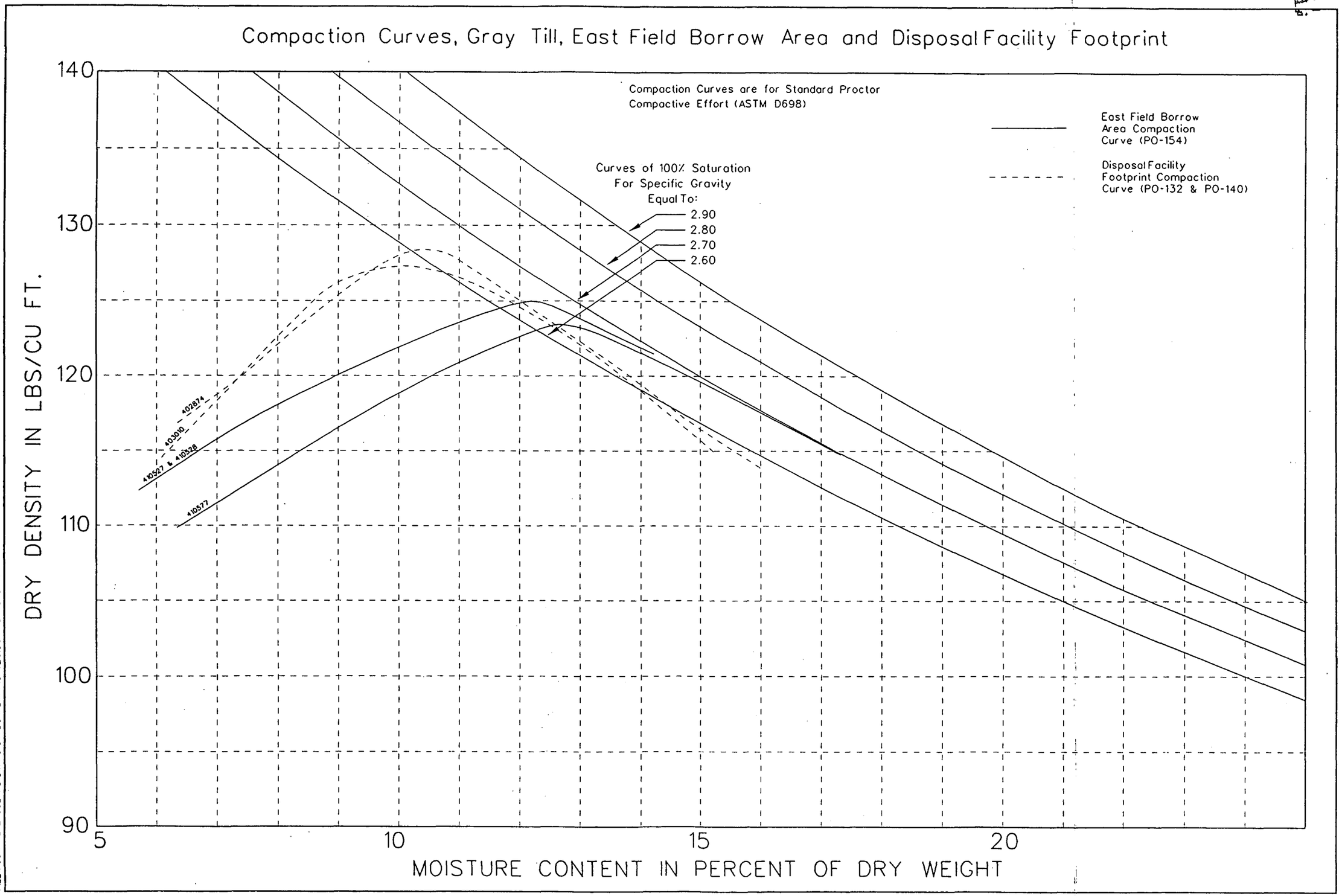

Figure 5-4 - Compaction Curves, Gray Till, East Field Borrow Area and Disposal Facility Footprint

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gray till show the same general range of OMCs and MDDs for both areas. These data support the finding in Geosyntec 1996, that within each horizon of the brown till, there are not significant differences in material properties between the EFBA and disposal facility footprint area.

Proposed Target Compaction Criteria

To construct compacted soil barriers for the OSDF, the designer will have to specify a range of densities and moistures for the construction contractor to use for placement of the candidate clay soils. This section proposes target density and moisture conditions for placement of the brown till based on the laboratory permeability testing of remolded brown till samples from the disposal facility footprint (PO-132 and PO-140) and the EFBA (PO-101 and PO-154). The designer may modify these proposed ranges based on the field scale testing results of the test pad program and other design considerations.

Figure 5-5 shows a plot of the laboratory coefficient of permeability verses relative compaction (based on Standard Proctor compactive effort) for remolded laboratory permeability tests of brown till clay samples from the disposal facility footprint and EFBA. The data points on the figure indicate the pre-test moisture content (molding water content) relative to the optimum moisture content. The figure illustrates that specifying a target density and water content range based on a compaction curve data for the soil is a viable method to specify placement to achieve the desired permeability.

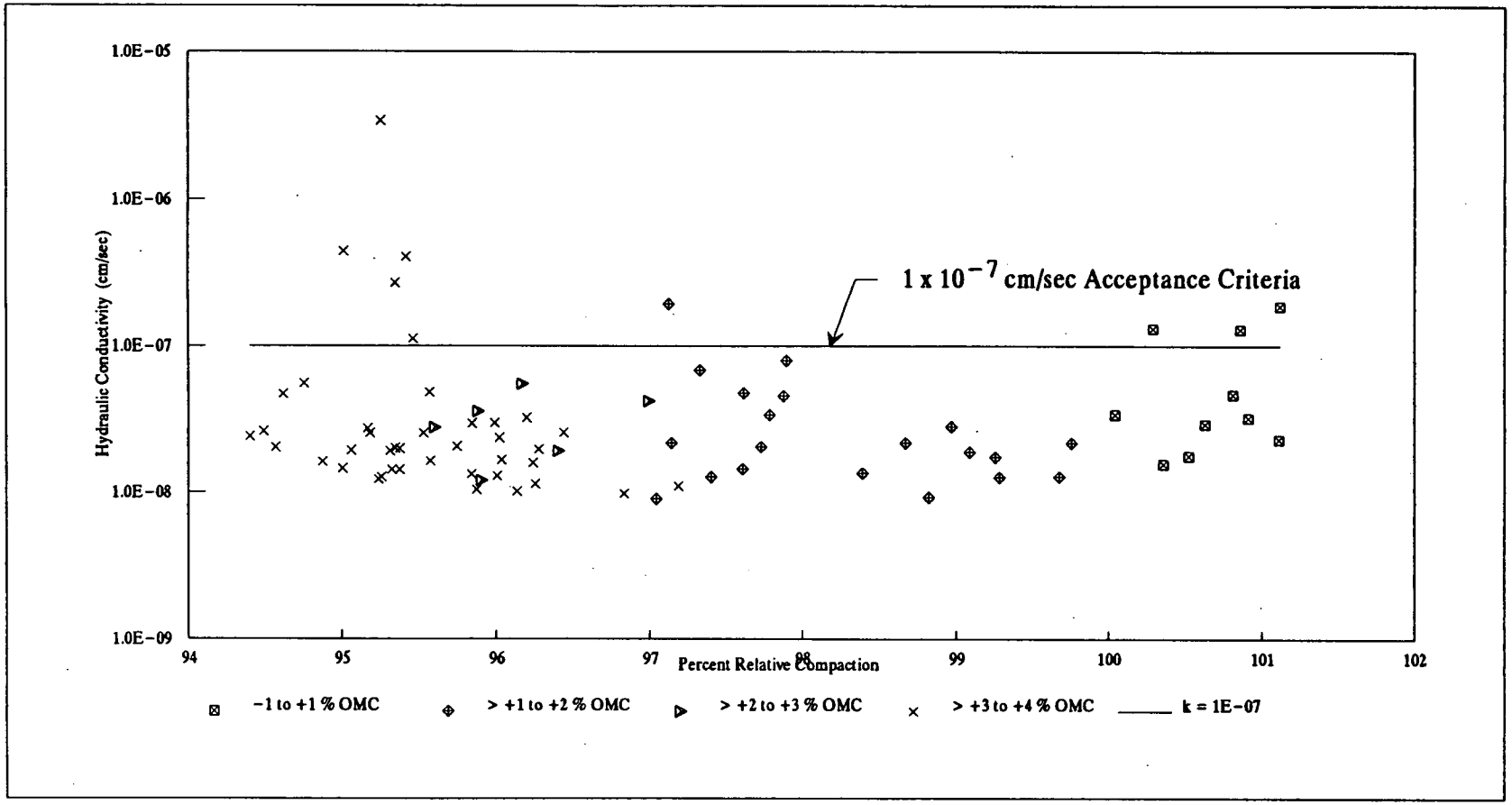
The results of laboratory permeability testing of remolded samples of brown till during PO-101, PO-132, PO-140 and PO-154 provide a basis for establishing a target moisture and density range for field placement. The proposed target ranges for the brown till clay soils at the EFBA and Disposal Facility Footprint are:

1) Density: 95 to 97 percent of MDD based on Standard Proctor compactive effort
2) Moisture: +2 to +4 percent wet of OMC based on Standard Proctor compactive effort

The laboratory test results from PO-101 (Tables 4-15 and 4-16) suggest that compacting the till at water contents of greater than about +4 percent wet of OMC (for example +4 to +6 wet of OMC) using a standard compactive effort will also achieve acceptable hydraulic conductivities. In this situation, based on the shape of the Standard Proctor compaction curves for the brown till, the density of the compacted soils would likely fall within a range from about 90 to 95 percent MDD based on Standard Proctor compactive effort.

Preliminary Estimate of APZ for Brown Till from Laboratory Testing

Figure 5-1 illustrates the concept of the APZ. The APZ graph provide a means to field verify that the compacted clay barriers achieve acceptable permeability. During construction, Construction Quality Control field measurements of density and moisture of various compacted soil lifts of the barrier are taken



Notes:

1. Data Source: PO-154, PO-132 (PARSONS 1995c) and PO-140 (PARSONS 1995b)

Figure 5-5 - Laboratory Hydraulic Conductivity vs. Relative Compaction for Various Molding Water Contents

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and compared with the acceptable moisture/density zone of the APZ graph. Measurements that are within the APZ indicate that the maximum coefficient of permeability limit for the lift (1×10^{-7} cm/sec for the proposed disposal facility) has been met.

From the laboratory tests performed during PO-132, PO-140 and PO-154, preliminary approximate estimates of APZs were developed for the brown till to provide information for the Test Pad Program. Figures 5-6 and 5-7 show the estimated APZ for two approximate depth intervals (horizons) within the brown till. These APZs are preliminary, are based on laboratory testing, and they will need to be modified based upon testing conducted during the planned Test Pad program.

A preliminary APZ was developed for the following approximate depth intervals consistent with the approach described in the Draft Test Pad Work Plan (Geosyntec 1996):

1) Brown Till - 0 to 5 feet bgs, excluding topsoil (upper horizon)
2) Brown Till - 5 to 10 feet bgs (lower horizon)

These depth intervals were selected based on the availability of Standard Proctor compaction test data and associated remolded permeability testing (i.e., PO-132, PO-140 and PO-154).

Development of the preliminary APZs used the five point EFBA permeability test results illustrated in Figures 4-13 through 4-20, and the results of single point permeability tests of brown till from the disposal facility footprint area (PO-132 and PO-140, Appendix H). The results of these tests were superimposed on the same graphic as the corresponding representative compaction curves of the samples tested from each horizon. This allowed for estimation of the zone having less than 1×10^{-7} hydraulic conductivity.

All the laboratory permeability test results within the APZ have hydraulic conductivity less than 1×10^{-7} cm/sec. Because test data had few samples with coefficients of permeability greater than 1×10^{-7} cm/sec, the 1×10^{-7} cm/sec lower boundary line is estimated. The percent saturation of the 1×10^{-7} cm/sec boundary line shown on the APZ graphics is about 90 to 92 percent, assuming a specific gravity of 2.70. Additionally, the lower right bound of the APZ was established as 95 percent of the MDD of the representative compaction curve with the lowest MDD. The upper bound to the APZ represents an approximation of the 100 percent saturation curve for the soils based on the permeability and specific gravity test results. The applicability and, if applicable, value of a vertical right bound to the APZ based on workability and shear strength should be evaluated as part of the test pad program.

Comparison of APZ for Brown Till Horizons

Comparison of Figures 5-6 and 5-7 suggest that a single APZ could be used to "envelope" both of the brown till horizons. This should be verified by the Test Pad Program. The hatched area of both curves

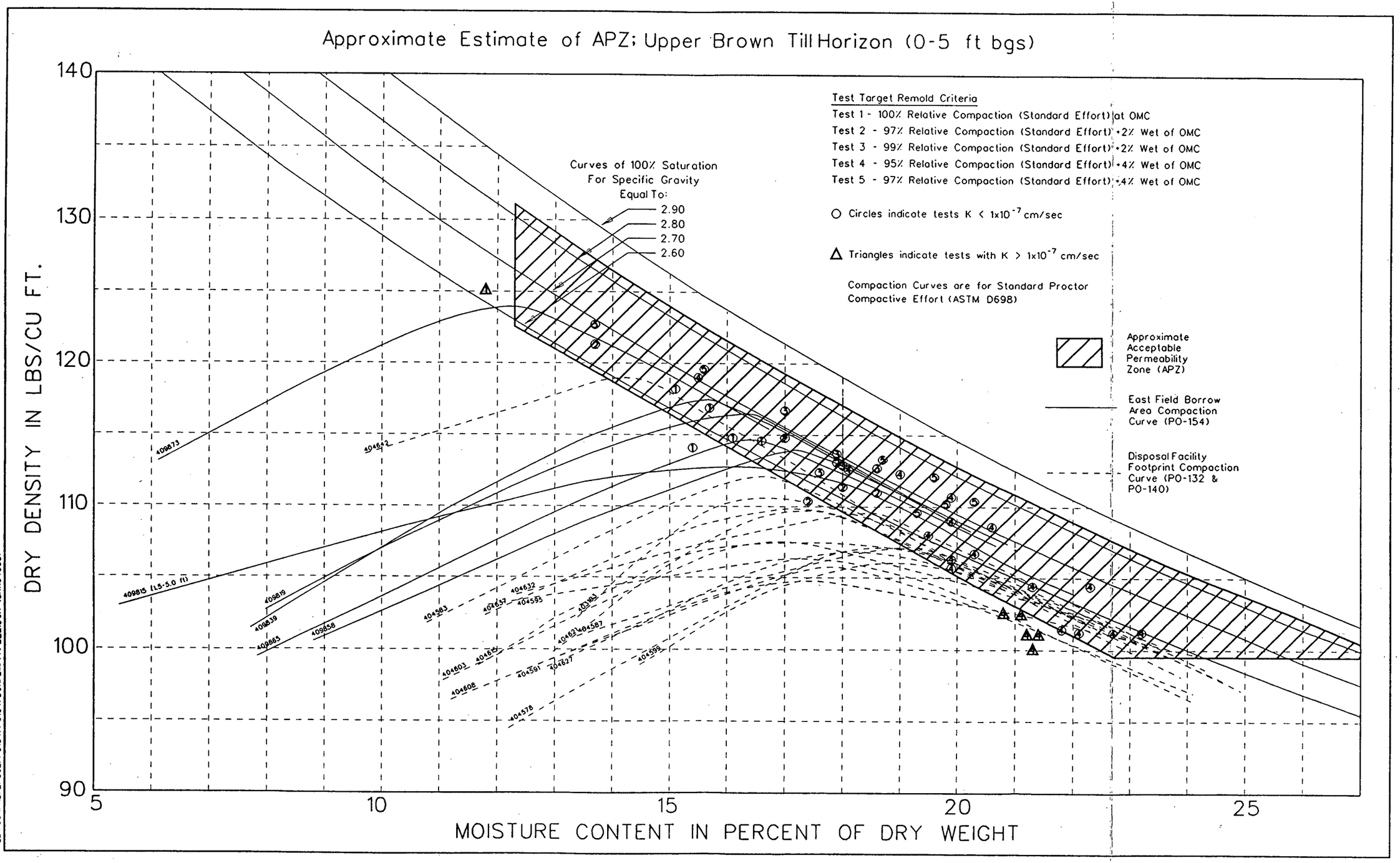

Figure 5-6 - Approximate Estimate of APZ; Brown Till Upper Horizon (0 - 5 feet bgs)

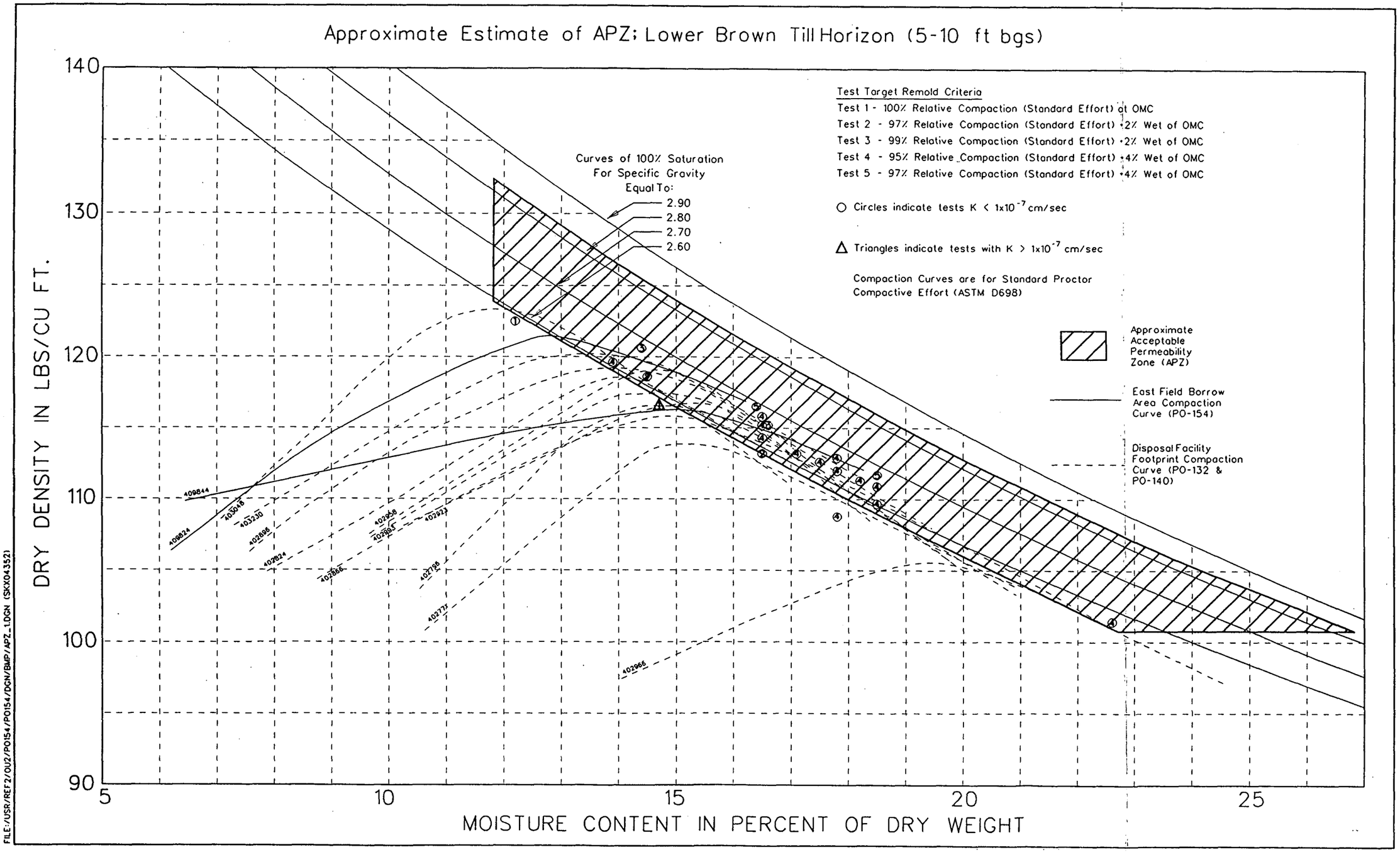

Figure 5-7 - Approximate Estimate of APZ; Brown Till Lower Horizon (5 - 10 feet bgs)

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is essentially the same. Figures 5-6 and 5-7 illustrate that the majority of the 0 to 5 foot brown till samples that underwent permeability tests had lower MDDs and higher OMCs than the brown till samples from 5 to 10 feet. The samples tested from the 5 to 10 foot horizon showed a much tighter grouping of compaction curves, and generally had MDDs higher, and OMCs lower than the brown till within the 0 to 5 foot horizon. Sample #402966 (see Figure 5-7) is a fat clay from boring 11471 (PO-132). Considering that similar zones fat clay could be encountered within the 5-10 foot horizon extends the APZ zone into the range of lower MDD and higher OMC typical of the 0 to 5 foot brown till horizon.

5.1.3 Material Properties of South Field Borrow Area

Typically in the SFBA the brown till/stratified glacial deposits depth ranges between 12 and 15 feet. Table 5-3 presents average values and standard deviations of index properties and compaction data for the SFBA soil samples tested during PO-154 geotechnical investigation. Comparing the ARARs to the average values for percent greater than 0.75 inches, percent passing the No. 200 sieve, and percent soil particles less than 0.002 mm, the materials appear to comply with the grain size requirements. No samples tested had any particles greater than 2 inches in diameter, which complies with the ARARs requirement of no particles greater than 2 inches in diameter.

As reported in Table 5-3, the average natural moisture content for the 0 - 12 foot interval in the SFBA is 20 percent by weight. The average OMC as determined by Standard Proctor compaction test (ASTM D 698) is 14 percent by weight, approximately 6 percent over optimum moisture content. Assuming that the borrow materials are placed at 2 to 4 percent above optimum moisture, the moisture content of the SFBA soils will need to be lowered before they are placed in the liner or cap of the OSDF.

The average soil activity and plasticity indexes of the SFBA soil are 0.8 and 18 percent. According to Holtz and Kovacs 1981, these values are indicative of soils having low swell potential.

As summarized in Table 4-19, the laboratory permeability testing on the SFBA soil samples, compacted to 97 percent of MDD and +4 percent of OMC as determined by Standard Proctor, the average permeability tested at 5 psi effective confining pressure was 7.0×10^{-8} cm/sec. The average value is less than the maximum value for hydraulic conductivity specified in the ARARs (1×10^{-7} cm/sec). Although the average satisfies the ARARs requirements, two individual test results were greater than 1×10^{-7} cm/sec. The samples with measured permeabilities greater than 1×10^{-7} cm/sec were classified as sandy silt (ML) and silty clay (CL-ML) according to USCS. These permeability tests were from samples located at depths greater than 5 feet below the ground surface.

The soils in the SFBA was divided into two depth intervals to determine if the material index and physical properties varied between the two depth intervals. The depth intervals considered as potential borrow areas are 0 to 5.0 feet bgs (excluding topsoil) and 5.0 to 12.0 feet bgs. These depth intervals were

chosen to determine if differences existed in grain size characteristics, Atterberg limits, and Standard Proctor compaction tests performed on samples from the two depth intervals.

Table 5-3 - Average and Standard Deviation of Geotechnical Properties for the SFBA by Depth with ARARs

Geotechnical Property	0-12 Feet BGS		0-5 Feet BGS		5-12 Feet BGS		ARAR
	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	
Percent Greater than 0.75 inches	<1	1	<1	1	<1	1	≤10
Percent Passing No. 200 Sieve	87	16	88	10	85	20	≥50
Percent Smaller than 0.002 mm	28	9	33	7	23	9	≥25
Natural Moisture Content	20	4	21	3	20	5	NA
Optimum Moisture Content[1]	14	1	14	NA	14	1	NA
Maximum Dry Density[1]	119	2	118	NA	119	2	NA
Plasticity Index	18	11	26	10	11	5	NA
Activity	0.8	0.2	0.9	0.2	0.6	0.1	NA

Notes: [1] As determined by Standard Proctor (ASTM D 648)
NA Not Applicable
BGS Below Ground Surface

SFBA Depth Interval 0 feet to 5.0 feet (Excluding Topsoil)

Table 5-3 presents average values and standard deviations for percentage of particle sizes for 13 samples collected from this depth interval of the SFBA. Comparing the ARARs to the average values for percent greater than 0.75 inches, percent of soil particles passing the No. 200 sieve, and percent of soil particles smaller than 0.002 mm, the material appears to satisfy the grain size requirements in the ARARs. It should be noted that one sample out of the 13 samples did not have 25 percent of the soil particles that were less than 0.002 mm in diameter, but all the ARARs grain size requirements were met by the remaining samples.

As reported in Table 5-3, the average natural moisture content of the soil for this interval is 21 percent by weight. A Standard Proctor compaction test was performed on only one sample from this depth interval. The optimum moisture content reported was 14 percent by weight. As a result, the soil from this depth interval may have to be dried between 2 and 4 percent before being placed in the OSDF, depending on the moisture requirements specified for cap and liner of the OSDF.

The average activity and plasticity index of the soil from 0 to 5.0 feet are 0.9 and 26 percent. According to Holtz and Kovacs (1981), these values suggest that the soils have a low to medium swell potential. It should noted that four of the 13 samples tested exhibited high swell potentials (between 5 and 25 percent according to Holtz and Kovacs [1981]) and were classified as fat clays with varying amounts of sand.

As summarized in Table 4-19, two permeability tests were performed on remolded soil samples from this depth interval. One sample was categorized as brown till, the other as fill. The tested samples were remolded to 97 percent of the maximum dry density and +4 percent wet of the OMC as determined by Standard Proctor compaction test using a 5 psi effective confining pressure. The permeability reported for the remolded brown till lean clay sample was 3.0×10^{-8} cm/sec and 1.4×10^{-8} cm/sec for the remolded fill.

SFBA Depth Interval 5.0 feet to 12.0 feet

Table 5-3 presents average values and standard deviations for percentage of particle sizes for 10 samples collected from this depth interval of the SFBA. Comparing the ARARs to the average values for percent greater than 0.75 inches, percent passing the No. 200 sieve, and percent soil particles less than 0.002 mm, the materials appear to comply with the grain size requirements except for the percent of soil particles less than 0.002 mm in diameter. No samples tested had any particles greater than 2 inches in diameter, which complies with the ARARs requirement of no particles greater than 2 inches in diameter.

As reported in Table 5-3, the average natural moisture content for the soil for this interval is 20 percent by weight. The average OMC as determined by Standard Proctor compaction test (ASTM D 698) is 14 percent by weight. Assuming that specifications will require the borrow materials for the cap and liner of the OSDF are placed at 2 to 4 percent above OMC, the moisture content of the excavated SFBA (natural moisture content) soils may need to be lowered before they are placed in the liner or cap of the OSDF if no drying occurs during excavation, hauling, and stockpiling.

The average activity and plasticity index of the soil from 5.0 to 12.0 feet are 0.6 and 11 percent. According to Holtz and Kovacs (1981), these values suggest that the soils have a low swell potential (less than 5 percent).

As summarized in Table 4-19, 10 permeability tests were performed on remolded soil samples from this depth interval. The tested samples were remolded to 97 percent of the maximum dry density and +4 percent of the optimum moisture content as determined by Standard Proctor compaction test. The average of the 12 samples tested for permeability was 7.4×10^{-8} cm/sec using a 5 psi effective confining pressure.

Comparison of the Two SFBA Depth Intervals

In general, the 0 to 5.0 feet interval samples are finer grained than the 5.0 to 12.0 feet interval samples. On average, the 0 to 5.0 feet interval samples contain approximately 10 percent more clay (minus 0.002 mm material) than the 5.0 to 12.0 feet samples. All the samples in the 0 to 5.0 feet interval classified as lean clays or fat clays with varying amounts of sand according to the USCS, while two of the samples in the 5.0 to 12.0 feet interval classified as either silty sand or silt. The remaining samples from the 5.0 to 12.0 feet interval classified as silty clay or lean clay with varying amounts of sand. Between 12.0 and 15.0 feet, approximately half of the SFBA soil samples classified as silty sands.

Overall, the liquid limit and plasticity index results for the 0 to 5.0 feet interval are higher than the reported values for the 5.0 to 12.0 feet interval. The plastic limit values reported are similar between the 0 to 5.0 and 5.0 to 12.0 feet intervals. As a result of the higher plasticity indices and clay contents, the activity values of the 0 to 5.0 feet samples were higher than the 5.0 to 12.0 feet samples. The higher activity values indicate that there may be increased possibility of swell in 0 to 5.0 feet interval soils once recompacted.

The SFBA depth intervals both have in situ moisture contents that are approximately 6 percent by weight greater than the optimum moisture content determined by Standard Proctor compaction test. As a result, both the 0 to 5.0 feet interval and the 5.0 to 12.0 feet interval would need to be dried between 2 and 4 percent by weight to achieve a goal of 2 to 4 percent above optimum moisture content in the liner and cap of the OSDF. If the SFBA soils are to be used for compacted hydraulic barriers, the acceptable compaction moisture content range will have to be determined for the SFBA materials through determination of the APZ. To determine the APZ, additional permeability tests should be performed on recompacted samples from the SFBA at varying density and moisture contents, similar to the permeability tests performed on the EFBA soil samples.

All of the clay samples in the SFBA meet the ARARs requirement for permeability when the samples are confined at 5 psi, compacted to 97 percent maximum dry density (Standard Proctor), and compacted at approximately 4 percent above optimum moisture content as determined by Standard Proctor compaction test. Two samples in the 5.0 to 12.0 feet interval had measured permeabilities above the ARARs requirement of 1×10^{-7} cm/sec; these samples classified as sandy silt (ML) and silty-clay (CL-ML) according to USCS.

Additional Geotechnical Properties in the SFBA

Currently results from one consolidation test are available on a remolded sample from the SFBA. The sample was remolded at 85 percent of maximum dry density at or near OMC as determined by Standard Proctor compaction test. Borrow materials for the OSDF cap, liner, and berms will be compacted to at least 95 percent of maximum dry density as determined by Standard Proctor. As a result, additional

consolidation data should be collected on recompacted SFBA soils similar to the compaction conditions expected in the construction of the OSDF to accurately estimate settlement if the SFBA soils will be used in construction of the OSDF. Table 4-9 summarizes the results of the available consolidation data in the SFBA.

If borrow soils from the SFBA are used for construction of the OSDF, shear testing should be performed on recompacted SFBA soils that simulate the expected compaction requirements in the OSDF. Tables 4-12 and 4-13 summarize the available shear strength data on remolded SFBA soils.

Another concern when recompacting soils is the workability of the soils during compaction. According to Holtz and Kovacs (1981), the workability of soils can be estimated using the USCS symbol of the soil. The majority of the fine-grained SFBA soils tested were classified as CL soils (lean clays), and the remaining soils classified mainly as CH soils (fat clays). In general lean clays exhibit good to poor workability characteristics where the workability is expected to become worse as the moisture content rises above optimum moisture content. As a result, the soils used for general fill (berms and reclamation of waste unit areas) compacted near optimum moisture content as determined by Standard Proctor compaction test should be fairly easier to work with than soils used in select fill (caps and liners) where the moisture content will be higher than the optimum moisture content. Usually CH soils are considered to have poor workability. Due to their high plasticity and clay contents, they tend to stick badly to equipment when wet, and make compaction and hauling difficult when wet. If the CH soils were kept dry of, or near, OMC for general use the workability of the soils may be better than if the soils were wet in the case of select fill.

5.1.4 Recommendations

This subsection presents a summary of relevant findings and recommendations for use of the EFBA and SFBA materials based on the evaluations and analyses presented in Subsections 5.1.2 and 5.1.3. Consideration is given to the ARARs presented in Table 5-1 and standard engineering practice for the design and construction of landfills.

East Field Borrow Area

The brown till in the upper 15 feet (excluding topsoil) of the EFBA is expected to perform well in recompacted soil liner applications. Although not all of the samples meet the ARARs relating to grain size, the required hydraulic conductivity of 1×10^{-7} cm/sec can readily be met if the soils are properly compacted. Consistent with Table 5-1 and the Draft Test Pad Work Plan (Geosyntec 1996), it is permissible to forgo the grain size ARARs if it is demonstrated that the materials used for the recompacted soil liner can consistently be placed with a maximum permeability of 1×10^{-7} cm/sec. Based on the results of the compaction testing and the laboratory permeability testing of compacted samples, the brown till from the upper 10 feet of the EFBA (excluding topsoil) are expected to have permeabilities

less than 1 x 10^{-7} cm/sec if they are compacted in the band ranging from a minimum of 97 percent MDD at 2 percent to 4 percent over OMC to a minimum of 95 percent MDD at 4 percent over OMC. The only brown till clay samples from the EFBA that were measured to have laboratory permeabilities less than the ARAR of 1 x 10^{-7} cm/sec were compacted at approximately MDD at OMC.

Because of particles with dimensions greater than 2 inches encountered at the EFBA, some field size control may be required prior to soil placement. As described previously, a minimal number of brown till samples collected from the EFBA were measured to have particles greater than 2 inches though the sampling methods were not conducive to collection of particles of this size. The degree of field size control that will be required will be determined during excavation for construction of the test pad. It should be noted that a relatively small amount of oversize particles should not impact the overall hydraulic conductivity of the compacted soils if care is taken during placement to ensure that segregation of the oversize particles is minimized (Shelley and Daniel 1993). This conclusion can be confirmed during large-scale field testing of the Test Pad.

As described in Subsection 5.1.2, the materials at the EFBA tend to have an increasing percentage of coarse-grained particles with depth. The primary functional impact of this difference in soil type (i.e., grading downward from lean clay and lean clay with sand to sandy lean clay) is to cause variations in the compaction properties. In general, the maximum dry density increases and the optimum moisture content decreases with increasing percentage of coarse-grained particles. Because of this variability, it is recommended that Proctor curves and APZs be developed for the materials from approximately 0 feet to 5 feet, and below 5 feet. This can be done in conjunction with construction of the Test Pad. These APZs can be used to confirm whether a single APZ is appropriate for the brown till. Proctor compaction testing will be required during Test Pad construction to verify which of the APZs is appropriate for comparison. It is also recommended that large-scale, field hydraulic conductivity testing be performed during Test Pad construction to allow for correlation with laboratory testing results. These recommendations are consistent with the Draft Test Pad Work Plan (Geosyntec 1996). In addition, though the hydraulic conductivity differences at varying confining pressures are minimal, it is recommended that laboratory hydraulic conductivity testing model effective pressures in the field as closely as practical.

As presented on Table 5-2, the average moisture content of the brown till at the EFBA is approximately 18 percent. This compares with the average OMC of the EFBA soils determined from compaction testing (i.e., 16 percent), indicating that brown till excavated from the EFBA are within the range of desired water contents for placement of compacted clay liners (i.e., 2 percent to 4 percent above OMC). This conclusion is illustrated in Figure 5-8, which shows moisture content versus depth for the EFBA in addition to the measured OMC versus depth. The actual quantity of water that will need to be added will be determined during construction based on field moisture content analyses and compaction testing.

Based on results of shear strength testing and slope stability analyses performed for the Geotechnical Investigation Report for PO-140 (PARSONS 1995b), problems with respect to slope stability are not expected for brown till of the EFBA that is compacted to at least 95 percent of the maximum dry density. Although the shear strength testing mentioned above was performed on soil samples collected from below the proposed footprint of the on-site disposal facility, the brown till from the EFBA is expected to behave similarly. Results of unconsolidated undrained tests performed for this report show significant strength increases for samples remolded to 90 percent of the maximum dry density as compared to those remolded to 85 percent of the maximum dry density. Consideration should be given to performance of additional strength tests on brown till samples collected from the EFBA remolded to conditions anticipated for use in applications which are specified at less than 95 percent MDD (e.g., general backfill).

Based on results of index testing of the brown till from the EFBA and conclusions made in Holtz and Kovacs (1981), swelling is not expected to be a problem for the compacted soils from the EFBA.

In summary, the brown till of the EFBA is considered good material for recompacted soil liner applications. As shown in the laboratory, brown till materials to about 10 feet bgs (excluding topsoil) can be compacted to obtain permeabilities of less than 1×10^{-7} cm/sec. Because of variations in soil type that generally appear to be a function of depth, it is recommended that separation of the top 5 feet and the interval from 5 to 15 feet be performed. Some limited field size control of oversize particles (greater than 2 inches) may be required for all the soils in addition to separation of organic materials from the upper interval. The two soil intervals will require separate compaction and index testing to determine the appropriate placement specifications. In general, it is expected that the brown till is within the desired range of the water contents for placement of compacted soil liners (i.e., 2 percent to 4 percent above OMC). The brown till of the EFBA are expected to behave adequately with respect to slope stability. Field shear strength testing should be considered during the test pad program to verify final design configurations using measured strength values for typical soils to be used in construction.

South Field Borrow Area

Soils from the SFBA are suggested for use primarily as general fill. Enough information is known about the SFBA soils, and their properties are such that they would be adequate for use in the waste unit reclamation or for use in berm material in the OSDF. If the SFBA soils are used in berm construction of the OSDF, additional consolidation and shear testing should be performed to estimate settlements and estimate factors of safety against general slope failure.

Clay soils from the SFBA could be used as select fill material if shown acceptable based on additional testing of the soils. Additional testing would mainly consist of permeability tests performed on the SFBA soils to determine permeability characteristics as a function of density and moisture content. In addition, shear testing would be needed to determine boundaries of the APZ for the SFBA. If the SFBA soils are used as select material, the depth interval from 0 to approximately 7 or 8 feet bgs appears to be the better

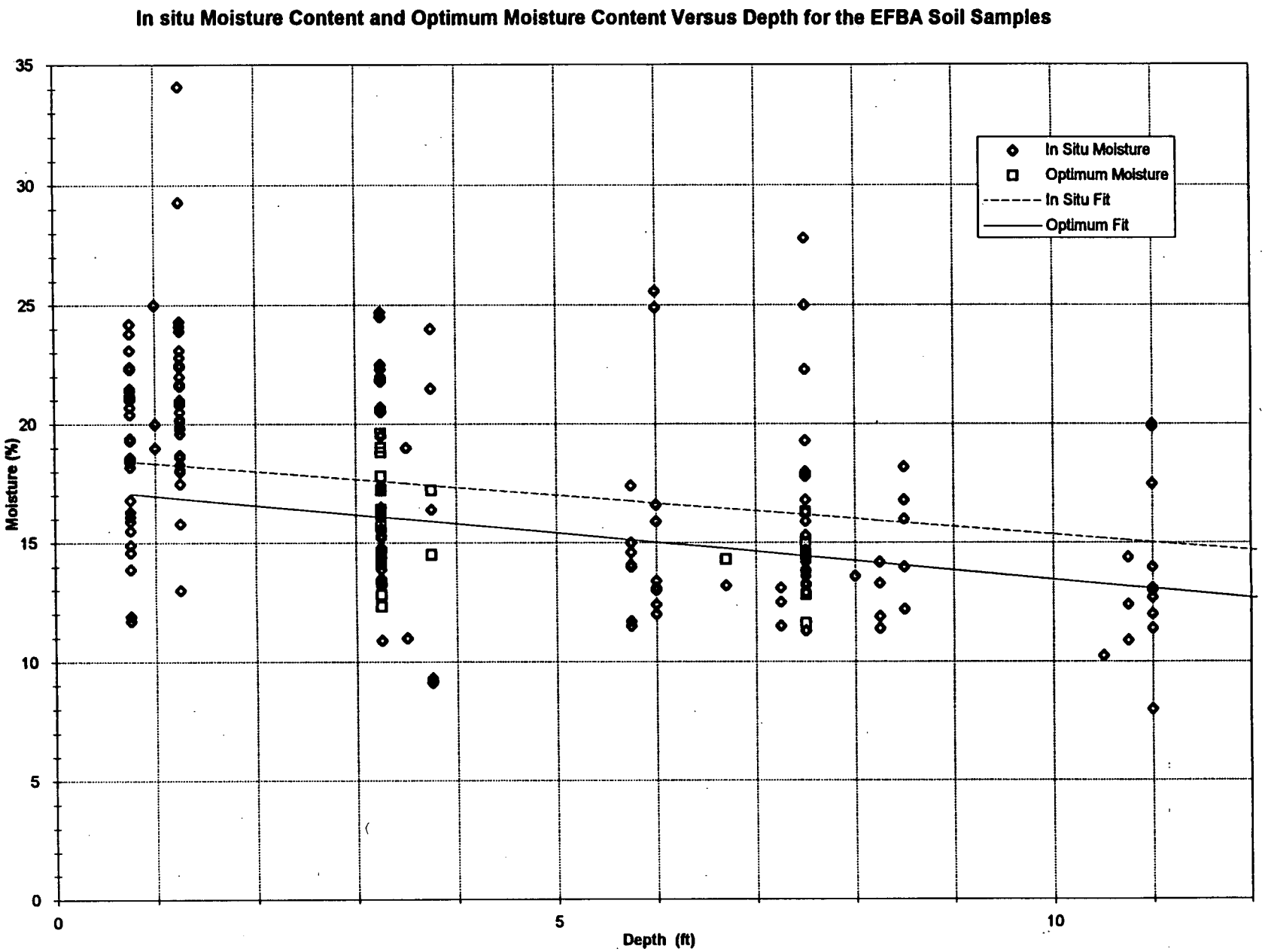

Figure 5-8 - In Situ Moisture Content and Optimum Moisture Content Versus Depth for the EFBA Soil Samples

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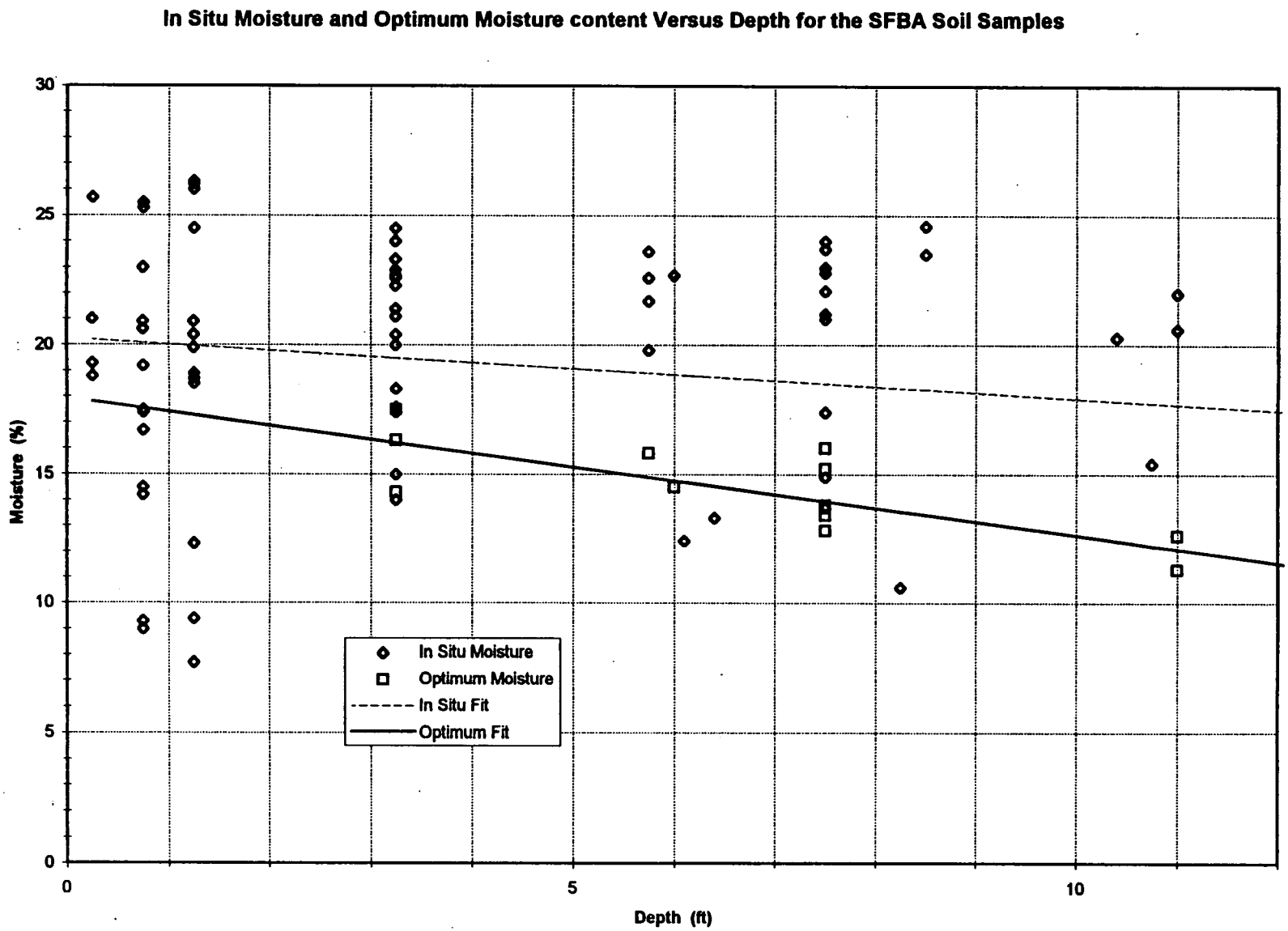

Figure 5-9 - In Situ Moisture Content and Optimum Moisture Content Versus Depth for the SFBA Soil Samples

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suited candidate material than soils found deeper. In general, below 7 to 8 feet the soils in the SFBA become more sandy and begin to alternate between clayey till, and sand and silt seams. The presence of the sand and silt in the borrow materials would begin to not satisfy the ARARs grain size requirements and permeability requirements.

If SFBA soils are to be used as select fill in the OSDF (cap and liner), the moisture content of the SFBA soils upon excavation may need to be reduced. Figure 5-9 shows that the natural moisture content is higher than the OMC determined for soil samples at similar depths. In addition, the average natural moisture content in the SFBA is approximately 6 percent by weight higher than the corresponding average OMC.

Finally, the top 1 to 2 feet of the SFBA soils will have to be separated from the soils used for structural fill due to organic matter in the soil such as roots, grass, etc. The top 1 to 2 feet of soil from the SFBA can be stockpiled and used for topsoil once reclamation of the OU-2 waste units and borrow areas is complete.

5.2 Slope Stability Analyses

Stability of temporary slopes at the EFBA was investigated. The stability of temporary slopes at the SFBA was also investigated. The results of stability analyses for the type of soil materials found in the SFBA are presented in *Fly Ash Piles and South Field Waste Units Geotechnical Report* (PARSONS 1996). The following subsections describe the methodology, cross-sections, software, and results of the EFBA slope stability analyses.

5.2.1 Methodology

Using cross-sections developed for the slope stability analyses from geotechnical test borings from *Technical Report 5.1A Engineering Evaluation Report for On-Site Disposal* (DOE 1993); *On-Site Disposal Cell Pre-Design Activities Engineering Report* (PARSONS 1994a); and borings performed during the *On-Site Clay Borrow Areas* geotechnical investigation, PO-154, possible temporary slope scenarios that may arise during excavation of the EFBA were evaluated. Figure 5-10 shows the location of two cross-sections used for the stability analyses. Figures 5-11 and 5-12 show the cross-sections. Slopes varying from 1H/1V to 1.5H/1V were investigated for slope stability against failure. The slopes extended from the approximate final grade of the proposed excavation to the existing ground surface at the location where the excavation height was a maximum. The height of slope analyzed is 8 feet for cross-section X-X' and 14 feet for cross-section Y-Y'. The investigated slopes are represented by a straight line having slopes of either 1H/1V or 1.5H/1V extending from the approximate proposed excavation finish grade to the existing ground surface. During actual excavation, the heights of the slopes that were investigated for these analyses will probably never be attained, but the heights were investigated to present a worst case scenario.

According to Bishop and Bjerrum (1960), temporary cut slopes should be analyzed using the $\phi=0$ analysis. Therefore, the undrained cohesion (c_u) values from PARSONS 1995b and PO-154 were used for the shear strength parameters of the brown and gray tills. Using the PARSONS 1995b data assumes that the shear strength properties of the soils in the OSDF area are similar to those of the soils in the EFBA. The undrained shear strength values for SC-SM soils from DOE 1993 were used for the sand lenses within the glacial till strata. The GMA shear strength values were assumed equal to values used in the slope stability analysis reported in PARSONS 1995b. Table 5-4 summarizes the shear strength parameters used for temporary slope analyses in the EFBA.

For the purpose of the stability analysis, saturated soils were assumed at 5 feet below the existing ground surface to conservatively simulate perched water zones that may be encountered in the brown and gray till. It was assumed that the soils are saturated at the ground surface at the toe of the investigated temporary slopes.

The proposed gradually sloping final grades at the reclaimed EFBA (approximately 3H:1V maximum) were assumed to be less than the temporary slopes analyzed and, as such, were not investigated.

Table 5-4 - Soil Property Values Used in Analyses of EFBA Temporary Slopes

Soil Stratum	Moist Unit Weight (pcf)	Saturated Unit Weight (pcf)	Undrained Cohesion, c_u (psf)	Undrained Internal Friction, ϕ_u (°)
Brown Till	132.0	136.0	513	0.0
Gray Till	140.0	144.0	1700	0.0
Sand Lenses	146.3	148.0	300	21.0
GMA	140.0	149.0	0	33.0

5.2.2 Cross-Sections

Two cross-sections were used for the slope stability analyses. The first cross-section (X-X') was developed using geotechnical test borings from PARSONS 1994a. Cross-section X-X' shown in Figure 5-11 is idealized. From boring logs the cross-section intercepts a clayey-silty sand seam of thickness varying to 5 feet between elevation 570 and 577 feet. The clayey-silty sand zone thins to the northwest and southeast; pinching out between borings G2-201 and 203, and at Boring G2-208. An approximation of this sand zone was included in the soil profile analyzed. The final grade of the proposed excavation is not expected to intercept the clayey-silty sand seam since it pinches out before reaching the lowest point of the proposed excavation. To evaluate a greater height of slope, a second cross-section (Y-Y') was

developed further to the south of X-X' using geotechnical test borings from the PO-154 investigation (PARSONS 1994a and DOE 1993). Idealized cross-section Y-Y' that was evaluated is typically more representative of the stratigraphy of the entire EFBA. In general the EFBA consists of the GMA overlain by glacial till deposits consisting of a gray till overlain by a brown till. Isolated and sporadic clayey or silty sand and silt lenses are located across the EFBA. Based on boring logs, a 1-foot-thick clayey, silty sand lens at elevation 563 was included in the soil profile which was analyzed.

5.2.3 Software

The analyses were performed using the XSTABL slope stability computer model, developed by Interactive Software Designs, Inc.; Moscow, Idaho. This model performs two-dimensional equilibrium analyses and incorporates a random surface generator used for searching out the critical failure surface for a given slope. All analyses performed assumed static conditions and utilized the Bishop's Simplified Method of determining slope stability.

5.2.4 Results and Recommendations

Table 5-5 summarizes the results of the slope stability analyses. Since the slopes are temporary construction slopes, Factors of Safety (FOS) against slope failure greater than 1.2, the investigated temporary construction slopes are considered safe. According to the performed analyses, maximum slopes of 1H/1V should be safe throughout the entire EFBA. In the event saturated sand seams are encountered, flatter slopes may be necessary to prohibit sloughing of the sand seams along the excavated slope faces. In addition, sumps and pumps may be necessary to remove water from the excavations.

The results of the slope stability analysis have FOS values above the recommended value of 1.2, and are consistent with Occupational Safety and Health Administration (OSHA) regulations for excavations. OSHA limits clayey soil slopes under 20 feet in height to a maximum slope of 1H/1V. OSHA also limits slopes in submerged soils where water is freely draining to 1.5H/1V for heights under 20 feet.

Table 5-5 - Results of Slope Stability Analyses

Cross-Section	**A-A' (H = 8 ft)**		**B-B'(H = 14 ft)**	
Slope	**1H/1V**	**1.5H/1V**	**1H/1V**	**1.5H/1V**
Factor of Safety	3.04	3.06	1.99	2.09

Note: H = Height of Slope

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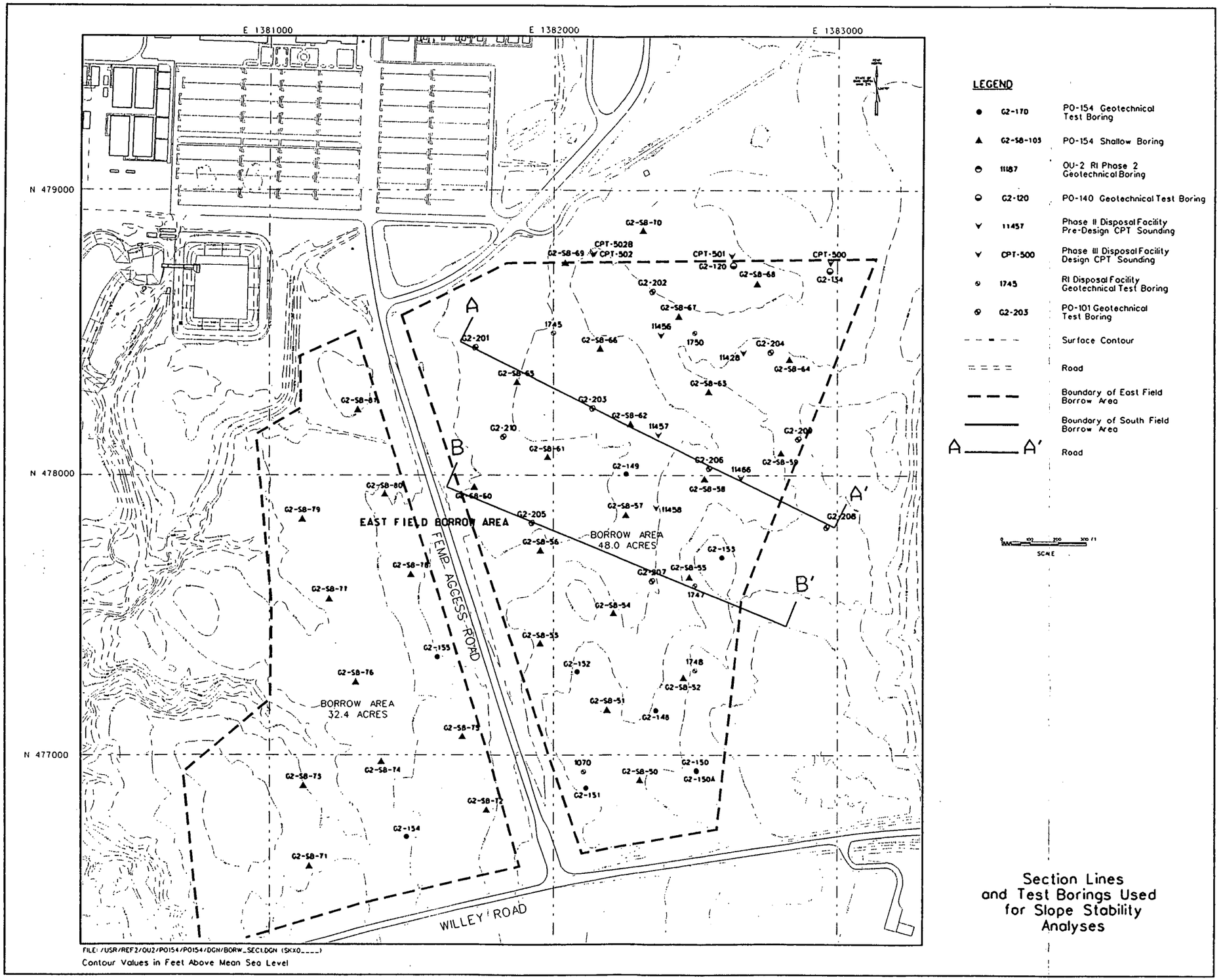

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Figure 5-10 - Map Showing Section Lines and Test Borings Used for Slope Stability Analyses

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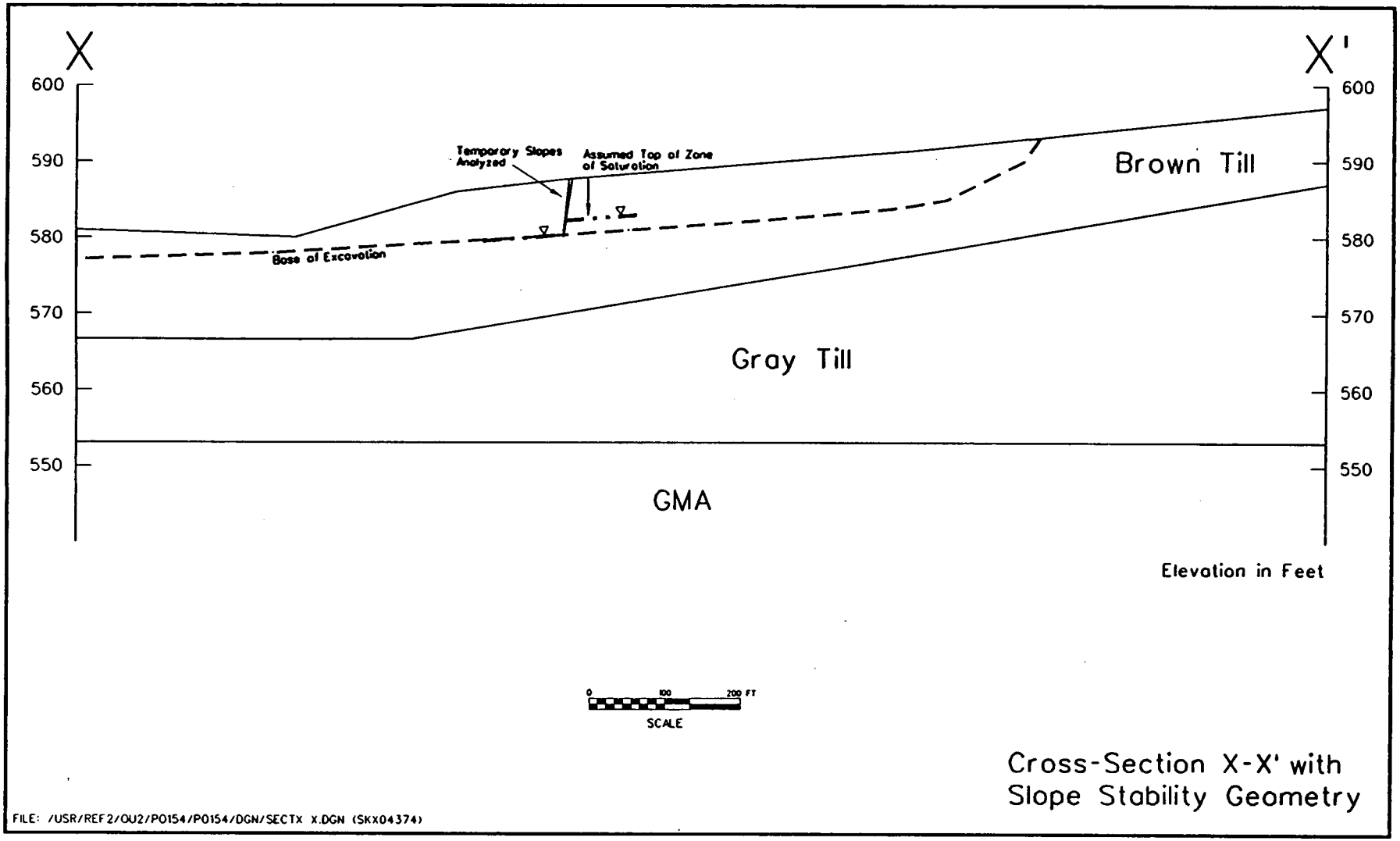

Figure 5-11 - Cross-Section X-X' with Slope Stability Geometry

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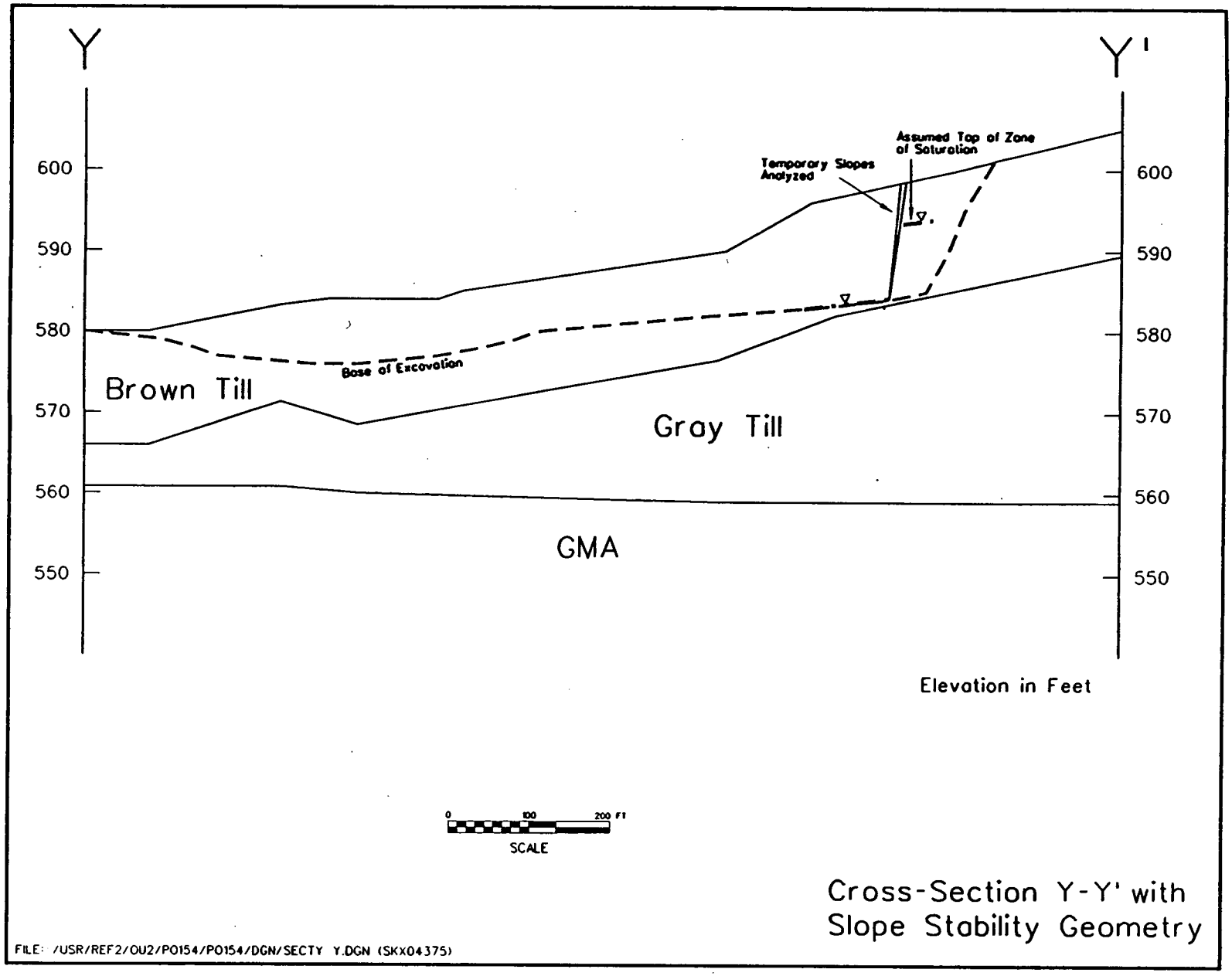

Figure 5-12 - Cross-Section Y-Y' With Slope Stability Geometry

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5.3 Geotechnical Monitoring and Testing

Based on the evaluations and analyses presented in Subsection 5.1, the geotechnical monitoring and testing to be performed during construction of the OSDF should be relatively straightforward. In general, it is recommended that geotechnical monitoring and testing procedures follow those outlined in the technical guidance document entitled "Quality Assurance and Quality Control for Waste Containment Facilities" (US EPA 1993).

5.4 Site Restoration

The site restoration activities recommended for implementation following excavation of borrow areas include uniform grading to minimize erosion due to runoff and re-establishment of native vegetation.

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SECTION 6

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APPENDIX A

BORING COORDINATES AND ELEVATIONS

PO 154 Test Boring Locations In The EFBA and SFBA

On-Site Location	Boring Identification	Northing (NAD 27)	Easting (NAD 27)	Northing (NAD 83)	Easting (NAD 83)	Surface Elevation	Depth (feet)
EFBA	G2-148	477159	1382363	477188	1350894	595.5	16.5
EFBA	G2-149	478000	1382258	478030	1350789	585.8	16.5
EFBA	G2-150	476941	1382505	476970	1351037	600.8	19.0
EFBA	G2-150A	476938	1382507	476967	1351038	600.9	25.0
EFBA	G2-151	476883	1382114	476912	1350645	596.5	20.0
EFBA	G2-152	477297	1382082	477326	1350614	595.1	20.0
EFBA	G2-153	477700	1382595	477730	1351126	603.2	20.0
EFBA	G2-154	476710	1381482	476739	1350014	577.0	13.8
EFBA	G2-155	477348	1381591	477377	1350122	582.9	16.0
SFBA	G2-156	478189	1379726	478218	1348257	576.8	20.0
SFBA	G2-157	478432	1379210	478462	1347741	574.8	20.0
SFBA	G2-158	478837	1378993	478866	1347524	575.5	20.0
SFBA	G2-159	478643	1378773	478673	1347304	570.9	20.0
SF/SFBA	G2-164	478055	1379337	478085	1347868	576.1	24.0
SF/SFBA	G2-167	477895	1379603	477925	1348134	580.3	24.0

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PO 154 Shallow Boring Locations In The EFBA and SFBA

On-Site Location	Boring Identification	Northing (NAD 27)	Easting (NAD 27)	Northing (NAD 83)	Easting (NAD 83)	Surface Elevation	Depth (feet)
EFBA	G2-SB-50	476908	1382306	476938	1350837	595.8	8.4
EFBA	G2-SB-51	477158	1382189	477188	1350720	598.2	10.0
EFBA	G2-SB-52	477272	1382459	477301	1350990	590.5	10.0
EFBA	G2-SB-53	477393	1381954	477423	1350486	591.9	9.7
EFBA	G2-SB-54	477500	1382210	477530	1350741	596.4	10.0
EFBA	G2-SB-55	477627	1382481	477656	1351012	586.2	10.2
EFBA	G2-SB-57	477850	1382257	477880	1350788	585.9	10.0
EFBA	G2-SB-58	477978	1382536	478008	1351067	591.9	10.0
EFBA	G2-SB-59	478072	1382803	478102	1351334	595.1	10.0
EFBA	G2-SB-60	477950	1381723	477979	1350254	579.9	10.0
EFBA	G2-SB-61	478057	1381981	478087	1350512	582.7	10.5
EFBA	G2-SB-62	478178	1382274	478207	1350805	587.0	10.0
EFBA	G2-SB-63	478291	1382549	478320	1351080	593.0	10.0
EFBA	G2-SB-64	478405	1382831	478435	1351362	596.1	9.5
EFBA	G2-SB-65	478324	1381872	478353	1350403	584.2	10.0
EFBA	G2-SB-66	478444	1382165	478474	1350696	589.1	10.0
EFBA	G2-SB-67	478557	1382444	478587	1350975	591.3	10.0
EFBA	G2-SB-68	478672	1382718	478701	1351249	588.2	10.0
EFBA	G2-SB-69	478743	1382041	478773	1350572	586.6	10.0
EFBA	G2-SB-70	478856	1382317	478886	1350849	588.1	10.5
EFBA	G2-SB-71	476604	1381142	476633	1349673	577.7	10.0
EFBA	G2-SB-72	476802	1381764	476832	1350296	583.1	10.0
EFBA	G2-SB-73	476890	1381121	476919	1349652	573.7	6.4
EFBA	G2-SB-74	476975	1381394	477004	1349925	576.7	10.0
EFBA	G2-SB-75	477066	1381679	477095	1350210	581.5	10.0
EFBA	G2-SB-76	477258	1381303	477288	1349834	575.6	6.0
EFBA	G2-SB-77	477550	1381212	477580	1349743	574.9	6.0
EFBA	G2-SB-78	477637	1381498	477667	1350029	581.4	10.0
EFBA	G2-SB-79	477835	1381119	477864	1349650	574.7	10.0
EFBA	G2-SB-80	477924	1381407	477953	1349938	578.9	10.0
EFBA	G2-SB-81	478227	1381312	478256	1349843	579.5	10.3
SFBA	G2-SB-82	478087	1379584	478116	1348115	577.1	10.0
SFBA	G2-SB-83	478320	1379453	478349	1347984	576.8	10.0
SFBA	G2-SB-84	478327	1379260	478356	1347791	575.2	10.2
SFBA	G2-SB-85	478425	1378954	478455	1347485	568.2	7.2
SFBA	G2-SB-86	478351	1378703	478380	1347234	567.8	10.0
SFBA	G2-SB-87	478565	1378572	478594	1347103	569.9	10.0
SFBA	G2-SB-88	478704	1379050	478734	1347581	575.4	10.2
SFBA	G2-SB-89	478814	1378504	478843	1347035	568.9	7.8
SFBA	G2-SB-90	478821	1378724	478850	1347255	573.7	10.0
SF/SFBA	G2-SB-95	478187	1379111	478216	1347642	569.5	10.0
SF/SFBA	G2-SB-96	478071	1379395	478100	1347926	576.0	10.0
SF/SFBA	G2-SB-98	477973	1379636	478003	1348167	572.3	10.5
SF/SFBA	G2-SB-99	477807	1379552	477836	1348083	577.9	10.3

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Locations of Existing Test Borings having Geotechnical Data in the EFBA and SFBA

On-Site Location	Boring Identification	Northing (NAD 27)	Easting (NAD 27)	Northing (NAD 83)	Easting (NAD 83)	Surface Elevation	Depth (feet)
EFBA	1070	476940	1382104	476969	1350635	598.0	29.5
EFBA	1745	478500	1382000	478529	1350531	586.0	27.0
EFBA	1747	477600	1382500	477629	1351031	597.4	21.5
EFBA	1748	477300	1382500	477329	1351031	601.0	32.0
EFBA	1749	478000	1382900	478029	1351431	597.5	30.0
EFBA	1750	478500	1382500	478529	1351031	593.0	30.0
EFBA	G2-201	478450	1381724	478479	1350255	580.6	24.5
EFBA	G2-202	478647	1382350	478676	1350881	590.1	75.0
EFBA	G2-203	478235	1382137	478264	1350668	587.6	24.5
EFBA	G2-204	478434	1382765	478463	1351296	596.2	24.2
EFBA	G2-205	477823	1381924	477852	1350455	583.5	23.7
EFBA	G2-206	478020	1382521	478049	1351052	591.4	24.5
EFBA	G2-207	477618	1382349	477647	1350880	589.0	77.0
EFBA	G2-208	477809	1382962	477838	1351493	596.3	24.2
EFBA	G2-209	478126	1382863	478155	1351394	598.8	25.0
EFBA	G2-210	478133	1381824	478162	1350355	583.2	25.0
EFBA	G2-120	478773	1382634	478802	1351165	588.1	21.5
EFBA	G2-134	478746	1382973	478775	1351504	590.0	14.0

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APPENDIX B

GEOTECHNICAL TEST BORING FIELD LOGS AND GEOTECHNICAL LOGGING REPORTS

FEMP
LITHOLOGIC LOG

CONTROL NO: 200310G2148-004

PROJECT NUMBER: 20.03.10

PROJECT NAME: GEOTECHNICAL INVESTIGATION BORROW AREAS / OU2 WASTE UNITS

BORING NUMBER: G2-148

COORDINATES: SEE SURVEY REPORT

RELATED FAL NO.: 200310G2148-002

SURFACE ELEVATION: SEE SURVEY REPORT

GROUNDWATER LEVEL: N/K | DATE: N/K | TIME: N/K | DATE STARTED: 9/22/95

GROUNDWATER LEVEL: N/K | DATE: N/K | TIME: N/K | DATE COMPLETED: 9/22/95

GEOLOGIST: R. Nicks

WATER USED DURING DRILLING: N/A

DRILLING CONTRACTOR: Alliance

DRILLING EQUIPMENT: Mobile B-61 HSA

DRILLER/HELPER: Ed Miller, Bryan Bryan

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 5/6 yellowish brown, stiff, moist	CL	0.75 1.5	upper 6" 10YR 4/6 dk. yel. brn
	1229 09/22/95 410571	4 4 6	15"	w/ trace of sand @ 3"			
5	1235 9/22/95 410572	6 10 14	16"	10YR 5/4 yellowish brown, v. stiff moist	CL	2.75 3.5	1/8" wet seams @ 5' and 6'
	1300 9/22/95 410573	2 2 3 3	24"	w/ scattered gravel to 1/2"	CL	3.25	
10	1311 9/22/95 410574	11 22 26 (48)	0"	Gray/brown mottle @ 11' in cuttings			No retainer basket - "teeth" torn off - in backwards? (32) = 18"-24" interval
	1325 9/22/95 410575	10 10 15	14"	Sandy Lean Clay 2.5Y 4/1 dark gray, v. stiff, moist w/ scattered gravel to 1" ~~Sandy 10YR 4/1 dark gray, very dense, moist~~	CL GW CL	>4.5	
15	1335 9/22/95 410576	7 16 16	17"	Sandy Lean Clay 10YR 4/1 dark gray, v. stiff to hard, moist	CL	>4.5	
				TOTAL DEPTH 16'			

1330 GW 390 cms 410577

INSTRUMENT	BACKGROUND	DATE	TIME
PID			
ALPHA		N A	
BETA/GAMMA			

NOTES: Grouted w/ 2 bags and 40 gal. H2O

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUSAMSCO\GEOTECH\LITHO LOG.EPS

JK 1-11-96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-148	Drilling Method: Mobile B-61 HSA	Date Started: 9/22/95
Coordinates: N 477,159 E 1,382,363	Geologist: R. Nicks	Date Completed: 9/22/95
Ground Surface Elevation: 594.54 feet AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, D = Denison Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay with trace of sand, yellowish brown, very stiff, moist, CL	410571	2.5 - 4.0	SS	4, 4, 6	15	MC
		410572	5.0 - 6.5	SS	6, 10, 14	16	MC, GS, AL
	Trace of gravel. Mottle gray/brown, at 11 feet	410573	7.5 - 9.5	D	NA	24	MC, GS, AL, CU
		410574	10.0 - 12.0	SS	11, 22, 26, 32	0	
12	Sandy lean clay, dark gray, very stiff, moist, trace of gravel, (CL)	410575	12.5 - 14.0	SS	10, 10, 15	14	MC
	Clayey sand SC	410576	15.0 - 16.5	SS	7, 16, 16	17	MC, GS, AL
16.5	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP
LITHOLOGIC LOG

CONTROL NO: 2003106G2149-006

Page 1 of 1

PROJECT NAME: GEOTECHNICAL INVESTIGATION BORROW AREAS/OU2 WASTE UNITS

PROJECT NUMBER: 10.03.10

BORING NUMBER: G2-149

COORDINATES: SEE SURVEY REPORT

RELATED FAL NOs.: 2003106G2149-003, 4 & 5

SURFACE ELEVATION: SEE SURVEY REPORT

GROUNDWATER LEVEL: — DATE: N/K TIME: —

DATE STARTED: 9/21/95

GEOLOGIST: R. Nicks

GROUNDWATER LEVEL: — DATE: N/K TIME: —

DATE COMPLETED: 9/22/95

WATER USED DURING DRILLING: NONE

DRILLING CONTRACTOR: Alliance

DRILLING EQUIPMENT: Mobile B61 HSA

DRILLER/HELPER: ED MILLER, Bryon Bryan

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 w/SAND 10YR 5/6 yellowish brn. v.stiff, moist.	CL		
	1606 ~~41052~~ Gr. 9/21/95 410521	6 9 13	18"		CL	2.0-2.5	
5	1614 9/21/95 410522	6 8 16	18"	w/scat. gravel to 10YR 5/4 yellowish brown	CL	>4.5	
	1622 9/21/95 410523	7 11 18	15"	2.5Y 4/4 olive brown	CL	>4.5	
10	1630 9/21/95 410524	7 13 17(40)	23"	2.5Y 4/2 dk. grayish brown	CL	>4.5	← mottled brown/gray @ 11.5 (40) represents blows from 18"-24" of interval
	1639 9/21/95 410525	6 10 16	10"	2.5Y 4/1 dk. gray	CL	3.0-4.5	spoon wet @ 13.5
15	1651 9/21/95 410526	9 19 20	18"	1" Sand wet, 2.5Y 4/1 dk.gr. Lean Clay 2.5Y 4/1 dk. Gr. with sand and scat. grav. to ½" v.stiff, moist	CL	>4.5	1" Sand @ 16.0
				TOTAL DEPTH 16.5			9/21/95 grouted to 1' of surface 2 bags, vogel.
20							

INSTRUMENT	BACKGROUND	DATE	TIME
PID			
ALPHA		A	
BETA/GAMMA		N	

NOTES: 9/22/95 placed cement plug in upper bed

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS\MISC\GEOTECH\LITHO LOG EPS

JW 9/11/96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-149	Drilling Method: Mobile B-61 HSA	Date Started: 9/21/95
Coordinates: N, 478,000 E 1,382,258	Geologist: R. Nicks	Date Completed: 9/22/95
Ground Surface Elevation: 585.80 ft. AMSL	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. Coordinates are based on NAD 1927.
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 sand, yellowish brown, very stiff, moist, CL	410521	2.5 - 4.0	SS	6, 9, 13	18	MC, AL
		410522	5.0 - 5.5	SS	6, 8, 16	18	MC
	Trace of Gravel to 1\4 inch Color varies from olive brown to a gray at 12.5 feet	410523	7.5 - 9.0	SS	7, 11, 18	15	MC, GS, AL
		410524	10.0 - 12.0	SS	7, 13, 17, 20	23	MC
	Sand layer at 16 feet, wet	410527	11.5 - 16.5	B	NA	60	P_{rL}, P_{rS}, MC, GS, AL, UUr 90, SP
		410525	12.5 - 14.0	SS	6, 10, 16	10	MC, GS, AL
		410526	15.0 - 16.5	SS	9, 19, 20	18	MC, AL
16.5	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP
LITHOLOGIC LOG

CONTROL NO: 200310150-009

Page 1 of 21

PROJECT NAME: Geotechnical Investigation Borrow Areas/OU2 Waste Units

PROJECT NUMBER: 2088.10

BORING NUMBER: G2-150

COORDINATES: NA

RELATED FAL NOs.: NA

SURFACE ELEVATION: NA

GROUNDWATER LEVEL: NA

DATE:

TIME:

DATE STARTED: 9/6/95

GEOLOGIST: R. Nicks

GROUNDWATER LEVEL: NA

DATE:

TIME:

DATE COMPLETED: 9/7/95

WATER USED DURING DRILLING:

DRILLING CONTRACTOR: Alliance

DRILLING EQUIPMENT: Mobil B-61 HSA

DRILLER/HELPER: Rodney / Dean

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
				Silt, 10yR 4/4 dark yellowish brn, stiff moist becoming clayey @ 3.0 and v.stiff to moist.	ML		
	8:20, 9/6/95 410251	4 6 6	12"			1.75 to 2.5	Hammer not dropping smoothly
				Clayey Silt, 10yR 4/4 dark yellowish brown, v.stiff, moist	ML		
5	10:25 9/6/95 410252	4 9 12	14"	Lean Clay 10yR 4/4 dark yellowish brn., stiff to v.stiff, moist - scat. grav. to 1/4"	CL	1.5 to 4.5	Scat. gravels to 1/4"
				Sand, f-m sand, 10yR 5/4 yel. brn., wet @6.0 dense	SP		
	10:40 9/6/95 410253	8 12 16	16"	Lean Clay with Sand 10yR 4/3, brown, hard, w/scat. grav. to 1/4" - rare to 1".	CL	>4.5	Considerable iron staining - mottled coloration.
10	410263 DRILLED * out, last sample	NA	12" +				9/7/95 rbd on Rods @ 18'. Acted off of shelby and kinked cable. Overdrill to recover 10-12; 13-15 not taken due to overdrill!
	NOT TAKEN NA	NA		Lean Clay gray on overdrill auger			
15	NA G. ~~NA~~			T.D. 15' Move south 2 ft. and drill G2-150A			2/3 bag of volclay + 1 1/2 gal. H_2O to grout to within 1' of top. Upper foot cement plug.
	NA			* Sample overdrilled and recovered 9/11/95. Top of tube "torn" out at hole for screw attachment.			
20							

INSTRUMENT	BACKGROUND	DATE	TIME
PID		NA	
ALPHA			
BETA/GAMMA			

NOTES:

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

ILLUS\MISC\GEOTECH\LITHO LOG.EPS

REVIEWED BY JL DATE 1-2-96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-150	Drilling Method: Mobile B-61 HSA	Date Started: 9/6/95
Coordinates: N 476,941 E 1,382,505	Geologist: R. Nicks	Date Completed: 9/7/95
Ground Surface Elevation: 600.78 feet AMSL	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. Coordinates are based on NAD 1927.
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, stiff, moist, ML	410251	2.5-4.0	SS	4, 6, 6	12	MC, GS, AL
3	Lean clay, dark yellowish brown, very stiff, moist, (ML)						
5	Lean clay, yellowish brown	410252	5.0 - 6.5	SS	4, 19, 12	14	MC
6	Fine to medium sand, dense, wet, (SP)						
7.5	Sandy lean clay, brown, hard, trace gravel to 1/4 inch, CL Turns gray at 14 feet	410253	7.5-9.0	SS	8, 12, 16	16	MC, GS, SG, AL
15	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 20031062/504-00678

FEMP
LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation Borrow Areas/OU2 Waste Units					PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-150A	COORDINATES: NA	RELATED FAL NOs.: NA			
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: NA	DATE:	TIME:	DATE STARTED: 9/7/95	
GEOLOGIST: R. Nicks	GROUNDWATER LEVEL: NA	DATE:	TIME:	DATE COMPLETED: 9	
WATER USED DURING DRILLING: NA	DRILLING CONTRACTOR: Alliance	DRILLING EQUIPMENT: Mobile B-61 HSA	DRILLER/HELPER: Ed, Dean 9/11 Ben and Dean		

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
				See Boring G2-150 for 0' to 10' Boring Log			This boring G2-150A drilled ≈ 2' s/o G2-150.
5							
10	1330 9/7/95 410254	NA	15"	Lean Clay with Sand, ~~olive~~ 10YR 4/1 dark greenish gray, hard, moist w/scattered gravel to 1". Irregular iron stained surfaces	CL	>4.5	450#-1000# down pressure shelby disturbed in bottom 6" switch to Dennison Sampler
	1453 9/7/95 410255	Dennison	*24"	10YR 5/1, Gray, stiff wet		4.0-1.5	*Sample integrity destroyed by removal from sampler.
15	~~1453~~ 0845 9/11/95 410256	Dennison	14"	10YR 5/1, Gray, v. stiff wet		2.5	≈ 100 gal. H_2O used
	0911 9/11/95 410257	10 19 22	18"	Gravelly Sand 2.5YR 5/1 Gray, dense, wet	SW		Blow counts not dependable - many "up" blows on hammer
20							

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

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

ILLUS\MISC\GEOTECH\UTHO LOG.EPS

REVIEWED BY JL DATE 2/14/96

KR

20031052150A-0089

FEMP
LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation Borrow Areas/OU2 Waste Units

PROJECT NUMBER: 20.03.10

BORING NUMBER: G2-150A

DEPTH (FEET)	SAMPLE TIME, DATE, AND NUMBER	BLOWS (per 6 inch)	RECOVERY (inches)	DESCRIPTION (Colors identified per Munsell Color Chart)	USCS SYMBOL	MEASURED CONSISTENCY (T&F)	REMARKS
20	0929 9/11/95 410258	5 6 9	17"	Lean Clay with Sand, 10y 5/1, Greenish Gray, moist, stiff, scattered gravel to 1/2"	CL		
	1008 9/11/95 410259	3 24 46	18"	Sandy Lean Clay 10y/5/1, Greenish gray v.stiff, stiff, moist	CL		
25				Sand, 10y 5/1, greenish gray, med. dense to dense, wet with gravel to 1/2"	SW		@24'9" sand
				Total Depth 25'			2 1/3 bags rolclay + 51 1/2 gal. H2O to grout within 1 ft. of surface. Cement plug in upper foot.

NOTES:

*ILLUSMISC\GEOTECH\LITHO LOG-PG 2.EPS

000138

11 1-2-96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-150A	Drilling Method: Mobile B-61 HSA	Date Started: 9/7/95
Coordinates: N 476,938 E 1,382,507	Geologist: R. Nicks	Date Completed:
Ground Surface Elevation: 600.92 feet AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, D = Denison Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
10	Sandy lean clay with gravel, dark greenish gray, hard, moist, gravel to 1 inch, CL	410254	10.0-12.0	ST	NA	15	MC, GS, AL
	Gray, stiff, wet at 14 feet	410255	13.0-15.0	D	NA	24	MC, GS, AL
	Gray,very stiff, wet at 16 feet	410256	15.0-17.0	D	NA	14	MC, GS, AL, UU
17.5	Silty, clayey sand with gravel, SC-SM	410257	17.5-19.0	SS	10, 19, 22	18	MC, GS, AL
20	Lean clay with sand, greenish gray, stiff, moist, trace gravel to 1/2 inch, (CL)	410258	20.0-21.5	SS	5, 6, 9	17	MC
23.5	Sandy lean clay, greenish gray, very stiff, moist, CL	410259	23.5-25.0	SS	3, 21, 16	18	MC, GS, AL
24.8	Sand with gravel to 1/2 inch, greenish gray, medium dense to dense, wet, (SW)						
25	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP
LITHOLOGIC LOG

CONTROL NO: 2003/C62-151-005

Page 1 of 1

PROJECT NAME: Geotechnical Investigation Borrow Areas/OU2 Waste Units			PROJECT NUMBER: 20.20.10
BORING NUMBER: G2-151	COORDINATES: NA	RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: 19' below surface	DATE: 09/12	TIME: 07:30	DATE STARTED: 9/11/95
GEOLOGIST: R. Nicks	GROUNDWATER LEVEL: NA	DATE:	TIME:	DATE COMPLETED: 9/12/95
WATER USED DURING DRILLING:	DRILLING CONTRACTOR: Alliance	DRILLING EQUIPMENT: Mobile B-61 HSA	DRILLER/HELPER: Ben, Dean

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 - 2.5y 5/6 light olive brown v.stiff, moist	CL		
	1345 9/11/95 410264	12 15 15	14"	~~S.1by Sand - 10yr 4/4 dark yellowish brown~~			
5	1403 9/11/95 410265	5 8 9	16"	S.1by Sand - 10yr 4/4 dark yellowish brown, med. dense, wet	SM		
	1430 9/11/95 410267	NA	8"	Lean Clay w/Sand and gravel to 1" 2.5y 4/4 olive brown v.stiff to hard, moist	CL		Crushed shelby. Both ends. Sawed tube off @ sub end.
10	1605 9/11/95 410269	Dennison NA	18"	Lean Clay w/silt 5y 4/1, Dark greenish gray v.stiff, to moist.		2.6	Sample disturbed, slid out of sample tube into outer barrel
	1625 9/11/95 410270	5 8 10	18"	Lean Clay w/ trace sand 10y 4/1, Dark greenish gray, v.stiff, moist w/sedt. gravel to 1/4"	CL		~~No sample because no cuttings after using water for Dennison~~ Cuttings came back after SPT @ 12.5-14.0
15	1637 9/11/95 410272	5 9 13	7"	SAA			Hole grouted (22 gal/bag of volclay) to within 1' of top of hole. 2 bags of grout used. Top 1' plugged w/type cement mix
	1650 9/11/95 410273	4 8 11	14"	SAA			
20				Total Depth 20'			

INSTRUMENT	BACKGROUND	DATE	TIME
PID	NA		
ALPHA			
BETA/GAMMA			

NOTES:

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS\MISC\GEOTECH\LITHO LOG.EPS

000140

REVIEWED BY SL DATE 2/8/96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-151	Drilling Method: Mobile B-61 HSA	Date Started: 9/11/95
Coordinates: N 476,883 E 138,2114	Geologist: R. Nicks	Date Completed: 9/12/95
Ground Surface Elevation: 596.50 feet AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, D = Denison Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, light olive brown, very stiff, moist, (CL)	410264	2.5-4.0	SS	12, 15, 15	14	MC
5	Silty, clayey sand, dark yellowish brown, medium dense, wet, SC-SM	410265	5.0-6.5	SS	5, 8, 9	16	MC, GS, AL,
6.5	Lean clay with sand and gravel to 1 inch, olive brown, very stiff to hard, moist, CL	410267	7.5-9.5	ST	NA	8	MC, GS, AL
10	Lean clay with sand, dark greenish gray, very stiff, moist, CL	410268	10.0-12.0	D	NA	18	Modal Dia., MC, GS, AL, Pr,
12.5	Sandy lean clay with trace sand, dark greenish gray, very stiff, moist, trace gravel to 1/4 inch, CL	410270	12.5-14	SS	5, 8, 10	18	MC
		410272	15.0-16.5	SS	5, 9, 13	7	MC, GS, AL
		410273	18.5-20.0	SS	4, 8, 11	14	MC
20	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP
LITHOLOGIC LOG

CONTROL NO: 2003/062152-004

Page 1 of 1

PROJECT NAME: Geotechnical Investigation Borrow Areas/OU2 Waste Units

PROJECT NUMBER: 20.03.10

BORING NUMBER: G2-152 | COORDINATES: NA | RELATED FAL NOs.: NA

SURFACE ELEVATION: NA | GROUNDWATER LEVEL: NA | DATE: | TIME: | DATE STARTED: 9/12/95

GEOLOGIST: R. Nicks | GROUNDWATER LEVEL: NA | DATE: | TIME: | DATE COMPLETED: 9/12/95

WATER USED DURING DRILLING: NA | DRILLING CONTRACTOR: Alliance | DRILLING EQUIPMENT: Mobile B-61 HSA | DRILLER/HELPER: Mark Laup, Ben Grimm, 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
				Sandy lean Clay 2.5y 5/4 light olive brown, hard, moist w/scat. gravel to 1/4" and localized v. stiff layers to 1"	CL	~~>4.5~~ Q.	
1	1330 9/12/95 410276	3 10 14	12"			>4.5	
5	1343 9/12/95 410277	5 10 12	18"	Lean Clay w/sand 2.5y 5/4 light olive brown, v. stiff, moist, with scat. gravel to 1/4"	CL	3.25	
	1405 9/12/95 410279	NA	14"	SAA			Shelby distorted - Rock in side of hole.
10	1415 9/12/95 410281	5 10 16	18"	Sandy lean Clay 2.5y 4/4 olive brown v. stiff, moist to wet w/scat. gravel to 1/4".	CL	2.0 1.0	≈ 4" zone
	1435 9/12/95 410282	NA	27"	Clay 10y 4/1 dark greenish gray v. stiff, moist w/scat. gravel to 2"	CH	Q. ~~2.5~~	Gray Clay in Bottom of Shelby, Brown Clay in top of Shelby
15	1445 9/12/95 410284	5 11 13	14"			2.5	
20	1500 9/12/95 410285	8 9 15	15"	Gravelly Sand 10y 4/1 Dense, wet	SW		
				Clay 10y 4/1 dark greenish gray v. stiff, wet w/scat gravel to 1/4"	CL	2.5-2.75	

INSTRUMENT	BACKGROUND	DATE	TIME
PID		NA	
ALPHA			
BETA/GAMMA			

NOTES: ~~Grouted w/volclay 22gal/bag to within 1ft. of surface. Frame with hole through auger. Cement plug last upper 1ft. with expansive cement~~

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*L:\US\MISC\GEOTECH\UTHO LOG.EPS

11/29/96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-152	Drilling Method: Mobile B-61 HSA	Date Started: 9/12/95
Coordinates: N 477,297 E 1,382,082	Geologist: R. Nicks	Date Completed: 9/12/95
Ground Surface Elevation: 595.09 feet AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, light olive brown, hard, moist, trace gravel to 1/4 inch, CL, localized very stiff layers to 1 inch	410276	2.5 - 4.0	SS	3, 10, 14	12	MC, AL, GS
		410278	2.0 - 6.0	B	NA	NA	Modal Dia.
5	Lean clay with sand, light olive brown, very stiff, moist, trace of gravel to 1/4 inch, (CL)	410277	5.0 - 6.5	SS	5, 10, 12	18	MC
		410279	7.0 - 9.0	ST	NA	14	MC, AL
		410280	6.0 - 10.8	B	NA	NA	Modal Dia.
9.5	Sandy lean clay, olive brown, very stiff, moist to wet, trace gravel to 1/4 inch (CL)	410281	10.0 - 11.5	SS	5, 10, 16	18	MC
	Silty, clayey sand with gravel at 13.5, SC-SM	410282	12.5 - 14.5	ST	NA	27	MC, GS, SG, AL, CU
		410283	10.0 - 14.0	B	NA	NA	
13.5	Clay, dark greenish gray, very stiff, moist, trace gravel to 2 inches, (CH)	410284	15.0 - 16.5	SS	5, 11, 13	14	Modal Dia.
							MC
18.5	Sandy lean clay, dark greenish gray, very stiff, wet, trace gravel to 1/4 inch, CL Gravelly sand, dense, wet, (SW) at 18.5 - 19.0	410285	18.5 - 20.0	SS	8, 9, 15	15	MC, GS, AL
20.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

000143

FEMP
LITHOLOGIC LOG

CONTROL NO: 2003062153-004

Page 1 of 1

PROJECT NAME:	GEOTECHNICAL INVESTIGATION BORROW AREAS/OU 2 WASTE UNITS
PROJECT NUMBER:	20.03.10
BORING NUMBER:	B2-153
COORDINATES:	NA
RELATED FAL NO.:	NA
SURFACE ELEVATION:	NA
GROUNDWATER LEVEL:	Dry
DATE:	
TIME:	
DATE STARTED:	9/13/95
GEOLOGIST:	R. Nicks
GROUNDWATER LEVEL:	NA
DATE:	
TIME:	
DATE COMPLETED:	9/13/95
WATER USED DURING DRILLING:	NA
DRILLING CONTRACTOR:	ALLIANCE
DRILLING EQUIPMENT:	MOBILE B-61 HSA
DRILLER/HELPER:	ED MILLER, DEAN DICKSON, BEN

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 w/SAND 2.5Y 5/4 LIGHT OLIVE BROWN, V.STIFF, MOIST	CL		
	0847 9/13/95 410286	7 13 17	9 12 13 17			>4.5	
5	0859 9/13/95 410287	NA	22"	LEAN CLAY W/TRACE SAND 2.5Y 5/4 LIGHT OLIVE BROWN, V.STIFF, MOIST		3.25	
	0908 9/13/95 410289	4 5 7	23"	Sandy LEAN CLAY w/TRACE GRAVEL TO 1". 2.5Y 5/4, LIGHT OLIVE BROWN STIFF, MOIST TO WET		1.0-2.5	
10	0921 9/13/95 410291	4 10 20	22"	LEAN CLAY w/TRACE SAND, 2.5Y 5/4 STIFF TO V.STIFF, MOIST, WITH SCATTERED GRAVEL TO 1" 11.0 - 11.5		2.5-3.0	DK. GRAY SPOTTED STAINING MANGANESE? ROCK IN TIP - BLOW COUNT NOT REPRESENTATIVE
	0936 9/13/95 410292	6 13 14	23"	10Y 4/1 DARK GREENISH GRAY, GRAVEL TO 1/4"		3.0-3.25	
15	0948 9/13/95 410294	8 9 10	18"			2.25 2.5	
	1029 9/13/95 410295	NA	20"	CLAY WITH TRACE SAND 10Y 4/1 DARK GREENISH GRAY, V.STIFF, MOIST, SCATTERED GRAVEL TO 1/2"	CH	2.75	
20				TOTAL DEPTH 20'			

410288 JAR

410290 JAR

410293 "JAR"/BAG

INSTRUMENT	BACKGROUND	DATE	TIME
PID		NA	
ALPHA			
BETA/GAMMA			

NOTES: 2½ bags grout (w/clay) and 50 gal. H2O grouted with tremie from bottom to 1' from ground surface. Upper foot cemented with expansive cement

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS\MSC\GEOTECH\LITHO LOG.EPS

000244

REVIEWED BY JL DATE 2/8/96

465

Boring No. G2-153	Drilling Method: Mobile B-61 HSA	Date Started: 9/13/95
Coordinates: N 477,700 E 1,382,595	Geologist: R. Nicks	Date Completed: 9/13/95
Ground Surface Elevation: 603.19 feet AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, light olive brown, very stiff, moist, (CL)	410286	2.5 - 4.0	SS	7, 13, 17	11	MC
4.3	Sandy lean clay, light olive brown, very stiff, moist, CL	410287	5.0 - 7.0	ST	NA	22	MC, GS, AL, UU
		410289	7.5 - 9.0	SS	4, 5, 7	23	MC
7	Sandy lean clay, light olive brown, stiff, moist to wet, trace of gravel to 1 inch, (CL)	410288	7.5 - 9.0	B	NA	NA	Modal Dia.
		410290	6.0 - 10.0	B	NA	NA	Modal Dia.
10	Sandy lean clay, stiff to very stiff, moist, and trace gravel to 1 inch, dark greenish gray trace gravel to 1/4 inch, CL	410291	10.0 - 10.5	SS	4, 10, 20	SS	MC, GS, AL
		410292	12.5 - 14.0	SS	6, 13, 14	13	MC
		410293	10.0 - 14.0	B	NA	NA	Modal Dia.
		410294	15.0 - 16.5	SS	8, 9, 10	18	MC, AL
17	Sandy lean clay, dark greenish gray, very stiff, moist, gravel to 1/2 inch, CL	410295	18.0 - 20.0	ST	NA	20	MC, GS, AL, UU
20	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 20031062154-005

FEMP LITHOLOGIC LOG

PROJECT NAME: Geotechical Investigation Borrow Areas/OU2 Waste Units			PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-154	COORDINATES: NA	RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: Dry	DATE: 9-12-95	TIME: 11:15	DATE STARTED: 9-12-95
GEOLOGIST/Engineer: K. Ernst	GROUNDWATER LEVEL: NA	DATE:	TIME:	DATE COMPLETED: 9-12-95
WATER USED DURING DRILLING: None	DRILLING CONTRACTOR: Alliance Env Inc.	DRILLING EQUIPMENT: Mobile Drill B-61/HSA	DRILLER/HELPER: M. Proctor/B. Forney/K. 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', cuttings brown clay, (2) some fill? possible to ~7'? based on auger cuttings
3.0	1030, 9-12-95, #410168	6-7-8	10"	Lean clay with sand (10YR5/6) yellowish brown, iron staining, trace fine gravel (1/4" typical) sand is fine to coarse, low plasticity, moist, very stiff. (brown clay is mottled in appearance (i.e., color) -- fill?)	CL	3.0	2" O.D Split-Spoon 2.5-4.0'
4.0							Augered to 5'
5.0							2" O.D split-spoon
6.0	1035, 9-12-96, #410169	4-6-12	17"	Lean clay with sand (10YR 6/4) light yellowish brown, iron staining, trace black organic nodules, trace fine gravel (1/8-1/4" typical), low plasticity, moist, sand is fine to medium stiff to very stiff, (brown clay is mottled in appearance -- fill?)	CL	1.5-4.0	1" sand seam at 5.8' stiffness (consistency) decreases with depth 4.0 → 1.5 tsf; gravel is rounded to subrounded
7.0	Augered to 7.5'						
8.0	1045, 9-12-95, #410170	9-13-21	15"	Lean clay with sand, (10YR 6/4) light yellowish brown, trace iron staining, few fine to coarse gravel (1/8" to 5/8" typical) low plasticity, moist, (sand is fine to coarse), hard	CL	4.5	2" OD. Split-Spoon 7.5-9.0'
9.0							
10.0							000146

INSTRUMENT	BACKGROUND	DATE	TIME
PID	NA		
ALPHA			
BETA/GAMMA			

NOTES: HSA = Hollow stem auger; 4 1/4" I.D. (3) Driller augered up some fragments of concrete while progressing to first sample interval. Site has man-made features nearby -- cinder block cistern, concrete (poured) within 30' -- possible footers for building ~~previously~~ location previously at or near boring

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS\MISC\GEOTECH\LITHO LOG.EPS

1-17-96

2003106 2154-006

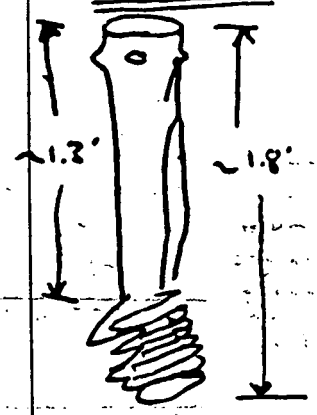
FEMP
LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation Borrow Areas/OU2 Waste Units

PROJECT NUMBER: 20.03.10

BORING NUMBER: GZ-154

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	1100, 9-12-95, # 410171	Push	19.5"	Top of tube is brown lean clay with sand — — — — — — brown/gray ~11'? — Bottom of tube: lean clay with sand, (5GY 5/1) greenish gray, few fine gravel 1/8 to 5/8" typical, low plasticity, moist, very stiff	CL	3.5 (bottom of tube)	3" O.D. Shelby Tube; 6" - 150 psi; 6→12" 45 psi; last 6" - 700 psi; 24" push 10-12'; Bottom 1" of tube crimped
11.0							
12.0							
13.0	1115, 9-12-95	Push	-	No recovery - tube failed due to compressive failure, piece of ordovician rock pulled from end of tube 1½" piece, flat — possible limestone float or block?			#410172 15 jar archive from bottom of ST. 3" O.D Shelby Tube; 0-12" → 1200 psi; 12-24" → 600 psi (1)
14.0	No Sample		13.8'				
15.0				Bottom of Boring = ~~14.5'~~ 13.8'			Sketch of Shelby tube 12.5 - 14.5'
16.0							
17.0							
18.0							
19.0							
20.0							
21.0							
22.0							



initial length of shelby tube before push was 2.5' (30")

NOTES: Directed driller/ PERMCO to push shelby tube 12.5 - 14.5' for additional sample material due to crimping of 10-12' shelby tube

(1) Driller said he was experiencing hard drilling at auger depth of about 12.5'

REVIEWED BY JL DATE 1-17-96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-154	Drilling Method: Mobile B-61 HSA	Date Started: 9/12/95
Coordinates: N 476,710 E 1,381,482	Geologist: K. Ernst	Date Completed: 9/12/95
Ground Surface Elevation: 577.00 feet AMSL	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. Coordinates are based on NAD 1927.
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	Clay cuttings, brown						
2.5	Lean clay with sand, yellowish brown, very stiff, moist, nonplastic, trace fine gravel to 1/4 inch, fine to coarse sand, (CL)	410168	2.5 - 4.0	SS	6, 7, 8	10	MC, AL
5	Lean clay with sand, light yellowish brown, stiff to very stiff, trace black organic nodules, trace fine gravel 1/8 to 1/4 inches, low plasticity, moist, sand is fine to medium, (CL)	410169	5.0 - 6.5	SS	4, 6, 12	17	MC
7.5	Lean clay with sand, light yellowish brown, hard, moist, trace fine to coarse gravel 1/8 to 5/8 inch, sand is fine to coarse, (CL)	410170	7.5 - 9.0	SS	9, 13, 21	15	MC, AL, UU
10	Sandy lean clay, very stiff, brown to greenish gray, trace gravel 1/8 to 5/8 inch, CL	410171	10.0 - 12.0	ST	NA	19.5	MC, GS, AL
13.8	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP
LITHOLOGIC LOG

CONTROL NO: 20031062155-004

Page 1 of 1

PROJECT NAME: Geotech. Investigation Borrow Areas / OU2 Waste Units

PROJECT NUMBER: 20.03.01

BORING NUMBER: G2-155

COORDINATES: NA

RELATED FAL NOs.: NA

SURFACE ELEVATION: NA

GROUNDWATER LEVEL: DRY

DATE: 9/12/95 TIME: 13:15

DATE STARTED: 9/12/95

GEOLOGIST: J. Erjavec

GROUNDWATER LEVEL: NA

DATE:

TIME: 14:20

DATE COMPLETED: 9/12/95

WATER USED DURING DRILLING: None

DRILLING CONTRACTOR: Alliance Env., Inc

DRILLING EQUIPMENT: Mobile B-61, HSA

DRILLER/HELPER: Fatmeyer M Proctor / B Clough / L 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
2							Augered to 2.5' Brown clay topsoil
4	13:28 9/12/95 410173	-4 -5 -8	10"	Light olive brown (2.5Y-5/6) clay (bottom 6"). topped by 4" of light yellowish brown (2.5Y-6/4) clay. Moist, abundant organic matter & trace sand & gravel (fine). V. stiff to very hard, low plasticity to med. plasticity. Iron staining	CL	3.0-5.0	SS 2"OD 2.5-4.0' 410180 2-4' ctgs brown Augered to 5'
6	13:35 9/12/95 410171	-9 -10 -14	15.5"	Pale yellow (2.5Y-7/4) mottled with light olive brown (2.5Y-5/6) clay. Moist to dry, some gravel (fine-coarse), trace sand, silt?, Very hard, low plasticity, some organic staining & iron staining.	CL	>5.0	SS 5.0-6.5' 410181 - 6-10' ctgs brown Augered to 7.5'
8	13:56 9/12/95 410175		22"	Light olive brown (2.5Y-5/4) clay with gravel (fine to coarse) (sub angular to subrounded), med. plasticity, moist, stiff to hard (vis. est.)	CL		ST 7.5-9.5' 150-6"/300-6"/450-6"/650-6" ; slight creep 410176 (Archived)
10	14:03 9/12/95 410177	-7 -10 -19	15"	Greenish gray (10Y-5/1) below light olive brown (2.5Y-5/4) clay & clayey sand (fg), Contact brown/gray interface at 10'? Brown clay - moist, low-med plasticity - some sand & fine gravel. Sand - poorly graded, well sorted, wet to moist, dense. Gray clay, moist, very hard, low plasticity.	CL	4.0->5.0	Augered to 9.5' SS 10.0-11.5
12							Augered to 12.5'
14	14:11 9/12/95 410178	-4 -8 -11	14"	Greenish gray (10Y-5/1) clay with trace to some gravel (fine to very coarse). Moist, hard to very hard, low plasticity. Some gravel from Ordovician bedrock (Bryozoan, brachiopod fragments.) Large rock cobble at 13" below top. Trace sand, no silt?	CL	4.0->5.0	SS 12.5-14.0' 410182 12-14' ctgs gray/brown Augered to 14.5'
16	14:18 9/12/95 410179	-5 -8 -16	17"	Greenish gray (10Y-5/1) clay with some sand (in layers) & some gravel (fine to very coarse)	CL	3.0	SS 14.5-16.0'
				Clay, moist, very stiff, low-med plasticity, crumbl, matrix of ord. bedrock as source.			BCB 16.0'

INSTRUMENT	BACKGROUND	DATE	TIME
PID		NA	
ALPHA			
BETA/GAMMA			

NOTES:

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

ILLUSTRATOR/GEOTECH/LITHO LOG.EPS

DATE 1-17-96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-155	Drilling Method: Mobile B-61 HSA	Date Started: 9/12/95
Coordinates: N 477,348 E 1,381,591	Geologist: J. Erjavec	Date Completed: 9/12/95
Ground Surface Elevation: 582.85 feet AMSL	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. Coordinates are based on NAD 1927.
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	Clay topsoil						
2.5	Lean clay with sand, light olive brown, very stiff to hard, moist, low to medium plasticity, trace gravel, (CL)	410173	2.5 - 4.0	SS	4, 5, 8	10	MC, AL
		410174	5.0 - 6.5	SS	9, 10, 14	15.5	MC
7.5	Sandy lean clay with fine to coarse gravel, light olive brown, medium plasticity, stiff to hard, moist, CL	410175	7.5 - 9.0	ST	NA	22	MC, GS, AL, UU
10	Sandy lean clay greenish gray, very hard, low plasticity, wet to moist, some gravel, CL	410177	10.0 - 11.5	SS	7, 10, 19	15	MC, AL
		410178	12.5 - 14.0	SS	4, 8, 11	14	MC
		410179	14.5 - 16.0	SS	5, 8, 16	17	MC, GS, AL
16	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: G2156-005

FEMP
LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation Borrow Areas/OU2 Waste Units			PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-156	COORDINATES: See Survey report	RELATED FAL NOs.: 200310-G2156-001 thru 015	
SURFACE ELEVATION: See survey report	GROUNDWATER LEVEL: 17.2 ft bgs	DATE: 7 Sep 95	TIME: 1300	DATE STARTED: 7 Sept 95
GEOLOGIST/Engineer: K. Ernst	GROUNDWATER LEVEL: N/K	DATE:	TIME:	DATE COMPLETED: 7 Sept 95
WATER USED DURING DRILLING: None	DRILLING CONTRACTOR: Alliance Env, Inc.	DRILLING EQUIPMENT: Mobile Drill B-61/HSA	DRILLER/HELPER: M. Proctor/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
0							Augered to 2.5' cuttings-brown topsoil and clay, dry
1.0							
2.0							
2.5							
3.0	0946, 9-7-95, 410128	4-5-5	12"	Lean Clay, brown (10YR 5/3), low plasticity, moist, iron stainings, trace fine roots, stiff	CL	1.0	2" O.D. Split Spoon
4.0	Augered to 5.0'						
5.0	1002, 9-7-95, 410129	Push	24"	Lean Clay, light yellowish brown (10YR 6/4), low plasticity, moist, red iron staining, very stiff	CL	2.5	3" O.D. Shelby Tube 1st 6"--150 psi 2nd 6"-- 250 psi last 6"-- 300 psi 24" push total Description is from bottom of shelby tube 8 oz jar Archive #410129 from bot of tube
6.0							
7.0							Augered to 7.5'
8.0	1027, 9-7-95, 410131	Push	21"	Lean Clay, gray (N 5/5) mottled with yellowish brown clay (at bottom of tube), low plasticity, moist, very stiff -- Interface of brown/gray 9.2' (estimated)	CL	2.5	3" O.D Shelby Tube 24" push 150 psi for 12" 300 psi for next 6" 400 psi for last 6" Description from bottom of tube Note ①
9.0							
10.0							Augered to 10'

INSTRUMENT	BACKGROUND	DATE	TIME
PID			
ALPHA			
BETA/GAMMA			

NOTES:
① 410132 is archive jar from Shelby Tube
Gravelly "chips" while augering through approx. 8.5' - 9.5' interval
bgs = below ground surface
O.D = outer diameter

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS/MISC/GEOTECH/LITHO LOG.EPS

G2156-006

FEMP
LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation Borrow Areas/OU2 Work Unit

PROJECT NUMBER: 20.03.10

BORING NUMBER: G2-156

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	1040, 9-7-95, 410133	4-14-11	17"	Sandy lean clay, greenish gray, (10Y5/1) low plasticity, moist, very stiff	CL	2.75	2"O.D. split spoon
11.0				10.8 brown silty sand, fine, moist	SM		■ 410134 is jar archive of brown silty sand
				11.3 sandy lean clay, greenish gray, low plasticity moist	CL		
12.0							Encountered water at 12.5', seam? Augered 11.5 - 12.5'
13.0	1050, 9-7-95, 410135	4-7-12	15"	Lean clay, greenish gray (10 Y 5/1), low plasticity, moist, very stiff	CL	3.25	2" O.D split spoon. Top 3" of sample wet, med. to fine sand grains on top of sample (1.4tsf?)
14.0							Augered 14 - 15'
15.0	1100, 9-7-95, 410136	5-8-10	15"	15.3 gray clayey sand with gravel, fine to coarse sand, subangular gravel, 3/4" max.	SC		2" O.D. split spoon sand is moist to wet
16.0				15.5 Sandy lean clay with gravel, grayish brown (2.5 Y 5/1), scattered gravel, (3/8 - 1/2" typical) subangular to subround, moist, low plasticity, very stiff	CL	3.0	
17.0				16.5			
18.0							
19.0	1120 9-7-95, 410137	4-4-12	19"	Sandy lean clay with gravel, greenish gray (10 Y 5/1), scattered gravel (1" max), fine to coarse, moist to wet, low plasticity, low plasticity, soft to very stiff	CL	0.25	2"O.D. split spoon wet to moist gravel is subangular to subround
20.0				20.2' Bottom of Boring = 20.0'	CL	1.5	moist
21.0							
22.0							

NOTES:

000152

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

11-94

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-156	Drilling Method: Mobile B-61 HSA	Date Started: 9/7/95
Coordinates: N 478,189 E 1,379,726	Geologist: K. Ernst	Date Completed: 9/7/95
Ground Surface Elevation: 576.76 AMSL	GWL/DATE: 17.2 BGS	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. Coordinates are based on NAD 1927.
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	Clay Topsoil						
2.5	Lean clay, brown, stiff, moist, low plasticity, CL	410128	2.5 - 4.0	SS	4, 5, 5	12	MC
	Light yellowish brown, very stiff, brown/gray at 9.2 feet	410129	5.0 - 7.0	ST	NA	24	MC,GS, AL, Pr
		410131	7.5 - 9.5	ST	NA	21	MC, GS, AL, CU
10	Lean clay, greenish gray, very stiff, moist, low plasticity, CL	410133	10.0 - 11.5	SS	4, 14, 11	17	MC, GS, AL
0.8	Silty sand, brown, fine, moist, (SM)						
1.3	Sandy lean clay, greenish gray, moist, low plasticity, (CL)						
2.5	Lean clay, greenish gray, low plasticity, very stiff, moist, (CL)	410135	12.5 - 14.0	SS	4, 7, 15	15	MC
		410136	15.0 - 16.5	SS	5, 8, 19	15	MC, GS, AL
5.5	Sandy lean clay with gravel, brown, gravel 3/8 inch to 1/2 inch, moist, very stiff, low plasticity to greenish gray, CL	410137	18.5 - 20.0	SS	4, 4, 12	19	MC
0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: G2200310-157-005

FEMP
LITHOLOGIC LOG

Page 1 of ____

PROJECT NAME: Geotech. Investigation Borrow Areas / OU2 Waste Units	PROJECT NUMBER: 20.03.01
BORING NUMBER: G2-157	COORDINATES: See survey reports
RELATED FAL NO.: G2200310-157-002 thru	
SURFACE ELEVATION: See survey reports	GROUNDWATER LEVEL: 17" 9" BGL; DATE: 9/7/95; TIME: 14:45 (16:17 WL RIG TIME)
DATE STARTED: 9/7/95	
GEOLOGIST: Jim Eiravec	GROUNDWATER LEVEL: N/K; DATE: ——; TIME: 16:07
DATE COMPLETED: 9/7/95	
WATER USED DURING DRILLING: None	DRILLING CONTRACTOR: Alliance Env., Inc
DRILLING EQUIPMENT: Mobile B-61, HSA	DRILLER/HELPER: M Proctor / B Clough / L. Fatney (B. Clough)

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' from cuttings, topsoil + clay
4	14:55 9/7/95 410138	-9 -11 -12	15"	Light olive brown (2.5Y-5/4) to light yellowish brown (2.5Y-6/4) clay with trace gravel (fine) low plasticity, very stiff, moist to dry. Organics present - roots, photosynthetic, mottled gray clay calcite in the brown clay (thin stringers).	CL	2.5-4.0	SS 2.5-4.0'
							Augered to 5'
6	15:01 9/7/95 410139	-5 -5 -6	17"	Light olive brown (2.5Y-5/6) clay with interbedded light gray clay (2.5Y-6/1), moist to wet, no gravel. Slight organics, low plasticity, stiff.	CL	1.5-2.0	SS 5.0-6.5'
							Augered to 7.5'
8	15:25 9/7/95 410140		23.5"	Greenish gray (10Y-5/1) clay (lean). Moist, medium plasticity, No gravel, stiff (est.). ST started in brown clay from visual inspection of top of tube	CL		ST 7.5-9.5' 150-18"/300-6" (lbs) 410141 (Archived) 15:27
10	15:41 9/7/95 410142		24	Greenish gray (10Y-5/1) clay (lean). Moist, low plasticity, no gravel. Stiff (est). Brown clay in top of tube from visual inspection	CL		Augered to 10' ST 10.0-12.0' 150-12"/up to 300 12" 410143 archived 15:43
12							Augered to 12.5'
14	15:48 9/7/95 410144	-3 -6 -14	16"	Greenish gray (10Y-5/1) clay with sand (vfg) & silt (lenses of sandy silt - probably). No gravel to trace. Wet, low plasticity, very stiff to hard.	CL	2.5-4.0	SS 12.5-14.0'
							Augered to 15'
16	15:55 9/7/95 410145	-5 -6 -5	15"	Dark greenish gray (10Y-4/1) silty clay with 4" sand (10Y-4/1) (med-fine gr.) at bit & ST, very wet, med plasticity, trace gravel (fg) very stiff. Sand well graded. Sand has matrix mineral component <5% (est.)	CL / SW	2.5-3.0	SS 15-16.5' SS-wet
18							Augered to 18.5'
20	16:07 9/7/95 410146	-3 -3 -7	12"	Greenish gray (10Y-5/1) silty clay with sand (vfg-fg) & trace gravel (fine). 2-3" of greenish gray sand at base SS (med-fg). Bot 20	CH / SW	1.0-5.0	SS 18.5-20'

INSTRUMENT	BACKGROUND	DATE	TIME
PID			
ALPHA			
BETA/GAMMA			

NOTES: Very wet, med to high plasticity, very soft to very hard (depending on particular content). Sand has ~10% to 5% matrix mineral component (est). Interval 15-20' has significant clastic component & apparent good permeability.

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS/MISC/GEOTECH/LITHO LOG.EPS

W. 1.94

Project No. PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-157	Drilling Method: Mobile B-61 HSA	Date Started: 9/7/95
Coordinates: N 478,432 E 1,379,210	Geologist: J. Erjavec	Date Completed: 9/7/95
Ground Surface Elevation: 574.78 feet AMSL	GWL/DATE: 17.75 BGS	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. Coordinates are based on NAD 1927.
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
0.0	Clay topsoil						
2.5	Lean clay, light olive brown to light yellowish brown, trace gravel, very stiff, low plasticity, CL, moist to dry light olive brown slight organics greenish gray	410138	2.5 - 4.0	SS	9, 11, 12	15	MC
		410139	5.0 - 6.5	SS	5, 5, 6	17	MC, GS, AL
		410140	7.5 - 9.5	ST	NA	23.5	MC, GS, AL, UU
		410142	10.0 - 12.0	ST	NA		MC, GS, AL, Pr
12.5	Clay with sand and silt, wet, very stiff to hard, low plasticity, (CL)	410144	12.5 - 14.0	SS	3, 6, 14	16	
15.5	Silt with sand, dark greenish gray, very wet, medium plasticity, very stiff, well, ML	410145	15.0 - 16.5	SS	5, 6, 5	15	MC, GS, AL
16.5	Sand, well graded, trace gravel, very wet, (SW)						
18.5	Silty clay, greenish gray, very soft with clay to very hard, (CH), very wet, medium to high plasticity	410146	18.5 - 20.0	SS	3, 3, 7	12	MC
19.8	Sand, (SW) greenish gray, fine to medium						
20.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP LITHOLOGIC LOG

CONTROL NO: 200310G2-158-005

Page 1 of 1

PROJECT NAME: Geotechnical Investigation Borehole / OU2 Waste Units			PROJECT NUMBER: 20-03-10
BORING NUMBER: G2-158	COORDINATES: See Survey Report	RELATED FAL NOs.: 200310G2-158-001 thru 016	
SURFACE ELEVATION: See Survey report	GROUNDWATER LEVEL: 17.5' below G.Surf.	DATE: 9/11/95	TIME: 8:59	DATE STARTED: 9/11/95
GEOLOGIST: J. Erjavec	GROUNDWATER LEVEL: 4.10.96	DATE:	TIME:	DATE COMPLETED: 9/11/95
WATER USED DURING DRILLING: None	DRILLING CONTRACTOR: Alliance Env. Inc	DRILLING EQUIPMENT: Mobile Drill B61-HSA	DRILLER/HELPER: N. Proctor / 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
2							Augered to 2.5' Green cuttings
4	9:00 9/11/95 410147	-6 -4 -9	12"	Light olive brown clay (2.5Y-5/3) · Some organics (black-dk. brown), med. plasticity moist very stiff. Trace roots, mottled appearance, (2.5Y-5/3 to 2.5Y-5/6) JE 4.10.96	CL	3.0	SS 2.5-4.0' 2" OD 410155 Cttgs. 1gal sample 2.0'-4.0' olive brown clay (Model stratum traits)
6	9:06 9/11/95 410148	-3 -4 -5	18"	Light olive brown clay (2.5Y-5/3-5/6), mottled, moist to wet, low plasticity, med. stiff to very stiff. Trace organics, roots, dk-brown to black; trace sand	CL	1.5-3.0	Augered to 5.0' SS 5.0-6.5'
8	9:24 9/11/95 410149 (Archived)		11"	Light olive brown silty clay (2.5Y-5/4) mottled with gray clay (2.5Y-5/6) or clayey silt, low plasticity, moist to wet * (wet), with sand (fg-mg) (410149 sample high) JE 4.10.96	CL/ML		Augered to 7.5' ST 7.5-9.5' 1501bs for 24" 4.10.96 410156 cttgs. sample 6-10'
10	9:36 9/11/95 410150		21"	Light olive brown silty clay (2.5Y-5/6) with sand (fg-mg), trace gravel (fine), wet, low plasticity, mottled JE	CL		Augered to 10' ST 10.0'-12.0' 1501bs at 24" 410151 (Archived) 410157 10'-14' (cttgs. sample brown clay & sand?) JE 4.10.96
12							
14	9:45 9/11/95 410152	-22 -5 -5	11"	Brownish yellow (10YR-6/8) to light olive brown (2.5Y-5/6) fg-mg sand with clay & gravel (fg-cg) subrounded-subangular, wet friable, well graded, poorly sorted, iron staining throughout. Some gravel cobbles with component. Very dense	SW		Augered to 12.5' SS 12.5'-14.0' spoon not retrieval
16	9:55 9/11/95 410153	-6 -9 -11	14"	Greenish gray (10Y-5/1) silty clay with sand (fg-mg), wet, very stiff to very hard, wet plasticity. Trace gravel (fine) 4.10.96 JE	CL	3.0->4.0	Augered to 15.0' SS 15.0-16.5'
18							Augered to 18.5'
20	10:04 9/11/95 410154	-8 -9 -5	11"	Greenish gray (10Y-5/1) silty clay (5" top) and greenish gray (10Y-5/1) sand with silt & clay. Sand (fg-mg), well graded, poorly sorted, wet Clay stiff to very stiff, Cobbles	CL/SW	Clay 2.0-2.5	SS 18.5'-20.0'

INSTRUMENT	BACKGROUND	DATE	TIME
PID 4-10-96 JE	Ø	9-11-95	N/K
ALPHA 4-10-96 JE	n/a	9-11-95	0
BETA/GAMMA	80 cpm	9-11-95	N/K

NOTES: JE
* - sample apparently slid out of tube

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS/MISC/GEOTECH/LITHO LOG EPS

SS 18.5-20.0' – Some gravel (fine to very coarse), subrounded.

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-158	Drilling Method: Mobile B-61 HSA	Date Started: 9/11/95
Coordinates: N 478,837 E 1,378,993	Geologist: J. Erjavec	Date Completed: 9/11/95
Ground Surface Elevation: 575.53 feet AMSL	GWL/DATE: 17.5 feet BGS	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. Coordinates are based on NAD 1927.*
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Brown topsoil						
2.5	Fat clay, light olive brown, very stiff, moist, CH, high plasticity	410147	2.5 - 4.0	SS	6, 6, 9	12	MC, GS, AL
		410155	2.0 - 4.0	B	NA	NA	Modal Dia.
	Lean clay, (CL)	410148	5.0 - 6.5	SS	3, 4, 5	18	MC
7.5	Lean clay, light olive brown, low plasticity, moist, CL	410149	7.5 - 9.5	ST	NA	11	
		410156	6.0 - 10.0	B	NA	NA	Modal Dia.
		410150	10.0 - 12.0	ST	NA	11	MC, GS, AL
		410157	10.0 - 14.0	B	NA	NA	Modal Dia.
12.5	Silty sand with gravel, brownish yellow, fine to medium sand, very dense, SM	410152	12.5 - 14.0	SS	22, 50/5	11	MC, GS, AL
15	Silty clay with sand, greenish gray, wet, very stiff to very hard, medium plasticity, trace gravel, (CL)	410153	15.0 - 16.5	SS	6, 9, 11	14	MC
19	Silty sand, wet, fine to medium sand, SM	410154	18.5 - 20.0	SS	8, 9, 5	11	MC, GS, AL
20	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP
LITHOLOGIC LOG

CONTROL NO: 20031062159-005

Page 1 of 1

PROJECT NAME: Geotechnical Investigation Borrow Areas / GU2 Waste Units			PROJECT NUMBER: 20.03.10
BORING NUMBER: 52-159	COORDINATES: See Survey Report	RELATED FAL NOs.: 310 62159-001 thru -013	
SURFACE ELEVATION: See Survey Report	GROUNDWATER LEVEL: 14'10" below ground surface	DATE: 9/11/95 TIME: 13:03	DATE STARTED: 9/11/95
GEOLOGIST: J. Erjavec	GROUNDWATER LEVEL: N/A DMS 4-10-96	DATE:	TIME: 14:25	DATE COMPLETED: 9/11/95
WATER USED DURING DRILLING: None	DRILLING CONTRACTOR: Alliance Env., Inc.	DRILLING EQUIPMENT: Mobile Drill B-61 HSA	DRILLER/HELPER: M. Proctor / B. Fontney / 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
2							Augered to 2.5' from cuttings, clay topsoil.
4	13:11 9/11/95 410158	-5 -6 -5	13"	Light olive brown (2.5Y-5/6) (top) clay to (bottom) sandy clay, moist, stiff to hard, trace sand, low-med plasticity, trace organics	CL	1.5+ >5.0	SS 2'-4.0' 2.5-4.0' 410165 (2.0-4.0 ctgs) olive brown clay
6	13:18 9/11/95 410159	-3 -2 -5	18"	Light olive brown to olive brown (2.5Y-5/4; 4/4) clay with silt, trace sand & gravel (med-coarse), moist, med. plasticity, stiff. organic matter present as roots & rootlets, & other plant material.	CL	1.0-1.5	SS 5-6.5'
					Augered		
8	13:24 9/11/95 410160	-8 -6 -5	17"	Light olive brown to olive brown (2.5Y-5/4; 4/4) clayey sand, moist, sand gravel (fine-med) Sand is (f-m-g), well-graded, poorly sorted, med dense.	SW-SC		SS 6.5-9.0' 410166 (6.0-10.0) ctgs olive brown clay & sand.
10					Augered		
12	13:31 9/11/95 410161	-10 -15 -12	14"	Light olive brown clayey gravelly sand (2.5Y-5/6) & silty clay (bottom of sample). Moist to wet. Sand well-graded, poorly sorted, med. dense. Gravel about 40-50% of sample in upper 6" of core.	SW-SC		SS 10-11.5' (olive brown clay, sand & gravel) 410167 (10.0-14.0) ctgs SS 12.5-14.0'
14	14:08 9/11/95 410162	-15 -14 -22	13"	Light olive brown sandy gravel (2.5Y-5/6). Gravel (coarse-fine; max ~1.5") wet, sand poorly sorted, well graded. Gravel well graded, poorly sorted, dense.	GW GP	4-10-96	
					GS	4-10-96	Augered to 15.0'
16	14:15 9/11/95 410163	-7 -7 -9	15"	Gray (N-5/) silty sand lower 8" gray (N-5/) sandy silt. Wet, sand poorly graded, well sorted, vfg. Trace gravel at top of core - & brown clay olive brown. Silt, low plasticity, stiff to very stiff.	SM ML SM	-upper 7" -lower 8"	SS 15.0-16.5'
18							Augered to 18.5'
20	14:27 9/11/95 410164	-14 -17 -28	18"	Dark greenish gray (10Y-4/1) clay (upper 12") over 6" of dark greenish gray silty clay with sand, moist to wet, hard to very hard, low plasticity in upper 12", med plasticity in bottom 6"	CL	>5.0	SS 18.5-20.0'

INSTRUMENT	BACKGROUND	DATE	TIME
PID	0.0	9-11-95	12:30
ALPHA	N/A DMS 4-10-96		
BETA/GAMMA	80 CPM	9-11-95	13:08

NOTES: N/A Per Groundwater level = Not known

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUSTRATOR/GEOTECHNL/THO LOG.EPS

JV 4-11-96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-159	Drilling Method: Mobile B-61 HSA	Date Started: 9/11/95
Coordinates: N 478,643 E 1,378,773	Geologist: J. Erjavec	Date Completed: 9/11/95
Ground Surface Elevation: 570.88 feet AMSL	GWL/DATE: 14', 10" BGS	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. Coordinates are based on NAD 1927.
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	Clay topsoil						
2.5	Sandy lean clay with sand, light olive brown, stiff to hard, moist, low to medium plasticity, trace organics, CL	410158	2.5 - 4.0	SS	5, 6, 5	13	MC, GS, AL
		410165	2.0 - 4.0	B	NA	24	Modal Dia.
5	Lean clay, light olive brown to olive brown, trace sand and gravel, medium to coarse gravel, moist, stiff, medium plasticity, (CL)	410159	5.0 - 6.5	SS	3, 2, 5	18	MC
		410166	6.0 - 10.0	B	NA	48	Modal Dia.
7.5	Silty sand, light olive brown to olive brown, medium dense, moist, SM	410160	7.5 - 9.0	SS	8, 6, 5	17	MC, GS, AL
10	Silty sand, light olive brown, moist to wet, medium dense, (SM)	410161	10.0 - 11.5	SS	10, 15, 12	14	MC
		410167	10.0 - 14.0	B	NA	48	Modal Dia.
12.5	Silty sand with gravel, light olive brown, fine to coarse gravel (1/2 inch), dense, wet, SM	410162	12.5 - 14.0	SS	15, 14, 22	13	MC, GS, AL
15	Sandy silt, gray, wet, very fine, trace gravel, clay brown at top of sample, stiff to very stiff, (ML)	410163	15.0 - 16.5	SS	7, 7, 9	15	MC
18.5	Sandy silty clay, very stiff, dark greenish gray, some sand, moist to wet, hard to very hard, CL-ML	410164	18.5 - 20.0	SS	14, 17, 28	18	MC, GS, AL
20	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 200310G2164-ØØ3

FEMP
LITHOLOGIC LOG

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. Nicks	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 Gaima, 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
				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" crnr to very stiff - moist to wet 2.5 Y 6/2 light brownish gray		1.75 2.25	
	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 2.5Y 5/1 gray, v. stiff, wet	CL	3.5	

2.5-4' A/O screen

410300 JAR

12' Archive 410303 JAR

410305 JAR

15-16.5' A/O screen

INSTRUMENT	BACKGROUND	DATE	TIME
PID		NK	
ALPHA			
BETA/GAMMA			

NOTES:

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS\MISC\GEOTECH\LITHO LOG EPS

4/95

4194

2003106 2164-004

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 1 1/2" 2.5Y 5/1 gray v.stiff, wet, with localized stiff layers to 3".	CL	1.0-2.0	Erronous blow count due to gravels.
	1556 9/13/95 410309	5 17 29	28"	10YR 4/4 dk.yel. bra		3.0 4.0	
				Sand w/scat. grav. v. Dense Wet	SW		← Bottom 3" Sand
25				Total Depth 24'			

NOTES: Hole grouted w/pelclay 20gal/bag, tremie from bottom to 1' from top. Grout and pull auger section, grout and pull section etc. etc. 1' cement plug at surface. 4½ Bags, 22 gallons for grout

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

4/95

1-11-96

000161

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: 200310G2167-002A

Page 1 of 2

PROJECT NAME: ~~G2 +~~ Geotechnical Investigation Borrow Areas/OU2 Waste Units			PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-167	COORDINATES: See Survey Report	RELATED FAL NOs.: 200310G2167-001 thru 014	
SURFACE ELEVATION: See Survey Report	GROUNDWATER LEVEL: ~~F~~ N/K — DMS 4-10-96	DATE:	TIME:	DATE STARTED: 9/18/95
GEOLOGIST: R. Nicks	GROUNDWATER LEVEL: ~~F~~ N/K - DMS - 4-10-96	DATE:	TIME:	DATE COMPLETED: ~~9/19/95~~ 9-18-95 DMS 4-10-
WATER USED DURING DRILLING: NONE	DRILLING CONTRACTOR: Alliance	DRILLING EQUIPMENT: Mobile B-61	DRILLER/HELPER: Ed. Miller,	

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.
	1000 9/18/95 410327	6 11 50-5"	10"	10YR 3/2 v. dk. grayish brown @ 3"		7.5	Hair roots @ 3" 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 @ 4"	CH	2.25 3.25	
	1030 9/18/95 410329	NA	21"	Lean Clay 10YR 5/4 yellowish brown, v. stiff moist	CL		
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		4.5 3.0-4.0	top of grout seal @ 10'4"
	1050 9/18/95 410331	2 10 9	18"	Clay 10YR 5/3 brown, v. stiff, moist	CH	2.5-3.25	← ½" outlet ← Bottom of grout seal 14"
				Lean Clay 10YR 5/3 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	
	1518 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" (2'8" plugs) let bentonite base seal hydrate ≈ 3 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.

N/K = Not known

N/A = Not applicable

TLLUS\MISC\GEOTECH\LITHO LOG EPS

4/95

20031062167 ØØ3

FEMP
LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation Burrow Area/Low waste units

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	1.5	
	1549 9/18/95 410335	6 12 20	15"	10YR 4/1 dk. gray, w/scat. gravel to 1".		40	
25				TOTAL DEPTH 24'			

NOTES:

11-96

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						

APPENDIX C

SHALLOW BORING FIELD LOGS AND GEOTECHNICAL LOGGING REPORTS

FEMP LITHOLOGIC LOG

CONTROL NO: 20031062SB50-006

Page 1 of 1

PROJECT NAME: Geotechnical Investigation Borrow Area	PROJECT NUMBER: 20.03.20
BORING NUMBER: G2-SB-50	COORDINATES: NA
RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: None; DATE: 9/7/95; TIME: 14:30
DATE STARTED: 9-6-95	
GEOLOGIST: Engineer J. Dunkin	GROUNDWATER LEVEL: NA; DATE: ; TIME:
DATE COMPLETED: 9-6-95	
WATER USED DURING DRILLING: None	DRILLING CONTRACTOR: FERMCO
DRILLING EQUIPMENT: Little Beaver Hyd. 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
		N/A	N/A	Lean Clay w/ Sand (10 yr 5/6) Yellowish Brown Moist, Low Plasticity, Some Fine Roots	CL	N/A	
.5	14:07 9-6-95 409809						
1.0	14:12 9-6-95 409810			Lean Clay w/ Sand (10 YR 4/6) Dark Yellowish Brown, Low to Med. Plasticity, Trace Fine Roots, Moist, Mottled with Yellow	CL		
1.5							
2.0				SAA Depth Rock @ 30" ~~Depth~~ 1-31-96 Fragments 1/2 to 3/4" Diam, Angular			Sample 409811 Contains ~10 gallon Soil
3.0	409811 9/7/95 11:53			No Roots Below 30"			
4.0				Lean Clay w/ Sand (10yr 4/6) Dark Yellowish Brown, Low to Med. Plasticity Trace Gravel, Moist	CL		
5.0				Rock @ 4.5' Fragments (1/2 to 2.5" Diam, Angular)			Rock Is Limestone Floater Fossils Present
				SAA			
6.0				Rock @ 6.0 ft Deep Fragments 1/2 - 1 1/2" Diam, Angular			Rock Is Limestone Floater
7.0	409812 9/7/95 12:40			Rock 7'2" Deep Fragments 1/2-2" Diam. Angular Limestone			
8.0				Refusal Due To Rock 8.4' Bottom Of Boring			Sample 409812 Contains ~7 gallon Soil
9.0							
10.0							

INSTRUMENT	BACKGROUND	DATE	TIME
PID	0.0	9/6/95	16:07
ALPHA			
BETA/GAMMA	75	9/6/95	16:05

NOTES: N/A - Not Applicable
4" Dia Auger
Visual Description Is From Auger Cuttings
Samples Are Auger Cuttings
Encountered Rock @ 8" Deep, Moved Hole 10" West Resumed Sampling @ 20"
SAA = Same As Above
Possible Some Grass In 1.5-5.0' Sample From Surface Vegetation (Also In 5.0-10.0' Sample)
Unable To Collect Adequate Amount Of Sample For 409811 + 409812 In First Hole Hand Augered Second Hole 8' To East Of First Hole To Gather

000167

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS/MISC/GEOTECH/LITHO LOG.EPS

Depth (ft)	BZ	PID
.5-1.0	75	0.0
1.0-1.5	75	0.0
1.5-2.0	75	0.0

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-50	Drilling Method: Little Beaver	Date Started: 9/6/95
Coordinates: N 476,908 E 1,382,306	Engineer: J. Dunlap	Date Completed: 9/6/95
Ground Surface Elevation: 595.8 AMSL	GWL/DATE: None 9/7/95	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, yellowish brown, moist, some fine roots (CL)	409809	0.5 - 1.0	B	NA	6	OC
1.0	Lean clay with sand, dark yellowish brown, trace fine roots, moist mottled with yellow, CL Roots stop at 2.5 feet	409810	1.0 - 1.5	B	NA	6	OC
4.0	Lean clay with sand, dark yellowish brown, trace gravel, moist CL	409811	1.5 - 5.0	B	NA	42	MC, GS, AL, SP, SU, CL
		409812	5.0 - 8.4	B	NA	41	MC, GS, AL, SP

8.4 Final Boring Depth

* USCS symbols in parentheses indicate visual classification.

FEMP
LITHOLOGIC LOG

CONTROL NO: 2003100G2SB51-003

Page 1 of 1

PROJECT NAME: GEOTECHNICAL INVESTIGATION BORROW AREAS/OUL WASTE UNITS			PROJECT NUMBER: 20.03.10
BORING NUMBER: E2-SB-51	COORDINATES: NA	RELATED FAL NOs.: 2003100G2SB51-001 ~~DA~~ 012	
SURFACE ELEVATION: See Survey reports NA	GROUNDWATER LEVEL: NA	DATE: 4-11-95 TIME:	DATE STARTED: 9/25/95
GEOLOGIST: R. Nicks	GROUNDWATER LEVEL: NA	DATE: 4-11-95 TIME:	DATE COMPLETED: 9/22/95
WATER USED DURING DRILLING: NA	DRILLING CONTRACTOR: FERMCO	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
				Clayey silt/silty clay mixture, 10YR 4/3 brown, v. stiff, moist	CL or ML	3.75	6" topsoil. Numerous hair roots to 2" becoming rare beyond 3".
1	9/25/95			LEAN CLAY 10YR 4/4 dk. yellowish brown, v. stiff, moist with trace of sand	CL	4.25	
	9/25/95						
2				Sandy Clay with Gravel, 10YR 6/3 brown, gravels to 1½"	CL	4.0	
3	9/25/95			10YR 5/4 yel. brn. @ 3"			
4				Lean Clay 10YR 5/4 yel brn, v. stiff, moist		2.5	
5				Lean Clay with trace sand 10YR 5/4 yel brn. v. stiff, moist		2.0	
6				Sandy Clay w/gravel to 1½" 10YR 5/4 yel. brn. stiff, wet		1.5	Hair rootlets 6"-7"
7							
8	9/25/95						
9						2.0	
10				TOTAL DEPTH 10"		1.75	

SEE NOTES

INSTRUMENT	BACKGROUND	DATE	TIME
PID		NA	
ALPHA			
BETA/GAMMA			

NOTES: Samples previously collected from Geoprobe auger boring

000169

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS/MISC/GEOTECH/LITHO LOG.EPS

Lithological log represents total lithology of this boring only. No associated samples relative to this boring location.
4-11-96 GPR.

JW 4-11-96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-51	Drilling Method: Geoprobe *w/augers*	Date Started: 9/25/95
Coordinates: N 477,158 E 1,382,189	Geologist: R. Nicks	Date Completed: 9/25/95
Ground Surface Elevation: 598.2 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Clayey silt/silty clay mixture, brown, very stiff, moist (CL-ML)	411162	0.5 - 1.0	B	NA	6	OC
0.8	Lean clay, dark yellowish brown, very stiff, moist with trace of sand (CL)	411163	1.0 - 1.5	B	NA	6	OC
1.5	Lean clay with sand, brown gravel to 1-1\2 inch diameter CL Turning yellowish brown at 4.0 feet	411164	1.5 - 5.0	B	NA	42	MC, GS, AL
4.0	Sandy lean clay with gravel, yellowish brown, very stiff, moist CL	411165	5.0 - 10.0	B	NA	60	MC, GS, AL, SP
6.0	Sandy clay with gravel, yellowish brown, stiff, wet CL Hair size rootlets between 6.0 - 7.0 feet						
10.0	Final Boring Depth						

*USCS symbols in parentheses indicate visual classification.

CONTROL NO: 200310G2SB52-003

FEMP LITHOLOGIC LOG

Page 1 of 1

PROJECT NAME: Geotech Investigation Borrow Areas / OU2 Waste Units			PROJECT NUMBER: 20.03.01
BORING NUMBER: 62-SB-~~1~~52	COORDINATES: NA	RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: DRY	DATE: 9/13/95	TIME: 10:35	DATE STARTED: 9/13/95
GEOLOGIST: J. Erjavec	GROUNDWATER LEVEL: NA	DATE:	TIME:	DATE COMPLETED: 9/13/95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: Fenco	DRILLING EQUIPMENT: Geoprobe #36	DRILLER/HELPER: M. Grube / 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
		N/A		Light olive brown clay 1st 6" with organic (plant) matter and topsoil			
	9:52 9/13/95 410001		6"	Light olive brown (2.5Y-5/4) Clay, moist, with roots, med-low plasticity	CL	N/A	0.5-1.0'
1	9:55 9/13/95 410002		6"	Light olive brown (2.5Y-5/4) clay with roots + plant material, low plasticity, moist	CL	N/A	1.0-1.5'
2	2-1-96 KR 10/5' ~~9:50~~ 9/13/95 410003		41" from 1.5'	Light olive brown clay (2.5Y-5/4) with roots & plant material, iron staining & abundant organic staining (black, to dark brown), moist, low plasticity, very hard	CL	>5.0	1.5-5.0' bottom root mass at ~2.0'
3							
4				Light olive brown clay (2.5Y-5/4) with gravel (fine to very coarse). Moist, low plasticity, very hard. Gravel almost 2" in width - and brittle, some organic + iron staining. (2.5-5/4) 2-1-96	CL	7.5	First Pull to 44"
5							5.0-10.0'
6	10:22 9/13/95 410004			Light olive brown clay mottled with light gray clay (2.5Y-7/1), moist, low-med plasticity, trace gravel (fine to medium gravel), iron staining & organic staining throughout (scattered), clay stiff to very stiff.	CL	1.5-3.0	
7			101" from 1.5'				
8			60" from 5'	Light olive brown (2.5-5/6) clay, with trace to some gravel (fine-med). Trace iron staining + organic material. Low plasticity, moist, hard to very hard.	CL	4.0-5.0	2nd Pull to 92"
9							
10				BGB 10'			

INSTRUMENT	BACKGROUND	DATE	TIME
PID		NA	
ALPHA			
BETA/GAMMA			

NOTES: N/A = Not Applicable

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

ILLUS\MISC\GEOTECH\LITHO LOG.EPS

4/95

000171

REVIEWED BY JL DATE 2/8/96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-52	Drilling Method: Geoprobe	Date Started: 9/13/95
Coordinates: N 477,272 E 1,382,459	Geologist: J. Erjavec	Date Completed: 9/13/95
Ground Surface Elevation: 590.5 AMSL	GWL/DATE: None/9/13/95	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, light olive brown, moist, roots Iron staining beginning at 1.5 feet (CL)	410001	0.5 - 1.0	B	NA	6	OC
		410002	1.0 - 1.5	B	NA	6	OC
		410003	1.5 - 5.0	B	NA	42	MC, AL
3.4	Lean clay with sand Light olive brown, moist, gravel up to 2 inches diameter becoming mottled with light gray at 5.0 feet and becoming stiff to very stiff CL	410004	5.0 - 10.0	B	NA	60	MC, GS, AL
10.0	Final Boring Depth *USCS symbols in parentheses indicate visual classification.						

CONTROL NO.: 200310G2SB53-005

FEMP
LITHOLOGIC LOG

PAGE 1 OF 1

PROJECT NAME: Geotechnical Investigation Borrow Areas			PROJECT NO.: 20.03.10
BORING NUMBER: G2-SB-53	COORDINATES: NA	DRILLING CONTRACTOR: FERMCO	DRILLER / HELPER: B. Noyer / D Smith
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: 5.0 ft bls	DATE: 9/8/95	TIME: 17:20	DATE STARTED: 9/8/95
~~GEOLOGIST:~~ Engineer J. Dunlap	GROUNDWATER LEVEL: 4.5 ft bls	DATE: 9/11/95	TIME: 8:45	DATE COMPLETED: 9/8/95
WATER USED DURING DRILLING: N/A GAL	WATER RECOVERED DURING DRILLING: NA GAL		DRILLING EQUIPMENT: "Little Beaver" Hyd. Auger Geoprobe

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	9-8-95 17:37 409813	N/A	NA 6"/6"	Lean Clay with Sand (10YR 5/4) Yellowish Brown, Low Plasticity, Moist, Fine Roots Present Trace Black Nodules, Stiff	CL	N/A	
1.0	9-8-95 17:59 409814		6"/6"				
1.5			6"/6"				Rootlets Present To 3.0'
1.9 2.0 2.3	17:25			~~SAA~~ JCB Becoming Dark Yellowish Brown (10YR 4/4) At 1.3ft			
3.0 3.5 4.0	9/8/95 409815		N/A	Lean Clay w/Sand (10yr 4/6) Dark Yellowish Brown, Trace Fine Roots, Moist, Med. Plasticity Mottled w/ Brownish Yellow (10YR 6/8), Stiff	CL		
5.0 5.7 6.0				Lean Clay, Trace Sand (10yr 5/6) Yellowish Brown, Moist, Med. Plasticity, Trace Black Nodules Trace Rootlets, Stiff	CL		
7.0				Lean Clay, Trace Sand (10yr 5/4) Yellowish Brown, Moist, Med. Plasticity, With Thin Interbedded Silt Layers (10YR 3/4) Dark Yellowish Brown, Stiff	CL		
8.0 8.7 9.0 9.7 10.0	17:42 9/8/95 409816			Lean Clay, Trace Sand (10yr 5/4) Yellowish Brown, Moist, Med. Plasticity, Trace Black Nodules, Soft	CL		
				Fine Clayey Sand (10YR 5/6) Yellowish Brown, Wet	SC		
				Silty Clay w/Sand (10yr 5/6) Yellowish Brown, wet, Soft	CL		
				Becoming Moist At 6.2ft			
				Silty Clay w/Sand+Gravel (10YR 5/6) Yellowish Brown, Moist (Gravel 1/4 to 1/2" Diam, Sub Angular)	CL		
				Bottom of Boring 9.7ft			

INSTRUMENT	BACKGROUND	DATE	TIME
PID	13.4	9/8/95	17:02
ALPHA	N/A		
BETA / GAMMA	70	9/8/95	17:01

NOTES:
SAA - Same As Above
N/A - Not Applicable
Visual Description From GeoProbe Samples
Samples Combination Of Geoprobe Samples And Augering
PID Fluctuating - Not Steady

000173

* SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

0.5-1.0' + 1.0-1.5' Samples From Geoprobe Core;

G:/WPSC/95-0037.DRW (2-15-95)

FS-F-3881 Depth	BZ	PID
.5-1.0	70	45.6
1.0-1.5	70	38.4
[illegible]	70	15.7

1/25/96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-53	Drilling Method: Geoprobe w/augers	Date Started: 9/8/95
Coordinates: N 477,393 E 1,381,954	Engineer: J. Dunlap	Date Completed: 9/8/95
Ground Surface Elevation: 591.9 AMSL	GWL/DATE: 5.45' BGL 9/11/95	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, yellowish brown, stiff, moist (CL)	409813	0.5 - 1.0	B	NA	6	OC
		409814	1.0 - 1.5	B	NA	6	OC
2.3	Lean clay with a trace of sand, yellowish brown, stiff, moist CL	409815	1.5 - 5.0	B	NA	42	MC, GS, AL, SP, Pr_1, SU, CL, Pr_5
5.0	Clayey sand, yellowish brown, wet (SC)						
5.7	Lean Clay with sand and gravel, yellowish brown, soft, wet, gravel to 1/2 inch (CL)	40916	5.0 - 10.0	B	NA	60	MC, AL
9.7	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP LITHOLOGIC LOG

CONTROL NO: 200310G2SB54-003

Page 1 of 1

PROJECT NAME: Geotech. Investigation Borrow Areas/ OU2 Waste Units	PROJECT NUMBER: 20.03.01
BORING NUMBER: G2-SB-54	COORDINATES: NA / RELATED FAL NOs.: NA
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: DRY / DATE: 9/13/95 / TIME: 11:20 / DATE STARTED: 9/13/95
GEOLOGIST: J. Erjavec	GROUNDWATER LEVEL: NA / DATE: / TIME: / DATE COMPLETED: 9/13/95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: Fenco / DRILLING EQUIPMENT: Geoprobe #36 / DRILLER/HELPER: M. Grabe / 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
		N/A		clay + topsoil, brown, moist to dry			
	11:01 9/13/95 410005		6"	Light olive brown clay (2.5Y-5/4), dry, roots present. Low plasticity.	CL		0.5-1.0'
1	11:04 9/13/95 410006		6"	Light olive brown clay (2.5Y-5/4), dry, roots. Low plasticity	CL		1.0-1.5'
2				olive brown clay (2.5Y-4/4) dry to moist, very hard, trace gravel. Low plasticity, gravel (fine to medium)	CL	>5.0	1.5-5.0' Root mass to about 2.5'
3	11:10 9/13/95 410007		42"	light olive brown clay (2.5Y-5/6), dry to moist, with gravel (fine-medium)			1st Push 37"
4				Light olive brown clay (2.5Y-5/6 to 5/4), dry to moist, trace gravel. Low plasticity, hard to very hard. Trace organics + roots. Bottom 8" has some sand + silt.			
5							5.0-10.0'
6				~10" of light olive brown clay (2.5Y-5/6 to 5/4) with silt, sand + trace gravel. Low plasticity, stiff, moist to dry.	CL	2.0	
7	11:18/11:34 9/13/95 410008		60" 48"	~18" of light olive brown (2.5Y-5/6) clay mottled with light gray (2.5Y-7/1) clay, moist, stiff to very hard. Trace gravel (coarse to fine), some sand (vfg), to trace sand.	CL	2.0-5.0	2nd Push to 48"
8				Light olive brown clay (2.5Y-5/6) with some light gray clay (2.5Y-7/1) + gray (2.5Y-6/1) Clay. Trace gravel, increasing with depth. Moist, very hard to hard, Low plasticity, trace sand. Gravel to very coarse, bedrock, Brachiopods - brisk weeki, Bryozoans, twibble parts Fenestrellina sp. Ordovician bedrock cobbles encountered from 10' + below - Bottomed out in cobble piece 18" below depth of this boring 8.0-10'	CL	4.0->5.0	
10							

INSTRUMENT	BACKGROUND	DATE	TIME
PID			
ALPHA			
BETA/GAMMA			

NOTES: N/A = Not applicable

000175

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

ILLUS\MISC\GEOTECH\LITHO LOG.EPS

4/95

1-23-96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-54	Drilling Method: Geoprobe w/augers	Date Started: 9/13/95
Coordinates: N 477,500 E 1,382,210	Geologist: J. Erjavec	Date Completed: 9/13/95
Ground Surface Elevation: 596.4 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, light olive brown, low plasticity, moist (CL)	410005	0.5 - 1.0	B	NA	6	OC
		410006	1.0 - 1.5	B	NA	6	OC
1.5	Lean clay with sand, light olive brown, moist, hard, scattered gravel CL	410007	1.5 - 5.0	B	NA	42	MC, GS, AL
5.0	Lean clay with sand and gravel, light olive brown, stiff to hard, moist. (CL)	410008	5.0 - 10.0	B	NA	60	MC, AL
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 20031OG2-SB55-004

FEMP LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation Berrow Areas			PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-55	COORDINATES: NA	RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: None	DATE: 9-11-95	TIME: 10:28	DATE STARTED: 9-11-95
~~GEOLOGIST:~~ Engineer J. Dunlap	GROUNDWATER LEVEL: NA	DATE: N/A	TIME: N/A	DATE COMPLETED: 9-11-95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FERMCO	DRILLING EQUIPMENT: Geoprobe / "Little Beaver" Hyd. 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
		N/A		Silty Lean Clay (10yr 5/6) Yellowish Brown, Moist, Low Plasticity w/ Fine Roots	CL	N/A	
1.0	10:13 9-11-95 409829		6"/6"	Silty Lean Clay (10yr 4/4) Dark Yellowish Brown, Moist, Low Plasticity w/ Fine Roots	CL		
1.5	10:16 9-11-95 409830		6"/6"	SAA			
1.7							
2.0	10:18 9-11-95 409831		N/A	Sandy Lean Clay (10yr 5/6) Brownish Yellow w/Trace Gravel (1/8 to 1/2" Diam) Moist, Low Plasticity w/ Fine Roots	CL		Roots Present To ~3.0 ft
				Becoming Med. Plasticity & More Moist @ 2.8'			
3.0	~~10:18~~ 1-31-96			Sandy Lean Clay (10yr 5/6) Yellowish Brown w/Gravel (1/4-3/4" Diam, Angular) Moist, Med. Plasticity (Occasionally Mottled Bluish Gray (5B 6/1))	CL		
4.0				Becoming Less Gravelly & More Moist & Plastic @ 4.5'			
5.0	10:20 9-11-95 409832			Lean Clay w/Sand (10yr 5/4) Yellowish Brown Moist, Med Plasticity, Some Iron Staining	CL		
5.8							
6.0			80 ~~70~~ 1-31-96	Lean Clay w/Sand & Gravel (1/4 to 1/2" Diam, Angular) (10yr 5/6) Yellowish Brown, Very Moist. Med. Plasticity	CL		
7.0			61.5"	Soft/Wet ~ 7.1 to 7.4'			
				Becoming More Stiff @ 7.8'			
8.0							
8.6							
9.0				Lean Clay w/Gravel (.5 to 1.0" Diam, Angular) (10yr 5/6 Yellowish Brown, Moist, Med Plasticity, Stiff to Very Stiff)	CL		
10.0				Bottom Of Boring 10.2 ft BLS			

000177

INSTRUMENT	BACKGROUND	DATE	TIME
PID	~~40~~ 1-31-96 ~~6~~ 10.6	9-11-95	9:25 ~~9:02~~ 1-31-96
ALPHA	N/A		
BETA/GAMMA	60	9-11-95	9:00

NOTES: N/A Not Applicable
Visual Description From Geoprobe Cores
0.5-1.0, 1.0-1.5, & 5.0-10.0' Samples Geoprobe Cores
1.5-5.0' Samples Geoprobe + Auger Cuttings
Boring Is Offset 1.0' West Of Planned Location
SAA - Same As Above

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS/MISC/GEOTECH/LITHO LOG.EPS

Depth (ft)	BZ	PID
.5-1.0	60	12.4 ~~40~~ 1-31-96
1.0-1.5	60	14.8
1.5-5.0	60	18.6

4/93

1/25/96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-55	Drilling Method: Geoprobe w/augers	Date Started: 9/11/95
Coordinates: N 477,627 E 1,382,481	Engineer: J. Dunlap	Date Completed: 9/11/95
Ground Surface Elevation: 586.2 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, moist. (CL)	409829	0.5 - 1.0	B	NA	6	OC
		409830	1.0 - 1.5	B	NA	6	OC
1.5	Sandy lean clay, brownish yellow, moist with trace of gravel to 1/2 inch. CL	409831	1.5 - 5.0	B	NA	42	MC, GS, SG, AL, CONr, SP
5.0	Lean clay with sand and gravel, yellowish brown, stiff to very stiff, moist (CL)	409832	5.0 - 10.0	B	NA	60	MC, AL, SU, CL

10.2 Final Boring Depth

* USCS symbols in parentheses indicate visual classification.

FEMP
LITHOLOGIC LOG

CONTROL NO: 200310G2SB56-003

Page 1 of 1

PROJECT NAME: Geotech Investigation Borrow Areas / OU2 Waste Units			PROJECT NUMBER: 20.03.01
BORING NUMBER: G2-SB-56	COORDINATES: NA	RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: DRY	DATE: 9/13/95	TIME: 13:23	DATE STARTED: 9/13/95
GEOLOGIST: J. Erjavec	GROUNDWATER LEVEL: N/A	DATE: N/A	TIME: NA	DATE COMPLETED: 9/13/95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: Fenco	DRILLING EQUIPMENT: Geoprobe #36	DRILLER/HELPER: M. Grobe / 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
		N/A		Brown clay & topsoil, root material			
1	13:02 9/13/95 410009		6"	Olive brown clay (2.5Y-4/3) with roots & plant material. Dry to moist	CL	N/A	0.5-1.0'
	13:04 9/13/95 410010		6"	Olive brown clay (2.5Y-4/3) with root material & dark yellowish brown clay (10YR-4/6). Dry to moist, stiff to hard, low plasticity.	CL	N/A	1.0-1.5' Base of root mass
2				Dark yellowish brown (10YR-4/4) clay, dry to moist, low-med plasticity, very stiff. Trace roots & rootlets, trace organic & iron staining.	CL	2.5-3.5	1.5-5.0'
3	13:06 9/13/95 410011		48" 2 ft	Light olive brown (2.5YR-5/4) clay mottled with light gray clay (2.5YR-7/1). Hard to very hard, moist, low plasticity. Some fg gray sand. Trace gravel (fine to coarse)	CL	4.0->5.0	1st Point to 36"
5	13:20 9/13/95 410012		60"	Light olive brown (2.5YR-5/4) clay mottled with light gray clay (2.5YR-7/1). Very hard to hard, moist to dry, low plasticity. Trace gravel & some sand in lenses, sand fg-vfg. Some organic staining throughout	CL	>5	5.0-10.0'
8				Light olive brown clay (2.5Y-5/6), slightly mottled at top with gray clay (2.5YR-7/1). Very hard to hard, moist, low plasticity. Increasing gravel content toward bottom. (fine to coarse gravel). Trace sand throughout	CL	4.0->5	2nd Point to 86"
10				BOB 10'			

INSTRUMENT	BACKGROUND	DATE	TIME
PID			
ALPHA	NA		
BETA/GAMMA			

NOTES: N/A = Not Applicable

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS/MISC/GEOTECH/LITHO LOG.EPS

4/95

000179

REVIEWED BY

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-56	Drilling Method: Geoprobe w/augers	Date Started: 9/13/95
Coordinates:	Geologist: J. Erjavec	Date Completed: 9/13/95
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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, olive brown, moist, stiff (CL)	410009	0.5 - 1.0	B	NA	6	OC
		410010	1.0 - 1.5	B	NA	6	OC
1.5	Lean clay, dark yellowish brown, very stiff, moist CL	410011	1.5 - 5.0	B	NA	42	MC, GS, AL,
5.0	Lean clay with sand, light olive brown, moist, hard (CL)	410012	5.0 - 10.0	B	NA	60	MC, AL,
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 20031062SB57-004

FEMP LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation Borrow Areas	PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-57	COORDINATES: NA / RELATED FAL NOs.: NA
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: None / DATE: 9-11-95 / TIME: 15:20 / DATE STARTED: 9-11-95
~~GEOLOGIST~~ Engineer: J. Dunlap	GROUNDWATER LEVEL: NA / DATE: NA / TIME: NA / DATE COMPLETED: NA
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FERMCO / DRILLING EQUIPMENT: Geoprobe/ "Little Beaver" Hyd. 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
0.5	15:14 9-11-95 409821	N/A	6"/6"	Silty Lean Clay (10yr 4/4) Dark Yellowish Brown, Moist Low Plasticity, w/ Fine Roots SAA	CL	N/A	
1.0	15:13 9-11-95 409822		6"/6"	SAA	CL		
1.5							
2.0	14:33 9-11-95 409823		N/A	Silty Lean Clay (10yr 3/6) Dark Yellowish Brown, Moist, Low Plasticity, w/Fine Roots, w/ Black Nodules	CL		
2.3							
3.0				Silty Lean Clay (10yr 4/6) Dark Yellowish Brown, Moist, Low Plasticity, w/Fine Roots w/ Black Nodules, Mottled w/Gray	CL		Fine Roots To ~ 3.0'
3.5							
4.0				Lean Clay w/Gravel (1/4 to 1/2" Diam, Angular) (10yr 5/6) Yellowish Brown, Moist Low Plasticity, Occasionally Mottled w/Gray	CL		
5.0	15:05 9-11-95 409824		N/A	Lean Clay w/Gravel (1/4 to 3/4" Diam, Angular) (10yr 5/4) Yellowish Brown, Moist, Med. Plasticity, Occasionally Mottled w/Gray, Occasional Iron Staining	CL		
6.0							
7.0							
8.0				8.2'-8.6' Limestone Floaters Occasional Limestone Rock To Bottom of Bore hole			Pieces Of Limestone In The Sample Up To 3" Diam, Subangular To Angular
9.0							
10.0				Bottom Of Boring 10.0'			

000131

INSTRUMENT	BACKGROUND	DATE	TIME
PID	20.5	9-11-95	14:20
ALPHA			
BETA/GAMMA	70	9-11-95	14:05

NOTES: N/A - Not Applicable
SAA - Same As Above
Visual Description From Geoprobe Core
.5-1.0 + 1.0-1.5 Sample From Geoprobe
1.5-5.0 + 5.0-10.0 Samples From Auger Cuttings + Geoprobe Cores
Borehole Offset 9" To North Of Original Location
Approx 3" Of Slough In Bottom Of Boring

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.
*ILLUS\MISC\GEOTECH\LTHO LOG.EPS

Depth	BK	PID
.5-1.0	70	49.5
1.0-1.5	70	36.7
1.5-5.0	70	21.5

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-57	Drilling Method: Geoprobe w/augers	Date Started: 9/11/95
Coordinates: N 477,850 E 1,382,257	Engineer: J. Dunlap	Date Completed:
Ground Surface Elevation: 585.9 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, moist	409821	0.5 - 1.0	B	NA	6	OC
		409822	1.0 - 1.5	B	NA	6	OC
		409823	1.5 - 5.0	B	NA	42	MC, GS, AL, SP, SU, CL
3.5	Sandy, lean clay with gravel, yellowish brown, moist	409824	5.0 - 10.0	B	NA	60	MC, GS, AL, SP, Pr_1, Pr_5
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP
LITHOLOGIC LOG

CONTROL NO: 200310G2SB58-003

Page 1 of 1

PROJECT NAME: Geotech Investigation Burrow Areas / OU2 - Waste Units			PROJECT NUMBER: 20.C3.01
BORING NUMBER: 62-SB-58	COORDINATES: NA	RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: ~10' Below Ground Surface (Continued)	DATE: 9/13/95	TIME: 14:07	DATE STARTED: 9/13/95
GEOLOGIST: J. Erjavec	GROUNDWATER LEVEL:	DATE:	TIME:	DATE COMPLETED: 9/13/95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: Fenco	DRILLING EQUIPMENT: Geoprobe #36	DRILLER/HELPER: M. Grote / 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
		N/A		olive brown clay with root material			
	13:41 9/13/95 13 ~~410013~~ JE 1.3.96	1.3.96	6"	Light olive brown clay (2.5Y-5/4), moist, low plasticity, root material, slightly mottled to (2.5Y-5/6)	CL	N/A	0.5-1.0' Root mass ends at 1.0'
	13:45 9/13/95 14 ~~410014~~ JE 1.3.96		6"	Light olive brown clay (2.5-5/6), moist, low plasticity very stiff, mottled to olive brown clay (2.5Y-4/4). Trace to some silt.	CL	3.0	1.0-1.5'
2	13:51 9/13/95 1.3.96 ~~410015~~ JE 1.3.96 410015		42"	Light olive brown (2.5Y-5/6) to olive yellow clay (2.5Y-6/8). Moist, very stiff, low plasticity. Trace roots, trace gravel (coarse) Large (2" x 1½") cobble in bottom of core. Gray, and bedrock?. (float?).	CL	2.0-3.0	1.5-5.0'
3				(2.5Y-6/8) olive yellow (top) to light olive brown (2.5Y-5/6) clay. Moist to dry, very hard, low plasticity. Scattered gravel (fg - very coarse) increasing in abundance toward bottom.	CL	>5.0	1st Push 36"
4							
5							5.0-10.0'
6				Light olive brown (2.5Y-5/6) clay with gravel (coarse gravel to fine) (1"-2" pieces common.) Trace organic & iron staining. Slight mottling of gray clay. Very hard. Low plasticity. Moist.	CL	>3.0	
7	13:57 9/13/95 ~~410015~~ JE 1.3.96 410016		60"				2nd Push to 87"
8				Light olive brown clay (2.5Y-5/6) with gravel + abundant organic staining. Very hard, moist, low plasticity. Gravel from fine to >1" diam.). Gravel composed of igneous/metamorphic fragments, limestone (bedrock) + rounded cobbles.	CL	>5.0	
9				(see note)			
10				BUB 10'			000183

INSTRUMENT	BACKGROUND	DATE	TIME
PID		NA	
ALPHA			
BETA/GAMMA			

NOTES: N/A = Not applicable

Note: Approx 8" below 10' encountered 6-8" of brown fg sand, wet. Apparent high permeability. Water Elevation Estimated from lithology of sediments

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS/MISC/GEOTECH/LITHO LOG.E*3

4/95

1/22/96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-58	Drilling Method: Geoprobe w/augers	Date Started: 9/13/95
Coordinates: N 477,978 E 1,382,536	Geologist: J. Erjavec	Date Completed: 9/13/95
Ground Surface Elevation: 591.9 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, light olive brown, very stiff, moist (CL)	410013	0.5 - 1.0	B	NA	6	OC
		410014	1.0 - 1.5	B	NA	6	OC
1.5	Lean clay with sand, light olive brown, hard, moist CL	410015	1.5 - 5.0	B	NA	42	MC, GS, AL
5.0	Lean clay with gravel, light olive brown, moist (CL)	410016	5.0 - 10.0	B	NA	60	MC, AL
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 20031OG25B59-004

FEMP
LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation Borrow Areas					PROJECT NUMBER: 20 03 10
BORING NUMBER: G2-SB-59	COORDINATES: NA		RELATED FAL NOs.: NA		
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: None	DATE: 9-11-95	TIME: 11.55	DATE STARTED: 9-11-95	
GEOLOGIST: Engineer J. Dunlap	GROUNDWATER LEVEL: NA	DATE: N/A	TIME: N/A	DATE COMPLETED: 9-11-95	
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FERMCO	DRILLING EQUIPMENT: Geoprobe / "Little Beaver" Hyd. 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
		N/A		Silty Lean Clay (10YR 3/6) Dark Yellowish Brown, Moist Low Plasticity, w/ Fine Roots	CL	N/A	
.5	11:58 9-11-95 409817		6"/6"	Silty Lean Clay (10YR 3/6) Yellowish Brown, Moist, low Plasticity w/ Fine Roots	CL		
1.0	11:57 9-11-95 409818		6"/6"	SAA w/Occasional Black Nodules	CL		
1.5	11.23 9-11-95 409819			Silty Lean Clay, Trace Sand (10YR 3/6) Dark Yellowish Brown, Moist, Low Plasticity To Medium Plasticity w/ Fine Roots, Occasional Black Nodules	CL		
2.0							
3.0				Becoming Mottled w/ Gray @ 3.0'			Fine Roots Present To ~3.3 ft bls.
4.0				Lean Clay w/Sand (10YR 4/6) Dark Yellowish Brown, Moist, Med. Plasticity, Mottled w/ Gray	CL		
5.0	9-20 96			Becoming Gravelly @ 4.7ft (~1/4" Diam., Angular) Cobble 3" Diam Semi Round			
	9-11-95 11:53 409820			Sandy Lean Clay w/Gravel (1/2 to 1" Diam) (10YR 5/6) Yellowish Brown, Moist, Med. Plasticity, Mottled w/Gray	CL		
6.0				Occestonal Iron Staining Beginning @ 6.0'			
7.0							
8.0				Encountered Rock @ 8.3' Severe Iron Staining Beginning @ 8.4' & Occasional Pieces Of Limestone To The Bottom Of			Used Geoprobe's Preprobe to Break Through Rock
9.0							Samples Covered w/ Gray Dust From Breaking Up Rock
10.0				Bottom Of Boring 10.0'			

INSTRUMENT	BACKGROUND	DATE	TIME
PID	10.1	9-11-95	11:11
ALPHA			
BETA/GAMMA	50	9-11-95	10:50

NOTES: N/A - Not Applicable
Visual Description From Geo Probe Cores
0.5-1.0, 1.0-1.5, 5.0-10.0 Samples From Geoprobe Cores
1.5-5.0 Sample From Auger Cuttings & Geoprobe Cores
SAA - Same As Above
Boring is Offset ~9" West Of Original Location

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS\MISC\GEOTECH\LITHO LOG.EPS

Depth (feet)	BZ	PID
0.5-1.0	50	62.1
1.0-1.5	50	27.5
1.5-5.0	80	19.2

000185

REVIEWED BY [signature] 1/26/9

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-59	Drilling Method: Geoprobe w/augers	Date Started: 9/11/95
Coordinates: N 478,072 E 1,382,803	Engineer: J. Dunlap	Date Completed: 9/11/95
Ground Surface Elevation: 595.1 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, moist (CL)	409817	0.5 - 1.0	B	NA	6	OC
		409818	1.0 - 1.5	B	NA	6	OC
3.5	Lean clay with sand, dark yellowish brown, moist CL	409819	1.5 - 5.0	B	NA	42	MC, GS, SG, AL, CONr, SP, Pr_1, Pr_5, UUr_{90}
5.0	Sandy lean clay with gravel, yellowish brown, moist (CL)	409820	5.0 - 10.0	B	NA	60	MC, AL
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP LITHOLOGIC LOG

CONTROL NO: 200310G260-003

Page 1 of 1

PROJECT NAME: Geotech Investigation Borrow Areas/OU2 Waste Units			PROJECT NUMBER: 20.03.01
BORING NUMBER: 62-SB-~~58~~ 60 02	COORDINATES: NA	RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: DRY	DATE: 9/13/95	TIME: 1500	DATE STARTED: 9/13/95
GEOLOGIST: J. Erjavec	GROUNDWATER LEVEL: NA	DATE: N/A	TIME: N/A	DATE COMPLETED: 9/13/95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: Fenco	DRILLING EQUIPMENT: Geoprobe #36	DRILLER/HELPER: M. Grote / 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
1.31.96		N/A		Brown clay & topsoil, roots & organic matter.			Auger mass ends 1st 6"
0.5 1	14:43 9/13/95 410017		6"	Olive brown (2.5Y-4/4) clay, moist, stiff, trace roots, low plasticity.	CL	N/A	0.5-1.0'
1.31.96 1.5 2	14:47 9/13/95 410018		6"	Olive brown (2.5Y-4/4) clay, moist, very stiff, low plasticity, Clay homogeneous in color.	CL	2.5-3.0	1.0-1.5'
2 1.31.96 2.5 3				Olive brown (2.5Y-4/3) clay, moist, homogeneous in color + consistency. very stiff. Trace roots + plant material. Low plasticity. TO 40"	CL	2.0-3.0	1.5-5.0' 39" 1st Push
3 3.5 4 1.31.96	14:50 9/13/95 410019		42"	Light olive brown (2.5Y-5/6) clay, moist to wet, mottled in appearance, soft to very stiff, trace organic staining, trace gravel (fine-medium), trace cg. sand in pockets (black to dark brown).	CL	0.5-3.0	
5 6 7 8 9 10	14:59 9/13/95 410020		60"	Olive brown (2.5Y-5/6) clay with some gravel (fine to coarse) (granitic-metamorphic angular fragments), wet to very hard, low plasticity, moist. Scattered organic material throughout. Trace silt. Light olive brown (2.5Y-5/4) clay, with gravel scattered throughout (fine to coarse) ~~wet~~ moist 1.31.96 clay, very hard, low plasticity, to dry. Some rock fragments are fossiliferous (from bedrock). Trace sand scattered throughout. BOB 10.0'	CL CL	4.0->5.0 >5.0	5.0-10.0' 82" 1.31.96 ~~84~~ 2nd Push

INSTRUMENT	BACKGROUND	DATE	TIME
PID	NA		
ALPHA			
BETA/GAMMA			

NOTES:

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

TLL/USMIS/GEOTECH/LITHO LOG.EPS

000187

REVIEWED BY JL DATE 1/23/96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-60	Drilling Method: Geoprobe w/augers	Date Started: 9/13/95
Coordinates: N 477,950 E 1,381,723	Geologist: J. Erjavec	Date Completed: 9/13/95
Ground Surface Elevation: 579.9 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, olive brown, stiff, moist (CL)	410017	0.5 - 1.0	B	NA	6	OC
		410018	1.0 - 1.5	B	NA	6	OC
1.5	Lean clay with sand, olive brown, soft to very stiff, moist CL	410019	1.5 - 5.0	B	NA	42	MC, GS, AL
5.0	Lean clay with gravel, olive brown, hard, moist (CL)	410020					MC, AL
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP LITHOLOGIC LOG

CONTROL NO: 20031OG25B61-004

PROJECT NAME: Geotechnical Investigation Borrow Areas					PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-61	COORDINATES: NA		RELATED FAL NOs.: NA		
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: 9.5' BGS	DATE: 9-11-95	TIME: 16:32	DATE STARTED: 9-11-95	
~~GEOLOGIST:~~ Engineer J. Dunlap	GROUNDWATER LEVEL: NA	DATE: NA	TIME: NA	DATE COMPLETED: NA	
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FERMCO	DRILLING EQUIPMENT: Geoprobe "Little Beaver" Hyd. 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
		N/A		Silty Lean Clay (10yr 4/4) Dark Yellowish Brown, Moist, Low Plasticity, w/ Fine Roots	CL	N/A	
0.5	16:35 9-11-95 409825		6"	Silty Clay (10yr 5/4) Yellowish Brown, Trace Sand, Moist, Low Plasticity, w/ Fine Roots	CL		
1.0	16:36 9-11-95 409826		6"	SAA	CL		
1.5	16:05 9-11-95 409827		N/A	Silty Lean Clay (10yr 4/6) Dark Yellowish Brown, Moist, Low To Med Plasticity, w/ Fine Roots, Occasional Black Nodules, Trace Iron Staining	CL		Fine Roots To ~ ~~3.4~~ 3.6 ft 2-20-96
2.0							
3.0							
4.0	2-20-96						
4.3				Becoming Gravelly @ 4.3 ft (1/4-1/2" Diam, Angular)			
5.0			2-20-96				
	16:33 9-11-95 409828			SAA 2-20-96 5.3 to 5.7' of Gravel (1/2 to 3/4", Angular) Occasional Iron Staining	CL		
6.0							
7.0	2-20-96						
7.3				Silty Sand, Wet	SM		
8.0				Becoming Finer As Going Deeper			
8.8				Sandy Lean Clay (10yr 4/6) Dark Yellowish Brown, w/ Gravel (1/4 to 1.5", Sub Angular To Angular)	CL		
9.0							
10.0				~~Bottom Of Boring 10.5'~~ JD 2-20-96			

INSTRUMENT	BACKGROUND	DATE	TIME
PID	15.5	9-11-95	15:57
ALPHA			
BETA/GAMMA	50	9-11-95	15:55

NOTES: N/A - Not Applicable
Visual Description Using Geoprobe Cores
0.5-1.0, 1.0-1.5, 5.0-10.0 Samples Using Geoprobe Cores
1.5-5.0 Auger Cuttings & Geoprobe Cores
SAA - Same As Above

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUSMISC\GEOTECH\LITHO LOG.EPS

Depth (ft)	By	PID
.5-1.0	GD	19.5
1.0-1.5	GD	22.6
[illegible]	[illegible]	20.6

REVIEWED BY JL DATE 3-18-96

FEMP
LITHOLOGIC LOG

PROJECT NAME:	PROJECT NUMBER:	BORING NUMBER:
Geotechnical Investigation Borrow Areas	20.03.10	G2-SB-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
10							
10.5	10.3	—	—	SAA Silty Lean Clay w/ Gravel (1/4-1" Angular) (10GY 4/1) DK Grnish Gray moist, mod Plasticity Bottom Of Boring 10.5'	CL		

NOTES: See Page 1

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-61	Drilling Method: Geoprobe w/augers	Date Started: 9/11/95
Coordinates: N 478,057 E 1,381,981	Engineer: J. Dunlap	Date Completed:
Ground Surface Elevation: 582.7 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, dark yellowish brown, moist CL	409825	0.5 - 1.0	B	NA	6	OC
		409826	1.0 - 1.5	B	NA	6	OC
		409827	1.5 - 5.0	B	NA	42	MC, GS, AL, SP
4.3	Sandy, silty clay with gravel, dark yellowish brown, moist to wet 7.3-8.8 (CL)	409828	5.0 - 10.0	B	NA	60	MC, AL, SU, CL
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 200310G2SB62-~~002~~ 003 10-6-95

FEMP
LITHOLOGIC LOG

Page 1 of 1

PROJECT NAME: Geotech Investigation Borrow Areas / OU2 Waste Units			PROJECT NUMBER: 20.03.01
BORING NUMBER: G2-SB-62	COORDINATES: NA	RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: DRY	DATE: 9/13/95	TIME: 15:40	DATE STARTED: 9/13/95
GEOLOGIST: J. Erjavec	GROUNDWATER LEVEL: NA	DATE:	TIME:	DATE COMPLETED: 9/13/95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: Fermco	DRILLING EQUIPMENT: Geoprobe #36	DRILLER/HELPER: M. Grobe / 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
		N/A		6" of topsoil, plant material & fauna (worms)			Root mass to ~1.0'
1	15:22 9/13/95 410021		6"	Olive brown (2.5Y-4/4) clay, dry to moist, roots, low plasticity, stiff	CL	N/A	0.5-1.0'
	15:27 9/13/95 410022		6"	Yellowish brown (10YR-5/6) to light olive brown (2.5-5/4) clay, dry to moist, organic matter, roots, low plasticity.	CL	N/A	1.0-1.5'
2	15:30 9/13/95 410023		42"	Olive brown (2.5Y-4/4) clay, dry to slightly moist, mottled with olive yellow clay (2.5Y-6/8). Very hard, low plasticity. Some gravel, increasing in abundance with depth. 1/2" of very tank grayish brown (2.5Y-3/2) sand at 29", (moist-sand)	CL	>5.0	1.5-5.0'
3							1st Push 34"
4				Light olive brown (2.5Y-5/6) clay mottled with olive yellow clay (2.5Y-6/8). 1" very tank grayish brown moist sand (2.5Y-3/2) at 36". Clay-moist to dry, trace agate staining, very hard. Fine to very coarse (2" dia) gravel.	CL	>5.0	
5							
6	15:38 9/13/95 410024		60" ~~48"~~ Je	Light olive brown (2.5Y-5/6) clay mottled with light gray (2.5Y-7/1) clay. Moist to dry. Very hard to hard. Organic staining increases with depth to abundant by 81". Gravel trace to some - increases with depth (fine to very coarse.) Trace to some sand throughout clay-low plasticity.	CL	4.0-5.0	5.0-10.0'
7							2nd push to 81"
8				Light olive brown clay with gravel (2.5Y-5/6) moist to slightly moist, very hard, low plasticity. Light gray clay scattered sparsely throughout. Gravel-some - fine to very coarse (>2") organics scattered throughout, some trace Fe staining. Small sand lenses (<.5") (2.5Y-3/2) moist, well graded, poorly sorted.		>5.0	
9							
10				BOB 10'			

INSTRUMENT	BACKGROUND	DATE	TIME	NOTES: N/A = Not Applicable
PID		NA		
ALPHA				
BETA/GAMMA				

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUSMISC\GEOTECH\LITHO LOG.EPS

REVIEWED ... 11/24/96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-62	Drilling Method: Geoprobe w/augers	Date Started: 9/13/95
Coordinates: N 478,178 E 1,382,274	Geologist: J. Erjavec	Date Completed: 9/13/95
Ground Surface Elevation: 587.0 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, olive brown, stiff, moist (CL)	410021	0.5 - 1.0	B	NA	6	OC
		410022	1.0 - 1.5	B	NA	6	OC
1.5	Sandy lean clay, olive brown, very hard, moist scattered gravel to 2 inches CL	410023	1.5 - 5.0	B	NA	42	MC, GS, AL
5.0	Sandy lean clay with gravel, light olive brown, very hard, moist (CL)	410024	5.0 - 10.0	B	NA	60	
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 200310G2SB63003

FEMP
LITHOLOGIC LOG

Page 1 of 1

PROJECT NAME: Geotech Investigation Borrow Areas / OU2 - Waste Units			PROJECT NUMBER: 20.03.01
BORING NUMBER: G2-SB-63	COORDINATES: NA	RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: DRY	DATE: 9/13/95	TIME: 16:20	DATE STARTED: 9/13/95
GEOLOGIST: J. Frijavec	GROUNDWATER LEVEL: NA	DATE:	TIME:	DATE COMPLETED: 9/13/95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: Fermco	DRILLING EQUIPMENT: Geoprobe # 36	DRILLER/HELPER: M. Grobe / 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
		N/A		Topsoil & brown clay with roots, dry to moist.			
1	16:62 9/13/95 410025		6"	Light olive brown clay (2.5Y-5/4), moist, some root material, low plasticity, trace organic staining	CL		0.5-1.0'
	16:05 9/13/95 410026		6"	Light olive brown (2.5Y-5/6) & yellowish brown (10YR-5/6) clay, moist, stiff (red), trace roots & organic material, low plasticity	CL		1.0-1.5'
2				Olive brown (2.5Y-4/4) & yellowish brown (10YR-5/6) clay. Very hard to hard, moist, low plasticity. Gravel trace to some (fine). Trace to coarse sand with depth. Trace organic staining throughout.	CL	4.5-5.0	1.5-5.0'
3	16:11 9/13/95 410027		42"				
4				Light Olive brown (2.5Y-5/4) clay with some yellowish brown (10YR-5/6) mottling. moist, very stiff to hard, very hard. Low plasticity. Some sand - 1" lenses, fg-mg, poorly sorted, well graded, moist!	CL	3.0-4.5	1st Push 43"
5							
6				Light olive brown (2.5Y-5/4) & olive yellow (2.5Y-6/8) clay. moist, hard to very hard, low plasticity. mottled. Trace organic staining. Some sand.	CL	4.0-5.0	5.0-10.0'
				At 6'2" - 3" of olive brown (2.5Y-4/3) sand, fg-mg. Poorly graded, well sorted, moist.		~2.0	
7	16:17 9/13/95 410028		60" 42"	Below sand, gravel increases (1" to 2" pieces). Sand continues some throughout. Some gray clay mottling.		4.0 top	2nd Push to 89"
8				olive brown (2.5Y-4/4) clay & cg. moist sand (~2") over light olive brown clay (2.5-5/4) Sand poorly sorted, well graded.		1.0 bottom	
9				Clay below. Stiff, moist to wet. Some gravel (fine to coarse (~ to 1½")). Low plasticity. Gravel composed of igneous fragments & sed. bedrock			
10				Bot 10'			

INSTRUMENT	BACKGROUND	DATE	TIME
PID			
ALPHA			
BETA/GAMMA			

NOTES: N/A = Not Applicable

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS\MISC\GEOTECH\LITHO LOG.EPS

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-63	Drilling Method: Geoprobe w/augers	Date Started: 9/13/95
Coordinates: N 478,291 E 1,382,549	Geologist: J. Erjavec	Date Completed: 9/13/95
Ground Surface Elevation: 593.0 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, light olive brown, moist (CL)	410025	0.5 - 1.0	B	NA	6	OC
		410026	1.0 - 1.5	B	NA	6	OC
1.5	Sandy lean clay, light olive brown, very stiff, moist CL	410027	1.5 - 5.0	B	NA	42	MC, GS, AL
		410028					
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 200310G2SB64-004

FEMP
LITHOLOGIC LOG

PROJECT NAME: GEOTECHNICAL INVESTIGATION BORROW AREA	PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-64	COORDINATES: NA
RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: NONE; DATE: 9/12/95; TIME: NA
DATE STARTED: 9/12/95	
GEOLOGIST: P. SCHWIND	GROUNDWATER LEVEL: NA; DATE: NA; TIME: NA
DATE COMPLETED: 9/12/95 ①	
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FERMCO
DRILLING EQUIPMENT: GEOPROBE / "LITTLE BEAVER" HND. AUGER	DRILLER/HELPER: B. 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
P.A.	~~13:00~~ 9/12/95	N/A		SILTY CLAY (10YR 4/3) BROWN, MOIST, FINE ROOTS	CL	N/A	
5	13:08 9/12/95 409833		6"/6"	SILTY CLAY (10YR 5/6) YELLOWISH BROWN MOIST FINE ROOTS	CL		
1.0	13:02 409834		6"/6"	SILTY CLAY (10YR [redacted] 4/4) DARK YELLOWISH BROWN, MOIST (CL 3-21-96)	CL		
1.5	13:10 9/12/95 409835 (10 GAL CAN)			SAA	CL		
2.0							
3.0				CLAY (2.5Y 5/4) LIGHT OLIVE BROWN MOIST	CL		
4.0							
5.0	13:12 9/12/95 409836 (1 ℓ JAR)			SAA	CL		
6.0				CLAY WITH GRAVEL (2.5Y 5/4) LIGHT OLIVE BROWN, MOIST SOME GRAY MOTTLING, IRON STAINING INCREASING w/ DEPTH (CL 3-21-96)	CL		.5-1.5" SUBANGULAR GRAVEL
7.0							
8.0							
9.0							
10.0				BOTTOM OF BORING, 9'6"			

000196

INSTRUMENT	BACKGROUND	DATE	TIME
PID	0.0	9-12-95	12:40
ALPHA			
BETA/GAMMA	70	9-12-95	12:45

NOTES: N/A – NOT APPLICABLE
SAA – SAME AS ABOVE
V/S. DESCR. FR. GEOPROBE CORES
.5-1 1-1.5 5-10 SAMPLES FR. GEOPROBE CORES
1.5-5 SAMPLE FR. AUGER CUTTINGS
BORING IS NORTHEAST ADJACENT TO DRIB. LOC.

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*TL:USMISC\GEOTECH\LITHO LOG.EPS

① "Date completed" is date the boring and sampling was completed. See associated Boring completion log for date grouted.

REVIEWED BY: JL DATE: 3/18/96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-64	Drilling Method: Geoprobe w/augers	Date Started: 9/12/95
Coordinates: N 478,405 E 1,382,831	Geologist: P. Schwind	Date Completed: 9/12/95
Ground Surface Elevation: 596.1 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, moist (CL)	409833	0.5 - 1.0	B	NA	6	OC
		409834	1.0 - 1.5	B	NA	6	OC
2.5	Lean clay with sand, light olive brown, moist (CL)	409835	1.5 - 5.0	B	NA	42	MC, GS, AL, SP, SU, CL
6.0	Lean clay with gravel, light olive brown, moist (CL)	409836	5.0 - 9.5	B	NA	54	MC, AL
9.5	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 2003106 2SB65-003

FEMP
LITHOLOGIC LOG

Page 1 of 1

PROJECT NAME: Geotech Investigation Borrow Areas / OU2 Waste Units			PROJECT NUMBER: 20.0301
BORING NUMBER: G2-SB-65	COORDINATES: NA	RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: DRY	DATE: 9/14/95	TIME: 12:40	DATE STARTED: 9/14/95
GEOLOGIST: J. Erjavec	GROUNDWATER LEVEL: NA	DATE:	TIME:	DATE COMPLETED: 9/14/95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: Fenco	DRILLING EQUIPMENT: Geoprobe # 56	DRILLER/HELPER: M. Grobe / 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
		N/A		Brown clay/topsoil with plant material.			
1	12:15 9/14/95 41Ø029		6"	Yellowish brown (10YR-5/8) clay with root material. Moist, low plasticity, stiff (est)	CL		0.5-1.0' bottom at root mass <1.0'
	12:20 9/14/95 41Ø030		6"	Dark yellowish brown (10YR-4/4) clay with trace roots. Moist, low plasticity - stiff to hard (est.)	CL		1.0-1.5'
2				Dark yellowish brown (10YR-4/4) grading to light olive brown (2.5Y-5/4) clay. Moist, low-med plasticity, very hard. Trace gravel with depth. Gravel fine. Trace sand with depth. Scattered organic staining throughout - increases with depth.	CL	> 5.0	1.5-5.0'
3	12:25 9/14/95 41Ø031		42"				First Push 40"
4				Light olive brown (2.5Y-5/6) mottle with light gray (2.5Y-7/1) clay. Moist, soft to stiff, low-med plasticity, Gravel fine-coarse, some sand.	CL	0.5-2.0	
5				Light olive brown (2.5Y/5/4) sandy clay, moist to wet. Gravel increases in size downhole. Silt present in significant amounts. Gravel (fine to very large >2" cobbles.) Trace iron staining.	CL	0.5-2.0	5.0-10.0
6							
7	12:35 9/14/95 41Ø032		60"				60" Sec Push
8				Light olive brown (2.5Y/5-4) clay. Moist very stiff, low plasticity. Trace gravel to ~100" then no gravel. Trace sand throughout. Abundant strong brown organic staining in horizontal planes (7.5YR-5/8).	CL	2.5-3.5	
9							
10				Bot 10'			

000198

INSTRUMENT	BACKGROUND	DATE	TIME
PID			
ALPHA			
BETA/GAMMA			

NOTES: N/A = Not Applicable

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

4/95

*ILLUS/MISC/GEOTECH/LITHO LOG.EPS

REVIEWED BY: [illegible] DATE: 11/24/96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-65	Drilling Method: Geoprobe w/augers	Date Started: 9/14/95
Coordinates: N 478,324 E 1,381,872	Geologist: J. Erjavec	Date Completed: 9/14/95
Ground Surface Elevation: 584.2 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, stiff, moist (CL)	410029	0.5 - 1.0	B	NA	6	OC
		410030	1.0 - 1.5	B	NA	6	OC
1.5	Lean clay with sand, dark yellowish brown, stiff to hard, moist. CL	410031	1.5 - 5.0	B	NA	42	MC, GS, AL
5.0	Lean clay with gravel, light olive brown, very stiff, moist to wet (CL)	410032	5.0 - 10.0	B	AN	60	MC, AL, SU, CL
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 2003WG2SB66-004

FEMP
LITHOLOGIC LOG

Page 1 of 1

*PROJECT NAME: GEOTECHNICAL INVESTIGATION BORROW AREA			PROJECT NUMBER: 20.03.10
BORING NUMBER: 62-SB-66	COORDINATES: NA	RELATED FAL NO.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: NONE	DATE: 9/12/95	TIME: NA	DATE STARTED: 9/12/95
GEOLOGIST: P. SCHWIND	GROUNDWATER LEVEL: NA	DATE: NA	TIME: NA	DATE COMPLETED: 9/12/95 ①
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FEAMCO	DRILLING EQUIPMENT: GEOPROBE / LITTLE BEAVER HND AUG.	DRILLER/HELPER: B. MEYER / 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
		N/A		SILT (10 YR 6/3) PALE BROWN, FINE ROOTS, DRY TO MOIST, NO PLASTICITY	ML	N/A	
.5	14:30 9/12/95 409837		6"/6"	SAA SILTY D.2.21.96	ML		
1.0	14:35 9/12/95 409838		6"/6"	CLAY (10 YR 3/6) DARK YELLOWISH BROWN, MOIST	CL		
1.5	14:44 9/12/95 409839 (10 GAL CAN)			LEAN CLAY WITH SAND (10 YR 5/4) YELLOWISH BROWN, MOIST, LO TO NO PLASTICITY	CL		FINE ROOTS TO ~3'
3.0				SAA BUT WITH SMALL GRAVEL, GRAY MOTTLING, IRON STAINING, VERY STIFF, MOIST, LO PLASTICITY	CL		1½" GRAVEL FRAGS @ 3.2'
4.0						3.0 → @ 4.5'	
5.0	15:07 9/12/95 409840 (1 ℓ JAR)			SAA, BUT W/ LESS GRAVEL (TRACE), MOIST, LO PLASTICITY	CL		
7.0				LEAN CLAY (10 YR 6/6) BROWNISH YELLOW, SLIGHT GRAY MOTTLING + IRON STAIN, HARD, MOIST, LO PLASTICITY	CL	4.0 → @ 7.5'	
9.0				LEAN CLAY WITH SAND (10 YR 6/6) BROWNISH YELLOW, VERY STIFF, MOIST, LO PLAS.	CL		
				INCREASINGLY MOIST		2.25 → @ 9'	
				SAA BUT WITH FEW GRAVEL FRAGS, MOIST, LO PLASTICITY	CL		
10.0				BOTTOM OF BORING 10'			

000200

INSTRUMENT	BACKGROUND	DATE	TIME
PID	0	9/12/95	14:25
ALPHA			
BETA/GAMMA	40	9/12/95	14:25

NOTES: N/A – NOT APPLICABLE
SAA – SAME AS ABOVE
BORING 1' NNW OF ORIG. LOCATION
VISUAL DESCR. FROM GEOPROBE CORES
.5-1 1-1.5, 5-10 SAMPLES FROM GEOPROBE CORES
1.5-5' SAMPLE FROM AUGER CUTTINGS + CORE

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

① "Date completed" is the date drilling and sampling was completed. See boring completion log for date when the sample was grouted.

*ILLUS/MISC/GEOTECH/LITHO LOG.EPS

1.21.96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-66	Drilling Method: Geoprobe w/augers	Date Started: 9/12/95
Coordinates: N 478,444 E 1,382,165	Geologist: P. Schwind	Date Completed: 9/12/95
Ground Surface Elevation: 589.1 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Silt, pale brown, moist (ML)	409837	0.5 - 1.0	B	NA	6	OC
		409838	1.0 - 1.5	B	NA	6	OC
1.0	Lean clay, dark yellowish brown, moist (CL)	409839	1.5 - 5.0	B	NA	6	MC, GS, AL, SP, Pr_1, Pr_5, UUr_{90}
1.5	Lean clay with sand, yellowish brown, moist CL	409840	5.0 - 10.0	B	NA		MC, AL
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 200310G2SB67-003

FEMP
LITHOLOGIC LOG

Page 1 of 1

PROJECT NAME: Geotech. Investigation Borrow Areas / OU2 waste units			PROJECT NUMBER: 20.05.01
BORING NUMBER: 52-SB-67	COORDINATES: NA	RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: Dry	DATE: 9/14/95 TIME: 13:26	DATE STARTED: 9/14/95
GEOLOGIST: J. Erjavec	GROUNDWATER LEVEL: NA	DATE: TIME:	DATE COMPLETED: 9/14/95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: Fenco	DRILLING EQUIPMENT: Geoprobe #36	DRILLER/HELPER: M. Grobe / 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
		N/A		Topsoil & yellowish brown clay, plants, roots		N/A	Root mass ends ~0.5'
1	13:05 9/14/95 410033		6"	Yellowish brown (10YR-5/8) clay with trace root material, low plasticity, moist.	CL		0.5-1.0'
	13:11 9/14/95 410034		6"	Same as above (10YR-5/8)	CL		1.0-1.5'
2	13:14 9/14/95 410035		42"	Dark yellowish brown (10YR-3/6) grading to light olive brown (2.5Y-5/4) clay, very stiff to hard, moist to dry. Trace gravel (fine), trace sand, & trace silty clay, trace roots. Low plasticity.	CL	3.5-4.0	1.5-5.0'
3							1st 40"
4				Light olive brown (2.5Y-5/4, 5/6) clay, moist to dry, hard to very hard, low plasticity. Trace gravel (fine to coarse - ~½"), trace organics.	CL	4.0-5.0	
5							
6	13:19 9/14/95 410036		60"	Light olive brown (2.5Y-5/4; 5/6) grading down to (5/4) clay, moist to dry, hard to very hard, low plasticity. Trace gravel (fine to very coarse ~1"). Trace sand in lower half to 88".	CL	4.0->5.0	5.0-10.0'
7							2nd to 82"
8				Light olive brown (2.5Y-5/4) to yellowish brown (10YR-5/4) clay, moist to dry, hard to very hard, low plasticity. Some to trace gravel throughout (fine-coarse) ~1".	CL	4.0->5.0	
9							
10				BOB 10'			000202

INSTRUMENT	BACKGROUND	DATE	TIME
PID	NA		
ALPHA			
BETA/GAMMA			

NOTES: NA = Not Applicable

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUSVMS/CGEOTECH/LITHO LOG.EPS

4/95

11/24/96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-67	Drilling Method: Geoprobe w/augers	Date Started: 9/14/95
Coordinates: N 478,557 E 1,382,444	Geologist: J. Erjavec	Date Completed: 9/14/95
Ground Surface Elevation: 591.3 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, moist (CL)	410033	0.5 - 1.0	B	NA	6	OC
		410034	1.0 - 1.5	B	NA	6	OC
1.5	Lean clay with sand, dark yellowish brown, very stiff to hard, moist CL	410035	1.5 - 5.0	B	NA	42	MC, GS, AL, SU, CL
		410036	5.0 - 10.0	B	NA	60	MC, AL

10.0 *Final Boring Depth*

* USCS symbols in parentheses indicate visual classification.

FEMP
LITHOLOGIC LOG

CONTROL NO: 200310G2SB68-004

Page 1 of 1

*PROJECT NAME: Geotechnical Investigation Borrow Areas			PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-68	COORDINATES: NA	RELATED FAL NO.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: 9' 10"	DATE: 9-13-95	TIME: 14:12	DATE STARTED: 9-13-95
GEOLOGIST: Engineer J. Dunlap	GROUNDWATER LEVEL: N/A	DATE: NA	TIME: NA	DATE COMPLETED: NA
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FERMCO	DRILLING EQUIPMENT: Geoprobe / "Little Beaver" Hyd. Auger	DRILLER/HELPER: B. Nayer / M. Schley	

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
		N/A		Lean Clay (10YR 3/2) Very Dark Grayish Brown, Moist, Med. Plasticity w/ Fine Roots w/ Black Nodules	CL	N/A	
.5	12:58 9-13-95 409841		6"/6"	SAA	CL		
1.0	12:59 9-13-95 409842		6"/6"	Lean Clay (10YR 3/1) Very Dark Gray, Moist, Med to High Plasticity, w/ Fine Roots, Occasional Mottled w/ Yellowish Brown	CL		No Organic Smell
1.5	13:25 9-13-95 409843			SAA			
1.8 2.0				Lean Clay w/ Trace Sand (10YR 3/4) Dk. Yellowish Brown Mottled w/ Very Dk Gray, Moist, Med Plasticity w/ Fine Roots	CL		
2.3				Lean Clay w/ Trace Sand (10YR 4/4) Dk. Yellowish Brown, Moist, Med Plasticity, Occassional Mottled w/ Gray & Black	CL		
2.8 3.0				Seam by Lean Clay (10YR 4/6) Dk. Yellowish Brown, Moist, Med Plasticity, Occassional Black Nodules. ~~Mottled w/ Gray~~ QD rl 2-26-96 4.2	CL		
4.0				Occassional Iron Staining @ 4.4 ft QD 2-26-96 rl Becoming Mottled w/ Greenish Gray @ 4.5 ft QD			
5.0	~~13:25~~ 9-13-95 14:10 409844			SAA			
6.0			rl 2-26-96	Wet Pale Brown Clayey Sand Layer @ 6.0 ft QD ~.25 inches Thick (SC) ~~Becoming~~ Having More Gravel @ 6.4 ft			
6.8 7.0 7.1				Limestone (10YR 5/2) Grayish Brown			
8.0				Lean Clay w/ Gravel (1/4 to 1/2" Diam, Sub Angular) (10YR 4/6) Dk Yellowish Brown Mottled w/ Greenish Gray, Moist, Low To Med. Plasticity, Occasional Grayish Brown Limestone Fragments	CL		
9.0				rl 2-26-96 clean QD 9.1 ft 0.25" Thick Fine Brown ~~Sand~~ Sand Seam Having More Limestone Fragments And Iron Staining Below 9.2 ft To Bottom of Boring			
10.0				Bottom of Boring 10.0 ft			

INSTRUMENT	BACKGROUND	DATE	TIME
PID	0	9-13-95 (rl 2-26-96 QD)	12:40
ALPHA			
BETA/GAMMA	60	9-13-95	12:40

NOTES: N/A - Not Applicable
Visual Description @ 0.5'-1.0 & 1.0-1.5' Samples From Geoprobe Cores
1.5-5.0, 5.0-10.0 ft Sample From Auger Cuttings & Geoprobe Core
Boring Offset 9" To East of Original Plan
SAA - Same As Above

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS\MISC\GEOTECH\LITHO LOG.EPS

000204

JL 1-31-96
rl 2-26-96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-68	Drilling Method: Geoprobe w/augers	Date Started: 9/13/95
Coordinates: N 478,672 E 1,382,271	Engineer: J. Dunlap	Date Completed: 9/13/95
Ground Surface Elevation: 588.2 AMSL	GWL/DATE: 9'10" 9/13/95	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, moist CL	409841	0.5 - 1.0	B	NA	6	OC
		409842	1.0 - 1.5	B	NA	6	OC
		409843	1.5 - 5.0	B	NA	42	MC, GS, AL, SP
6.8	Lean clay with sand, dark yellowish brown, moist CL	409844	5.0 - 10.0	B	NA	60	MC, GS, AL, SP, Pr_1, Pr_5, UUr_{90}
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP
LITHOLOGIC LOG

PROJECT NAME:	PROJECT NUMBER:	BORING NUMBER:
See Page #1	20.03.10	G2-SB-76

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				SAA			
0.5				Bottom of Boring 10.5ft			

000206

NOTES:

CONTROL NO.: 20GB10G23B69-003

FEMP

LITHOLOGIC LOG

PAGE 1 OF 1

PROJECT NAME: Geotech Investigation Borrow Areas / OU2 Waste Units	PROJECT NO.: 20.03.01
LOCATION/NUMBER: 52-SB-69	COORDINATES: NA
DATE STARTED: 9/14/95	DATE COMPLETED: 9/14/95
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: DRY
DATE: 9/14/95	TIME: 14:17
GROUNDWATER LEVEL: NA	DATE:
TIME:	
GEOLOGIST: J. Erjavec	DRILLING CONTRACTOR: Fenco
DRILLING EQUIPMENT: Geoprobe #36	DRILLER: M. Snoke / K. Reynolds
WATER USED DURING DRILLING: N/A GAL	WATER RECOVERED DURING DRILLING: NA GAL
WATER LOST DURING DRILLING: NA GAL	

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
				Brown topsoil to plant material - brown clay		N/A	Root mass to 0.5
1	14:35 9/14/95 A1Ø038		6"	Yellowish brown (10YR-5/6) clay, moist to dry, low plasticity, trace sand.	CL		0.5-1.0'
1	14:35 9/14/95 A1Ø038		6"	Same as above. + trace organic staining.	CL		1.0-1.5'
2							1.5-5.0'
3	14:07 9/14/95 A1Ø039		42"	Dark yellowish brown (10YR-4/4) clay, dry to slightly moist, very hard, low plasticity. Trace gravel. Gravel (that's sand cg-mg at 34" (8" bd))	CL	>5.0 dry. 3.0-5.0	1st to 36" 1.5-5.0' 14:05
5			(36"-60")	Light yellowish brown (10YR-6/4) to yellowish brown (10YR-5/4) clay. Dry to slightly moist. 2" of dry gravel sand (cg-fg) at 14". Low plasticity clay, stiff to very hard. Trace to some sand throughout.	CL		5.0-10.0'
6							2nd to 81"
7	14:12 9/14/95 A1Ø04Ø	Total per 60"	(60"-81")	Yellowish brown (10YR-6/4) clay grading to light olive (2.5YR-5/4) clay. Dry to moist. Trace gravel (cg) Low plasticity, very hard to hard.		4.0-5.0 brown >5.0	
8			(81"-120")	Light olive brown (2.5Y-5/4) clay with sand to 88". Below with trace gravel to 1". Clay-moist, low plasticity, very hard. Scattered organic staining horizontally throughout 81"-120". BOB 10'			
9							
10							

METER	BKGD	DATE	TIME
PID			
ALPHA		NA	
BETA / GAMMA			

SAMPLING EQUIPMENT:	
TYPE OF SAMPLER	
DIAMETER OF SAMPLER	
WEIGHTS OF HAMMER	

NOTES: N/A - Not Applicable

* SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

FS-F-3681

G:/WPSC/95-0037.DRW (07-

000207

1/24/9

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-69	Drilling Method: Geoprobe w/augers	Date Started: 9/14/95
Coordinates: N 478,743 E 1,382,041	Geologist: J. Erjavec	Date Completed: 9/14/95
Ground Surface Elevation: 586.6 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, moist (CL)	410037	0.5 - 1.0	B	NA	6	OC
		410038	1.0 - 1.5	B	NA	6	OC
1.5	Lean clay with sand, dark yellowish brown, hard to very hard, moist CL	410039	1.5 - 5-0	B	NA	42	MC, GS, AL, SU, CL
8.3	Lean clay with sand, light olive brown, very hard, moist	410040	5.0 - 10.0	B	NA	60	MC, AL
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 200310G2SB68-004

FEMP
LITHOLOGIC LOG

*PROJECT NAME: Geotechnical Investigation Borrow Areas	PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-70	COORDINATES: NA
RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: 4'9" BGS; DATE: 9-13-95; TIME: 15:57
DATE STARTED: 9/3-95	GEOLOGIST: Engineer J. Dunlap
GROUNDWATER LEVEL: 4'8" BGS; DATE: 9-13 95; TIME: 16:08	DATE COMPLETED:
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FERMCO
DRILLING EQUIPMENT: Geoprobe, Little Beaver Hyd. Auger	DRILLER/HELPER: B. Neyer / M. Schley

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
		N/A		Lean Clay (10yr 3/3) Dark Brown, moist, Med. Plasticity, w/ Fine Roots	CL	N/A	
3 5	9-13-95 15:14 409845		6"/6"	Lean Clay (10yr 4/4) Dk Yellowish Brown, moist, Med Plasticity, w/ Fine Roots + Occasional Black Nodules	CL		
1.0	9-13-95 15:21 409846		6"/6"	SAA			
1.5 2.0	9-13-95 15:36 409847			Sandy Lean Clay (10YR 5/4) Yellowish Brown, Low Plasticity, moist, w/ Fine Roots Having More Gravel @ 2.0 ft (1/4 to 1/2" Diam, Sub Angular)	CL		
2.8 3.0				Lean Clay (10YR 3/1) Very Dk. Gray, moist, Med. Plasticity, Soft, Trace Fine Roots Roots To 3.3 ft	CL		Smells Like Motor oil or Diesel
4.0							
4.6 5.0				Lean Clay, Trace Sand (10yr 4/3) Brown, Mottled w/ Dark Gray, Moist, Med. Plasticity, ~~Fractures~~	CL		
5.0	9-13-95 16:01 409848			Lean Clay, Trace Sand (10yr 4/3) Brown Mottled w/ Dark Gray, moist, Med. Plasticity ~~Trace Roots (Fine)~~	CL		
5.6 6.0			6.4"	Lean Clay (10YR 4/4) Dark Yellowish Brown, Occasionally Mottled w/ Dk. Greenish Gray, moist, Med Plasticity, w/ Occasional Black Nodules Dk. Gray Mottling Stops @ 6.7 ft	CL		
7.0							
8.0				Gravelly @ 8.3 to 8.5 ft (1/2" to 3/4" Diam, Semi Round)			
9.0				Lean Clay (10YR 3/1) Very Dark Gray, Mottled w/ Dk. Yellowish Brown, Wet, High Plasticity, Soft	CH		
9.6 10.0				Silty Lean Clay w/ Sand (10yr 4/6) Dk Yellowish Brown, Moist, Med. Plasticity, Mottled w/ Dk. Greenish Gray	CL		

INSTRUMENT	BACKGROUND	DATE	TIME
PID	1.6	9-13-95	15:02
ALPHA			
BETA/GAMMA	60 cpm	9-13-95	15:03

NOTES: Borehole Offset 9" East Of Original Plan
N/A - Not Applicable
Visual Description, 5-1.0', 10-1.5', 5.0-10' Samples From Geoprobe Core
15'-5.0' Sample From Auger Cuttings + Geoprobe Core
SAA - Same As Above

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

S:\MISC\GEOTECH\LITHO LOG.EPS

000209

REVIEWED BY JL DATE 2/15/96

~~125~~ 70
200310G2SB08-005

FEMP
LITHOLOGIC LOG

PROJECT NAME: See Page #1

PROJECT NUMBER: 20.03.10

BORING NUMBER: G2-SB-76

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 Boring 10.5ft			

NOTES:

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

000210

REVIEWED BY JL DATE 2/15/96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-70	Drilling Method: Geoprobe w/augers	Date Started: 9/13/95
Coordinates: N 478,856 E 1,382,317	Engineer: J. Dunlap	Date Completed: 9/13/95
Ground Surface Elevation: 588.1 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, yellowish brown, soft at 2.8 - 4.6, moist CL	409845	0.5 - 1.0	B	NA	6	OC
		409846	1.0 - 1.5	B	NA	6	OC
		409847	1.5 - 5.0	B	NA	42	MC, GS, AL, SP
4.7	Lean clay with sand, brown, locally soft, moist to wet, scattered gravel to 3/4 inch between 8.3 and 8.5 (CL)	409848	5.0 - 10.0	B	NA	60	MC, AL
10.5	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP LITHOLOGIC LOG

CONTROL NO: 20030162587 1-003

Page 1 of 1

PROJECT NAME: Geotech. Investigation Borrow Areas / OU2 Waste Units			PROJECT NUMBER: 20.03.01
BORING NUMBER: 52-SB-71	COORDINATES: NA	RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: DRY	DATE: 9/19/95	TIME: 14:55	DATE STARTED: 9/19/95
GEOLOGIST: J. Erjavec	GROUNDWATER LEVEL: NA	DATE:	TIME:	DATE COMPLETED:
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: Franco	DRILLING EQUIPMENT: Scorpio #36	DRILLER/HELPER: M. Grobe / 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
				Brown clay & topsoil. Plant material, roots			Cut ways ends ~1.5'
1	14:37 9/19/95 410041		6"	Light olive brown (2.5Y-5/3) clay, with roots, dry, low plasticity, stiff (est)	CL	N/A	0.5-1.0'
	14:40 9/19/95 410042		6"	Light olive brown (2.5Y-5/3) clay with roots, moist to dry, low plasticity, stiff (est)	CL	N/A	1.0-1.5'
2	14:43 9/19/95 410043		42"	Yellowish brown (10YR-5/4) clay. Consistent homogeneous color throughout, moist, hard to very hard, low plasticity, trace roots.	CL	4.0-5.0	1.5-5.0'
3				(top 8") Brown (10YR-4/3) to (to 5') light olive brown (2.5YR-5/6) Clay, moist, stiff to hard, low plasticity. Some silt in bottom of sample.	CL	3.0+	
4							
5				silty			
6	14:50 9/19/95 410044		60"	Light olive brown (2.5Y-5/4) clay, moist, low plasticity, very stiff, 2" of fg, wet sand at 5'9". Sand yellowish brown (10YR-5/4) poorly graded, well sorted. Clay loses silt content after sand.	CL	3.0-3.5	5.0-10.0'
7				Yellowish brown (10YR/5-4) clay with some silt, sand & trace gravel. ~81" is a 4" yellowish brown sand (10YR-5/4) wet, well sorted, poorly graded. Clay is very hard, low plasticity & moist.	CL	3.0+	
8							
9							
10				BOB 10'			

INSTRUMENT	BACKGROUND	DATE	TIME
PID		NA	
ALPHA			
BETA/GAMMA			

NOTES: N/A = Not Applicable

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS/MISC/GEOTECH/LITHO LOG.EPS

JL 1-19-96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-71	Drilling Method: Geoprobe	Date Started: 9/14/95
Coordinates: N 476,604 E 1,381,142	Geologist: J. Erjavec	Date Completed: 9/14/95
Ground Surface Elevation: 577.7 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, light olive brown, stiff, moist CL	410041	0.5 - 1.0	B	NA	6	OC
		410042	1.0 - 1.5	B	NA	6	OC
		410043	1.5 - 5.0	B	NA	42	MC, GS, AL, SU, CL
5.0	Lean clay with sand, light olive brown, very hard, moist (CL)	410044	5.0 - 10.0	B	NA	60	MC, AL
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 200310G2SB72-003

FEMP LITHOLOGIC LOG

PROJECT NAME: GEOTECHNICAL INVESTIGATION BORROW AREA	PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-72	COORDINATES: Refer to Survey Report
RELATED FAL NOs.: 200310G2SB72-002	
SURFACE ELEVATION: Refer to Survey Report	GROUNDWATER LEVEL: 8.7 DATE: 9/14/95 TIME: 14:55
DATE STARTED: 9/14/95	
GEOLOGIST: P. SCHWIND	GROUNDWATER LEVEL: NK DATE: NK TIME: NK
DATE COMPLETED: 9-14-95	
WATER USED DURING DRILLING: NONE	DRILLING CONTRACTOR: FERMCO
DRILLING EQUIPMENT: LITTLE BEAVER HYDR AUGER	DRILLER/HELPER: B. MEYER / 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				CLAYEY SILT (10 YR 3/2) VERY DARK GRAYISH BROWN, FINE ROOTS, NON PLASTIC, MED. STIFF, MOIST	ML	1.5	
1.0	14:25, 9/14/95 409849		6" 6"	SAA			
1.5	14:26, 9/14/95 409850		6" 6"	SAA			
2.0	14:41, 9/14/95 409851 (2 1ℓ JARS)			SAA			
2.5				SILTY CLAY (2.5 Y 5/6) LIGHT OLIVE BROWN WITH DARK BROWN MOTTLING, MED. PLASTICITY, VERY STIFF, ~~FOU~~ MOIST, IRON STAINING P.S.	CL		FINE ROOTS TO ~3'
3						2.2	NO ROOTS
4							FEW GRAVEL PART (~1") FROM 4-5'
5.0	14:56, 9/14/95 409852 (10 GAL DRUM)			CLAY WITH FEW GRAVEL (2.5Y 5/4) LIGHT OLIVE BROWN, MED TO HI PLASTICITY, MOIST, BECOMING WET WITH DEPTH, SOFT	CL/CH		MOIST
6							
7						.5	
8							WET!
9							
10				BOTTOM OF BORING 10'			

INSTRUMENT	BACKGROUND	DATE	TIME
PID	0	9/14/95	14:15
ALPHA		N/A	
BETA/GAMMA	40	9/14/95	14:15

NOTES: N/A - NOT APPLICABLE
SAA - SAME AS ABOVE
VIS. DESCR. FROM GEOPROBE CORES + AUGER CUTTINGS;
.5-1, 1-1.5, 1.5-5.0 SAMPLES FR. CORES
5-10 FR. AUGER CUTTINGS

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS/MISC/GEOTECH/LITHO LOG.EPS

4/95

4-11-96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-72	Drilling Method: Geoprobe	Date Started: 9/14/95
Coordinates: N 476,802 E 1,381,764	Geologist: P. Schwind	Date Completed: 9/14/95
Ground Surface Elevation: 583.1 AMSL	GWL/DATE: 8.7 9/14/95	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Clayey silt, very dark grayish brown, medium stiff, moist (ML)	409849	0.5 - 1.0	B	NA	6	OC
		409850	1.0 - 1.5	B	NA	6	OC
2.0	Lean clay, light olive brown, very stiff, moist CL	409851	1.5 - 5.0	B	NA	42	MC, GS, AL, SU, CL
5.0	Lean clay with sand, light olive brown, soft with depth, moist CL	409852	5.0 - 10.0	B	NA	60	MC, GS, AL, SP
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 200310G2SB73-003

FEMP LITHOLOGIC LOG

Page 1 of 1

PROJECT NAME: Geotechnical Investigation Borrow Areas OU2			PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-73	COORDINATES: Refer to Survey Report	RELATED FAL NO.: 200310G2SB73-002	
SURFACE ELEVATION: Refer to Survey Report	GROUNDWATER LEVEL: None	DATE: 9-15-95	TIME: 16:12	DATE STARTED: 9-15-95
GEOLOGIST: Engineer 4-11-96 J. Dunlap	GROUNDWATER LEVEL: NK	DATE: NK	TIME: NK	DATE COMPLETED: 9-15-95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FERMCO	DRILLING EQUIPMENT: Geoprobe/ "Little Beaver" Hyd. 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
	4-11-96 ~~409853~~	N/A		Silty Lean Clay (10yr 4/2) Dk Yellowish Brown, Moist, Med. Plasticity, w/ Fine Roots	CL	N/A	
.5	15:40 9-15-95 409853		6"/6"	SAA			Geoprobe Macro Core
1.0	15:41 9-15-95 409854		6"/6"	SAA			Geoprobe Macro Core
1.5	16:10 9-15-95 409855			Lean Clay (10yr 4/6) Dk Yellowish Brown, Mottled w/ Yellowish Brown, Occassional Black Nodules, Moist, Low to Med. Plasticity, Fine Roots	CL		
2.0							
3.0							
3.2				Roots Stop @ 2.0 ft ~~Sandy Lean Clay~~ Clayey Sand (10YR 4/6) Dk. Yellowish Brown, Moist Occassional Black Nodules, Mottled w/ Yellowish Brown, ~~w/ Interbedded Thin Sand Seams~~ Becoming Siltier w/ Dept (Turns To SM About 4.0ft)	~~CL~~ SC		Sand is Fine Geoprobe Macro Core → Auger Cuttings
4.0					SM		
4.7				Fine Sand (10YR 4/4) Dk. Yellowish Brown, w/ Silt, Moist To Wet	SM		
5.0							
5.3				Clayey Silt (10YR 5/8) Yellowish Brown, Mottled w/ (2.5Y 6/2) Light Brownish Gray, Low Plasticity, Moist To Wet	CL-ML		
6.0							
6.4				Bottom Of Boring 6.4ft			

INSTRUMENT	BACKGROUND	DATE	TIME
PID	3.1	9-15-95	16:05
ALPHA		N/A	
BETA/GAMMA	60	9-15-95	15:35

NOTES: N/A - Not Applicable
Visual Description, 0.5-1.0', & 1.0-1.5' Samples From Geoprobe Cores
1.5-6.0' Sample From Geoprobe Core & Auger Cuttings
Geoprobe Advanced To 6.4ft Bgs, The Auger Was Advanced To Only 6.0ft Bgs; Therefore, The Depth For Sample # 409855 Is 1.5-6.0ft

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.
*ILLUS\MISC\GEOTECH\LITHO LOG.EPS

4/95

1-96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-73	Drilling Method: Geoprobe	Date Started: 9/15/95
Coordinates: N 476,890 E 1,381,121	Geologist: J. Dunlap	Date Completed: 9/15/95
Ground Surface Elevation: 573.7 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, moist (CL)	409853	0.5 - 1.0	B	NA	6	OC
		409854	1.0 - 1.5	B	NA	6	OC
1.5	Lean clay with sand, dark yellowish brown, moist to wet CL	409855	1.5 - 6.0	B	NA	54	MC, GS, AL, SP, SU, CL
6.4	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP LITHOLOGIC LOG

CONTROL NO: 200310G2SB74-ØØ3

Page 1 of 1

PROJECT NAME:	Geotech Inv. Borrow Areas / OU2 Waste Units
PROJECT NUMBER:	20.03.10
BORING NUMBER:	G2-SB-74
COORDINATES:	Refer to Survey Report
RELATED FAL NOs.:	200310G2SB74-002
SURFACE ELEVATION:	5[illegible]4'0" Refer to Survey Report
GROUNDWATER LEVEL:	DRY
DATE:	9/18/95
TIME:	16:25
DATE STARTED:	9/18/95
GEOLOGIST:	J. Eriavec
GROUNDWATER LEVEL:	NK
DATE:	NK
TIME:	NK
DATE COMPLETED:	9/18/95
WATER USED DURING DRILLING:	N/A
DRILLING CONTRACTOR:	Fenco
DRILLING EQUIPMENT:	Geoprobe/Little Beaver
DRILLER/HELPER:	B. Vexer / 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
				Brown clay + topsoil, roots.		N/A	background B/G 5Ø PID = Ø
1	9:35 9/18/95 409856		6"	Light olive brown clay (2.5Y-5/4) with some roots, moist low plasticity.	CL	N/A	0.5-1.0' B/G = 5Ø PID = Ø
	9:40 9/18/95 409857		6"	Light olive brown clay (2.5Y-5/4) with trace roots, moist, low plasticity	CL	N/A	1.0-1.5' B/G = 5Ø PID = Ø
2	9:5Ø 9/18/95 409858		42"	Light olive brown clay (2.5Y-5/4), moist to very moisty low plasticity, medium hard to stiff, softening with depth. Trace roots at top. Trace gravel (granule (2.0-4.0 mm) to pebble sized, Angular to subrounded, Trace sand with depth. mottling to yellowish brown (10YR-5/6) with depth.	CL	5.0 1.5	1.5-6.0' B/G = 5Ø PID = Ø (Auger 18"-60" for 409858) 1st Push 43" B/G = 5Ø PID = Ø
3							
4							
5							
6	10:15 9/18/95 409859		60"	mottled clay (light olive brown 2.5Y-5/4) + yellowish brown (10YR-5/6), moist, very hard to v. stiff low plasticity. Some gravel (granule to pebble), trace sand.	CL	3.0-5.0	5.0-10.0' 2nd to 67" B/G = 5Ø/5Ø PID = .2/.2
7							
8				Yellowish brown clay (10YR-5/4), moist very stiff to very hard, low plasticity. Some gravel, increasing with depth (granule to cobble >16 mm), gravel has ord. lithic component, bioclastic fragments. Trace to some cg sand, moist. Gray clay mottling last 6" at bottom.	CL	3.0-5.0	3rd to 93" from 60"
9							
10				BOB 10' (slough in bottom of hole)			4th to 126"

INSTRUMENT	BACKGROUND	DATE	TIME
PID	Ø ppm	9/18/95	9:3Ø
ALPHA	N/A		
BETA/GAMMA	7Ø ~~80~~	9/18/95	9:3Ø

NOTES: N/A = Not applicable
Boring slightly offset from location

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUSMISC\GEOTECH\LITHO LOG.EPS

4-95

000218

4-11-96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-74	Drilling Method: Geoprobe	Date Started: 9/18/95
Coordinates: N 476,975 E 1,381,394	Geologist: J. Erjavec	Date Completed: 9/18/95
Ground Surface Elevation: 576.7 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, light olive brown, moist (CL)	409856	0.5 - 1.0	B	NA	6	OC
		409857	1.0 - 1.5	B	NA	6	OC
1.5	Lean clay with sand, light olive brown, stiff to hard, soft locally, moist to very moist CL	409858	1.5 - 5.0	B	NA	42	MC, GS, SG, AL, CONr, SP, Pr_1, Pr_5, UUr_{90}
		409859	5.0 - 10.0	B	NA	60	MC, AL
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP LITHOLOGIC LOG

CONTROL NO: 20030162SB75-002

Page 1 of 1

PROJECT NAME: Geotech Investigation Borrow Areas / OU2 Waste Units			PROJECT NUMBER: 20.03.01
BORING NUMBER: 62-SB-75	COORDINATES: NA	RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: DRY	DATE: 9/14/95	TIME: 15:48	DATE STARTED: 9/14/95
GEOLOGIST: J. Eijavec	GROUNDWATER LEVEL: NA	DATE:	TIME:	DATE COMPLETED: 9/14/95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FermCo	DRILLING EQUIPMENT: Geoprobe #36	DRILLER/HELPER: M Grobe / 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
				Brown clay + topsoil, moist, roots, plant material			Fact mass to 0.5'
	15:17 9/14/95 41ØØ45		6"	Yellowish brown (10YR-5/4) clay, moist, stiff (est), low plasticity. Trace roots. Topsoil?	CL		0.5-1.0'
1	15:21 9/14/95 41ØØ46		6"	Dark yellowish brown (10YR-4/4) clay, moist, very stiff, low plasticity, trace roots.	CL	2.5	1.0-1.5' 1.5-5.0'
2	15:25 9/14/95 41ØØ47		42"	Dark yellowish brown (10YR-4/4) grading to light olive brown mottled (2.5YR-5/4) clay. Moist, very stiff to very hard, low plasticity. Trace gravel increasing with depth. 2" plus cobble in base at 32"	CL	3.0-5.0	1st Push to 33"
3							
4				Yellowish brown (10YR-5/4) to light olive brown (2.5YR-5/4) clay, moist to dry, very hard, low plasticity. Trace gravel, trace sand.	CL	>5.0	
5				~~Yellowish brown (10YR-~~ Same as above interval.	CL	>5.0	5.0-10.0' ~~2nd to 64"~~
6							2nd Push to 74"
7	15:41 9/14/95 41ØØ48		60"	Same as above (10YR-5/4) to (2.5YR-5/4) with increasing proportion of light olive brown with depth. Gravel trace to some. Fine to very coarse (~2"). Trace sand + trace silt, moist to dry, very hard	CL	>5.0	
8							
9							
10				BOB 10.0'			

INSTRUMENT	BACKGROUND	DATE	TIME
PID		NA	
ALPHA			
BETA/GAMMA			

NOTES: N/A - Not Applicable

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

ILLUSTMISC\GEOTECH\LITHO LOG.EPS

000220

JL 1-18-96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-75	Drilling Method: Geoprobe	Date Started: 9/14/95
Coordinates: N 477,066 E 1,381,679	Geologist: J. Erjavec	Date Completed: 9/14/95
Ground Surface Elevation: 581.5 AMSL	GWL/DATE: Dry 9/14/95	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, stiff, moist (CL)	410045	0.5 - 1.0	B	NA	6	OC
1.0	Lean clay with sand, dark yellowish brown, very stiff to hard, moist CL	410046	1.0 - 1.5	B	NA	6	OC
		410047	1.5 - 5.0	B	NA	42	MC, GS, AL, SU, CL
		410048	5.0 - 10.0	B	NA	60	
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 200310G2SB76-ØØ3

FEMP
LITHOLOGIC LOG

Page 1 of 1

PROJECT NAME: Geotech. Invest. Burn Areas / OU2 Waste Units			PROJECT NUMBER: 20.03.10
BORING NUMBER: 62-SB-76	COORDINATES: Refer to Survey Report	RELATED FAL NO.: 200310G2SB76-002	
SURFACE ELEVATION: Refer to Survey Report	GROUNDWATER LEVEL: DRY	DATE: 9/18/95	TIME: 11:05	DATE STARTED: 9/18/95
GEOLOGIST: J. Erjavec	GROUNDWATER LEVEL: NK	DATE: NK	TIME: NK	DATE COMPLETED: 9/18/95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FoxCo	DRILLING EQUIPMENT: Geoprobe/Little Beaver	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
				Brown topsoil + some clay, root material		N/A	3/6 7Ø PID Ø
1	10:58 9/18/95 409860		6"	olive brown clay (2.5Y-4/4), moist, low plasticity, roots present throughout.	CL		3/6 7Ø PID Ø
	10:52 9/18/95 409861		6"	Same as above	CL		3/6 7Ø Root mass to 1.5' PID Ø
2 3 4 5	10:53 9/18/95 409862		54"	Light olive brown (2.5Y-5/4 to 5/6) clay, mottled, moist to very moist (increasing moisture with depth. Very stiff to hard low plasticity. Increasing silt content with depth - 40-48" = silty clay. ~~Stiff to~~ Trace to some sand (fg) increasing with depth. Trace gravel (granule-sized 2.0-4.0 mm). Trace iron/organic staining throughout. Bottom 4" of core has some light gray (2.5Y-7/1) clay.	CL	3.0-4.Ø	3/6 7Ø PID Ø 1st Push to 40" 3/6 7Ø PID = Ø (1.5-6.0' sample contains coarse-grained cuttings) 2nd to 70" 3/6 7Ø
6				BOB 6.0'			

INSTRUMENT	BACKGROUND	DATE	TIME
PID	0/7Ø ppm	9/18/95	10:49
ALPHA		NA	
BETA/GAMMA	5Ø	9/18/95	10:48

NOTES: N/A - Not Applicable

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

ILLUS/MISC/GEOTECH/LITHO LOG.EPS

4/95

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-76	Drilling Method: Geoprobe	Date Started: 9/18/95
Coordinates: N 477,258 E 1,381,303	Geologist: J. Erjavec	Date Completed: 9/18/95
Ground Surface Elevation: 575.6 AMSL	GWL/DATE: Dry 9/18/95	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, olive brown, very stiff to hard, moist CL	409860	0.5 - 1.0	B	NA	6	OC
		409861	1.0 - 1.5	B	NA	6	OC
		409862	1.5 - 6.0	B	NA	54	MC, GS, AL, SP
6.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP
LITHOLOGIC LOG

CONTROL NO: 2100310625B77-002 3

Page 1 of 1

PROJECT NAME: GEOTECHNICAL INVESTIGATION BORROW AREAS / OU2 WASTE UNITS			PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-77	COORDINATES: NA	RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: NA	DATE:	TIME:	DATE STARTED: 9/15/95
GEOLOGIST: R. NICKS	GROUNDWATER LEVEL: NA	DATE:	TIME:	DATE COMPLETED: 9/15/95
WATER USED DURING DRILLING: NA	DRILLING CONTRACTOR: FERMCO	DRILLING EQUIPMENT: Geoprobe	DRILLER/HELPER: Grabb, 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
				Clayey Silt to 2" - 10YR 4/3 brown, stiff, moist, trace sand	ML		0-2" Numerous hair rootlets - 1/16" roots to 18" - Few hairroots to 35" 1/2" root at 6"
1	0815 9/15/95 41,0040		6"	2.5Y 5/3 light olive brown	CL	0.5 to 2.5	
	0820 9/15/95 41,0050		6"	Lean Clay w/trace sand 2.5Y 5/3 lt. olive brown, stiff, moist			
2				Lean Clay w/sand, 10YR 4/3 brown to 2.5Y 6/4 to 6/6 Lt. yel brown to olive yellow mottled. v. stiff moist			
3						3.5-4.0	— hair rootlets to 34"
4	0835 9/15/95 41,0051		Gr. ~~59"~~ ~~60"~~ 54"				
5				Clayey Sand w/gravel to 3/4" 10YR 5/6 yellowish brown dense to v. dense, moist	SW		
				Lean Clay w/trace of sand, 2.5Y 4/4 olive brown v. stiff, moist	CL	4.5	
				Silt 2.5Y 6/4 Lt. yel. brn.	ML	4.0	
6				T.D. 6'			
7							
8	~~9/15~~ Gr.						
9							
10							

COPY

INSTRUMENT	BACKGROUND	DATE	TIME
PID			NA
ALPHA			
BETA/GAMMA			

NOTES:

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

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JL 1-18-96

Project No: P0154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-77	Drilling Method: Geoprobe	Date Started: 9/15/95
Coordinates: N 477,550 E 1,381,212	Geologist: R. Nicks	Date Completed: 9/15/95
Ground Surface Elevation: 574.9 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, stiff to very stiff, moist CL	410049	0.5 - 1.0	B	NA	6	OC
		410050	1.0 - 1.5	B	NA	6	OC
		410051	1.5 - 6.0	B	NA	54	MC, GS, AL, SU, CL
6.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 200310G2SB78-003

FEMP
LITHOLOGIC LOG

Page 1 of 1

PROJECT NAME: Geotech. Investig. Borrow Areas / OU2 - Waste Units			PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-78	COORDINATES: Refer to Survey Report	RELATED FAL NO.: 200310G2SB78-002	
SURFACE ELEVATION: Refer to Survey Report	GROUNDWATER LEVEL: 7.15' Below Ground Surf.	DATE: 9/18/95	TIME: 14:48	DATE STARTED: 9/18/95
GEOLOGIST: J. Fryzek	GROUNDWATER LEVEL: NK	DATE: NK	TIME: NK	DATE COMPLETED: 9/18/95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: Fermco	DRILLING EQUIPMENT: Geoprobe-"Little Beast"	DRILLER/HELPER: B. Meyer / 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
0.5	1 ~~Jf~~			Brown clay & topsoil, roots.		N/A	Root mass to 0.5'
1.0	1 13:45 9/18/95 409863		6"	Yellowish brown (10YR-5/4) clay, moist to dry, low plasticity, trace roots	CL	N/A	0.5-1.0' BG60 PID = 1.0
1.5	2 ~~Jf~~ 14:12 14:49 13:49 9/18/95 409864		6"	Same as above.	CL	N/A	1.0-1.5' BG60 PID = 1.0
2.0	2 ~~3~~ ~~Jf~~			Yellowish brown clay (10YR-5/6), moist, low plasticity, very stiff. Trace roots, organic staining throughout (red-brown).	CL	3.5	1.5'-5.0' BG=~~80~~ 70 PID=~~70~~
3.0	3 13:58 9/18/95 409865		42"				
4.0	~~4~~ ~~Jf~~			Grading to: dark yellowish brown (10YR-4/4) clay, moist to very moist, med stiff to ~~stiff~~, some silt, some vcg sand (wet), trace organic staining, trace gravel (gravel 2+mm) Sand angular to low sphericity	CL	0.5-1.0	1st to 42" (409865 - cuttings added 1.5-5.0')
5.0	5						2nd to 62"
	6			Yellowish brown clay (10YR-5/4) & yellowish brown sand (10YR-5/4), wet, (clay-soft), med plasticity. Sand cg to fine gr, well sorted, poorly graded. With some gravel (granule-pebble), schist fragments (black, micaceous).	CL / SC		5.6-10.0' 3rd to 75" from 60"
	7 14:20 9/18/95 409866		60"	Yellowish brown sand (10YR-5/4) with clay. Sand, poorly sorted, well graded, wet. Clay - very stiff to hard (10YR-5/4), moist. Some gravel in both lithologies, (gravel to cobble sized), ord. lithologies (others.	SW / CL	4.0-5.0	
	8						
	9			Sand approx. 10-14" in thickness at 75"-90". Clay to bottom of boring. Clay has some organic staining, increasing with depth. BGB = 10'			4th to 108"
	10						

INSTRUMENT	BACKGROUND	DATE	TIME
PID	0.4 ppm	9/18/95	13:41
ALPHA	N/A		
BETA/GAMMA	50	9/18/95	13:43

NOTES: N/A = Not applicable

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS\MISC\GEOTECH\LITHO LOG.EPS

JK 4-11-96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-78	Drilling Method: Geoprobe	Date Started: 9/18/95
Coordinates: N 477,637 E 1,381,498	Geologist: J. Erjavec	Date Completed: 9/18/95
Ground Surface Elevation: 581.4 AMSL	GWL/DATE: 7.15 9/18/95	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, moist (CL)	409863	0.5 - 1.0	B	NA	6	OC
		409864	1.0 - 1.5	B	NA	6	OC
1.5	Lean clay with sand, yellowish brown, stiff to very stiff, moist to wet CL	409865	1.5 - 5.0	B	NA	42	MC, GS, AL, SP, Pr_1, Pr_5
5.0	Alt. layers of lean clay with sand, and sand, yellowish brown, very stiff to hard, moist to wet (CL)	409866	5.0 - 10.0	B	NA	60	

10.0 Final Boring Depth

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 2002310625879-003

FEMP
LITHOLOGIC LOG

Page 1 of 1

PROJECT NAME: Geotechnical Investigation Boring Areas/Our Waste Units	PROJECT NUMBER: 20.03-10
BORING NUMBER: G2-S8-79	COORDINATES: NA / RELATED FAL NOs.: NA
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: NA / DATE: / TIME: / DATE STARTED: 9/15/95
GEOLOGIST: R. Nicks	GROUNDWATER LEVEL: NA / DATE: / TIME: / DATE COMPLETED: 9/15/95
WATER USED DURING DRILLING:	DRILLING CONTRACTOR: FERMCO / DRILLING EQUIPMENT: Geoprobe / DRILLER/HELPER: Grobe, 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
				Lean Clay, 10YR 3/3 dk. brn, stiff to v. stiff, moist.	CL	2.0	Num. Rootlets to 6"
1	0860 9/15/95 410052		6"				
	0850 9/15/95 410053		6"	Lean Clay, 2.5Y 4/4 olive brown v. stiff moist w/ trace		3.25	
2						4.5	
3	0903 9/15/95 410054	NA	42" 59" Ca.	2.5Y 5/6 light olive brn mottled with 2.5Y 4/4	CL	3.0	← horizons
4							
5						4.5	Ca. ← ~~horizons~~
				Sand 10YR 4/4 dk. yel. brown, dense to v. dense, wet, scattered gravel to 1"			
6				w/alternating layers 4-5" of fine sand - SP			
7	0917 9/15/95 410055		60"		SW	--	
8							
9							
10				Total Depth 10'			

INSTRUMENT	BACKGROUND	DATE	TIME
PID	NA		
ALPHA			
BETA/GAMMA			

NOTES:

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ELLIS/MISC/GEOTECH/LITHO LOG.EPS

JL 1-18-96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-79	Drilling Method: Geoprobe	Date Started: 9/15/95
Coordinates: N 477,835 E 1,381,119	Geologist: R. Nicks	Date Completed: 9/15/95
Ground Surface Elevation: 574.7 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, olive brown, very stiff, moist CL	410052	0.5 - 1.0	B	NA	6	OC
		410053	1.0 - 1.5	B	NA	6	OC
		410054	1.5 - 5.0	B	NA	42	MC, GS, AL, SU, CL
5.0	Sand, dark yellow brown, dense to very dense, wet (SW)	410055	5.0 - 10.0	B	NA	60	MC, AL
10.0	*Final Boring Depth*						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 200310G2SB80-003

FEMP LITHOLOGIC LOG

Page 1 of 1

PROJECT NAME: Geotech. Investig. Borrow Areas / OU2 Waste Units			PROJECT NUMBER: 20.05.10
BORING NUMBER: 62-SB-80	COORDINATES: Refer to Survey Report	RELATED FAL NOs.: 200310G2SB80-002	
SURFACE ELEVATION: Refer to Survey Report	GROUNDWATER LEVEL: 7.4' BG Surf.	DATE: 9/18/95	TIME: 15:50	DATE STARTED: 9/18/95
GEOLOGIST: J. Erjavec	GROUNDWATER LEVEL: NK	DATE: NK	TIME: NK	DATE COMPLETED: 9/18/95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: Fenco	DRILLING EQUIPMENT: Geoprobe "Little Beaver"	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
				Olive brown clay / topsoil & roots		N/A	70-22 B/G 80
1	9/18/95 409867 15:09		6"	Light olive brown (2.5Y-5/3) clay, moist to dry, low plasticity. With roots	CL	N/A	0.5-1.0' PID 22 B/G 70 50
	9/18/95 409868		6"	Same as above	CL	N/A	1.0-1.5' PID 22 Root mass to 1.5' B/G 50
2				Dark yellowish brown (10YR-4/4) to yellowish brown (10YR-5/4) clay. Moist, medium stiff to very stiff, low plasticity. Black organic remains near top of core. Increased silt with depth to some by 4'. Increased sand with depth to some by 4'. Gravel increasing with depth as well (granule 2-4mm to pebble sized). Trace organics throughout.	CL	1.0-3.0	1.5-5.0' PID 23 B/G 50
3	15:13 9/18/95 409869		42"				1st to 42"
4							
5							2nd to 63"
				Yellowish brown sandy clay (10YR-5/4). Moist to wet, soft to stiff (cut), low plasticity. Silt content increases with depth to silty, sandy clay at 80". Some gravel (granule to cobble size to >40 mm), Gravel Ord Bedrock, conglomerate to granitic.	CL	N/A	5.0-10.0' PID 23 B/G = 50
6							
7	15:35 9/18/95 409870		60"				3rd to 88" from 60"
8				Same as above to 95" then 8-10" of clayey sand, well sorted, poorly graded, wet, fg-mg. Color (10YR-5/6). 6" more of yellowish brown clay (no sand), then to bottom with dark greenish gray clay (10Y-4/1), very hard, moist, with gravel (granule to pebble), low plasticity.	SC		6
9					CL	>50	
	Brown Gray contact			Bottom			4th run to 132" (actually ~120" because of slough more)
10							

INSTRUMENT	BACKGROUND	DATE	TIME
PID	2.2	9/18/95	15:03
ALPHA		N/A	
BETA/GAMMA	50	9/18/95	15:05

NOTES: N/A = Not Applicable

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS\MISC\GEOTECH\LITHO LOG.EPS

4/95

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4/1/96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-80	Drilling Method: Geoprobe	Date Started: 9/18/95
Coordinates: N 477,924 E 1,381,407	Geologist: J. Erjavec	Date Completed: 9/18/95
Ground Surface Elevation: 578.9 AMSL	GWL/DATE: 7.4 9/18/95	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, olive brown, moist (CL)	409867	0.5 - 1.0	B	NA	6	OC
		409868	1.0 - 1.5	B	NA	6	OC
1.5	Sandy lean clay, dark yellowish brown, medium stiff to stiff and very stiff, moist CL	409869	1.5 - 5.0	B	NA	42	MC, GS, AL, SP
5.0	Sandy lean clay, yellowish brown, soft to stiff, moist to wet, with clean sand layers 8" to 10" (CL)	409870	5.0 - 10.0	B	NA	6	MC, AL
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP
LITHOLOGIC LOG

CONTROL NO: 200310G2SB81-003

Page 1 of 1

PROJECT NAME: Geotech. Investig. Borrow Areas / OU2 Waste Units			PROJECT NUMBER: 2003.10
BORING NUMBER: G2-SB-81	COORDINATES: Refer to Survey Report	RELATED FAL NOs.: 200310G2SB81-002	
SURFACE ELEVATION: Refer to Survey Report	GROUNDWATER LEVEL: DRY	DATE: 9/18/95	TIME: 1652	DATE STARTED: 9/18/95
GEOLOGIST: J. Erjavec	GROUNDWATER LEVEL: NK	DATE: NK	TIME: NK	DATE COMPLETED: 9/18/95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: Fermco	DRILLING EQUIPMENT: Geoprobe "Little Beast"	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
				Brown topsoil & clay, moist, with root material		N/A	Root mass to 0.5' PID = 3.1 B/G = 50
1	1615 9/18/95 409871		6"	Dark yellowish brown clay (10YR 4/4), moist, low plasticity.	CL	N/A	0.5-1.0' B/G = 50 PID = 3.1
	1621 9/18/95 409872		6"	Same as above (0.5-1.0')	CL	N/A	1.0-1.5' B/G = 60 PID = 3.1
2				Dark yellowish brown clay (10YR-5/4), moist to dry, trace sand scattered throughout. Homogenous color throughout (2.5Y) stiff, low plasticity. Trace to sparse gravel (granule-sized ~2 mm). Homogenous lithology to 5'	CL	N/A	1.5-5.0' B/G = 60 PID = 3.1
3	1626 9/18/95 409873		42"				1st Push to 45"
4							
5							
6				Yellowish brown (10YR-5/4) to light yellowish brown (2.5Y-6/4) clay, with silt, increasing with depth. Moist, low plasticity, med stiff to very stiff, ~~trace~~ sparse gravel scattered throughout - granule-pebble sized,	CL	1.0-2.5	5.0-10.0' 2nd Push to 69" PID = 3.3 B/G = 60
7	1646 9/18/95 409874		60"				
8				Continue of (10YR-5/4) with increasing sand & gravel content, moist to wet. Low plasticity to med plasticity, stiff to very stiff.	CL	1.0-3.0	3rd Push to 96" from 61"
9			*	7" of gray clay (greenish) (10Y-4/1) starting at approx. 124" (10'4"). moist, very hard to hand, low plasticity! Bottom 10.3'			
10	B/G Interface ~ 10'4"						4th push 49" below 96"

INSTRUMENT	BACKGROUND	DATE	TIME
PID	3.1 ppm	9/18/95	1612
ALPHA	NA		
BETA/GAMMA	40	9/18/95	1612

NOTES: N/A = Not Applicable (-5" slough)

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

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4/95

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-81	Drilling Method: Geoprobe	Date Started: 9/18/95
Coordinates: N 478,227 E 1,381,312	Geologist: J. Erjavec	Date Completed: 9/18/95
Ground Surface Elevation: 579.5 AMSL	GWL/DATE: Dry 9/18/95	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, moist (CL)	409871	0.5 - 1.0	B	NA	6	OC
		409872	1.0 - 1.5	B	NA	6	OC
5.0	Sandy lean clay, yellowish brown, stiff to very stiff, moist CL	409873	1.5 - 5.0	B	NA	42	MC, GS, AL, SG, CONr, SP, Pr_1, SU, CL, Pr_5, UUr_{90}
		409874	5.0 - 10.0	B	NA	60	MC, GS, AL
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 20031062 3B82-002

FEMP
LITHOLOGIC LOG

PROJECT NAME: Geotech Inv. Borrow Areas / OU2 Waste Units			PROJECT NUMBER: 20.03.01
BORING NUMBER: G2-SB-82	COORDINATES: NA	RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: DRY	DATE: 9/19/95	TIME: 10:01	DATE STARTED: 9/19/95
GEOLOGIST: J. Erjavec	GROUNDWATER LEVEL:	DATE:	TIME:	DATE COMPLETED: 9/19/95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: Fermco	DRILLING EQUIPMENT: Geoprobe "Little Beaver"	DRILLER/HELPER: B 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
				Brown topsoil with roots, moist			B/G=60 PID=.8
1	0903 9/19/95 409875		6"	Pale brown clay (10YR-6/3) with root material, dry.	CL		0.5-1.0' Roots to 1.0' B/G=60 PID=.8
	0906 9/19/95 409876		6"	Same as above, but w/o root material.	CL		1.0-1.5 1st Push to 18" B/G=70 PID=.8
2	0911 9/19/95 409877		42"	Pale brown (10YR-6/3) clay grading to dark yellowish brown (10YR-4/4) clay. Moist, low plasticity, scattered roots throughout. Silt? near 35-40". Very stiff.	CL	2.5-3.5	1.5-5.0' B/G=70 PID=.8
3					CL/ML?		2nd Push to 40"
4				Brown (10YR-5/3) mottled with yellowish brown (10YR-5/6) clay. Moist, med stiff to stiff, low plasticity. Increasing silt content with depth as well as vfg sand. Approx. 30-25" of silty clay from 35" to 60"	~~CL~~	1.0-1.5	
5					CL/ML? (or clayey silt)		
6	0940 9/19/95 409878		60"	Yellowish brown (10YR-5/4) clayey silt, wet, low plasticity, med stiff to stiff (estimated). Very scarce gravel (granule 2-4mm) to pebble-sized.	ML	N/A	5.0-10.0' 3rd Push to 65" 4th push to 75" from 60"
7				Alternating CL/ML through bottom of boring. More silty clay with depth than clayey silt. Moist to wet, trace gravel to scarce. Trace sand. Organic staining scattered throughout (brown to strong brown). Silt content from 5-10' make clay weak in consistency.	CL	N/A	B/G=50 PID=0
8							
9					CL		
10				BOB 10'			5th Push to 118"

INSTRUMENT	BACKGROUND	DATE	TIME
PID	0.8	9/19/95	0901
ALPHA			
BETA/GAMMA	50	9/19/95	0:900

NOTES: N/A = Not Applicable

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

ILLUS\MISC\GEOTECH\LITHO LOG.EPS

9/15/96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-82	Drilling Method: Geoprobe	Date Started: 9/19/95
Coordinates: N 478,087 E 1,379,584	Geologist: J. Erjavec	Date Completed: 9/19/95
Ground Surface Elevation: 577.1 AMSL	GWL/DATE: Dry 9/19/95	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, pale brown, stiff moist CL	409875	0.5 - 1.0	B	NA	6	OC
		409876	1.0 - 1.5	B	NA	6	OC
		409877	1.5 - 5.0	B	NA	42	MC, GS, AL
5.0	Lean clay, yellowish brown, medium stiff to stiff, moist to wet	409878	5.0 - 10.0	B	NA	60	MC, GS, AL, SP, Pr, SU, CL
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP
LITHOLOGIC LOG

CONTROL NO: 20031062583-002

Page 1 of 1

PROJECT NAME:	GEOTECHNICAL INVESTIGATION BORROW AREAS/OU2 WASTE UNITS
PROJECT NUMBER:	20.03.10
BORING NUMBER:	62-SB-83
COORDINATES:	NA
RELATED FAL NOs.:	NA
SURFACE ELEVATION:	NA
GROUNDWATER LEVEL:	NA
DATE:	
TIME:	
DATE STARTED:	9/15/95
GEOLOGIST:	R. NICKS
GROUNDWATER LEVEL:	NA
DATE:	
TIME:	
DATE COMPLETED:	9/15/95
WATER USED DURING DRILLING:	
DRILLING CONTRACTOR:	FIREMCO
DRILLING EQUIPMENT:	Geoprobe
DRILLER/HELPER:	Grobe, 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
				Clayey silt 10YR 4/3 brown, v. stiff, moist	ML	2.75	Num. rootlets to 6'
1	1005 9/15/95 410056		6"	Lean Clay w/ trace Sand 10YR 4/4 dk. yel. brown, v. stiff moist	CL	2.0	
	1009 9/15/95 410057		6"			4.5	
2							
				1" of Clayey Silt 10YR 4/2 brown, v. stiff, moist	ML		Numerous rootlets
3	1020 9/15/95 410058		42" 59" Ch.	~~Clayey Silt~~ Lean Clay 10YR 5/6 yel. brn, v. stiff, moist	ML CL	3.25	
4							
5		NA					
6				Silt 2.5Y 5/6 light olive brown firm to stiff, moist	ML	1.5	
				Lean Clay 2.5Y 4/6 dk. yel. brn. firm to stiff, wet	CL	1.0-1.5	
7	1035 9/15/95 410059		60"	Silt 2.5Y 5/6 light olive brown, stiff, moist	ML	1.75	
8							
9				Lean Clay 2.5Y 5/6 light olive brown v. stiff moist, high plasticity	CH	4.5	
10				TOTAL DEPTH 10'			

INSTRUMENT	BACKGROUND	DATE	TIME	NOTES:
PID				
ALPHA				
BETA/GAMMA				

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

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N. 2/16/01

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-83	Drilling Method: Geoprobe	Date Started: 9/15/95
Coordinates: N 478,320 E 1,379,453	Geologist: R. Nicks	Date Completed: 9/15/95
Ground Surface Elevation: 576.8 AMSL	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.* Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay with a trace of sand, dark yellowish brown, very stiff, moist CL	410056	0.5 - 1.0	B	NA	6	OC
		410057	1.0 - 1.5	B	NA	6	OC
		410058	1.5 - 5.0	B	NA	42	MC, GS, AL, SU, CL
5.0	Silt, light olive brown, firm to stiff, moist (ML)	410059	5.0 - 10.0	B	NA	60	MC, AL
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP LITHOLOGIC LOG

CONTROL NO: 200310G2SB84-0002

Page 1 of 1

PROJECT NAME: Geotech. Inv., Borrow Areas / OU2 waste units			PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-84	COORDINATES: NA	RELATED FAL NOs.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: DRY	DATE: 9/19/95	TIME: 11:22	DATE STARTED: 9/19/95
GEOLOGIST: J. Eijavec	GROUNDWATER LEVEL:	DATE:	TIME:	DATE COMPLETED:
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: Fenco	DRILLING EQUIPMENT: Geoprobe "Little Beaver"	DRILLER/HELPER: B Neyan/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
				topsoil yellowish brown clay, with some roots		N/A	Roots to 0.5'
1	10:33 9/19/95 409879		6"	Yellowish brown clay (10YR-5/4), moist, low plasticity. Trace roots	CL	N/A	0.5-1.0' PID = Ø to 5' B/G = 50 (throughout)
	10:35 9/19/95 409880		6"	Dark yellowish brown clay (10YR-4/4) moist, low plasticity. trace roots.	CL	N/A	1.0-1.5'
2				Brownish yellow (10YR-6/6) silty clay to brownish yellow (10YR-6/6) clayey silt Moist, low plasticity to no plasticity. Homogeneous color throughout.	CL	N/A	1.5-5.0'
3	10:40 9/19/95 409881		42"	Trace scattered vfg to fg sand. No gravel.	ML		1st Push to 47"
4							
5							
6				Alternating layers (1"-4") of yellowish brown (10YR-5/6) silty clay + clayey silt with fg-vfg sand. Moist, low to no plasticity. Some small lenses of wet, vfg-fg sand (< 1".) Organic staining increasing with depth, Pure clay lenses, very hard, moist, tense. Conspicuous absence of gravel.	ML/CL	>5.0 for clay	5.0-10.0'
7	10:53 9/19/95 409882		60"				
8							2nd to 95"
		BROWN CLAY / GRAY CLAY INTERFACE					
9				Dark greenish gray (10Y-4/1) silty clay, moist to wet, low plasticity, stiff. Some of this interval may be clayey silt. No gravel. Trace sand (fg-vfg). BOB 10/2"	CL	1.0-2.0	
10							3rd to 120"

INSTRUMENT	BACKGROUND	DATE	TIME
PID	Ø ppm	9/19/95	1032
ALPHA			
BETA/GAMMA	50	9/19/95	1032

NOTES: N/A - Not Applicable

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

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Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-84	Drilling Method: Geoprobe w/augers	Date Started: 9/19/95
Coordinates: N 478,327 E 1,379,260	Geologist: J. Erjavec	Date Completed: 9/19/95
Ground Surface Elevation: 575.2 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, very hard, moist CL	409879	0.5 - 1.0	B	NA	6	OC
		409880	1.0 - 1.5	B	NA	6	OC
		409881	1.5 - 5.0	B	NA	42	MC, GS, AL
8.3	Lean clay, dark greenish gray, stiff, moist to wet CL	409882	5.0 - 10.0	B	NA	60	MC, GS, AL, SP, Pr, SU, CL
10.2	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

356

FEMP
LITHOLOGIC LOG

CONTROL NO: 2003106 25B85-002

Page 1 of 1

PROJECT NAME: GEOTECHNICAL INVESTIGATION BORROW AREAS/OU2 WASTE UNITS			PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-85	COORDINATES: NA	RELATED FAL NO.: NA	
SURFACE ELEVATION: NA	GROUNDWATER LEVEL: NA	DATE:	TIME:	DATE STARTED: 9/15/95
GEOLOGIST: R. NICKS	GROUNDWATER LEVEL: NA	DATE:	TIME:	DATE COMPLETED: 9/15/95
WATER USED DURING DRILLING: NA	DRILLING CONTRACTOR: FLEMCO	DRILLING EQUIPMENT: Geoprobe	DRILLER/HELPER: Grook, 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
				Lean Clay 10YR 3/3 dark brown, stiff, moist, becoming v. stiff @ 1'	CL		Numerous rootlets and hair roots to 4"
1	1100 9/15/95 410060	NA	6"	10YR 4/4 @ 1'9" dk. yel. brn stiff to v. stiff, moist		2.0	
	1105 9/15/95 410061		6"			2.0	
2				2.5Y 5/3 light ~~yel~~ olive brown		2.5	
3	1108 9/15/95		42"			2.5	
4						2.5	
5	410062			Lean Clay w/trace sand 10YR 4/4 dk. yel. brn scat grav. to 1", v. stiff, moist		2.25	
6	1120 9/15/95 410063		26"		CL	4.5	
7							
8	~~9/15/95~~			TOTAL DEPTH ~~[illegible]~~ 7'2". Refusal on a rock			
9							
10							

INSTRUMENT	BACKGROUND	DATE	TIME
PID			
ALPHA			
BETA/GAMMA			

NOTES:

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUMASC/GEOTECH/UTIO LOG.EPS

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HC 3-7-96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-85	Drilling Method: Geoprobe	Date Started: 9/15/95
Coordinates: N 478,425 E 1,378,954	Geologist: R. Nicks	Date Completed: 9/15/95
Ground Surface Elevation: 568.2 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, dark brown, stiff to very stiff, moist (CL)	410060	0.5 - 1.0	B	NA	6	OC
1.0	Fat clay, light olive brown, stiff to very stiff, moist CH	410061	1.0 - 1.5	B	NA	6	OC
		410062	1.5 - 5.0	B	NA	42	MC, GS, AL, SU, CL
4.5	Lean clay with sand, dark yellowish brown, very stiff, moist (CL)	410063	5.0 - 7.2	B	NA	26	MC, AL
7.2	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP LITHOLOGIC LOG

CONTROL NO: 200310G25B86-002

Page 1 of 1

PROJECT NAME: Geotech. Investig. Borrow Areas / OU-2 waste Units			PROJECT NUMBER: 20.03.10
BORING NUMBER: 62-SB-86	COORDINATES: See Survey Report	RELATED FAL NOs.: 200310G25B86-001 thru 016	
SURFACE ELEVATION: See Survey Report	GROUNDWATER LEVEL: DRY	DATE: 9/19/95	TIME: 13:42	DATE STARTED: 9/19/95
GEOLOGIST: J. Erjavec	GROUNDWATER LEVEL: N/A	DATE:	TIME:	DATE COMPLETED: 9/19/95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: Franco	DRILLING EQUIPMENT: "Little Beaver" Geoprobe	DRILLER/HELPER: B. 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
				Topsoil, dark yellow brown clay, some roots		N/A	
	13:05 9/19/95 409883		6"	Yellowish brown clay (10YR-5/4) clay, moist, low plasticity.	CL	N/A	0.5-1.0' PID=0 — for 0/G> 40 while sector
1	13:07 9/19/95 409884		6"	Same as above	CL	N/A	1.0-1.5'
2	13:15 9/19/95 409885		42"	Yellowish brown (10YR-5/4 to 5/6) clay, moist, very stiff, low plasticity. Some silt throughout. Homogenous color near top at (10YR-5/4) to mottled (5/4 to 5/6) with depth. Gravel rare to scarce (granule 2-4mm). Scattered organic stains throughout.	CL	2.0-2.5	1.5-5.0' 1st Push to 42"
3							
4							
5							
6				Yellowish brown (10YR-5/4) to pale brown (10YR-6/3) clay grading ~8" to strong brown (7.5YR-5/6) sandy clay, moist, stiff to very stiff. Sand, cg-mg, moist.	CL	N/A	5.0-10.0' 6'3"
7	13:25 9/19/95 409886		60"	Strong brown (7.5YR-5/6) sand with clay & gravel. fg-mg, moist, friable, well sorted, poorly graded.	SP-SC		2nd to 8'3"
8				Yellowish brown (10YR-5/4) silty clay. wet, low plasticity, stiff(?).	CL		7'10"
9	BROWN GRAY INTERFACE			Greenish gray (10Y-5/1) clayey gravel with sand. wet, Gravel (granule to cobble-sized). Poorly sorted, well graded. BOB 10	GC		8'9" 3rd to 12.6"
10							

INSTRUMENT	BACKGROUND	DATE	TIME
PID	0 ppm	9/19/95	13:00
ALPHA	N/A		
BETA/GAMMA	40	9/19/95	13:01

NOTES: N/A = Not Applicable

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

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000242

REVIEWED BY HL DATE 3-7-96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-86	Drilling Method: Geoprobe	Date Started: 9/19/95
Coordinates: N 478,351 E 1,378,703	Geologist: J. Erjavec	Date Completed: 9/19/95
Ground Surface Elevation: 567.8 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, moist (CL)	409883	0.5 - 1.0	B	NA	6	OC
		409884	1.0 - 1.5	B	MA	6	OC
1.5	Fat clay, yellowish brown, very stiff, moist CH	409885	1.5 - 5.0	B	NA	42	MC, GS, AL
5.0	Sandy lean clay, yellowish brown, stiff to very stiff, moist to wet CL	409886	5.0 - 10.0	B	NA	60	MC, GS, AL, SP, SU, CL
10.0	*Final Boring Depth*						

* USCS symbols in parentheses indicate visual classification.

FEMP LITHOLOGIC LOG

CONTROL NO: 200310G2SB87-002

Page 1 of 1

PROJECT NAME: GEOTECHNICAL INVESTIGATION BORROW AREAS/OU2 WASTE UNITS			PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-87	COORDINATES: Refer to Survey Report ~~N/A~~ JC 4-10-96	RELATED FAL NO.: JC 4-10-96 ~~N/A~~ 200310G2SB87-001	
SURFACE ELEVATION: Refer to Survey Report ~~N/A~~ JC 4-10-96	GROUNDWATER LEVEL: N/A	DATE: NK	TIME: NK	DATE STARTED: 9/15/95
GEOLOGIST: R. Nicks	GROUNDWATER LEVEL: N/A	DATE: NK	TIME: NK	DATE COMPLETED: 9/15/95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: FERMCO	DRILLING EQUIPMENT: Geoprobe	DRILLER/HELPER: Grobe, 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
				Lean Clay 10YR 4/2 dk. gr. brn, v. stiff moist	CL		Numerous rootlets to 4"
1	1149 9/15/95 410064		6"	10YR 4/3 Brown @ 0.5 ft.		>4.5	
	1155 9/15/95 410065		6"			2.5	
2				Alkaline stringers 10YR 5/3 Brown			
3	1155 9/15/95 410066		42" 54 Ch.	Silt 10YR 7/2 light gray to 10YR 3/6 dark yel. brown w/scat grav. to ½"	ML	>4.5	
4							
5				Lean Clay 2.5Y 5/4 lt. olive brn, v. stiff, moist	CL	>4.5	
6							
7	1214 9/15/95 410067		60"	Silt 2.5Y 5/6 light olive brown, stiff to v. stiff, moist	ML	3.0	
8				Lean Clay 10YR 5/6 yel. brown v. stiff, moist	CL	3.5	
9				Silt 2.5Y 5/2 grey/olive brown, stiff, wet	ML		
				Sand 10YR 5/1 gray dense wet	SP		
10				Clay 10YR 5/1 gray, v. stiff, wet	CL		TOTAL DEPTH 10'

INSTRUMENT	BACKGROUND	DATE	TIME
PID			
ALPHA			
BETA/GAMMA			

NOTES:

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*LLU/DMB/CO/GEOTECH/LITHO LOG.EPS

REVIEWED BY dk DATE 3-7-96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-87	Drilling Method: Geoprobe	Date Started: 9/15/95
Coordinates: N 478,565 E 1,378,572	Geologist: R. Nicks	Date Completed: 9/15/95
Ground Surface Elevation: 569.9 AMSL	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, dark gray brown, very stiff, moist (CL)	410064	0.5 - 1.0	B	NA	6	OC
		410065	1.0 - 1.5	B	NA	6	OC
1.5	Lean clay, dark yellowish brown, very stiff, moist CL	410066	1.5 - 5.0				MC, GS, AL
6.3	Silt (ML) and lean clay (CL) with 3" lenses of sand (SP) light olive brown, stiff to very stiff, moist to wet, sands (SP) dense and wet	410067	5.0 - 10.0	B	NA	60	MC, AL, SU, CL
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

CONTROL NO: 200310G2SB88-002

FEMP
LITHOLOGIC LOG

Page 1 of 1

PROJECT NAME: Geotech. Investig. Borrow Areas / OU2-Waste Units			PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-88	COORDINATES: N/A	RELATED FAL NO.: N/A	
SURFACE ELEVATION: N/A	GROUNDWATER LEVEL: DRY	DATE: 9/19/95 TIME: 14:57	DATE STARTED: 9/19/95
GEOLOGIST: J. Eijavec	GROUNDWATER LEVEL: N/A	DATE: TIME:	DATE COMPLETED: 9/19/95
WATER USED DURING DRILLING: N/A	DRILLING CONTRACTOR: Franco	DRILLING EQUIPMENT: Geoprobe "Little Beaver"	DRILLER/HELPER: B. 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
				top soil, clay & roots, moist		N/A	Main root mass to ~1.0'
	14:35 9/19/95 409887		6"	light olive brown clay (2.5Y-5/3), moist, inst low plasticity	CL		0.5-1.0' First tube 8" (sample coll.
1	14:38 9/19/95 409888		6"	light olive brown clay (2.5Y-5/3) moist, trace roots, low plasticity	CL		1.0-1.5' 710=0 816=50
2				mottled light olive brown clay (2.5Y-5/3) with yellowish brown clay (10YR-5/6), moist, very stiff, low plasticity. Scattered brown organic staining throughout.	CL	2.5-3.0	1.5-5.0' through section
3	14:44 9/19/95 409889		42"				
4							2nd to 50"
5							
6				mottled light olive brown clay (2.5Y-5/3) with yellowish brown clay (10YR-5/6), moist, very stiff to hard, low plasticity. Organic staining throughout. Scarce gravel	CL	3.0-4.0	5.0-10.0' 3rd to 74"
7	14:50 9/19/95 409890		60"	mottled light olive brown clay (2.5Y-5/3) with yellowish brown clay (10YR-5/6) + increasing silt content with depth., Moist, very stiff, low plasticity. Increase in light gray (10YR-7/1) component at ~7'. Scarce gravel	CL	3.0	4th to 104" 5th - no recovery
8							
9				light olive brown silty clay + clayey silt (2.5Y-5/3), moist to wet, stiff, low plasticity. No gravel	CL/ML	2.0-3.0	
10				BOB 10.2'			6th to 130"

INSTRUMENT	BACKGROUND	DATE	TIME
PID	0ppm	9/19/95	14:27
ALPHA			
BETA/GAMMA	50	9/19/95	14:27

NOTES: N/A = Not applicable
Hand augered 2nd 18" for first two sample collections (887 & 888) because samples continued to slip out of geoprobe boring tool.

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS/MISC/GEOTECH/LITHO LOG.EPS

000246

REVIEWED BY KK DATE 3-7-96

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-88	Drilling Method: Geoprobe	Date Started: 9/19/95
Coordinates: N 478,704 E 1,379,050	Geologist: J. Erjavec	Date Completed: 9/19/95
Ground Surface Elevation: 575.4 AMSL	GWL/DATE: Dry 9/19/95	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, light olive brown, moist (CL)	409887	0.5 - 1.0	B	NA	6	OC
		409888	1.0 - 1.5	B	NA	6	OC
1.5	Fat clay, light olive brown, stiff to hard, moist to wet CH	409889	1.5 - 5.0	B	NA	42	MC, GS, AL, SU, CL
5.0	Lean clay, light olive brown, very stiff, moist to wet CL	409890	5.0 - 10.2	B	NA	60	MC, GS, AL, SP, Pr

10.2 Final Boring Depth

* USCS symbols in parentheses indicate visual classification.

FEMP
LITHOLOGIC LOG

CONTROL NO: 200310G25B89-002

Page 1 of 1

PROJECT NAME: Geotechnical Investigation Borrow Areas			PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-89	COORDINATES: Refer to Survey Report JC 4-10-96	RELATED FAL NOs.: 200310G25B89-001 NA JC 4-10-96	
SURFACE ELEVATION: Refer to Survey Report JC 4-10-96	GROUNDWATER LEVEL: Dry	DATE: 9-18-95	TIME: 1042	DATE STARTED: 9-18-95
GEOLOGIST: K. Ernst	GROUNDWATER LEVEL: NA	DATE: NA	TIME: NA	DATE COMPLETED: 9-18-95 ①
WATER USED DURING DRILLING: None	DRILLING CONTRACTOR: FERMCO	DRILLING EQUIPMENT: Hand Auger	DRILLER/HELPER: Mike Grob/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		N/A		Silt (10YR 6/4) light yellowish brown, roots 1/8" dia., low to no plasticity, moist	ML	N/A	
	1005, 9-18-95 410068			SAA, few fine hairline rootlets	ML		1-2 jar
1.0	1007, 9-18-95 410069			Silty clay (10YR 6/4) light yellowish brown, low to no plasticity, few fine gravel, 1/8" typical, moist	CL		1-2 jar
2.0	1025, 9-18-95 410070			Lean Clay (10YR 6/4) light yellowish brown, low plasticity, moist, trace iron staining	CL		1-gal jar for geotech lab; 1-2 jar for chemical tests
3.0				Silty clay (2.5Y 6/4) light yellowish brown, low to no plasticity, dry to moist, trace iron staining	CL/ML		
4.0				clayey silt (10YR 6/4) light yellowish brown, low to no plasticity, moist	ML		piece of wood (1" slab) - root material ~4.5'
5.0							
	1040, 9-18-95 410071			silty clay (10YR 4/6) dark yellowish brown, with sand few fine gravel up to 3/4" subangular typical, fine root material 1/8" to 1/16" dia., low to no plasticity	CL/ML		possible roots (fine) from tree
6.0							
7.0				clayey silty silt (10YR 6/4) lt. yellowish with fine gravel, up to 3/4" subangular typical, moist, low to no plasticity	CL/ML		2" rock piece (subangular gravel)
	7.8'			Bottom of boring 7.8'			Refusal due to large object. possible rock?
8.0							
9.0							
10.0							

INSTRUMENT	BACKGROUND	DATE	TIME
PID	NA		
ALPHA			
BETA/GAMMA			

NOTES: visual description of auger cuttings brought to ground surface with 3" dia hand auger

① Date completed sampling, see boring completion log for date grouted

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

ILLUS\MISC\GEOTECH\LITHO LOG EPS

NA = Not Applicable

Project No: PO154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-89	Drilling Method: Geoprobe	Date Started: 9/18/95
Coordinates: N 478,814 E 1,378,504	Engineer: K. Ernst	Date Completed: 9/18/95
Ground Surface Elevation: 568.9 AMSL	GWL/DATE: Dry 9/18/95	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk Sample

Depth (ft)	Description [USCS Symbol]*	Sample No.	Sample Depth (ft)	Sample Type	Blows per 6"	Recovery (in)	Laboratory Tests
0	Lean clay, light yellowish brown, moist (CL)	410068	0.5 - 1.0	B	NA	6	OC
		410069	1.0 - 1.5	B	NA	6	OC
1.5	Fat clay, light yellowish brown, moist CH	410070	1.5 - 5.0	B	NA	42	MC, GS, AL, SU, CL
5.0	Lean clay, dark yellowish brown, moist (CL)	410071	5.0 - 7.8	B	NA	34	MC, AL
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP
LITHOLOGIC LOG

CONTROL NO: 200310G2SB90-003

Page 1 of 1

PROJECT NAME: Geotechnical Investigation Borrow Areas/OU2 Waste Units				PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-SB-90	COORDINATES: Refer to Survey Report	RELATED FAL NOs.: 200310G2SB90-002		
SURFACE ELEVATION: Refer to Survey report	GROUNDWATER LEVEL: Dry after drilling	DATE: 9/20/95	TIME: 1620	DATE STARTED: 9/20/95
GEOLOGIST: R. Nicks	GROUNDWATER LEVEL: NK	DATE: NA	TIME: NA	DATE COMPLETED: 9/20/95
WATER USED DURING DRILLING:	DRILLING CONTRACTOR: FERMCO	DRILLING EQUIPMENT: Geoprobe	DRILLER/HELPER: Bill Neyer, Karen 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				Top Soil 10YR 4/3 dk. brn. Lean Clay w/sand stiff, moist	CL	1.0	
				Lean Clay, 10YR 4/6 dk. yel. brn. stiff, moist			
1	1529 9/20/95 409891	NA	6"			2.5	slightly porous 1/32" holes numerous hair roots
	1535 9/20/95 409892	NA	6"				
2							
				Silt 10YR 4/6 stiff, moist brownish yellow	ML	2.0	
3	1550 9/20/95 409893	NA	42"	Silty Sand Qn. Qn. m. dense to dense	SM		1/8" rootlets
			Qn.	Sandy Silt 7.5YR 4/4 brown stiff to v. stiff, moist Qn.		3.0-4.5	
				Clayey Silt 10YR 4/6 dk. yel. brn., v. stiff, moist	ML	4.5	
4							
5							
				Sandy lean Clay 10YR 3/4 dk. yel brn. stiff, moist	CL	2.5	porous - up to 1/16" pores
6	Qn.						
				Lean Clay 10YR 5/6 yel. brn. stiff to v. stiff, moist w/1/8" clay laminae 10YR 5/3 brn. v. stiff moist	CL	2.25	Very Silty laminae near horizontal 1/32" layers
7							
	1610 9/20/95 409894	NA	60"	Silty Clay 10YR 5/4 yel. brn. soft, to stiff, wet	CL		
8				Silt 10YR 5/6 yel. brn. soft to stiff, moist	ML	1.5	"laminae brns" @ ≈ 30° dip moon like parting surfaces
9				Sand 10YR 4/4 dk yel brn. w/scat grave/ to 1/2"	SW		
10				TOTAL DEPTH 10'			

INSTRUMENT	BACKGROUND	DATE	TIME	NOTES:
PID				
ALPHA				
BETA/GAMMA				

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS\MISC\GEOTECH\LITHO LOG.EPS

Project No: P0154	Project Title: Geotechnical Investigation Borrow Areas	
Boring No. G2-SB-90	Drilling Method: Geoprobe	Date Started: 9/20/95
Coordinates: N 478,821 E 1,378,724	Geologist: R. Nicks	Date Completed: 9/20/95
Ground Surface Elevation: 573.7 AMSL	GWL/DATE: Dry 9/20/95	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. Coordinates are based on NAD 1927.
SS = Split-Spoon Sample, ST = Shelby Tube Sample, B = Bulk 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, dark yellowish brown, stiff, moist CL	409891	0.5 - 1.0	B	NA	6	OC
		409892	1.0 - 1.5	B	NA	6	OC
		409893	1.5 - 5.0	B	NA	42	MC, GS, AL, SU, CL
5.0	Sandy silt, yellowish brown, stiff to very stiff, moist to wet ML	409894	5.0 - 10.0	B	NA	60	MC, GS, AL, SP, Pr
10.0	Final Boring Depth						

* USCS symbols in parentheses indicate visual classification.

FEMP LITHOLOGIC LOG

CONTROL NO: 200310G2SB95-003

Page 1 of 1

PROJECT NAME: Geotechnical Inv. Borrow Areas \ OU2 Waste Units	PROJECT NUMBER: 20.03.10
BORING NUMBER: GZ-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: 1285; 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. Copannari

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	
	11:23 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	PID>15 Hole #1 9/15>60 Hole #1 1st to 15"
1	10:56 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	
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	40-50	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		49"
5					SC (#2)		
	Brown / Gray Interface 11:10 96				CL	40-50	Hole #2 2nd to 6"
6				Light olive brown sandy clay, moist to wet, low plasticity, hard to very hard. (2.5Y-5/6)	CL	20-30	Hole #1 3rd to 77"
	Below Gray Interface Hole #2			Greenish gray (10Y-5/1) clay, moist, med stiff to stiff, low plasticity to med plasticity, some sand throughout. Some gravel, ordinal subangular to subrounded, (granule to pebble sized)			*1-see note 4-10-96
7	12:05 401899 9/21/95		~42"				Hole #2 2nd to 6"
8							*-2 Hole #2 2nd to 6"
			~8'10"	Grading to — Greenish gray (10Y-5/1) silt, wet, some sand, trace gravel.	ML		
9							
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
*1 - Hit rock - unable to retrieve sample from sampler - stuck offset 6" & retry
*-2 - Driller pushed to 10', because of liquefied sand in boring, likely lost some of this sample. Estimated 8'10" for grading to gray silt.

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST

*ILLUS\MISC\GEOTECH\UTHO LOG EPS

* N/A = NOT Applicable

#3 - Slough from sand filled hole to ~5.0' BG surface. Water present in sand at that depth.

Project 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: 200310G2SB96-003

FEMP
LITHOLOGIC LOG

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
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. Nayer / 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	1320 9-25-95 409900	N/A	6" / 6"	Lean Clay (10YR 5/6) Dk. Yellowish Brown, w/Roots, Moist, Med. Stiff	CL	.75	Large Roots in 2nd Core Sample
.5				Lean Clay (10YR 5/6) Dk. Yellowish Brown, moist, w/Fine Roots, Stiff, Occasional Black Nodules, Fill	CL	1.75	
	1320 9-25-95 409901		6" / 6"	~~Lean Clay (10YR 5/6) Dk. Yellowish~~ SAA			
1.0	1323 9-25-95 409902		6" / 6"	Lean Clay (10YR 5/6) Dk. Yellowish Brown, moist, very stiff, w/ Black Nodules, w/ Fine Roots Fill	CL	2.25	
1.5	1345			SAA			
2.0 2.2							
3.0	9-25-95						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	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
10.0							

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.

*LLU:\MSC\GEOTECH\LITHO LOG.EPS

✓ Duplicate sample #409913 taken at 5' → 10' depth @ 1406

000254

Project 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						

CONTROL NO: 200310G23B98-003

FEMP LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation Borrow Areas / OU2 Waste Units	PROJECT NUMBER: 20.03.10
BORING NUMBER: G2-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 DMS 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" 4 1/4 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"/10"	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, (10YR 5/2) Grayish Brown, w/ Sand, Fill	GM		Density Is Estimated
1.0	1517 9-25-95 409907		6"/6"				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 1.3" 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 @ 5.3ft to 5.5ft, 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 @ 8.0ft			
9.0				Becoming More Wet @ 8.8ft - 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	DMS 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

4/95

4-11-96

20031062SB98-004

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

4/95

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

JV 4-11-96

000257

Project 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						

FEMP LITHOLOGIC LOG

CONTROL NO: 200310G2SB99-003

Page 1 of 2

PROJECT NAME: Geotechnical Investigation Borrow Areas / OU2 Waste Units			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
0.5	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	
1.0	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	
1.5	0912 9-27-95 409922		6" / 6"				
2.0 / 2.1				Concrete, Broken + Porous			Roots End @ 2.0ft
3.0	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 @ 3.1ft	CL	>>4.0	Hard Augering @ 3.3ft (Limestone Fragment) ~~Hard Drilling~~ QD
4.0	409923 1.5-5' 1006						
5.0							
5.4				5.4ft Becoming Stiff		1.5	
6.0							
6.3				Sandy Lean Clay (2.5Y 6/3) Lt. Yellowish Brown, Moist (Wet From 6.5 to 6.9ft), mottled w/ DK. Yellowish Brown, Med Stiff, ~~Trace Sand~~ QD	CL	0.75	
7.0				Becoming Stiff @ 7.3ft		1.5	
8.0	1025 9-27-95			Silty Lean Clay (10YR 5/6) Yellowish Brown, Moist, ~~Med~~ Stiff Becoming Mottled w/ Gray @ 8.0ft Some Iron Staining Beginning @ 8.4ft	CL	1.5	
9.0				Iron Staining Becoming Heavier @ 9.0ft To Bottom of Bore Hole And Becomes Very Stiff		3.0	
10.0	409924 5'-10' 1025						

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 Geoprobe Macro Core
Samples: A Composite Of Macro Core + Auger Cuttings
Bottom of Core @ 10.3ft Below Ground Surface (BGS)
SAA - Same As Above
Augered To 10.1 ft (BGS)

*SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST.

*ILLUS/MISC/GEOTECH/LITHO LOG.EPS D1 D

0912 A/B Screen 1'-1.5' 4-10-96

0731 7.5'-8' A/B Screen

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	

4-11-96

200310G2SB99-004

FEMP
LITHOLOGIC LOG

PROJECT NAME: Geotechnical Investigation Borrow Areas/OU2 Waste Units

PROJECT NUMBER: 20.03.10

BORING NUMBER: GZ-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							
10.3				SAA			
				End Of Boring 10.3 ft			

NOTES:

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

4/95

JN 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_{res}, CU_{res}, 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						

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: 200194603
Customer Number: 410165
Batch Number: Sieve-95-060

Material: Soil

Boring No:	G2-159
Sample No:	410165
Sample Depth:	2.0-4.0 ft

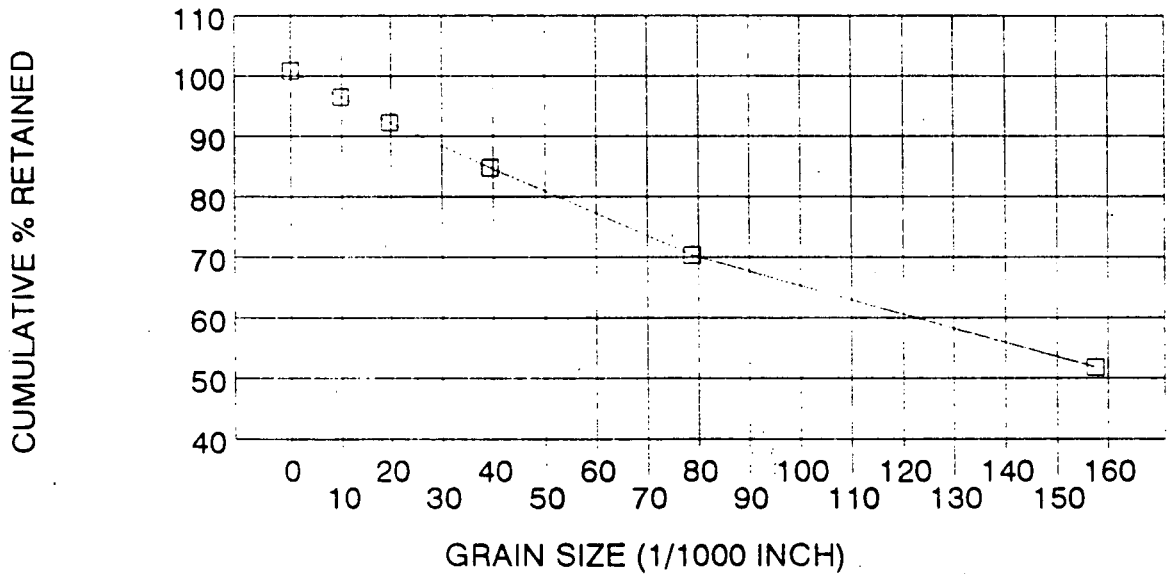
Sample Weight: 1613.26 grams

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	835.90	51.81	51.81	157.5	
2 mm	298.70	18.52	70.33	78.7	
1 mm	232.50	14.41	84.74	39.4	
0.5mm	120.91	7.49	92.24	19.7	
0.25 mm	68.83	4.27	96.50	9.8	
Pan	71.13	4.41	100.91	---	

SIEVE ANALYSIS
200194603



Grain Size Retained			Name	Date
40%	>157.5	Analyzed By:	H.J.VOLK	12/28/95
50%	>157.5	Checked By:	~~>157.5~~ D.Beadle	12-29-95
90%	26	Approved By:	~~>157.5~~ MB	12-29-95

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MODAL DIAMETER TESTING

Sample Number: 200194613
Customer Number: 410166
Batch Number: Sieve-95-060

Material: Soil

Boring No:	G2-159
Sample No:	410166
Sample Depth:	6.0-10.0 ft

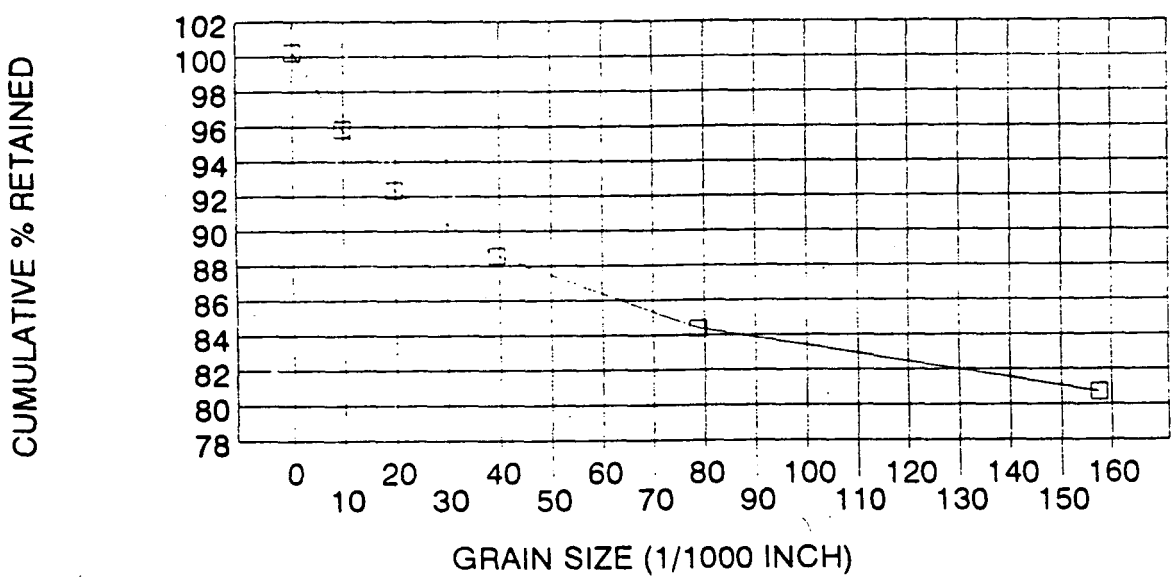
Sample Weight: 1675.67 grams

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	1352.16	80.69	80.69	157.5	
2 mm	61.50	3.67	84.36	78.7	
1 mm	70.25	4.19	88.56	39.4	
0.5mm	63.47	3.79	92.34	19.7	
0.25 mm	58.46	3.49	95.83	9.8	
Pan	74.04	4.42	100.25	---	

SIEVE ANALYSIS
200194613



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%	32	Approved By:	[illegible]	12-29-95

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000265

MODAL DIAMETER TESTING

Sample Number: 200194614
Customer Number: 410167
Batch Number: Sieve-95-060

Material: Soil

Boring No:	G2-159
Sample No:	410167
Sample Depth:	10.0-14.0 ft

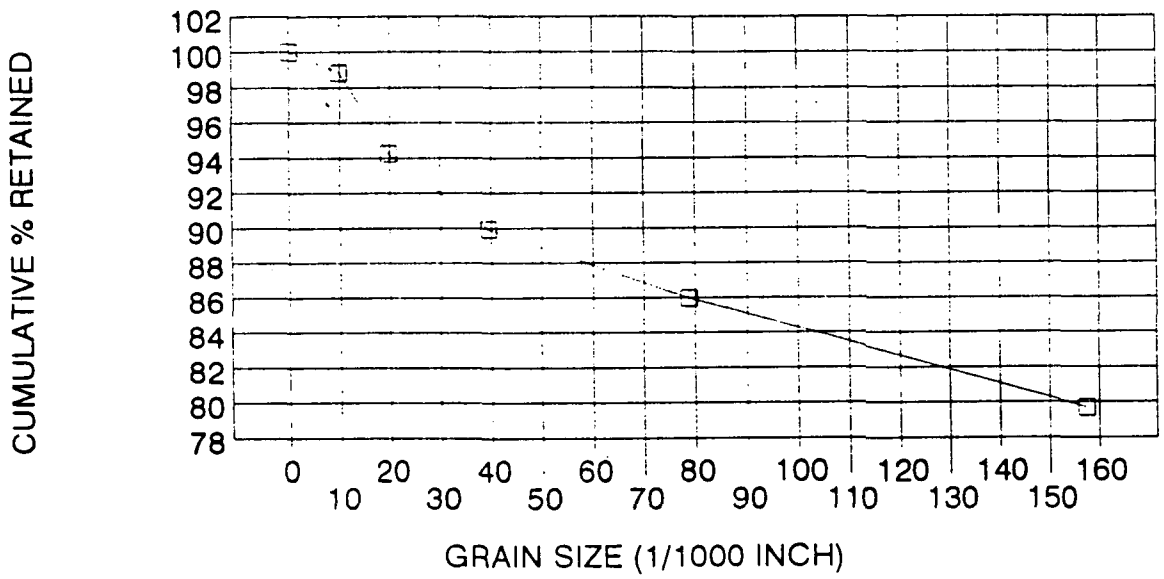
Sample Weight: 1766.84 grams

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	1407.58	79.67	79.67	157.5	
2 mm	110.78	6.27	85.94	78.7	
1 mm	70.35	3.98	89.92	39.4	
0.5mm	76.30	4.32	94.24	19.7	
0.25 mm	81.00	4.58	98.82	9.8	
Pan	20.42	1.16	99.98	---	

SIEVE ANALYSIS
200194614



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%	39	Approved By:	[illegible]	12-29-95

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MODAL DIAMETER TESTING

Sample Number: 200194615
Customer Number: 410155
Batch Number: Sieve–95– 060

Material: Soil

Boring No:	G2-158
Sample No:	410155
Sample Depth:	2.0–4.0 ft

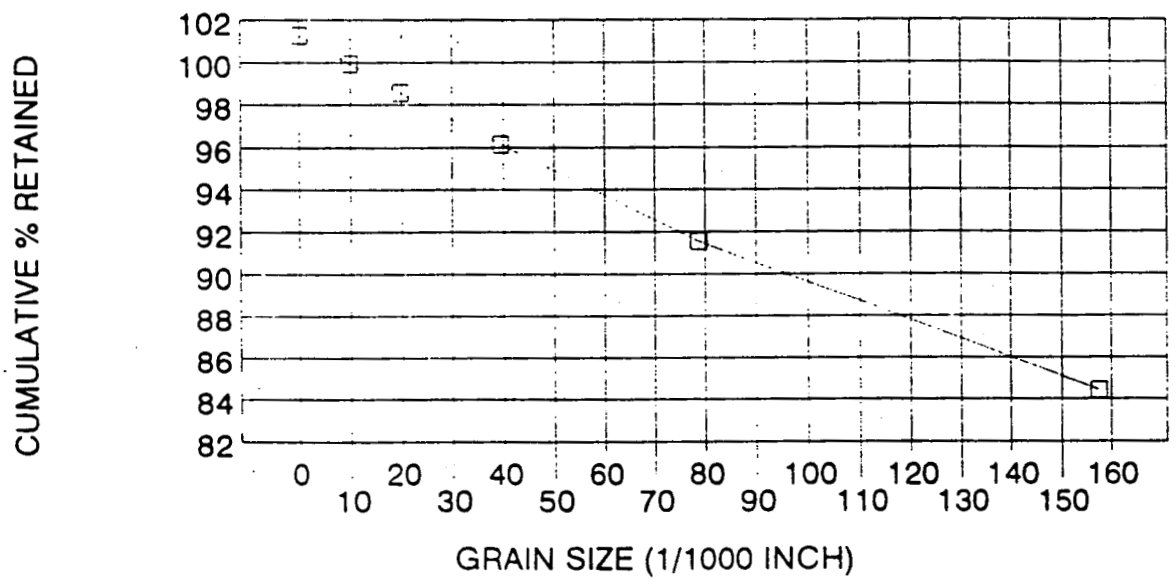
Sample Weight: 1659.33 grams

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	1400.75	84.42	84.42	157.5	
2 mm	118.40	7.14	91.55	78.7	
1 mm	76.21	4.59	96.14	39.4	
0.5mm	40.43	2.44	98.58	19.7	
0.25 mm	22.35	1.35	99.93	9.8	
Pan	22.41	1.35	101.28	---	

SIEVE ANALYSIS
200194615



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%	96	Approved By:	[illegible]	12-29-95

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000267

MODAL DIAMETER TESTING

Sample Number: 200194616
Customer Number: 410156
Batch Number: Sieve–95– 060

Material: Soil

Boring No:	G2-158
Sample No:	410156
Sample Depth:	6.0-10.0 ft

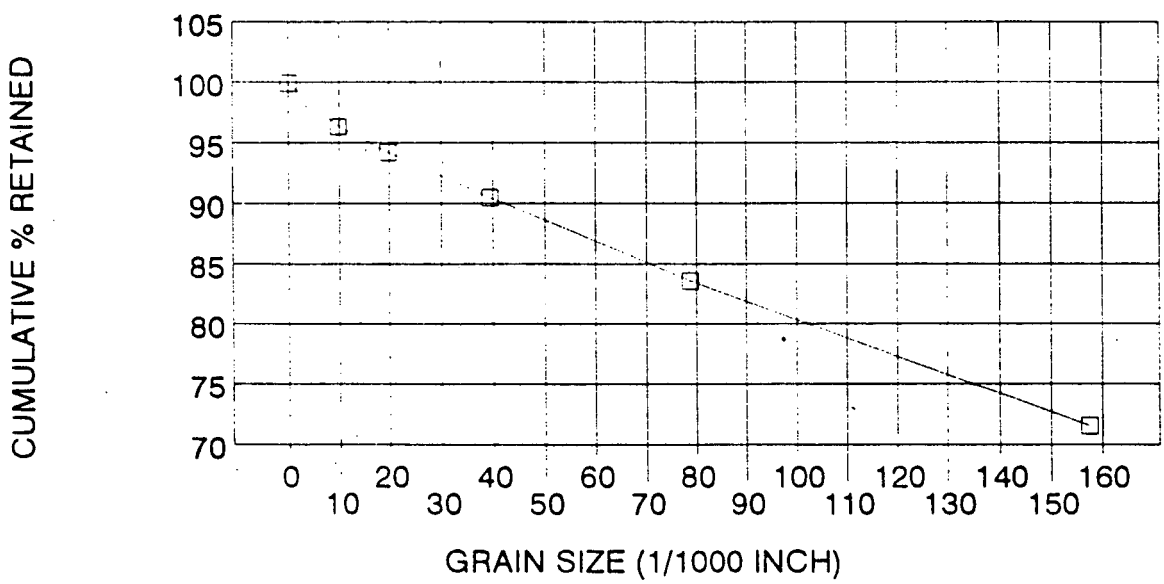
Sample Weight: 1347.35 grams

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	964.02	71.55	71.55	157.5	
2 mm	162.34	12.05	83.60	78.7	
1 mm	92.56	6.87	90.47	39.4	
0.5mm	49.91	3.70	94.17	19.7	
0.25 mm	28.70	2.13	96.30	9.8	
Pan	48.66	3.61	99.91	---	

SIEVE ANALYSIS
200194616



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%	42"	Approved By:	[illegible]	12-29-95

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MODAL DIAMETER TESTING

Sample Number: 200194617
Customer Number: 410157
Batch Number: Sieve–95– 060

Material: Soil

Boring No:	G2-158
Sample No:	410157
Sample Depth:	10.0-14.0 ft

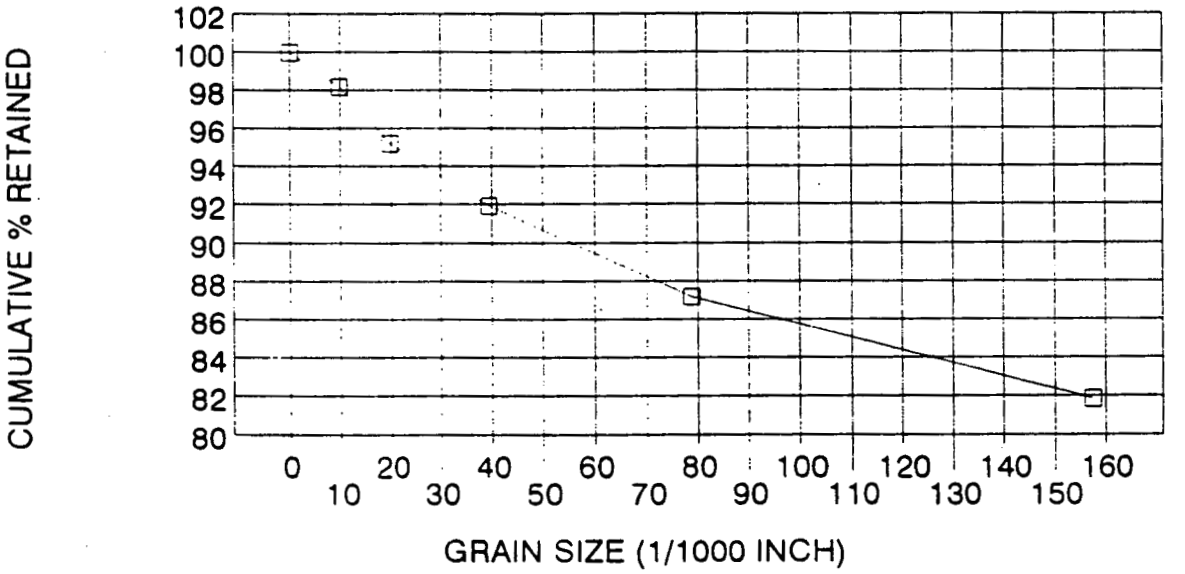
Sample Weight: 1666.16 grams

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	1363.94	81.86	81.86	157.5	
2 mm	88.53	5.31	87.17	78.7	
1 mm	79.28	4.76	91.93	39.4	
0.5mm	54.19	3.25	95.19	19.7	
0.25 mm	49.77	2.99	98.17	9.8	
Pan	29.93	1.80	99.97	---	

SIEVE ANALYSIS
200194617



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%	55	Approved By:	[illegible]	12-29-95

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000259

MODAL DIAMETER TESTING

Sample Number: 200194618
Customer Number: 410072
Batch Number: Sieve-95-060

Material: Soil

Sample Weight: 1563.31 grams

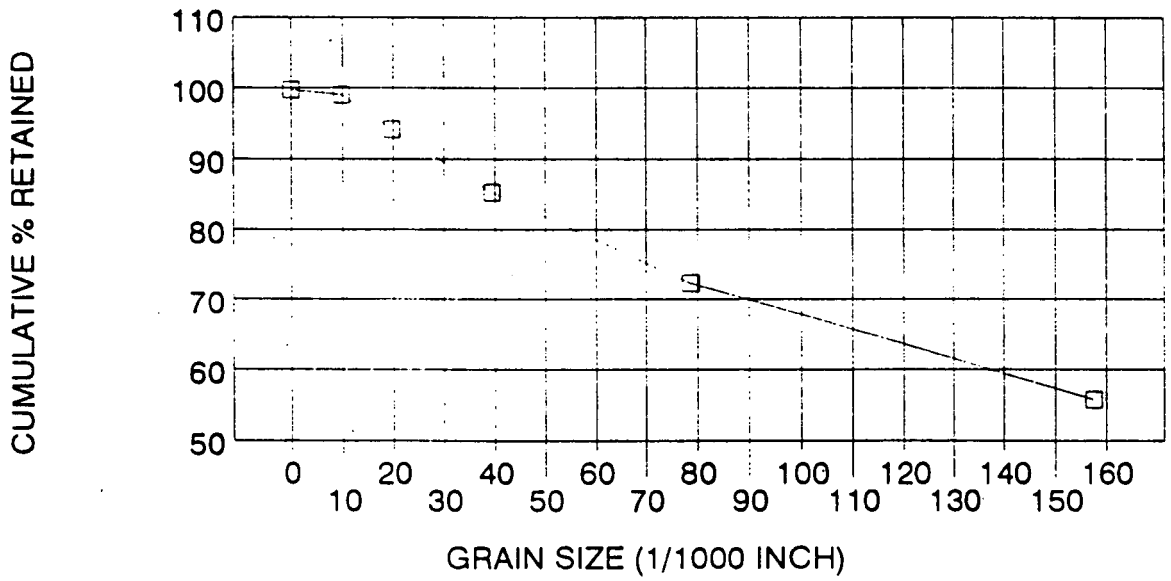
Boring No:	G2-SB-62
Sample No:	410072
Sample Depth:	1.5-5.0 ft

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	871.34	55.74	55.74	157.5	
2 mm	258.64	16.54	72.28	78.7	
1 mm	203.07	12.99	85.27	39.4	
0.5mm	138.83	8.88	94.15	19.7	
0.25 mm	76.21	4.87	99.03	9.8	
Pan	11.60	0.74	99.77	---	

SIEVE ANALYSIS
200194618



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%	29	Approved By:	[illegible]	12-29-95

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MODAL DIAMETER TESTING

Sample Number: 200194619
Customer Number: 410180
Batch Number: Sieve-95-060

Material: Soil

Boring No:	G2-155
Sample No:	410180
Sample Depth:	2.0-4.0 ft

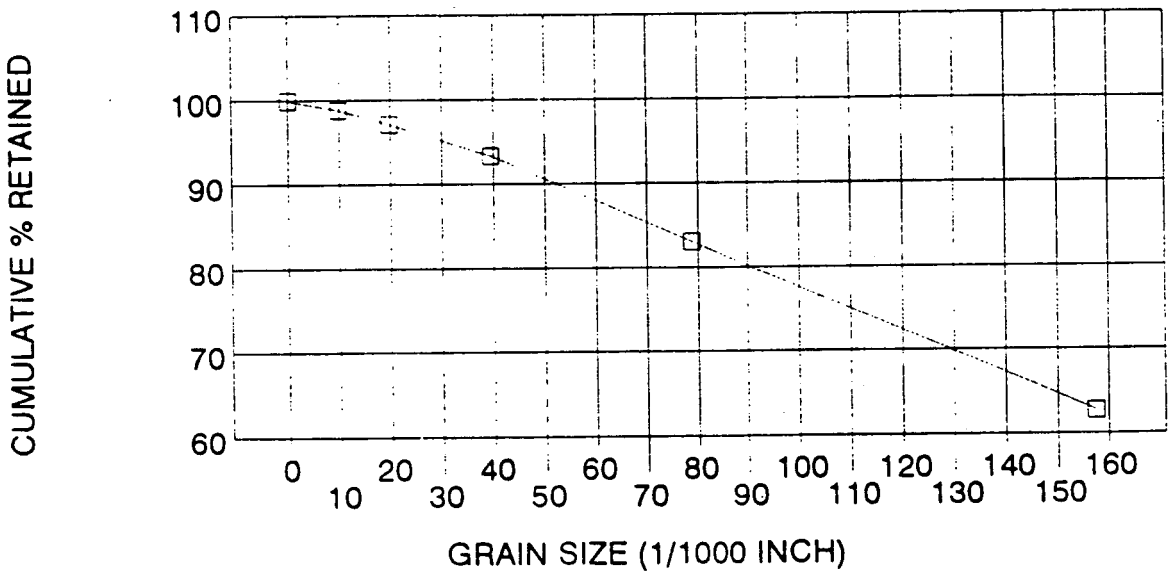
Sample Weight: 1608.83 grams

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	1008.67	62.70	62.70	157.5	
2 mm	327.14	20.33	83.03	78.7	
1 mm	165.82	10.31	93.34	39.4	
0.5mm	60.46	3.76	97.09	19.7	
0.25 mm	27.74	1.72	98.82	9.8	
Pan	17.88	1.11	99.93	---	

SIEVE ANALYSIS
200194619



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%	52	Approved By:	[illegible]	12-29-95

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000271

MODAL DIAMETER TESTING

Sample Number: 200194620
Customer Number: 410181
Batch Number: Sieve-95-060

Material: Soil

Boring No:	G2-155
Sample No:	410181
Sample Depth:	6.0-10.0 ft

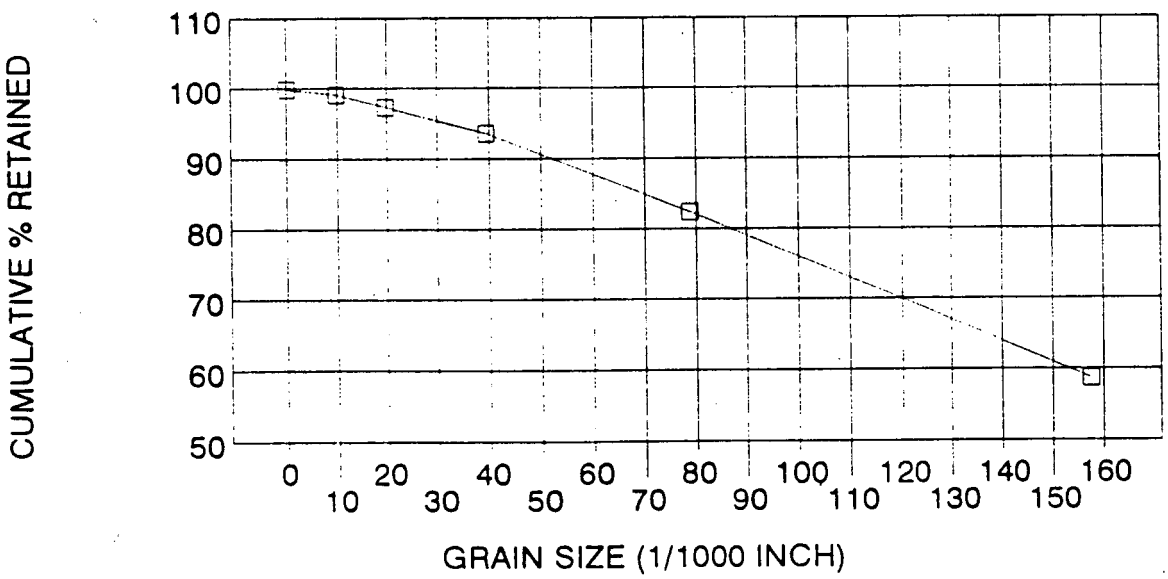
Sample Weight: 1618.4 grams

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	950.38	58.72	58.72	157.5	
2 mm	382.58	23.64	82.36	78.7	
1 mm	181.06	11.19	93.55	39.4	
0.5mm	59.81	3.70	97.25	19.7	
0.25 mm	29.69	1.83	99.08	9.8	
Pan	12.45	0.77	99.85	---	

SIEVE ANALYSIS
200194620



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%	52"	Approved By:	[illegible]	12-29-95

File: G:\EPM\SIEVE8

MODAL DIAMETER TESTING

Sample Number: 200194621
Customer Number: 410182
Batch Number: Sieve-95-060

Material: Soil

Boring No:	G2-155
Sample No:	410182
Sample Depth:	10.0-14.0 ft

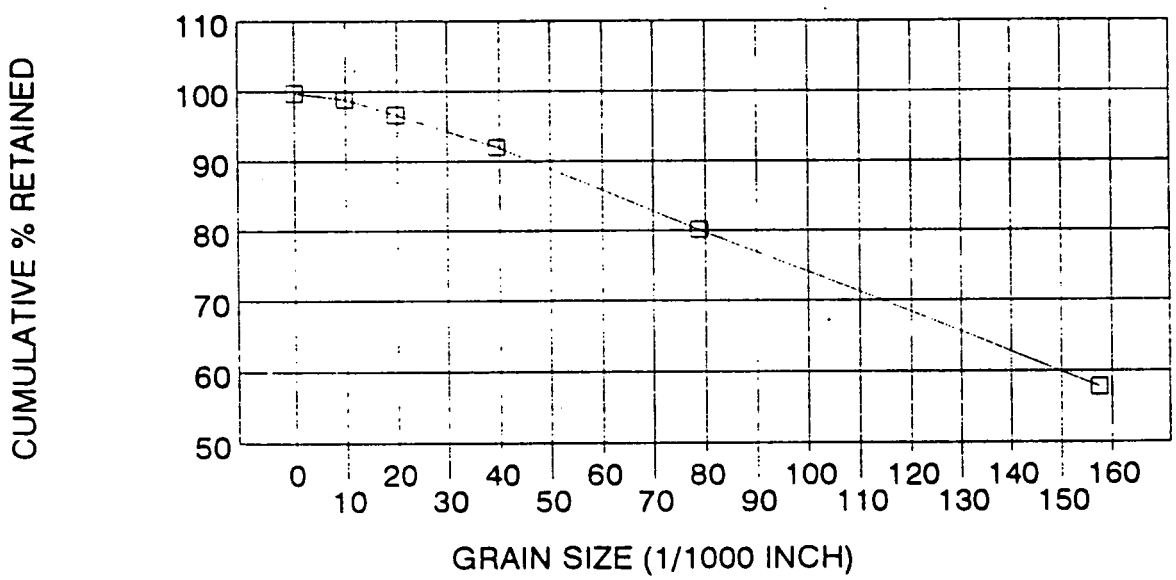
Sample Weight: 1549.01 grams

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	895.70	57.82	57.82	157.5	
2 mm	345.33	22.29	80.12	78.7	
1 mm	183.53	11.85	91.97	39.4	
0.5mm	71.88	4.64	96.61	19.7	
0.25 mm	34.41	2.22	98.83	9.8	
Pan	14.81	0.96	99.78	---	

SIEVE ANALYSIS
200194621



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%	46	Approved By:	[illegible]	12-29-95

File: G:EPM SIEVE8

000273

MODAL DIAMETER TESTING

Sample Number: 200194622
Customer Number: 410073
Batch Number: Sieve–95– 060

Material: Soil

Sample Weight: 1589.16 grams

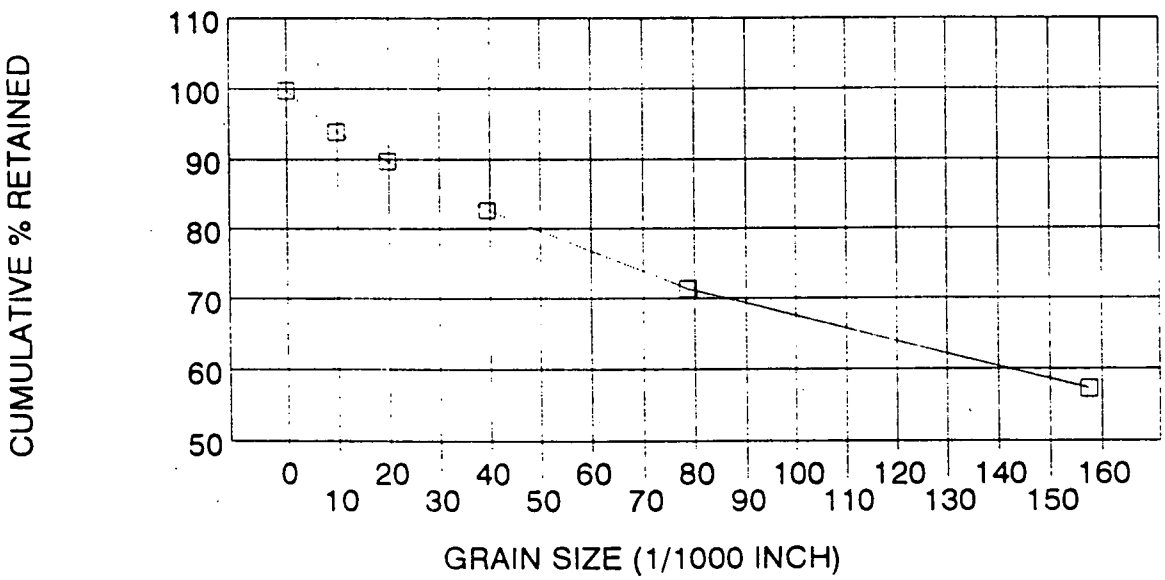
Boring No:	G2-SB-69
Sample No:	410073
Sample Depth:	1.5-5.0 ft

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	909.54	57.23	57.23	157.5	
2 mm	223.90	14.09	71.32	78.7	
1 mm	179.19	11.28	82.60	39.4	
0.5mm	112.94	7.11	89.71	19.7	
0.25 mm	65.95	4.15	93.86	9.8	
Pan	94.20	5.93	99.78	---	

SIEVE ANALYSIS
200194622



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%	19	Approved By:	[illegible]	12-29-95

File: G:\EPM\SIEVE8

MODAL DIAMETER TESTING

Sample Number: 200194623
Customer Number: 410266
Batch Number: Sieve-95-060

Material: Soil

Boring No:	G2-151
Sample No:	410266
Sample Depth:	2.0-6.0 ft

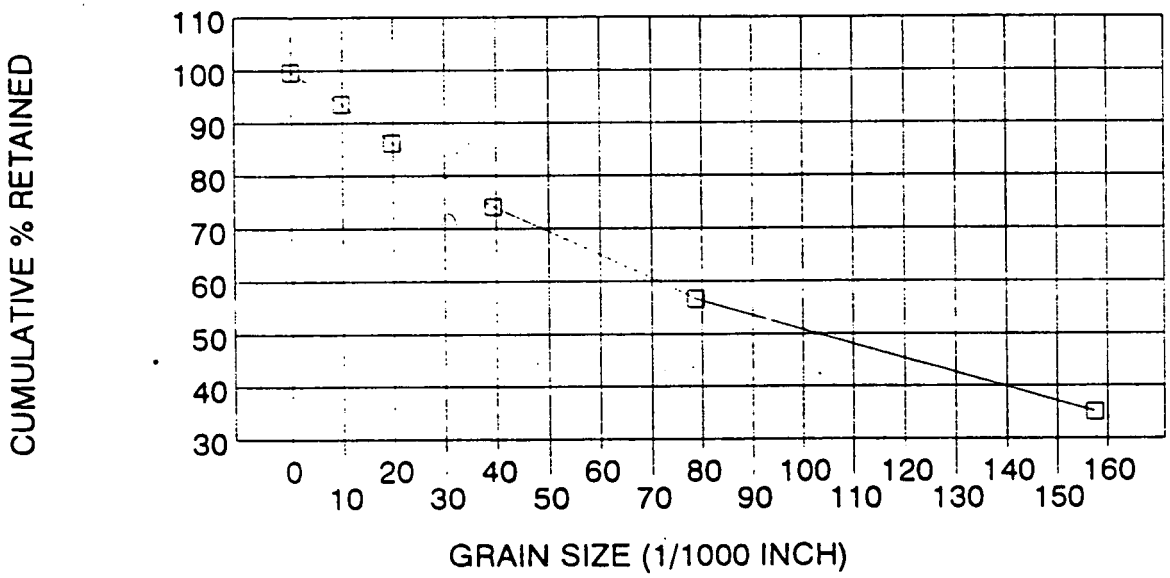
Sample Weight: 1687.57 grams

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	591.06	35.02	35.02	157.5	
2 mm	365.65	21.67	56.69	78.7	
1 mm	293.80	17.41	74.10	39.4	
0.5mm	204.70	12.13	86.23	19.7	
0.25 mm	124.44	7.37	93.61	9.8	
Pan	101.77	6.03	99.64	---	

SIEVE ANALYSIS
200194623



Grain Size Retained			Name	Date
40%	139	*Analyzed By:*	H.J.VOLK	12/28/95
50%	103	*Checked By:*	BBeagle	12-29-95
90%	15	*Approved By:*	BBeagle	12-29-95

File: G:\EPM\SIEVE8

000275

MODAL DIAMETER TESTING

Sample Number: 200194624
Customer Number: 410268
Batch Number: Sieve–95– 060

Material: Soil

Boring No:	G2-151
Sample No:	410268
Sample Depth:	6.0-10.0 ft

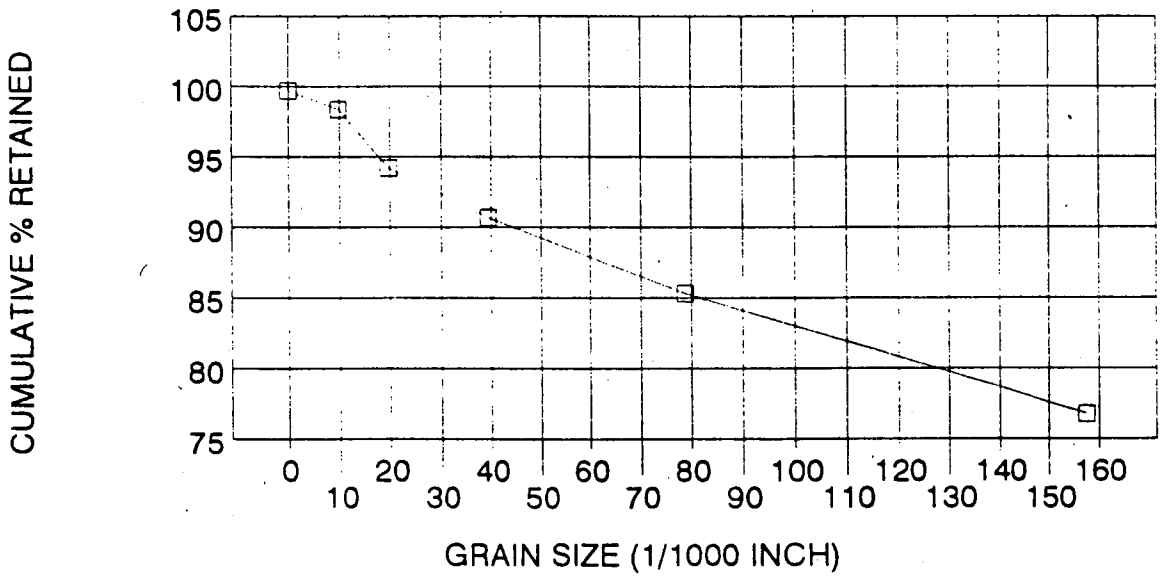
Sample Weight: 1699.06 grams

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	1304.48	76.78	76.78	157.5	
2 mm	144.77	8.52	85.30	78.7	
1 mm	91.33	5.38	90.67	39.4	
0.5mm	59.68	3.51	94.19	19.7	
0.25 mm	70.79	4.17	98.35	9.8	
Pan	23.16	1.36	99.71	---	

SIEVE ANALYSIS
200194624



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%	44	Approved By:	[illegible]	12-29-95

File: G:EPMSIEVE8

MODAL DIAMETER TESTING

Sample Number: 200194625
Customer Number: 410271
Batch Number: Sieve–95– 060

Material: Soil

Boring No:	G2-151
Sample No:	410271
Sample Depth:	10.0-14.0 ft

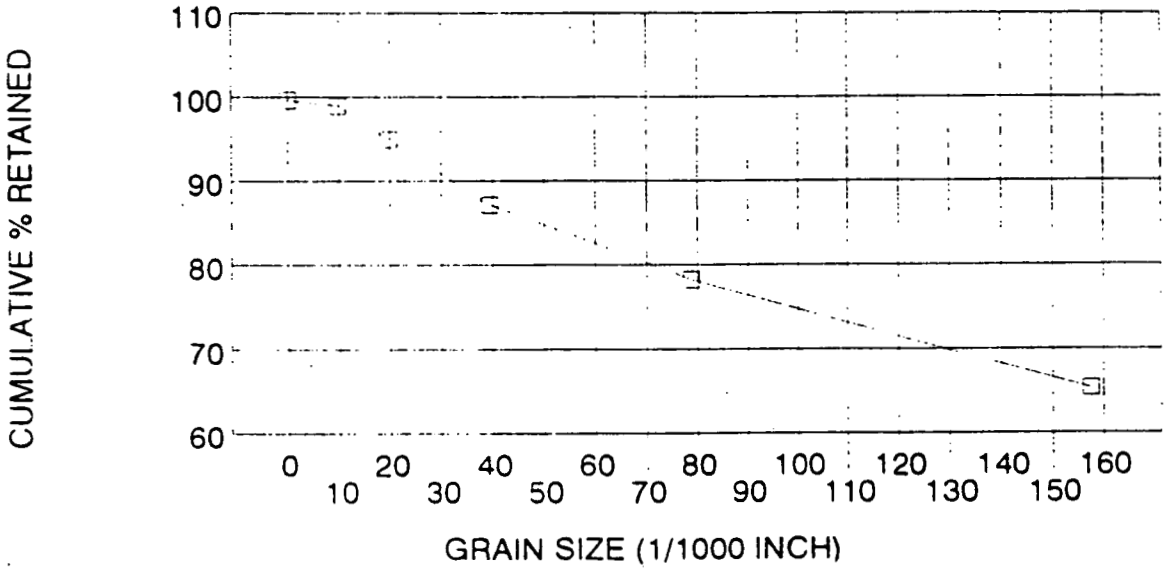
Sample Weight: 1621.1 grams

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	1059.34	65.35	65.35	157.5	
2 mm	208.30	12.85	78.20	78.7	
1 mm	144.64	8.92	87.12	39.4	
0.5mm	127.27	7.85	94.97	19.7	
0.25 mm	65.30	4.03	99.00	9.8	
Pan	10.62	0.66	99.65	---	

SIEVE ANALYSIS
200194625



Grain Size Retained	
40%	7157.5
50%	7157.5
90%	32

	Name	Date
Analyzed By:	H.J.VOLK	12/28/95
Checked By:	[illegible]	12.29.95
Approved By:	[illegible]	12.29.95

File: G:EPMSIEVES

000277

MODAL DIAMETER TESTING

Sample Number: 200194626
Customer Number: 410278
Batch Number: Sieve-95-060

Material: Soil

Boring No:	G2-152
Sample No:	410278
Sample Depth:	2.0-6.0 ft

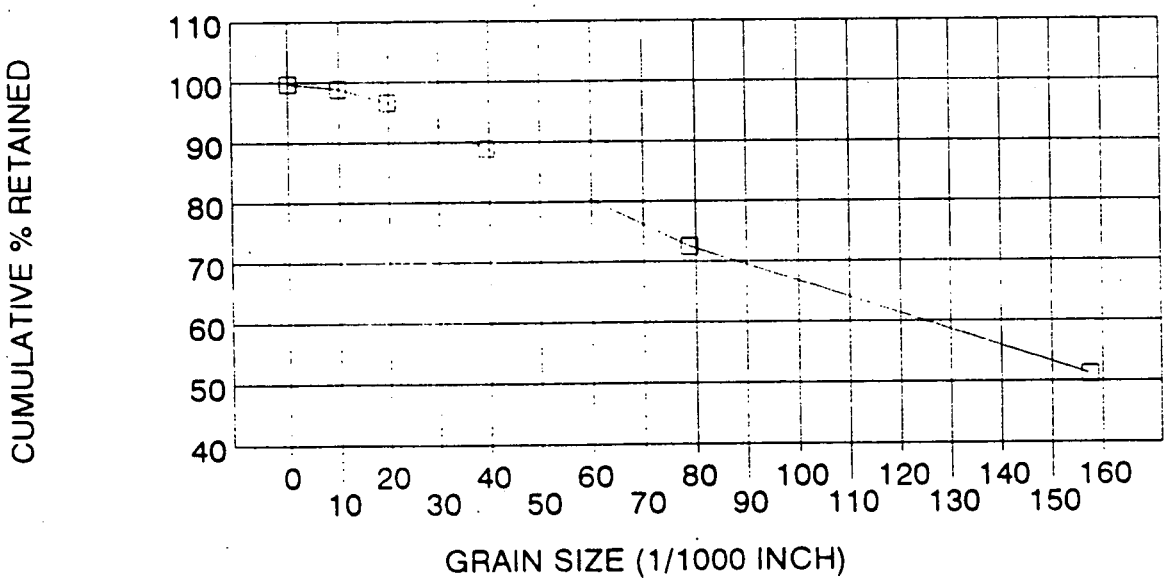
Sample Weight: 1700.27 grams

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	869.96	51.17	51.17	157.5	
2 mm	363.01	21.35	72.52	78.7	
1 mm	277.20	16.30	88.82	39.4	
0.5mm	132.65	7.80	96.62	19.7	
0.25 mm	39.52	2.32	98.95	9.8	
Pan	13.94	0.82	99.77	---	

SIEVE ANALYSIS
200194626



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%	36	Approved By:	[illegible]	12-29-95

File: G:EPM SIEVE8

MODAL DIAMETER TESTING

Sample Number: 200194627
Customer Number: 410280
Batch Number: Sieve-95-060

Material: Soil

Boring No:	G2-152
Sample No:	410280
Sample Depth:	6.0-10.0 ft

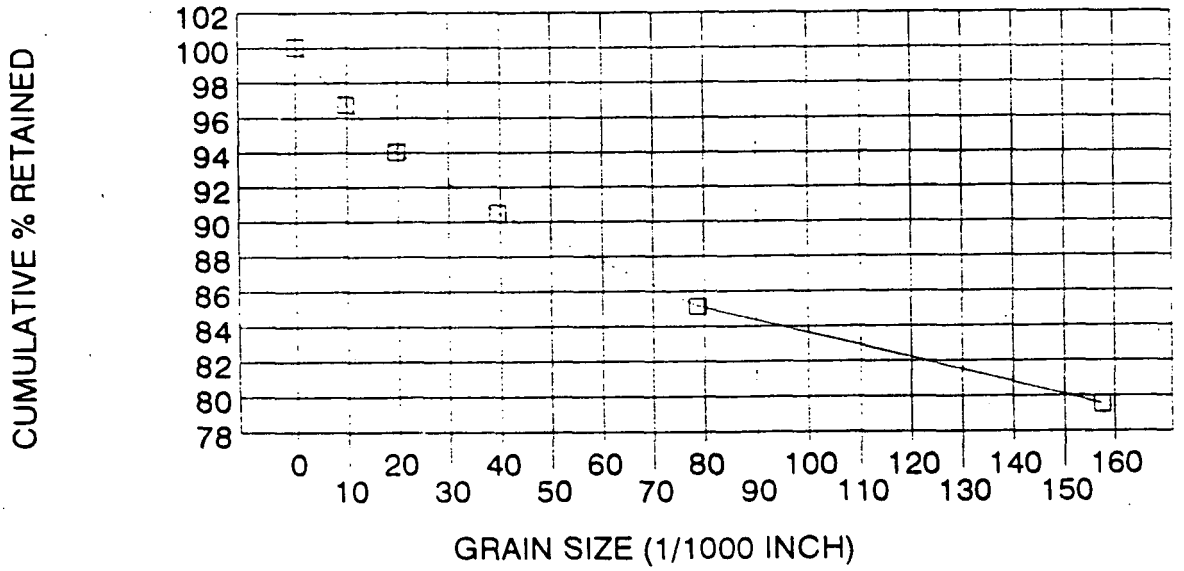
Sample Weight: 1719.71 grams

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	1367.67	79.53	79.53	157.5	
2 mm	96.04	5.58	85.11	78.7	
1 mm	92.14	5.36	90.47	39.4	
0.5mm	61.05	3.55	94.02	19.7	
0.25 mm	46.61	2.71	96.73	9.8	
Pan	56.75	3.30	100.03	---	

SIEVE ANALYSIS
200194627



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%	43	Approved By:	[illegible]	12-29-95

File: G:\EPM\SIEVE8

000279

MODAL DIAMETER TESTING

Sample Number: 200194628
Customer Number: 410283
Batch Number: Sieve-95-060

Material: Soil

Boring No:	G2-152
Sample No:	410283
Sample Depth:	10.0-14.0 ft

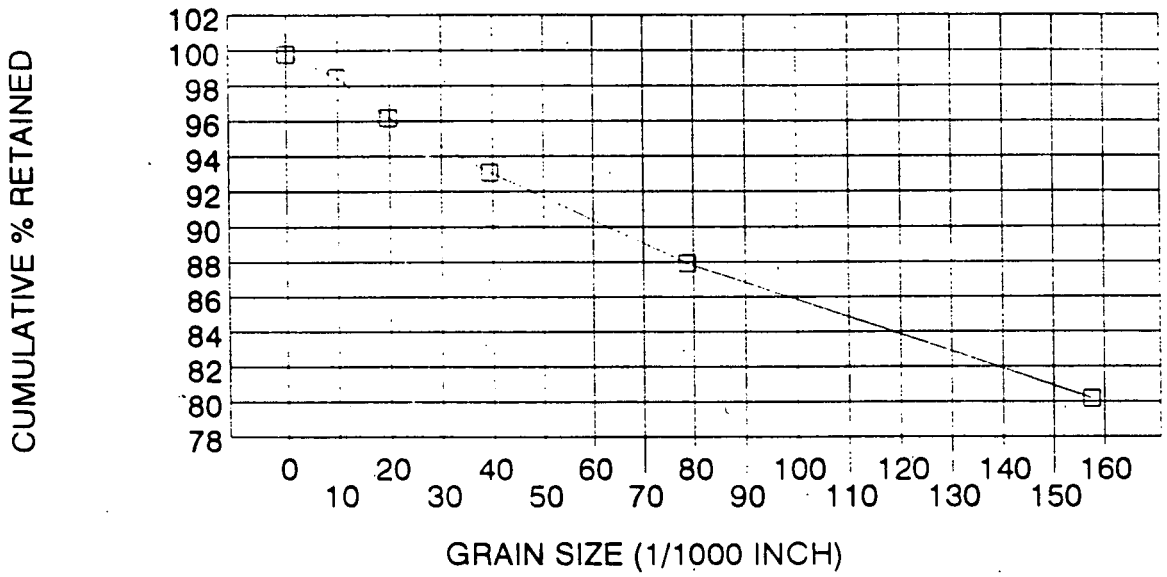
Sample Weight: 1675.75 grams

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	1343.55	80.18	80.18	157.5	
2 mm	129.58	7.73	87.91	78.7	
1 mm	86.15	5.14	93.05	39.4	
0.5mm	52.13	3.11	96.16	19.7	
0.25 mm	38.18	2.28	98.44	9.8	
Pan	22.32	1.33	99.77	---	

SIEVE ANALYSIS
200194628



Grain Size Retained			Name	Date
40%	71.57.5	Analyzed By:	H.J.VOLK	12/28/95
50%	71.57.5	Checked By:	[illegible]	12-29-95
90%	63	Approved By:	[illegible]	12-29-95

File: G:\EPM\SIEVE8

MODAL DIAMETER TESTING

Sample Number: 200194629
Customer Number: 410288
Batch Number: Sieve–95– 060

Material: Soil

Boring No:	G2-153
Sample No:	410288
Sample Depth:	2.0-6.0 ft

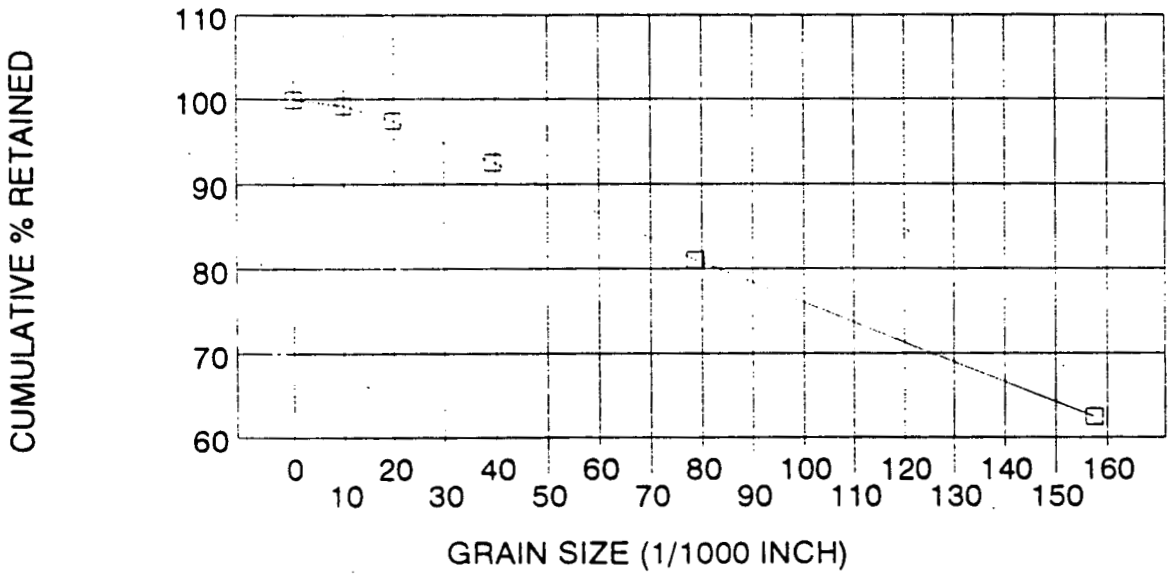
Sample Weight: 1632.75 grams

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	1018.66	62.39	62.39	157.5	
2 mm	304.06	18.62	81.01	78.7	
1 mm	188.15	11.52	92.54	39.4	
0.5mm	80.57	4.93	97.47	19.7	
0.25 mm	28.35	1.74	99.21	9.8	
Pan	11.64	0.71	99.92	---	

SIEVE ANALYSIS
200194629



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%	48	Approved By:	[illegible]	12-29-95

File: G:\EPM\SIEVE8

000281

MODAL DIAMETER TESTING

Sample Number: 200194630
Customer Number: 410290
Batch Number: Sieve-95-060

Material: Soil

Boring No:	G2-153
Sample No:	410290
Sample Depth:	6.0-10.0 ft

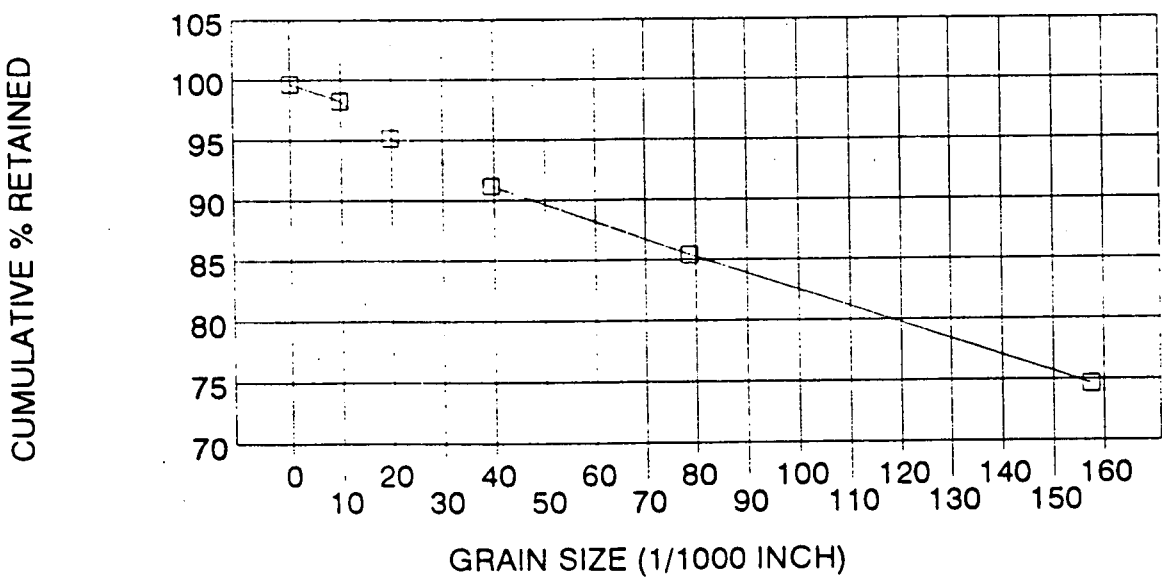
Sample Weight: 1678.33 grams

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	1253.13	74.67	74.67	157.5	
2 mm	180.14	10.73	85.40	78.7	
1 mm	96.65	5.76	91.16	39.4	
0.5mm	66.91	3.99	95.14	19.7	
0.25 mm	52.08	3.10	98.25	9.8	
Pan	23.67	1.41	99.66	---	

SIEVE ANALYSIS
200194630



Grain Size Retained			Name	Date
40%	157.5	Analyzed By:	H.J.VOLK	12/28/95
50%	157.5	Checked By:	B Bigle	12-29-95
90%	47	Approved By:	B Bigle	12-29-95

File: G:EPM\SIEVE8

MODAL DIAMETER TESTING

Sample Number: 200194631
Customer Number: 410293
Batch Number: Sieve–95– 060

Material: Soil

Sample Weight: 1544.68 grams

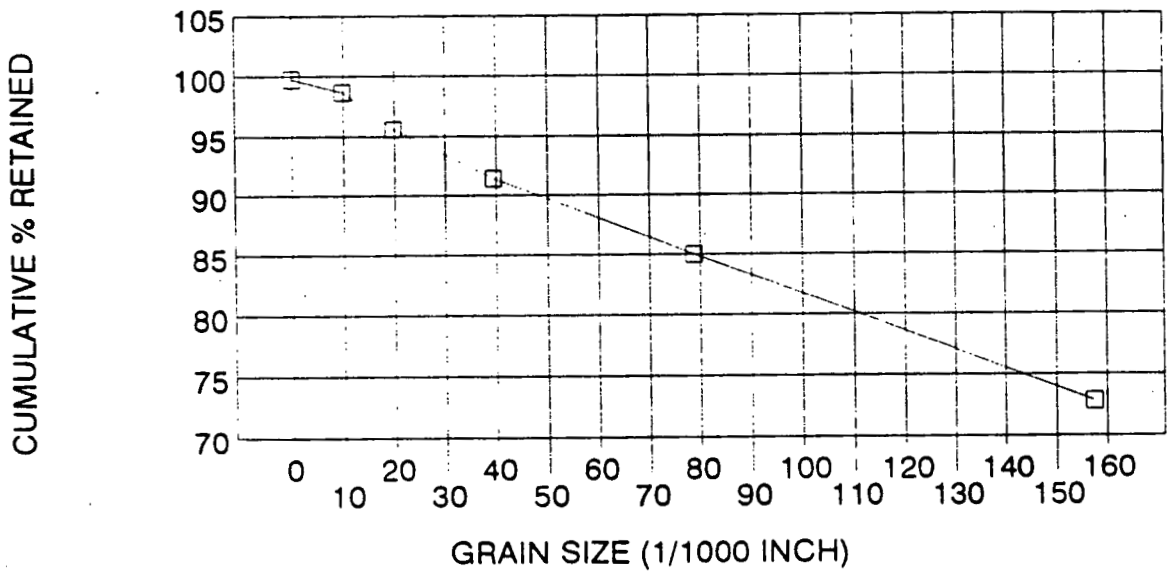
Boring No:	G2-153
Sample No:	410293
Sample Depth:	10.0-14.0 ft

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	1125.44	72.86	72.86	157.5	
2 mm	187.73	12.15	85.01	78.7	
1 mm	98.57	6.38	91.39	39.4	
0.5mm	64.57	4.18	95.57	19.7	
0.25 mm	47.52	3.08	98.65	9.8	
Pan	16.81	1.09	99.74	---	

SIEVE ANALYSIS
200194631



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%	48	Approved By:	[illegible]	12-29-95

File: G:\EPM\SIEVE8

APPENDIX E

COMPACTION CURVES

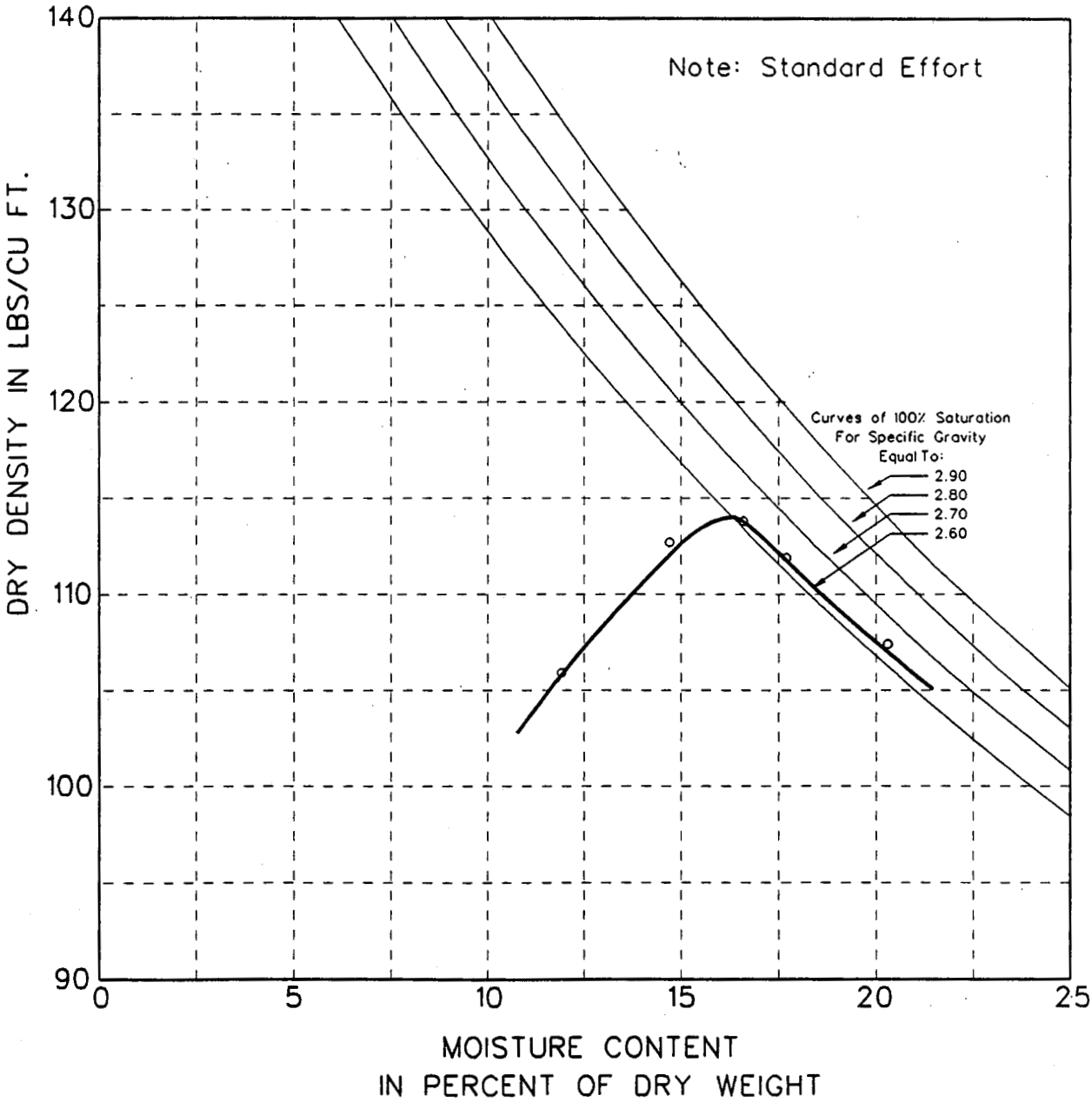
Boring: G2-SB-50 Sample Number: 409811 Depth: 1.5-5.0 ft

Description: Dark Yellowish Brown Lean Clay with Sand [CL]

Optimum Moisture Content: 16.3% Maximum Dry Density: 114.0 lbs/ft^3

Specific Gravity: 2.75 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/08/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/OU2/P0154/P0154/DGN/BMP/409811C.DGN (SKX04116)

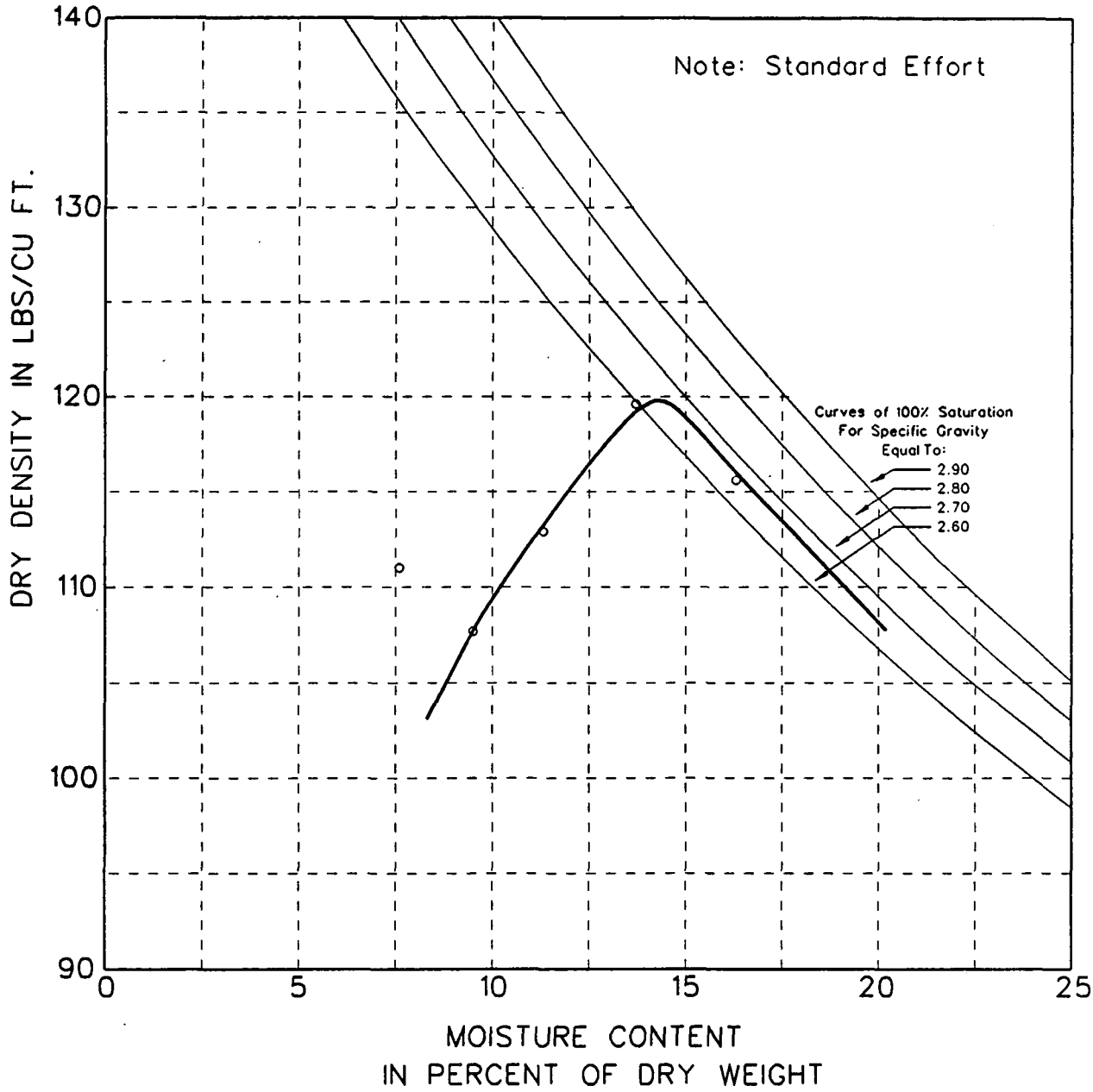
Boring: G2-SB-50 Sample Number: 409812 Depth: 5.0-10.0 ft

Description: Dark Yellowish Brown Lean Clay with Sand [CL]

Optimum Moisture Content: 14.3% Maximum Dry Density: 119.8 lbs/ft^3

Specific Gravity: 2.69 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/05/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/OU2/P0154/P0154/DGN/BMP/409812C.DGN (SKX04117)

000286

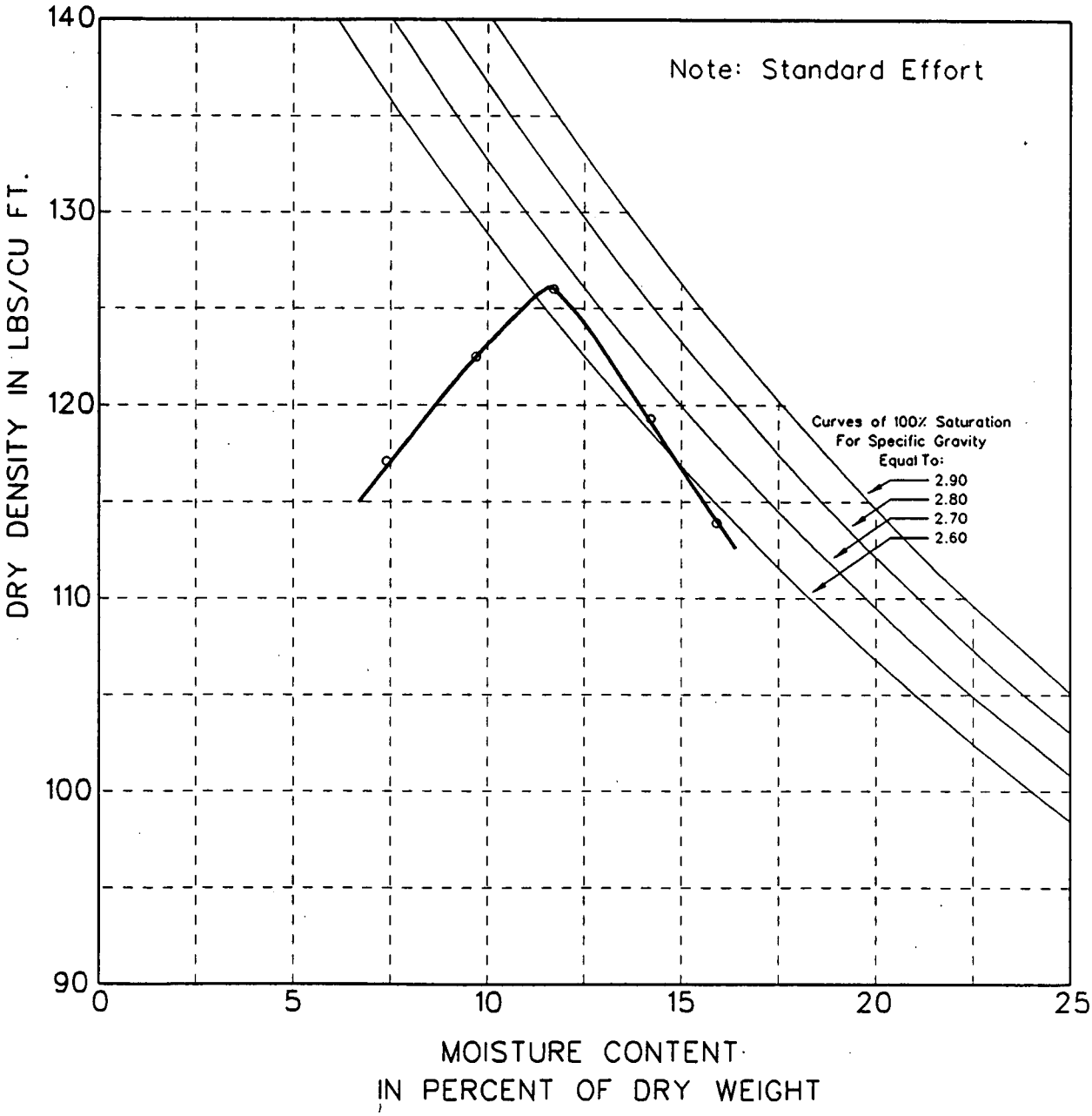
Boring: G2-SB-51 Sample Number: 411165 Depth: 5.0-10.0 ft

Description: Yellowish Brown Sandy Lean Clay with Gravel [CL]

Optimum Moisture Content: 11.6% Maximum Dry Density: 126.1 lbs/ft^3

Specific Gravity: 2.70 Compaction Method: ASTM D 698 Method B

Lab: Advanced Terra Testing, Inc. Date Tested: 11/22/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/002/P0154/P0154/DGN/B&P/411165C.DGN (SK:X04187)

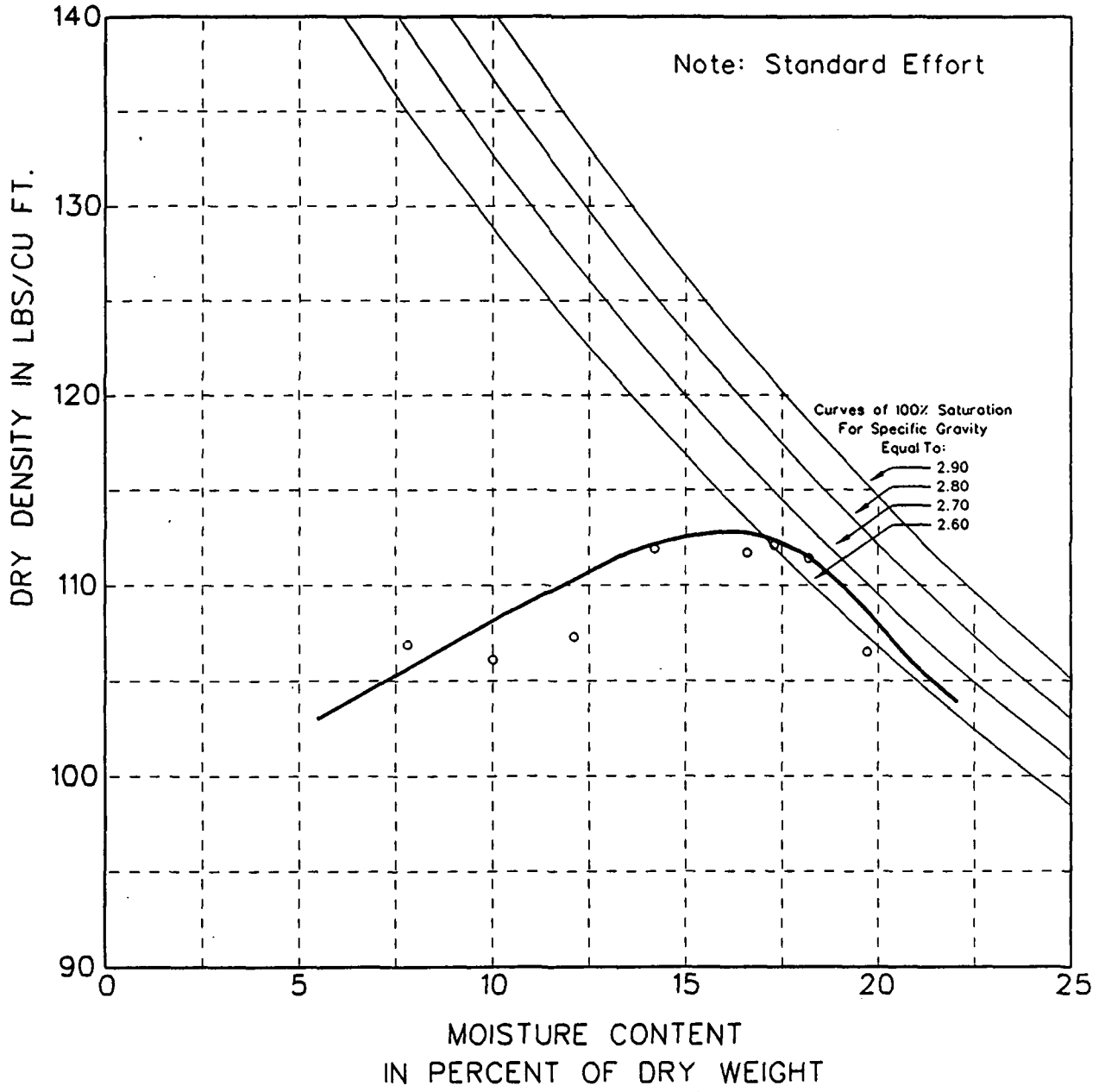
Boring: G2-SB-53 Sample Number: 409815 Depth: 1.5-5.0 ft

Description: Yellowish Brown Lean Clay [CL]

Optimum Moisture Content: 16.2% Maximum Dry Density: 112.8 lbs/ft^3

Specific Gravity: 2.72 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 9/28/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/OU2/P0154/DGN/BaP/409815C.DGN (SK10418)

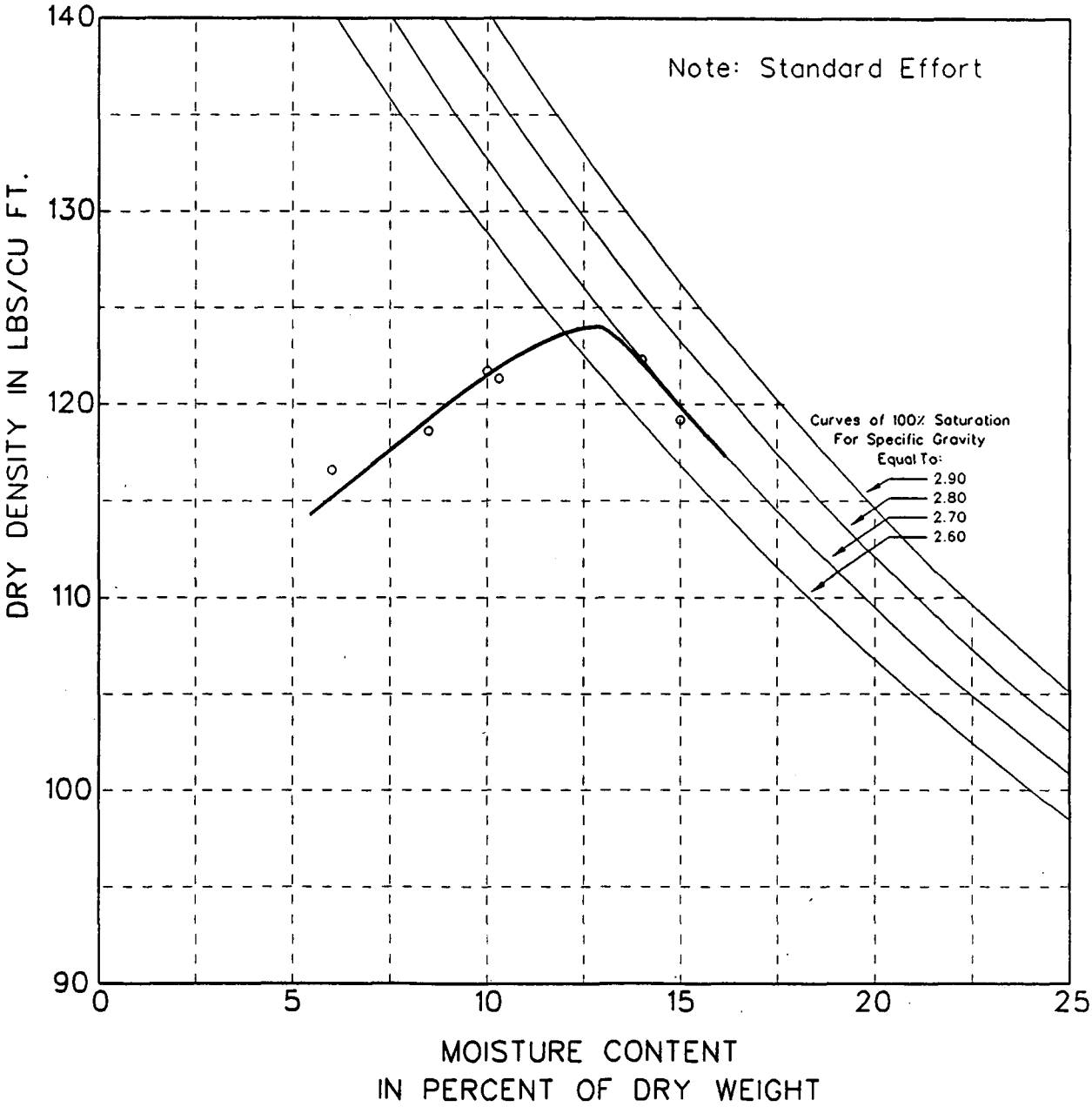
Boring: G2-SB-55 Sample Number: 409831 Depth: 1.5-5.0 ft

Description: Brownish Yellow Sandy Lean Clay [CL]

Optimum Moisture Content: 12.8% Maximum Dry Density: 124.0 lbs/ft^3

Specific Gravity: 2.80 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 9/28/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/OU2/P0154/DGN/BMP/409831C.DGN (SKX04125)

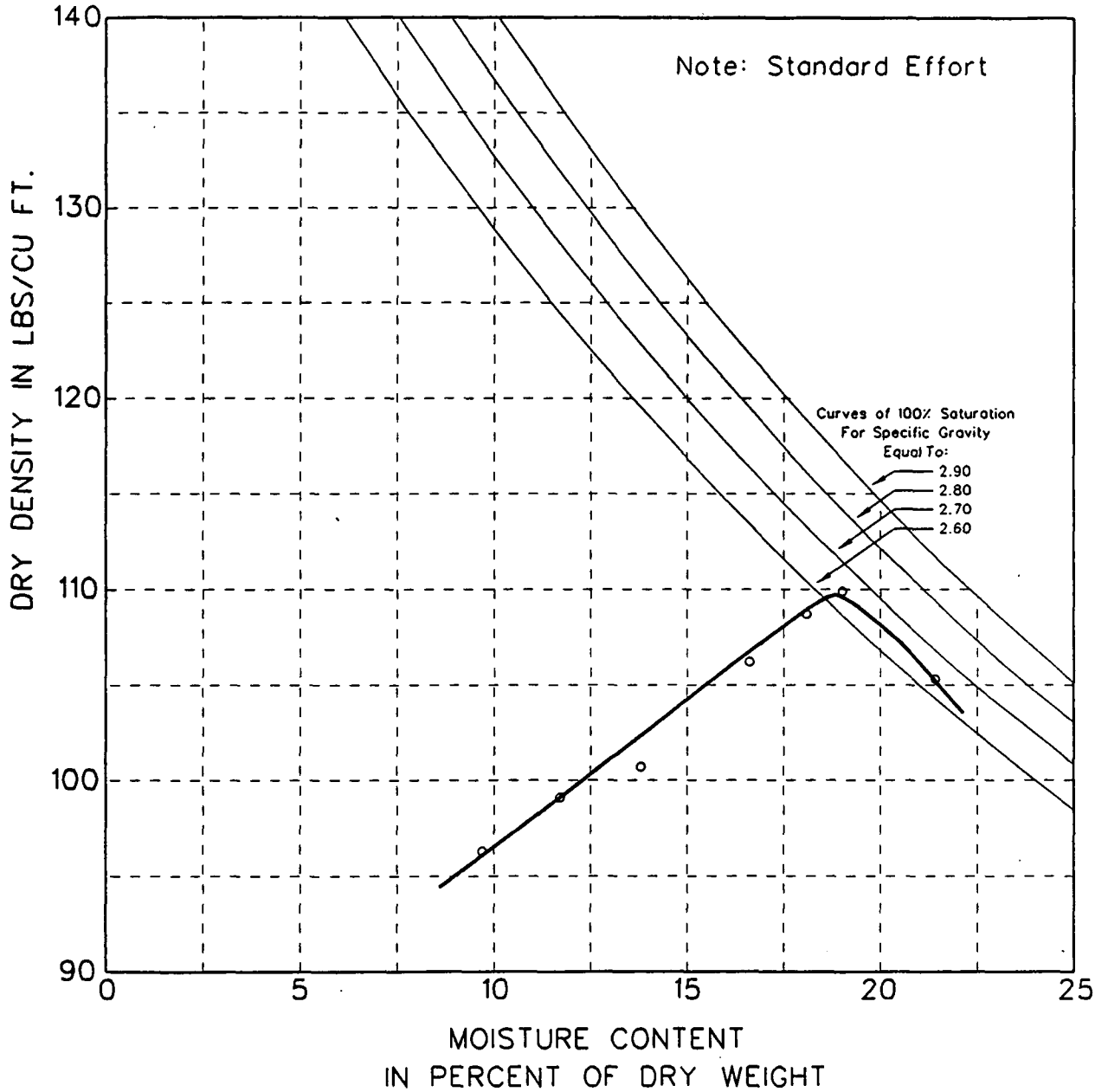
Boring: G2-SB-57 Sample Number: 409823 Depth: 1.5-5.0 ft

Description: Dark Yellowish Brown Lean Clay [CL]

Optimum Moisture Content: 18.8% Maximum Dry Density: 109.7 lbs/ft^3

Specific Gravity: 2.69 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/08/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/OU2/PO154/PO154/DGN/BMP/409823C.DGN (SKX04120)

000290

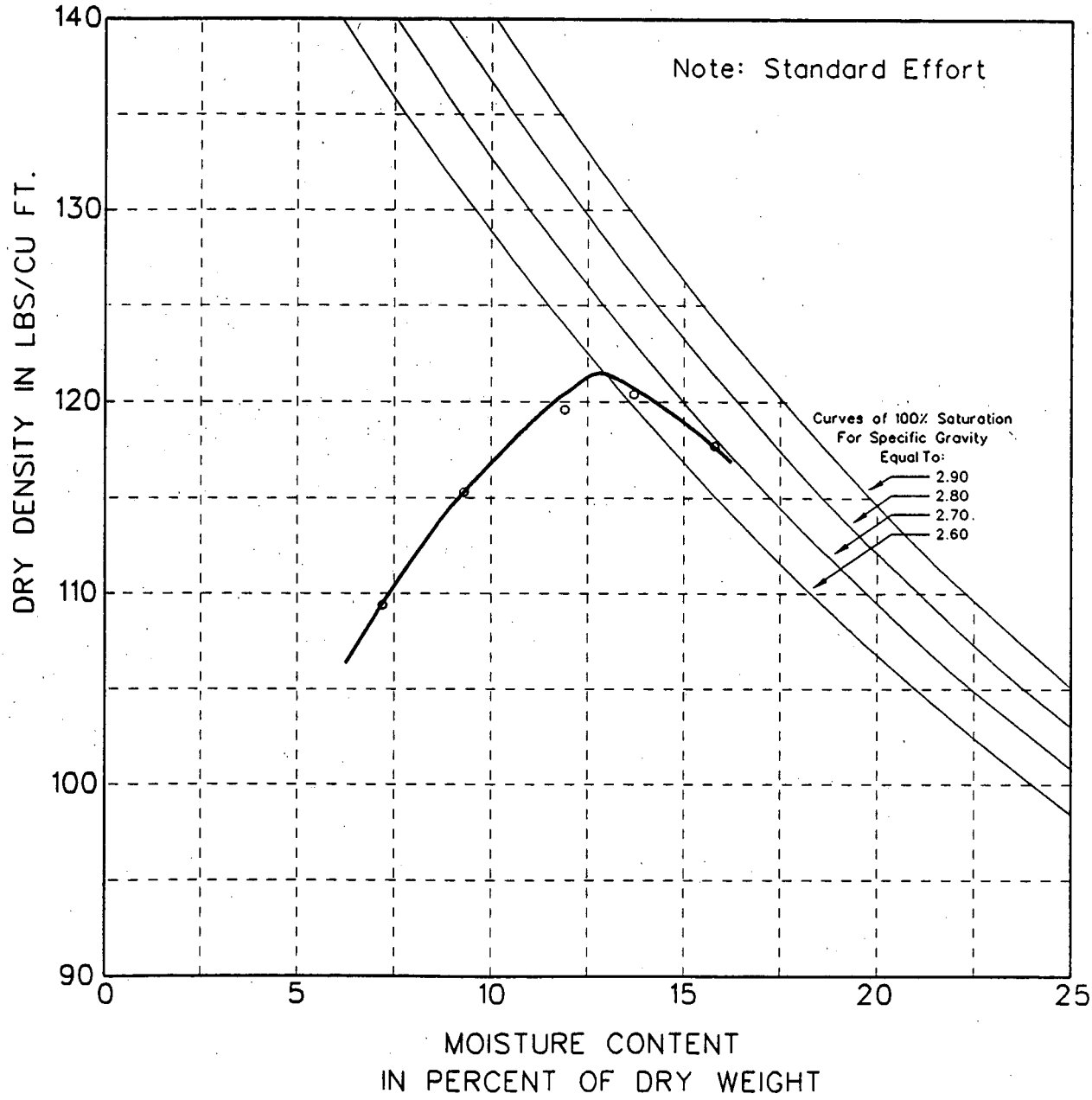
Boring: G2-SB-57 Sample Number: 409824 Depth: 5.0-10.0 ft

Description: Yellowish Brown Sandy Lean Clay with Gravel [CL]

Optimum Moisture Content: 12.8% Maximum Dry Density: 121.5 lbs/ft^3

Specific Gravity: 2.76 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 9/11/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/OU2/PO154/PO154/DGN/BMP/409824C.DGN (SKK04121)

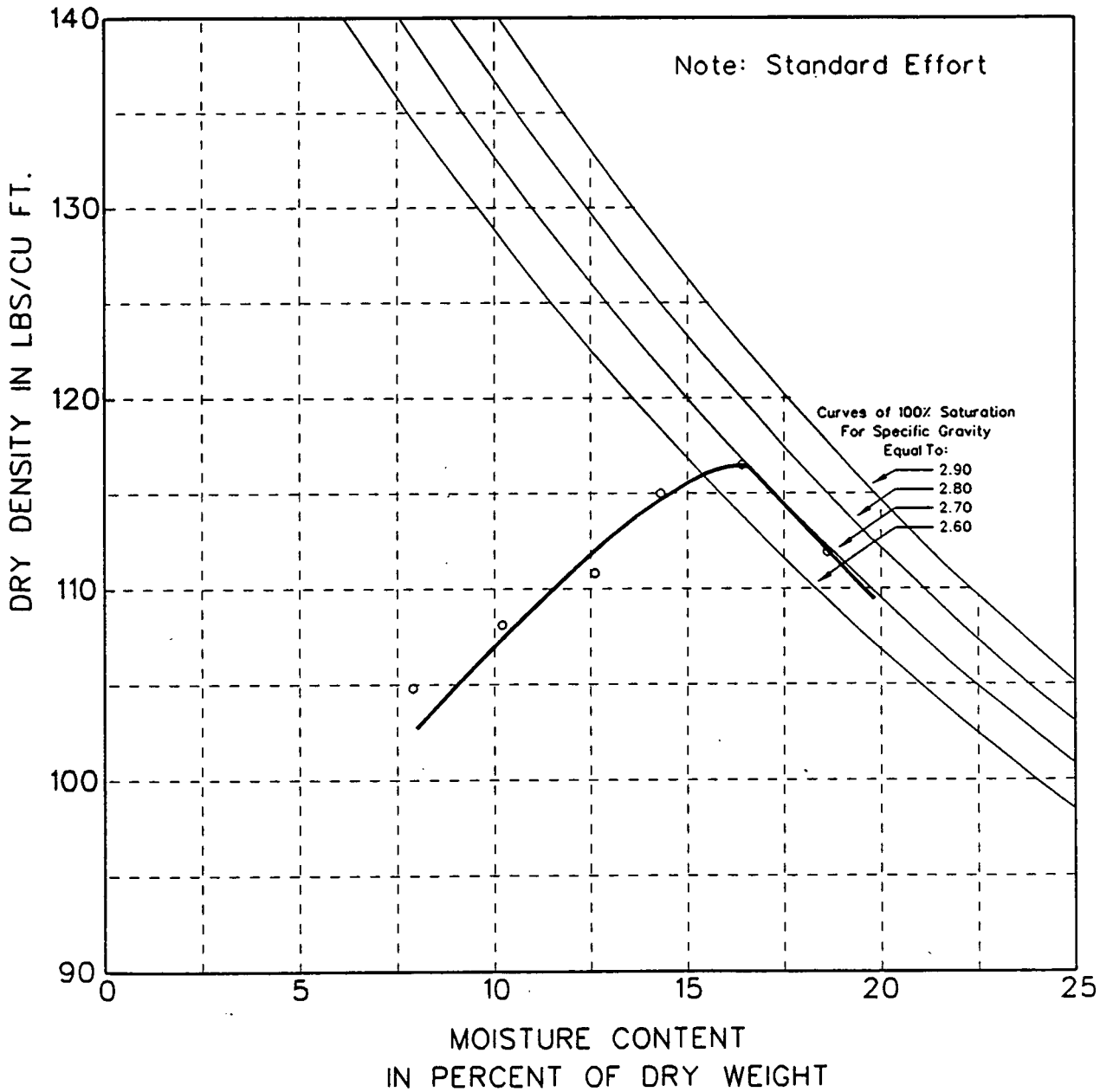
Boring: G2-SB-59 Sample Number: 409819 Depth: 1.5-5.0 ft

Description: Dark Yellowish Brown Lean Clay with Sand [CL]

Optimum Moisture Content: 16.4% Maximum Dry Density: 116.5 lbs/ft^3

Specific Gravity: 2.69 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 9/25/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/002/P0154/DGN/BMP/409819C.DGN (SK104119)

000292

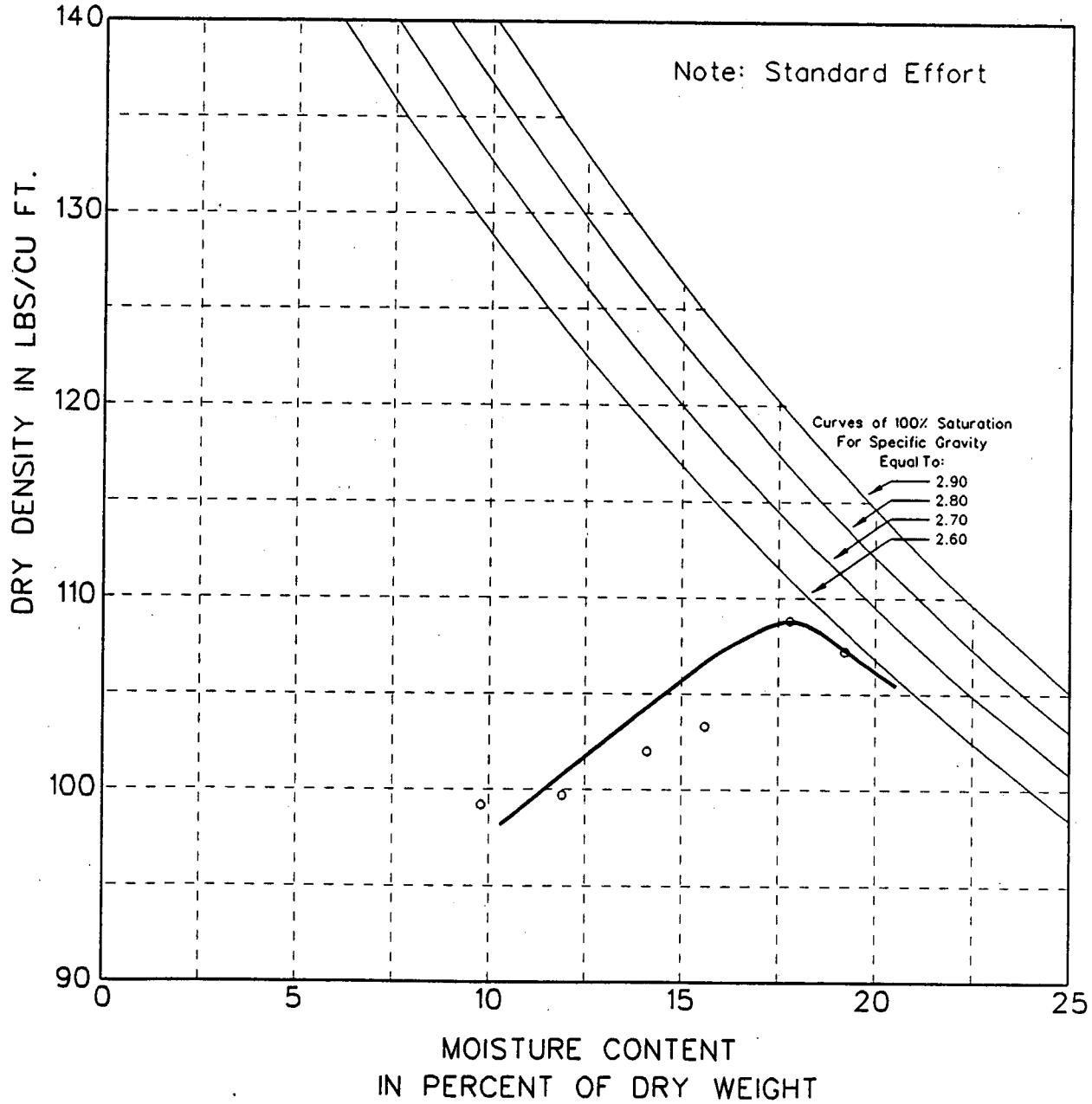
Boring: G2-SB-61 Sample Number: 409827 Depth: 1.5-5.0 ft

Description: Dark Yellowish Brown Lean Clay with Sand [CL]

Optimum Moisture Content: 17.8% Maximum Dry Density: 108.8 lbs/ft^3

Specific Gravity: 2.75 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/04/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/002/P0154/P0154/DGN/BMP/409827C.DGN (SKX04122)

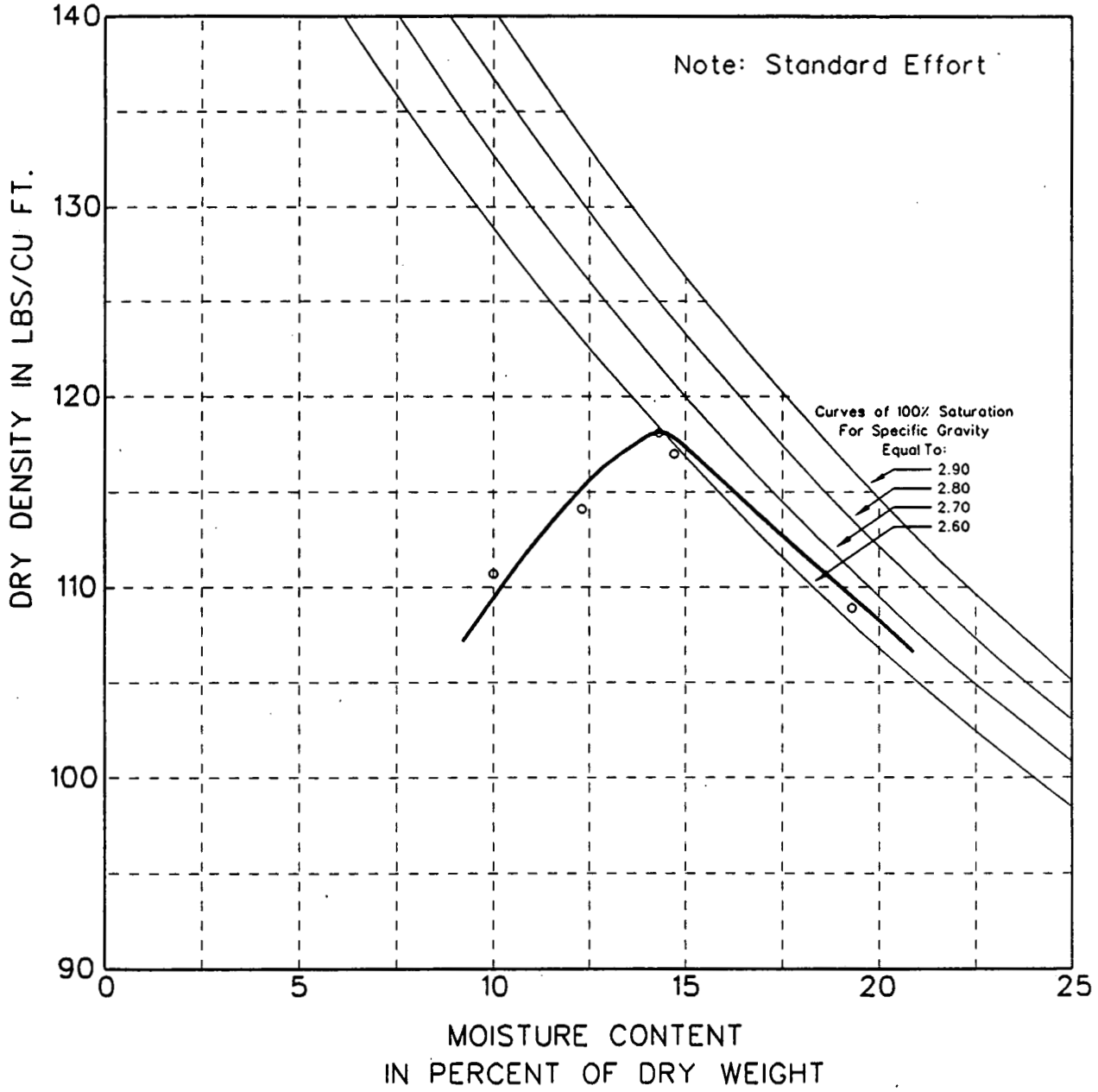
Boring: G2-SB-64 Sample Number: 409835 Depth: 1.5-5.0 ft

Description: Light Olive Brown Lean Clay with Sand [CL]

Optimum Moisture Content: 14.3% Maximum Dry Density: 118.1 lbs/ft^3

Specific Gravity: 2.79 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/09/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/0U2/P0154/DGN/BMP/409835C.DGN (SKX04126)

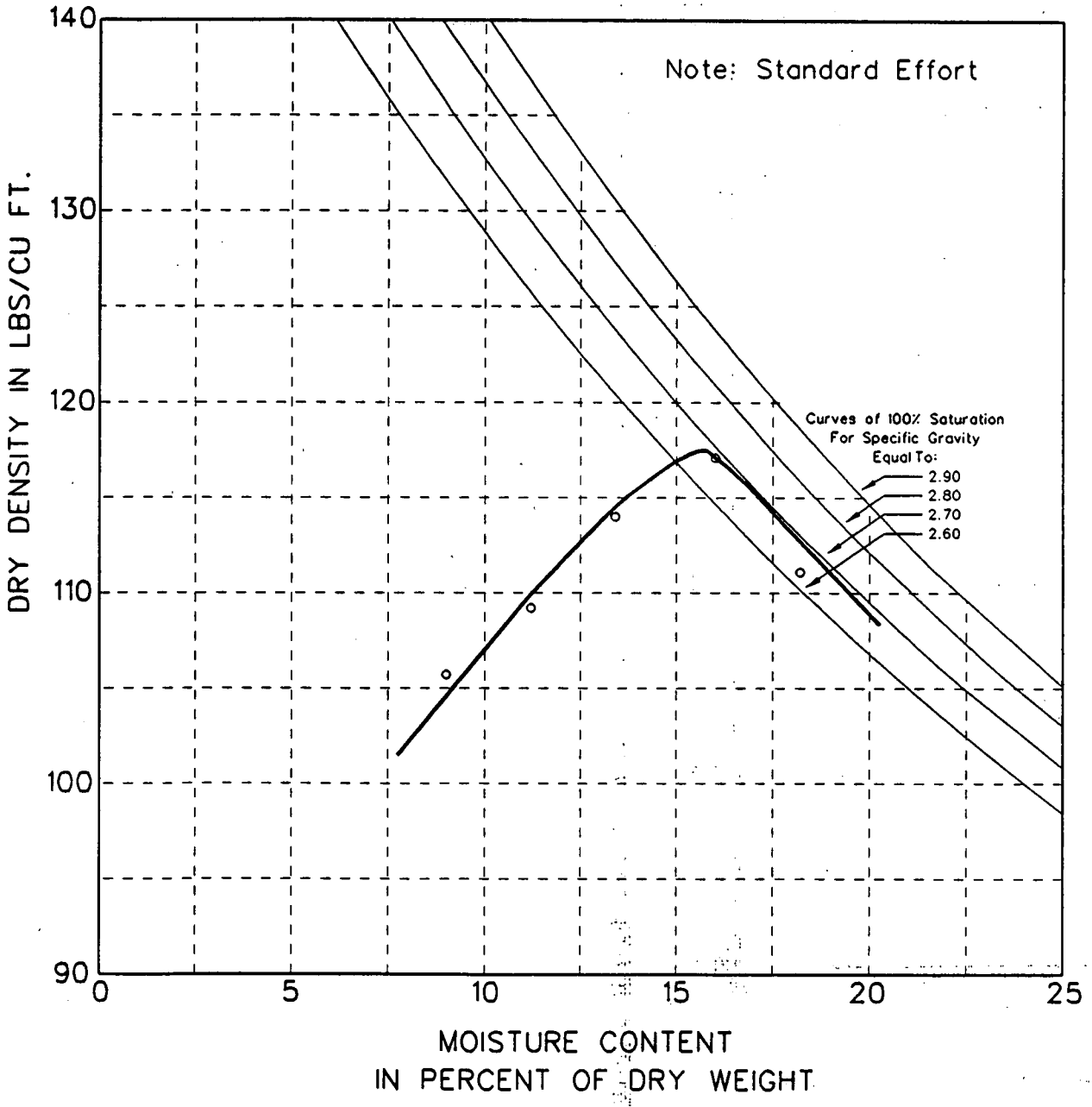
Boring: G2-SB-66 Sample Number: 409839 Depth: 1.5-5.0 ft

Description: Yellowish Brown Lean Clay with Sand [CL]

Optimum Moisture Content: 15.7% Maximum Dry Density: 117.5 lbs/ft^3

Specific Gravity: 2.68 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/05/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/002/P0154/P0154/DGN/BMP/409839C.DGN (SKX04127)

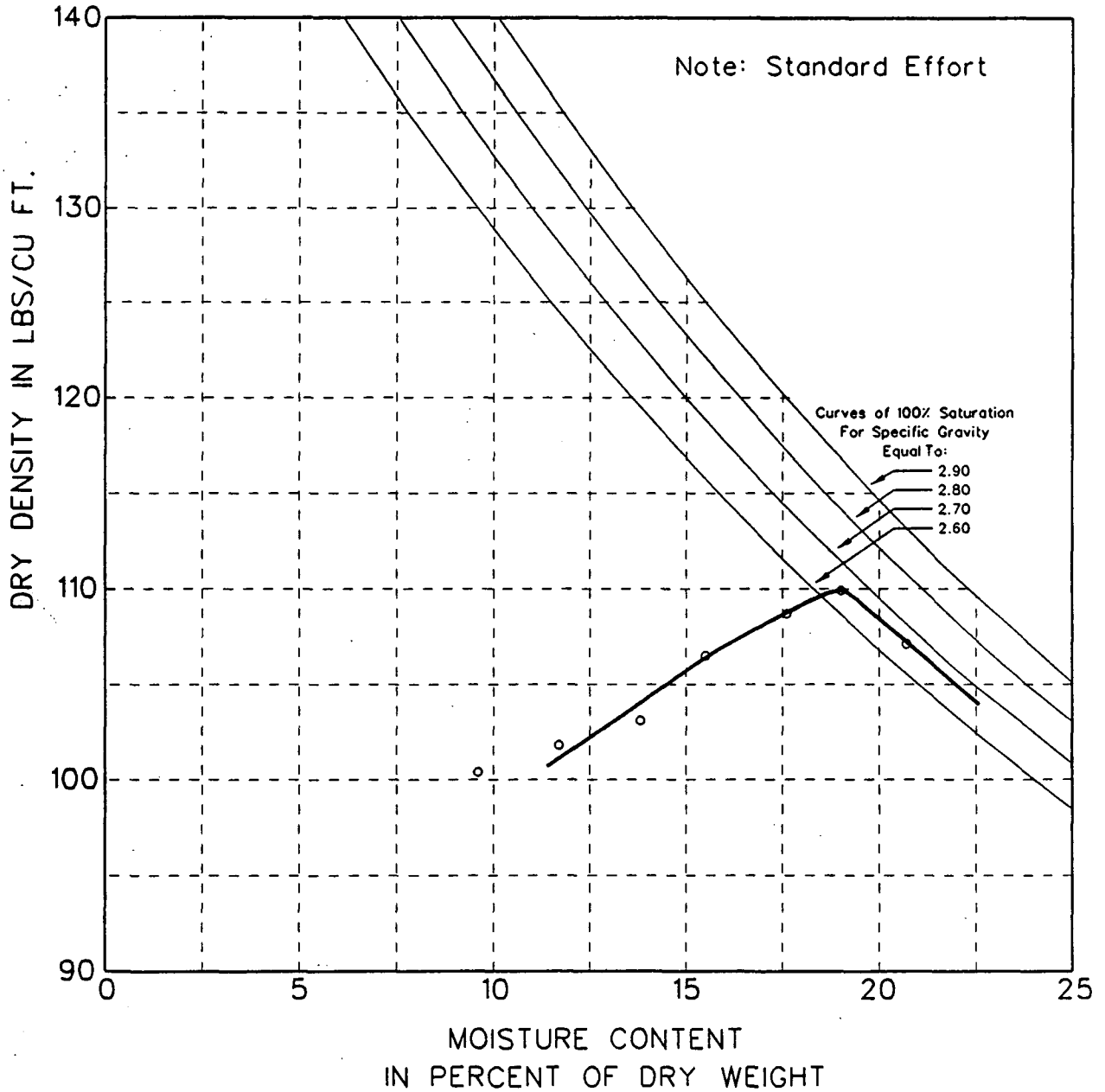
Boring: G2-SB-68 Sample Number: 409843 Depth: 1.5-5.0 ft

Description: Dark Yellowish Brown Lean Clay [CL]

Optimum Moisture Content: 19.0% Maximum Dry Density: 109.9 lbs/ft^3

Specific Gravity: 2.69 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/06/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/002/P0154/P0154/DGN/BMP/409843C.DGN (SKX04128)

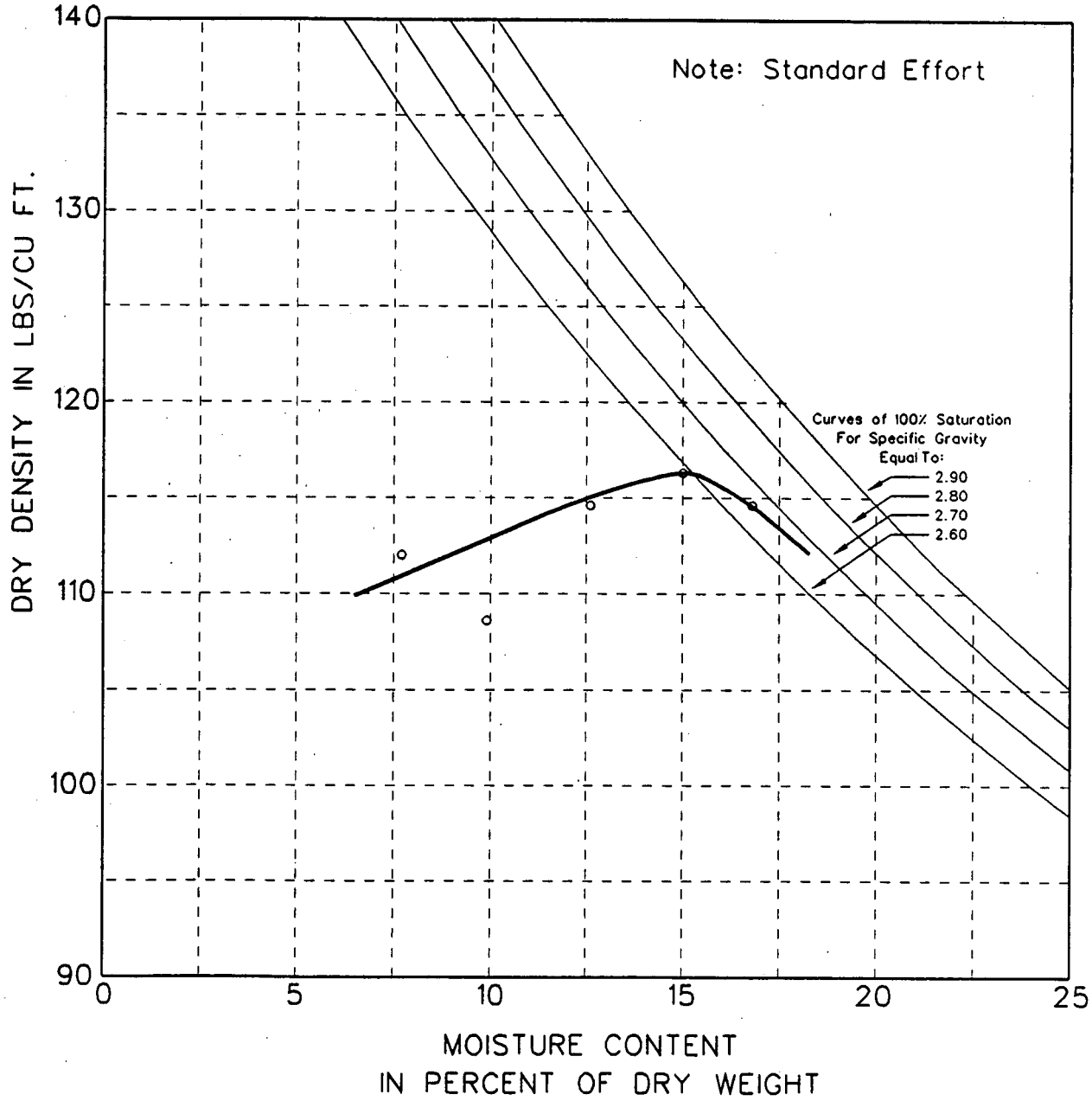
Boring: G2-SB-68 Sample Number: 409844 Depth: 5.0-10.0 ft

Description: Dark Yellowish Brown Lean Clay with Sand [CL]

Optimum Moisture Content: 15.0% Maximum Dry Density: 116.3 lbs/ft^3

Specific Gravity: 2.83 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/16/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/002/P0154/P0154/DGN/BMP/409844C.DGN (SKX04129)

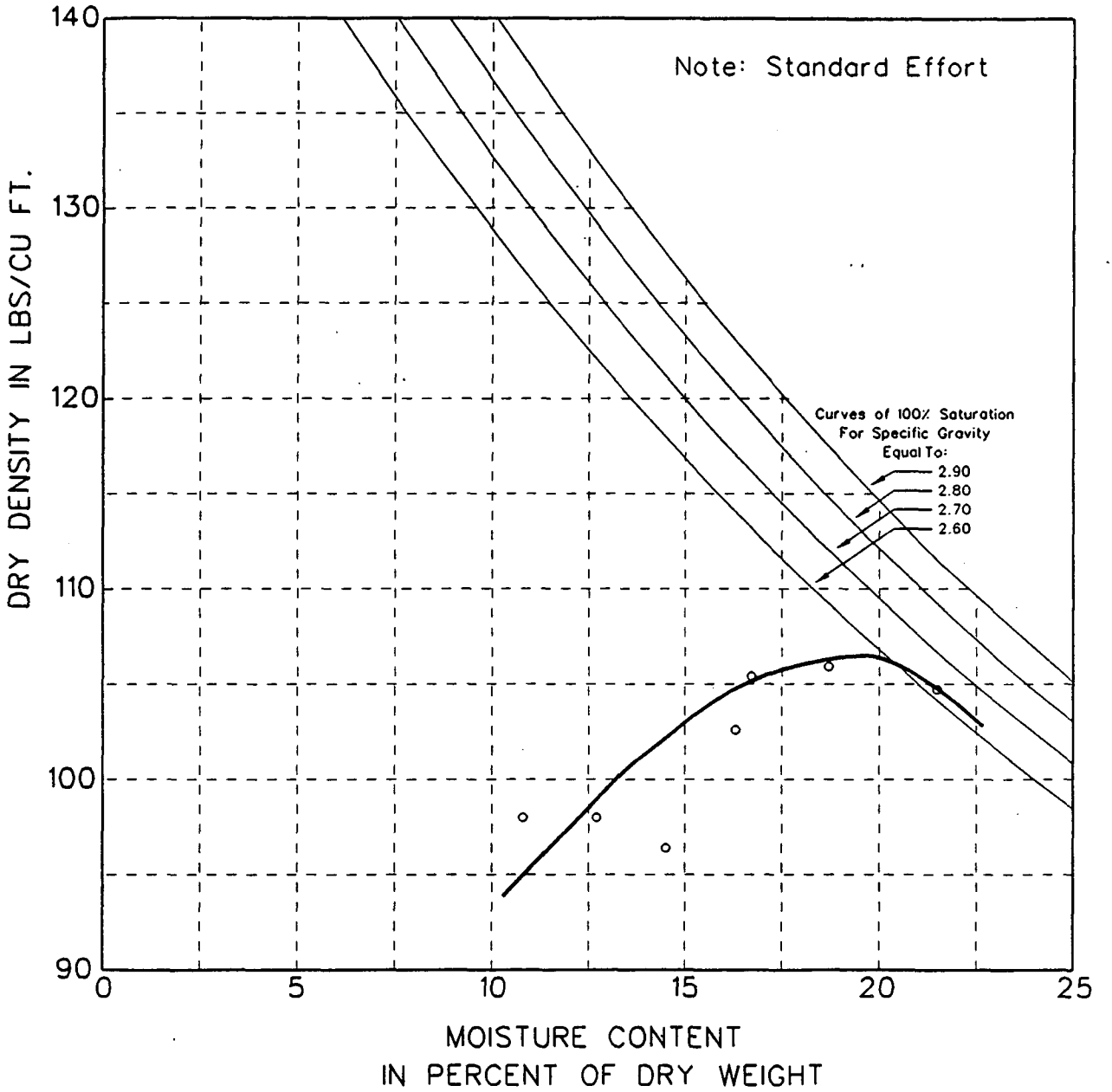
Boring: G2-SB-70 Sample Number: 409847 Depth: 1.5-5.0 ft

Description: Yellowish Brown Lean Clay with Sand [CL]

Optimum Moisture Content: 19.6% Maximum Dry Density: 106.5 lbs/ft^3

Specific Gravity: 2.71 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/10/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/OU2/P0154/P0154/DGN/BMP/409847C.DGN (SK:K04130)

000298

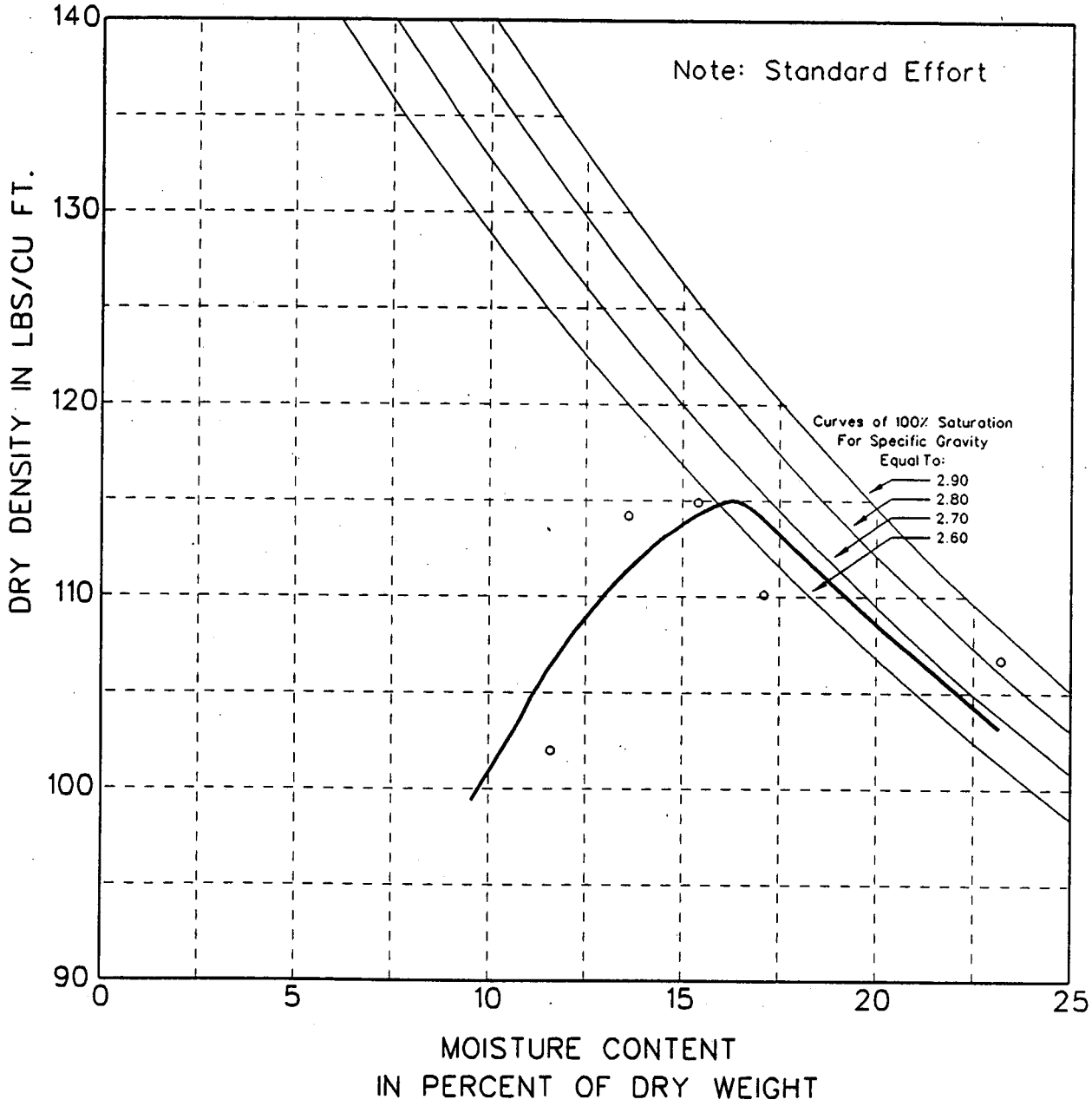
Boring: G2-SB-72 Sample Number: 409852 Depth: 5.0-10.0 ft

Description: Light Olive Brown Lean Clay with Sand [CL]

Optimum Moisture Content: 16.3% Maximum Dry Density: 115.0 lbs/ft^3

Specific Gravity: 2.73 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/09/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/OU2/PO154/DGN/BMP/409852C.DGN (SKX04123)

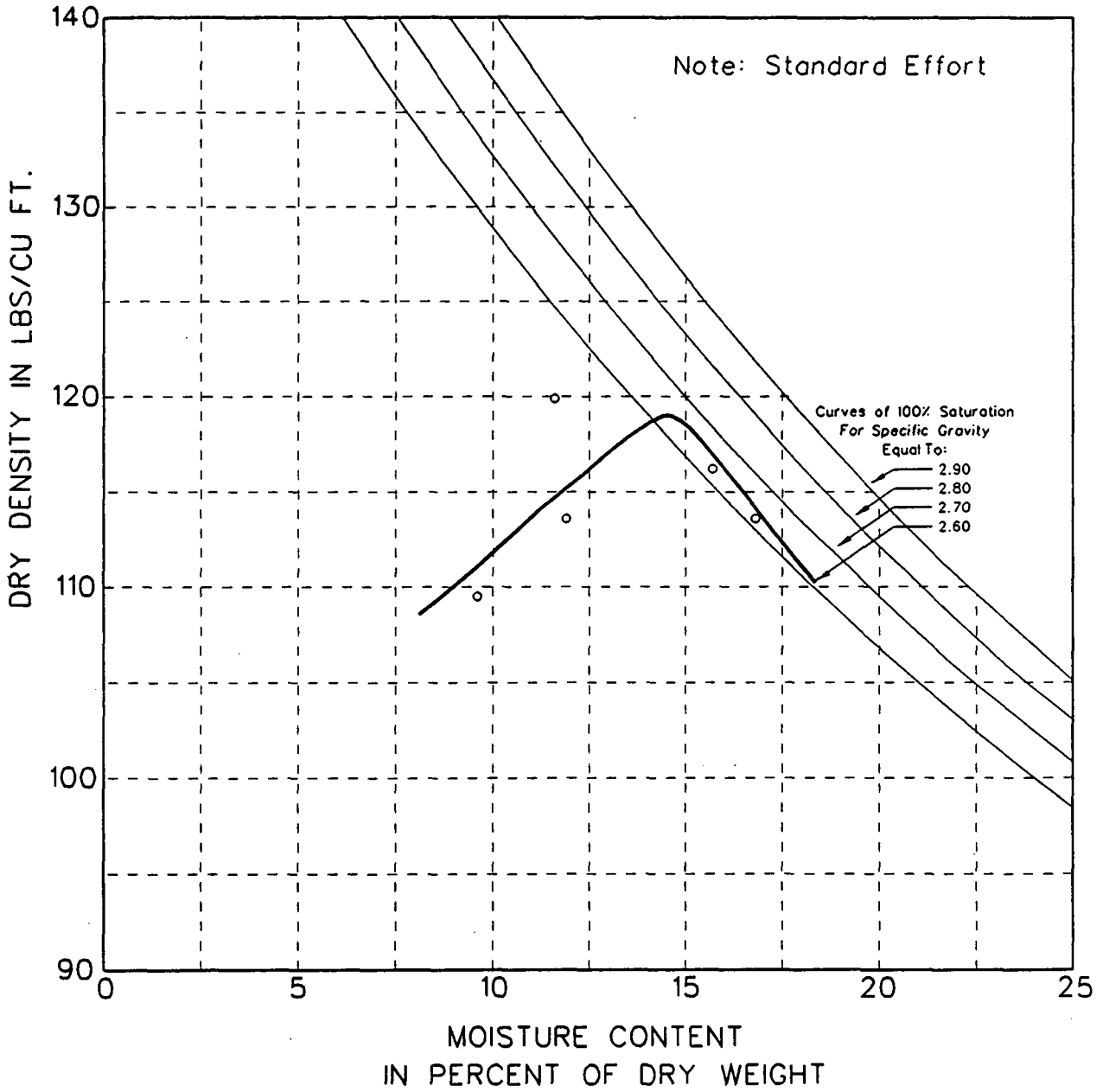
Boring: G2-SB-73 Sample Number: 409855 Depth: 1.5-6.0 ft

Description: Dark Yellowish Brown Lean Clay with Sand [CL]

Optimum Moisture Content: 14.5% Maximum Dry Density: 119.0 lbs/ft^3

Specific Gravity: 2.80 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/06/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/OU2/PO154/PO154/DGN/BMP/409855C.DGN (SKX04124)

000300

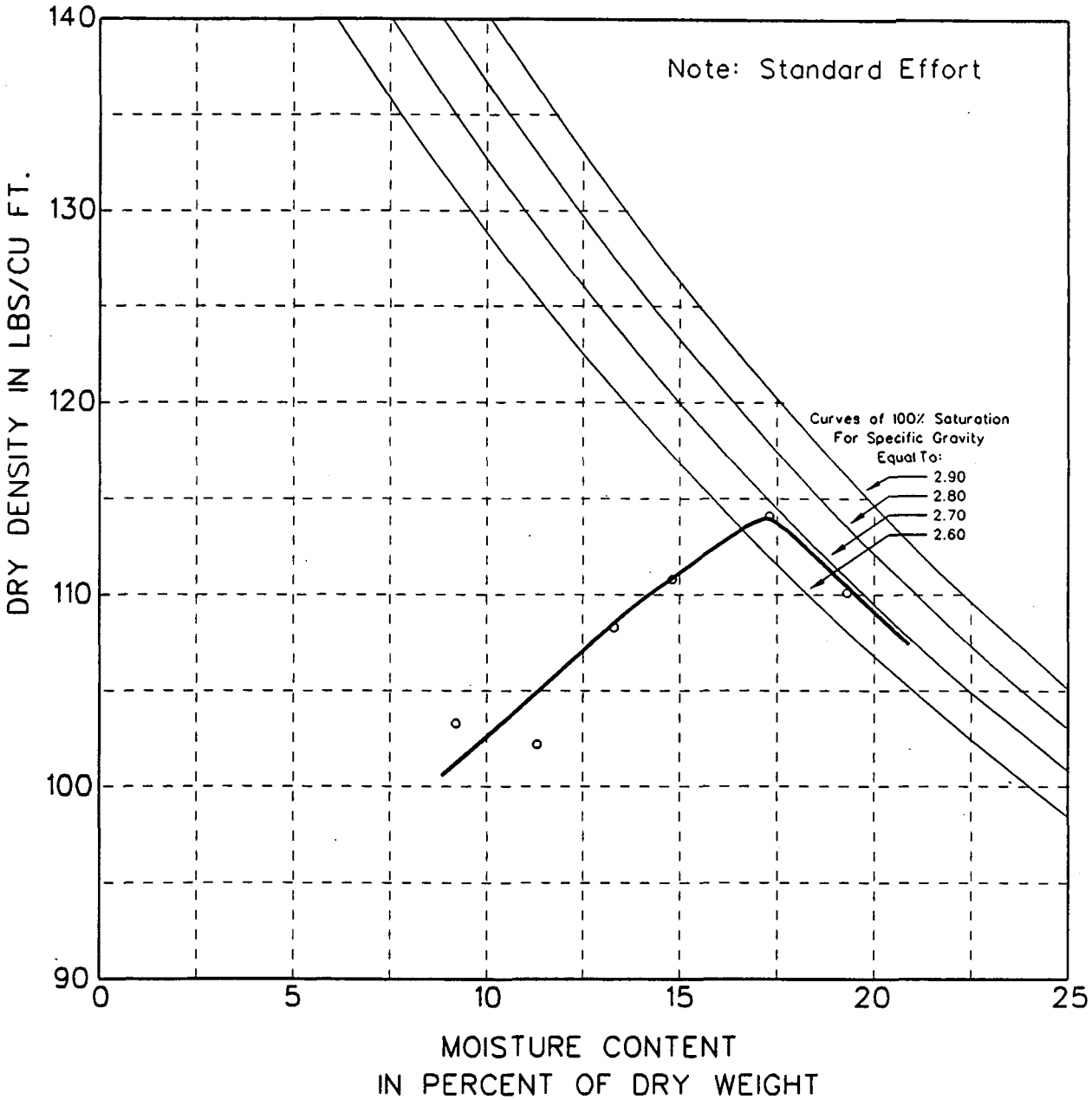
Boring: G2-SB-74 Sample Number: 409858 Depth: 1.5-5.0 ft

Description: Light Olive Brown Lean Clay with Sand [CL]

Optimum Moisture Content: 17.2% 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: 10/06/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/OU2/P0154/P0154/DGN/BMP/409858C.DGN (SKK0413)

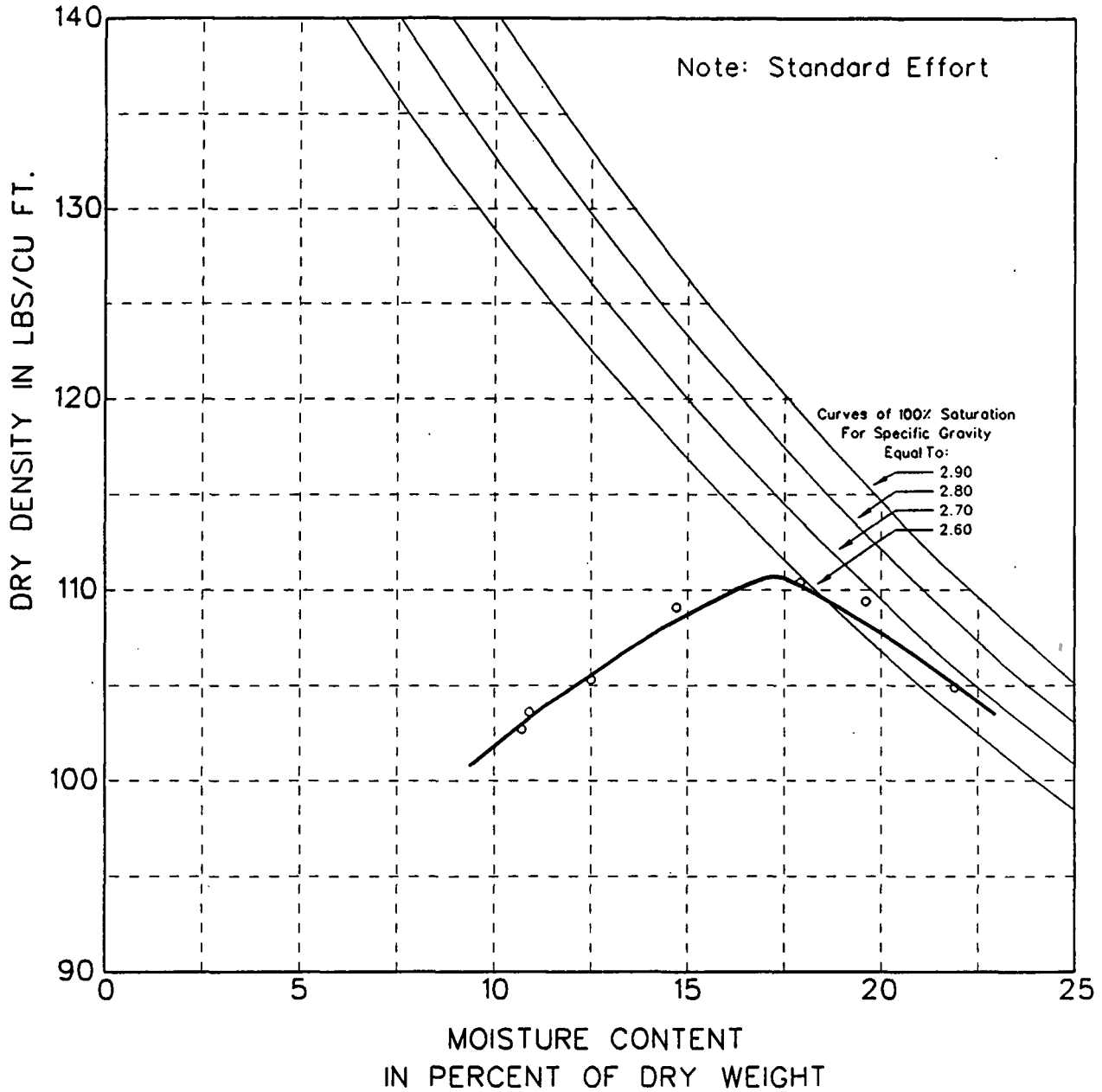
Boring: G2-SB-76 Sample Number: 409862 Depth: 1.5-6.0 ft

Description: Olive Brown Lean Clay [CL]

Optimum Moisture Content: 17.2% Maximum Dry Density: 110.7 lbs/ft^3

Specific Gravity: 2.70 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/17/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/002/P0154/P0154/DGN/BMP/409862C.DGN (SKX04132)

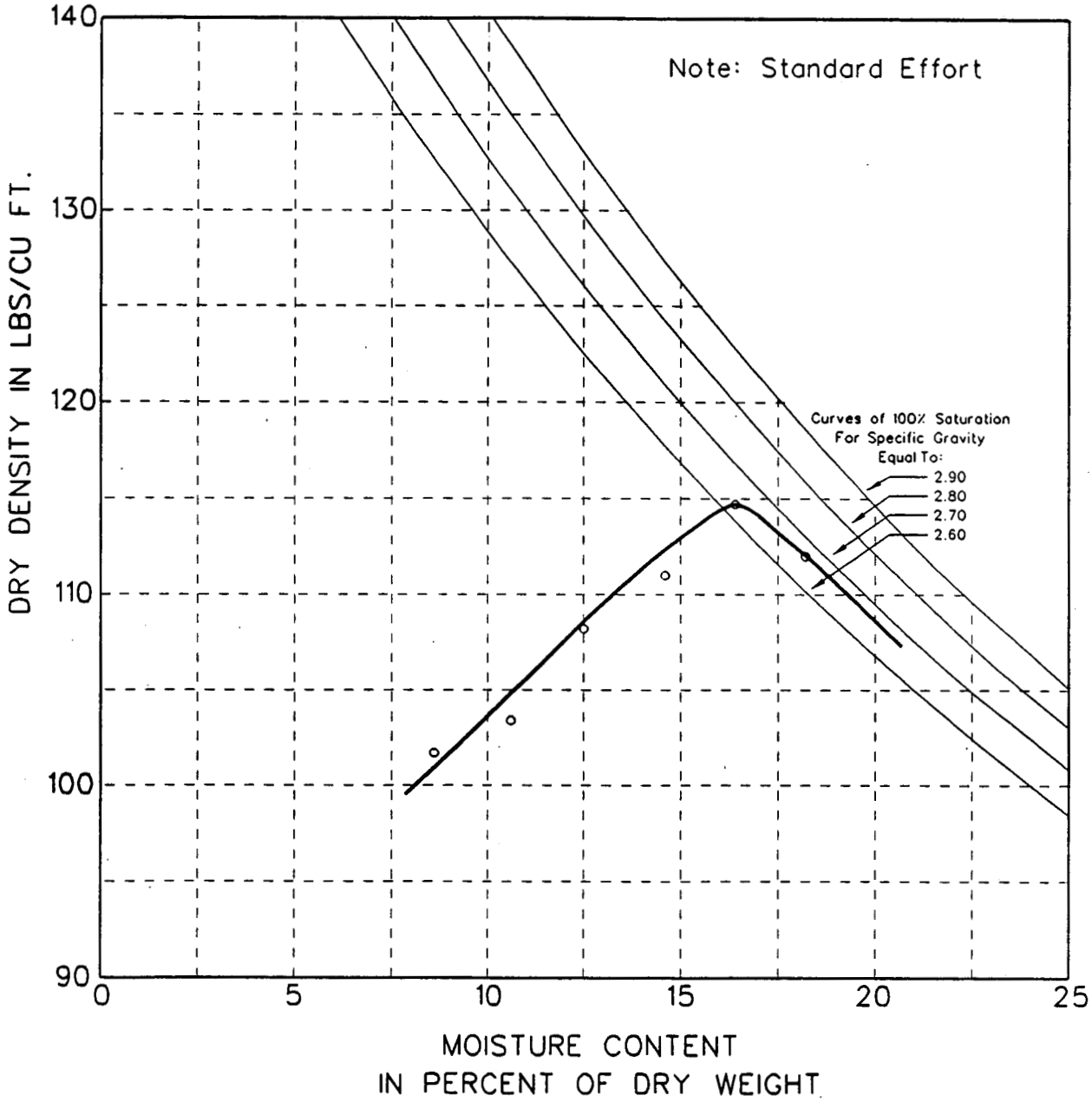
Boring: G2-SB-78 Sample Number: 409865 Depth: 1.5-5.0 ft

Description: Yellowish Brown Lean Clay with Sand [CL]

Optimum Moisture Content: 16.4% Maximum Dry Density: 114.7 lbs/ft^3

Specific Gravity: 2.63 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/06/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/OU2/PO154/DGN/BMP/409865C.DGN (SKX04133)

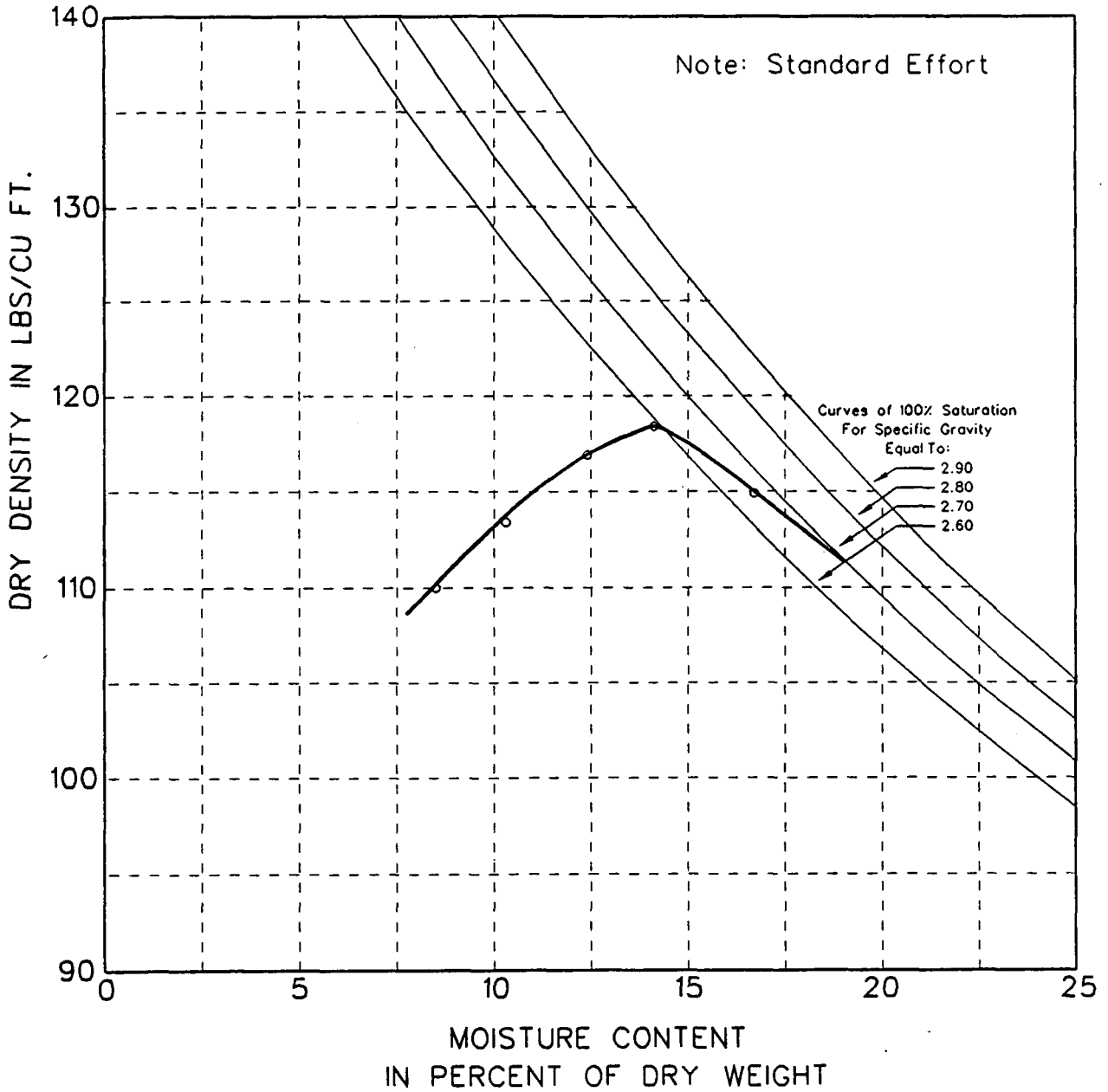
Boring: G2-SB-80 Sample Number: 409869 Depth: 1.5-5.0 ft

Description: Dark Yellowish Brown Sandy Lean Clay [CL]

Optimum Moisture Content: 14.1% Maximum Dry Density: 118.4 lbs/ft^3

Specific Gravity: 2.70 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/04/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship:

FILE:/USR/REF2/OU2/PO154/PO154/DGN/BMP/409869C.DGN (SKX04134)

000304

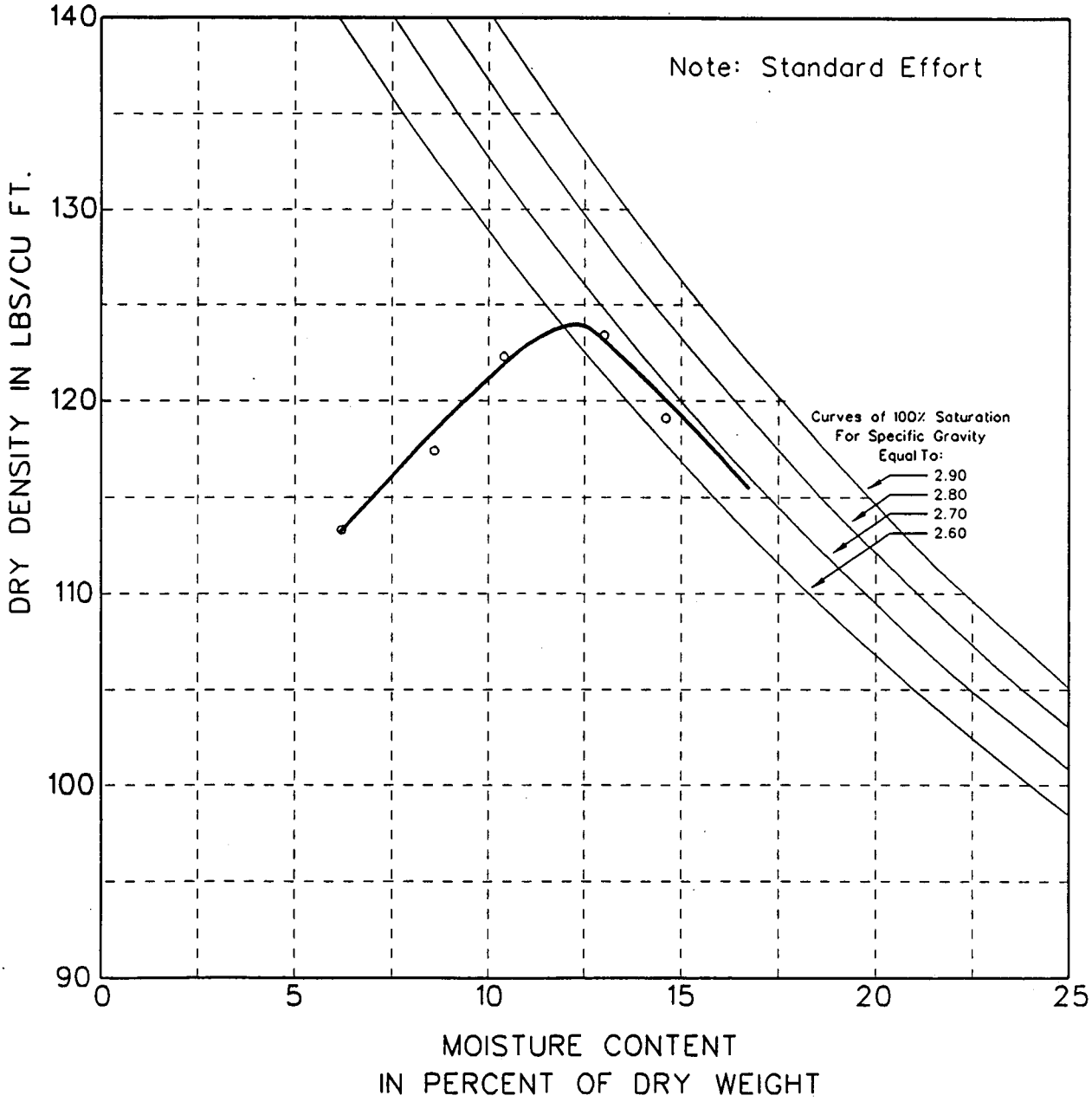
Boring: G2-SB-81 Sample Number: 409873 Depth: 1.5-5.0 ft

Description: Yellowish Brown Sandy Lean Clay [CL]

Optimum Moisture Content: 12.3% Maximum Dry Density: 124.0 lbs/ft^3

Specific Gravity: 2.75 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/09/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/0U2/P0154/P0154/DGN/BMP/409873C.DGN (SKX04135)

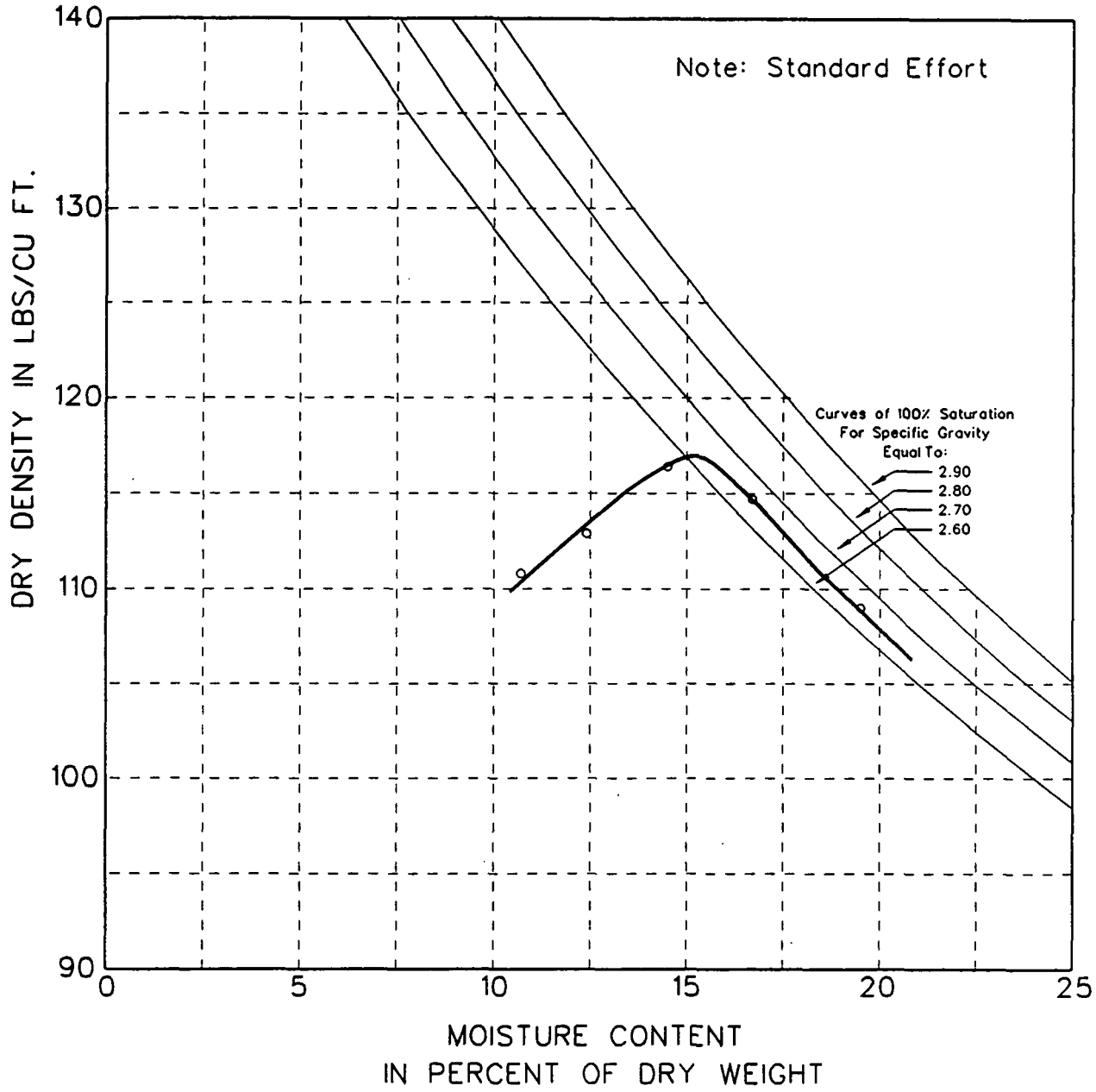
Boring: G2-SB-82 Sample Number: 409878 Depth: 5.0-10.0 ft

Description: Yellowish Brown Lean Clay [CL]

Optimum Moisture Content: 15.2% Maximum Dry Density: 117.0 lbs/ft^3

Specific Gravity: 2.78 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/15/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/002/P0154/P0154/DGN/BMP/409878C.DGN (SKX04136)

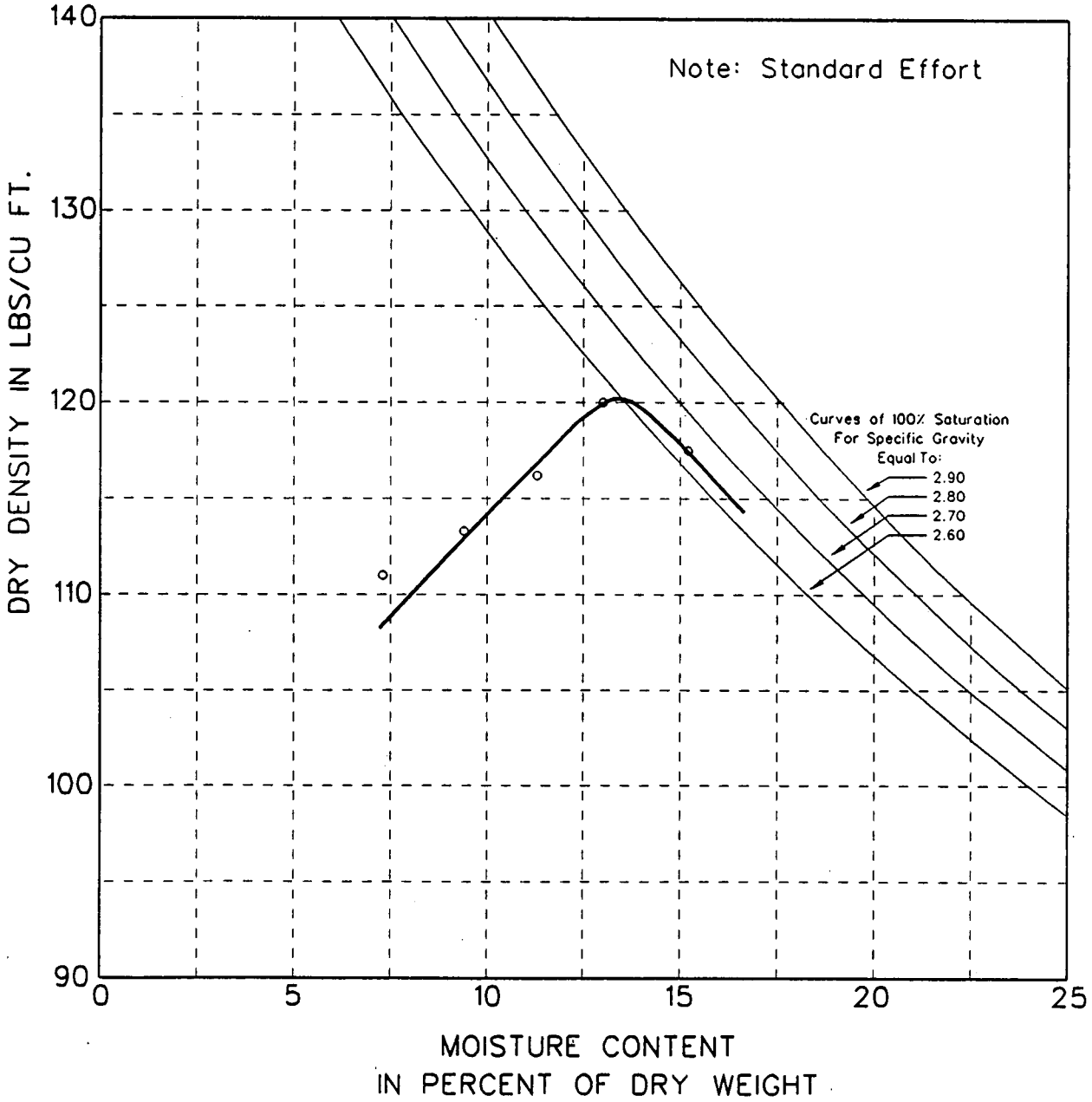
Boring: G2-SB-84 Sample Number: 409882 Depth: 5.0-10.0 ft

Description: Yellowish Brown Lean Clay [CL]

Optimum Moisture Content: 13.4% Maximum Dry Density: 120.2 lbs/ft^3

Specific Gravity: 2.77 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/09/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/OU2/P0154/P0154/DGN/BMP/409882C.DGN (SKX04137)

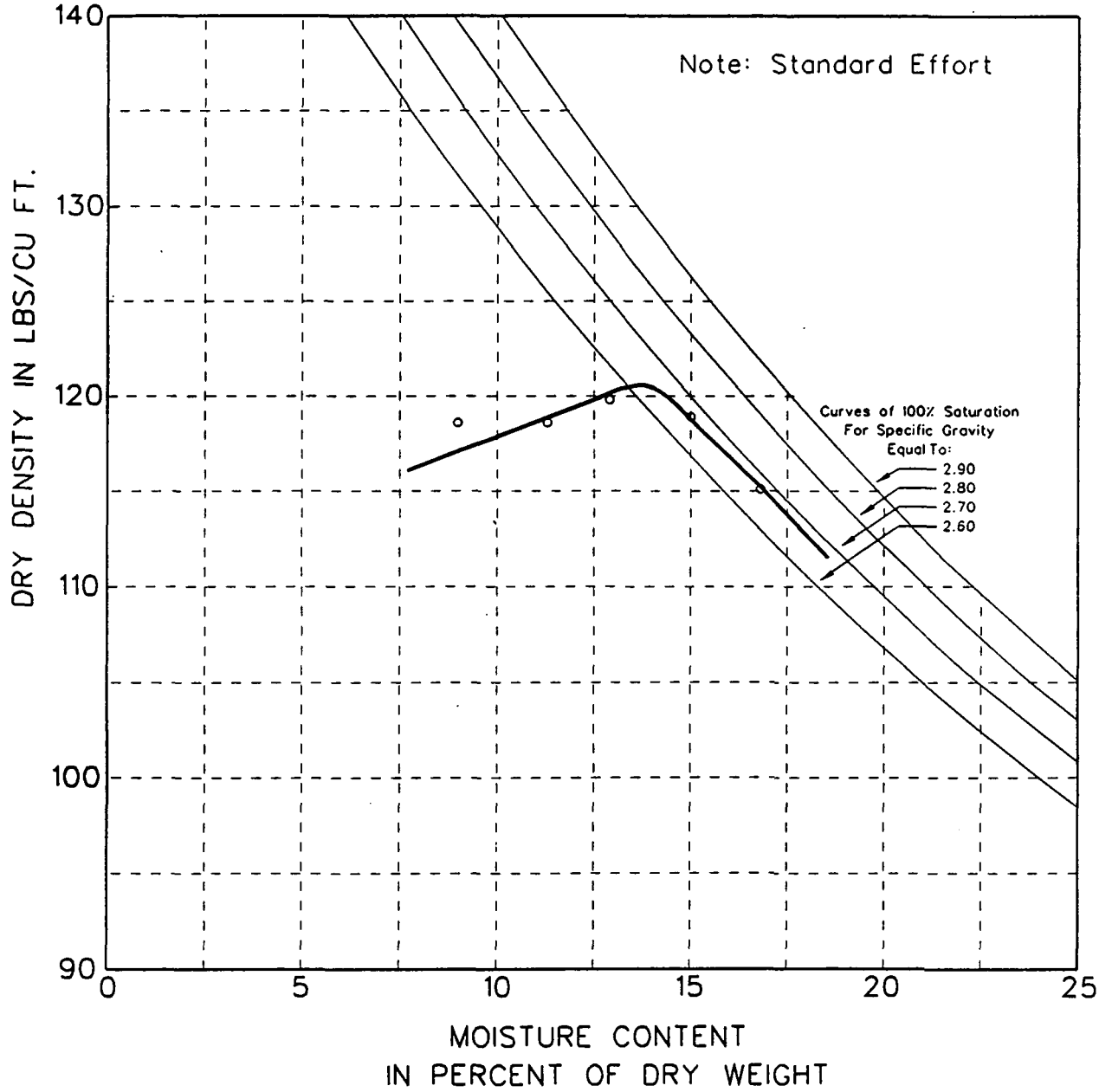
Boring: G2-SB-86 Sample Number: 409886 Depth: 5.0-10.0 ft

Description: Yellowish Brown Sandy Lean Clay [CL]

Optimum Moisture Content: 13.7% Maximum Dry Density: 120.6 lbs/ft^3

Specific Gravity: 2.78 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/09/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/OU2/PO154/DGN/BMP/409886C.DGN (SK:K041138)

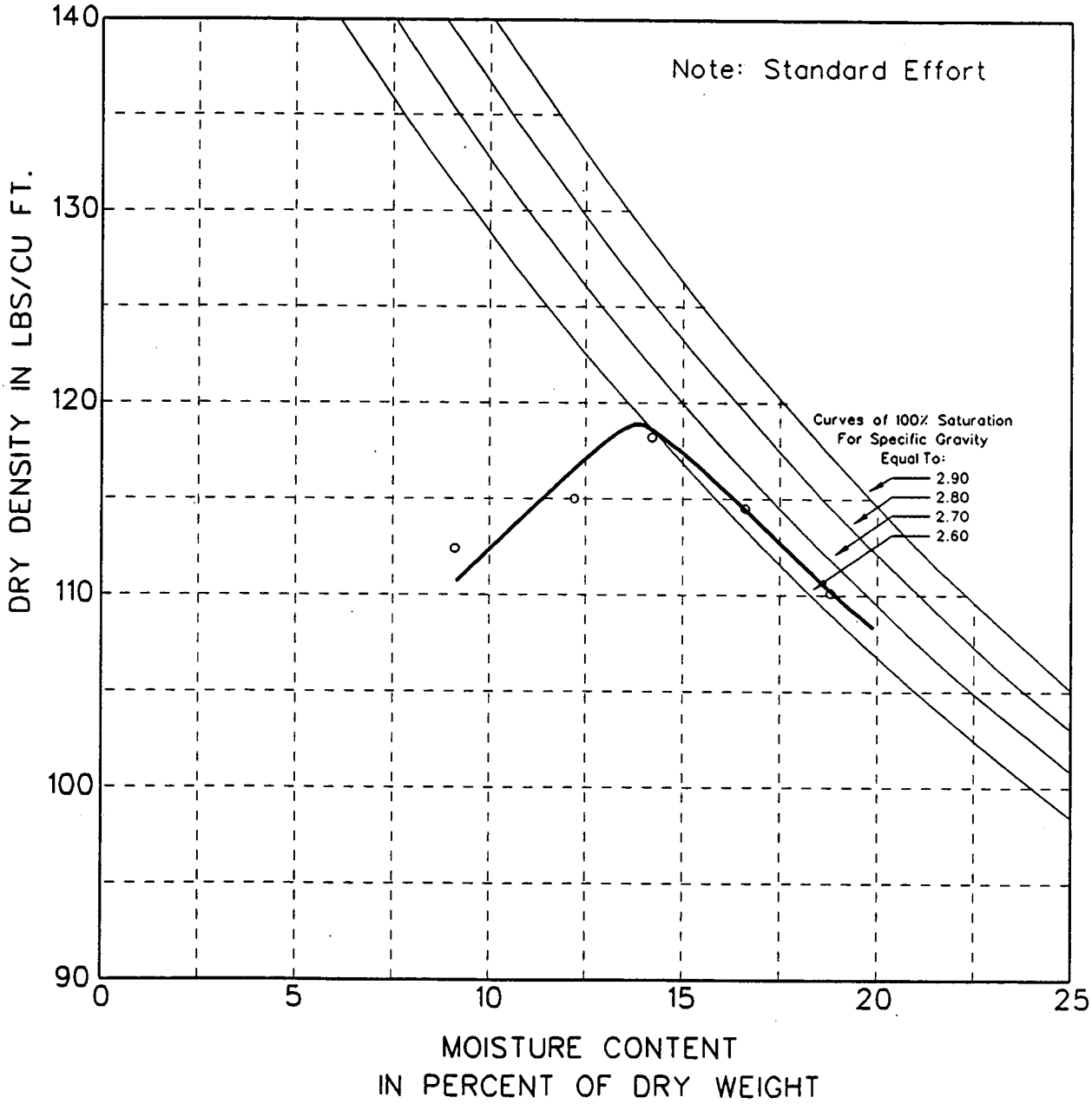
Boring: G2-SB-88 Sample Number: 409890 Depth: 5.0-10.0 ft

Description: Light Olive Brown Lean Clay [CL]

Optimum Moisture Content: 13.8% Maximum Dry Density: 118.9 lbs/ft^3

Specific Gravity: 2.77 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/15/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/0U2/PO154/DGN/BMP/409890C.DGN (SK:X04139)

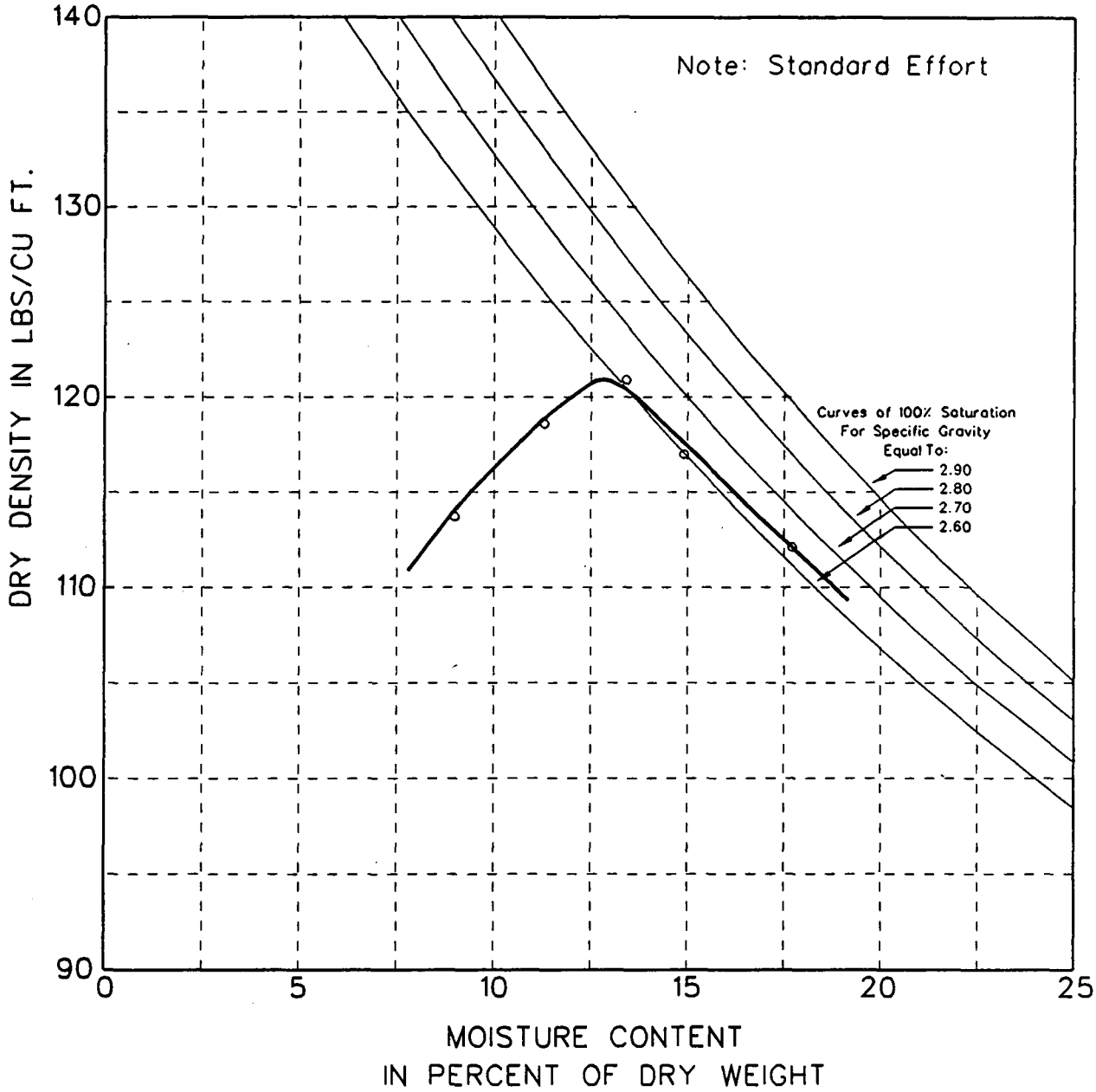
Boring: G2-SB-90 Sample Number: 409894 Depth: 5.0-10.0 ft

Description: Yellowish Brown Sandy Silt [ML]

Optimum Moisture Content: 12.8% Maximum Dry Density: 120.9 lbs/ft^3

Specific Gravity: 2.72 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/15/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/OU2/PO154/BGN/BMP/409894C.DGN (SKX0414D)

000310

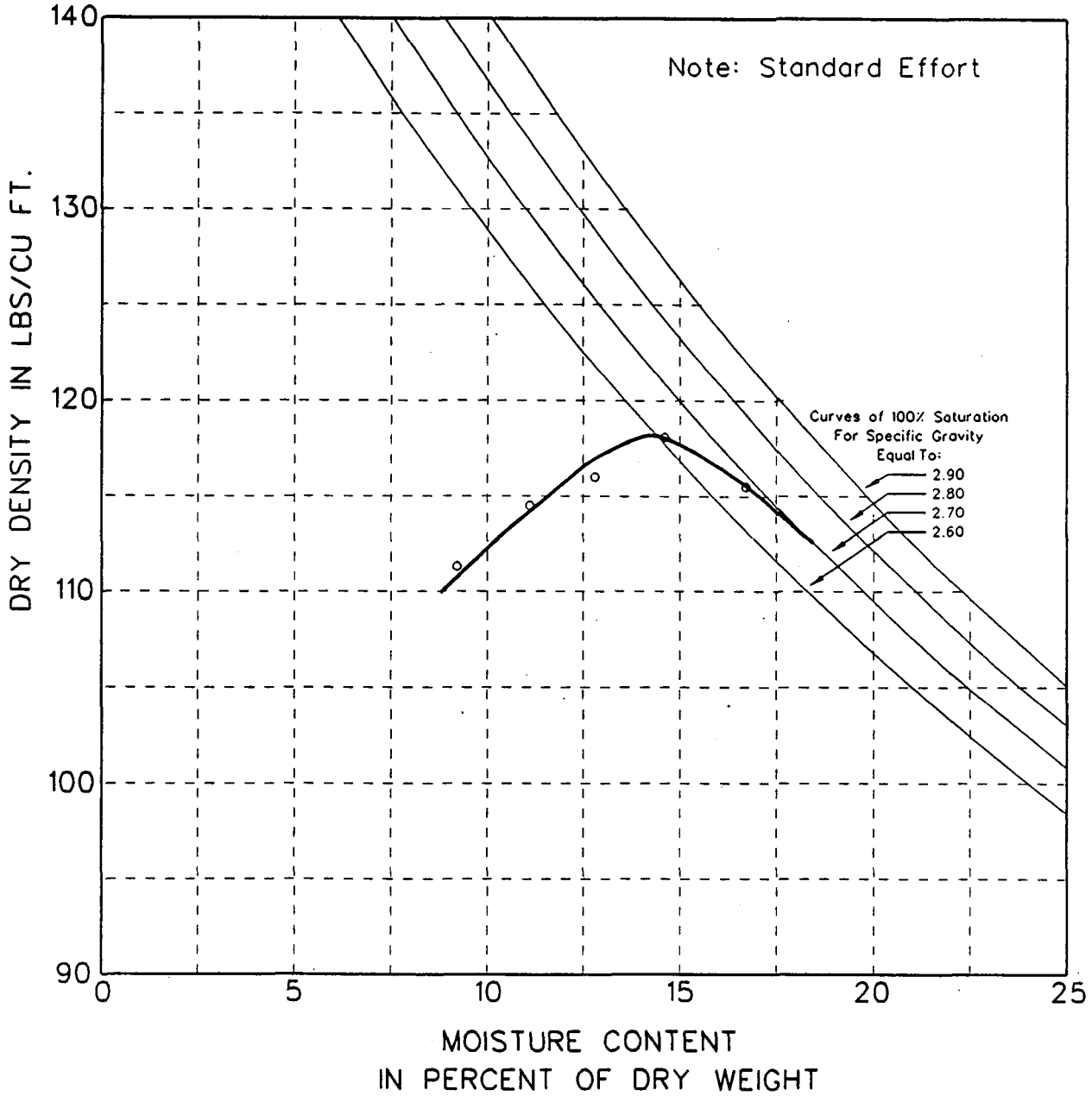
Boring: G2-SB-95 Sample Number: 409898 Depth: 1.5-5.0 ft

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



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/OU2/PO154/PO154/DGN/BMP/409898C.DGN (SKX04141)

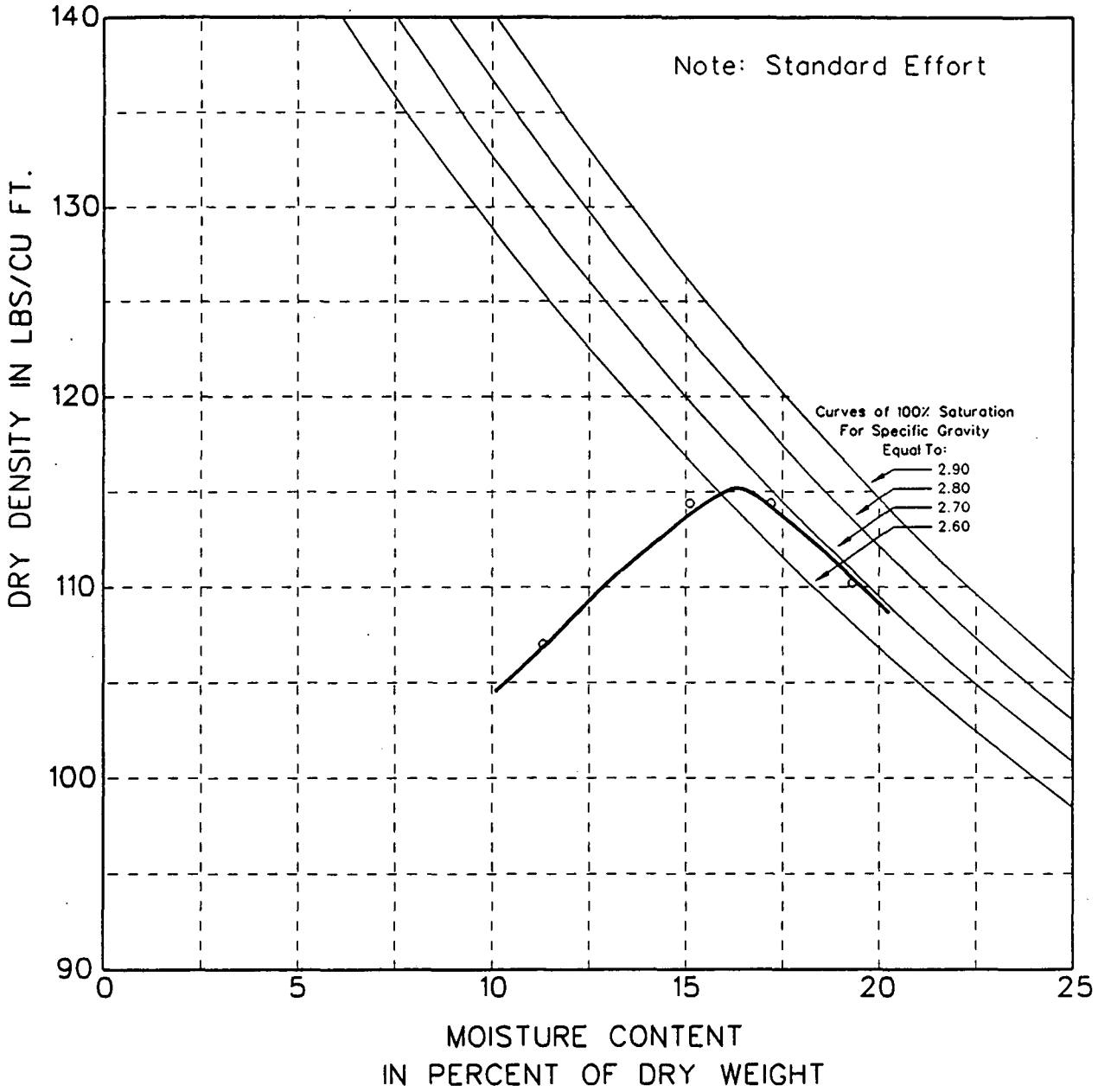
Boring: G2-SB-96 Sample Number: 409903 Depth: 1.5-5.0 ft

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



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/002/P0154/DGN/BMP/409903C.DGN (SKK04142)

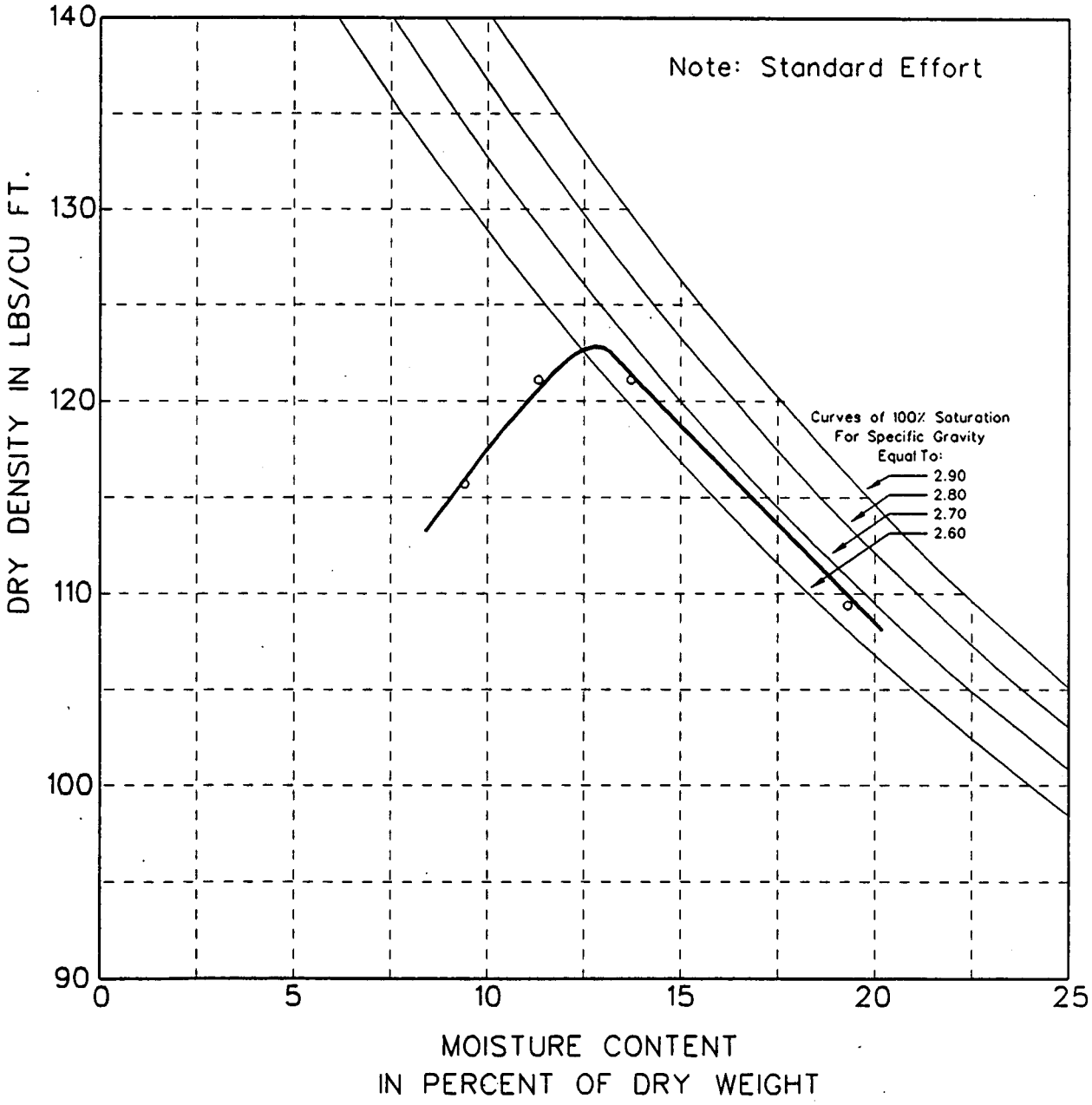
Boring: G2-SB-96 Sample Number: 409904 Depth: 5.0-10.0 ft

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



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/002/P0154/DGN/BMP/409904C.DGN (SKX04143)

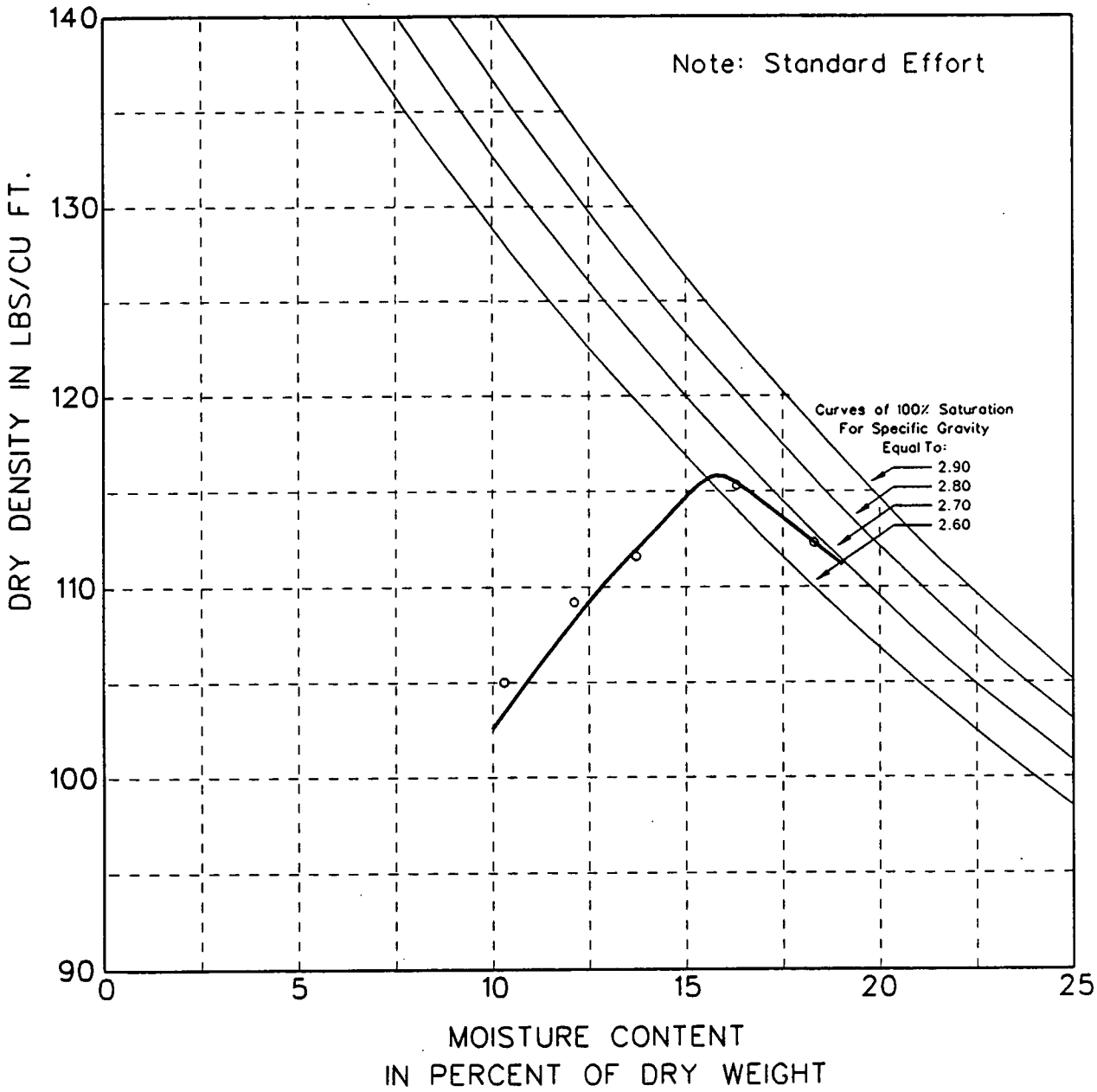
Boring: G2-SB-98 Sample Number: 409908 Depth: 1.5-10.0 ft

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



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/OU2/P0154/P0154/DGN/B&P/409908C.DGN (SKX04144)

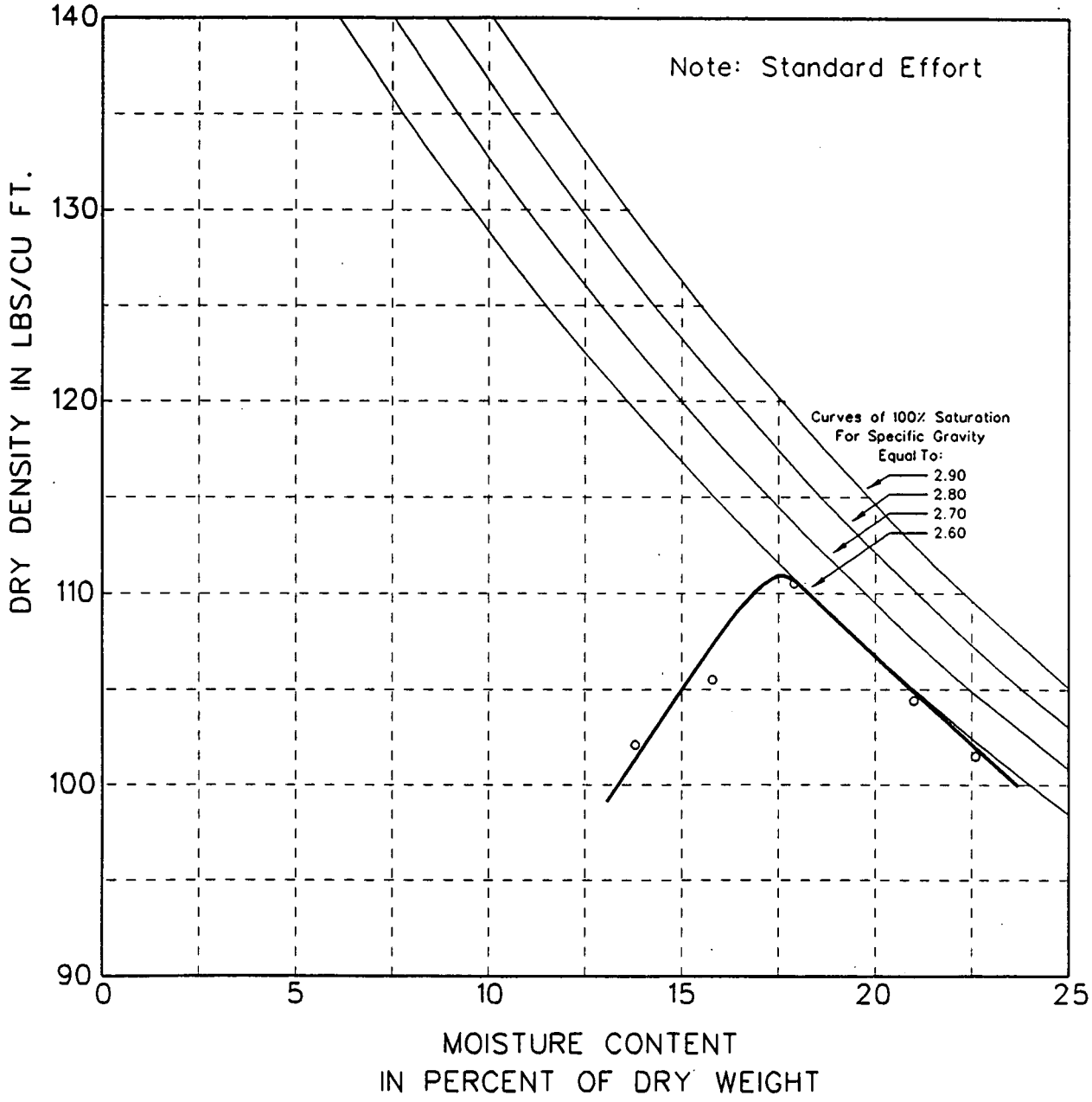
Boring: G2-SB-99 Sample Number: 409923 Depth: 1.5-5.0 ft

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



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/002/P0154/P0154/DGN/BMP/409923C.DGN (SKX04147)

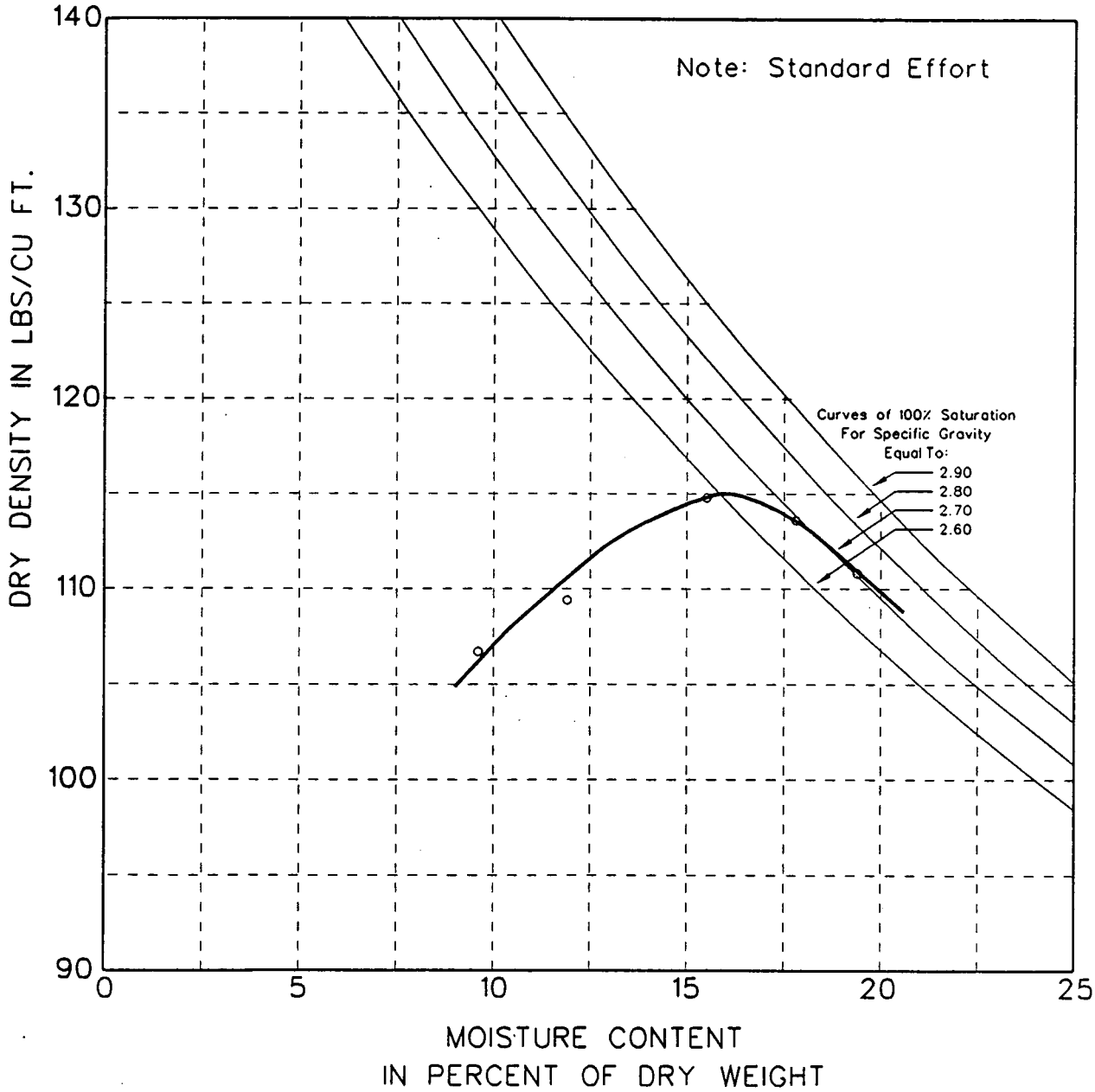
Boring: G2-SB-99 Sample Number: 409924 Depth: 5.0-10.0 ft

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



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/002/P0154/P0154/DGN/BMP/409924C.DGN (SKX04148)

000316

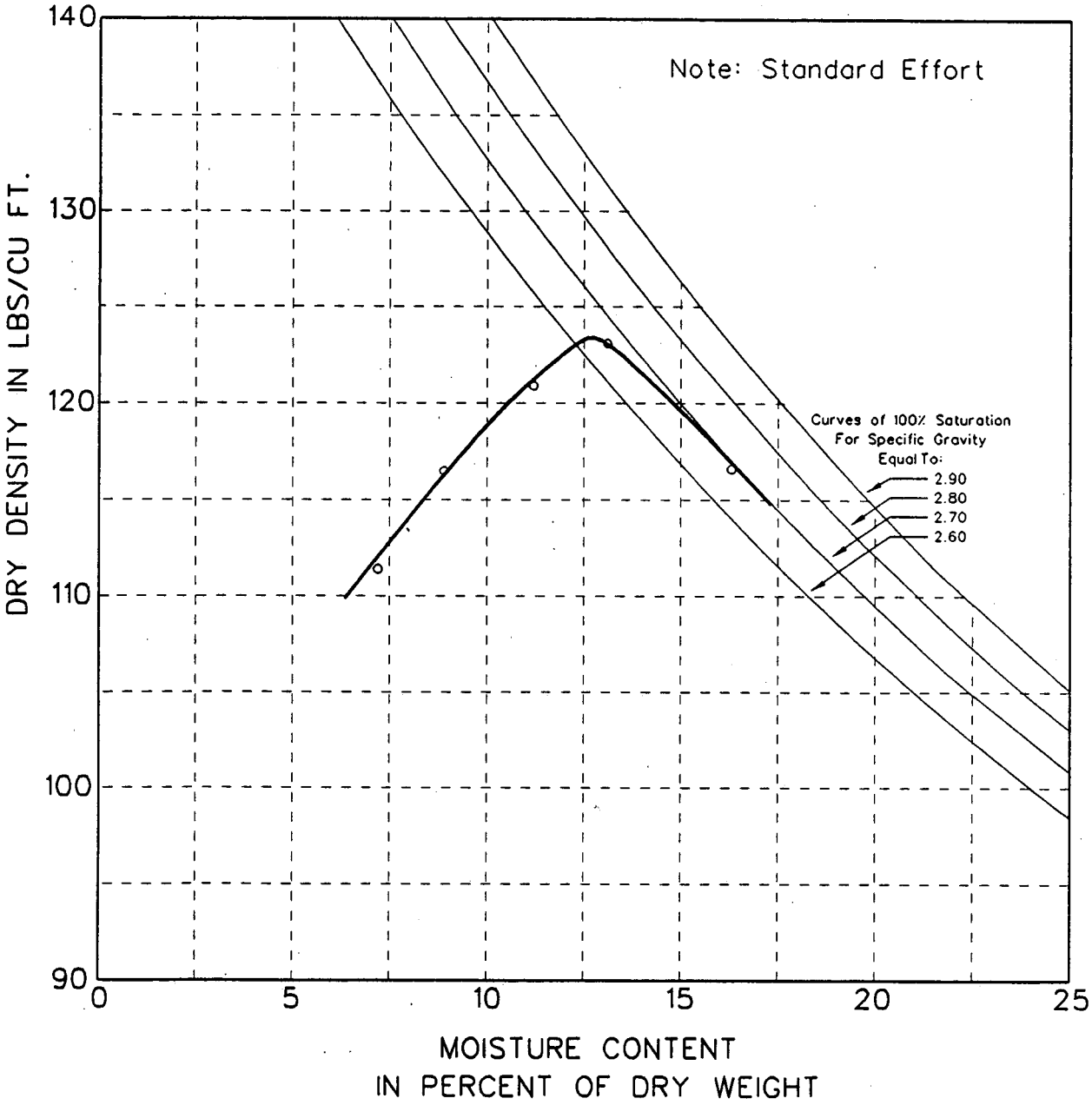
Boring: G2-148 Sample Number: 410577 Depth: 11.0-16.5 ft

Description: Dark Gray Lean Clay with Sand [CL]

Optimum Moisture Content: 12.7% Maximum Dry Density: 123.4 lbs/ft^3

Specific Gravity: 2.69 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/05/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/OU2/PO154/PO154/DGN/BMP/410577C.DGN (SKX04158)

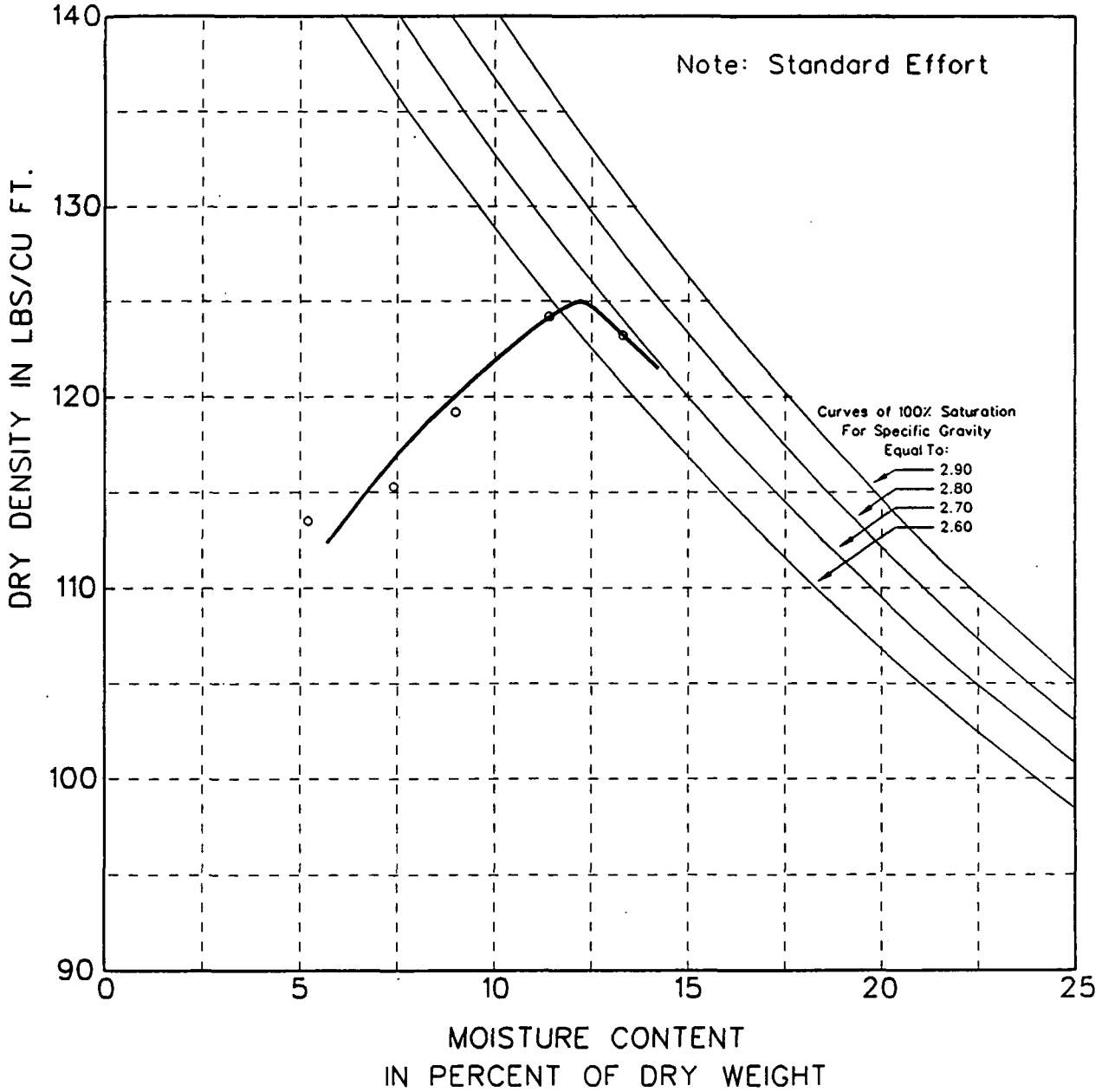
Boring: G2-149 Sample Number: 410527-28 Depth: 11.0-16.5 ft

Description: Dark Gray Sandy Lean Clay [CL]

Optimum Moisture Content: 12.2% Maximum Dry Density: 125.0 lbs/ft^3

Specific Gravity: 2.70 Compaction Method: ASTM D 698 Method A

Lab: Advanced Terra Testing, Inc. Date Tested: 10/05/95



Note: Characteristic Shape of Compaction Curve Based on Soil Type Typical Moisture-Density Relationship.

FILE:/USR/REF2/0U2/P0154/DGN/BMP/410527C.DGN (SKX04157)

000318

Sample No. G2-201-204 Depth 0 - 24.5 Elevation _____

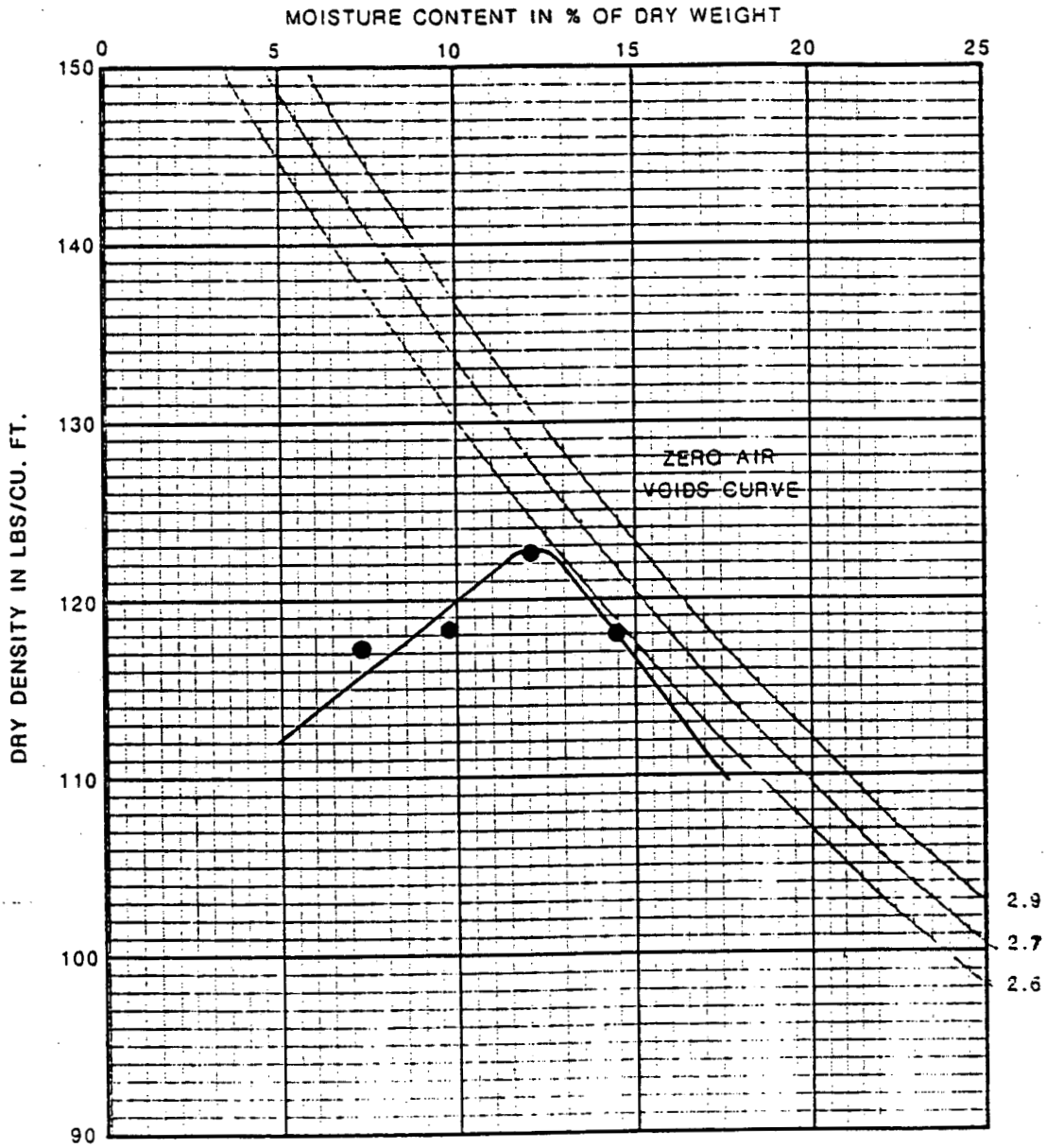
Soil Composite 201, 202, 203, 204

Location Proposed On-Site Disposal Cell (PO-101)

Optimum Moisture Content 12.0%

Maximum Dry Density 122.7 pcf

Method of Compaction ASTM D 698, Method A



COMPACTION TEST DATA

ADVANCED TERRA TESTING

File _____

Sample No. G2-205-208 Depth 0 - 24.5 Elevation _____

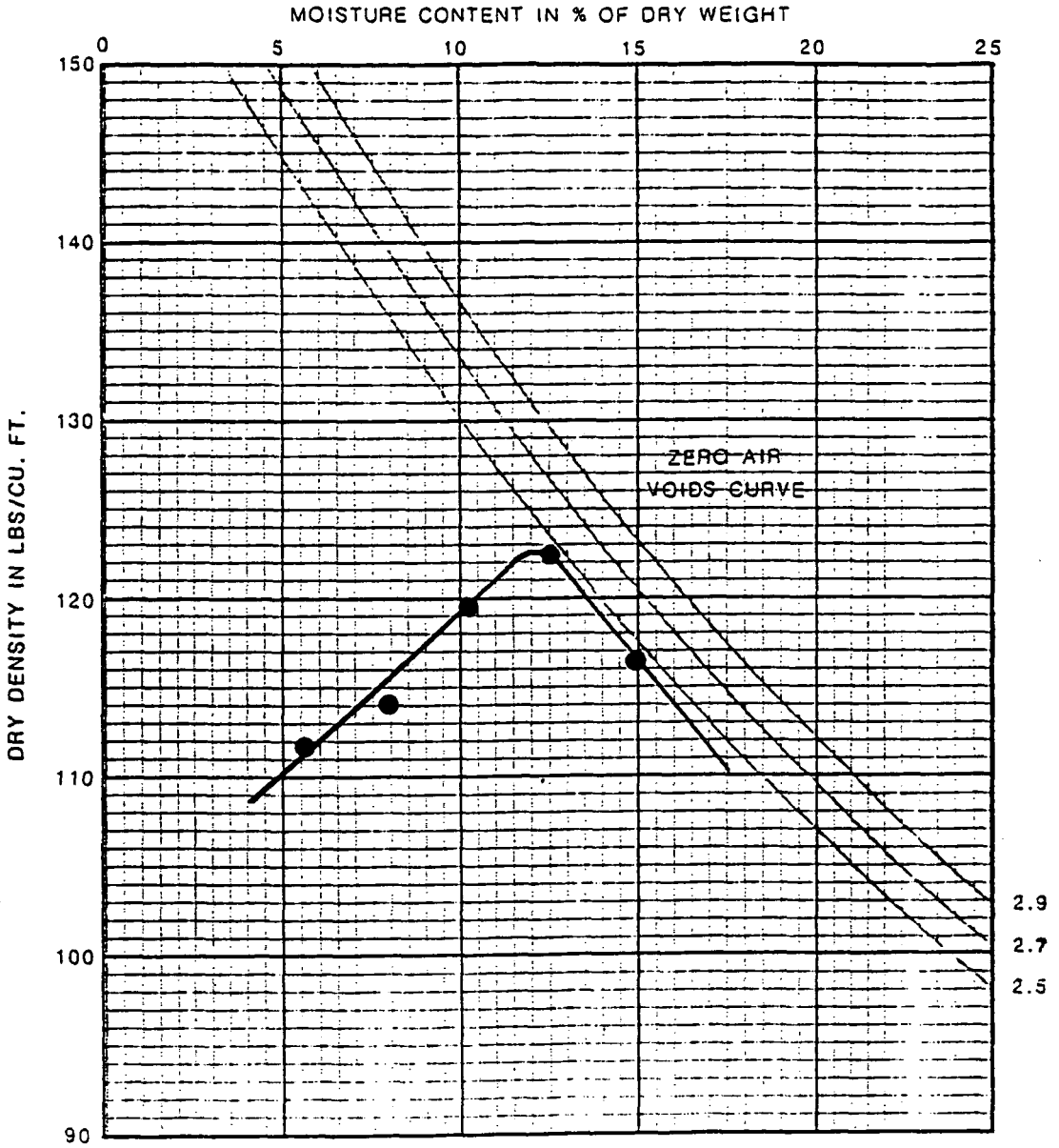
Soil Composite 205, 206, 207, 208

Location Proposed On-Site Disposal Cell (PO-101)

Optimum Moisture Content 12.3%

Maximum Dry Density 122.5 pcf

Method of Compaction ASTM D 698, Method A



COMPACTION TEST DATA

ADVANCED TERRA TESTING

File

000320

Sample No. G2-209 Depth 0 - 25 Elevation

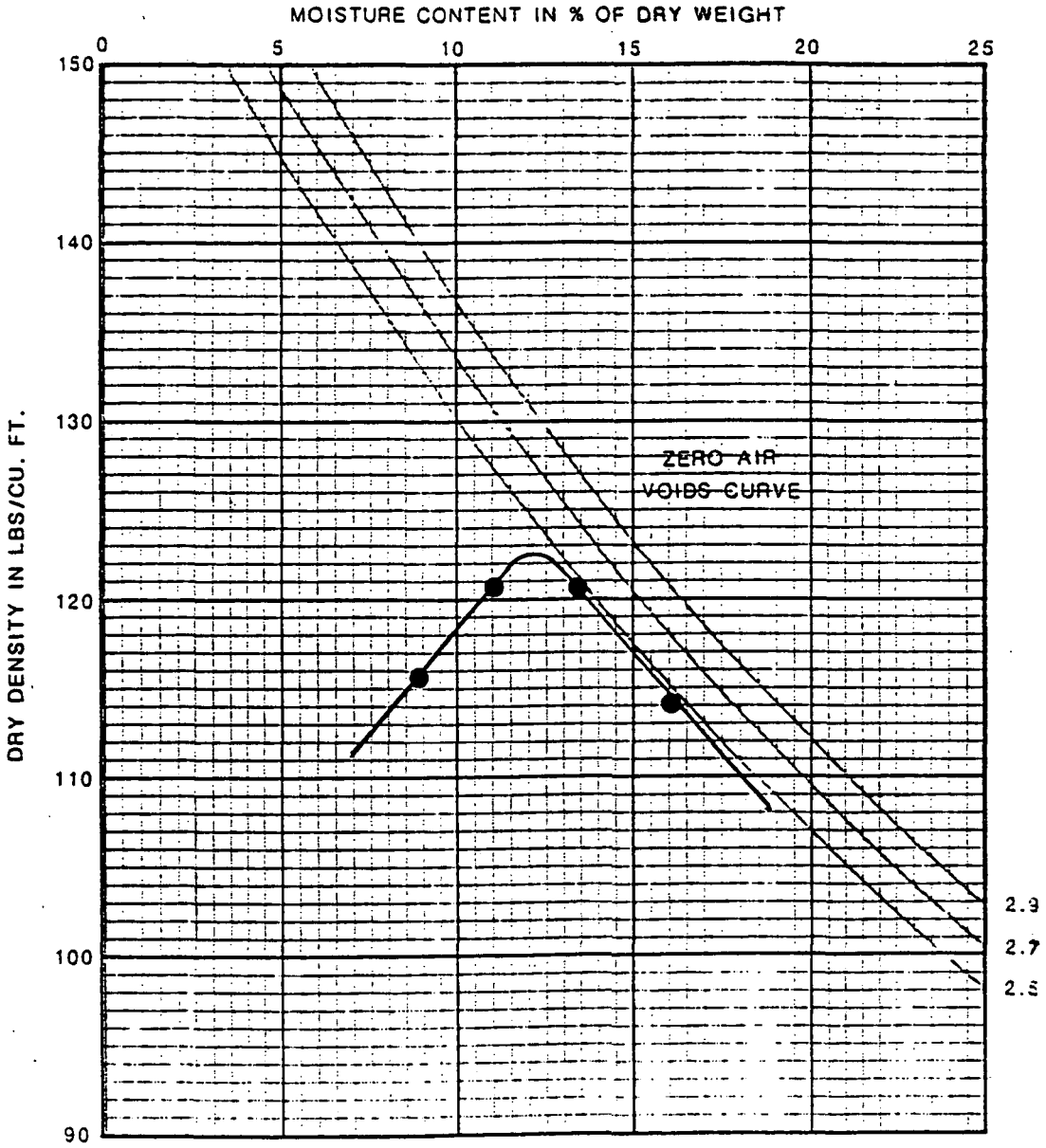
Soil Brown and Gray Sandy Lean Clay (CL)

Location Proposed On-Site Disposal Cell (PO-101)

Optimum Moisture Content 12.3%

Maximum Dry Density 122.3 pcf

Method of Compaction ASTM D 698, Method A



File

COMPACTION TEST DATA

ADVANCED TERRA TESTING

Sample No. G2-210 Depth 0 - 25 Elevation _____

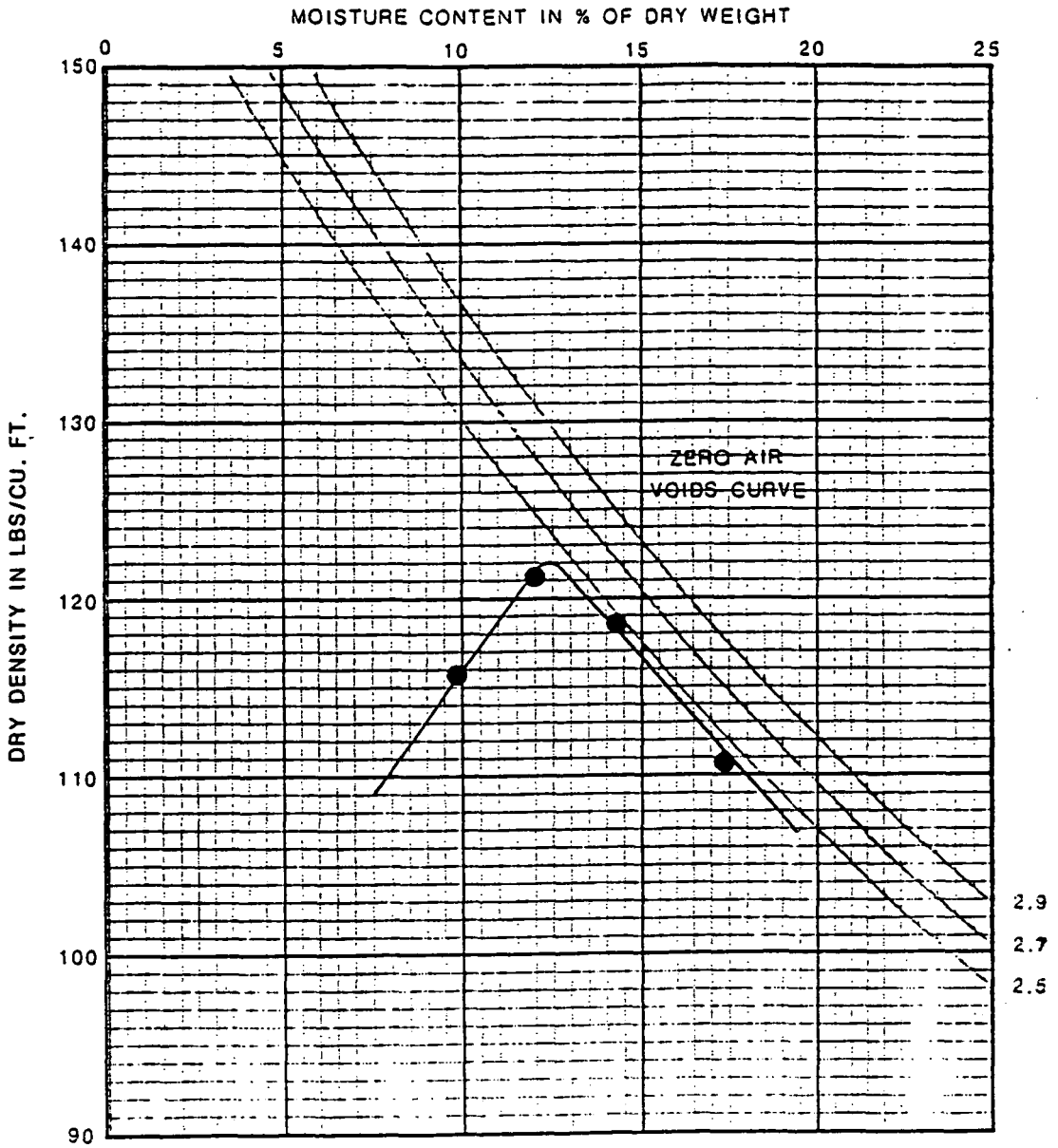
Soil Brown and Gray Lean Clay with Sand (CL)

Location Proposed On-Site Disposal Cell (PO-101)

Optimum Moisture Content 12.4%

Maximum Dry Density 122.3 pcf

Method of Compaction ASTM D 698, Method A



COMPACTION TEST DATA

ADVANCED TERRA TESTING

File _____

000322

Sample No. G2-209 Depth 0-24.5' Elevation

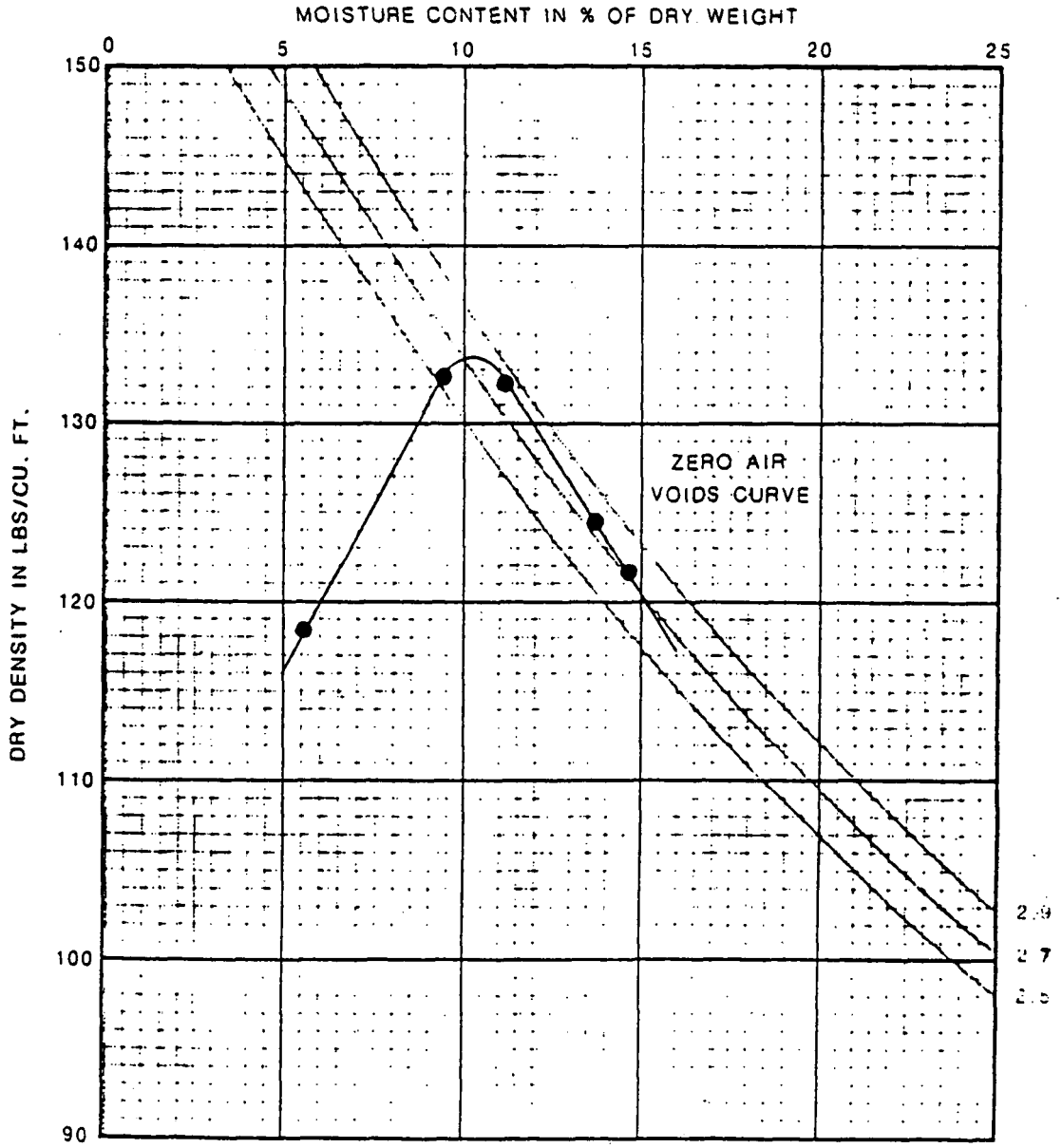
Soil Bulk

Location Onsite Waste Disposal Cell

Optimum Moisture Content 10.3 %

Maximum Dry Density 133.6 pcf

Method of Compaction ASTM D 1557 A



File Parsons PO 101
2059-10

COMPACTION TEST DATA

ADVANCED TERRA TESTING

APPENDIX F

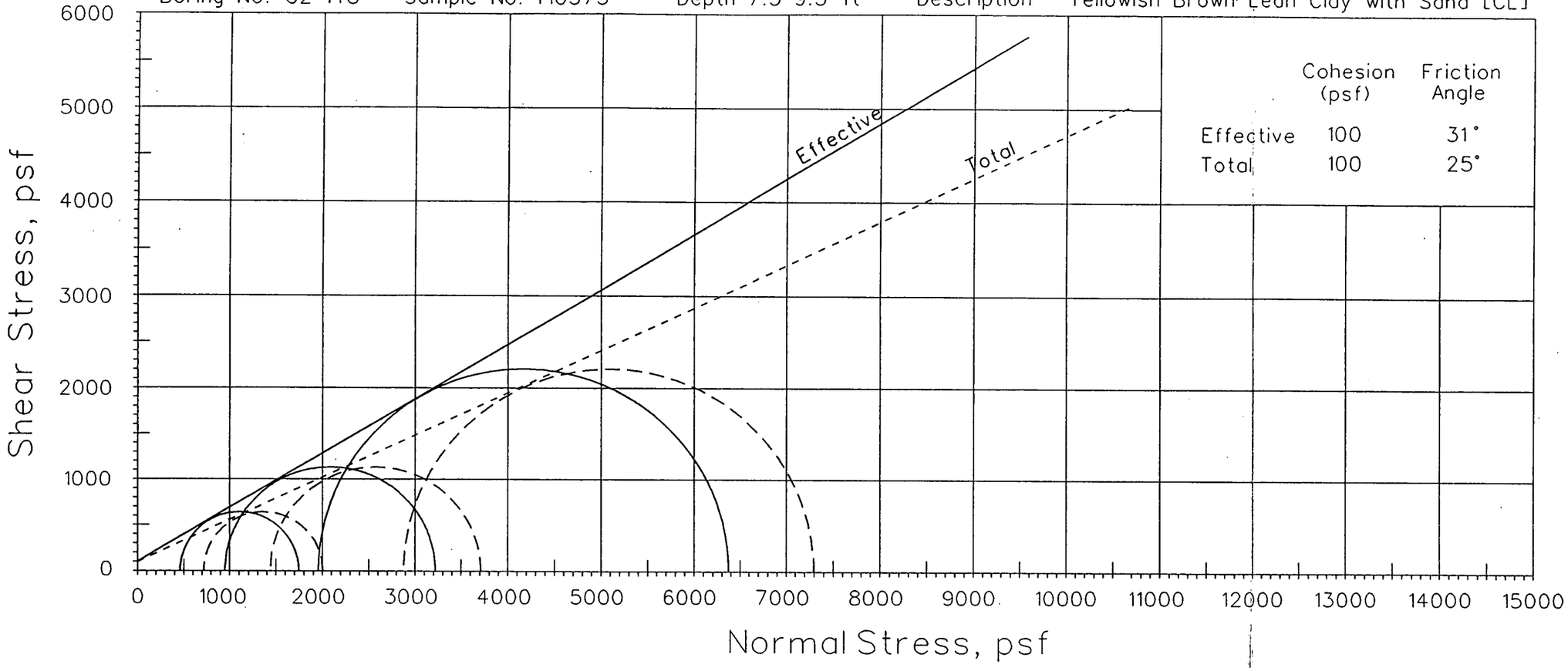
MOHR CIRCLES

CU TRIAXIAL COMPRESSION TESTS -

UNDISTURBED SAMPLES

Triaxial Compression Test Report

Boring No. G2-148 Sample No. 410573 Depth 7.5-9.5 ft Description - Yellowish Brown Lean Clay with Sand [CL]



Type of Test: CU w/pp - STAGED Sample Type: In Situ Failure Criteria: Max. Principal Stress Ratio

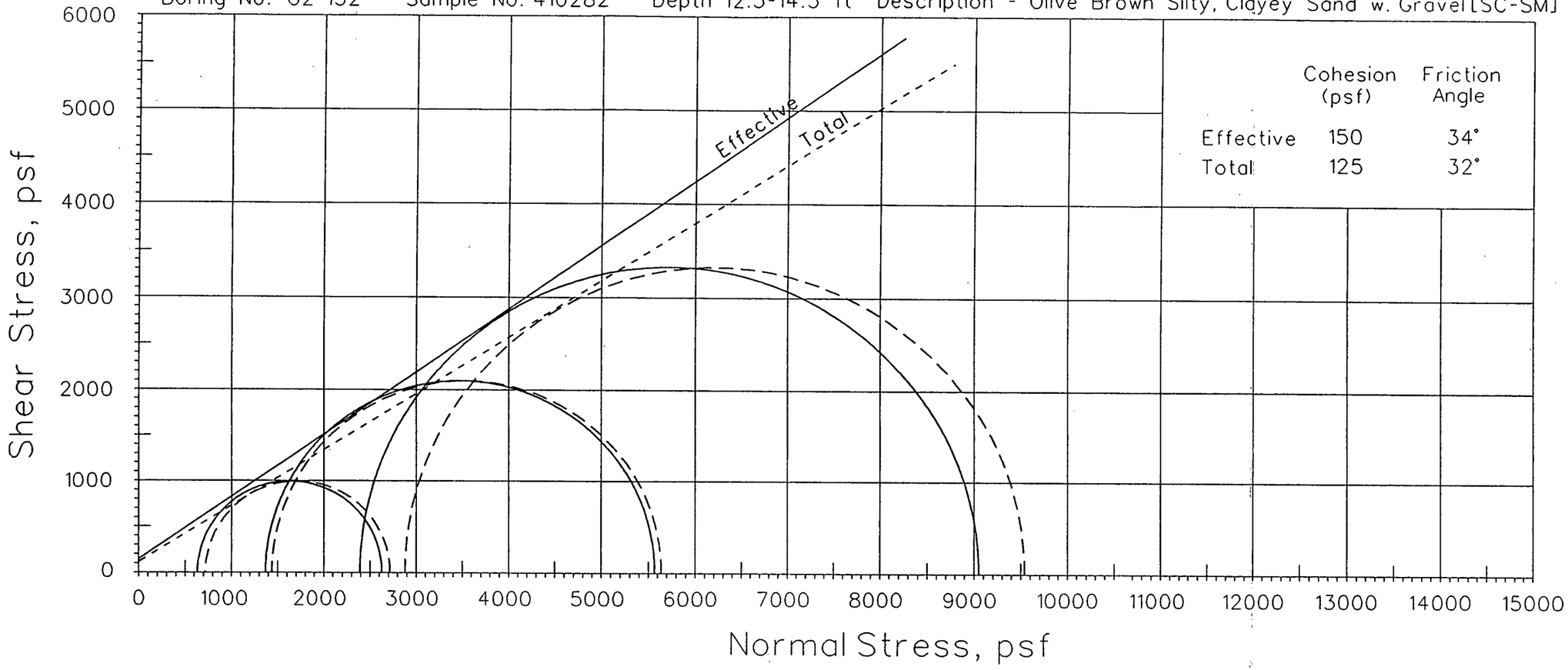
Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Delta Pore Pressure (psf)	Effective Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-148	7.5-9.5	A-STG1	18.2	15.4	135.7	114.8	5.05	1288	259	461	1749	3.80
		A-STG2	18.2	15.4	145.4	123.1	2.57	2272	490	950	3223	3.39
		A-STG3	18.2	15.4	147.7	125.0	3.78	4419	922	1958	6377	3.26

1. Saturated Test.

CAD FILE: /USR/REF2/OU2/PO154/PO154/DGN/410573A_MO.DGN (SKX04024)

Triaxial Compression Test Report

Boring No. G2-152 Sample No. 410282 Depth 12.5-14.5 ft Description - Olive Brown Silty, Clayey Sand w. Gravel [SC-SM]



Type of Test: CU w/pp - STAGED Sample Type: In Situ Failure Criteria: Max. Principal Stress Ratio

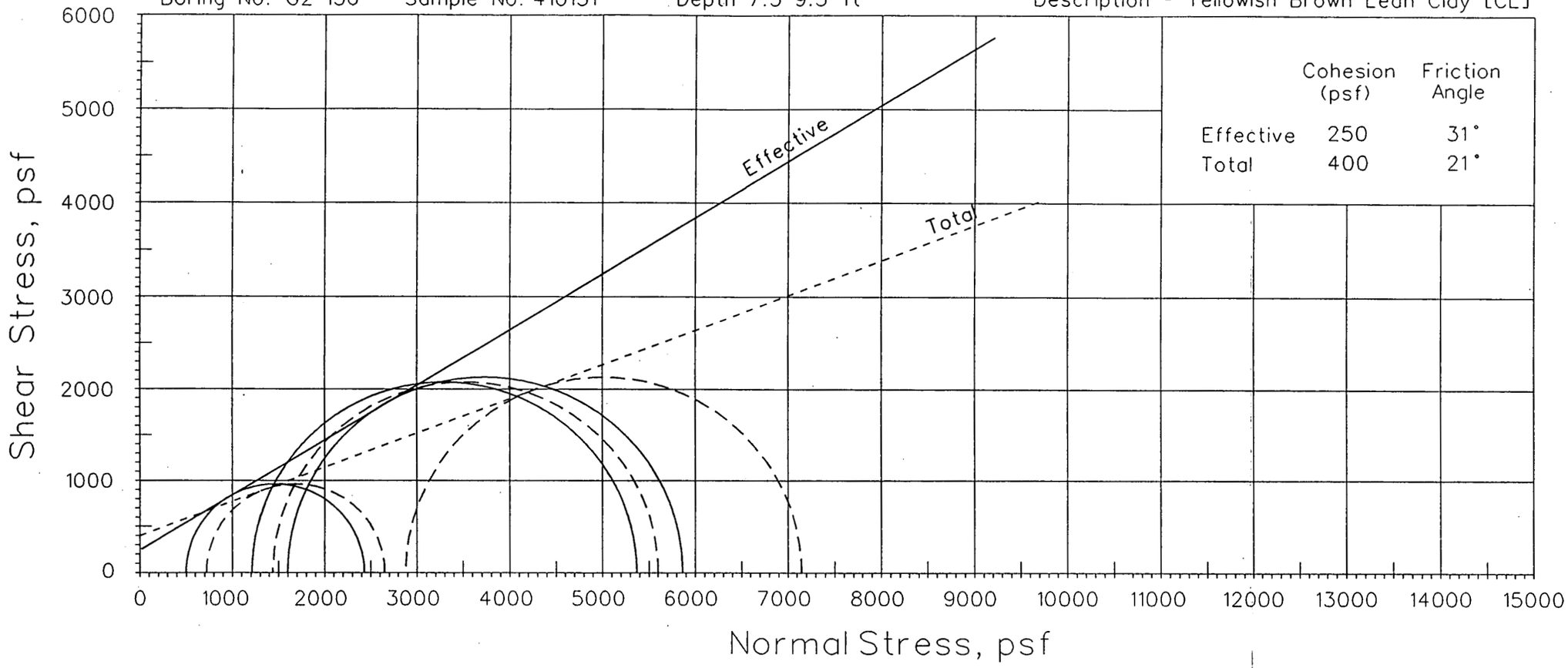
Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Delta Pore Pressure (psf)	Effective Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-152	12.5-14.5	A-STG1	11.5	10.4	146.3	131.2	2.40	1999	86	634	2633	4.16
		A-STG2	11.5	10.4	145.8	130.7	0.99	4202	72	1368	5570	4.07
		A-STG3	11.5	10.4	146.5	131.4	2.51	6664	490	2390	9054	3.79

1. Saturated Test.

CAD FILE: /USR/REF2/OU2/PO154/PO154/DGN/410282A_MO.DGN (SKX04023)

Triaxial Compression Test Report

Boring No. G2-156 Sample No. 410131 Depth 7.5-9.5 ft Description - Yellowish Brown Lean Clay [CL]



Type of Test: CU w/pp Sample Type: In Situ Failure Criteria: Max. Principal Stress Ratio

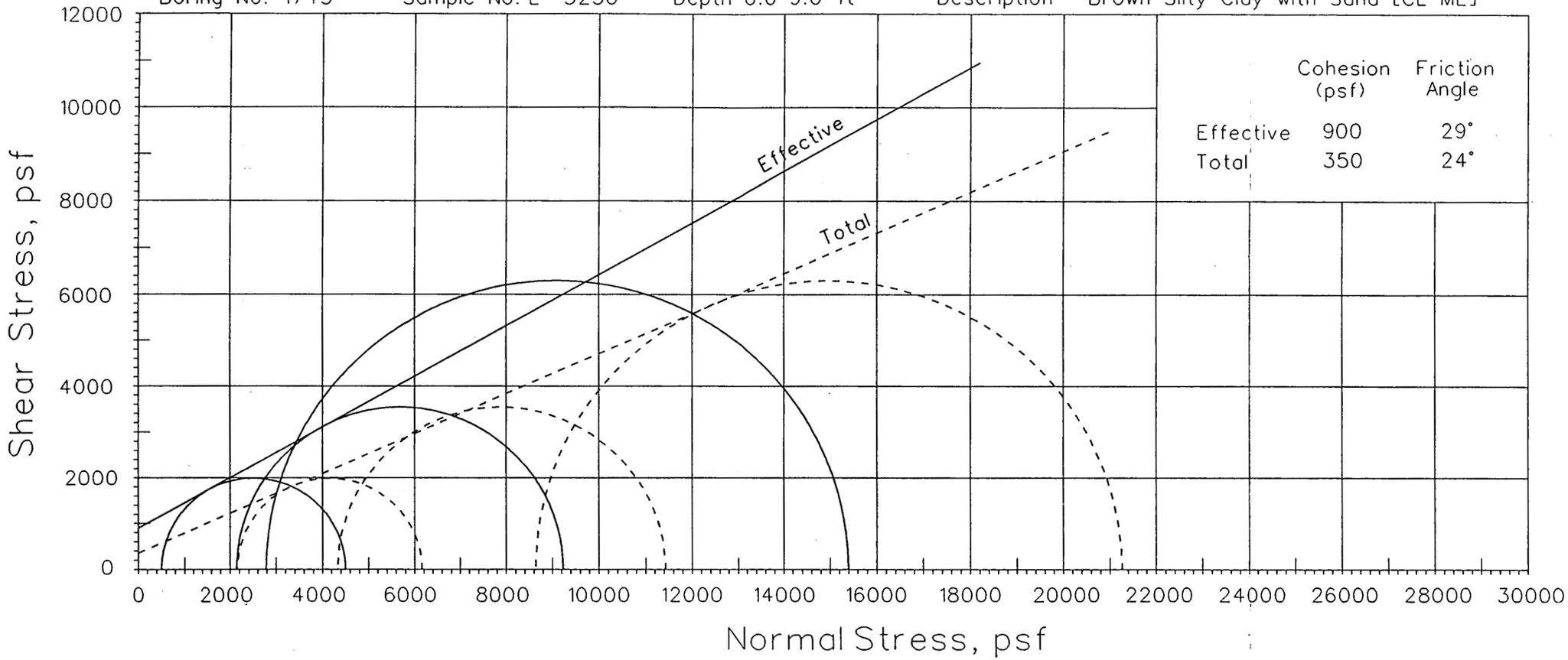
Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Delta Pore Pressure (psf)	Effective Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-156	7.5-9.5	A	21.6	22.2	132.3	108.8	3.61	4160	230	1210	5370	4.44
		B	23.1	22.1	130.9	106.4	5.48	4269	1282	1598	5867	3.67
		C	24.6	24.3	128.7	103.3	3.91	1934	222	498	2432	4.88

1. Saturated Test.

CAD FILE: /USR/REF2/OU2/PO154/PO154/DGN/410131A_MO.DGN (SKX04022)

Triaxial Compression Test Report

Boring No. 1745 Sample No. L- 3250 Depth 6.0-9.0 ft Description - Brown Silty Clay with Sand [CL-ML]



Type of Test: CU w/pp Sample Type: In Situ Failure Criteria: Max. Principal Stress Ratio

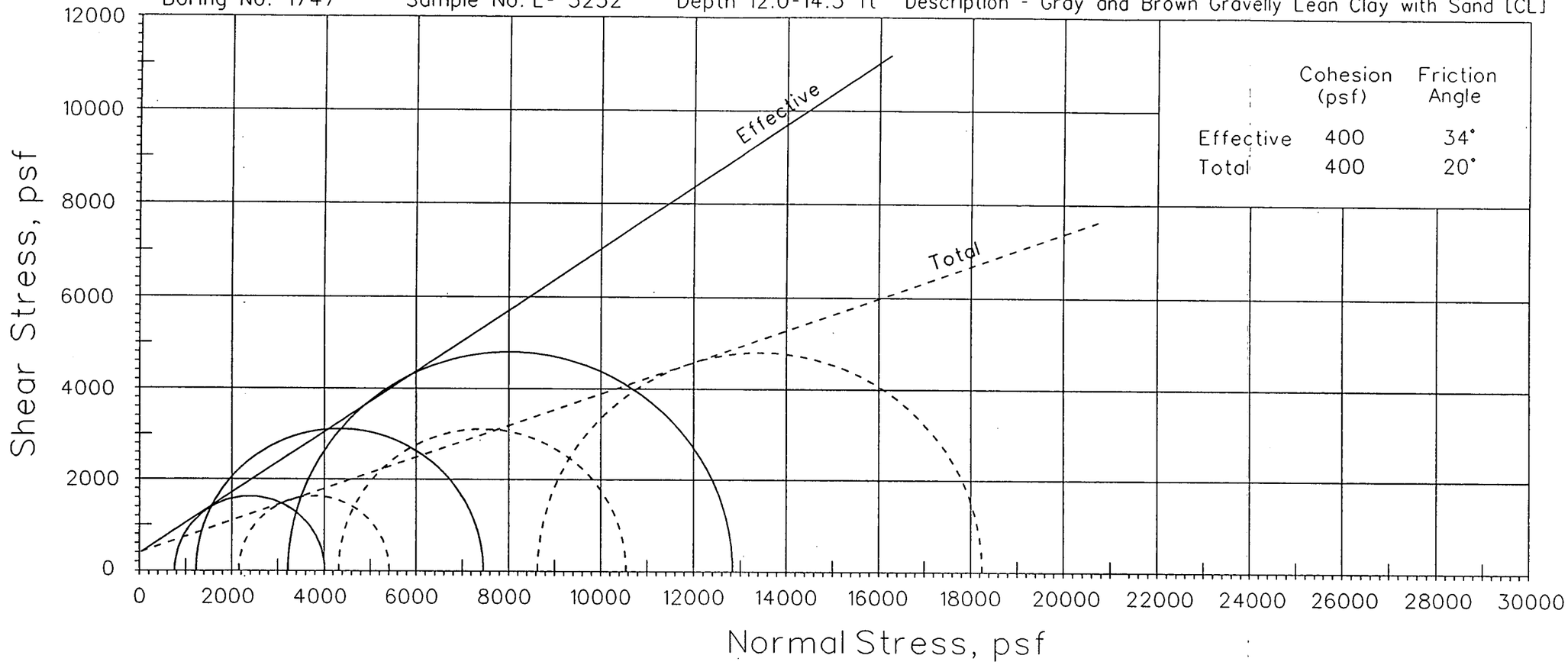
Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Pore Pressure (psf)	Effective Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
1745	6.0-9.0	1	17.9	16.7	138.3	117.3	3.7	4000	1656	500	4500	9.00
		2	14.4	15.4	140.8	123.1	4.8	7100	2189	2140	9240	4.32
		3	14.1	11.0	143.4	125.7	4.7	12620	5861	2780	15400	5.54

Data Source: H.C. Nutting Co., data file: 3250, 5/20/92.

CAD FILE: /USR/REF2/OU2/PO140/PO140/DGN/1745MO.DGN (SKX03805)

Triaxial Compression Test Report

Boring No. 1747 Sample No. L- 3252 Depth 12.0-14.5 ft Description - Gray and Brown Gravelly Lean Clay with Sand [CL]



Type of Test: CU w/pp Sample Type: In Situ Failure Criteria: Max. Principal Stress Ratio

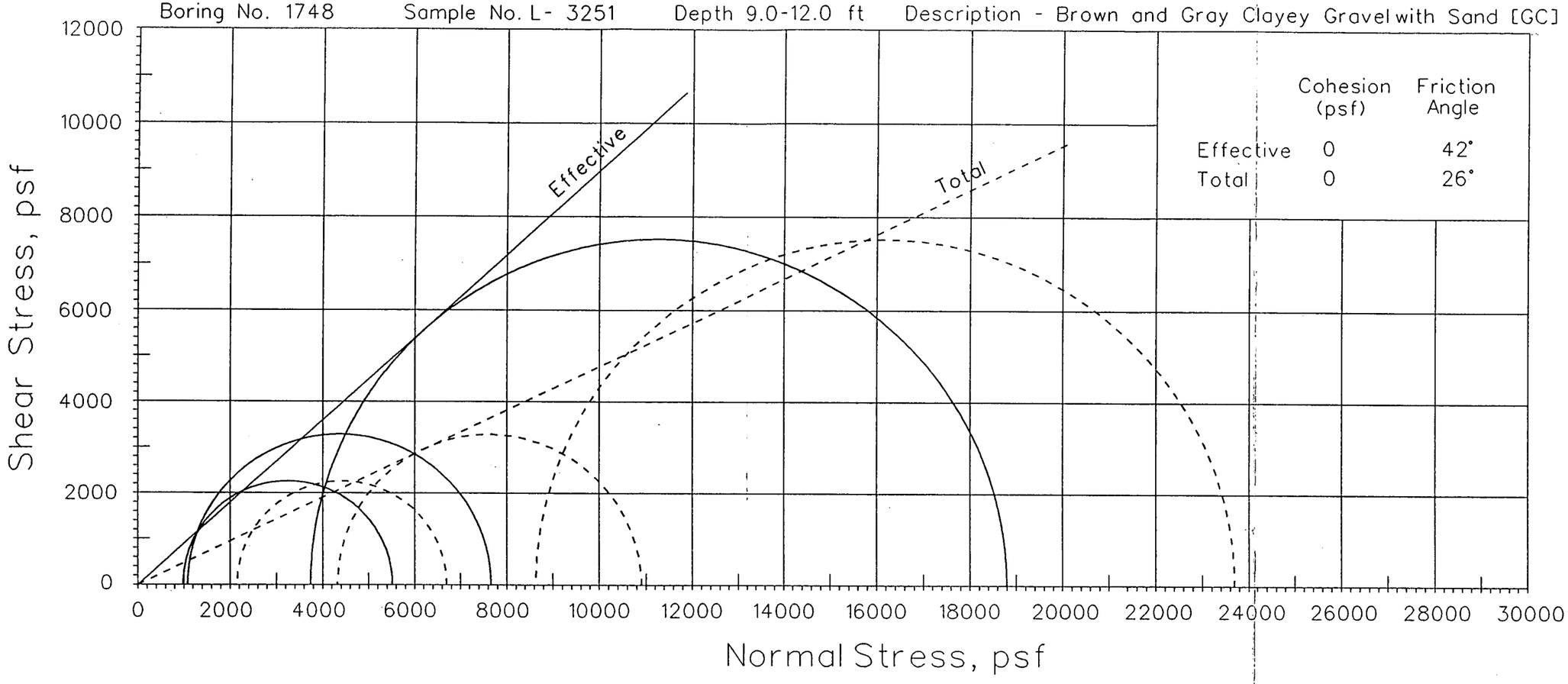
Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Pore Pressure (psf)	Effective Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
1747	12.0-14.5	1	13.4	12.1	142.2	125.4	3.6	3260	1397	760	4020	5.29
		2	13.6	12.9	143.5	126.3	7.1	6240	3096	1220	7460	6.11
		3	12.4	11.2	143.9	128.0	6.2	9620	5414	3220	12840	3.99

Data Source: H.C. Nutting Co., data file: 3252, 5/26/92. CAD FILE: /USR/REF2/OU2/PO140/PO140/DGN/1747MO.DGN (SKX03807)

1. CU Test Data Sheet Describes Test Specimens as Gray and Brown Sandy Lean Clay with Gravel and Rock

Triaxial Compression Test Report

Boring No. 1748 Sample No. L- 3251 Depth 9.0-12.0 ft Description - Brown and Gray Clayey Gravel with Sand [GC]



Type of Test: CU w/pp Sample Type: In Situ Failure Criteria: Max. Principal Stress Ratio

Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Pore Pressure (psf)	Effective Confining Pressure (sigma$_3$) (psf)	Major Principal Stress (sigma$_1$) (psf)	Principal Stress Ratio
			Initial	Final								
1748	9.0-12.0	1	9.7	10.8	148.0	134.9	3.1	4540	1181	980	5520	5.63
		2	11.2	11.7	146.2	131.5	3.2	6580	3240	1080	7660	7.09
		3	12.0	10.9	144.6	129.1	4.5	15060	4896	3740	18800	5.03

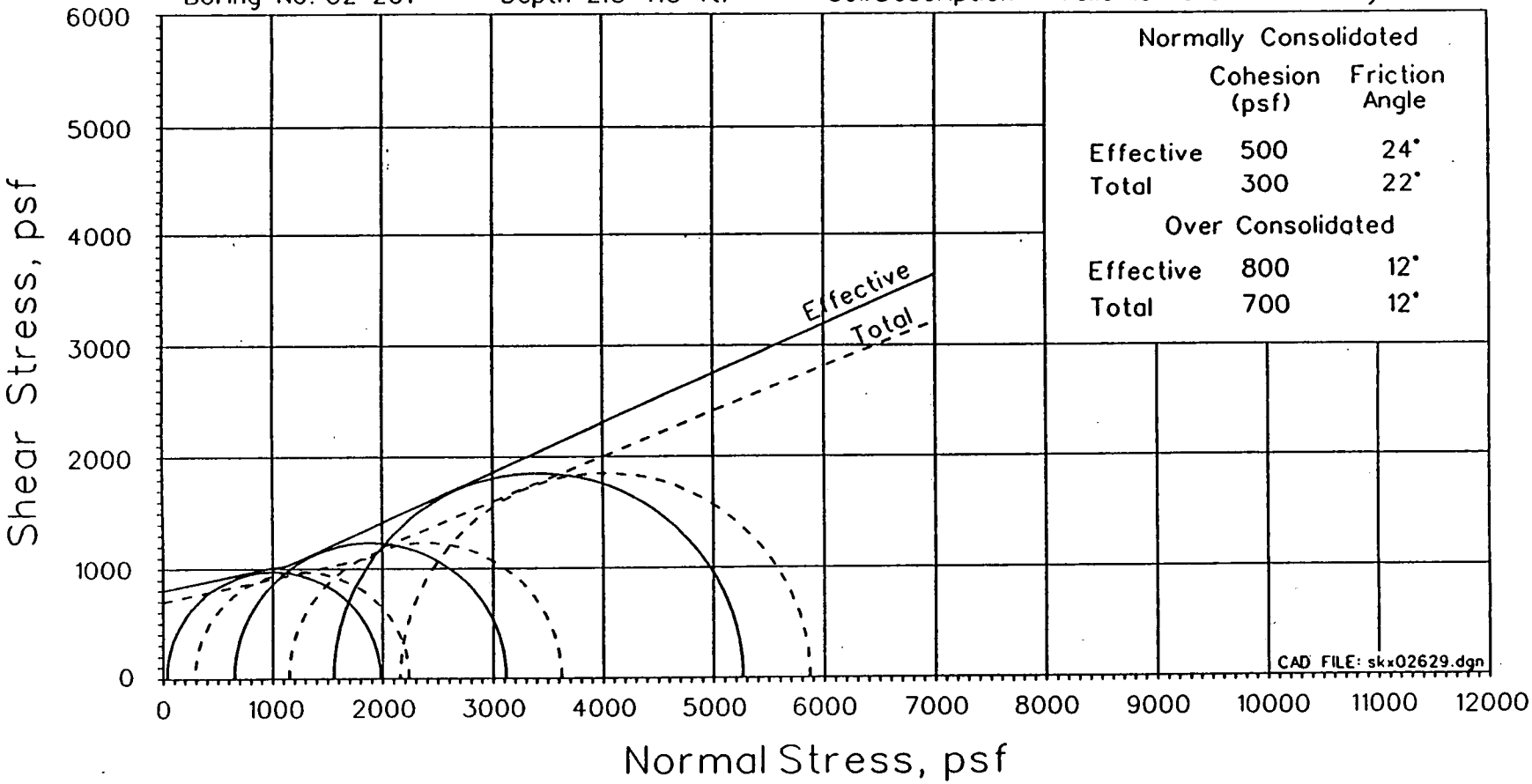
Data Source: H.C. Nutting Co., data file: 3251, 5/18/92.

CAD FILE: /USR/REF2/OU2/PO140/PO140/DGN/1748MO.DGN (SKX03806)

1. CU Test Data Sheet Describes Test Specimens as Brown and Gray Sandy Lean Clay with Gravel and Rock

Triaxial Compression Test Report

Boring No. G2-201 Depth 2.5-4.5 ft. Soil Description - Yellowish brown lean clay [CL]



Type of Test: CU w/pp Sample Type: Insitu

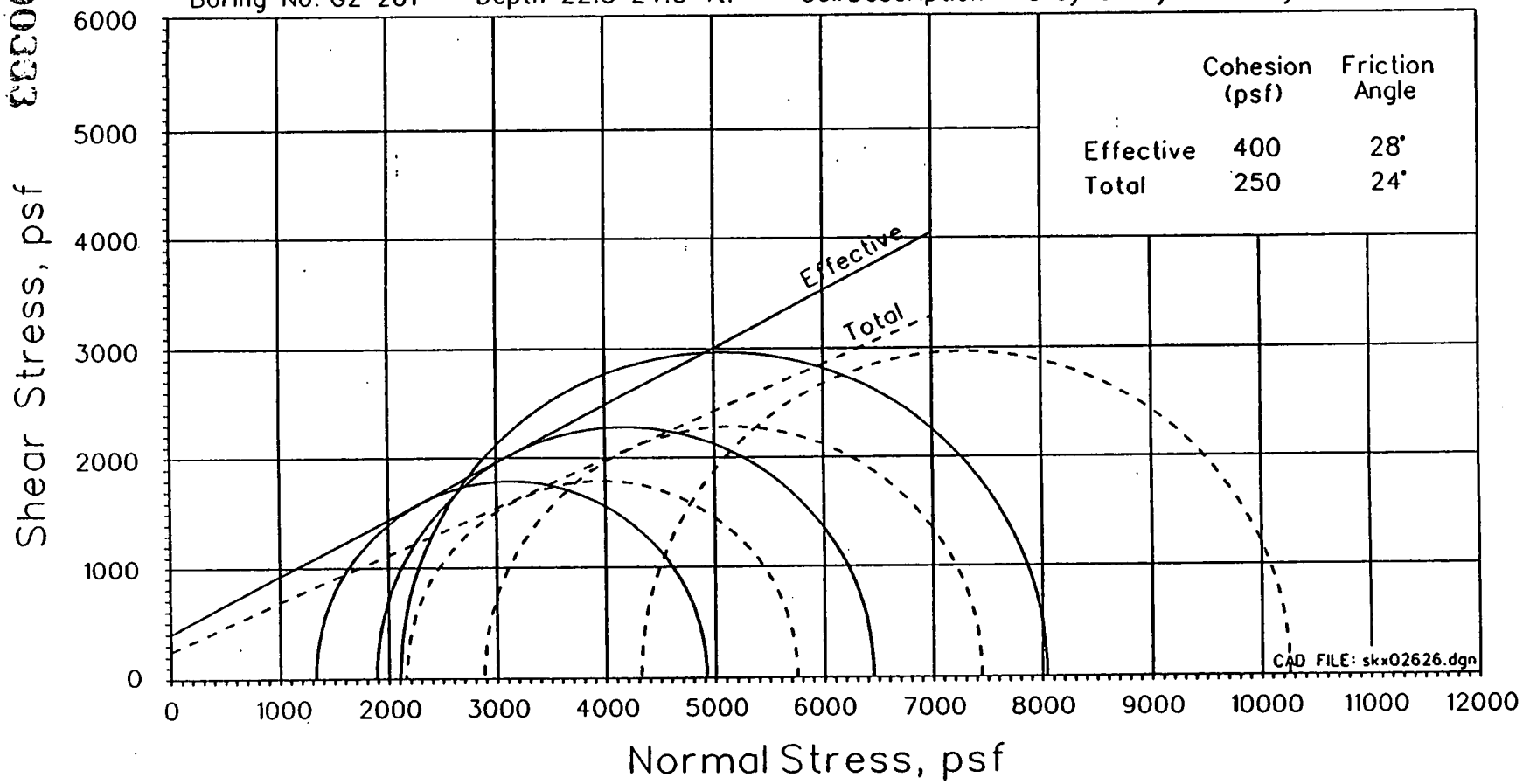
Boring No.	Depth (feet)	Stage	Moisture Content (%) Initial	Moisture Content (%) Final	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Pore Pressure (psf)	Effective Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
G2-201	2.5-4.5	1	18.2	27.5	119.4	101.1	0.33	1953	259	29	1982	68.82
		2	17.7	25.7	120.9	102.8	1.37	2472	504	648	3120	4.82
		3	20.4	24.7	130.2	108.2	3.33	3711	605	1555	5266	3.39

000332

358

Triaxial Compression Test Report

Boring No. G2-201 Depth 22.5-24.5 ft. Soil Description - Gray sandy lean clay [CL]



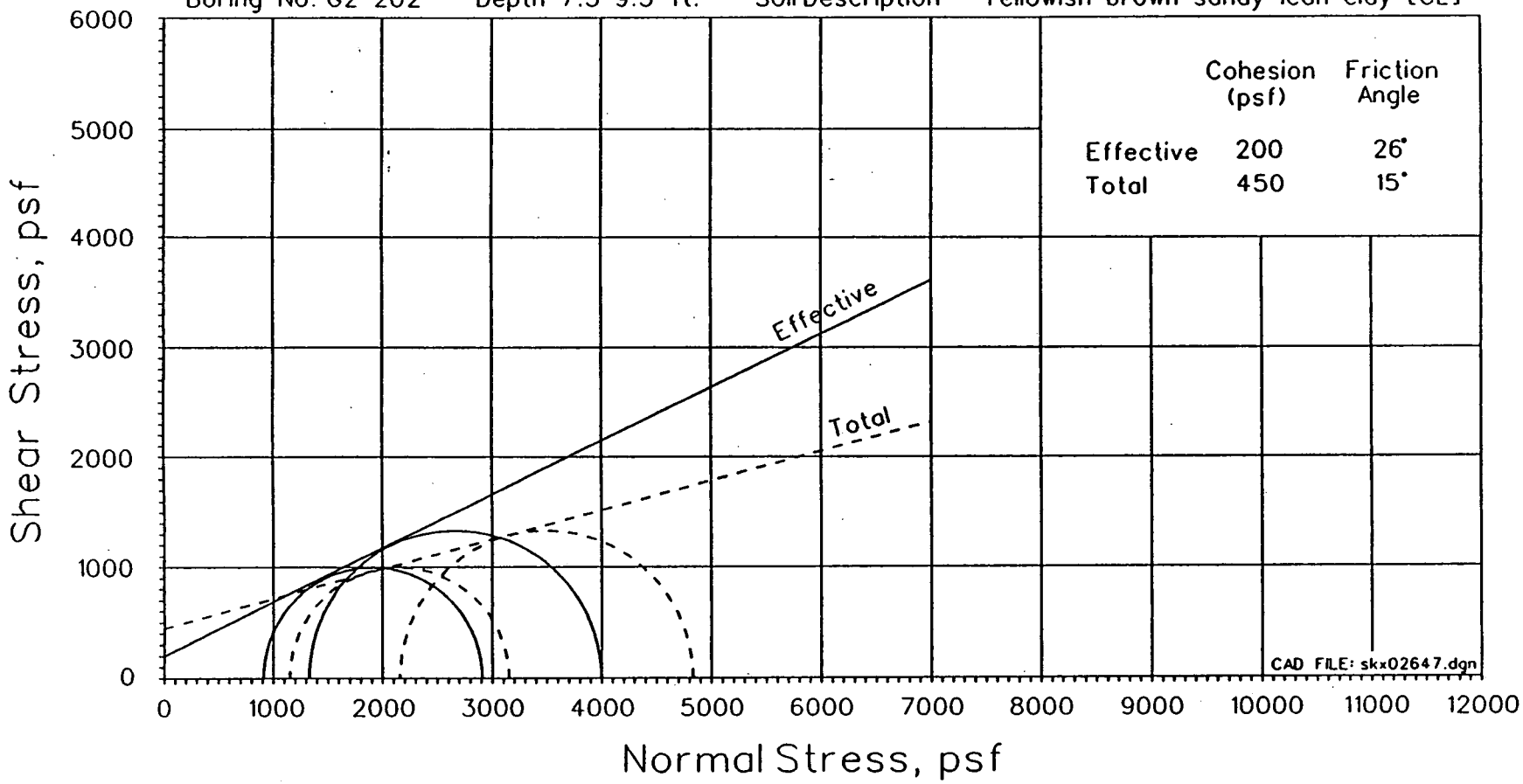
Type of Test: CU w/pp Sample Type: Insitu

Boring No.	Depth (feet)	Stage	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Pore Pressure (psf)	Effective Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-201	22.5-24.5	1	12.6	12.2	143.7	127.6	6.17	3595	835	1325	4919	3.71
		2	13.0	12.1	143.4	126.9	5.14	4566	994	1886	6453	3.42
		3	13.8	12.5	142.4	125.2	6.06	5938	2218	2102	8041	3.82

000333

Triaxial Compression Test Report

Boring No. G2-202 Depth 7.5-9.5 ft. Soil Description - Yellowish brown sandy lean clay [CL]



Type of Test: CU w/pp Sample Type: Insitu

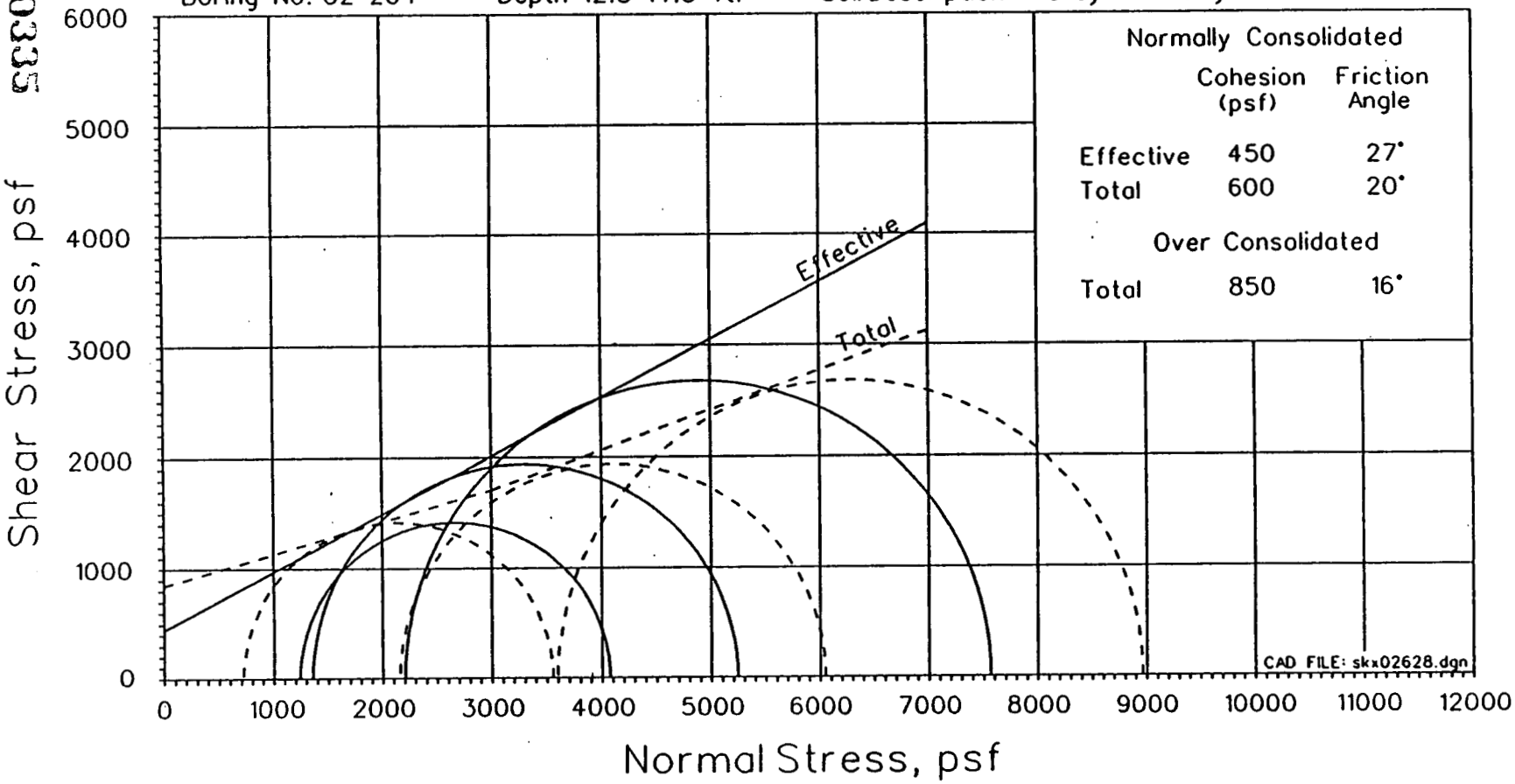
Boring No.	Depth (feet)	Stage	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Pore Pressure (psf)	Effective Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-202	7.5-9.5	1	14.2	14.4	139.6	122.3	3.60	2673	835	1325	3997	3.02
		2	14.1	14.7	142.4	124.8	0.96	2001	245	907	2908	3.21

000334

356

Triaxial Compression Test Report

Boring No. G2-204 Depth 12.5-14.5 ft. Soil Description - Gray lean clay with sand [CL]



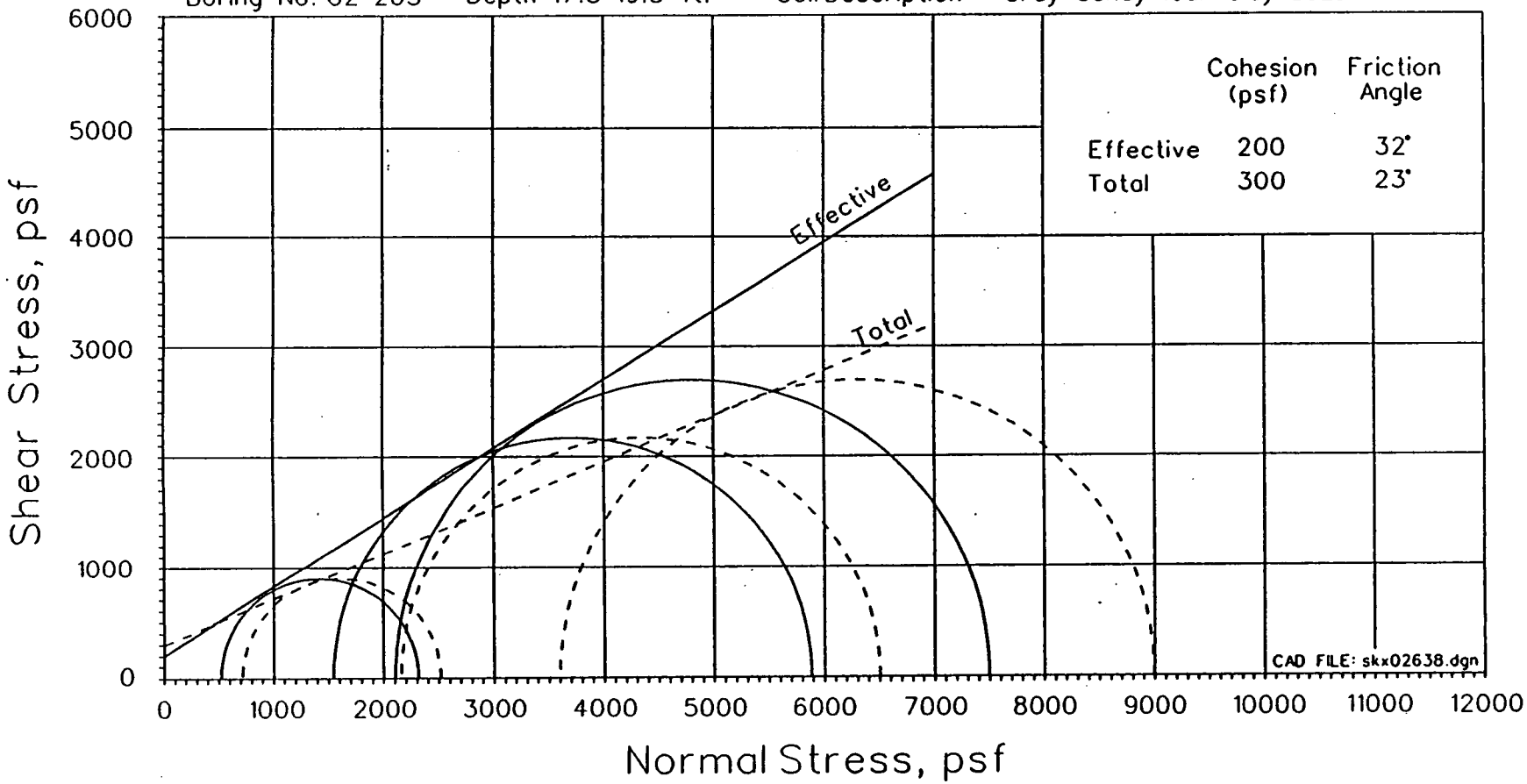
Type of Test: CU w/pp Sample Type: Insitu

Boring No.	Depth (feet)	Stage	Moisture Content (%) Initial	Moisture Content (%) Final	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Pore Pressure (psf)	Effective Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
G2-204	12.5-14.5	1	12.5	13.2	142.9	127.0	6.18	2838	-518	1238	4076	3.29
		2	12.9	12.8	144.0	127.6	3.56	3888	806	1354	5242	3.87
		3	12.7	12.1	145.9	129.5	4.43	5366	1397	2203	7569	3.44

000335

Triaxial Compression Test Report

Boring No. G2-205 Depth 17.5-19.5 ft. Soil Description - Gray sandy lean clay [CL]



Type of Test: CU w/pp Sample Type: Insitu

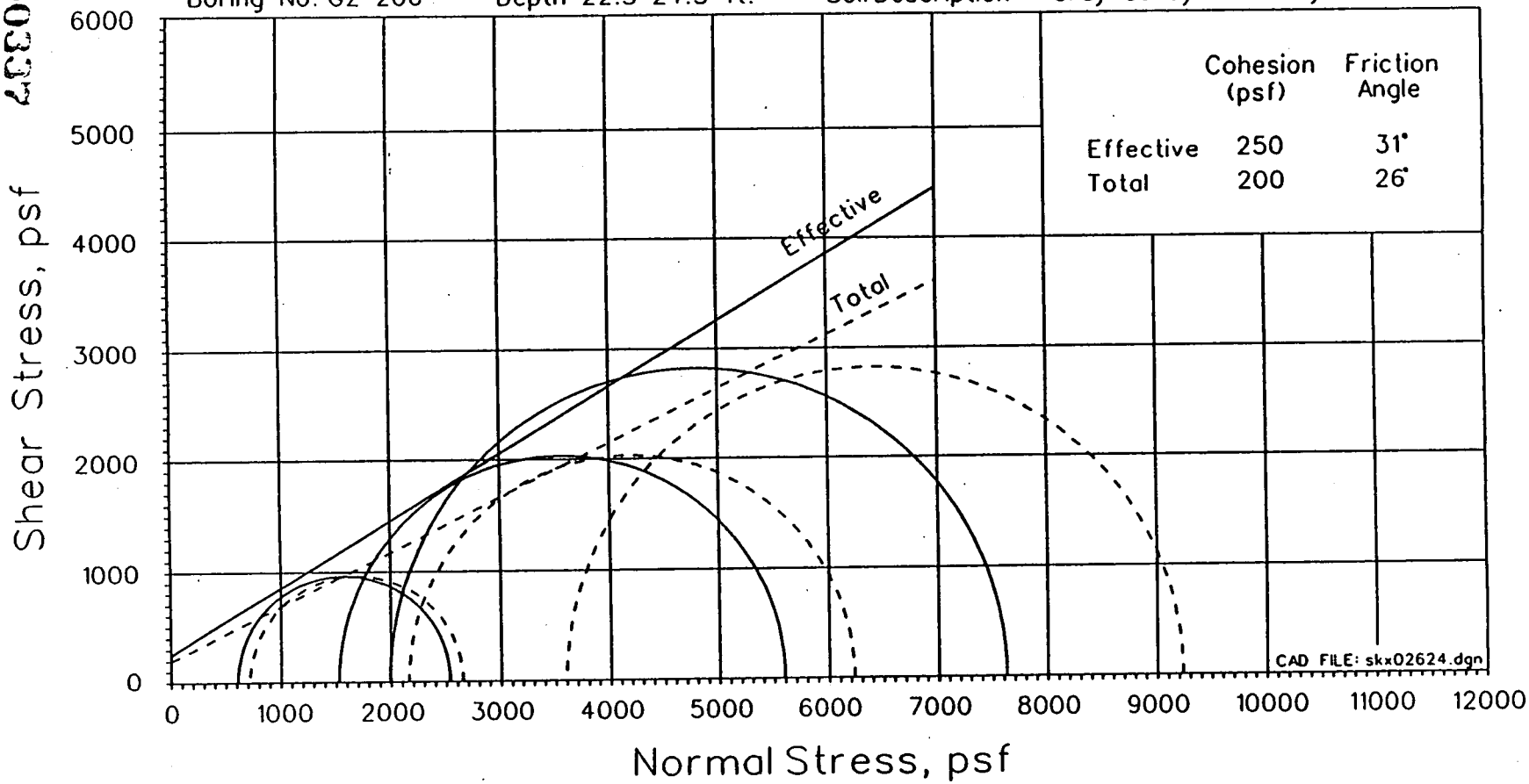
Boring No.	Depth (feet)	Stage	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Pore Pressure (psf)	Effective Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-205	17.5-19.5	1	12.2	12.6	143.3	127.7	2.68	1797	202	518	2316	4.47
		2	13.0	12.5	143.1	126.6	6.75	4344	619	1541	5885	3.82
		3	12.6	12.6	144.4	128.2	5.97	5395	1498	2102	7498	3.57

000336

358

Triaxial Compression Test Report

Boring No. G2-206 Depth 22.5-24.5 ft. Soil Description - Gray sandy lean clay [CL]



Type of Test: CU w/pp Sample Type: Insitu

Boring No.	Depth (feet)	Stage	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Pore Pressure (psf)	Effective Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-206	22.5-24.5	1	12.8	13.0	143.5	127.2	2.51	1932	115	605	2537	4.20
		2	12.7	12.4	144.2	128.0	5.87	4072	634	1526	5598	3.67
		3	12.7	12.1	144.4	128.1	6.92	5638	1613	1987	7625	3.84

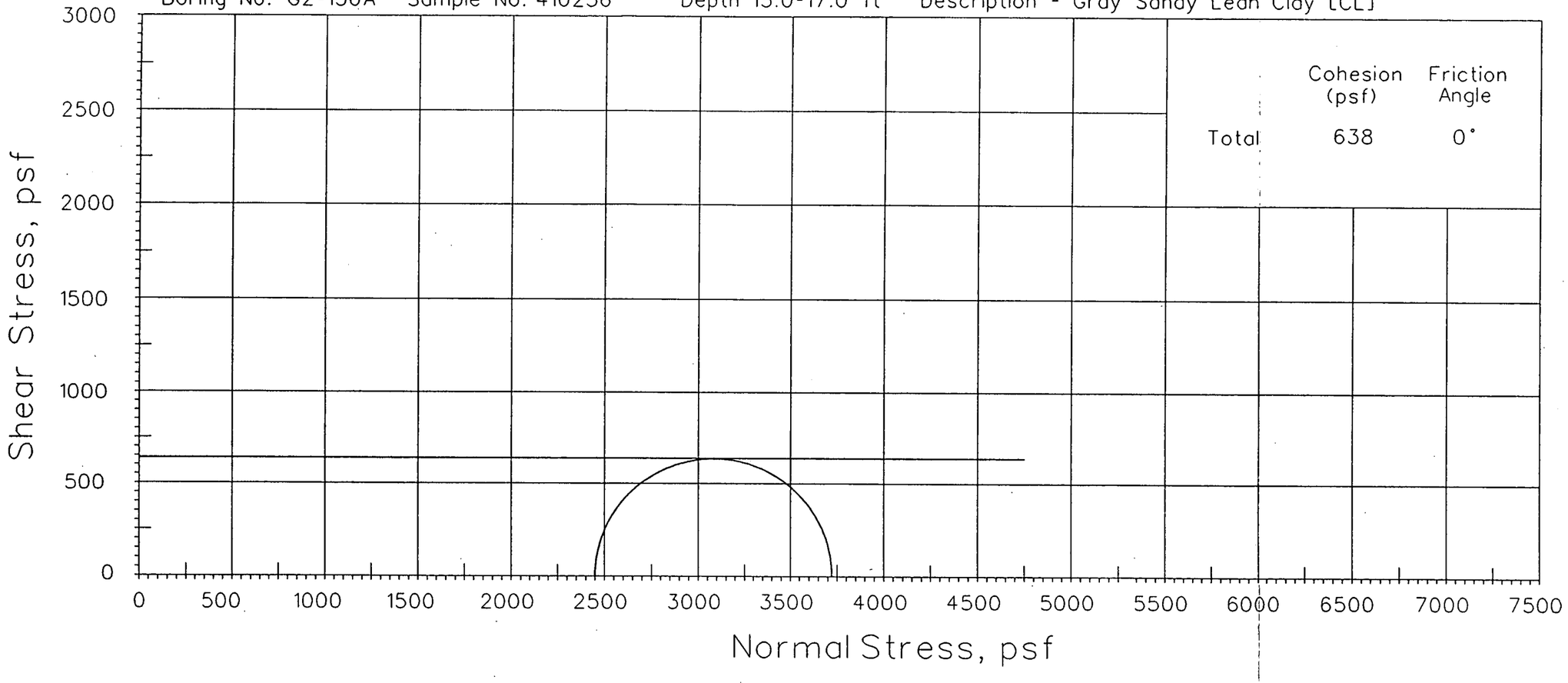
000337

UU TRIAXIAL COMPRESSION TESTS -

UNDISTURBED SAMPLES

Triaxial Compression Test Report

Boring No. G2-150A Sample No. 410256 Depth 15.0-17.0 ft Description - Gray Sandy Lean Clay [CL]



Type of Test: TX/UU Sample Type: In Situ Failure Criteria: 15% Axial Strain

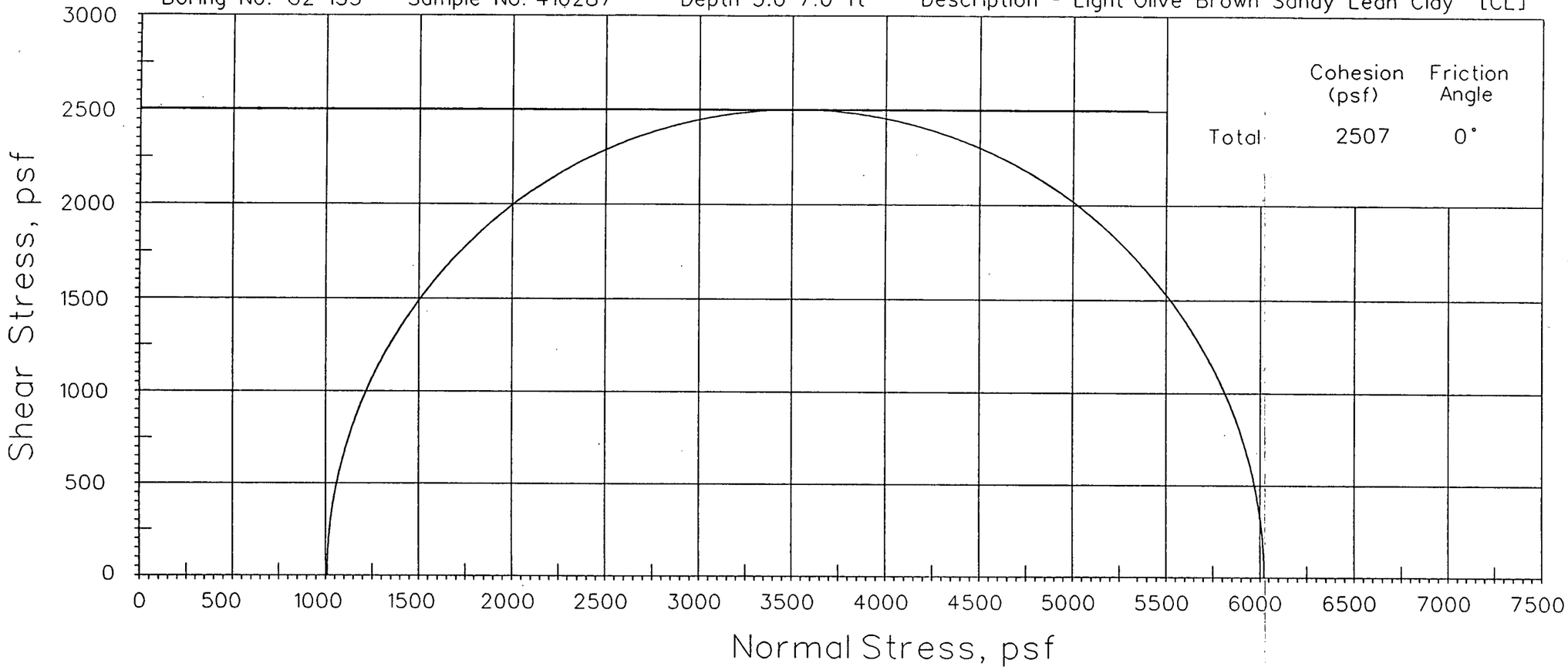
Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Delta Pore Pressure (psf)	Total Confining Pressure (sigma$_3$) (psf)	Major Principal Stress (sigma$_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-150A	15.0-17.0	410256A	14.7	14.1	142.7	124.4	15.02	1275	N/A	2448	3723	1.52

1. Saturated Single Point Test.
2. N/A = Not Applicable

CAD FILE: /USR/REF2/OU2/PO154/PO154/DGN/410256B_MO.DGN (SKX04196)

Triaxial Compression Test Report

Boring No. G2-153 Sample No. 410287 Depth 5.0-7.0 ft Description - Light Olive Brown Sandy Lean Clay [CL]



Type of Test: TX/UU Sample Type: In Situ Failure Criteria: 15% Axial Strain

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								
G2-153	5.0-7.0	410287	13.1	13.1	143.6	127.0	15.07	5014	N/A	1008	6022	5.97

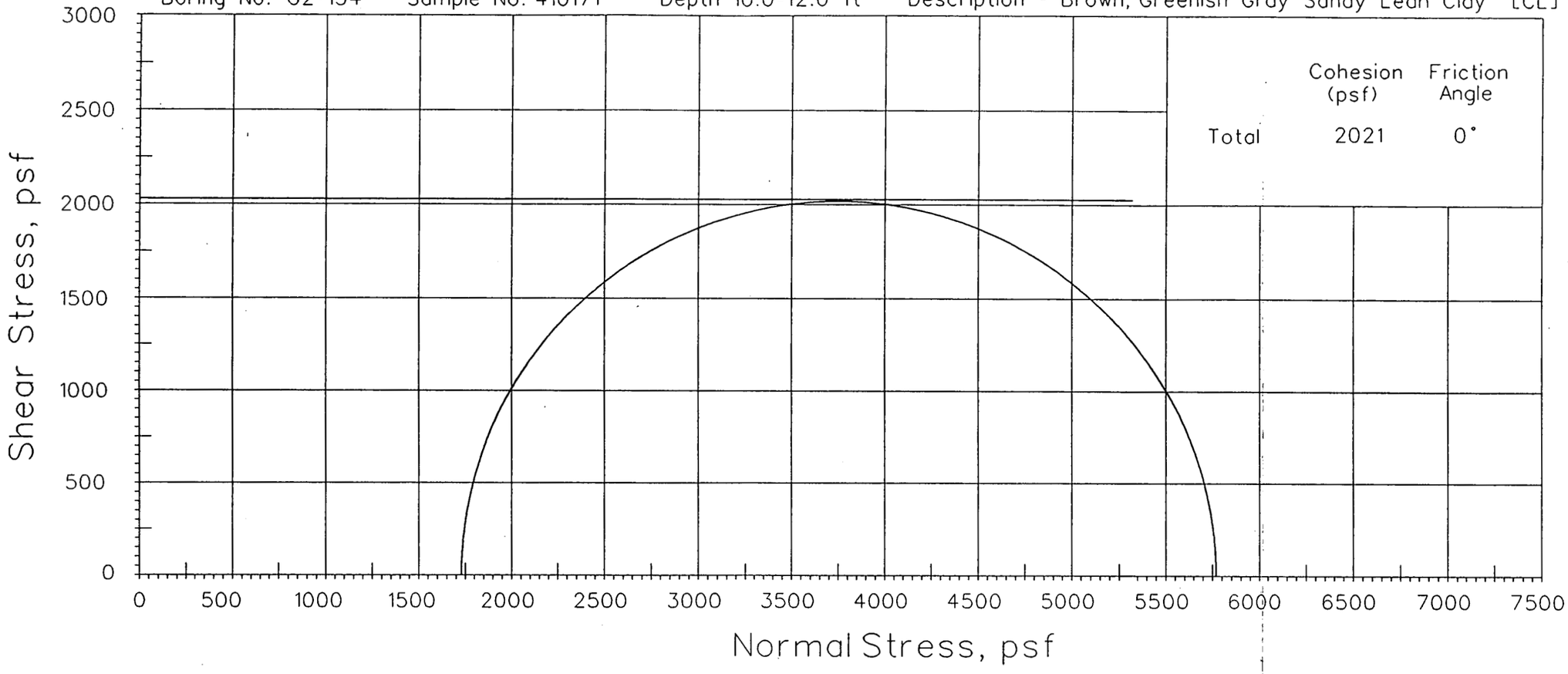
1. Saturated Single Point Test.
2. N/A = Not Applicable

CAD FILE: /USR/REF2/OU2/P0154/P0154/DGN/410287B_MO.DGN (SKX04198)

Triaxial Compression Test Report

L-356

Boring No. G2-154 Sample No. 410171 Depth 10.0-12.0 ft Description - Brown, Greenish Gray Sandy Lean Clay [CL]



Type of Test: TX/UU Sample Type: In Situ Failure Criteria: 15% Axial Strain

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								
G2-154	10.0-12.0	410171B	11.4	12.5	142.5	128.0	14.20	4042	N/A	1728	5770	3.34

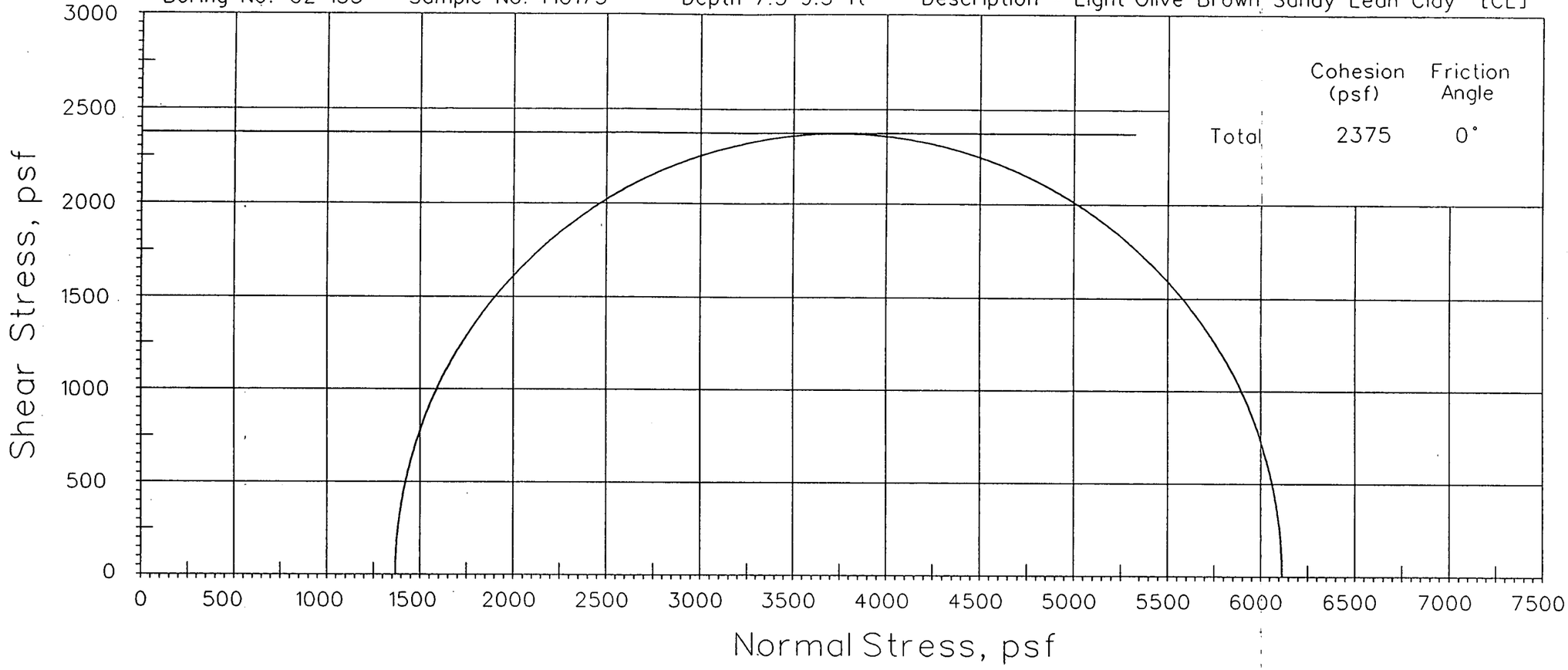
1. Saturated Single Point Test.
2. N/A = Not Applicable

CAD FILE: /USR/REF2/OU2/P0154/P0154/DGN/410171B_MO.DGN (SKX04197)

000341

Triaxial Compression Test Report

Boring No. G2-155 Sample No. 410175 Depth 7.5-9.5 ft Description - Light Olive Brown Sandy Lean Clay [CL]



Type of Test: TX/UU Sample Type: In Situ Failure Criteria: 15% Axial Strain

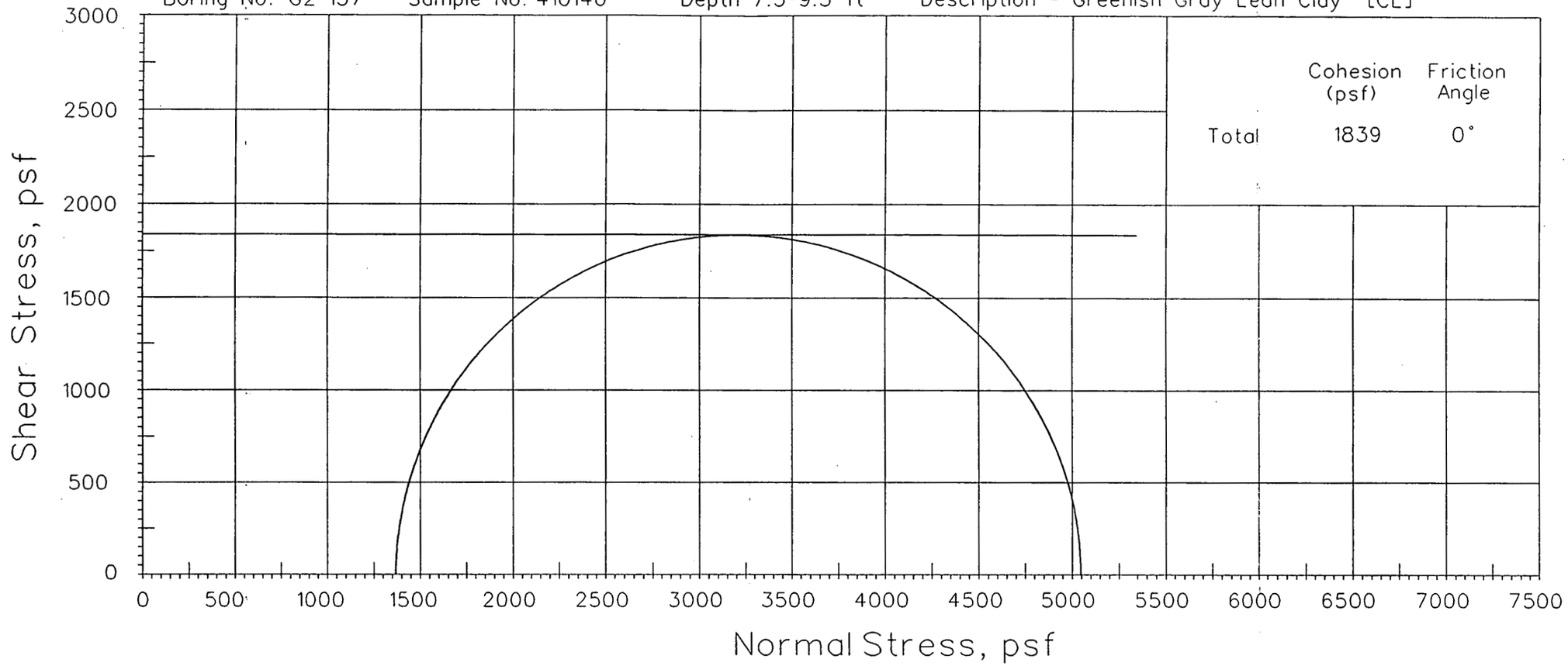
Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Delta Pore Pressure (psf)	Total Confining Pressure (sigma$_3$) (psf)	Major Principal Stress (sigma$_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-155	7.5-9.5	410175A	12.2	13.8	143.5	127.8	14.89	4749	N/A	1368	6117	4.47

1. Saturated Single Point Test.
2. N/A = Not Applicable

CAD FILE: /USR/REF2/OU2/P0154/P0154/DGN/410175B_MO.DGN (SKX04195)

Triaxial Compression Test Report

Boring No. G2-157 Sample No. 410140 Depth 7.5-9.5 ft Description - Greenish Gray Lean Clay [CL]



Type of Test: TX/UU Sample Type: In Situ Failure Criteria: Maximum Deviator Stress

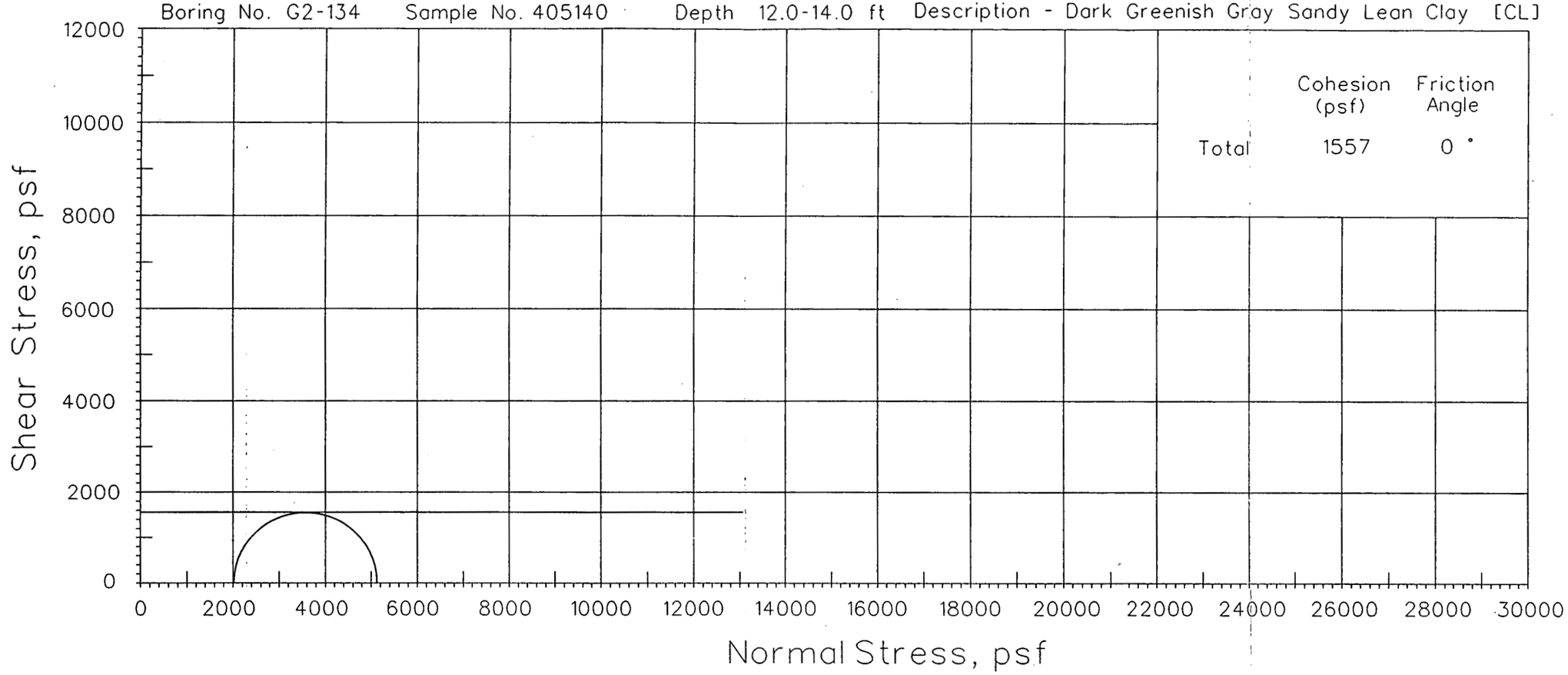
Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Delta Pore Pressure (psf)	Total Confining Pressure (sigma$_3$) (psf)	Major Principal Stress (sigma$_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-157	7.5-9.5	410140	23.5	23.0	133.0	107.7	10.48	3678	N/A	1368	5046	3.69

1. Saturated Single Point Test.
2. N/A = Not Applicable

CAD FILE: /USR/REF2/OU1/P019/P019/DGN/410140B_MO.DGN (SKX04194)

Triaxial Compression Test Report

Boring No. G2-134 Sample No. 405140 Depth 12.0-14.0 ft Description - Dark Greenish Gray Sandy Lean Clay [CL]



Type of Test: UU - Single Point Sample Type: In Situ Failure Criteria: 15% Axial Strain

Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Pore Pressure (psf)	Total Confining Pressure (sigma$_3$) (psf)	Major Principal Stress (sigma$_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-134	12.0-14.0	405140	12.6	12.1	143.7	127.6	15.14	3115	N/A	2016	5131	2.55

1. Saturated Test.
2. N/A = Not Applicable

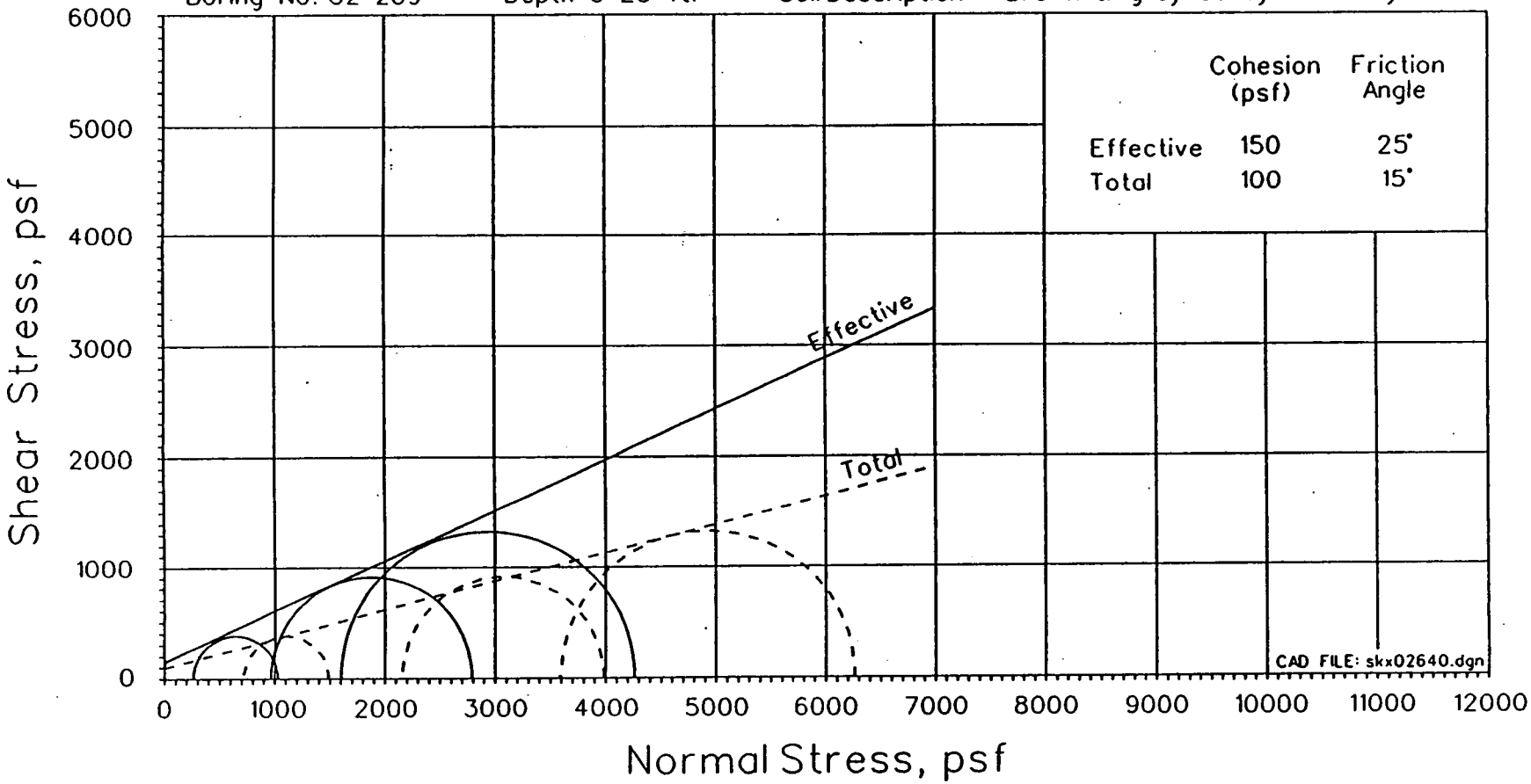
CAD FILE: /USR/REF2/OU2/PO140/PO140/DGN/405140C_MO.DGN (SKX03850)

CU TRIAXIAL COMPRESSION TESTS - REMOLDED 95 PERCENT MDD

AT OR NEAR OPTIMUM MOISTURE CONTENT (ASTM D 698)

Triaxial Compression Test Report

Boring No. G2-209 Depth 0-25 ft. Soil Description - Brown & gray sandy lean clay [CL]



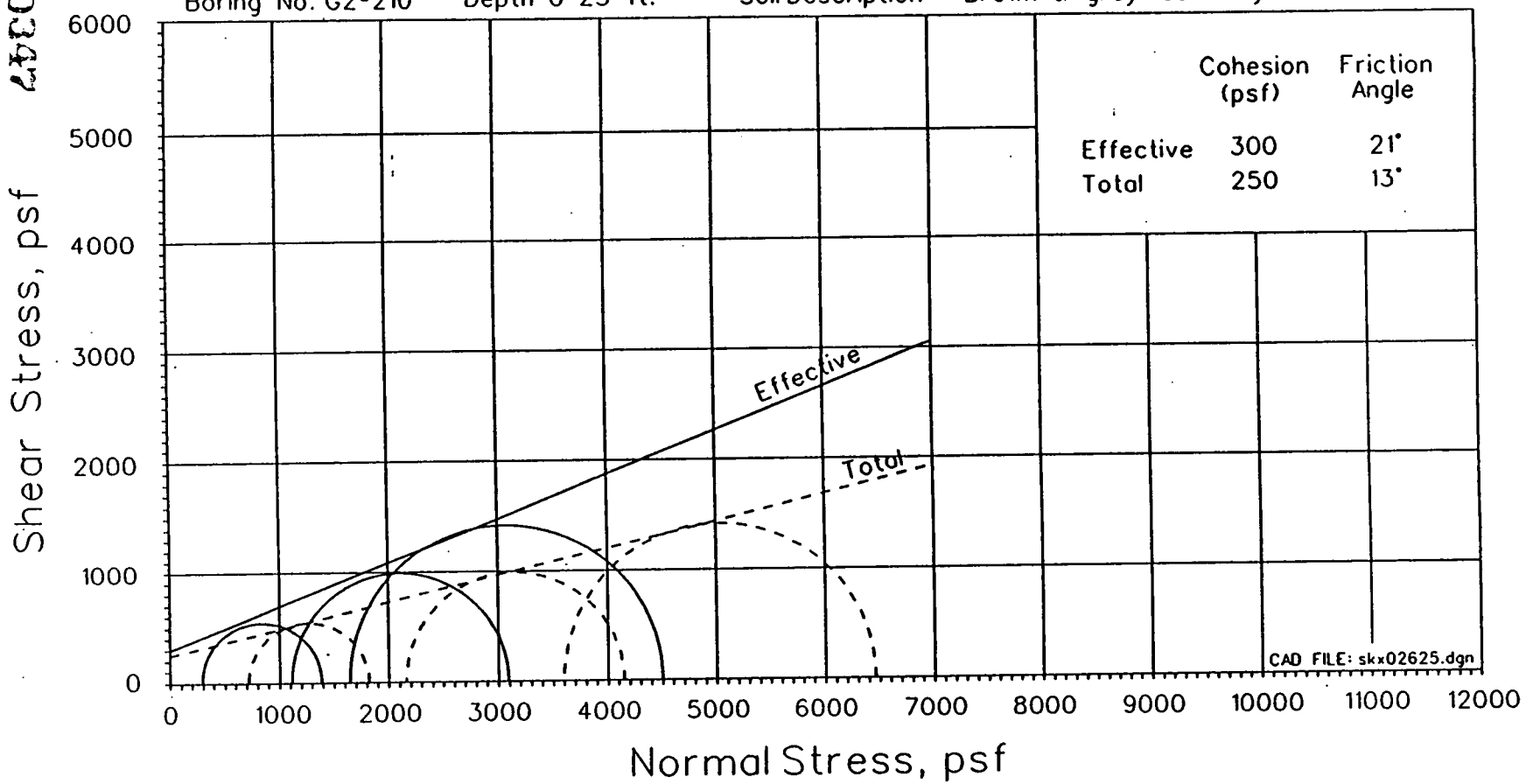
Type of Test: CU w/pp Sample Type: Remold

Boring No.	Depth (feet)	Stage	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Pore Pressure (psf)	Effective Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-209	0-25	1	12.0	17.6	131.4	117.3	3.36	770	461	259	1030	3.97
		2	12.1	16.0	131.6	117.4	9.33	1827	1195	965	2791	2.89
		3	12.1	15.2	130.6	116.5	10.12	2665	2002	1598	4263	2.67

000346

Triaxial Compression Test Report

Boring No. G2-210 Depth 0-25 ft. Soil Description - Brown & gray lean clay with sand [CL]



Type of Test: CU w/pp Sample Type: Remold

Boring No.	Depth (feet)	Stage	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Pore Pressure (psf)	Effective Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-210	0-25	1	12.0	18.1	131.4	117.3	1.67	1102	432	288	1390	4.83
		2	12.0	16.1	133.1	118.9	10.28	1986	1051	1109	3095	2.79
		3	11.9	14.8	133.2	119.1	6.86	2861	1958	1642	4503	2.74

000347

CU TRIAXIAL COMPRESSION TESTS - REMOLDED 85 PERCENT MDD

AT OR NEAR OPTIMUM MOISTURE CONTENT (ASTM D 698)

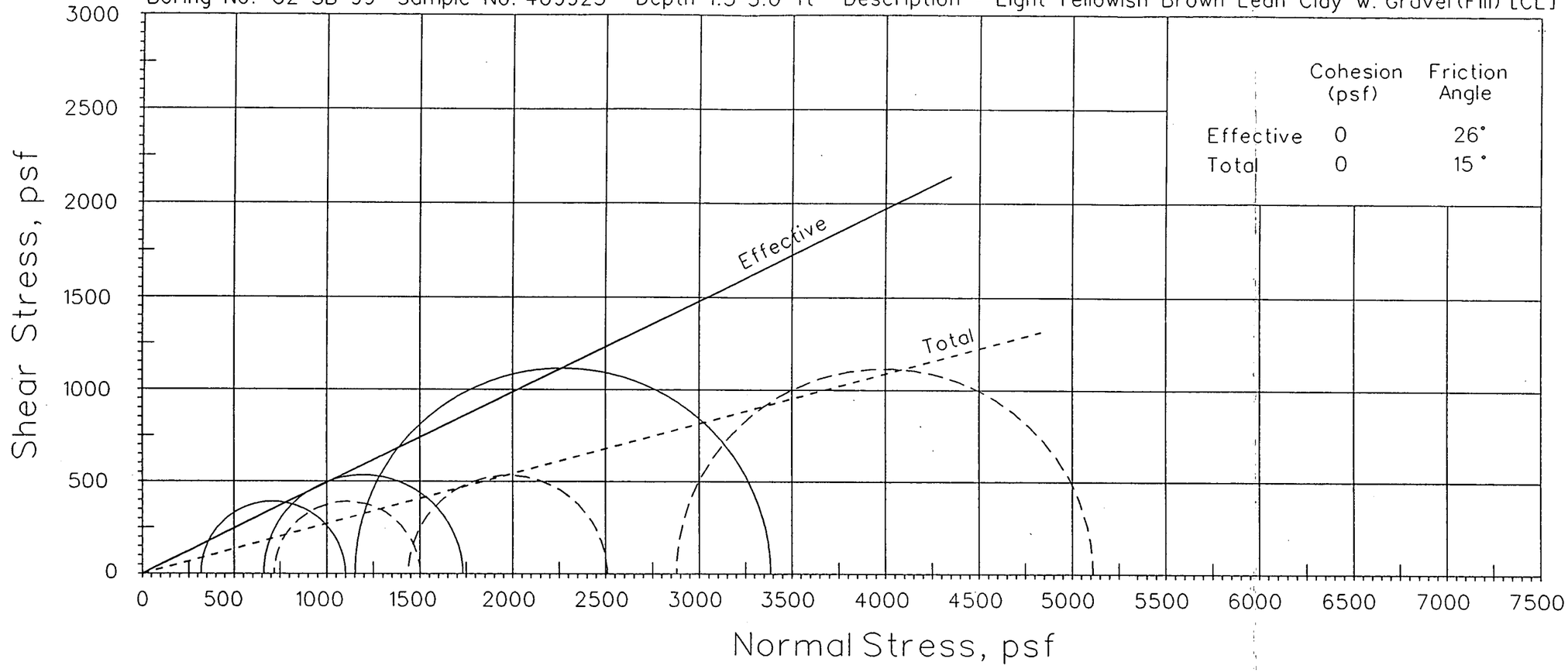
UU TRIAXIAL COMPRESSION TESTS - REMOLDED 90 PERCENT MDD

AT OR NEAR OPTIMUM MOISTURE CONTENT (ASTM D 698)

000349

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

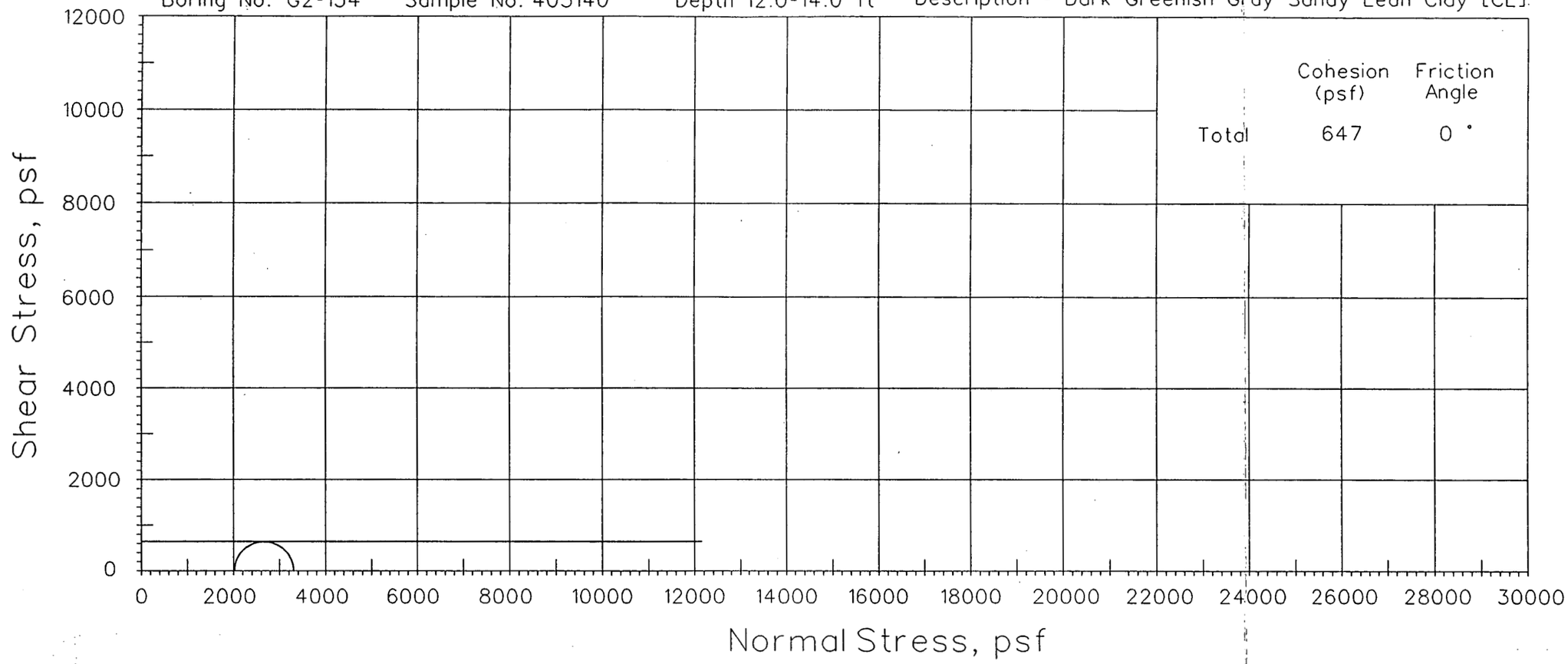
1. Saturated Test.

CAD FILE: /USR/REF2/OU2/P0154/P0154/DGN/409923MO.DGN (SKX04093)

Triaxial Compression Test Report

E-856

Boring No. G2-134 Sample No. 405140 Depth 12.0-14.0 ft Description - Dark Greenish Gray Sandy Lean Clay [CL]



Type of Test: UU - Single Point Sample Type: Remolded 95% MDD[3] Failure Criteria: Max. Principle Stress Ratio

Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Pore Pressure (psf)	Total Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-134	12.0-14.0	405140	14.5	14.6	136.8	119.5	11.64	1294	N/A	2016	3310	1.64

1. Saturated Test.
2. N/A = Not Applicable
3. Remolded Wet of Optimum Moisture Content In Accordance with ASTM D698

CAD FILE: /USR/REF2/OU2/PO140/PO140/DGN/405140A_MO.DGN (SKX03836)

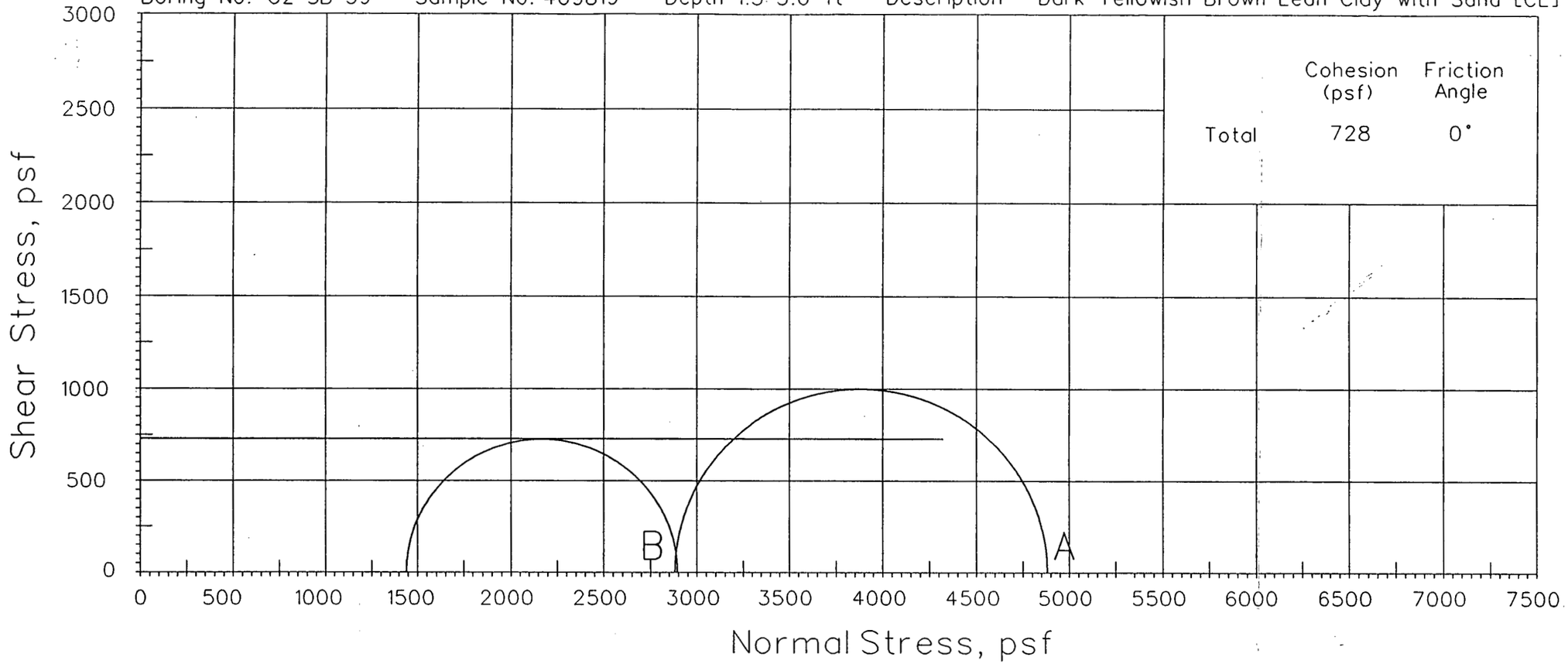
000351

UU TRIAXIAL COMPRESSION TESTS - REMOLDED 95 PERCENT MDD

AT OR NEAR OPTIMUM MOISTURE CONTENT (ASTM D 698)

Triaxial Compression Test Report

Boring No. G2-SB-59 Sample No. 409819 Depth 1.5-5.0 ft Description - Dark Yellowish Brown Lean Clay with Sand [CL]



Type of Test: TX/UU - UUr90 Sample Type: Remolded 90% MDD Failure Criteria: 15% Axial Strain(A); Max. Dev. Stress (B)

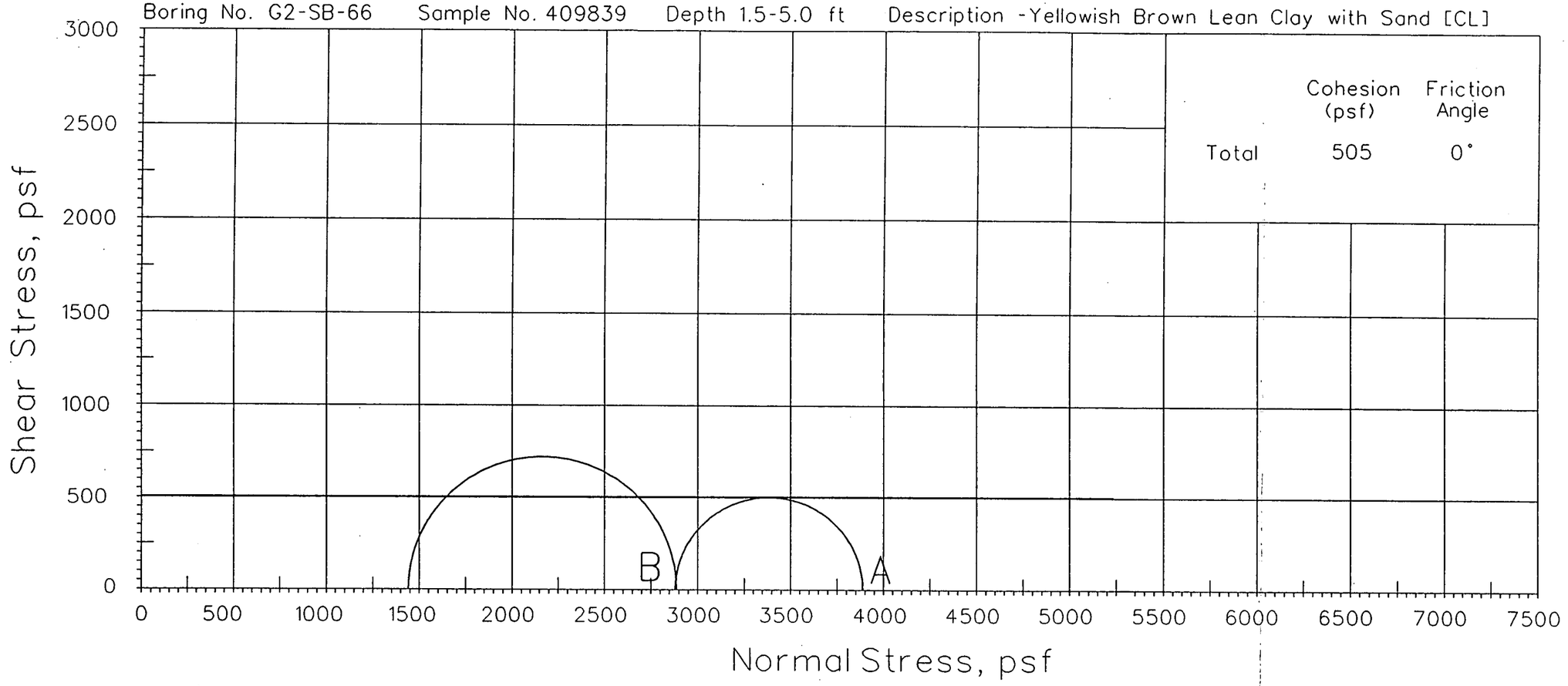
Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Delta Pore Pressure (psf)	Total Confining Pressure (sigma$_3$) (psf)	Major Principal Stress (sigma$_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-SB-59	1.5-5.0	409819A	19.8	21.9	127.3	106.3	15.00	2002	N/A	2880	4882	1.70
		409819B	19.8	22.4	127.3	106.3	13.20	1456	N/A	1440	2896	2.01

1. Saturated 2-Point Test.
2. N/A = Not Applicable

CAD FILE: /USR/REF2/OU1/P0154/P0154/DGN/409819A_MO.DGN (SKX04199)

Triaxial Compression Test Report

Boring No. G2-SB-66 Sample No. 409839 Depth 1.5-5.0 ft Description -Yellowish Brown Lean Clay with Sand [CL]



Type of Test: TX/UU - UUr90 Sample Type: Remolded 90% MDD Failure Criteria: 15% Axial Strain

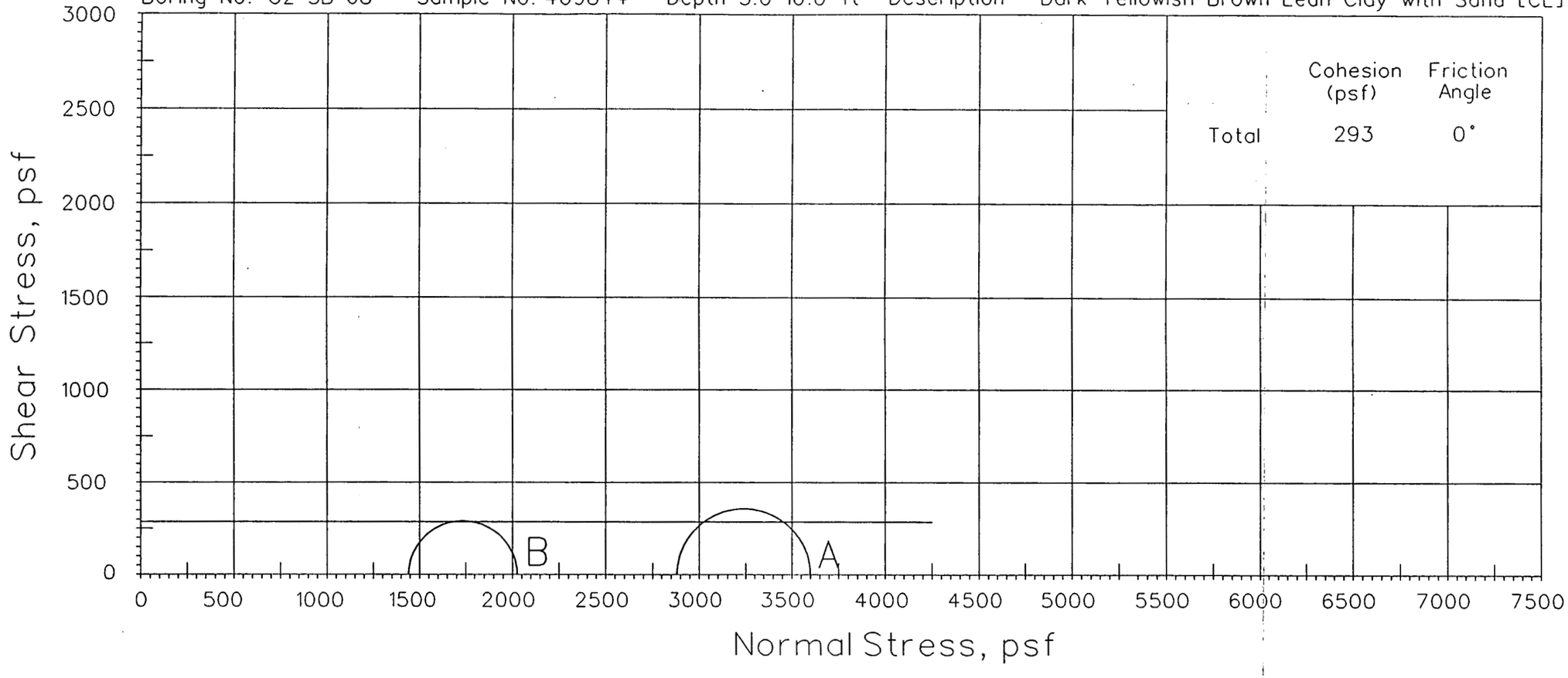
Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Delta Pore Pressure (psf)	Total Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-SB-66	1.5-5.0	409839A	18.9	21.5	127.2	107.0	15.00	1009	N/A	2880	3889	1.35
		409839B	18.3	20.7	128.8	108.8	14.80	1448	N/A	1440	2888	2.01

1. Saturated 2-Point Test.
2. N/A = Not Applicable

CAD FILE: /USR/REF2/OU1/P0154/P0154/DGN/409839A_MO.DGN (SKX04200)

Triaxial Compression Test Report

Boring No. G2-SB-68 Sample No. 409844 Depth 5.0-10.0 ft Description - Dark Yellowish Brown Lean Clay with Sand [CL]



Type of Test: TX/UU - UUr90 Sample Type: Remolded 90% MDD Failure Criteria: 15% Axial Strain

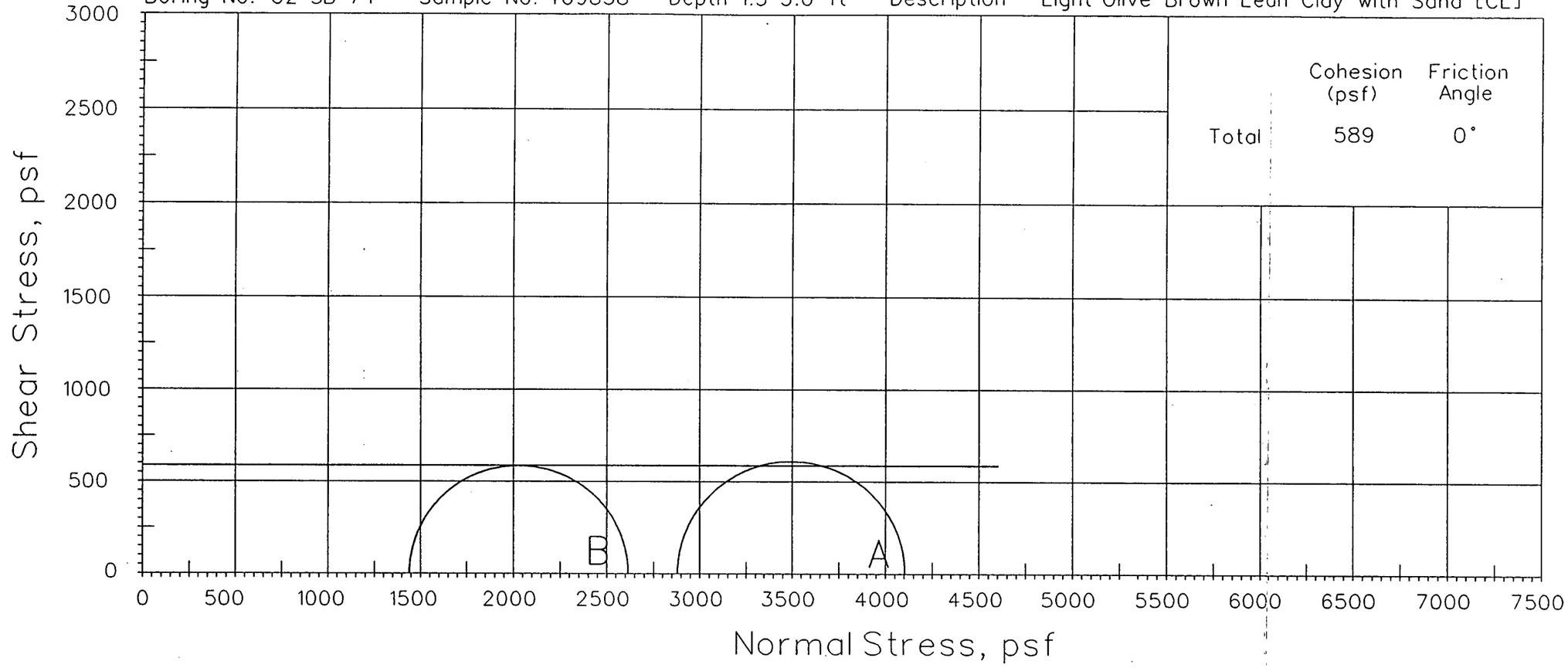
Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Delta Pore Pressure (psf)	Total Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-SB-68	5.0-10.0	409844A	18.5	21.1	124.6	105.2	15.00	720	N/A	2880	3600	1.25
		409844B	15.3	21.2	123.8	107.4	15.00	586	N/A	1440	2026	1.41

1. Saturated 2-Point Test.
2. N/A = Not Applicable

CAD FILE: /USR/REF2/OU1/P0154/P0154/DGN/409844A_MO.DGN (SKX04201)

Triaxial Compression Test Report

Boring No. G2-SB-74 Sample No. 409858 Depth 1.5-5.0 ft Description - Light Olive Brown Lean Clay with Sand [CL]



Type of Test: TX/UU - UUr90 Sample Type: Remolded 90% MDD Failure Criteria: 15% Axial Strain

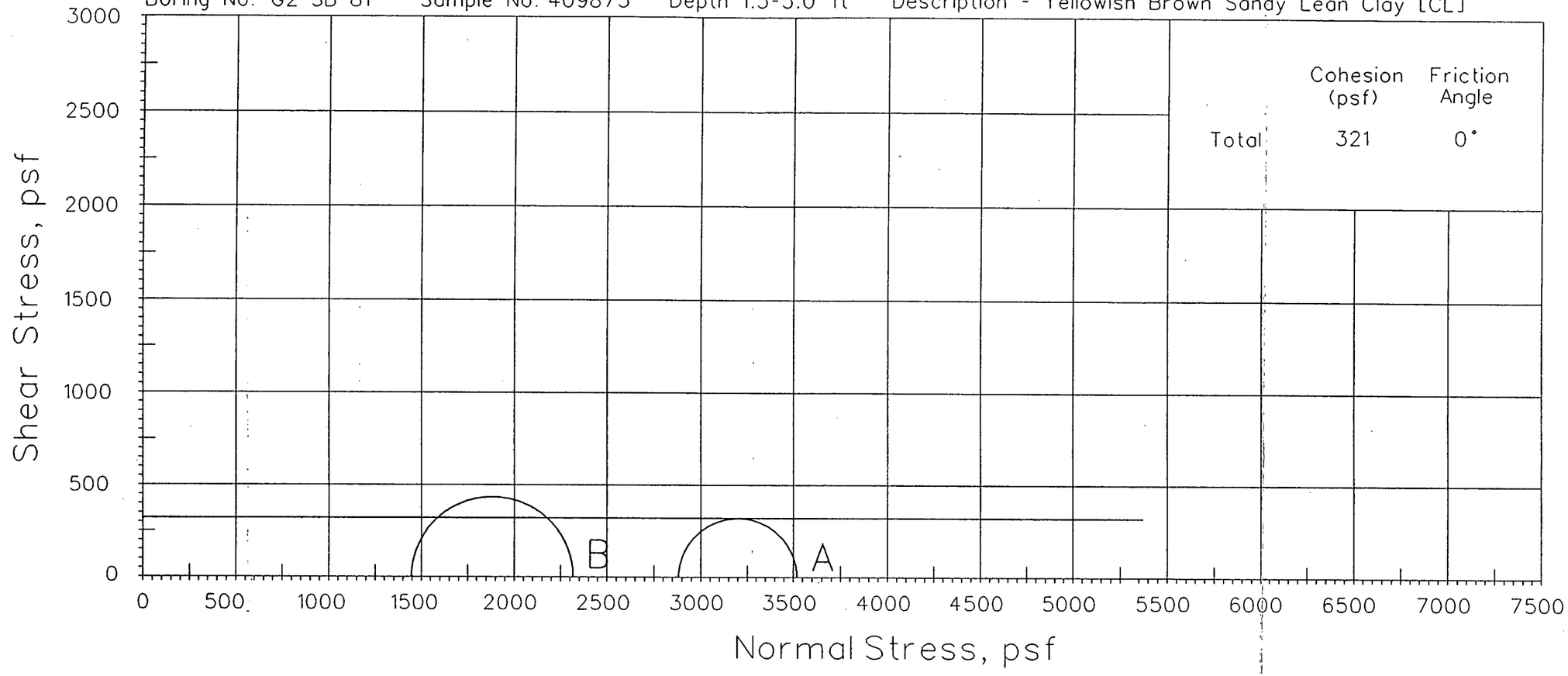
Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Delta Pore Pressure (psf)	Total Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-SB-74	1.5-5.0	409858A	20.4	23.7	124.9	103.8	15.00	1226	N/A	2880	4106	1.43
		409858B	20.5	23.7	125.3	104.0	15.00	1177	N/A	1440	2617	1.82

1. Saturated 2-Point Test.
2. N/A = Not Applicable

CAD FILE: /USR/REF2/OU1/P0154/P0154/DGN/409858A_MO.DGN (SKX04202)

Triaxial Compression Test Report

Boring No. G2-SB-81 Sample No. 409873 Depth 1.5-5.0 ft Description - Yellowish Brown Sandy Lean Clay [CL]



Type of Test: TX/UU - UUr90 Sample Type: Remolded 90% MDD Failure Criteria: 15% Axial Strain

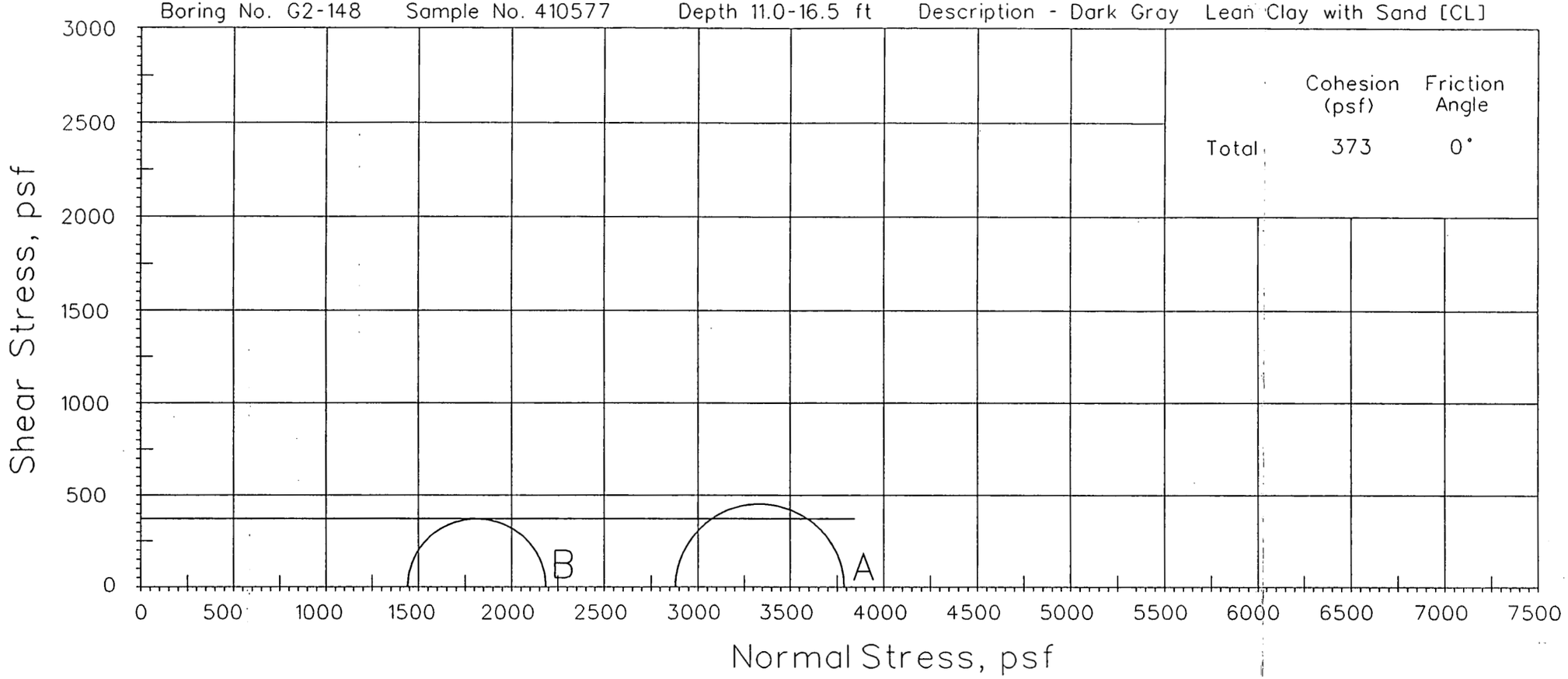
Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Delta Pore Pressure (psf)	Total Confining Pressure (sigma$_3$) (psf)	Major Principal Stress (sigma$_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-SB-81	1.5-5.0	409873A	14.9	17.2	130.5	113.5	15.00	641	N/A	2880	3521	1.22
		409873B	15.3	17.1	130.7	113.3	15.00	873	N/A	1440	2313	1.61

1. Saturated 2-Point Test.
2. N/A = Not Applicable

CAD FILE: /USR/REF2/OU1/P0154/P0154/DGN/409873A_MO.DGN (SKX04203)

Triaxial Compression Test Report

Boring No. G2-148 Sample No. 410577 Depth 11.0-16.5 ft Description - Dark Gray Lean Clay with Sand [CL]



Type of Test: TX/UU - UUr90 Sample Type: Remolded 90% MDD Failure Criteria: 15% Axial Strain

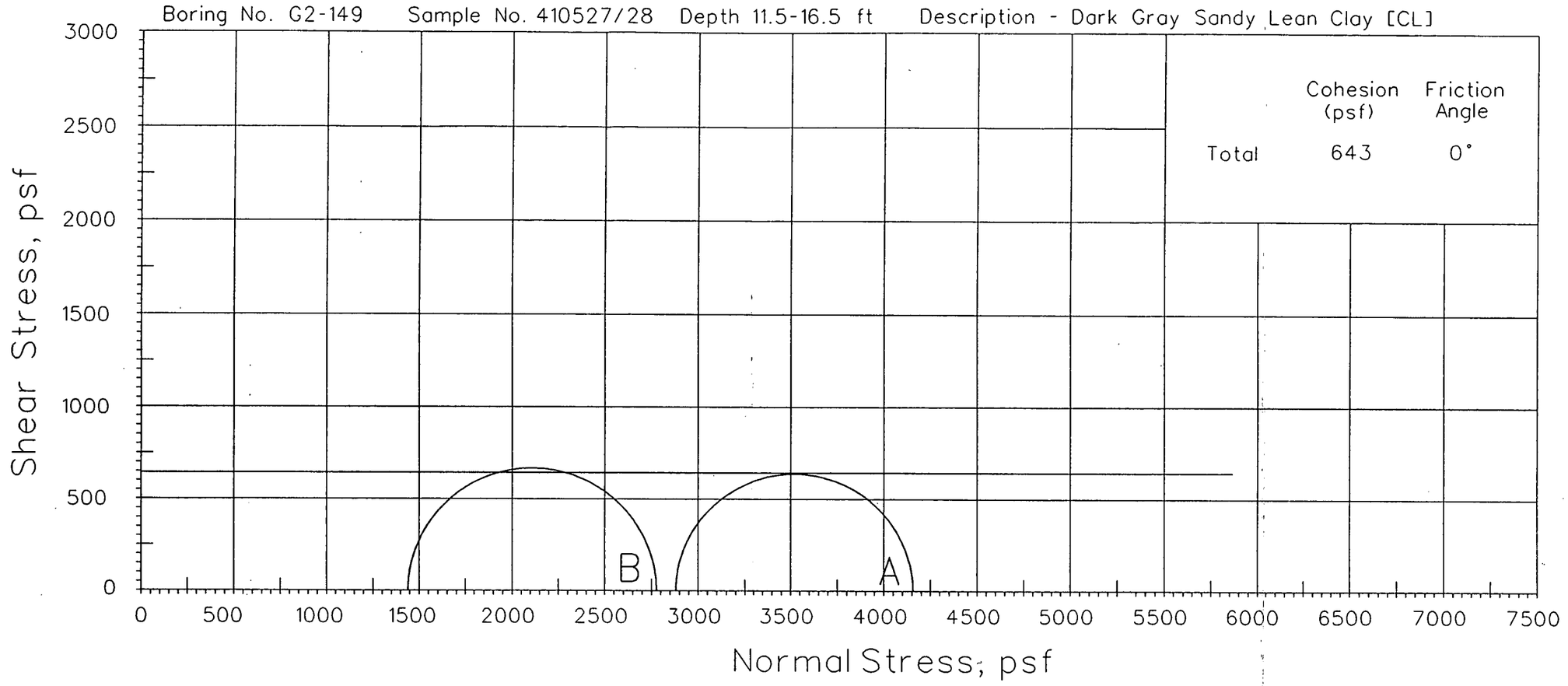
Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Delta Pore Pressure (psf)	Total Confining Pressure (sigma$_3$) (psf)	Major Principal Stress (sigma$_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-148	11.0-16.5	410577A	16.0	19.0	129.3	111.5	15.00	909	N/A	2880	3789	1.32
		410577B	16.2	18.6	129.3	111.3	15.00	746	N/A	1440	2186	1.52

1. Saturated 2-Point Test.
2. N/A = Not Applicable

CAD FILE: /USR/REF2/OU2/P0154/P0154/DGN/410577A_MO.DGN (SKX04204)

Triaxial Compression Test Report

Boring No. G2-149 Sample No. 410527/28 Depth 11.5-16.5 ft Description - Dark Gray Sandy Lean Clay [CL]



Type of Test: TX/UU - UUr90 Sample Type: Remolded 90% MDD Failure Criteria: 15% Axial Strain(B); Max. Dev. Stress (A)

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								
G2-149	11.5-16.5	A	15.7	17.0	132.7	114.7	13.40	1277	N/A	2880	4157	1.44
		B	15.7	16.9	132.4	114.5	15.00	1338	N/A	1440	2778	1.93

1. Saturated 2-Point Test.
2. N/A = Not Applicable

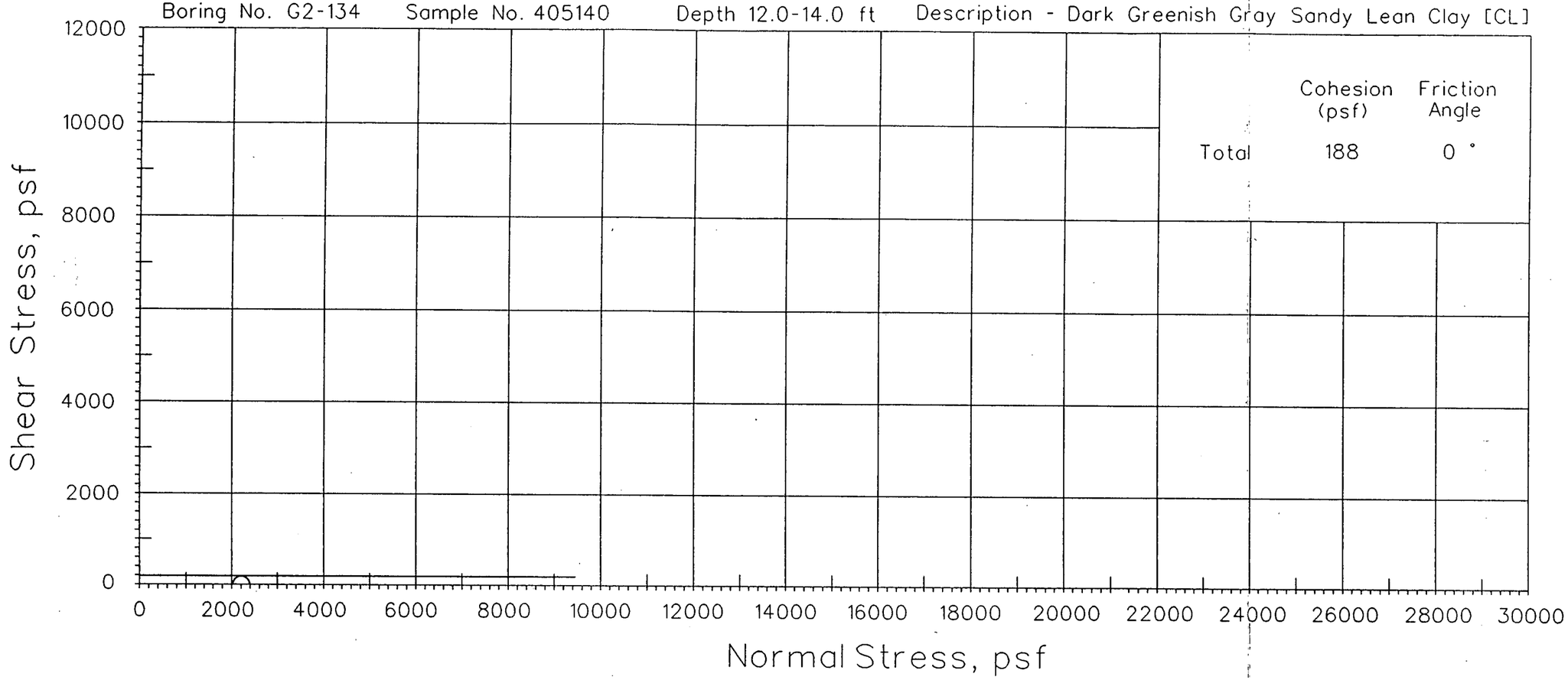
CAD FILE: /USR/REF2/OU1/P0154/P0154/DGN/4_2728A_MO.DGN (SKX04205)

UU TRIAXIAL COMPRESSION TESTS - REMOLDED 85 PERCENT MDD

AT OR NEAR OPTIMUM MOISTURE CONTENT (ASTM D 698)

Triaxial Compression Test Report

Boring No. G2-134 Sample No. 405140 Depth 12.0-14.0 ft Description - Dark Greenish Gray Sandy Lean Clay [CL]



Type of Test: UU - Single Point Sample Type: Remolded 85% MDD[3] Failure Criteria: Max. Principle Stress Ratio

Boring No.	Depth (feet)	Spec. No.	Moisture Content (%)		Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Axial Strain (%)	Deviator Stress (psf)	Pore Pressure (psf)	Total Confining Pressure ($sigma_3$) (psf)	Major Principal Stress ($sigma_1$) (psf)	Principal Stress Ratio
			Initial	Final								
G2-134	12.0-14.0	405140	10.9	16.5	117.3	105.8	14.96	377	N/A	2016	2393	1.19

1. Saturated Test.

3. Remolded At or Near Optimum Moisture Content In Accordance with ASTM D698

CAD FILE: /USR/REF2/OU2/PO140/PO140/DGN/405140B_MO.DGN (SKX03839)

G

APPENDIX G

LEACHATE PERMEANT TEST RESULTS

Appendix G
Leachate Permeant Test Results

This appendix contains a summary of all laboratory analysis results for the permeant to be used in conducting hydraulic conductivity tests on recompacted on-site borrow soils. Request for analysis (RFA) forms are included for identification of sample numbers. The three RFA forms included are for a field blank (subsamples 200197445 through 200197452), the permeant sample (subsamples 200197455 through 200197462), and a permeant duplicate sample (subsamples 200197769 through 200197776). The RFA forms are followed by a summary table listing analysis results for each subsample. Subsample numbers for radionuclide analyses are not included on the RFA forms. They are 200197453 (field blank), 200197463 (permeant), and 200197777 (permeant duplicate).

FERMCO

P.O. BOX 538704
CINCINNATI, OH 45253-8704

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD

REFERENCE DOCUMENT NO.: SPL-95-3435

ORIGINAL MEF NO.: N/A

CORRESPONDING REFERENCE DOCUMENT NO.:

PAGE 1 OF 1

RELEASE NO.: 1000009180	PROJECT NO.: 20.03.10	FOR SAMPLE RELATED PROBLEMS, ACS CONTACT / PHONE: BILL WEGGEMAN 648-5373	CONTRACT PURCHASE ORDER / TASK ORDER NO.: 4-34226
PROJECT NAME: PERMEABILITY TEST		REQUIRED REPORT DATE / LAB TAT: NORMAL - PER CONTRACT	SAMPLE SHIPMENT DATE: 11-14-95
PROJECT CONTACT / PHONE: TONY SNEDEGAR 648-4637		RECEIVING LAB NAME: TCT	SAMPLE SHIPPER (Print): CBell
CHARGE NO: 26651	LOT MARKING NO: N/A	RECEIVING LAB ADDRESS: 1908 Innwell Business Ctr Dr St Louis, MO 63144	OFF-SITE LAB CONTACT: Paul Smith

SAMPLING TEAM (Print) & GROUP NAME / PHONE: D/ HARRY MCCANN; JILL DEMUTH GWM - 648-3268

SAMPLING TEAM (Signature & Badge No.): Jill DeMuth (70453) Harry K McCann 70855

ITEM NO.	SAMPLE NUMBER: FACTS ID	CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX	COMP	GRAB	FILTERED	COLLECTION DATE	COLLECTION TIME	CONTAINER TYPE	CONTAINER VOL.	NO. CONTRS	PRESERVATION	ABL	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
1	200197445		* W A	✓		N	11/13/95	1109	AGTL	250 ml	2	H_2SO_4 pH<2 Cool to 4°C	B	TOX - TABLE 40 * 3.3	X	
2	200197446		* W A	✓		N	11/13/95	1109	AGTL	250 ml	1	H_2SO_4 pH<2 Cool to 4°C	B	TOC - TABLE 40 * 3.3	X	
3	200197447		* W A	✓		N	11/13/95	1109	AG	2L	1	Cool to 4°C	L	CLP SVOC - TABLE 33 * 3.3	X	
4	200197448		* W A	✓		N	11/13/95	1109	P	1L	1	HNO_3 pH<2 Cool to 4°C	L	CLP METALS (TOTAL) - TABLE 35 * 3.3	X	
5	200197449		* W A	✓		N	11/13/95	1109	AG	500 ml	1	H_2SO_4 pH<2 Cool to 4°C	B	PHENOLS - TABLE 40 * 3.3	X	
6	200197450		* W A	✓		N	11/13/95	1109	P	500 ml	2	NaOH pH>9 ZnAc Cool to 4°C	B	SULFIDE - TABLE 41 * 3.3	X	
7	200197451		* W A	✓		N	11/13/95	1109	P	1L	1	Cool to 4°C	B	SULFATE/CHLORIDE * FLUORIDE - TABLE 40 3.3	X	
8	200197452		* W A	✓		N	11/13/95	1109	P	1L	1	H_2SO_4 pH<2 Cool to 4°C	B	NITRATE - NITRITE** * 3.3	X	
9			NO FURTHER ANALYSES													
10							JCD 11/13/95									

SPECIAL INSTRUCTIONS: * GROUNDWATER

*% WT or VOL HNO_3 <0.15%; H_2SO_4 <0.35%; NaOH <0.05%

* TOTAL VIA SAM ** AMMONIA/TON PHOSPHORUS (TOTAL) EPA METHOD 365.1 - TABLE 40

RELINQUISHED: ITEM / REASON	RELINQUISHED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME	RECEIVED: RECEIVED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME
1-8 LAB ANALYSES	[redacted]	1 70453	11/14/95	1310	[redacted]	40171	11/14/95	1335
1-8 TO SHIPPING		2 10171	11-14-95	0700		2 630	11-14-95	0700
1-8 Ship		3 630	11-14-95	1300		3	11/15/95	1000
		4				4		
		5				5		

DISTRIBUTION OF COPIES: WHITE - ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP; YELLOW - ON-SITE - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP; BLUE - SAMPLING TECH / PROJECT FILE

ES-F 3261 (09-21-95)

000364

BAK 11-14-95

C9 ST C9

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD

FERMCO

P.O. BOX 538704
CINCINNATI, OH 45253-8704

REFERENCE DOCUMENT NO.: SPL-95-3434

ORIGINAL MEF NO.: N/A

CORRESPONDING REFERENCE DOCUMENT NO.:

RELEASE NO.: 1000009180

PROJECT NO.: 20.03.10

FOR SAMPLE RELATED PROBLEMS, ACS CONTACT / PHONE: BILL WESTERMAN 648-5373

CONTRACT PURCHASE ORDER: 43627

PROJECT NAME: PERMEABILITY TEST

REQUIRED REPORT DATE / LAB TAT: NORMAL - PER CONTRACT

SAMPLE SHIPMENT DATE: 11-14-95

PROJECT CONTACT / PHONE: TONY SNIDER 648-4637

RECEIVING LAB NAME: TCT

SAMPLE SHIPPER (Print): C Rell

CHARGE NO.: 26651

LOT MARKING NO.: N/A

RECEIVING LAB ADDRESS: 1905 Innerbelt Bus Ctr Dr St Louis, MO 63114

OFF-SITE LAB CONTACT: Paul Smith

SAMPLING TEAM (Print) & GROUP NAME / PHONE: DI HARRY MCLANN; JILL DEMUTH GWM - 648-3268

SAMPLING TEAM (Signature & Badge No.): Jill DeMuth, 70853 Harry L McLann 70855

ITEM NO.	SAMPLE NUMBER: FACTS ID	SAMPLE NUMBER: CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX	COMP	GRAB	FILTERED	COLLECTION: DATE	COLLECTION: TIME	CONTAINER: TYPE	CONTAINER: VOL.	NO. CONTRS	PRESERVATION	ABL	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
1	200197455		* W A	✓		N	11/13/95	1109	AGTL	250 mL	2	H_2SO_4 pH<2 Cool to 4°C	B	TOX - TABLE 40 # 3.3	Y	
2	200197456		* W A	✓		N	11/13/95	1109	AGTL	250 mL	1	H_2SO_4 pH<2 Cool to 4°C	B	TOC - TABLE 40 # 3.3	Y	
3	200197457		* W A	✓		N	11/13/95	1109	AG	2L	2	Cool to 4°C	C	CLP SVOC - TABLE 33 # 3.3 ⊗	Y	
4	200197458		* W A	✓		N	11/13/95	1109	P	1L	1	HNO_3 pH<2 Cool to 4°C	C	CLP METALS (TOTAL) - TABLE 35 # 3.3	Y	
5	200197459		* W A	✓		N	11/13/95	1109	AG	500 mL	1	H_2SO_4 pH<2 Cool to 4°C	B	PHENOLS - TABLE 40 # 3.3	Y	
6	200197460		* W A	✓		N	11/13/95	1109	P	500 mL	2	NaOH pH>9 2% AC Cool to 4°C	B	SULFIDE - TABLE 41 # 3.3	Y	
7	200197461		* W A	✓		N	11/13/95	1109	P	1L	1	Cool to 4°C	B	SULFATE/CHLORIDE FLUORIDE - TABLE 40 # 3.3	Y	
8	200197462		* W A	✓		N	11/13/95	1109	P	1L	1	H_2SO_4 pH<2 Cool to 4°C	B	NITRATE/NITRITE ** # 3.3	Y	
9					NO		FURTHER DUPLICATES							C.T. 40C		
10							J&O 11/13/95									

SPECIAL INSTRUCTIONS: * GROUND WATER

* % WT or VOL HNO_3 <0.15%; H_2SO_4 <0.35%; NaOH <0.08% ⊗ MS/MSD LAB SAMPLE

* TOTAL U RESULTS IN ppm ** AMMONIA/TKN PHOSPHORUS (TOTAL) EPA METHOD 365.1 - TABLE 40

RELINQUISHED: ITEM / REASON	RELINQUISHED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME	RECEIVED	BADGE NO.	DATE	TIME
1-8 LAB ANALYSIS	[redacted]	70853	11/13/95	1310	[redacted]	10171	11/13/95	1335
1-8 To Ship		10171	11-14-95	0700		630	11-14-95	0745
1-8 Shipped		630	11-14-95	1300			11-14-95	1000

DATE 11-14-95

0003365

FERMCO

P.O. BOX 538704
CINCINNATI, OH 45253-8704

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD

REFERENCE DOCUMENT NO.: SIL-95-3436

ORIGINAL MEF NO.: N/A

CORRESPONDING REFERENCE DOCUMENT NO.:

PAGE 1 OF 1

RELEASE NO.: 000009180	PROJECT NO.: 20.03.10	FOR SAMPLE RELATED PROBLEMS, ACS CONTACT / PHONE: Bill Westerman 648-5171	CONTRACT PURCHASE ORDER / TASK ORDER NO.: 113478L
PROJECT NAME: Permeability Test		REQUIRED REPORT DATE / LAB TAT: Normal - Per Contract	SAMPLE SHIPMENT DATE: 11-14-95
PROJECT CONTACT / PHONE: Tony Sudak 648-4637		RECEIVING LAB NAME: JCT	SAMPLE SHIPPER (Print): Chell
CHARGE NO: 2651	LOT MARKING NO.: N/A	RECEIVING LAB ADDRESS: 1308 Industrial Bus. Center Dr. St. Louis, MO 63144	OFF-SITE LAB CONTACT: Paul Sa[illegible]

SAMPLING TEAM (Print) & GROUP NAME / PHONE: D. Harry McCann; J. DeMuth GWM - 648-3268

SAMPLING TEAM (Signature & Badge No.): [signature] 70953 Harry L McC[illegible] 70855

ITEM NO.	FACTS ID	CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX	COMP	GRAB	FILTERED	COLLECTION DATE	COLLECTION TIME	CONTAINER TYPE	CONTAINER VOL.	NO. CONTRS.	PRESERVATION	ASL	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N) FERMCO	SAMPLE OKAY? (Y/N) OFF-SITE
1	200197769		* W A	✓		N	11/13/95	1109	AGTL	250 mL	2	H_2SO_4 pH<2 Cool to 4°C	B	TOX - Table 40 * 3.3	Y	
2	200197770		* W A	✓		N	11/13/95	1109	AGTL	250 mL	1	H_2SO_4 pH<2 Cool to 4°C	B	TOC - Table 40 * 3.3	Y	
3	200197771		* W A	✓		N	11/13/95	1109	AG	2L	1	Cool to 4°C	C	CLP SVOC - Table 33 * 3.3	Y	
4	200197772		* W A	✓		N	11/13/95	1109	P	1L	1	HNO_3 pH<2 Cool to 4°C	C	CLP Metals (Total) - Table 15 * 3.3	Y	
5	200197773		* W A	✓		N	11/13/95	1109	AG	500 mL	1	H_2SO_4 pH<2 Cool to 4°C	B	Phenols - Table 40 * 3.3	Y	
6	200197774		* W A	✓		N	11/13/95	1109	P	500 mL	2	NaOH pH>9 2-Ac Cool to 4°C	B	Sulfide - Table 41 * 3.3	Y	
7	200197775		* W A	✓		N	11/13/95	1109	P	1L	1	Cool to 4°C	B	Sulfate/Chloride & Fluoride - Table 40 3.3	Y	
8	200197776		* W A	✓		N	11/13/95	1109	P	1L	1	H_2SO_4 pH<2 Cool to 4°C	B	Nitrate - Nitrite ** * 3.3	Y	
9							No Fluoride Bottles JCD 11/13/95									
10																

SPECIAL INSTRUCTIONS: * Ground water

* % WT as Vol HNO_3 <0.15% ; H_2SO_4 <0.35% ; NH_4OH <0.08%

* Total U in Aqu ** Ammonia/TKN Phosphorus (Total) EPA Method 365.1 - Table 40

RELINQUISHED: ITEM / REASON	RELINQUISHED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME	RECEIVED: RECEIVED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME
1-8 Lab Analysis	[redacted]	1 70855	11/13/95	1510	[redacted]	1 70855	11/13/95	1535
1-8 To Shipping		2 16171	11-14-95	0700		2 636	11-14-95	0700
1-8 Ship		3 636	11-14-95	1300		3	11-15-95	1030
		4				4		
		5				5		

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FS-F-3361 (09-21-95)

0003366

RELEASE	SAMPLE ID	LOCATION	MATERIAL	SAMPLING COMMENTS	QA TYPE	PARAMETER	FF	LR	LSIGMA	LQ	VR	VS	VQ	UNITS
1000009180	200197445	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Total Organic Halogens	UNFILTERED	0.0172			0.0172			mg/L
1000009180	200197446	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Total Organic Carbon	UNFILTERED	1		U	1		U	mg/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	1,2,4-Trichlorobenzene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	1,2-Dichlorobenzene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	1,3-Dichlorobenzene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	1,4-Dichlorobenzene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	2,2-oxybis(1-Chloropropane)	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	2,4,5-Trichlorophenol	UNFILTERED	25		U	25		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	2,4,6-Trichlorophenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	2,4-Dichlorophenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	2,4-Dimethylphenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	2,4-Dinitrophenol	UNFILTERED	25		U	25		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	2,4-Dinitrotoluene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	2,6-Dinitrotoluene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	2-Chloronaphthalene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	2-Chlorophenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	2-Methylnaphthalene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	2-Nitroaniline	UNFILTERED	25		U	25		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	2-Nitrophenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	3,3'-Dichlorobenzidine	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	3-Nitroaniline	UNFILTERED	25		U	25		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	4,6-Dinitro-2-methylphenol	UNFILTERED	25		U	25		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	4-Bromophenyl phenyl ether	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	4-Chloro-3-methylphenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	4-Chlorophenylphenyl ether	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	4-Nitroaniline	UNFILTERED	25		U	25		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	4-Nitrophenol	UNFILTERED	25		U	25		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Acenaphthene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Acenaphthylene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Anthracene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Benzo(a)anthracene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Benzo(a)pyrene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Benzo(b)fluoranthene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Benzo(g,h,i)perylene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Benzo(k)fluoranthene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Butyl benzyl phthalate	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Carbazole	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Chrysene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Di-n-butyl phthalate	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Di-n-octyl phthalate	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Dibenzo(a,h)anthracene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Dibenzofuran	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Diethyl phthalate	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Dimethyl phthalate	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Fluoranthene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Fluorene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Hexachlorobenzene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Hexachlorobutadiene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Hexachlorocyclopentadiene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Hexachloroethane	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Indeno(1,2,3-cd)pyrene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Isophorone	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	N-Nitroso-di-n-propylamine	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	N-Nitrosodiphenylamine	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Naphthalene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Nitrobenzene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Pentachlorophenol	UNFILTERED	25		U	25		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Phenanthrene	UNFILTERED	10		U	10		U	ug/L

000367

356

000368

RELEASE	SAMPLE ID	LOCATION	MATERIAL	SAMPLING COMMENTS	QA TYPE	PARAMETER	FF	LR	LSIGMA	LQ	VR	VS	VQ	UNITS
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Phenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Pyrene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	bis(2-Chloroethoxy)methane	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	bis(2-Chloroethyl)ether	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	bis(2-Ethylhexyl)phthalate	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	o-Methylphenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	p-Chloroaniline	UNFILTERED	10		U	10		U	ug/L
1000009180	200197447	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	p-Methylphenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Aluminum	UNFILTERED	0.043		U	0.043		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Antimony	UNFILTERED	0.004		U	0.004		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Arsenic	UNFILTERED	0.002		U	0.002		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Barium	UNFILTERED	0.004		U	0.004		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Beryllium	UNFILTERED	0.004		U	0.004		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Cadmium	UNFILTERED	0.004		U	0.004		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Calcium	UNFILTERED	0.278		U	0.278		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Chromium	UNFILTERED	0.004		U	0.004		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Cobalt	UNFILTERED	0.014		U	0.014		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Copper	UNFILTERED	0.006		U	0.006		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Iron	UNFILTERED	0.058		U	0.058		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Lead	UNFILTERED	0.001		U	0.001		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Magnesium	UNFILTERED	0.067		U	0.067		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Manganese	UNFILTERED	0.004		U	0.004		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Mercury	UNFILTERED	0.00012		B	0.00012		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Nickel	UNFILTERED	0.019		U	0.019		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Potassium	UNFILTERED	0.106		U	0.106		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Selenium	UNFILTERED	0.004		UN*	0.004		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Silver	UNFILTERED	0.001		U	0.001		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Sodium	UNFILTERED	0.173		U	0.173		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Thallium	UNFILTERED	0.002		U	0.002		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Vanadium	UNFILTERED	0.014		U	0.014		U	mg/L
1000009180	200197448	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Zinc	UNFILTERED	0.014		U	0.014		U	mg/L
1000009180	200197449	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Phenols	UNFILTERED	0.005		U	0.005		U	mg/L
1000009180	200197450	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Sulfide	UNFILTERED	1		U	1		U	mg/L
1000009180	200197451	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Alkalinity as CaCO3	UNFILTERED	2		U	2		U	mg/L
1000009180	200197451	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Chloride	UNFILTERED	0.05		U	0.05		U	mg/L
1000009180	200197451	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Fluoride	UNFILTERED	0.05		U	0.05		U	mg/L
1000009180	200197451	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Specific Conductivity	UNFILTERED	11.1			11.1			umhos/cm
1000009180	200197451	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Sulfate	UNFILTERED	0.1		U	0.1		U	mg/L
1000009180	200197452	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Ammonia	UNFILTERED	0.03		U	0.03		U	mg/L
1000009180	200197452	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Nitrate/Nitrite	UNFILTERED	0.028			0.028			mg/L
1000009180	200197452	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Phosphorus	UNFILTERED	0.0715			0.0715			mg/L
1000009180	200197452	FIELD BLANK	DI WATER	MIX 1085-1082 UNFILTERED	FIELD BLANK	Total Organic Nitrogen	UNFILTERED	0.1		U	0.1		U	mg/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Cesium-137	UNFILTERED	-0.244	1.1	U	-0.504		U	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Plutonium-238	UNFILTERED	-0.023	.031		-0.023		U	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Plutonium-239/240	UNFILTERED	-0.024	.021	U	-0.01		U	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Radium-226	UNFILTERED	0.611	.085		0.819			pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Radium-228	UNFILTERED	0.299	1.2	U	0.696		U	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Strontium-90	UNFILTERED	-0.653	.86	U	-0.311		UJ	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Technetium-99	UNFILTERED	2.07	5.2	U	0.92		UJ	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Thorium-228	UNFILTERED	0.082	.11	U	0.11		U	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Thorium-230	UNFILTERED	-0.026	.031		-0.008		U	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Thorium-232	UNFILTERED	-0.001	.024	U	0.011		U	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Uranium, Total	UNFILTERED	0	.071	U	0		U	ug/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Uranium-234	UNFILTERED	0.084	.091	U	0.144		J	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Uranium-235/236	UNFILTERED	0.022	.045		0.022		U	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Uranium-238	UNFILTERED	0.129	.069		0.144			pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Cesium-137	UNFILTERED	-0.244	1.1	U	-0.504		U	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Plutonium-238	UNFILTERED	-0.023	.031		-0.023		U	pCi/L

RELEASE	SAMPLE ID	LOCATION	MATERIAL	SAMPLING COMMENTS	QA TYPE	PARAMETER	FF	LR	1 SIGMA	LQ	VR	VS	VQ	UNITS
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Plutonium-239/240	UNFILTERED	-0.024	.021	U	-0.01		U	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Radium-226	UNFILTERED	0.511	.085		0.619			pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Radium-228	UNFILTERED	0.299	1.2	U	0.696		U	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Strontium-90	UNFILTERED	-0.653	.86	U	-0.311		UJ	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Technetium-99	UNFILTERED	2.07	5.2	U	0.92		UJ	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Thorium-228	UNFILTERED	0.082	.11	U	0.11		U	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Thorium-230	UNFILTERED	-0.026	.031		-0.008		U	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Thorium-232	UNFILTERED	-0.001	.024	U	0.011		U	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Uranium, Total	UNFILTERED	0	.071	U	0		U	ug/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Uranium-234	UNFILTERED	0.084	.091	U	0.144		J	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Uranium-235/236	UNFILTERED	0.022	.045		0.022		U	pCi/L
1000009180	200197453	FIELD BLANK	DI WATER	MIX 1082-1085 UNFILTERED	FIELD BLANK	Uranium-238	UNFILTERED	0.129	.069		0.144			pCi/L
1000009180	200197455	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Total Organic Halogens	UNFILTERED	0.0197			0.0197		UJ	mg/L
1000009180	200197456	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Total Organic Carbon	UNFILTERED	10.2			10.2		J	mg/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	1,2,4-Trichlorobenzene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	1,2-Dichlorobenzene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	1,3-Dichlorobenzene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	1,4-Dichlorobenzene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	2,2-oxybis(1-Chloropropane)	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	2,4,5-Trichlorophenol	UNFILTERED	25		U	25		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	2,4,6-Trichlorophenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	2,4-Dichlorophenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	2,4-Dimethylphenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	2,4-Dinitrophenol	UNFILTERED	25		U	25		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	2,4-Dinitrotoluene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	2,6-Dinitrotoluene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	2-Chloronaphthalene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	2-Chlorophenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	2-Methylnaphthalene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	2-Nitroaniline	UNFILTERED	25		U	25		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	2-Nitrophenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	3,3'-Dichlorobenzidine	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	3-Nitroaniline	UNFILTERED	25		U	25		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	4,6-Dinitro-2-methylphenol	UNFILTERED	25		U	25		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	4-Bromophenyl phenyl ether	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	4-Chloro-3-methylphenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	4-Chlorophenylphenyl ether	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	4-Nitroaniline	UNFILTERED	25		U	25		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	4-Nitrophenol	UNFILTERED	25		U	25		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Acenaphthene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Acenaphthylene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Anthracene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Benzo(a)anthracene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Benzo(a)pyrene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Benzo(b)fluoranthene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Benzo(g,h,i)perylene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Benzo(k)fluoranthene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Butyl benzyl phthalate	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Carbazole	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Chrysene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Di-n-butyl phthalate	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Di-n-octyl phthalate	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Dibenzo(a,h)anthracene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Dibenzofuran	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Diethyl phthalate	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Dimethyl phthalate	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Fluoranthene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Fluorene	UNFILTERED	10		U	10		U	ug/L

000369

359

RELEASE	SAMPLE ID	LOCATION	MATERIAL	SAMPLING COMMENTS	QA TYPE	PARAMETER	FF	LR	LSIGMA	LQ	VR	VS	VQ	UNITS
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Hexachlorobenzene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Hexachlorobutadiene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Hexachlorocyclopentadiene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Hexachloroethane	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Indeno(1,2,3-cd)pyrene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Isophorone	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	N-Nitroso-di-n-propylamine	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	N-Nitrosodiphenylamine	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Naphthalene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Nitrobenzene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Pentachlorophenol	UNFILTERED	25		U	25		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Phenanthrene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Phenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Pyrene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	bis(2-Chloroethoxy)methane	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	bis(2-Chloroethyl)ether	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	bis(2-Ethylhexyl)phthalate	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	o-Methylphenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	p-Chloroaniline	UNFILTERED	10		U	10		U	ug/L
1000009180	200197457	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	p-Methylphenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Aluminum	UNFILTERED	0.0602		B	0.0602		U	mg/L
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Antimony	UNFILTERED	0.0055		B	0.0055		U	mg/L
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Arsenic	UNFILTERED	0.002		U	0.002		U	mg/L
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Barium	UNFILTERED	0.0652		B	0.0652			mg/L
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Beryllium	UNFILTERED	0.004		U	0.004		U	mg/L
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Cadmium	UNFILTERED	0.004		U	0.004		U	mg/L
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Calcium	UNFILTERED	96.3			96.3			mg/L
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Chromium	UNFILTERED	0.004		U	0.004		U	mg/l
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Cobalt	UNFILTERED	0.014		U	0.014		U	mg/l
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Copper	UNFILTERED	0.006		U	0.006		U	mg/l
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Iron	UNFILTERED	0.392			0.392		UJ	mg/L
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Lead	UNFILTERED	0.0024		B	0.0024		U	mg/L
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Magnesium	UNFILTERED	51.4			51.4			mg/L
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Manganese	UNFILTERED	0.004		U	0.004		U	mg/L
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Mercury	UNFILTERED	0.00015		B	0.00015		U	mg/L
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Nickel	UNFILTERED	0.019		U	0.019		U	mg/L
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Potassium	UNFILTERED	1.55		B	1.55			mg/L
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Selenium	UNFILTERED	0.0116		N*	0.0116		UJ	mg/L
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Silver	UNFILTERED	0.0024		B	0.0024			mg/L
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Sodium	UNFILTERED	28.7			28.7			mg/L
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Thallium	UNFILTERED	0.0022		B	0.0022		U	mg/l
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Vanadium	UNFILTERED	0.02		B	0.02		U	mg/l
1000009180	200197458	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Zinc	UNFILTERED	0.0508			0.0508			mg/l
1000009180	200197459	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Phenols	UNFILTERED	0.005		U	0.005		U	mg/L
1000009180	200197460	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Sulfide	UNFILTERED	1		U	1		UJ	mg/L
1000009180	200197461	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Alkalinity as CaCO3	UNFILTERED	324			324			mg/l
1000009180	200197461	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Chloride	UNFILTERED	25.3			25.3			mg/L
1000009180	200197461	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Fluoride	UNFILTERED	0.78			0.78			mg/L
1000009180	200197461	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Specific Conductivity	UNFILTERED	820			820			umhos/cm
1000009180	200197461	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Sulfate	UNFILTERED	122			122			mg/L
1000009180	200197462	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Ammonia	UNFILTERED	0.03		U	0.03		U	mg/L
1000009180	200197462	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Nitrate/Nitrite	UNFILTERED	0.153			0.153		U	mg/L
1000009180	200197462	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Phosphorus	UNFILTERED	0.139			0.139		UJ	mg/L
1000009180	200197462	MIX 1082/1085	GROUND WATER	UNFILTERED	NORMAL	Total Organic Nitrogen	UNFILTERED	0.1		U	0.1		U	mg/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Cesium-137	UNFILTERED	-0.119	1.1	U	-0.379		U	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Plutonium-238	UNFILTERED	0.003	.024		0.003		U	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Plutonium-239/240	UNFILTERED	-0.02	.021	U	-0.006		U	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Radium-226	UNFILTERED	0.205	.068		0.313		U	pCi/L

000320

RELEASE	SAMPLE ID	LOCATION	MATERIAL	SAMPLING COMMENTS	QA TYPE	PARAMETER	FF	LR	LSIGMA	LQ	VR	VS	VQ	UNITS
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Radium-228	UNFILTERED	0.272	1.3	U	0.669		U	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Strontium-90	UNFILTERED	-0.845	.94	U	-0.503		UJ	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Technetium-99	UNFILTERED	129	9		127.6		J	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Thorium, Total	UNFILTERED	-0.064	.26	U	0.046		U	ug/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Thorium-228	UNFILTERED	-0.021	.084		0.007		U	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Thorium-230	UNFILTERED	0.016	.033	U	0.034		U	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Thorium-232	UNFILTERED	0.005	.023	U	0.017		J	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Uranium, Total	UNFILTERED	3240	160		3240			ug/l
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Uranium-234	UNFILTERED	825	44		827.14		J	pCi/l
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Uranium-235/236	UNFILTERED	31.2	6.6		29.428		J	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Uranium-238	UNFILTERED	1080	54		1076.168			pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Cesium-137	UNFILTERED	-0.119	1.1	U	-0.379		U	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Plutonium-238	UNFILTERED	0.003	.024		0.003		U	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Plutonium-239/240	UNFILTERED	-0.02	.021	U	-0.006		U	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Radium-226	UNFILTERED	0.205	.068		0.313		U	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Radium-228	UNFILTERED	0.272	1.3	U	0.669		U	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Strontium-90	UNFILTERED	-0.845	.94	U	-0.503		UJ	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Technetium-99	UNFILTERED	129	9		127.6		J	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Thorium, Total	UNFILTERED	-0.064	.26	U	0.046		U	ug/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Thorium-228	UNFILTERED	-0.021	.084		0.007		U	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Thorium-230	UNFILTERED	0.016	.033	U	0.034		U	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Thorium-232	UNFILTERED	0.005	.023	U	0.017		J	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Uranium, Total	UNFILTERED	3240	150		3240			ug/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Uranium-234	UNFILTERED	825	44		827.14		J	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Uranium-235/236	UNFILTERED	31.2	6.6		29.428		J	pCi/L
1000009180	200197463	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	NORMAL	Uranium-238	UNFILTERED	1080	54		1076.168			pCi/L
1000009180	200197769	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Total Organic Halogens	UNFILTERED	0.0206			0.0206		UJ	mg/L
1000009180	200197770	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Total Organic Carbon	UNFILTERED	14.2			14.2		J	mg/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	1,2,4-Trichlorobenzene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	1,2-Dichlorobenzene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	1,3-Dichlorobenzene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	1,4-Dichlorobenzene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	2,2-oxybis(1-Chloropropane)	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	2,4,5-Trichlorophenol	UNFILTERED	25		U	25		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	2,4,6-Trichlorophenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	2,4-Dichlorophenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	2,4-Dimethylphenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	2,4-Dinitrophenol	UNFILTERED	25		U	25		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	2,4-Dinitrotoluene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	2,6-Dinitrotoluene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	2-Chloronaphthalene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	2-Chlorophenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	2-Methylnaphthalene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	2-Nitroaniline	UNFILTERED	25		U	25		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	2-Nitrophenol	UNFILTERED	10		U	10		U	ug/l
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	3,3'-Dichlorobenzidine	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	3-Nitroaniline	UNFILTERED	25		U	25		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	4,6-Dinitro-2-methylphenol	UNFILTERED	25		U	25		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	4-Bromophenyl phenyl ether	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	4-Chloro-3-methylphenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	4-Chlorophenylphenyl ether	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	4-Nitroaniline	UNFILTERED	25		U	25		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	4-Nitrophenol	UNFILTERED	25		U	25		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Acenaphthene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Acenaphthylene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Anthracene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Benzo(a)anthracene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Benzo(a)pyrene	UNFILTERED	10		U	10		U	ug/L

RELEASE	SAMPLE ID	LOCATION	MATERIAL	SAMPLING COMMENTS	QA TYPE	PARAMETER	FF	LR	LSIGMA	LQ	VR	VS	VQ	UNITS
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Benzo(b)fluoranthene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Benzo(g,h,i)perylene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Benzo(k)fluoranthene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Butyl benzyl phthalate	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Carbazole	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Chrysene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Di-n-butyl phthalate	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Di-n-octyl phthalate	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Dibenzo(a,h)anthracene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Dibenzofuran	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Diethyl phthalate	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Dimethyl phthalate	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Fluoranthene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Fluorene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Hexachlorobenzene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Hexachlorobutadiene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Hexachlorocyclopentadiene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Hexachloroethane	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Indeno(1,2,3-cd)pyrene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Isophorone	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	N-Nitroso-di-n-propylamine	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	N-Nitrosodiphenylamine	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Naphthalene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Nitrobenzene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Pentachlorophenol	UNFILTERED	25		U	25		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Phenanthrene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Phenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Pyrene	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	bis(2-Chloroethoxy)methane	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	bis(2-Chloroethyl)ether	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	bis(2-Ethylhexyl)phthalate	UNFILTERED	2		BJ	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	o-Methylphenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	p-Chloroaniline	UNFILTERED	10		U	10		U	ug/L
1000009180	200197771	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	p-Methylphenol	UNFILTERED	10		U	10		U	ug/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Aluminum	UNFILTERED	0.203			0.203		U	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Antimony	UNFILTERED	0.0051		B	0.0051		U	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Arsenic	UNFILTERED	0.002		U	0.002		U	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Barium	UNFILTERED	0.0647		B	0.0647		.	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Beryllium	UNFILTERED	0.004		U	0.004		U	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Cadmium	UNFILTERED	0.004		U	0.004		U	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Calcium	UNFILTERED	96.5			96.5		.	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Chromium	UNFILTERED	0.004		U	0.004		U	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Cobalt	UNFILTERED	0.014		U	0.014		U	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Copper	UNFILTERED	0.006		U	0.006		U	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Iron	UNFILTERED	0.495			0.495		J	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Lead	UNFILTERED	0.0038			0.0038		U	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Magnesium	UNFILTERED	51.5			51.5		.	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Manganese	UNFILTERED	0.004		U	0.004		U	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Mercury	UNFILTERED	0.0001		B	0.0001		U	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Nickel	UNFILTERED	0.019		U	0.019		U	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Potassium	UNFILTERED	1.62		B	1.62		.	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Selenium	UNFILTERED	0.004		UN*	0.004		UJ	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Silver	UNFILTERED	0.0023		B	0.0023		.	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Sodium	UNFILTERED	28.8			28.8		.	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Thallium	UNFILTERED	0.002		U	0.002		U	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Vanadium	UNFILTERED	0.0206		B	0.0206		U	mg/L
1000009180	200197772	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Zinc	UNFILTERED	0.048			0.048		.	mg/L
1000009180	200197773	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Phenols	UNFILTERED	0.005		U	0.005		U	mg/L

000372

RELEASE	SAMPLE ID	LOCATION	MATERIAL	SAMPLING COMMENTS	QA TYPE	PARAMETER	FF	LR	LSIGMA	LQ	VR	VS	VQ	UNITS
1000009180	200197774	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Sulfide	UNFILTERED	2.3			2.3		J	mg/L
1000009180	200197775	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Alkalinity as CaCO3	UNFILTERED	323			323			mg/L
1000009180	200197775	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Chloride	UNFILTERED	24.5			24.5			mg/L
1000009180	200197775	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Fluoride	UNFILTERED	0.78			0.78			mg/L
1000009180	200197775	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Specific Conductivity	UNFILTERED	837			837			umhos/cm
1000009180	200197775	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Sulfate	UNFILTERED	122			122			mg/L
1000009180	200197776	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Ammonia	UNFILTERED	0.03		U	0.03		U	mg/l
1000009180	200197776	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Nitrate/Nitrite	UNFILTERED	0.158			0.158		U	mg/l
1000009180	200197776	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Phosphorus	UNFILTERED	0.152			0.152		UJ	mg/l
1000009180	200197776	MIX 1082/1085	GROUND WATER	UNFILTERED	DUPLICATE	Total Organic Nitrogen	UNFILTERED	0.1		U	0.1		U	mg/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Cesium-137	UNFILTERED	-0.119	1.1	U	-0.379		U	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Plutonium-238	UNFILTERED	0.01	.033	U	0.01		U	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Plutonium-239/240	UNFILTERED	-0.007	.02	U	0.007		U	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Radium-226	UNFILTERED	0.2	.074		0.308		U	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Radium-228	UNFILTERED	0.591	1.4	U	0.988		UJ	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Strontium-90	UNFILTERED	-0.123	.97	U	0.219		UJ	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Technetium-99	UNFILTERED	76.5	7.3		75.3		J	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Thorium, Total	UNFILTERED	-0.037	.28	U	0.073		U	ug/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Thorium-228	UNFILTERED	0.135	.1		0.163		J	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Thorium-230	UNFILTERED	0.013	.031	U	0.031		U	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Thorium-232	UNFILTERED	0.008	.025	U	0.02		U	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Uranium, Total	UNFILTERED	3170	140		3170			ug/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Uranium-234	UNFILTERED	868	47		870.302		J	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Uranium-235/236	UNFILTERED	42.5	8		40.705		J	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Uranium-238	UNFILTERED	1060	54		1060.256			pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Cesium-137	UNFILTERED	-0.119	1.1	U	-0.379		U	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Plutonium-238	UNFILTERED	0.01	.033	U	0.01		U	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Plutonium-239/240	UNFILTERED	-0.007	.02	U	0.007		U	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Radium-226	UNFILTERED	0.2	.074		0.308		U	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Radium-228	UNFILTERED	0.591	1.4	U	0.988		UJ	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Strontium-90	UNFILTERED	-0.123	.97	U	0.219		UJ	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Technetium-99	UNFILTERED	76.5	7.3		75.3		J	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Thorium, Total	UNFILTERED	-0.037	.28	U	0.073		U	ug/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Thorium-228	UNFILTERED	0.135	.1		0.163		J	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Thorium-230	UNFILTERED	0.013	.031	U	0.031		U	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Thorium-232	UNFILTERED	0.008	.025	U	0.02		U	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Uranium, Total	UNFILTERED	3170	140		3170			ug/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Uranium-234	UNFILTERED	868	47		870.302		J	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Uranium-235/236	UNFILTERED	42.5	8		40.705		J	pCi/L
1000009180	200197777	MIX 1082/1085	GROUND WATER	MIX 1082-1085 UNFILTERED	DUPLICATE	Uranium-238	UNFILTERED	1060	54		1060.256			pCi/L

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APPENDIX H

COMPACTION AND REMOLDED PERMEABILITY DATA FROM PRIOR INVESTIGATIONS OF DISPOSAL FACILITY FOOTPRINT AREA

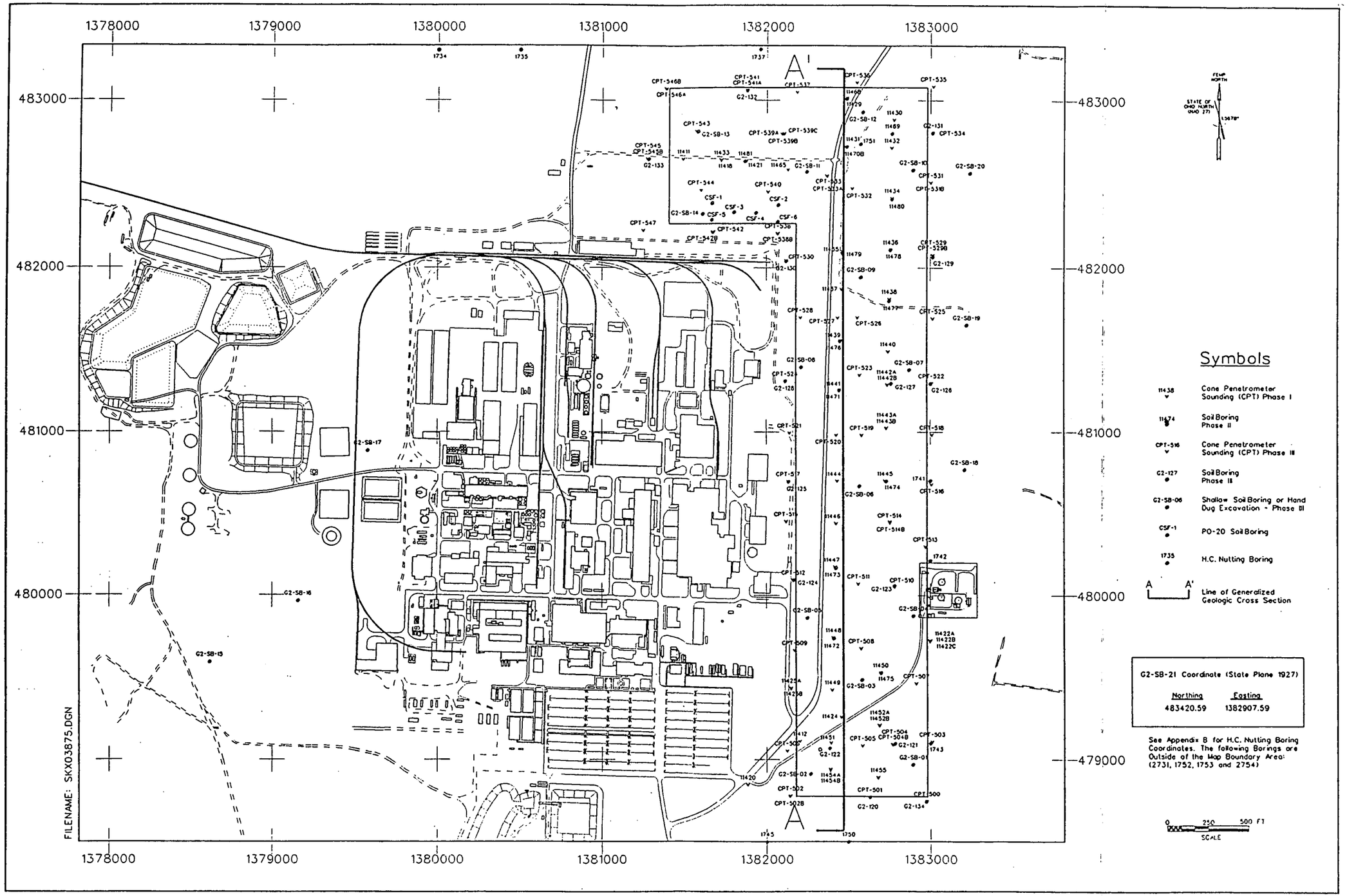

Figure 2-3 - Soil Boring, Shallow Excavation, CPT, and Generalized Geotechnical Cross-Section Location Map

Table G-7 - Summary of Index Properties and Standard Compaction Tests of Bulk Samples

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 (.002mm) (%)	Clay (.002mm) (%)	Silt (%)	Clay (%)	Specific Gravity	Compaction Method	Opt. Moisture Content (%)	Maximum Dry Density (pcf)	Data Source
11468	403103	Bulk	2.0	6.5	Brown Till	Lean clay with sand	CL	19.0	45.3	16.2	29.1	9.5	14.3	46.2	30.0	39.2	37.0	2.75	Standard	16.7	110.5	PO 132
11468	403104	Bulk	9.0	13.0	Brown Till	Lean clay with sand	CL	14.1	30.8	14.1	16.7	0.0	29.3	47.7	23.0	41.7	29.0	2.78	Standard	11.6	125.0	PO 132
11469	402824	Bulk	3.0	7.5	Brown Till	Lean clay with sand	CL	15.9	36.1	15.1	21.0	5.6	21.6	46.8	26.0	37.8	35.0	2.70	Standard	13.9	118.5	PO 132
11469	402828	Bulk	7.5	12.0	Brown Till	Lean clay with sand	CL	13.1	29.4	13.0	16.4	3.6	24.8	46.6	25.0	39.6	32.0	2.69	Standard	11.3	123.7	PO 132
11470B	403169-1	Bulk	3.5	7.5	Brown Till	Sandy silt	ML	16.8	17.7	15.7	2.0	6.9	37.2	47.9	8.0	45.9	10.0	2.70	Standard	11.1	125.0	PO 132
11470B	403170-1	Bulk	7.5	12.0	Brown Till	Sandy silt	ML	13.7	17.3	16.7	0.6	1.5	32.5	57.0	9.0	54.0	12.0	2.72	Standard	11.4	124.0	PO 132
11471	402966	Bulk	3.0	7.5	Brown Till	Fat clay	CH	24.9	50.5	19.3	31.2	0.0	3.9	65.1	31.0	57.1	39.0	2.72	Standard	19.3	105.6	PO 132
11471	402978	Bulk	7.5	10.5	Brown Till	Lean clay	CL	24.0	43.0	21.8	21.2	0.0	4.0	69.0	27.0	64.0	32.0	2.71	Standard	17.4	110.6	PO 132
11472	402958	Bulk	3.5	7.5	Brown Till	Lean clay with sand	CL	15.5	30.9	14.0	16.9	3.1	20.1	48.8	28.0	39.8	37.0	2.74	Standard	14.4	119.0	PO 132
11472	402959	Bulk	9.0	12.0	Brown Till	Sandy lean clay	CL	10.5	28.7	13.8	14.9	5.8	33.6	37.6	23.0	31.6	29.0	2.69	Standard	12.0	124.9	PO 132
11473	402923	Bulk	3.0	7.5	Brown Till	Lean clay with sand	CL	14.9	35.4	15.8	19.6	0.9	16.2	53.9	29.0	45.9	37.0	2.76	Standard	15.1	116.7	PO 132
11473	402925	Bulk	7.5	12.0	Brown Till	Lean clay with sand	CL	13.3	31.0	14.8	16.2	2.1	21.0	48.9	28.0	38.9	38.0	2.76	Standard	13.7	120.6	PO 132
11474	402896	Bulk	3.0	7.5	Brown Till	Lean clay with sand	CL	17.2	28.1	16.2	11.9	1.1	17.4	58.5	23.0	53.5	28.0	2.79	Standard	13.7	119.2	PO 132
11474	402901	Bulk	7.5	12.0	Brown Till	Lean clay with sand	CL	12.6	26.2	13.8	12.4	2.4	21.4	54.2	22.0	47.2	29.0	2.76	Standard	12.8	122.6	PO 132
11475	403264	Bulk	4.5	8.5	Fill	Lean clay with sand	CL	23.1	42.8	15.8	27.0	0.4	15.1	54.5	30.0	46.5	38.0	2.71	Standard	18.1	108.3	PO 132
11476	402993	Bulk	3.5	7.5	Brown Till	Lean clay with sand	CL	14.7	33.0	14.8	18.2	5.0	17.6	48.4	29.0	40.4	37.0	2.72	Half Std.	15.2	113.3	PO 132
11476	402993	Bulk	3.5	7.5	Brown Till	Lean clay with sand	CL	14.7	33.0	14.8	18.2	5.0	17.6	48.4	29.0	40.4	37.0	2.72	Standard	14.6	117.4	PO 132
11476	403010	Bulk	12.0	15.0	Gray Till	Lean clay with sand	CL	14.1	20.7	12.7	8.0	0.3	26.7	53.0	20.0	43.0	30.0	2.75	Standard	10.5	127.3	PO 132
11477	402866	Bulk	3.5	7.5	Brown Till	Lean clay with sand	CL	21.3	42.2	16.6	25.6	0.4	19.3	49.3	31.0	41.3	39.0	2.79	Standard	14.6	116.0	PO 132
11477	402874	Bulk	14.0	18.0	Gray Till	Sandy lean clay	CL	15.1	22.7	14.5	8.2	2.7	39.0	44.3	14.0	40.3	18.0	2.72	Standard	10.5	128.4	PO 132
11478	402796	Bulk	3.5	7.5	Brown Till	Lean clay with sand	CL	20.9	35.3	16.6	18.7	3.5	22.1	46.4	28.0	39.4	35.0	2.71	Standard	14.7	116.5	PO 132
11478	402813	Bulk	7.5	10.0	Brown Till	Sandy lean clay	CL	14.1	26.6	14.8	11.8	3.6	27.7	45.7	23.0	38.7	30.0	2.71	Standard	12.7	122.6	PO 132
11479	403048	Bulk	3.5	7.5	Brown Till	Sandy lean clay	CL	14.4	28.8	14.1	14.7	3.2	32.8	44.0	20.0	37.0	27.0	2.75	Standard	11.8	123.3	PO 132
11479	403049	Bulk	7.5	10.5	Brown Till	Sandy lean clay	CL	NA	25.2	14.9	10.3	7.1	28.7	43.2	21.0	36.2	28.0	2.75	Half Std.	13.0	119.5	PO 132
11480	402771	Bulk	3.0	7.5	Brown Till	Lean clay with sand	CL	21.3	38.5	15.8	22.7	1.5	15.7	51.8	31.0	43.8	39.0	2.78	Standard	15.2	113.8	PO 132
11480	402774	Bulk	7.5	12.0	Brown Till	Lean clay with sand	CL	14.8	27.2	14.4	12.8	0.5	20.7	54.8	24.0	48.8	30.0	2.76	Standard	12.5	123.5	PO 132
11481	403230	Bulk	3.5	7.5	Brown Till	Sandy lean clay with gravel	CL	14.7	30.7	14.5	16.2	16.6	21.6	40.8	21.0	33.8	28.0	2.74	Standard	13.4	120.2	PO 132
11481	403231	Bulk	13.5	18.5	Gray Till	Lean clay with sand	CL	11.8	24.9	12.8	12.1	1.3	28.1	48.6	22.0	40.6	30.0	2.69	Half Std.	12.5	122.2	PO 132
G2-SB-1	404608	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	29.3	48.9	18.6	30.3	1.0	6.9	60.1	32.0	50.1	42.0	2.73	Standard	17.5	104.8	PO 140
G2-SB-2	404603	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	28.6	41.0	18.1	22.8	0.1	7.7	63.2	29.0	54.2	38.0	2.69	Standard	17.0	107.5	PO 140
G2-SB-3	404591	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	27.1	46.1	17.6	28.5	0.0	4.4	65.6	30.0	57.6	38.0	2.67	Standard	17.8	105.8	PO 140
G2-SB-4	404615	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	21.0	47.6	17.8	29.8	5.5	10.3	52.2	32.0	44.2	40.0	2.70	Standard	17.2	107.5	PO 140
G2-SB-2,3,4,6	404617	Bulk	0.0	1.5	Top Soil	Lean Clay	CL	23.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.61	Standard	17.7	105.6	PO 140
G2-SB-5	404627	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	21.0	49.7	18.8	30.9	1.3	8.8	55.9	34.0	47.9	42.0	2.71	Standard	18.2	106.8	PO 140
G2-SB-6	404595	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	22.0	36.5	19.6	16.9	0.0	6.8	70.2	23.0	61.2	32.0	2.66	Standard	17.3	106.3	PO 140
G2-SB-7	404632	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	20.6	45.1	17.6	27.5	2.1	9.9	56.0	32.0	47.0	41.0	2.72	Standard	18.5	109.6	PO 140
G2-SB-8	404621	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	23.5	42.0	17.1	24.9	0.3	9.4	59.3	31.0	50.3	40.0	2.74	Standard	17.5	109.7	PO 140
G2-SB-9	404587	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	22.3	48.4	18.6	29.8	0.4	8.1	58.5	33.0	49.5	42.0	NA	Standard	19.2	107.2	PO 140
G2-SB-10	404637	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	19.1	46.5	17.2	29.3	3.0	12.4	51.6	33.0	42.6	42.0	2.77	Standard	17.1	109.9	PO 140
G2-SB-11	404642	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	15.1	29.1	16.3	12.8	5.8	16.6	57.6	20.0	47.6	30.0	2.77	Standard	14.3	119.0	PO 140
G2-SB-8,9,10,11	404644	Bulk	0.0	1.5	Top Soil	Lean Clay	CL	33.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.67	Standard	19.3	105.3	PO 140
G2-SB-12	404599	Bulk	1.5	4.2	Brown Till	Fat Clay	CH	21.0	50.4	19.1	31.3	0.4	10.4	51.2	38.0	42.2	47.0	2.73	Standard	18.1	106.1	PO 140
G2-SB-13	404583	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	24.0	46.0	17.2	28.9	1.5	11.9	52.6	34.0	44.6	42.0	NA	Standard	16.6	112.1	PO 140
G2-SB-14	404578	Bulk	1.5	5.0	Brown Till	Fat Clay	CH	20.9	51.5	18.2	33.3	1.2	10.5	52.3	36.0	44.3	44.0	NA	Standard	18.7	107.1	PO 140
G2-SB-15	404649	Bulk	1.0	2.0	Brown Till	Lean Clay	CL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Standard	21.4	101.0	PO 140
G2-SB-16	404650	Bulk	1.0	2.0	Brown Till	Lean Clay	CL	24.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Standard	20.9	103.9	PO 140
G2-SB-17	405366	Bulk	1.0	2.0	Brown Till	Lean Clay	CL	17.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Standard	19.3	109.1	PO 140
G2-209	G2-209 / Bulk	Bulk	0.0	25.0	Br and Gr Till	Sandy Lean Clay	CL	NA	27.7	13.2	14.5	3.0	27.0			40.0	30.0	2.80	Standard	12.3	122.3	PO 101
G2-210	G2-210 / Bulk	Bulk	0.0	25.0	Br and Gr Till	Lean Clay with Sand	CL	NA	27.6	14.1	13.5	3.0	22.0			44.0	31.0	2.76	Standard	12.4	122.3	PO 101
G2-201-204	G2-201-204	Bulk	0.0	24.5	Br and Gr Till	Lean Clay with Sand	CL	NA	27.0	15.0	12.0	3.0	25.0			44.0	28.0	2.79	Standard	12.0	122.7	PO 101
G2-205-208	G2-205-208	Bulk	0.0	24.5	Br and Gr Till	Sandy Lean Clay	CL	NA	27.0	14.0	13.0	3.0	27.0			42.0	28.0	2.81	Standard	12.3	122.5	PO 101

Notes:

1. Sample Type: Bulk — Bulk sample
2. Compaction Method: Standard — Standard Proctor Compactive Effort (ASTM D 698, Method A)
3. Clay size particles defined as those smaller than 0.005 mm (Reference: ASTM D 422)
4. Natural Moisture Content: Moisture contents shown for PO-132 bulk samples are average values from tests on shelby tubes taken at or near the bulk sample depth interval. Moisture contents shown for PO-140 bulk sample are moisture contents of the sample.
5. NA — Not available
6. Data Source:
   - PO 132 — Disposal Facility Pre-Design Geotechnical Investigation, PARSONS Project Order 132, July 1995; corresponds to FERMCO Phase II Investigation; borings located within the proposed disposal facility foot print.
   - PO 140 — Disposal Facility Geotechnical Investigation, PARSONS Project Order 140, November 1995; corresponds to FERMCO Phase III Investigation; borings/excavations located within the proposed disposal facility foot print and along proposed haul roads.
   - PO 101 — On-Site Disposal Cell, Pre-Design Activities Investigation, PARSONS Project Order 101, April and July 1994; borings located outside of proposed disposal facility footprint (south).

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Table G-11 - Summary of Laboratory Permeability Tests, Remolded Specimens

Boring No.	Sample No.	Sample Type	Top Depth (feet)	Bottom Depth (feet)	General Stratum	USCS Group Name	USCS Group Symbol	Natural Moisture Content	Compaction Method	Opt. Moisture Content (%)	Maximum Dry Density (pcf)	Test Type	Confining Pressure (psf)	Target Remold Conditions	Pre-Test Moisture (%)	Pre-Test Dry Density (pcf)	Percent Wet of Optimum	Percent Compaction	Coeff. of Perm (last 4 determinations) k1 (cm/sec)	k2 (cm/sec)	k3 (cm/sec)	k4 (cm/sec)	Average Coeff. of Permeability (cm/sec)	Data Source
11468	403103	Bulk	2.0	6.5	Brown Till	Lean clay with sand	CL	19.0	Standard	16.7	110.5	P_r	1440	Note 4a.	19.9	106.3	3.2	96.2	2.8E-08	3.5E-08	3.3E-08	3.3E-08	3.2E-08	PO 132
11469	402824	Bulk	3.0	7.5	Brown Till	Lean clay with sand	CL	15.9	Standard	13.9	118.5	P_r	1440	Note 4a.	17.1	113.2	3.2	95.5	2.6E-08	2.7E-08	2.4E-08	2.4E-08	2.5E-08	PO 132
11470B	403169-1	Bulk	3.5	7.5	Brown Till	Sandy silt	ML	16.8	Standard	11.1	125.0	P_r	1440	Note 4a.	14.5	119.5	3.4	95.6	4.6E-07	4.2E-07	4.2E-07	4.6E-07	4.4E-07	PO 132
11471	402966	Bulk	3.0	7.5	Brown Till	Fat clay	CH	24.9	Standard	19.3	105.6	P_r	1440	Note 4a.	22.6	101.4	3.3	96.0	2.5E-08	2.3E-08	2.3E-08	2.3E-08	2.4E-08	PO 132
11472	402958	Bulk	3.5	7.5	Brown Till	Lean clay with sand	CL	15.5	Standard	14.4	119.0	P_r	1440	Note 4a.	17.8	112.9	3.4	94.9	1.5E-08	1.7E-08	1.7E-08	1.6E-08	1.6E-08	PO 132
11473	402923	Bulk	3.0	7.5	Brown Till	Lean clay with sand	CL	14.9	Standard	15.1	116.7	P_r	1440	Note 4a.	18.2	111.3	3.1	95.4	1.2E-08	1.5E-08	1.5E-08	1.5E-08	1.4E-08	PO 132
11474	402896	Bulk	3.0	7.5	Brown Till	Lean clay with sand	CL	17.2	Standard	13.7	119.2	P_r	1440	Note 4a.	16.5	114.3	2.8	95.9	3.5E-08	3.6E-08	3.7E-08	3.5E-08	3.6E-08	PO 132
11475	403264	Bulk	4.5	8.5	Fill	Lean clay with sand	CL	23.1	Standard	18.1	108.3	P_r	1440	Note 4a.	21.3	103.8	3.2	95.8	3.1E-08	2.9E-08	2.9E-08	2.9E-08	3.0E-08	PO 132
11476	402993	Bulk	3.5	7.5	Brown Till	Lean clay with sand	CL	14.7	Standard	14.6	117.4	P_r	1440	Note 4a.	17.5	112.6	2.9	95.9	1.2E-08	1.2E-08	1.2E-08	1.2E-08	1.2E-08	PO 132
11477	402866	Bulk	3.5	7.5	Brown Till	Lean clay with sand	CL	21.3	Standard	14.6	116.0	P_r	1440	Note 4a.	18.5	109.7	3.9	94.6	1.8E-08	2.2E-08	2.1E-08	2.0E-08	2.0E-08	PO 132
11478	402796	Bulk	3.5	7.5	Brown Till	Lean clay with sand	CL	20.9	Standard	14.7	116.5	P_r	1440	Note 4a.	17.8	112.0	3.1	96.1	1.1E-08	9.8E-09	9.8E-09	9.9E-09	1.0E-08	PO 132
11479	403048	Bulk	3.5	7.5	Brown Till	Sandy lean clay	CL	14.4	Standard	11.8	123.3	P_r	1440	Note 4a.	13.9	119.6	2.1	97.0	4.2E-08	4.3E-08	4.1E-08	4.2E-08	4.2E-08	PO 132
11480	402771	Bulk	3.0	7.5	Brown Till	Lean clay with sand	CL	21.3	Standard	15.2	113.8	P_r	1440	Note 4a.	17.8	108.8	2.6	95.6	3.0E-08	2.7E-08	2.7E-08	2.7E-08	2.8E-08	PO 132
11481	403230	Bulk	3.5	7.5	Brown Till	Sandy lean clay with gravel	CL	14.7	Standard	13.4	120.2	P_r	1440	Note 4a.	16.5	115.2	3.1	95.8	1.2E-08	1.5E-08	1.3E-08	1.3E-08	1.3E-08	PO 132
G2-SB-1	404608	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	29.3	Standard	17.5	104.8	P_r	576	Note 4a.	21.3	100.0	3.8	95.4	3.9E-07	4.1E-07	4.1E-07	4.1E-07	4.1E-07	PO 140
G2-SB-2	404603	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	28.6	Standard	17.0	107.5	P_r	576	Note 4a.	20.8	102.5	3.8	95.3	2.9E-07	2.7E-07	2.6E-07	2.5E-07	2.7E-07	PO 140
G2-SB-3	404591	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	27.1	Standard	17.8	105.8	P_r	576	Note 4a.	21.4	101.0	3.6	95.5	1.2E-07	1.1E-07	1.1E-07	1.1E-07	1.1E-07	PO 140
G2-SB-4	404615	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	21.0	Standard	17.2	107.5	P_r	576	Note 4a.	21.1	102.4	3.9	95.3	3.5E-06	3.3E-06	3.4E-06	3.4E-06	3.4E-06	PO 140
G2-SB-5	404627	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	21.0	Standard	18.2	106.8	P_r	576	Note 4a.	22.1	101.2	3.9	94.8	5.9E-08	5.5E-08	5.3E-08	5.4E-08	5.5E-08	PO 140
G2-SB-6	404595	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	22.0	Standard	17.3	106.3	P_r	576	Note 4a.	21.2	101.0	3.9	95.0	4.4E-07	4.8E-07	4.2E-07	4.3E-07	4.4E-07	PO 140
G2-SB-7	404632	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	20.6	Standard	18.5	109.6	P_r	576	Note 4a.	22.3	104.4	3.8	95.3	1.4E-08	1.2E-08	1.3E-08	1.2E-08	1.3E-08	PO 140
G2-SB-8	404621	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	23.5	Standard	17.5	109.7	P_r	576	Note 4a.	21.3	104.4	3.8	95.2	2.9E-08	2.8E-08	2.6E-08	2.6E-08	2.7E-08	PO 140
G2-SB-9	404587	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	22.3	Standard	19.2	107.2	P_r	576	Note 4a.	23.2	101.2	4.0	94.4	2.5E-08	2.3E-08	2.3E-08	2.5E-08	2.4E-08	PO 140
G2-SB-10	404637	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	19.1	Standard	17.1	109.9	P_r	576	Note 4a.	19.9	105.7	2.8	96.2	5.9E-08	5.4E-08	5.4E-08	5.3E-08	5.5E-08	PO 140
G2-SB-11	404642	Bulk	1.5	5.0	Brown Till	Lean Clay with Sand	CL	15.1	Standard	14.3	119.0	P_r	576	Note 4a.	18.1	112.6	3.8	94.6	4.7E-08	4.5E-08	4.8E-08	4.7E-08	4.7E-08	PO 140
G2-SB-12	404599	Bulk	1.5	4.2	Brown Till	Fat Clay	CH	21.0	Standard	18.1	106.1	P_r	576	Note 4a.	21.8	101.4	3.7	95.6	5.0E-08	4.6E-08	4.7E-08	4.8E-08	4.8E-08	PO 140
G2-SB-13	404583	Bulk	1.5	5.0	Brown Till	Lean Clay	CL	24.0	Standard	16.6	112.1	P_r	576	Note 4a.	20.3	106.7	3.7	95.2	2.8E-08	2.3E-08	2.5E-08	2.5E-08	2.5E-08	PO 140
G2-SB-14	404578	Bulk	1.5	5.0	Brown Till	Fat Clay	CH	20.9	Standard	18.7	107.1	P_r	576	Note 4a.	22.7	101.2	4.0	94.5	2.9E-08	2.5E-08	2.6E-08	2.4E-08	2.6E-08	PO 140
G2-209	G2-209 / Bulk	Bulk	0.0	25.0	Br and Gr Till	Sandy Lean Clay	CL	---	Standard	12.3	122.3	P_r	1440	Note 4b.	11.7	116.3	-0.6	95.1	1.5E-06	1.5E-06	1.4E-06	1.4E-06	1.5E-06	PO 101
G2-209	G2-209 / Bulk	Bulk	0.0	25.0	Br and Gr Till	Sandy Lean Clay	CL	---	Modified	10.3	133.6	P_r	720	Note 4c.	10.0	131.8	-0.3	98.7	2.6E-08	2.4E-08	2.5E-08	2.5E-08	2.5E-08	PO 101
G2-209	G2-209 / Bulk	Bulk	0.0	25.0	Br and Gr Till	Sandy Lean Clay	CL	---	Modified	10.3	133.6	P_r	720	Note 4d.	12.1	128.4	1.8	96.1	8.6E-09	7.4E-09	8.6E-09	8.7E-09	8.3E-09	PO 101
G2-209	G2-209 / Bulk	Bulk	0.0	25.0	Br and Gr Till	Sandy Lean Clay	CL	---	Modified	10.3	133.6	P_r	720	Note 4e.	14.9	120.9	4.6	90.5	2.0E-08	2.0E-08	1.8E-08	1.9E-08	1.9E-08	PO 101
G2-210	G2-210 / Bulk	Bulk	0.0	25.0	Br and Gr Till	Lean Clay with Sand	CL	---	Standard	12.4	122.3	P_r	1440	Note 4b.	11.8	116.5	-0.6	95.3	2.3E-06	2.2E-06	2.1E-06	2.1E-06	2.2E-06	PO 101
G2-210	G2-210 / Bulk	Bulk	0.0	25.0	Br and Gr Till	Lean Clay with Sand	CL	---	Standard	12.4	122.3	P_r	720	Note 4c.	12.0	120.0	-0.4	98.1	1.8E-06	1.9E-06	1.8E-06	1.9E-06	1.9E-06	PO 101
G2-210	G2-210 / Bulk	Bulk	0.0	25.0	Br and Gr Till	Lean Clay with Sand	CL	---	Standard	12.4	122.3	P_r	720	Note 4d.	13.8	118.0	1.4	96.5	7.1E-06	6.6E-06	6.2E-06	6.1E-06	6.5E-06	PO 101
G2-210	G2-210 / Bulk	Bulk	0.0	25.0	Br and Gr Till	Lean Clay with Sand	CL	---	Standard	12.4	122.3	P_r	720	Note 4e.	16.9	113.5	4.5	92.8	3.8E-08	3.5E-08	3.5E-08	3.5E-08	3.6E-08	PO 101

Notes:

1. Sample Type: Bulk — Bulk sample

2. Compaction Method:
   - Standard — Standard Proctor Compactive Effort (ASTM D 698, Method A)
   - Modified — Modified Proctor Compactive Effort (ASTM D 1557, Method A)

3. Test Type: P_r — Triaxial, Remolded, Back-Pressure Permeability (ASTM D 5084)

4. Target Remold Conditions:
   - 4a. Minimum dry density: 95 % of the maximum Standard Proctor Dry Density; Moisture content: at or near 4 % wet of optimum moisture content
   - 4b. 95% of the maximum Standard Proctor Dry Density; Moisture content: at or near optimum moisture content
   - 4c. At or near optimum moisture content (-0.5%, +1.5%) at dry density in a band about +/-4 pcf from compaction curve dry density
   - 4d. +2% wet of optimum (+/-1%) at dry density in a band about +/-4 pcf from compaction curve dry density
   - 4e. +5% wet of optimum (+/-1%) at dry density in a band about +/-4 pcf from compaction curve dry density

5. Natural Moisture Content: Moisture contents shown for PO-132 bulk samples are average values from tests on shelby tubes taken at or near the bulk sample depth interval. Moisture contents shown for PO-140 bulk sample are moisture contents of the sample.

6. Data Source:
   - PO 132 — Disposal Facility Pre-Design Geotechnical Investigation, PARSONS Project Order 132, July 1995; corresponds to FERMCO Phase II Investigation; borings located within the proposed disposal facility foot print.
   - PO 140 — Disposal Facility Geotechnical Investigation, PARSONS Project Order 140, November 1995; corresponds to FERMCO Phase III Investigation; borings/excavations located within the proposed disposal facility foot print and along proposed haul roads
   - PO 101 — On-Site Disposal Cell, Pre-Design Activities Investigation, PARSONS Project Order 101, April and July 1994; borings located outside of proposed disposal facility footprint (south).

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