CONTRACT PROVISIONS AND PLANS

FOR THE CONSTRUCTION OF:

Phase 5B Project: Package 2 – Salmon Creek Treatment Plant Secondary Treatment Process Improvements

VOLUME III – GEOTECHNICAL DATA REPORT

Discovery Clean Water Alliance Project No. 92-2017-0053

A Discovery Clean Water Alliance Capital Project with Clark Regional Wastewater District as Administrative Lead

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April 2022

CONTRACT PROVISIONS AND PLANS

Phase 5B Project: Package 2 - Salmon Creek Treatment Plant Secondary Treatment Process Improvements

VOLUME VI – GEOTECHNICAL DATA REPORT

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Phase 5B Project – Salmon Creek Treatment Plant Improvements

Geotechnical Data Report

August 2019

Clark Regional Wastewater District

Phase 5B Project – Salmon Creek Treatment Plant Improvements

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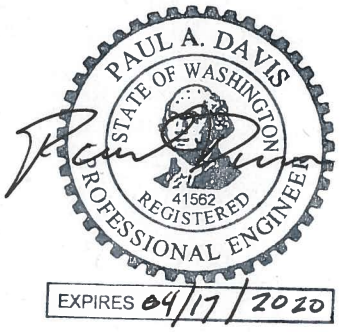

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This report has been prepared under the direction of a registered engineer.

Document History and Status

Revision	Date	Description	By	Review	Approved
1	2/26/2019	Internal QC draft	PD	BH	
2	8/18/2019	final	PD	BH	

Contents

Acronyms and Abbreviations

CH2M	CH2M HILL, Inc.
GDR	Geotechnical Data Report
Jacobs	Jacobs Engineering Group Inc.
SCTP	Salmon Creek Treatment Plant
SPT	Standard Penetration Test

1. Introduction

Jacobs Engineering Group Inc. (Jacobs) has been contracted by the Clark Regional Wastewater District to provide design services for Phase 5B Improvements supporting the new proposed facilities at the Salmon Creek Treatment Plant (SCTP). This Geotechnical Data Report (GDR) summarizes the existing geotechnical data as applicable to the new facilities as well as the results of a geotechnical subsurface exploration performed at the proposed Secondary Clarifier 5.

1.1 Purpose and Scope

This GDR summarizes the subsurface and foundation conditions for the project and presents the findings to the design team, owner, and for inclusion in bidding documents for contractor's information.

The scope of work consisted of the following items:

1) Reviewing existing geotechnical data collected from the SCTP site, including previous soil borings and laboratory testing
2) Performing an exploratory soil boring in the vicinity of the proposed Secondary Clarifier 5 to a total depth of 51.5 feet below ground surface (bgs)
3) Performing laboratory testing of selected samples recovered during drilling
4) Preparing this GDR

1.2 Description of Project Facilities

The SCTP is located in the northwest area of Vancouver, Washington as show on Figure 1. The main facilities to be added as part of the Phase 5B project include a new secondary clarifier (No. 5) and new aeration basin (No. 7). A few small ancillary facilities are also planned. The new facilities are summarized as follows:

Aeration Basin 7 – The new basin will be constructed immediately east of existing Aeration Basin 6 and will be connected using the provisions for future expansion included in the original design of Aeration Basin 6. The new basin will be a reinforced concrete structure, approximately 40-feet wide by 180-feet long with a bottom of slab elevation of 23.5 feet. Geotechnical design and construction analysis and recommendations for this facility will be based on previous subsurface explorations performed in the vicinity of the proposed structure.

Secondary Clarifier 5 – The new secondary clarifier will be constructed adjacent to and west of existing Secondary Clarifier 4. It will be a circular, reinforced concrete basin approximately 120 feet in diameter. The structure will be partially above grade with a larger portion of the structure below grade with a bottom of slab elevation of 20 feet. Existing ground surface elevation in the vicinity of the proposed clarifier ranges from 32 feet to 36 feet. Geotechnical design and construction analysis and recommendations for this facility will be based on data from the recent subsurface exploration (soil boring), located at the site of Secondary Clarifier 5, as well as existing explorations in the area.

The Phase 5B, Package 1 contract does not include design of either the Aeration Basin 7 or Secondary Clarifier 5, but only the smaller ancillary facilities. These are described generally as follows:

Smaller Ancillary Structures

- Preliminary/Primary Odor Control – Series of small structures (less than 15-foot-wide blower facilities and 12-foot-diameter bio-trickling towers) that will be constructed at-grade with a bearing pressure of less than 1,500 psf on mat foundations
- Solids Process Odor Control – Approximately 20-foot by 30-foot, lightly loaded at-grade structure on mat foundation

- Facility 89 – Oil Storage Building - Approximately 20-foot by 30-foot, lightly loaded concrete masonry unit walled structure on mat foundation

Although the Phase 5B, Package 1 work does not include design of Aeration Basin 7 or Secondary Clarifier 5, it is anticipated to be part of the Package 2 work, and therefore data for these facilities is included herein.

2. Technical Data

This section provides a summary of geotechnical explorations in the vicinity of the project improvements and laboratory testing programs.

2.1 Geotechnical Exploration Data

The SCTP has had fairly extensive geotechnical explorations performed at the site for previous facility improvements. The explorations applicable to the Phase 5B project are summarized in the following subsections. The pertinent information from these reports is included for reference in Appendix A.

2.1.1 CH2M HILL, Inc. (1973)

Twelve soil borings, designated B-1 through B-12, were advanced as part of a January 1973 exploration of the SCTP area. The explorations ranged in depth from 20 feet to about 50 feet. Simple stick boring logs from the exploration provide ground surface elevations, soil descriptions, field N-values, and groundwater depths. The borings typically encountered silty sand, fine to medium sand, and sandy silt, with pockets of clay, overlying the Troutdale Formation gravels. The Troutdale Formation was generally encountered at depths ranging from 35 to 50 feet bgs, while one boring (B-5) encountered the Troutdale Formation at approximately 15 feet bgs. Groundwater was encountered at depths ranging from 5 to 28 feet bgs at the time of drilling.

2.1.2 CH2M HILL, Inc. (1974)

Thirteen geotechnical borings (TH-1 through TH-13) were drilled for the design of the existing outfall in January 1974 by CH2M HILL, Inc. (CH2M). The boring nearest the SCTP (TH-1) was terminated in the sand and gravel of the Troutdale Formation, which was encountered at a depth of approximately 45 feet bgs. All other borings advanced as part of this exploration were further from the SCTP and are therefore not included in the summary of subsurface conditions.

2.1.3 Century West Engineering (1986, 1989, and 1990)

Three investigations were completed by Century West Engineering in the vicinity of the SCTP between 1986 and 1990. Two soil borings (B-1 and B-2) were advanced in 1986, and four soil borings (B-3 through B-6) were advanced in 1989. An additional three borings (B-7 through B-9) were advanced in the same area in 1990. These explorations were conducted in support of proposed expansions to the SCTP. The borings advanced in 1989 and 1990 were drilled using a Mobile B-61 drill rig using hollow-stem augers. Borings B-5 and B-6 were located at the west end of the treatment plant property, closest to the currently proposed project and the BNSF railroad. These borings were advanced to depths of about 35 and 38 feet bgs, respectively, and encountered 35 to 40 feet of silt and sand. Boring B-5 encountered the Troutdale Formation at a depth of approximately 35 feet bgs. Boring B-6 was terminated in very dense sand at a depth of 40 feet bgs.

2.1.4 CH2M HILL, Inc. (1996)

Twelve soil borings (2B-1 through 2B-12) were advanced in the vicinity of the SCTP between January 24 and February 23, 1995. The borings were advanced to depths ranging from 21.5 to 95.5 feet bgs using CME 75 and CME 55 drill rigs and either mud rotary or hollow-stem auger techniques. Borings 2B-11 and 2B-10 were advanced at the west end of the treatment plant property and are the closest to the currently proposed project. These borings were advanced to depths of 60.3 and 36.5 feet bgs, respectively.

2.1.5 Project-Specific Exploration

Following review of previous geotechnical data, it was determined that a single exploratory boring would be drilled at the new Secondary Clarifier 5 location to support the design of the facility. The boring, B-1-18, was drilled on November 19, 2018, by Holt Drilling from Vancouver Washington using a Mobile B-60

truck-mounted drill rig using mud rotary drilling methods. A Jacobs geotechnical engineer provided continuous observation and logging of all boreholes completed as part of this program.

Soil samples were obtained every 5 feet using a split-spoon sampler with 18-inch drive intervals. Split-spoon samples were obtained by the Standard Penetration Test (SPT) Method (ASTM D 1586), which consists of driving a 2-inch-outside-diameter split-barrel sampler into the soil with a 140-pound weight falling freely through a distance of 30 inches. The sampler was driven in 3 successive 6-inch increments with the number of blows per increment being recorded. The sum of the number of blows required to advance the sampler the second and third 6-inch increments is termed the Standard Penetration Resistance (N-value) and is presented on the borings logs included in Appendix B. The samples were sealed in plastic bags and transported to FEI Testing and Inspection of Corvallis, Oregon for further classification and testing.

Soil samples from the borings were examined and visually classified in general accordance with ASTM D 2488, *Visual-Manual Procedure for Description of Soils*.

A 2-inch diameter polyvinyl chloride piezometer was installed in the boring to 50 feet with a 10-foot screen between 40 feet and 50 feet bgs. The piezometer was installed to measure changes in groundwater level and to perform slug testing for estimating hydraulic conductivity.

The project-specific boring near Secondary Clarifier 5 and relevant historical borings are shown on the boring location plans (Figures 2 through Figure 5).

2.1.6 Laboratory Testing

Selected soil samples were assigned classification testing and performed by FEI Testing and Inspection from Corvallis, Oregon. These tests included the following:

- ASTM D422, *Standard Test Method for Particle-Size Analysis of Soils*
- ASTM D4318, *Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils*
- ASTM D1140, *Standard Test Method for Determining the Amount of Material Finer than No. 200 Sieve in Soils by Washing*

Table 1 shows the laboratory testing summary results.

Table 1. Laboratory Testing Summary Results

Sample	Moisture Content (%)	Liquid Limit	Plasticity Index	Fines Content (%)	Sand Content (%)	Gravel Content (%)
B-1 at 15 feet bgs	--	--	--	53.3	46.7	0
B-1 at 20 feet bgs	27.6	32	12	64.6	--	--
B-1 at 25 feet bgs	33.5	--	--	29	--	--
B-1 at 30 feet bgs	24.7	--	--	17.4	--	--
B-1 at 35 feet bgs	24.0	--	--	12.6	--	--
B-1 at 40 feet bgs	26.2			17	--	--
B-2 at 45 feet bgs	28.4			17.3	--	--
B-2 at 50 feet bgs	22.2			13.7	--	--

Laboratory testing reports are presented in Appendix C.

2.1.7 Slug Testing

A slug test was performed by Holt Drilling on November 20, 2018, in general accordance with ASTM D 4044, *Standard Test Method for Instantaneous Change in Head (Slug) for Determining Hydraulic Properties of Aquifers*.

The test was performed by introducing a 1-gallon water slug into the piezometer and measuring water drawdown with time interval until substantial recovery of the water within the piezometer.

Raw data from the slug test is included in Appendix D.

3. Interpretations

This section discusses the results of a published literature review of the geologic conditions in the vicinity of the project site. It also presents a discussion of the subsurface conditions at the project site as observed during the geotechnical field exploration.

3.1 Regional Geology

The project is located within the Portland Basin of the Willamette Lowland geological province. The Willamette Lowland geological province is a structural and erosional lowland area bordered by the uplifted marine rocks of the Coast Range to the west and volcanic rocks of the Cascade Range to the east. Continental and marine strata interfinger beneath and adjacent to the Willamette Lowland. The Willamette Lowland extends from Eugene, Oregon, north to the Lewis River in southern Washington. In the northern two-thirds of the lowland, the marine sedimentary rocks and Cascade Range volcanic rocks are overlain by up to 1,000 feet of lava of the Columbia River Basalt group. Folding and faulting during and after incursion of the Columbia River Basalt Group formed four major depositional basins: the Portland Basin, the Tualatin Basin, the central Willamette Valley, and the southern Willamette Valley. These basins, separated in most places by uplands capped by Columbia River Basalt Group, have locally accumulated more than 1,600 feet of fluvial sediment derived from the Cascade and Coast Ranges or transported into the region by the Columbia River. During Pleistocene time, large-volume glacial-outburst floods, which originated in western Montana, periodically flowed down the Columbia River drainage and inundated the Willamette Lowland. These floods deposited up to 250 feet of silt, sand, and gravel in the Portland Basin (Gannett and Caldwell, 1998).

3.2 Subsurface Conditions

3.2.1 Secondary Clarifier 5

The boring performed in November 2018 indicated this location is underlain by approximately 12 feet of fill consisting of silt with gravel and cobbles. SPT N-values were 8 and 15. The gravel is sub rounded to sub angular and cobbles were sub rounded with sizes up to about 8 inches. Below the fill were native layers of sandy silt and sandy lean clay to about 25 feet bgs. The sandy silt was recovered using an oversize sample because of low recovery in the overlying fill layers. The sandy lean clay layer had an N-value of 9, indicating firm consistency. Below these layers, the soil was loose to medium dense silty sand with varying degrees of fines content and SPT N-values that ranged from 8 to 27.

The soil profile in this area with interbedded sandy silt/clay and silty sand is consistent with other borings in the area including B-10 from 1973 and 2B-2 from 1995. Hard drilling and sampling was observed at 95 feet bgs in boring 2B-2 from 1995 with refusal blow count. It is likely that this location encountered bedrock, likely a conglomerate of the Troutdale Formation.

Groundwater was measured in the 2018 boring in January and February 2019. Additional historical groundwater measurements have been recorded from previous borings nearby including B-10 (from 1973) and 2B-2 from 1995. These groundwater measurements and corresponding elevation are included in Table 2.

Table 2. Secondary Clarifier 5 Area - Recent and Historical Groundwater Level

Boring Number	Month/Year	Depth (feet)	Approximate Elevation (feet)
B-10 (73)	July 1973	20	6
2B-2	January 1995	31	5 ft
B-1-18	January 2019	24.65	7.35
B-1-18	February 2019	23.32	8.68
B-1-18	June 2019	24.33	7.03

3.2.2 Aeration Basin 7

Previous borings in the vicinity of the new aeration basin include B-1 (from 1986, ground surface elevation of 35 feet), B-6 (from 1973, ground surface elevation of 47 feet) and 2B-6 (from 1995, ground surface elevation of 58.6 feet). These borings indicate the subsurface conditions at this location consist primarily of firm to stiff sandy silt to silt with conglomerate bedrock encountered between approximately 22 and 40 feet bgs. The elevation of the borings varied depending on ground surface at the time of the explorations. However, the depth to bedrock (dense gravel conglomerate) varied between about elevation 7 and 12, then sloping up to the south slope with depth to bedrock about 22 feet below the slope surface.

Groundwater was measured in boring B-1 (1986) at a depth of about 23 feet corresponding to an elevation of about 13 feet.

4. Limitations

4.1 Limitations

This GDR has been prepared for the exclusive use of the Clark Regional Wastewater District, for specific application to the SCTP Phase 5B project. This GDR has been prepared in accordance with generally accepted geotechnical engineering practice. No other warranty, express or implied, is made.

The information contained in this GDR is based on the data obtained from the field explorations described herein. The explorations indicate subsurface and groundwater conditions only at specific locations and times, and only to the depths penetrated. They do not necessarily reflect variations that may exist between exploration locations. Subsurface conditions and water levels at other locations may differ from conditions occurring at these explored locations. Also, the passage of time may result in a change in conditions at these locations.

If any changes in the nature, design, or location of the facilities are planned, the information contained in this report should not be considered valid unless the changes are reviewed, and the data verified in writing by Jacobs. Jacobs is not responsible for any claims, damages, or liability associated with interpretation of subsurface data, or for the reuse of subsurface data, without the express written authorization of Jacobs.

5. References

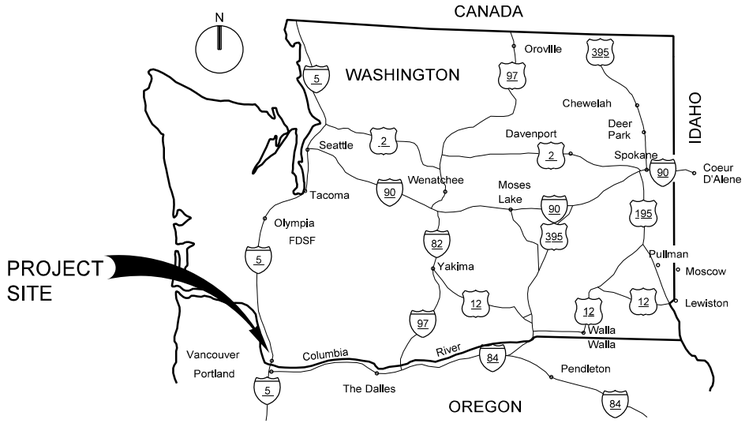
Gannett, M. W., and R.R. Caldwell. 1998. *Geologic Framework of the Willamette Lowland Aquifer System, Oregon and Washington*. U.S. Geological Survey, Professional Paper 1424-A.

Figures

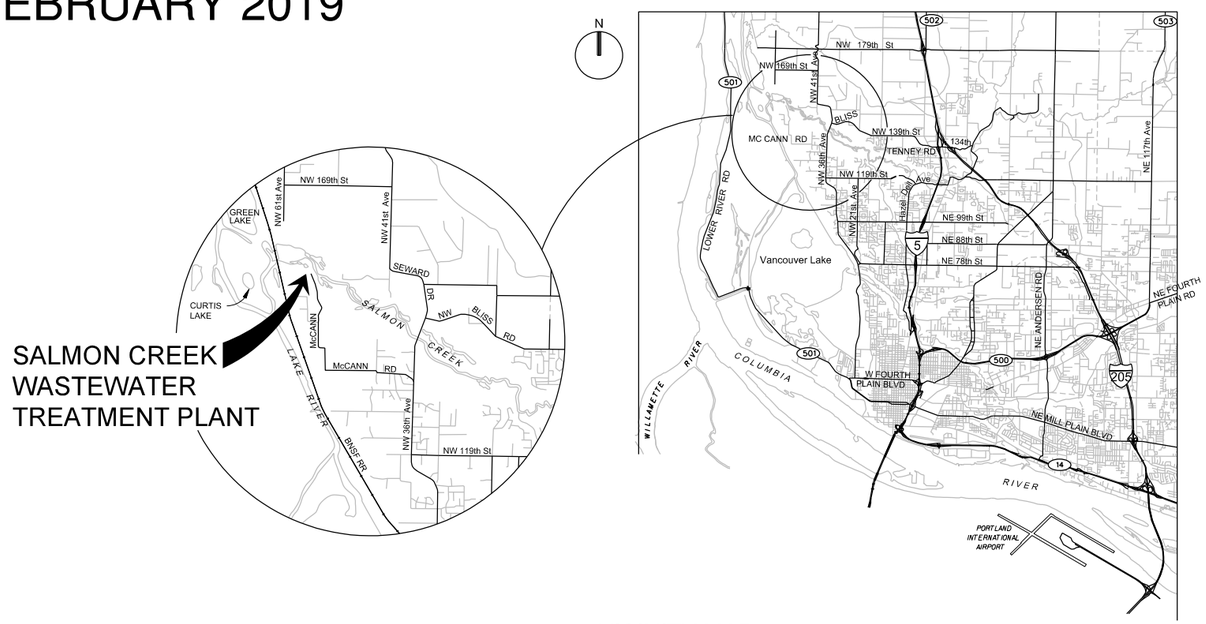
SALMON CREEK TREATMENT PLANT (SCTP)
PHASE 5B PROJECT

DISCOVERY CLEAN WATER ALLIANCE PROJECT #XX-XXXX-XXXX

FEBRUARY 2019



LOCATION MAP



VICINITY MAP

ALLIANCE BOARD OF DIRECTORS:
JULIE OLSON, CLARK COUNTY
NORM HARKER, CLARK REGIONAL WASTEWATER DISTRICT
RON ONSLOW, CITY OF RIDGEFIELD
SHANE BOWMAN, CITY OF BATTLE GROUND

CLARK REGIONAL WASTEWATER DISTRICT

JACOBS
1737 NORTH FIRST STREET,
SUITE 300
SAN JOSE, CA 95112

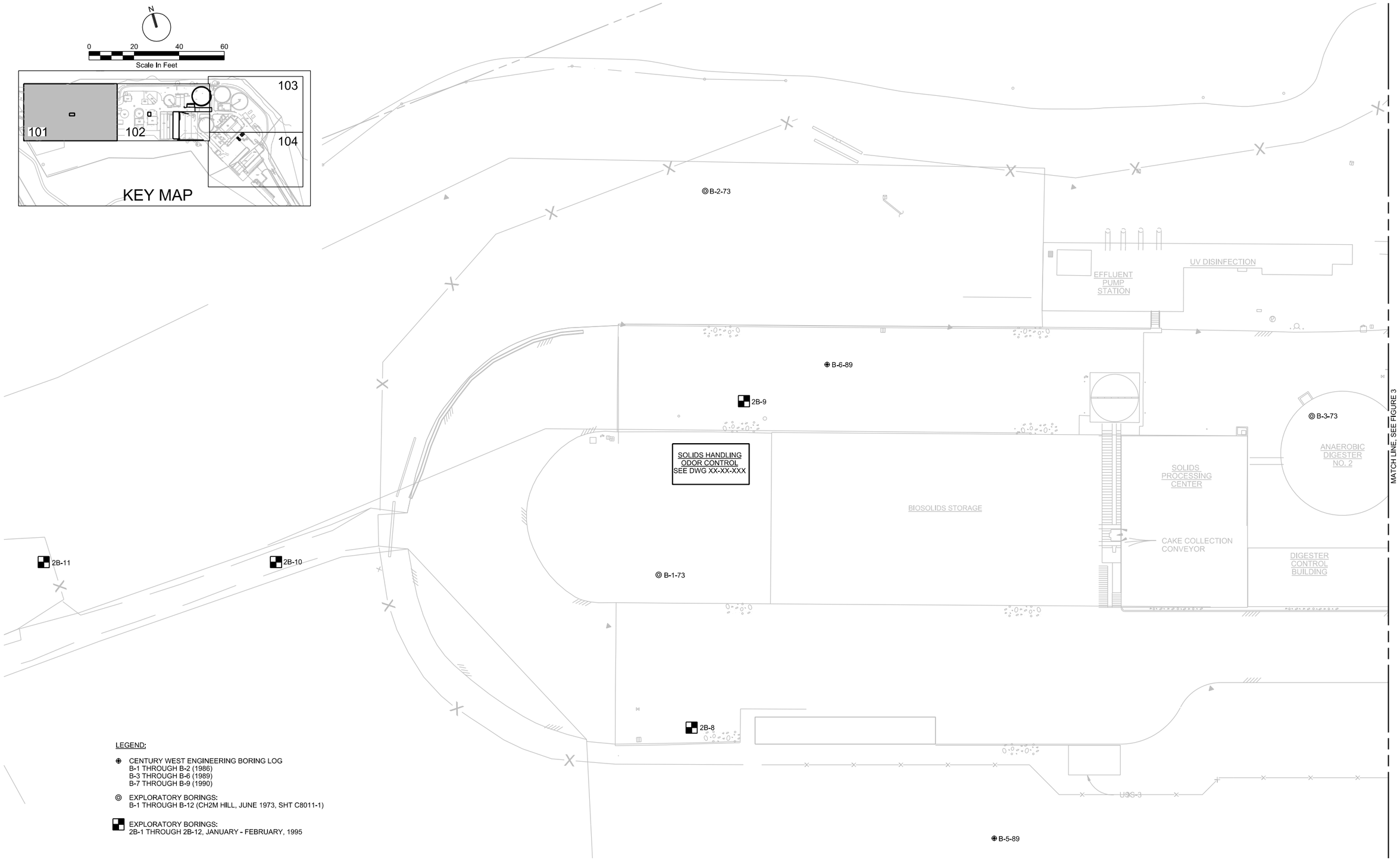
QUALITY ASSURANCE	***PROJECT MANAGER***	***DISTRICT ENGINEER***
BRADY FULLER DATE	*DALE LOUGH* DATE	*ROBIN KRAUSE* DATE

UTILITY CONTACTS

SANITARY SEWER: CLARK REGIONAL WASTEWATER DISTRICT	(360) 750-5876
STORM SEWER: CLARK COUNTY	(360) 397-2121
WATER: CLARK PUBLIC UTILITIES	(360) 992-8022
GAS: NW NATURAL	(503) 226-4211
ELECTRICAL: CLARK PUBLIC UTILITIES	(360) 992-3000

FIGURE 1
PROJECT LOCATION, VICINITY AND SITE MAPS
GEOTECHNICAL DATA REPORT
PHASE 5B SCTP IMPROVE DESIGN
SALMON CREEK WWTP

JACOBS



LEGEND:

- ⊕ CENTURY WEST ENGINEERING BORING LOG
  B-1 THROUGH B-2 (1986)
  B-3 THROUGH B-6 (1989)
  B-7 THROUGH B-9 (1990)
- ◎ EXPLORATORY BORINGS:
  B-1 THROUGH B-12 (CH2M HILL, JUNE 1973, SHT C8011-1)
- EXPLORATORY BORINGS:
  2B-1 THROUGH 2B-12, JANUARY - FEBRUARY, 1995

FIGURE 2
BORING LOCATION PLAN

GEOTECHNICAL DATA REPORT
PHASE 5B SCTP IMPROVE DESIGN
SALMON CREEK WWTP

JACOBS

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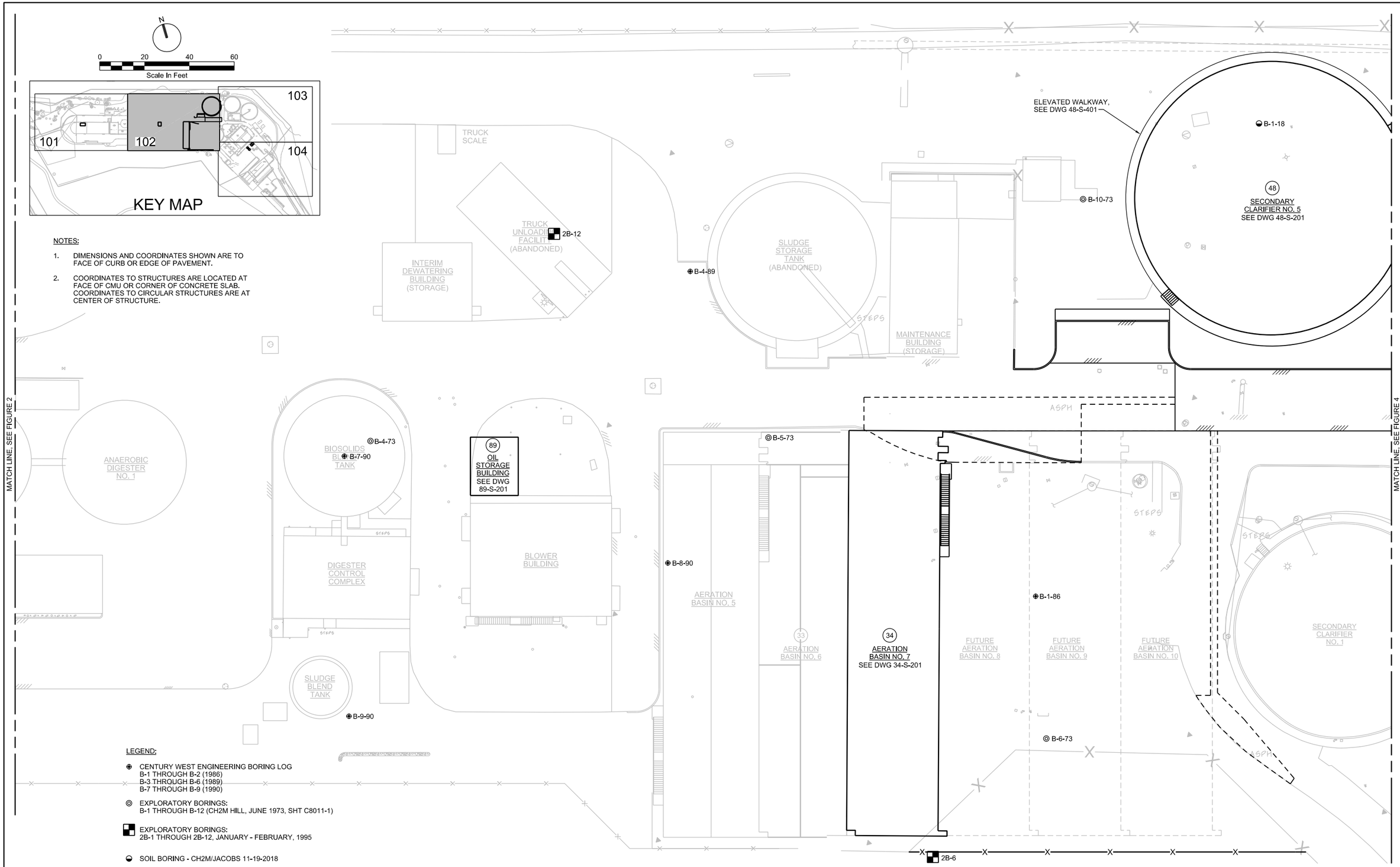
NOTES:

1. DIMENSIONS AND COORDINATES SHOWN ARE TO FACE OF CURB OR EDGE OF PAVEMENT.
2. COORDINATES TO STRUCTURES ARE LOCATED AT FACE OF CMU OR CORNER OF CONCRETE SLAB. COORDINATES TO CIRCULAR STRUCTURES ARE AT CENTER OF STRUCTURE.



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- ⊕ CENTURY WEST ENGINEERING BORING LOG
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  B-3 THROUGH B-6 (1989)
  B-7 THROUGH B-9 (1990)
- ◎ EXPLORATORY BORINGS:
  B-1 THROUGH B-12 (CH2M HILL, JUNE 1973, SHT C8011-1)
- ■ EXPLORATORY BORINGS:
  2B-1 THROUGH 2B-12, JANUARY - FEBRUARY, 1995
- ◒ SOIL BORING - CH2M/JACOBS 11-19-2018

FIGURE 3
BORING LOCATION PLAN
GEOTECHNICAL DATA REPORT
PHASE 5B SCTP IMPROVE DESIGN
SALMON CREEK WWTP

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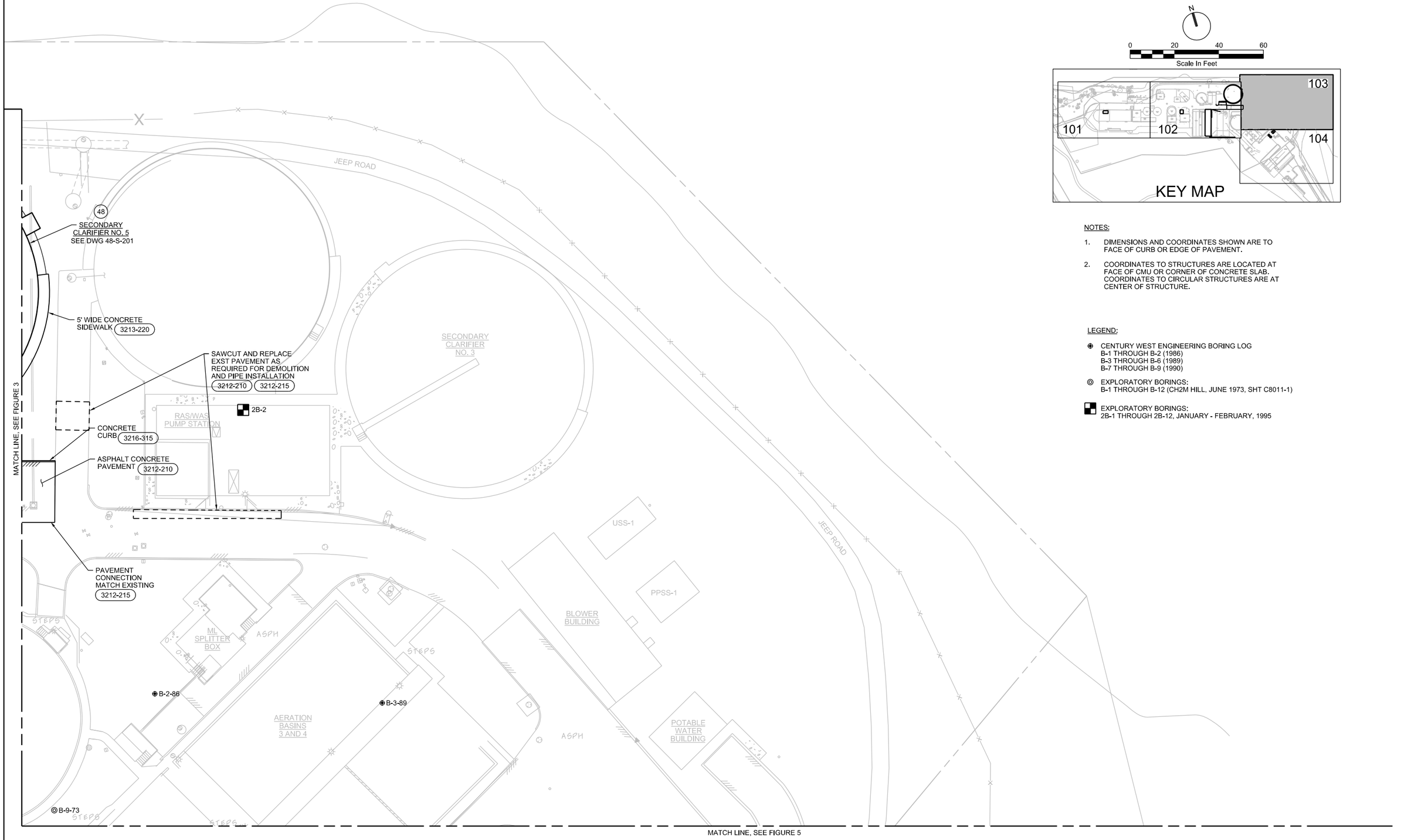

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LEGEND:

⊕ CENTURY WEST ENGINEERING BORING LOG
B-1 THROUGH B-2 (1986)
B-3 THROUGH B-6 (1989)
B-7 THROUGH B-9 (1990)

◎ EXPLORATORY BORINGS:
B-1 THROUGH B-12 (CH2M HILL, JUNE 1973, SHT C8011-1)

EXPLORATORY BORINGS:
2B-1 THROUGH 2B-12, JANUARY - FEBRUARY, 1995

FIGURE 4
BORING LOCATION PLAN

GEOTECHNICAL DATA REPORT
PHASE 5B SCTP IMPROVE DESIGN
SALMON CREEK WWTP

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MATCH LINE, SEE FIGURE 4

MATCH LINE, SEE FIGURE 3

AERATION BASINS 1 AND 2

STEPS

STEPS

STEPS

22
BIOTRICKLING TOWERS
SEE DWG 22-S-211

2B-1

ASPH

JEEP ROAD

RESTORE AREA WITH GRASS

B-8-73

SAWCUT AND REPLACE EXST PAVEMENT AS REQUIRED FOR DEMOLITION AND PIPE INSTALLATION
3212-210 3212-215

RESTORE AREA WITH GRASS

PRELIMINARY TREATMENT

GATE

2B-5

PRIMARY TREATMENT

2B-3

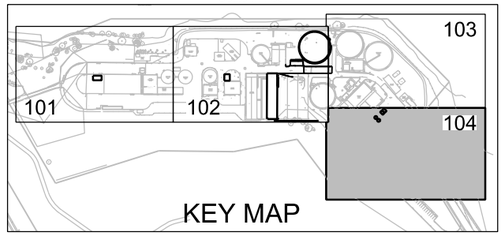
2B-4

OPERATIONS CENTER

PLANT ACCESS ROAD

N

0 20 40 60
Scale In Feet



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◎ EXPLORATORY BORINGS:
B-1 THROUGH B-12 (CH2M HILL, JUNE 1973, SHT C8011-1)

EXPLORATORY BORINGS:
2B-1 THROUGH 2B-12, JANUARY - FEBRUARY, 1995

FIGURE 5
BORING LOCATION PLAN
GEOTECHNICAL DATA REPORT
PHASE 5B SCTP IMPROVE DESIGN
SALMON CREEK WWTP

JACOBS

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Appendix A
Previous Geotechnical Data

Geotechnical Data Report
Salmon Creek Waste Water Treatment Plant
Phase 3 Expansion
Vancouver, Washington

Prepared For
Clark County
Department of Public Works
Division of Environmental Services
Vancouver, Washington

Prepared By
CH2M HILL
Portland Oregon

108015.TP
February 1996

Introduction

Purpose and Scope of Work

This report presents the findings of a geotechnical exploration performed for the Salmon Creek Waste Water Treatment Plant (SCWWTP) Phase 3 Expansion Program. This exploration was authorized by Clark County, Washington, by execution of Task Order No. 9, Phase 3 Expansion Program Engineering Services, dated April 29, 1994.

The purpose of the exploration was to collect data for geotechnical analysis and to develop geotechnical design recommendations for proposed new structures. The following is our scope of work for this geotechnical exploration:

- Review available geotechnical data from previous explorations at the site.
- Drill, log, and sample 12 exploratory soil borings at the site to depths ranging from 21.5 to 95.5 feet below existing grade.
- Advance two soil borings at a proposed outfall extension site in the Columbia River.
- Install six piezometers at the plant site to measure water levels.
- Conduct laboratory testing of selected soil samples to verify field classifications, measure index properties, and evaluate strength and compressibility characteristics.
- Prepare this report summarizing the findings of the exploration.

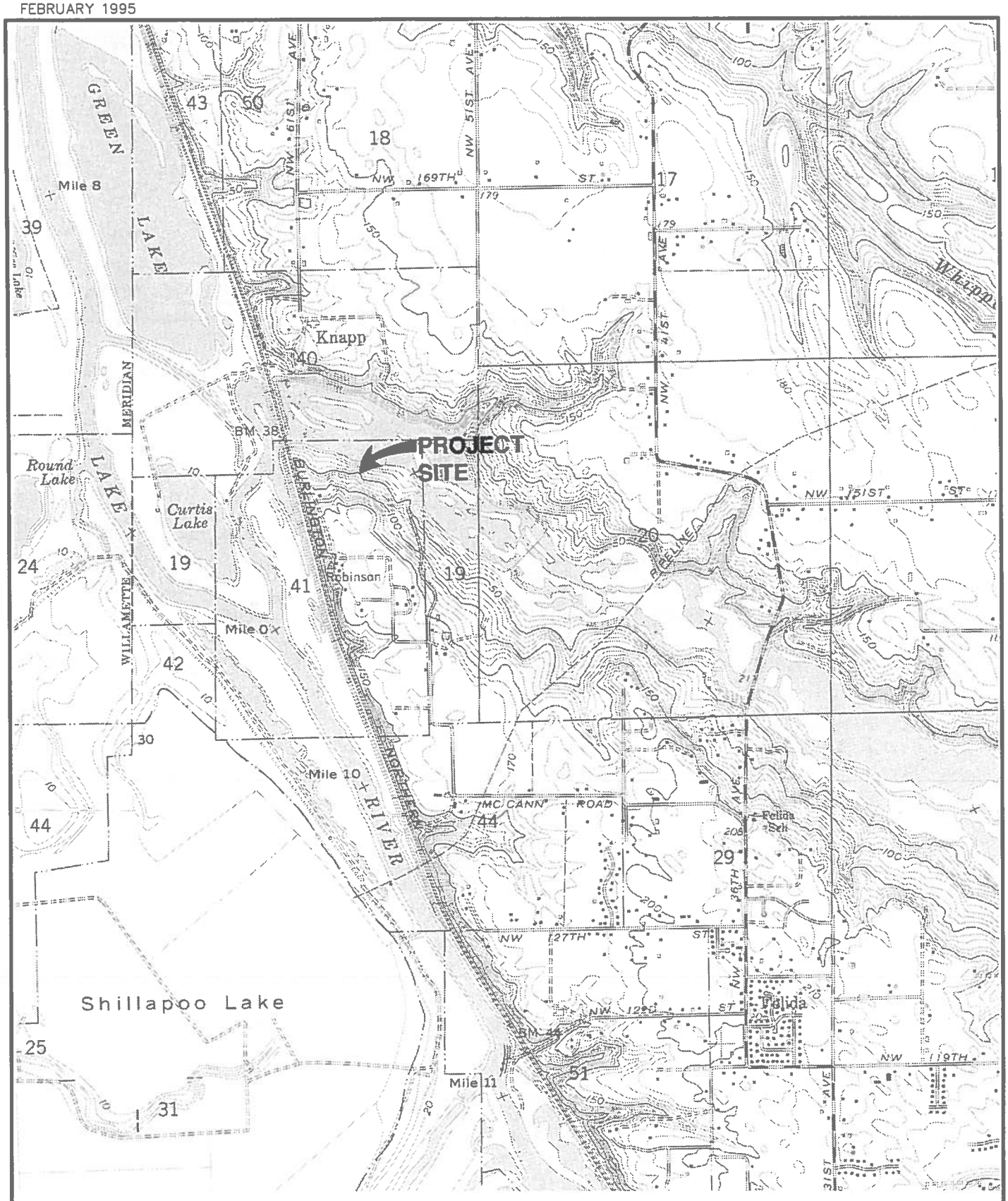
Background

Site Location and Description

The Salmon Creek Waste Water Treatment Plant (SCWWTP) is located at the north end of McCann Road in Clark County, Washington. The treatment plant is located on the south side of Salmon Creek, approximately 1000 feet upstream (east) of the Columbia River floodplain, as shown on the site vicinity map (Figure 1).

The plant site is a relatively level bench separating Salmon Creek from the bottom of a moderate slope approximately 160 feet high. Review of construction drawings indicates that the site was created by cutting and filling at the bottom of the slope during the original plant construction. On the slope south of the plant site, the ground is covered by trees and heavy brush and has an average slope of approximately 4 horizontal to 1 vertical (4H: 1V). West of the existing plant facilities, the ground surface is near the same elevation as the plant, and appears to have been filled. The ground surface in this area is relatively clear of trees and brush; however, some

FEBRUARY 1995



BASE MAP FROM USGS VANCOUVER QUADRANGLE, OREGON–WASHINGTON
7.5 MINUTE SERIES (TOPOGRAPHIC) 1961, PHOTOREVISED 1978

0 1000 2000
SCALE IN FEET

OPW35382.EN.03

Figure 1
SITE VICINITY MAP
SALMON CREEK WASTEWATER
TREATMENT PLANT
CLARK COUNTY, WASHINGTON

CH2MHILL

5382M01.DWG

construction debris and spoil piles are present. The topography of the plant site is shown on Figure 2.

Project Description

Four alternative site layouts for the Phase 3 expansion were originally evaluated in the SCWWTP Master Plan/Engineering Report (CH2M HILL 1995). The evaluation concluded that expansion to the south of the existing plant would have lowest overall costs, and a southern expansion became the selected alternative. Expansion to the south will involve regrading of the site, including excavation of the slope and construction of a permanent retaining wall along the southern edge of the site. Proposed new structures also include a new administration building, and several new treatment structures. Construction of a new pump station at 36th Avenue, and a new force main, has been postponed to Phase 4, therefore these have not been considered in the scope of work for this exploration. Approximate locations of the proposed structures are shown on Figure 2.

Based on conceptual drawings, the retaining wall will generally be less than 20 feet high. During construction of the primary clarification and aeration basins, excavation will be required at the base of the retaining wall, assuming that the retaining wall is constructed first.

The proposed new administration building will be a two-story structure constructed by excavation into the slope at the east end of the site. The first floor of the structure—which will be partially buried—will be built at approximately the same grade as the existing plant facilities. This first floor will be used as a garage and maintenance area. The upper floor of the administration building will contain staff offices.

Treatment structures included in the Phase 3 expansion generally will be concrete slab-on-grade with depths ranging from 0 to 40 feet below existing ground surface. These structures will include the following: two anaerobic digesters, a dewatering facility, an effluent pump station, a disinfection structure, an aeration basin, a secondary clarifier, a return solids pump station, a headworks structure (screening and grit removal), and a primary clarifier.

An existing effluent outfall extends from the plant site to the Columbia River to the west. This outfall will be extended approximately 150 feet further into the river channel during the proposed Phase 3 Expansion.

Geologic Hazards

A geologic hazards evaluation was completed by Cornforth Consultants, Inc. (CCI), in August 1994. According to this evaluation, the project is located within the Willamette lowland geological province, on sand-sized Quaternary catastrophic flood deposits (CCI 1994).

Based on the geologic descriptions, these materials are up to 50 feet thick, and overlie the Troutdale Formation. The hazards evaluation considered potential geologic hazards including slope stability, faults and seismicity, and liquefaction. A copy of the Geologic Hazards report is included in Appendix A.

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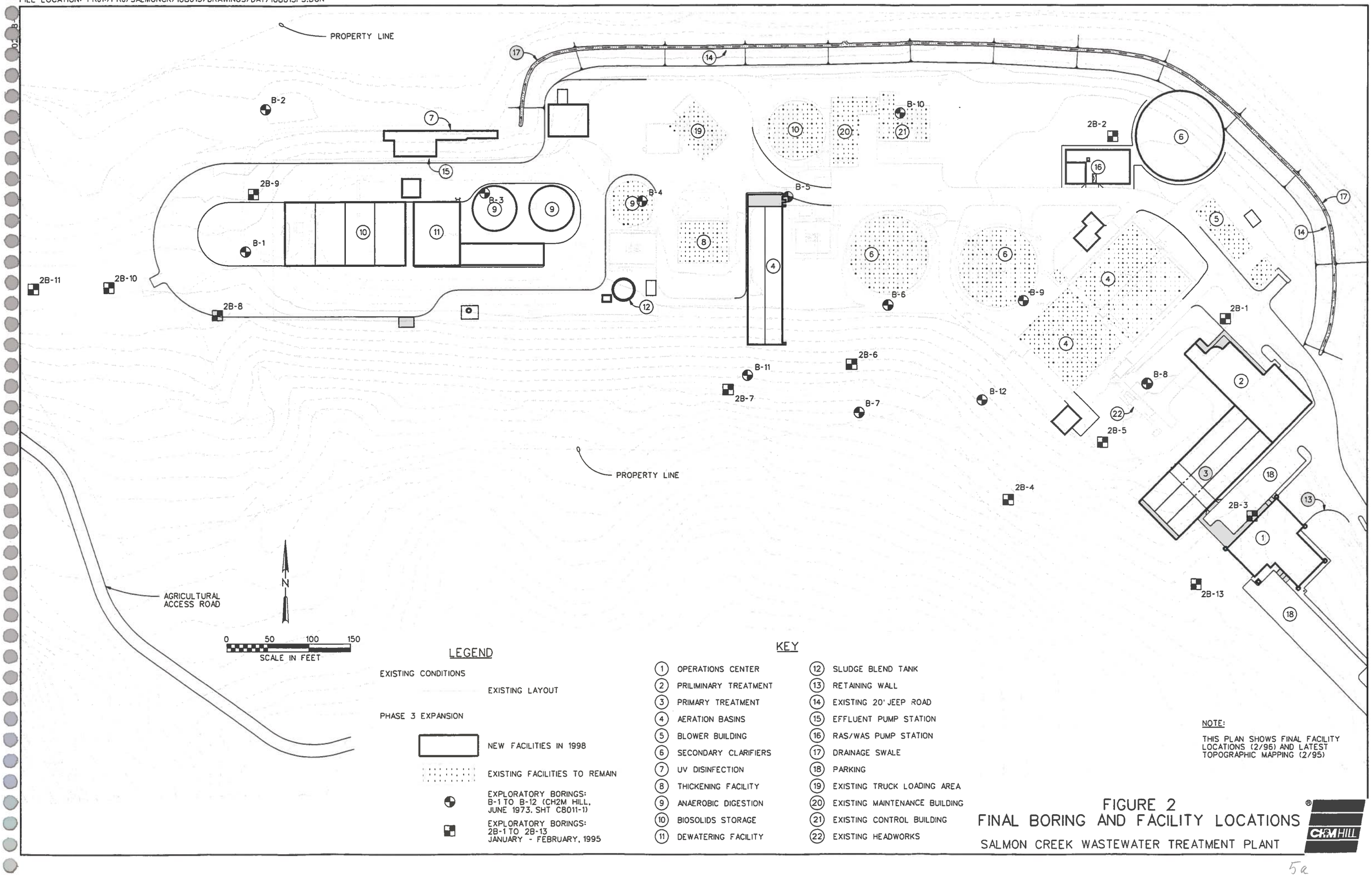


LEGEND

EXISTING CONDITIONS

EXISTING LAYOUT

PHASE 3 EXPANSION

NEW FACILITIES IN 1998

EXISTING FACILITIES TO REMAIN

EXPLORATORY BORINGS: B-1 TO B-12 (CH2M HILL, JUNE 1973, SHT C8011-1)

EXPLORATORY BORINGS: 2B-1 TO 2B-13 JANUARY - FEBRUARY, 1995

KEY

1. OPERATIONS CENTER
2. PRILIMINARY TREATMENT
3. PRIMARY TREATMENT
4. AERATION BASINS
5. BLOWER BUILDING
6. SECONDARY CLARIFIERS
7. UV DISINFECTION
8. THICKENING FACILITY
9. ANAEROBIC DIGESTION
10. BIOSOLIDS STORAGE
11. DEWATERING FACILITY
12. SLUDGE BLEND TANK
13. RETAINING WALL
14. EXISTING 20' JEEP ROAD
15. EFFLUENT PUMP STATION
16. RAS/WAS PUMP STATION
17. DRAINAGE SWALE
18. PARKING
19. EXISTING TRUCK LOADING AREA
20. EXISTING MAINTENANCE BUILDING
21. EXISTING CONTROL BUILDING
22. EXISTING HEADWORKS

NOTE:

THIS PLAN SHOWS FINAL FACILITY LOCATIONS (2/96) AND LATEST TOPOGRAPHIC MAPPING (2/95)

FIGURE 2
FINAL BORING AND FACILITY LOCATIONS
SALMON CREEK WASTEWATER TREATMENT PLANT

CH2MHILL

5a

PROPERTY LINE

B-2 19 2B-9 15 7 B-3 10 12 B-4 9 8 11 B-5 8 B-10 12 10 12 2B-12 2B-2 6 16 17 5 18 4 2B-1 2 3 B-9 6 6 8 B-6 2B-6 4 B-11 13 B-12 B-8 9 1 2B-5 2B-3 1 2B-4 13 18 2B-11 2B-10 18 B-1 17 2B-8 2B-7 B-7 14 PROPERTY LINE

LEGEND

EXISTING CONDITIONS

EXISTING LAYOUT

PHASE 3 EXPANSION

PROPOSED FACILITIES IN 1998

EXISTING FACILITIES TO REMAIN

NEW RETAINING WALL

EXPLORATORY BORINGS: B-1 TO B-12 (CH2M HILL, JUNE 1973, SHT C8011-1)

EXPORATORY BORINGS: 2B-1 TO 2B-12, JANUARY - FEBRUARY, 1995

KEY

1. ADMINISTRATION BLDG/LABORATORY
2. HEADWORKS (SCREENING/GRIT REMOVAL)
3. PRIMARY CLARIFICATION
4. AERATION BASINS
5. BLOWER BUILDING
6. SECONDARY CLARIFICATION
7. DISINFECTION
8. THICKENING FACILITY
9. ANAEROBIC DIGESTION
10. BIOSOLIDS STORAGE
11. DEWATERING FACILITY
12. MAINTENANCE BLDG
13. RETAINING WALL
14. EXISTING 20' JEEP ROAD
15. EFLUENT PUMP STATION
16. RETURN SOLIDS PUMP STATION
17. PIPE CHASE
18. PARKING

N

0 100 200 300

SCALE IN FEET

FIGURE 2
PROPOSED SITE PLAN

SALMON CREEK WASTEWATER TREATMENT PLANT

CH2MHILL

Previous Geotechnical Explorations

CH2M HILL performed a geotechnical exploration for the original plant design in 1973. A copy of a boring log drawing showing the findings of the field exploration is included in Appendix B.

Geotechnical explorations were performed by Century West Engineering Corporation in September 1989 and in February 1990. Copies of their reports were made available by Clark County, Washington, and are included in Appendices C and D.

Limitations

This report has been prepared for the exclusive use of Clark County, Washington and CH2M HILL for specific application to the proposed SCWWTP Phase 3 Expansion, in accordance with generally accepted geotechnical engineering practice. No other warranty expressed or implied is made.

The exploration boring logs and water level measurements attached to this report indicate subsurface conditions only at specific locations and times, and only to the depths penetrated. They do not necessarily reflect soil, strata, or water level variations that may exist among such locations. If variations in subsurface conditions from those indicated are noted during construction or in the event that any changes in the nature, design, or location of facilities are planned, the data contained in this report should not be considered valid unless the changes are reviewed by CH2M HILL.

CH2M HILL is not responsible for any claims, damages, or liabilities associated with interpretation of subsurface data, or reuse of subsurface data, without the express authorization of CH2M HILL.

Technical Data

Field Exploration

Twelve soil borings were advanced at the treatment plant site between January 24, 1995 and February 23, 1995 at the locations shown on Figure 2. These borings were advanced by Geotech Explorations of Tualatin, Oregon using truck-mounted and track-vehicle-mounted CME 75 and CME 55 drill rigs. Boring depths ranged from 21.5 to 95.5 feet below existing ground levels. In general, the soil borings were completed using mud rotary techniques with a tri-cone roller bit. However, at the request of Clark County, borings 2B-2, 2B-8, 2B-9, 2B-10, and 2B-11 were advanced using hollow stem augers to allow inspection of cuttings by an archeologist. In borings 2B-2 and 2B-9, the drilling method was switched to mud rotary below respective depths of 55 and 21.5 feet to limit collapse or "blow-in" of sandy soils.

Two borings, OB-1 and OB-2, were advanced at the location of the proposed outfall extension in the Columbia River. These borings were advanced from a barge by Geotech Explorations, of Tualatin, Oregon, using a truck-mounted CME 75 drill rig. Borings OB-1 and OB-2 were advanced at approximately 65 feet and 130 feet, respectively, from the end of the existing outfall diffuser, in approximate alignment with the existing outfall. The borings were advanced to approximate depths of 31.5 to 46.5 feet below the river bottom, using mud rotary methods, and steel casing to contain drilling fluids and cuttings.

Representative disturbed samples of materials encountered in the soil borings were obtained at 5- foot intervals with a standard 2-inch outside diameter standard split-spoon sampler, following the requirements of the Standard Penetration Test (ASTM D 1586). This test is used to characterize the consistency or density of in-place soil by measuring penetration resistance expressed as "blow counts." The blow count is the number of blows required to advance the standard split-spoon sampler 6 inches using a 140-pound hammer falling 30 inches. The sampler is driven 18 inches, and the blow count is recorded for each 6-inch increment. The sum of the blows for the second and third increments is referred to as the N-value. Low N-values indicate soft or loose deposits, while high N-values are evidence of hard or dense materials. After the sampler has been driven and the blow counts recorded, the sampler is withdrawn from the boring to recover a disturbed soil sample.

Thin-walled tube samples were recovered in locations where fine-grained soil deposits were encountered. The tube sample provides a relatively undisturbed sample for laboratory testing. The samples were obtained using a 3-inch-diameter thin-walled seamless steel tube that is 30 inches long in accordance with ASTM D 1587. The tube was pushed in one continuous stroke approximately 24 inches into undisturbed soil with the hydraulic drive head of the drill rig.

Soil samples were examined in the field and visually classified by a CH2M HILL geotechnical engineer in accordance with the visual-manual procedure for description of soils (ASTM D 2488). Sampling intervals and classifications of soils are presented on the boring logs in Appendix E. Pocket penetrometer and/or torvane measurements were made when the soil consistency permitted such measurements. The results of the pocket penetrometer and torvane measurements are shown on the boring logs. Soil classifications shown on boring logs were revised as necessary, based on results of laboratory testing and examination.

Upon completion, all borings were backfilled with bentonite chips, except for borings 2B-2, 3, 5, 6, 9, and 11, where piezometers were installed. A lath labeled with the boring identification was placed near each borehole for marking the location of soil boring sites.

Laboratory Testing

General

CH2M HILL developed a laboratory testing program to verify field classifications, measure index properties, and evaluate strength and compressibility characteristics. The laboratory testing was performed by the Corvallis, Oregon, office of Foundation Engineering, Inc.

Index Testing

The following index testing was performed to verify classifications of selected representative soil samples:

- ASTM D 2216, *Laboratory Determination of Water Content* (37 total)
- ASTM D 1140, *Amount of Material in Soils Finer Than the No. 200 Sieve*, (26 total)
- ASTM D 4318, *Liquid Limit, Plastic Limit, and Plasticity Index of Soils* (14 total)

Index properties and a more detailed discussion of the laboratory test results are provided in the Laboratory Testing Report prepared by Foundation Engineering, included in Appendix F, Laboratory Testing.

Consolidation Tests

Three one-dimensional consolidation tests were performed. One-dimensional consolidation tests are used to evaluate the compressibility characteristics of soil. These characteristics are used in estimating the magnitude and rate of settlement. Procedures for performing consolidation tests are described in ASTM D 2435, *One-Dimensional Consolidation Properties of Soils*. Results of the consolidation tests are included in the Laboratory Testing Report prepared by Foundation Engineering, included in Appendix F, Laboratory Testing. A single consolidation test was performed by Applied Geotechnology, inc., of Portland, Oregon. The results of this test are also presented in Appendix F.

Direct Shear

Direct Shear tests are used to assess the strength characteristics of granular soils, which are easily disturbed by sample preparation and difficult to test by other means. Procedures for performing direct shear tests are described in ASTM D 3080, *Direct Shear Tests Under Consolidated Drained Conditions*. One direct shear test was performed on a sample of sandy silt collected from boring 2B-4. The results of this test are shown in Appendix F.

Triaxial Compression

Two series of consolidated-undrained triaxial shear tests with pore pressure measurements were performed on samples recovered from the field exploration. Triaxial shear tests provide a more versatile means of evaluating the shear strength of soil, and eliminate some of the technical shortcomings of the direct shear test. Detailed guidelines and procedures for performing triaxial shear tests are described by ASTM D 4767, *Consolidated-Undrained Triaxial Compression Test on Cohesive Soils*. The results of the tests are presented in Appendix F.

Subsurface Conditions

Plant Site

The findings of the exploratory borings, field visual-manual classifications, and the laboratory testing were used to develop a generalized profile of the SCWWTP site. This profile, described in order of increasing depth, includes the following layers: fill, sand and silt alluvium, plastic silt, and gravel. A more detailed description of each of these general layers is presented below. Boring logs showing detailed conditions at each boring location are included in Appendix E.

Fill

Material which appeared to be fill was encountered in several areas of the plant site. Near the east end of the site, along the northern edge, in borings 2B-1 and 2B-2, compacted gravely fill was encountered to approximate depths of 10 to 15 feet. N-values in this material ranged from 26 to 55 blows per foot (bpf), indicating medium dense to dense conditions.

At the west end of the site— in borings 2B-10 and 2B-11— silty fill and sludge were encountered to depths ranging from 4 to 8 feet below the ground surface. SPT N values recorded in this material ranged from 3 to 12 bpf, indicating a very soft to stiff consistency.

Boring 2B-12 was advanced near a truck parking area west of the existing maintenance building and biosolids storage structure. This area previously was the location of a sludge lagoon. Gravely and sandy fill was encountered to a depth of approximately 14 feet below ground surface. N-values measured in this material ranged from 11 to 38 bpf, indicating a relative density ranging from medium dense to dense.

Sand and Silt Alluvium

Sand and silt alluvium was encountered at the ground surface over the entire site, except where fill was encountered. The thickness of the alluvial sand and silt layer varied, and in general, increased towards the north. The maximum depth of the layer ranged from 19 to 95 feet below the ground surface. SPT N values recorded in the sand and silt alluvium ranged from 3 to 48 bpf, indicating a relative density ranging from very loose to dense. In general, the very loose material was encountered near the water level.

Low Plasticity Clay

In borings 2B-3, 4, 5, 6, 7, and 11, advanced on or near the slope south of the plant site, a low plasticity clay was encountered beneath the sand and silt alluvium The upper surface of this layer was variable and was encountered at depths ranging from 4 to 45 feet below the ground surface. The thickness of the layer was also variable and ranged from 5 to 20 feet. SPT N values recorded ranged from 19 to 41 bpf, indicating a consistency ranging from very stiff to hard. In some locations, gravely lenses were encountered within the clay.

Gravel

Gravel was encountered beneath the sand and silt alluvium, and the low plasticity clay was generally encountered over the entire site. The depth at which the gravel was encountered ranged from 16.5 to 95.5 feet below the ground surface. SPT N values recorded in the gravel exceeded 50 bpf, indicating a very dense relative density. More detailed information is presented in Appendix E, Boring Logs.

Groundwater

Water level measurements could not be made in most borings because the drilling mud used to stabilize the borehole prevents groundwater from entering the borehole. Boring 2B-8 was advanced to a depth of 25.3 feet below existing ground surface using hollow stem augers and was dry upon completion. A depth to water of 33.5 feet was recorded in boring 2B-10 upon completion, on 2/21/95.

Piezometers were installed in borings 2B-2, 3, 5, 6, 9 and 11 to allow measurement of water levels. The piezometer tip was constructed with a 2-inch diameter slotted Schedule 40 PVC. The riser was constructed of 1-inch diameter, blank PVC. Water level readings from the piezometers are included in Table 1.

Table 1. Water Level Measurements

Boring No.	Depth to Water (ft)	Date Measured
2B-2	29.0	2/15/95
2B-3	28.8	2/23/95
2B-5	15.0	2/15/95
2B-6	14.5	2/16/95
	17.2	2/17/95
	18.5	2/20/95
2B-9	25.0	1/25/95
2B-11	20.5	2/23/95

Fluctuations in water levels will occur as a result of variations in rainfall, temperature, and other factors.

Outfall Extension

In the borings performed at the outfall extension site in the Columbia River, sand was encountered throughout the depth of drilling. An exception was thin layers of silty material encountered between depths of 20 to 30 feet of the borings. N-values in the upper 30 feet of the borings generally ranged from 4 to 28 bpf, indicating loose to medium dense conditions. Below a depth of approximately 30 feet, N-values ranged from 33 bpf to 50 blows for 6 inches, indicating dense conditions.

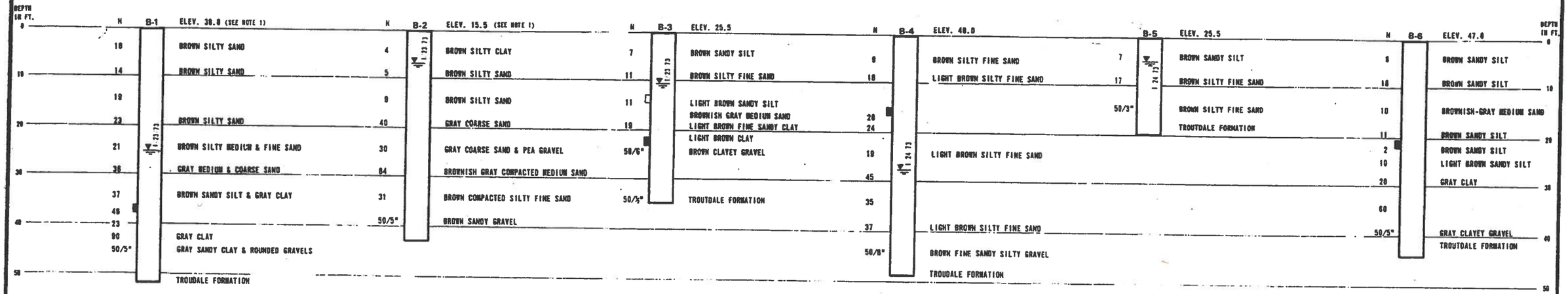
References

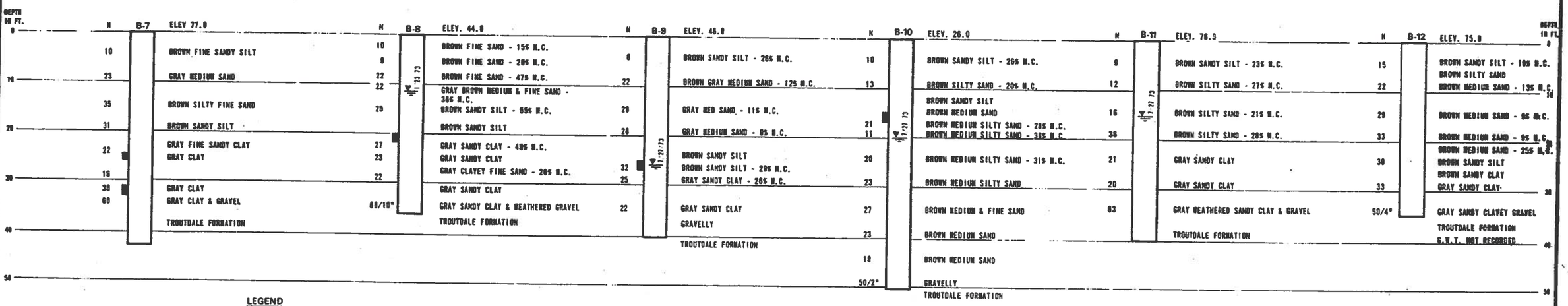
Century West Engineering Corporation 1989. Geotechnical Exploration for Salmon Creek Wastewater Treatment Plant Expansion.

Century West Engineering Corporation 1990. Subsurface Exploration, Revised Digester Location, Salmon Creek Wastewater Treatment Plant.

CH2M HILL 1995. Master Plan/Engineering Report for the Phase 3 Expansion Program, Report prepared for Clark County, Department of Public Works

Cornforth Consultants, Inc. 1994. Geotechnical Hazard Evaluation, Salmon Creek Wastewater Treatment Plant Expansion.





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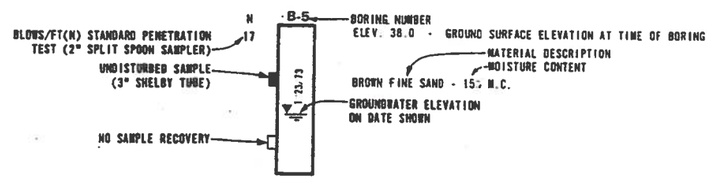


NOTES:

1. B-1 AND B-2 ARE LOCATED OUTSIDE LIMITS OF CONSTRUCTION
2. ELEVATION AT TOP OF BORING IS ORIGINAL GRADE PRIOR TO PREVIOUS SITE PREPARATION CONTRACT.
3. THIS LOG REPRESENTS ONLY THE OPINION OF THE ENGINEER AS TO THE CHARACTER OF MATERIALS ENCOUNTERED IN THE TEST HOLES NO WARRANTY EXPRESSED OR IMPLIED IS GIVEN IN REGARD TO ANY VARIATIONS WHICH MAY OCCUR BETWEEN TEST HOLE SITES.
4. THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

REUSE OF DOCUMENTS

THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF CH2M HILL AND IS NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CH2M HILL.

RECORD DRAWING JANUARY 1976

JAMES G. GOETZ

CH2M HILL

DES. RLF
DR. DLS/BKM
CHK. JDB
APPD. GRG

NO.	DATE	REVISION	BY	APPD.

APPROVED
DEPARTMENT OF PUBLIC WORKS
CLARK COUNTY

CLARK COUNTY, WASHINGTON
SALMON CREEK SEWERAGE PROJECT
WATER RECLAMATION PLANT

GENERAL
SOILS LOGS

SHEET OF 56: 5
PROJ. NO.: P6737.1
DATE: MARCH 1974
DWG. NO.: C6737-1

Ap B

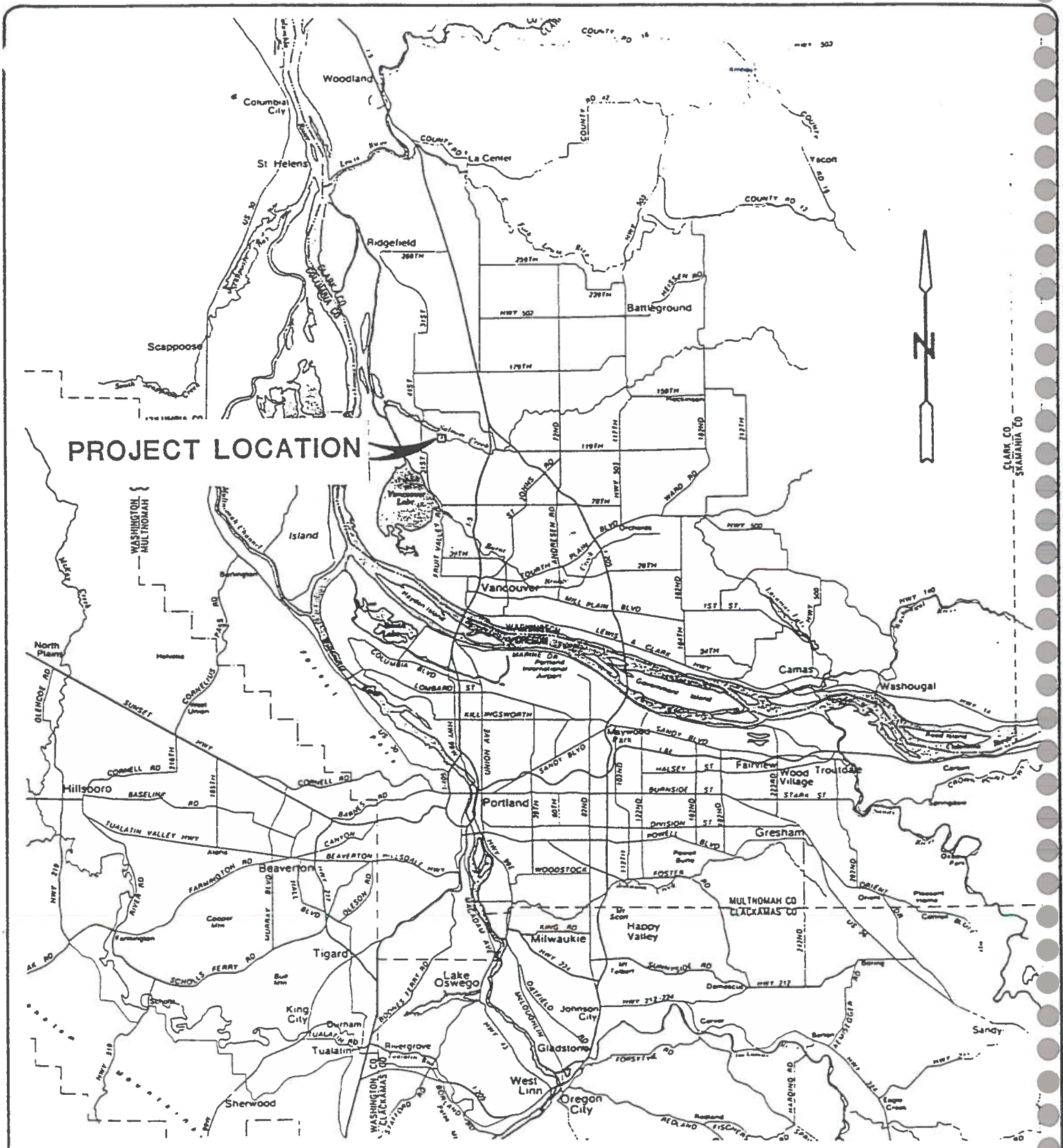
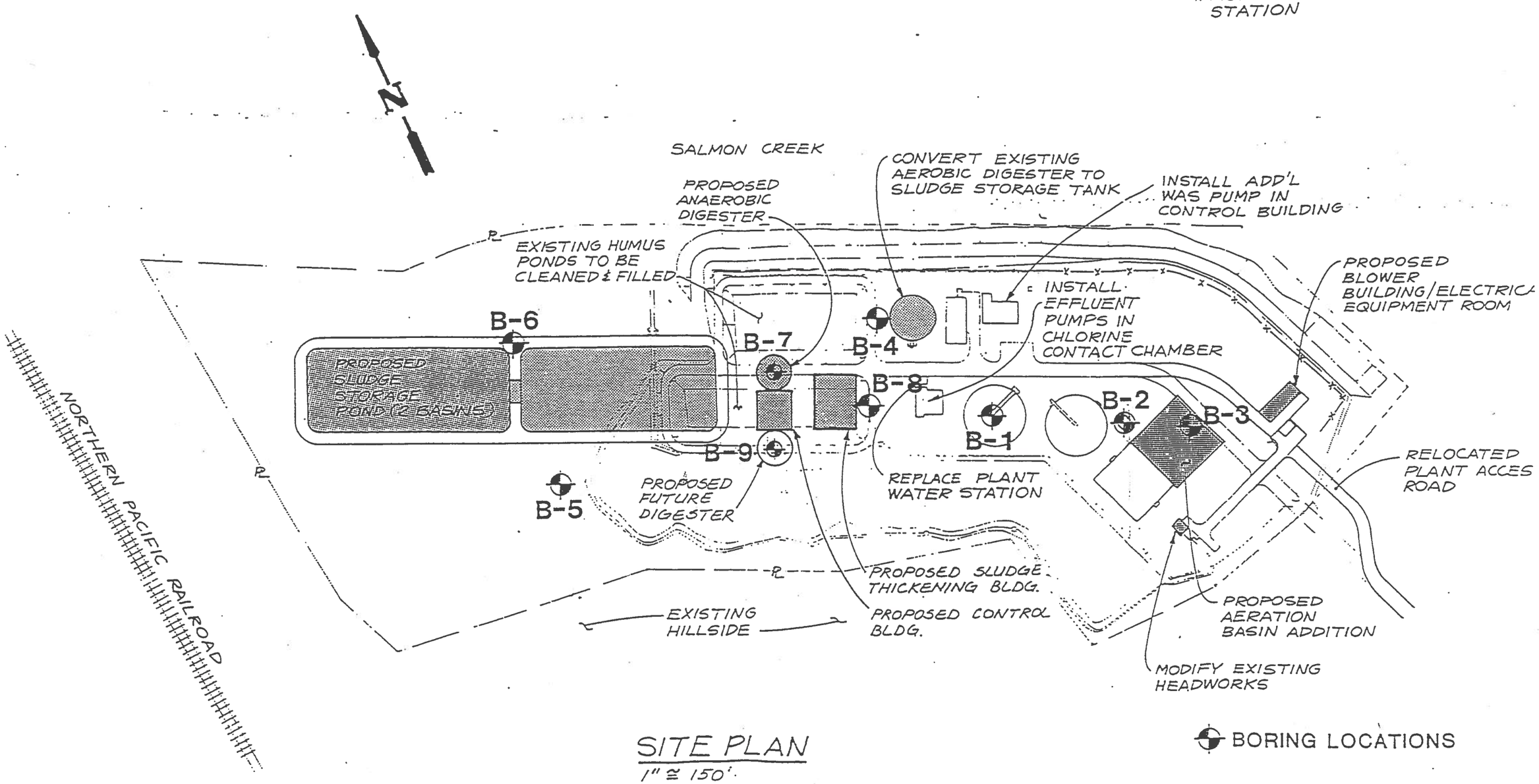


FIGURE 1

DESIGN BY	MVH	CHECKED BY	MVH	**VICINITY MAP**	APPROVED MVH
SURVEY BY		SCALE	1" = 5 MI.	**SALMON CREEK WWTP**	DATE AUG. 1989
DRAWN BY	SMM	DWG. NO.	40018.003.01	**CLARK CO., WASHINGTON**	CENTURY WEST ENGINEERING

ADDITIONAL WORK NOT SHOWN
* MODIFY 36TH AVENUE PUMP STATION



SITE PLAN
1" ≅ 150'

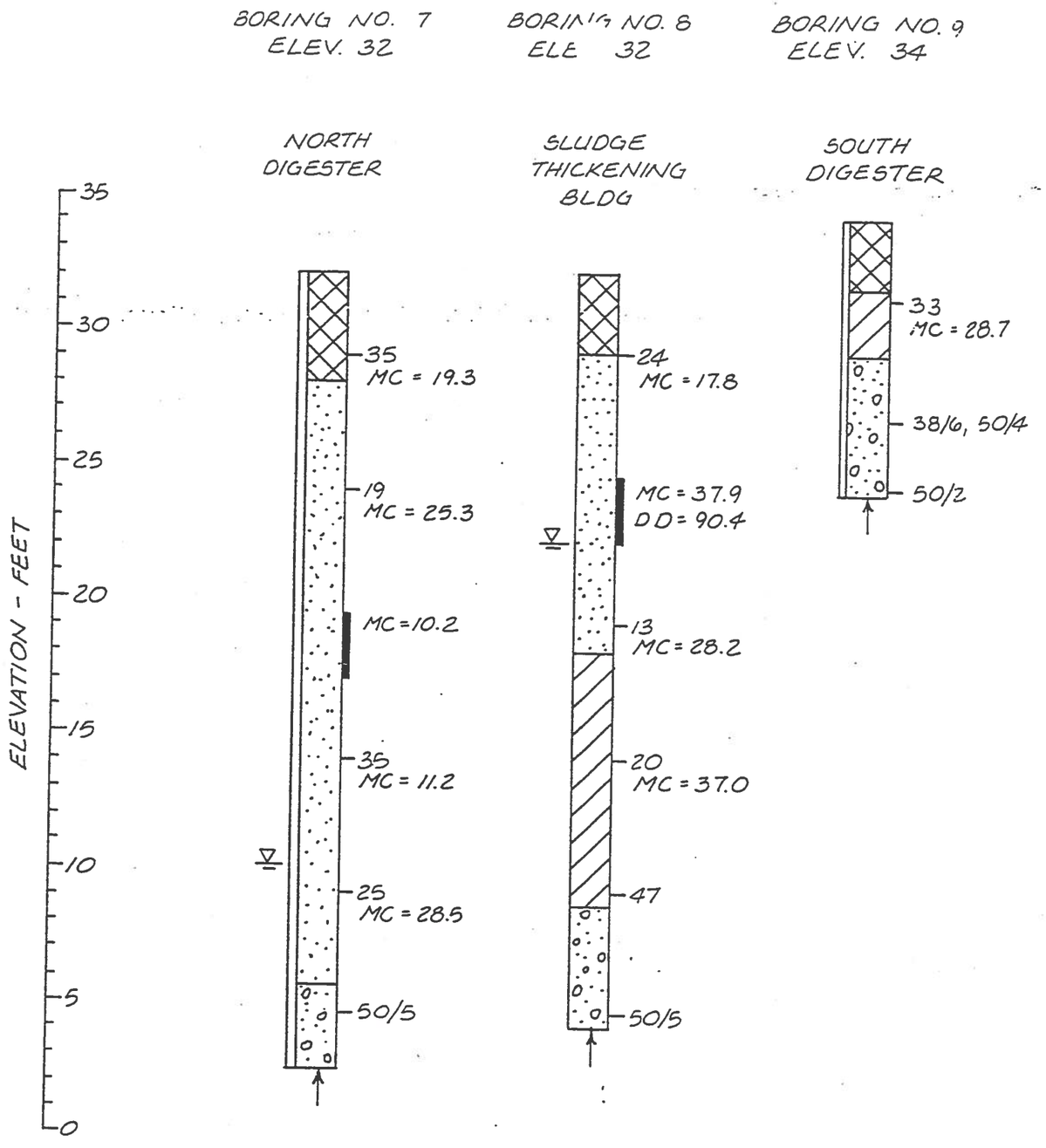
BORING LOCATIONS

IB/IA EXPANSION

CENTURY WEST CAROLLO
A Joint Venture
CENTURY WEST ENGINEERING CORPORATION
JOHN CAROLLO ENGINEERS

PROPOSED EXPANSION IB/IIA IMPROVEMENTS
SITE PLAN, FIGURE 1
SALMON CREEK W.W.T.P.
CLARK COUNTY, WASHINGTON

Ap D1



LEGEND

- FILL, MAN-MADE, MODERATELY COMPACT, SAND, SILTY, GRAVELLY, SLIGHTY CLAYEY, MOIST TO VERY MOIST, BROWN (AF).
- SAND, MEDIUM DENSE TO DENSE, CLEAN TO VERY SILTY, WITH SILT LENSES, SLIGHTLY CLAYEY, OCCASSIONAL ROUNDED GRAVELS. BROWN TO GRAY (SM, SP, SC).
- SILT, STIFF TO VERY STIFF, SANDY, SLIGHTLY CLAYEY, VERY MOIST TO WET, GRAY TO BROWN (ML).
- GRAVEL, DENSE TO VERY DENSE (TROUTDALE FORMATION), SANDY, COBBLY, CLAYEY, MOIST GRAY.
- 35 — INDICATES THAT 35 BLOWS OF A 140-LB HAMMER FALLING 30-INCHES ARE REQUIRED TO DRIVE A 2-INCH DIAMETER SAMPLER 12-INCHES.
- ▽ — INDICATES THE DEPTH TO THE GROUND WATER TABLE.
- INDICATES THE DEPTH AT WHICH A SHELBY TUBE SAMPLE WAS TAKEN.
- MC — INDICATES MOISTURE CONTENT OF SAMPLE IN PERCENT.
- DD — INDICATES DRY DENSITY OF SOIL IN POUNDS PER CUBIC FOOT.

REVISIONS				
NO.	BY	APPVL		DATE

DESIGNED BY	MVH	DATE	FEB 1990
DRAWN BY	SMM	SCALE	NTS
CHECKED BY	MVH	SEC.	
DRAWING NO.		40018.003.01	

LOGS OF EXPLORATORY BORINGS

SALMON CREEK WASTEWATER TREATMENT PLANT
CLARK COUNTY, WASHINGTON

CENTURY WEST ENGINEERING CORPORATION

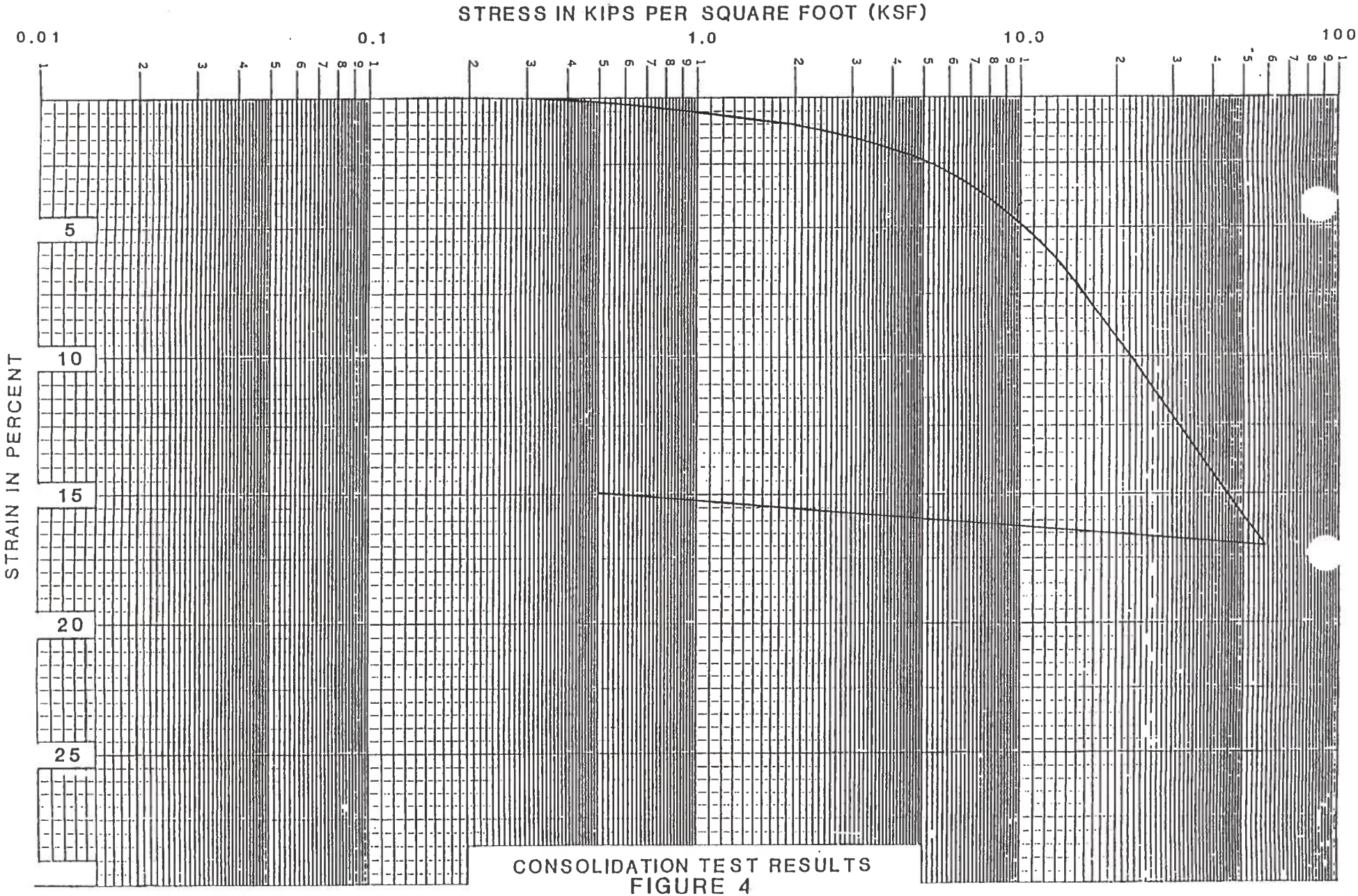
FIGURE 2

AP D2

CENTURY WEST ENGINEERING MAIL: PO BOX 1174 PORTLAND, OR 97709 (503)388-3500

CLIENT Clark County Washington PROJECT Salmon Creek Wastewater Facility

MATERIAL DESCRIPTION SILT (lense), very sandy, brown (ML) BORING B-8 DEPTH 10.0'



CONSOLIDATION TEST RESULTS
FIGURE 4

Appendix E

Boring Logs

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	2B-1 SHEET 1 OF 2

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark County, Vancouver, WA

ELEVATION 43.8 Feet **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Mud Rotary, 4-7/8 inch Tri-cone bit, CME-75

WATER LEVELS Not Measured **START** 01/24/95 **FINISH** 01/24/95 **LOGGER** D.E. Harris

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	5.0					Start drilling at 11:00 am.
5.0	8.5	1-SS	0.7	8-14-12 (26)	SILT, (ML), Brown, moist. Tip of sampler contained sandy silt, mottled brown and orange-brown, with gravel.	
	10.0					
10.0	11.5	2-SS	0.2	4-10-10 (20)	SILT, (ML), Gray, dry to moist, appears to be native material.	Swapped to 3-7/8 inch tri-cone. Having trouble maintaining borehole, gravel collapsing back into hole.
	15.0					
15.0	18.5	3-SS	0.9	4-8-12 (20)	Upper 0.1 feet: SILT, (ML), Brown, moist. Middle 0.2 feet: SILTY SAND, (SM), Gray-brown, moist. Lower 0.8 feet: SILT, (ML), Gray, moist, slow dilatancy, low to medium plasticity.	
	20.0					
20.0	21.5	4-SS	1.1	4-7-7 (14)	SILT, (ML), Light brown, moist, stiff, slow dilatancy, low to medium plasticity.	Still having trouble maintaining open borehole.
	25.0					
25.0	26.5	5-SS	1.3	2-4-5 (9)	SILT, (ML), Brown, very moist to wet, stiff, rapid dilatancy, low plasticity. Contained 1/2 inch thick lense of SILTY SAND, (SM), brown wet.	
	30.0					

CH2M HILL

PROJECT NUMBER	BORING NUMBER
0PW35382.EN.03	2B-1 SHEET 2 OF 2

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark County, Vancouver, WA

ELEVATION 43.8 Feet **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Mud Rotary, 4-7/8 inch Tri-cone bit, CME-75

WATER LEVELS Not Measured **START** 01/24/85 **FINISH** 01/24/85 **LOGGER** D.E. Harris

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	30.0					
	31.5	6-ST	1.25	Push	SAND, (SP), Dark brown, wet.	Pushed only 1-1/2 feet because of hard push, lost approximately 3 inches.
	35.0					
35.0	38.5	7-SS	1.1	7-13-15 (28)	SAND, (SP), Same as above.	
	40.0					
40.0	41.5	8-SS	1.0	12-13-11 (24)	SAND, (SP), Same as above.	
	45.0					
45.0	46.5	9-SS	0.8	8-10-23 (33)	Upper 0.1 feet: SILT, (ML), Tan-brown, wet. Lower 0.7 feet: SAND, (SP), Brown. Fragments of broken basaltic gravel.	Encountered hard drilling at 46.5 feet.
	47.5					
	47.8	10-SS		50/3"	End Soil Boring at 47.8 feet	
50.0						
55.0						

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	2B-2 SHEET 1 OF 4

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark County, Vancouver, WA

ELEVATION 38.9 Feet **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Hollow Stem Auger, CME-75

WATER LEVELS Approx. 31 Feet (Below Ground) **START** 01/23/95 **FINISH** 01/24/95 **LOGGER** D.E. Harris

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
						Start drilling at 12:30 pm. Used 4-1/4 inch ID Hollow Stem Auger. Cuttings are gravelly, silty sand.
5.0	5.0					
	6.5	1-SS	0.8	25-19-22 (41)	SILTY SAND, (SM), Gray and gray-brown, moist, appears to be fill.	Cuttings similar to above.
10.0	10.0					
	11.5	2-SS	1.1	17-22-33 (55)	GRAVELLY, SILTY SAND, (SM), Mottled gray-brown and yellow-brown, moist, still appears to be fill.	
15.0	15.0					Driller indicates that auger is through gravelly material at 13.0 feet.
	18.5	3-SS	1.4	12-18-22 (38)	Upper 0.2 feet: SAND, (SP), Brown, moist, alternating SANDY SILT, (ML), Brown, moist, and SILTY SAND, (SM), Gray, moist. Lower 0.2 feet: SILT, (ML), Brown.	
20.0	20.0					
	21.5	4-SS	1.5	7-7-9 (16)	Alternating SANDY SILT, (ML), Gray, moist and SILT, (ML), brown, moist.	
25.0	25.0					
	27.0	5-ST	2.0	PUSH	SILT, (ML), Gray and gray-brown, moist.	
	28.8	6-SS	1.5	3-2-5 (7)	Upper 0.3 feet: SILT, (ML), Light brown, very moist, slow dilatancy. Middle 0.7 feet: Alternating layers of SANDY SILT, and SILT, brown, very moist. Lower 0.5 feet: SILTY SAND, (SM), Brown, very moist.	
	30.0					

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	2B-2 SHEET 2 OF 4

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark County, Vancouver, WA

ELEVATION 38.8 Feet **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Hollow Stem Auger, CME-75

WATER LEVELS Approx. 31 Feet (Below Ground) **START** 01/23/95 **FINISH** 01/24/95 **LOGGER** D.E. Harris

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	30.0					
	31.5	7-SS	1.5	2-3-5 (8)	Upper 1.2 feet: SILT, (ML), Brown, wet, less than 5% sand, dilatancy. Lower 0.3 feet: SANDY SILT, (ML), Brown, wet, approximately 30% sand.	Water level during drilling at 13:40
	35.0					
35.0		8-ST	2.0	PUSH		
	37.0					
	38.5	9-SS	1.5	8-10-9 (19)	Upper 1.0 feet: SAND, (SP), Brown, wet, medium, with lense of SILT, (ML). Lower 0.5 feet: SILT, (ML), Brown, wet, stiff to very stiff.	Borehole heaved/collapsed approximately 1 foot after sample at 37 feet.
	40.0					
40.0	41.5	10-SS	1.5	7-11-14 (25)	SAND with SILT, (SP), Brown, wet, medium dense.	
	45.0					
45.0	46.5	11-SS	1.5	10-9-10 (19)	Upper 0.5 feet: SAND, (SP), Brown, wet, very loose (cave in). Middle 0.8 feet: SAND with SILT, (SP), Brown, wet, medium dense, fine, less than 15% fines. Lower 0.4 feet: SAND with SILT (SP), Brown, medium dense, very fine.	Borehole collapsed approximately 4 feet after sample at 45 feet. Used quick gel slurry inside augers to maintain borehole stability.
	50.0					
50.0	51.5	12-SS		5-10-13 (23)	SILTY SAND, (SP), Brown, wet.	
	55.0					
55.0	56.5	13-SS	1.5	14-15-21 (36)	SILTY SAND, (SM), Brown, wet.	After reaching 55 feet swapped to mud-rotary drilling-used 3-7/8 inch tri-cone bit.
	60.0					

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	28-2 SHEET 3 OF 4

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark County, Vancouver, WA

ELEVATION 38.9 Feet **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Hollow Stem Auger, CME-75

WATER LEVELS Approx. 31 Feet (Below Ground) **START** 01/23/95 **FINISH** 01/24/95 **LOGGER** D.E. Harris

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS '6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	60.0					
	61.5	14-SS	1.5	18-14-15 (29)	SILTY SAND, (SM), Brown, same as above.	
	65.0					
65.0	66.5	15-SS	0.9	12-18-22 (38)	SILTY SAND, (SM), Same as above.	
	70.0					
70.0	71.5	18-SS	1.1	12-18-18 (34)	SILTY SAND, (SM), Same as above.	
75.0						
	80.0					
80.0	81.5	17-SS	1.3	14-20-28 (48)	SILTY SAND, (SM), Brown, wet, dense, rapid dilatancy.	
85.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	2B-2 SHEET 4 OF 4

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant LOCATION Clark County, Vancouver, WA

ELEVATION 38.9 Feet DRILLING CONTRACTOR Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Hollow Stem Auger, CME-75

WATER LEVELS Approx. 31 Feet (Below Ground) START 01/23/95 FINISH 01/24/95 LOGGER D.E. Harris

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
95.0	95.0					
	95.5	18-SS	0	50/1"	No Recovery	Encountered hard drilling, rig bouncing. Ended 9:39 am on 1/24/95.
					END SOIL BORING AT 95.5 FEET.	
100.0						
105.0						
110.0						
115.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	2B-3 SHEET 1 OF 3

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark County, Vancouver, WA

ELEVATION 72 Feet **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Mud Rotary, CME 55

WATER LEVELS 28.8 Feet Below Ground Surface, 2/~~22~~/95 **START** 02/20/95 **FINISH** 02/20/95 **LOGGER** D.E. Harris/J. Lukas

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
5.0	5.0					
	6.5	1-SS	1.1	1-1-2 (3)	Upper 0.9 feet: SILT, (ML), Brown, very moist Lower 0.2 feet: SANDY SILT, (ML), Brown, very moist	
	7.5					
	9.5	2-ST	1.75	PUSH	SAND, (SP), Dark brown, very moist to wet	Driller notes easy push
10.0	11.0	3-SS	1.0	2-4-5 (9)	Upper 0.3 feet: SANDY Silt, (ML), Brown, very moist	
	15.0				Middle 0.8 feet: SAND, (SP), Dark brown, moist, medium dense, fine to medium 0.3 feet. SANDY SILT, (ML), Brown, very moist	
15.0	17.0	4-ST	2.0	PUSH	SILTY SAND, (SM), Gray-brown, very moist, very fine	
	18.5	5-SS	0.9	7-11-12 (23)	SILTY SAND, (SM), Similar to above medium dense	
	20.0					
20.0	21.5	6-SS	1.3	10-13-13 (26)	SILTY SAND, (SM), Similar to above, upper 0.5 ft. medium sand	
	25.0					Driller notes harder drilling at 23 feet
25.0	26.5	7-SS	1.1	10-18-19 (35)	SAND, (SP), Gray-brown, very moist, dense, medium grained	
	30.0					

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	28-3 SHEET 2 OF 3

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark County, Vancouver, WA

ELEVATION 72 Feet **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Mud Rotary, CME 55

WATER LEVELS 28.8 Feet Below Ground Surface, 2/22/95 **START** 02/20/95 **FINISH** 02/20/95 **LOGGER** D.E. Harris/J. Lukas

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	COMMENTS
	30.0				SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	31.5	8-SS	1.8	6-10-17 (27)	SILTY SAND, (SP), Brown, very moist, medium dense, fine grained Micaceous	
	35.0					
35.0	38.5	9-SS	1.5	7-15-22 (37)	SILTY SAND, (SP), Dense, same as previous	
	40.0					
40.0	41.5	10-SS	1.7	7-13-27 (40)	SANDY SILT, (SM), Brown with some gray, moist, dense, micaceous	
	45.0					Driller notes stiffness increase at 44 feet
45.0	47.0	11-ST	2.0	PUSH	SILT, (MH), Blue-gray, moist, dense	Driller notes very stiff push, siltier material at 45 feet TV = 8 kg/cm^2 PP = 4.5+ kg/cm^2
	48.5	12-SS	1.8	10-18-23 (41)	SILT, (MH), Blue-gray, same as previous	
	50.0					
50.0	51.5	13-SS	1.7	9-14-19 (33)	SILT, (MH), Blue-gray, same as previous	
	55.0					
55.0	58.5	14-SS	1.8	7-12-14 (26)	SILT, (MH), Same as previous, trace black medium sand-size material (breaks with nail), medium dense	
	60.0					Driller notes beginning of gravel at 57.5 feet

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	2B-3 SHEET 3 OF 3

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark County, Vancouver, WA

ELEVATION 72 Feet **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Mud Rotary, CME 55

WATER LEVELS 28.8 Feet Below Ground Surface, 2/23/95 **START** 02/20/95 **FINISH** 02/20/95 **LOGGER** D.E. Harris/J. Lukas

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	80.0 81.5	15-SS	0.8	48/8",50/3"	SILT, (MH), Very (wet) moist, with some gravel, large gravel piece lodged in tip	
85.0	85.0 85.1	16-SS	0.3	50/1"	GRAVEL, (GW), Gray nd brown, very moist, very dense, some silt and sand END SOIL BORING AT 85.1 FEET.	PIEZOMETER INSTALLATION Bentonite plug from 85.1 feet to 58.5 feet, Sand from 58.5 feet to 55.0 feet, tip placed at 55.0 feet, sand from 55.0 feet to 50.3 feet, Bentonite plug from 50.3 feet to top of hole (room left for concrete for monument). Monument installed 2/23/95. WATER LEVEL 2/23/95 at 12:15 p.m. depth = 28.8 feet
70.0						
75.0						
80.0						
85.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
0PW35382.EN.03	2B-4 SHEET 1 OF 2

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark County, Vancouver, WA

ELEVATION 81.8 Feet **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Mud Rotary, CME 55

WATER LEVELS Not Measured **START** 02/16/95 **FINISH** 02/17/95 **LOGGER** J. Lukas

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
5.0	5.0					
	6.5	1-SS	1.2	7-10-13 (23)	SAND, (SP), Olive gray, very moist, medium dense, fine to medium grained, trace micaceous	
	10.0					
10.0	11.5	2-SS	1.1	10-13-17 (50)	SAND, (SP), Same as previous	
	15.0					Driller notes color change to light brown at 12.5 feet, possibly more silty material
15.0	16.5	3-SS	1.4	7-10-13 (23)	SILTY, sand (SP-SM),Brown with some light gray, very moist, medium dense, fine grained, micaceous	
	18.5	4-ST	2.1	PUSH		Driller notes pushing ST in sandy material. TV = 1 kg/cm^2 PP = 0.5 kg/cm^2
	20.0				SILTY sand, (SP-SM), Brown, same as previous	
20.0	21.5	5-SS	1.3	10-15-15 (30)	SILTY sand, (SP), Light brown, medium dense, moist, fine grained, micaceous	
	25.0					
25.0	26.5	6-SS	1.7	8-10-14 (24)	SILTY Sand, same as previous	
	30.0					Driller notes siltier, blue-gray material at 28 feet

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	2B-4 SHEET 2 OF 2

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark County, Vancouver, WA

ELEVATION 81.8 Feet **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Mud Rotary, CME 55

WATER LEVELS Not Measured **START** 02/16/95 **FINISH** 02/17/95 **LOGGER** J. Lukas

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	30.0	7-ST	2.0	PUSH	SILT (MH), Blue-Gray, very moist, highly plastic, trace sand	TV = 3 kg/cm^2 PP = 3 kg/cm^2
	32.0					
	35.0					
35.0	36.5	8-SS	1.8	6-10-12 (22)	SILT (MH), Same as previous, moist	
	40.0					Some gravel encountered at 37 feet. Driller relates that it may only be lenses; not as stiff as gravel encountered in other borings. Driller notes 6 inches fine gravel lense at 39 feet. At 39 feet notes gravel
40.0	40.3	9-SS	0.5	50/4"	GRAVEL (GP), Red and black, very dense, moist, some sand and blue-gray silt	
	45.0					
45.0	45.3	10-SS	0.3	50/4"	BLUE-GRAY SILT (MH), Top 1 inch to 2 inches. GRAVEL (GW), Red, brown, and black, moist, very dense, some sand END SOIL BORING AT 45.3 FEET.	
50.0						
55.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
OPW35382.EN.03	2B-5	SHEET 1 OF 2

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant LOCATION Clark County, Vancouver, WA

ELEVATION 46.7 Feet DRILLING CONTRACTOR Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Mud Rotary, CME-75

WATER LEVELS 15.0 Ft., 02/15/95 START 01/24/95 FINISH 01/25/95 LOGGER D.E. Harris

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
5.0	5.0					
	6.5	1-SS	1.2	8-9-10 (19)	SAND, (SP), Orange-brown to gray-brown, moist, medium dense.	
10.0	10.0					
	12.0	2-ST	1.4	PUSH		
	13.5	3-SS	1.5	6-8-10 (18)	Upper 0.3 feet: SAND, (SP), Brown, wet. Lower 1.1 feet: SILT, (ML), Brown, wet, rapid dilatancy, very stiff.	
15.0	15.0					
	16.5	4-SS	1.5	4-8-11 (19)	SILT, (ML), Brown, wet, moderate dilatancy, very stiff.	
20.0	20.0					
	22.0	5-ST	2.2	PUSH		
	23.5	6-SS	1.5	4-7-10 (17)	Upper 0.4 feet: SILT, (MH), Brown, wet. Lower 1.1 feet: SILT, (MH), Gray, wet.	
25.0	25.0					
	26.5	7-SS		19-22-34 (56)	SILT and GRAVEL, (ML), Gray, wet.	
	30.0					Drilling softened at 28 feet.

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	2B-5 SHEET 2 OF 2

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant LOCATION Clark County, Vancouver, WA

ELEVATION 46.7 Feet DRILLING CONTRACTOR Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Mud Rotary, CME-75

WATER LEVELS 15.0 Ft., 02/15/95 START 01/24/95 FINISH 01/25/95 LOGGER D.E. Harris

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	30.0	8-SS		25-50/1"	SANDY SILT and GRAVEL, Black, wet.	Drilling is moderately difficult, slow.
	35.0					
35.0	35.5	9-SS	0	20-50/2"	No Recovery	
					END SOIL BORING AT 35.7 FEET.	Installed piezometer at a depth of 20 feet. Split spoon contained cuttings of broken gravel. Finished drilling at 8:45 am.
40.0						
45.0						
50.0						
55.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	2B-8 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark County, Vancouver, WA

ELEVATION 58.6 Feet **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Mud Rotary, CME 55

WATER LEVELS 14.5 Feet Below Ground Surface, 2/18/95 **START** 02/15/95 **FINISH** 02/18/95 **LOGGER** J. Lukas

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	5.0					Driller notes beginning of silt layer at 4 feet Gravel at top of spoon sample
5.0	6.5	1-SS	1.8	7-9-12 (21)	Top 3 inches to 4 inches: SILT, (MH), Light brown, moist. Remainder: SILT, (MH), Blue-gray, moist	
	10.0					
10.0	12.0	2-ST	2.3	PUSH	SILT, (MH), Blue-Gray, moist	PP = 2.75 kg/cm^2
	13.5	3-SS	1.5	6-10-18 (28)		Slow drilling from 12.0': Stiff material, no gravel encountered, material clogging drill bit.
	15.0				SILT, (MH), Same as previous	
15.0	16.5	4-SS	1.3	10-14-19 (33)	SILT, (MH), Blue-gray with some light brown, moist, trace sand, Gravel in tip.	
	21.5					Driller notes gravel at 16.5 feet, assembly rattling
20.0	21.8	5-SS	0.2	50/4"	GRAVEL, (GP), Orangish brown with some black, moist, trace sand and silt END SOIL BORING AT 21.8 FEET.	3 inches silty slough at top of spoon, blue-gray When drilling mud removed, water was encountered filling hole at 4 feet, natural material (sand) filled hole from 21.5 feet to 19.5 feet, Piezometer tip at 19.5 feet resting on caved material. Colorado sand added up to 15.5 feet.
25.0						

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	2B-7 SHEET 1 OF 2

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant LOCATION Clark County, Vancouver, WA

ELEVATION 73.8 Feet DRILLING CONTRACTOR Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Mud Rotary, CME 55

WATER LEVELS Not Measured START 02/14/95 FINISH 02/15/95 LOGGER D.E. Harris/J. Lukas

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
5.0	5.0					
	6.5	1-SS	1.0	7-7-6 (13)	SAND, (SP), Brown, very moist, medium dense, fine to medium grained, trace micaceous	
						Driller notes still drilling through sandy soil
10.0	10.0					
	11.5	2-SS	0.9	6-9-11 (20)	SAND, (SP), Brown, very moist, medium dense, fine to medium grained, trace micaceous	
						Driller notes silt lense at 12.5 feet clogged pump
15.0	15.0					
	16.5	3-SS	1.1	9-15-17 (32)	SILTY, (SM), Brown, very moist, bense, fine grained, trace micaceous, thin layers of more sandy soil	Tip contained silt, dark gray
20.0	20.0					
	21.5	4-SS	1.1	7-11-15 (26)	SILTY SAND, (SM), Brown, very moist, medium dense, fine grained, trace micaceous	
25.0	25.0					
	26.5	5-SS	1.0	8-13-13 (26)	SANDY SILT, (ML), Brown, very moist, medium dense, micaceous	
						Cuttings show clay, silty layer beginning at 27.0 feet
	30.0					

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	2B-7 SHEET 2 OF 2

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant LOCATION Clark County, Vancouver, WA

ELEVATION 73.8 Feet DRILLING CONTRACTOR Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Mud Rotary, CME 55

WATER LEVELS Not Measured START 02/14/95 FINISH 02/15/95 LOGGER D.E. Harris/J. Lukas

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	30.0					
		8-ST	2.0	PUSH	SILT, Blue-gray, (MH), highly plastic	Tip has some gravel TV = .8 kg/ch^2 PP = 4.5 kg/cm^2
	32.0					
	32.5	7-SS	0.4	50/6"	SILT, (MH), Blue-gray, some gravel	Hard drilling begins at 32 feet.
35.0						
	38.7					
	38.8	8-SS	0.3	50/2"	GRAVEL, (GW), Light brown, yellowish orange, dark gray, moist, very dense, some sand-sized particles, fine to medium grained (gravel)	
					END OF BORING AT 38.8 FEET.	
40.0						
45.0						
50.0						
55.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	2B-8 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark County, Vancouver, WA

ELEVATION 49.8 Feet **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Hollow Stem Auger, CME 55

WATER LEVELS Not Measured **START** 02/21/95 **FINISH** 02/21/95 **LOGGER** J. Lukas

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
5.0	5.0					
	6.5	1-SS	1.0	2-3-3 (6)	SANDY SILT, (ML), Brown, moist, loose, micaceous	
	10.0					Driller notes easy push
10.0	11.5	2-SS	1.2	1-2-3 (5)	SAND, (SP), Brown, moist, loose, micaceous with some silt, fine grained	
	15.0					
15.0	17.0	3-ST	0	PUSH	No recovery.	
	17.5				Upper 0.7 feet: SAND, (SP), Same as previous, moist	
	18.0	4A-SS	1.2	2-4-4 (8)	Lower 0.5 feet: SAND, (SP), Brown and gray, loose, medium grained moist	
	20.0					
20.0	21.0	5-ST	1.3	PUSH	GRAVEL, (GW), Brown and gray, moist, some sand and silt. Gravel at tip	
	25.0					Driller notes harder drilling at 23 feet
25.0	25.3	6-SS	0	50/30"	GRAVEL, (GW), Gray, dry, dense	
					END OF BORING AT 25.3 FEET.	

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
OPW35382.EN.03	2B-9	SHEET 1 OF 2

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark County, Vancouver, WA

ELEVATION 30.4 Feet **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Hollow Stem Auger, CME 75

WATER LEVELS 25 Feet Below Ground Surface, 1/25/95 **START** 01/25/95 **FINISH** 01/25/95 **LOGGER** King Sampaco

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION	COMMENTS
					SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
						Start drilling at 10:15 am.
5.0	5.0					
	6.5	1-SS	1.0	2-4-3 (7)	SILT, (ML), Brown, wet, firm, contains sand.	
	10.0					
10.0	11.5	2-SS	1.0	2-4-8 (12)	SILT, (ML), Grayish brown, wet, medium stiff, with trace of sand.	
	15.0					
15.0	17.0	3-ST	2.0		SANDY SILT, (ML), Gray, moist.	
	18.5	4-SS	1.2	8-13-17 (30)	Upper 0.2 feet: SANDY SILT, (ML), Gray, wet. Lower 1.0 feet: SILT, (ML), Grayish brown, moist.	
	20.0					
20.0	21.5	5-SS	1.0	8-15-17 (32)	SANDY SILT, (ML), Brown, moist, stiff, rapid dilatancy.	
	25.0					
25.0	26.5	6-SS	1.4	8-13-13 (26)	SANDY SILT, (ML), Brown, wet.	Driller estimates water table at about 25 feet.
	30.0					

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	28-9 SHEET 2 OF 2

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant LOCATION Clark County, Vancouver, WA

ELEVATION 30.4 Feet DRILLING CONTRACTOR Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Hollow Stem Auger, CME 75

WATER LEVELS 25 Feet Below Ground Surface, 1/25/95 START 01/25/95 FINISH 01/25/95 LOGGER King Sampaco

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	COMMENTS
	30.0					
	31.5	7-SS	1.4	5-10-14 (24)	SANDY SILT (ML), Brown, wet, stiff.	Install piezometer at 30 feet.
					END SOIL BORING AT 31.5 FEET.	Drilling stopped at 11:15 am.
35.0						
40.0						
45.0						
50.0						
55.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	2B-10

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark County, Vancouver, WA

ELEVATION 44.0 Feet **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Hollow Stem Auger, CME-55

WATER LEVELS 33.5 Feet Below Ground Surface **START** 02/21/95 **FINISH** 02/21/95 **LOGGER** J. Lukas

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	COMMENTS
					SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
5.0	5.0					
	6.5	1-SS	1.0	2-5-7 (12)	SILTY SAND FILL, (SP), Brown, gray, and black streaks, moist, medium dense	Jar sample of cuttings taken: Cuttings have an odor; plastic debris found; dark material - possibly sludge.
	10.0					Driller notes natural material at 8 feet
10.0	12.0	2-ST	2.1	PUSH	SILT, (ML), Brown, moist, micaceous, some sand	PP = 1.75 kg/cm^2 TV = 4 kg/cm:+2
	13.5	3-SS	0.8	1-1-2 (3)	SILTY SAND, (SP), Brown, moist, loose micaceous, fine grained	
15.0	15.0					
	18.5	4-SS	1.2	5-8-7 (13)	SAND, (SP), Brown, moist (slightly), medium dense, micaceous, fine-grained, some silt	1 inch seam of gray, fine to medium sand at top of SS
20.0	20.0					
	21.5	5-SS	1.4	4-5-7 (12)	SAND, (SP), Brown, same as previous	
25.0	25.0					
	28.5	6-SS	1.3	6-9-12 (21)	Upper 0.2 feet: SAND, (SP), Brown, same as previous Lower 1.1 feet: SAND, (SP), Brown and gray, moist, medium dense, micaceous, medium grained	
	30.0					

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	28-10 SHEET 2 OF 2

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark County, Vancouver, WA

ELEVATION 44.0 Feet **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Hollow Stem Auger, CME-55

WATER LEVELS 33.5 Feet Below Ground Surface **START** 02/21/95 **FINISH** 02/21/95 **LOGGER** J. Lukas

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	COMMENTS
	30.0					DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	31.5	7-SS	1.2	5-8-8 (16)	SAND, (SP), Brown and gray, moist medium dense, micaceous, medium grained	
						Driller notes auger heave, water at 33.5
35.0	35.0					
	36.5	8-SS	2.0	5-16-30 (46)	SAND, (SP), Same as previous	Driller relates that blow count for 8-SS may not be representative because auger heave.
					END OF BORING AT 36.5 FEET.	
40.0						
45.0						
50.0						
55.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	2B-11 SHEET 1 OF 3

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark County, Vancouver, WA

ELEVATION 44.2 Feet **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT HS Augers, Mud Rotary, CME 55

WATER LEVELS 20.5 Feet Below Ground Surface **START** 02/21/95 **FINISH** 02/22/95 **LOGGER** J. Lukas

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
5.0	5.0					Driller notes small amount of gravel at 4.0 feet
	8.5	1-SS	1.0	2-2-2 (4)	FILL UPPER 0.8 ft: SAND, (SP), Gray and brown, slightly moist, loose, micaceous Lower 0.2 ft: SILT, (ML), Brown, moist, loose micaceous	
10.0	10.0					
	11.5	2-SS	1.2	1-1-2 (3)	SILT, (ML), Brown, slightly moist, loose, some sand, micaceous	
15.0	15.0					
	17.0	3-ST	2.0	PUSH	SAND, (SP), Brown, slightly moist, medium grained, micaceous	PP = Not avaliable TV = Not avaliable
	18.5	4-SS	1.3	5-5-6 (11)	SAND, (SP), Brown, and gray, slightly moist, medium dense, medium grained, micaceous	
20.0	20.0					
	21.5	5-SS	1.4	5-9-10 (19)	SAND, (SP), Same as previous SILT, (ML) (Plasticity), Light brown, very moist, medium dense, trace sand, micaceous	
25.0	25.0					End of HS augering at 21.5 feet Begin Mud rotary
	28.5	6-SS	1.7	4-7-11 (18)		
	30.0					

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	2B-11 SHEET 2 OF 3

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark County, Vancouver, WA

ELEVATION 44.2 Feet **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT HS Augers, Mud Rotary, CME 55

WATER LEVELS 20.5 Feet Below Ground Surface **START** 02/21/95 **FINISH** 02/22/95 **LOGGER** J. Lukas

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	30.0	7-ST	2.0	PUSH	SILT, (ML), Light brown, very moist, trace sand, micaceous	PP = 3.0 kg/cm^2 TV = 4.5 kg/cm^2
	32.0					
	33.5	8-SS	1.5	5-14-15 (24)	SILT, (ML), Light brown, moist, medium dense, trace sand, micaceous	
	35.0					Driller notes sand at 33.5 feet
35.0	38.5	9-SS	1.9	4-8-10 (18)	Upper 0.9 feet: SILT, (ML), Same as previous Lower 1.0 feet: SILTY SAND, (SP-SM), Light brown, very moist, medium dense	
	40.0					
40.0	41.5	10-SS	1.3	5-9-11 (20)	SILTY SAND, Same as previous	
	45.0				SILT, (MH), Blue-gray, very moist, highly plastic, micaceous	Driller notes blue-gray silty material at approximately 43.5 feet
45.0	48.5	11-SS	0.7	5-8-11 (19)		
	50.0					Driller notes gravel at approximately 47.5 feet
50.0	51.5	12-SS	0.4	12-31-50/4"	GRAVEL, (GP), Dark gray, very moist, some silt and sand	
	55.0					
55.0	55.5	13-SS	0.2	50/6"	GRAVEL, (GP), Dark gray, very moist, some silt	
	60.0					

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	28-11 SHEET 3 OF 3

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark County, Vancouver, WA

ELEVATION 44.2 Feet **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT HS Augers, Mud Rotary, CME 55

WATER LEVELS 20.5 Feet Below Ground Surface **START** 02/21/95 **FINISH** 02/22/95 **LOGGER** J. Lukas

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
80.0	80.0 80.3	4-SS	0.2	50/3"	GRAVEL, (GP), Same as previous END OF BORING AT 80.3 FEET.	PIEZOMETER INSTALLATION: Sand from 80.3 feet to 40.0 feet, tip installed at 40.0 feet, sand from 40.0 feet to 38.0 feet (top of piezometer), pea gravel from 38.0 to 35.5 feet, bentonite plug from 35.5 to 3.0 feet - concrete for monument from 3.0 to 0.0 feet. WATER LEVEL 2-23-95, 12:30 p.m. Depth = 20.5 feet.
85.0						
70.0						
75.0						
80.0						
85.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	2B-12 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark County, Vancouver, WA

ELEVATION _____ **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Mud Rotary, CME 55

WATER LEVELS Not Measured **START** 02/23/95 **FINISH** 02/23/95 **LOGGER** J. Lukas

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	1.0					
	2.5	1-SS	0.8	17-7-7 (14)	Upper 0.7: GRAVEL, (GP), Brown and grey, very moist, some sand Lower 0.1: SAND, (SP), Brown and Gray, very moist, medium dense, some gravel and silt, fill, trace micaceous	Top 3 inches Asphalt
	3.5	2A-SS	0.9	15-8-7 (15)		8 inches of redundancy on 2-SS
	5.0	3-SS	0.8	3-3-8 (11)	Upper 0.4: GRAVEL, (GP), Grey and brown, very moist, some sand Lower 0.5: SILTY SAND, (SP-SM), Brown and gray, very moist, medium dense, trace fine gravel, micaceous	Driller notes softer drilling at 2.75, but too much gravel in hole to push ST
5.0	6.5	4-SS	1.0	8-20-15 (35)	GRAVEL, (GP), Gray and brown, very moist, some sand and silt, trace micaceous - fill	3 inches SS from 5.0 - 6.5 with 150-lb. hammer
	8.0	5-SS	0.9	3-18-11 (29)	SAND, (SP), Gray with some brown, moist, some gravel, micaceous, fill, top silt, fine grained	
	9.5	6-SS	0.9	7-9-10 (19)	SAND, (SP), Same as previous, medium dense, fill	
10.0	11.0	7-SS	0.4	11-21-17 (38)	SAND, (SP), Same as previous SAND, (SP), Gray and brown, moist dense, trace micaceous and fine gravel, fill, fine grained	
	15.0					Driller notes finer sand at 14 feet
15.0	16.5	8-SS	1.1	2-4-4 (8)	SILTY SAND, (SP), Grey and br, moist, loose, micaceous (possibly native soil material)	
	18.5	9-SS	1.9	PUSH	Upper 0.9: SILTY SAND, (SP), Same as previous Lower 1.0: SAND, (SP), Gray, moist, trace micaceous and silt	
	20.0					
20.0	21.5	10-SS	1.2	4-8-13 (19)	Upper 0.8 feet: SAND, (SP), Brown, very moist, medium dense, micaceous, fine grained Lower 0.4 feet: SAND, (SP), Gray, moist, medium dense, micaceous, fine to medium grained END SOIL BORING AT 21.5 FEET.	
25.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
108015.TP.SW.GE	2B-13	SHEET 1 OF 2

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Proposed Cut Slope South of OPS Center

ELEVATION Approx. 10 ft above Boring 2B-3 **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Mud Rotary, CME 55 Track-Rig Mounted

WATER LEVELS Not Measured **START** 10/10/95 **FINISH** 10/10/95 **LOGGER** J. Lukas

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
						Begin drilling 0930 Cloudy, cool (60's), light precipitation
	5.0					Driller Notes: Silt to 4.5 ft., then sand
5.0	6.5	1-S	1.0	4-7-8 (15)	Top 0.1 ft. (possiby slough) = Silt, (ML), Brown, trace fine sand Sand, (SP), Grayish brown, moist, medium dense, medium-grained, 1- 1/2 in. silty sand seam	
	10.0					
10.0	11.5	2-S	1.2	9-11-12 (23)	Sand, (SP), Similar to above, no silt seams, moist to very moist	
	15.0					Driller Notes: Dense sand @ 12.5 ft.
15.0	18.5	3-S	1.0	9-10-9 (19)	Sand, (SP), Similar to above	
	20.0					Driller Notes: Slightly softer drilling at 19 ft.
20.0	21.5	4-S	1.2	12-15-13 (28)	Sand, (SP), Similar to above, trace coarse-grained sand	
	25.0					Driller Notes: Small gravels @ 22 ft
25.0	26.5	5-SS	1.3	9-15-18 (33)	Upper 0.2-Ft.: Sand, (SP), Similar to above (Sample 5A) Lower 1.1 Ft.: Silt, (ML), Lt. grayish brown with light brown mottling, moist, hard, with orangish brown sand seam, (SP), very moist (Sample 5B)	1030
	27.8	6-ST	1.1			
	30.0				Silt, (ML), Light brown, moist, hard	Driller Notes: 1 ft - 2 in. push PP = 4.5+ tsf TV = 0.5+ kg/cm^2

CH2M HILL

PROJECT NUMBER	BORING NUMBER
108015.TP.SW.GE	2B-13 SHEET 2 OF 2

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Proposed Cut Slope South of OPS Center

ELEVATION Approx. 10 ft above Boring 2B-3 **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Mud Rotary, CME 55 Track-Rig Mounted

WATER LEVELS Not Measured **START** 10/10/95 **FINISH** 10/10/95 **LOGGER** J. Lukas

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	30.0					
	31.5	7-S	1.5	5-9-9 (18)	Silty Clay, (ML-CL), Bluish-gray/gray, moist, very stiff	PP = 1.75 - 2.5 tsf
	35.0					
35.0						
	38.5	8-S	1.5	4-15-18 (33)	Silty Clay, (ML-CL), Similar to above, hard, some light brown "nodules" of silt, trace of fine sand, (sligtly gritty)	PP = 3.75 - 4.5+ tsf
	38.0	9-ST	1.5		Silty Sand, (SP-SM), Bluish-gray/gray, very moist, dense to very dense, sand is fine to medium grained	Push = 1.5 ft., Tip crumpled slightly PP = NP (4.5+) TV = NP Driller Notes: Gravels @ 37 ft - 8 in. Gravels dense - No sloughing of gravel sidewall
	40.0					
40.0						
	41.5	10-S	0.8	19-50/5"	Gravel, (GP), Gray w/brown, moist/very moist, very dense, cemented with a silt matrix, trace sand	1200
	45.0					
45.0						
	45.3	11-S	0.1	50/1st. 4"	Gravel, (GP-GW), Dark gray and orangish brown, very dense, sub-angular, (possibly drill cuttings)	Small recovery indicates that sampler may be pushing on a rock
					EOB = 45.3 ft. Piezometer installed: Tip @ 20 ft. Bentonite hole plug to 23 ft., sand pack from 23 ft. to 12.3 ft., hole plug to 2 ft., cement grout to ground surface. Morris flush monument installed	No water encountered entering the hole
50.0						
55.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	OB-1 SHEET 1 OF 2

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark Cnty, Vancouver, WA-20 ft from pile dolphin

ELEVATION _____ **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Mud Rotary, CME 75, Drilled from Barge

WATER LEVELS _____ **START** 02/01/95 **FINISH** 02/01/95 **LOGGER** D.E. Harris

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
						Mudline is 58 feet below deck 60 feet below waterline
	5.0					
5.0	6.5	1-SS	0.3	8-11-13 (24)	SAND, (SM), Dark gray, wet	
						Gravel at 7 feet (65 feet)
	10.0					
10.0	11.5	2-SS	0.1	6-9-5 (14)	SAND, (SP), Dark gray, wet, micaceous	
						70 feet below waterline - Gravelly from 70.5 to 72 feet
	15.0					
15.0	16.5	3-SS	0.3	6-7-7 (14)	SAND, (SP), Dark gray, wet micaceous	
						More firm drilling at 75 feet
	20.0					
20.0	21.5	4-SS	0.1	8-6-7 (13)	SAND, Same as above	
						80 feet below waterline
	25.0					
25.0	26.5	5-SS		4-5-10 (15)	SILT, (ML), Dark gray, wet, low plasticity Top of sample contains sand, SP, similar to above	
						85
	30.0					

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	OB-1 SHEET 2 OF 2

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark Cnty, Vancouver, WA-20 ft from pile dolphin

ELEVATION _____ **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Mud Rotary, CME 75, Drilled from Barge

WATER LEVELS _____ **START** 02/01/95 **FINISH** 02/01/95 **LOGGER** D.E. Harris

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	30.0					
	31.5	6-SS	0.1	11-11-7 (18)	SILT, (ML), Similar to above	
						90 feet below waterline
	35.0					Dense sand at 91.5 feet below waterline.
35.0	38.5	7-SS	0.3	13-17-21 (38)	SAND, (SP), Dark gray, wet, fine	
	40.0					
40.0	41.5	8-SS		24-50/6"	SAND, (SP), Same as above	
	45.0					
45.0	46.5	9-SS		12-15-18 (33)	SAND, (SP), Same as above	
					END OF BORING = 46.5 FEET.	
50.0						
55.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	OB-2 SHEET 1 OF 2

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant LOCATION Clark County, Vancouver, WA

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Mud Rotary, CME 75, Drilled from Barge

WATER LEVELS _____ START 03/29/95 FINISH 03/29/95 LOGGER D.E. Harris

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
						Surveyors located bore – hole shot elevation of bottom of mud tub 22 inches above water level Water depth is 49 feet
5.0	5.0					
	6.5	1-SS	0.8	8-18-23 (41)	SAND WITH SILT, (SP), Dark gray, wet, micaceous, dense	54 feet below water surface
	10.0					
10.0	11.5	2-SS	0.1	1-2-2 (4)	SAND, (SP), Dark gray, wet, micaceous, very loose	
	15.0					
15.0	15.5	3-SS	0.2	5-5-5 (10)	SAND, (SP), Same as above	
	20.0					Silt on tri-cone bit
20.0	20.5	4-SS	1.1	1-3-7 (10)	SILT, (ML), Dark gray, wet, stiff, low plasticity SAND, Similar to above, in tip of sampler	69 feet below water surface
	25.0					
25.0	25.5	5-SS	0.3	9-12-13 (25)	SAND, (SP), Dark gray, wet, medium dense	
	30.0					

CH2M HILL

PROJECT NUMBER	BORING NUMBER
OPW35382.EN.03	OB-2 SHEET 2 OF 2

SOIL BORING LOG

PROJECT Salmon Creek Wastewater Treatment Plant **LOCATION** Clark County, Vancouver, WA

ELEVATION _____ **DRILLING CONTRACTOR** Geo-Tech Explorations, Inc., Tualatin, OR

DRILLING METHOD AND EQUIPMENT Mud Rotary, CME 75, Drilled from Barge

WATER LEVELS _____ **START** 03/29/95 **FINISH** 03/29/95 **LOGGER** D.E. Harris

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	30.6	B-SS	0.2	10-14-14 (28)	SAND, (SP), Dark gray, wet, medium dense	
					BORING TERMINATED AT 31.5 FEET BELOW CHANNEL BOTTOM	
35.0						
40.0						
45.0						
50.0						
55.0						

Appendix F
Report of Laboratory Testing

LABORATORY TEST RESULTS

FOUNDATION ENGINEERING
Professional Geotechnical Services
5030 SW Philomath Boulevard Corvallis, Oregon 97333 (503) 757-7645 Fax: (503) 757-7650

Date: April 11, 1995

To: CH2M Hill, Inc.
P.O. Box 428
Corvallis, Oregon 97339

Attn: Joe Lukas

Project No.: 95103007

Re: Salmon Creek WWTP

Attached are the results of our testing for the above-referenced project including the testing that was previously reported with the exception of the triaxial shear tests. These results will follow shortly. Please call if you have any questions.

Copy to: *

Signature: (For) Susan Bednarz

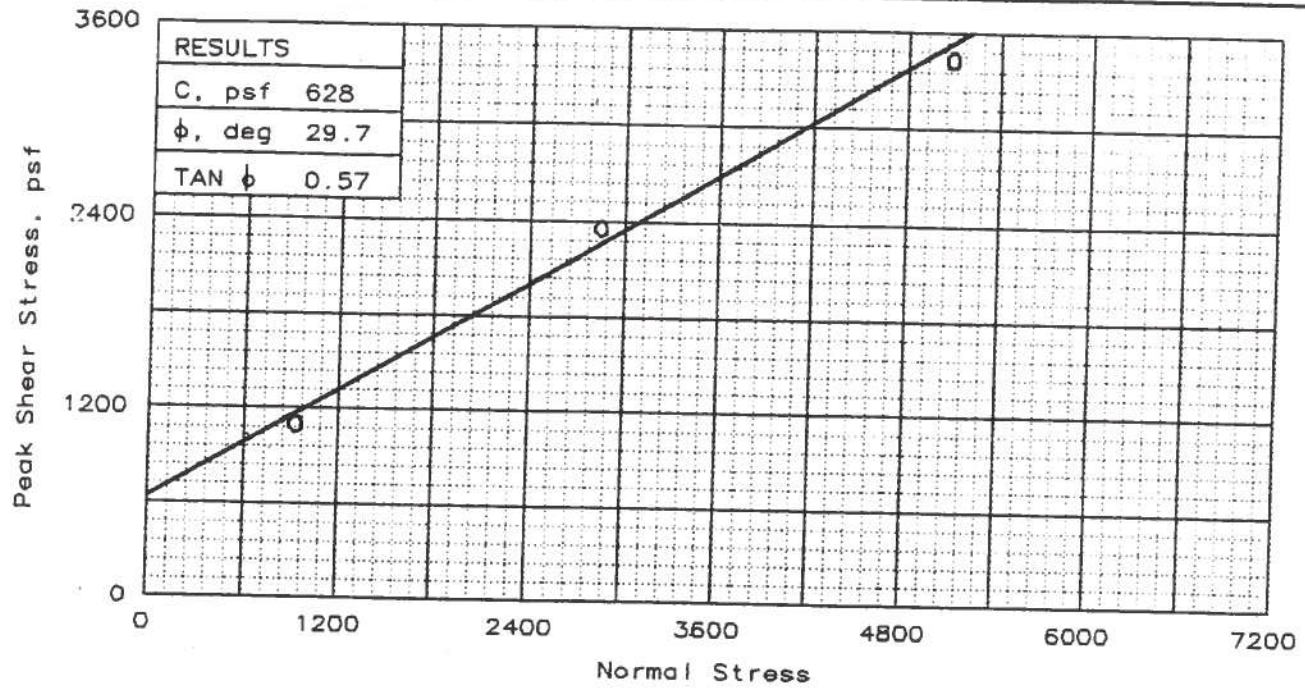
Chris Lund
Manager, Testing Services

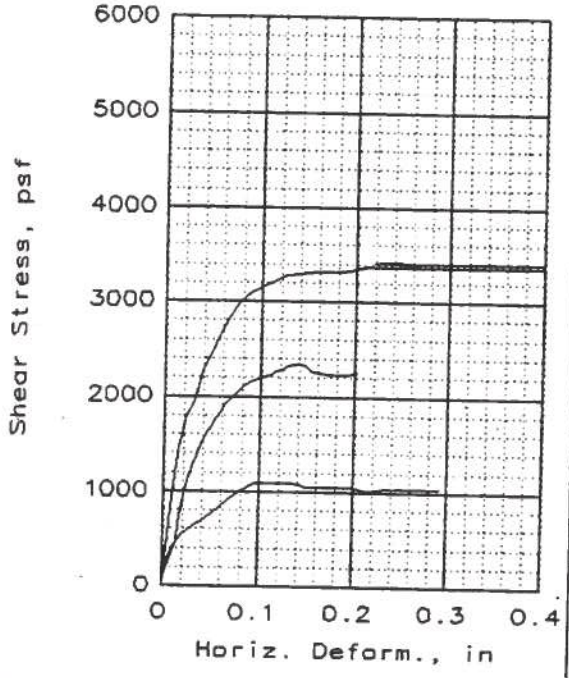
Table 1. Natural Water Contents and Atterberg Limits

Sample Number	Sample Depth (feet)	Natural Water Content (percent)	% Fines	LL	PL	PI	USCS Classification
2B-1, 4SS	20 - 21½	32.2	94.9	47	29	18	ML
2B-1, 5SS	25 - 26½	38.0	90.6	37	26	11	ML
2B-1, 6ST	30 - 31½	21.1	2.3				
2B-2, 7SS	30 - 31½	32.6	68.9	28	28	0	NP
2B-2, 8ST	35 - 37	25.3	31.2				NP
2B-3, 1SS	5 - 6½	40.4	83.3				
2B-3, 2ST	7½ - 9	24.9	42.0				
2B-3, 5SS	17 - 18½	25.9	69.9				
2B-4, 4ST	16½ - 18½	32.7	89.0				
2B-4, 5SS	20 - 21½	28.4	93.0				
2B-4, 7ST	30 - 32	28.8	98.0	34	23	11	CL-ML
2B-6, 4SS	15 - 16½	29.4	98.2	31	23	8	ML
2B-6, 5ST	20 - 22	26.6	94.0	33	22	11	CL-ML
2B-7, 2ST	10 - 12	24.4	87.0	37	19	18	CL
2B-8, 3SS	15 - 16½	28.9	60.4				
2B-8, 5SS	25 - 26½	30.4	64.3				
2B-8, 6ST	30 - 32	21.2	76.0	37	20	17	CL
2B-9, 2SS	10 - 11½	33.2	63.0				
2B-10, 2SS	10 - 11½	31.3	67.0				
2B-10, 5SS	20 - 21½	25.6	67.1				
2B-11, 3SS	12 - 13½	27.9	73.6				
2B-11, 4SS	15 - 16½	17.8	54.1				
2B-12, 6SS	25 - 26½	30.0	98.2	35	25	10	ML-CL
2B-12, 7ST	30 - 32	29.1	97.0	32	24	8	ML

Table 1. Natural Water Contents and Atterberg Limits

Sample Number	Sample Depth (feet)	Natural Water Content (percent)	% Fines	LL	PL	PI	USCS Classification
2B-13, 1SS	1 - 2½	15.9					
2B-13, 2ASS	2½ - 3½	13.7					
2B-13, 2BSS	2½ - 3½	26.1					
2B-13, 3SS	3½ - 5	22.3					
2B-13, 4SS	5 - 6½	16.6					
2B-13, 5SS	6½ - 8	20.3					
2B-13, 6SS	8 - 9½	17.2					
2B-13, 7SS	9½ - 11	19.0					
2B-13, 8SS	15 - 16½	32.3					
2B-13, 9SS	16½ - 18½	27.5					
2B-13, 10SS	20 - 21½	32.9					





SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	36.1	32.5	32.9
	DRY DENSITY, pcf	85.5	89.9	90.2
	SATURATION, %	102.3	102.4	104.3
	VOID RATIO	0.935	0.841	0.835
	DIAMETER, in	2.49	2.49	2.49
	HEIGHT, in	0.80	0.80	0.80
AT TEST	WATER CONTENT, %	36.1	32.5	32.9
	DRY DENSITY, pcf	86.1	90.7	91.3
	SATURATION, %	103.9	104.3	107.5
	VOID RATIO	0.920	0.825	0.812
	DIAMETER, in	2.49	2.49	2.49
	HEIGHT, in	0.79	0.79	0.79
NORMAL STRESS, psf		950	2870	5110
MAXIMUM SHEAR, psf		1094	2349	3424
RESIDUAL SHEAR, psf				
Strain rate, in/min		0.007	0.002	0.005

SAMPLE DATA

SAMPLE TYPE: Shelby Tube

DESCRIPTION: Brown, slightly sandy silt.

LL= --- PL= --- PI=

SPECIFIC GRAVITY= 2.65

REMARKS:

CLIENT: CH2M Hill

PROJECT: Salmon Creek WWTP

SAMPLE LOCATION: 2B-4, 4ST
16.5 to 18.5 feet

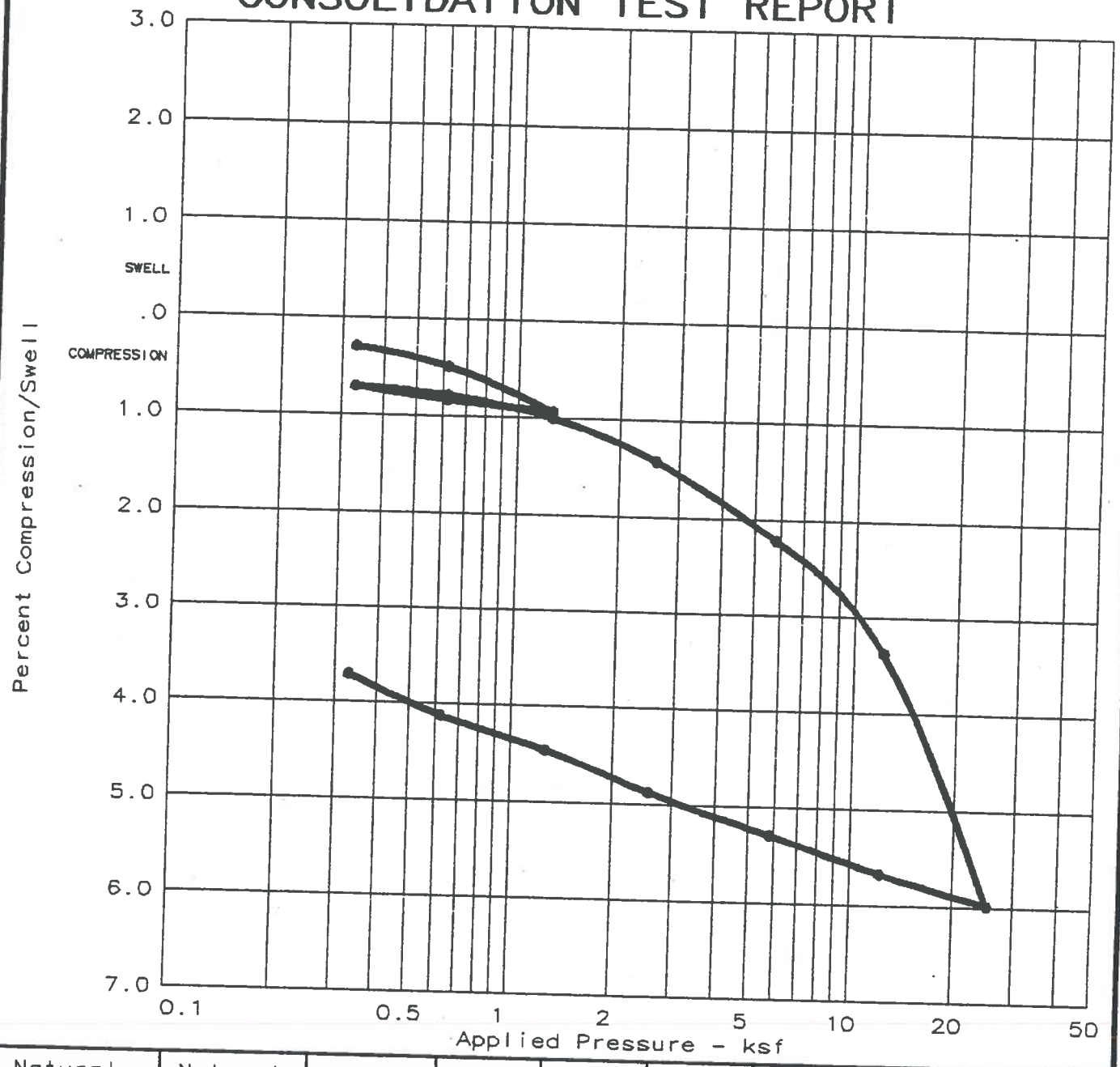
PROJ. NO.: 95103007 DATE: 3-28-95

DIRECT SHEAR TEST REPORT

FIG. NO. 1

Foundation Engineering, Inc.

CONSOLIDATION TEST REPORT



Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Initial void ratio
92.7 %	24.8	96.9	33	11	2.650	0.7079

TEST RESULTS

MATERIAL DESCRIPTION

Grey, low plasticity, silty clay.

Class: CL/ML

Project No.: 95103007
Project: Salmon Creek WWTP
Location: 2B-6, 5ST
20 to 22 feet
Date: 3-16-95

Remarks:

Loading sequence determined by CH2M Hill personnel.

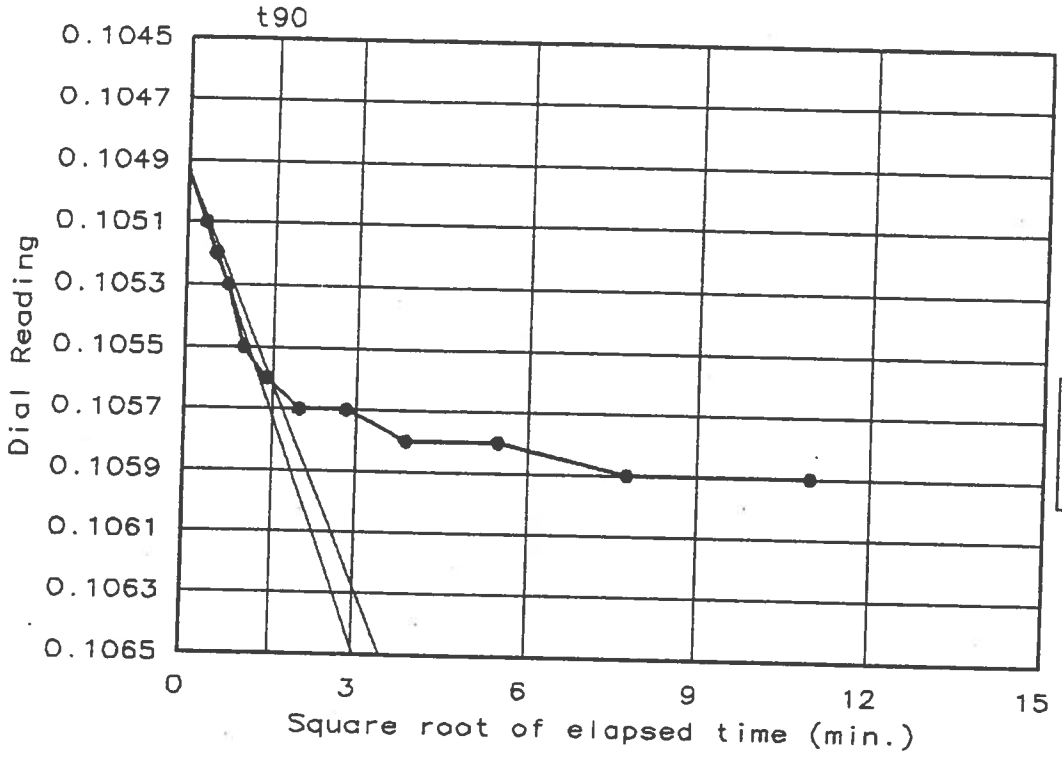
CONSOLIDATION TEST REPORT

Foundation Engineering, Inc.

Fig. No. 4

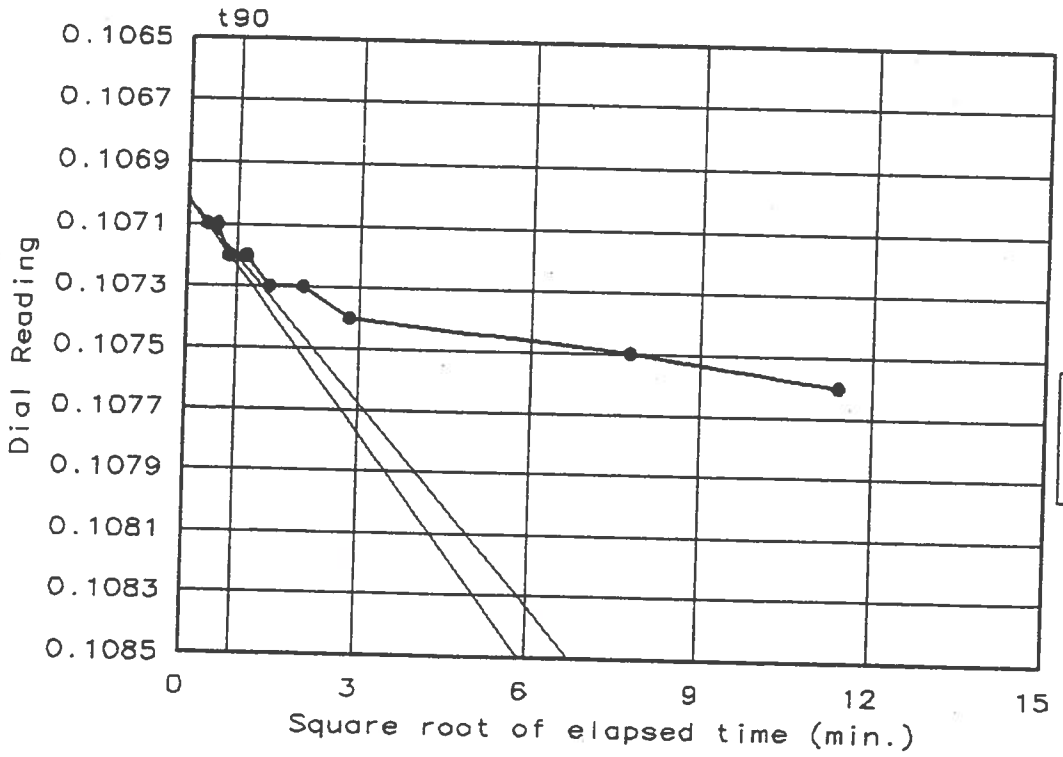
Dial Reading vs. Time

Project No.: 95103007
Project: Salmon Creek WWTP
Location: 2B-6, 5ST
20 to 22 feet
Date: 3-16-95



Load No.= 1
Load= 0.33 ksf
D_0 = 0.1049
D_{90} = 0.1056
D_{100}= 0.1057
T_{90}= 2.33 min.

C_v @ T_{90} = .054 $in.^2/min.$



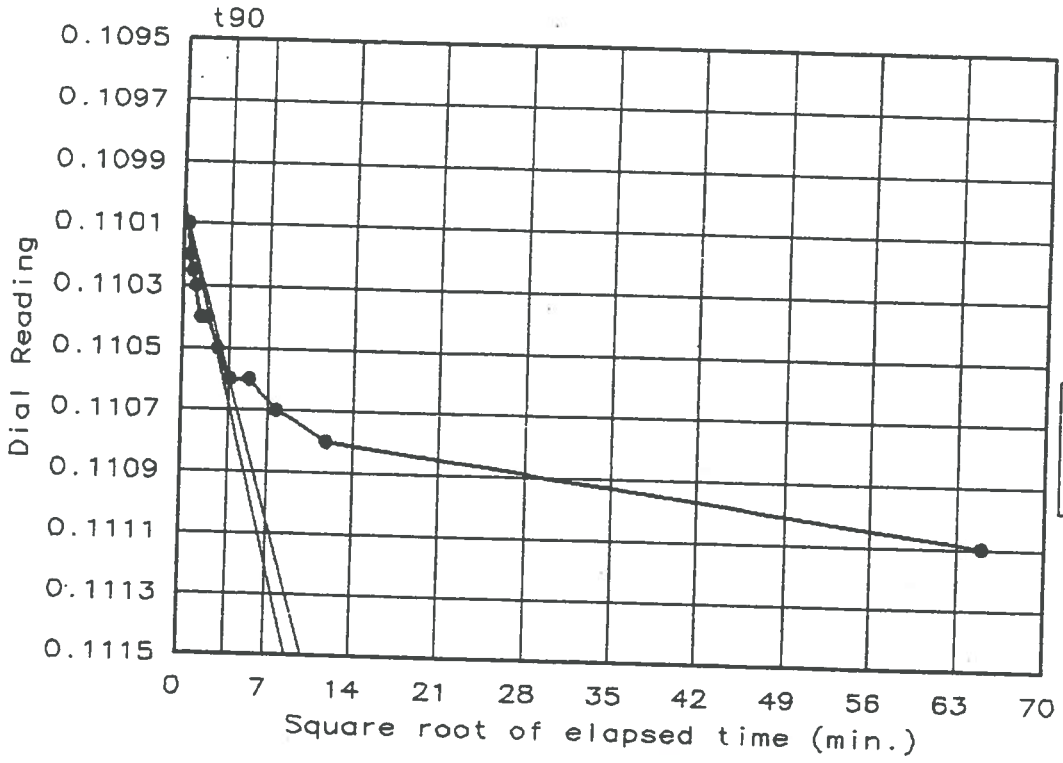
Load No.= 2
Load= 0.62 ksf
D_0 = 0.1070
D_{90} = 0.1072
D_{100}= 0.1072
T_{90}= 0.68 min.

C_v @ T_{90} = .183 $in.^2/min.$

Foundation Engineering, Inc.

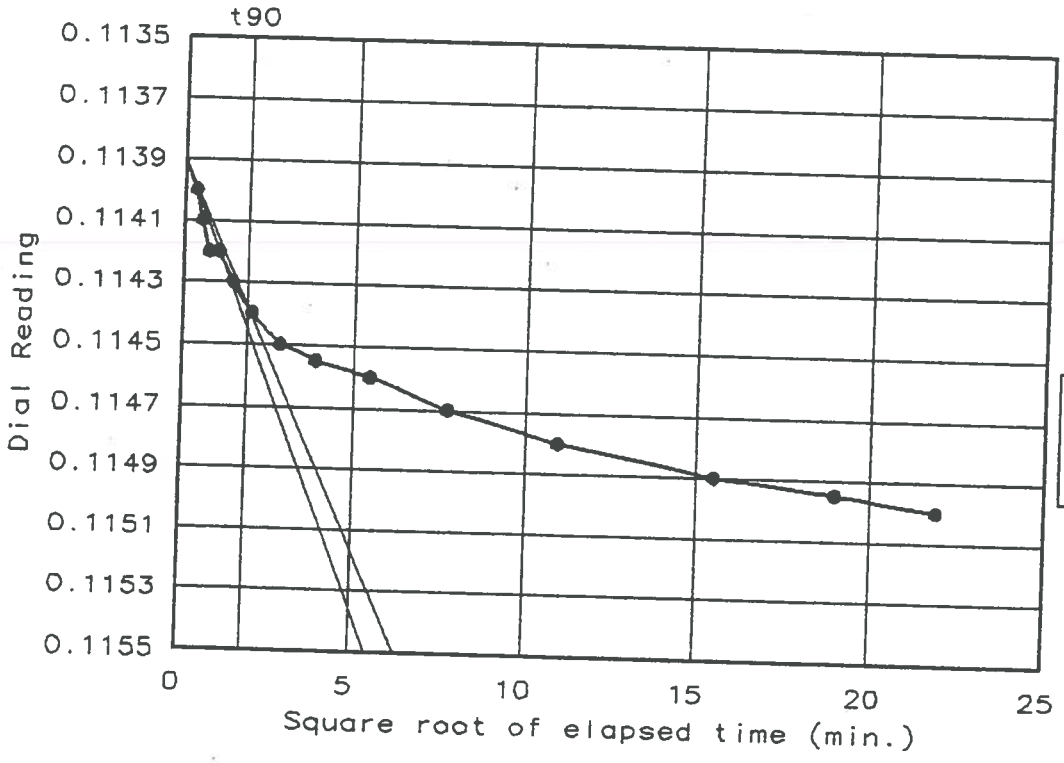
Dial Reading vs. Time

Project No.: 95103007
Project: Salmon Creek WWTP
Location: 2B-6, 5ST
20 to 22 feet
Date: 3-16-95



Load No.= 3
Load= 1.27 ksf
D_0 = 0.1100
D_{90} = 0.1106
D_{100}= 0.1107
T_{90}= 14.82 min.

C_v @ T_{90} = .008 $in.^2/min.$

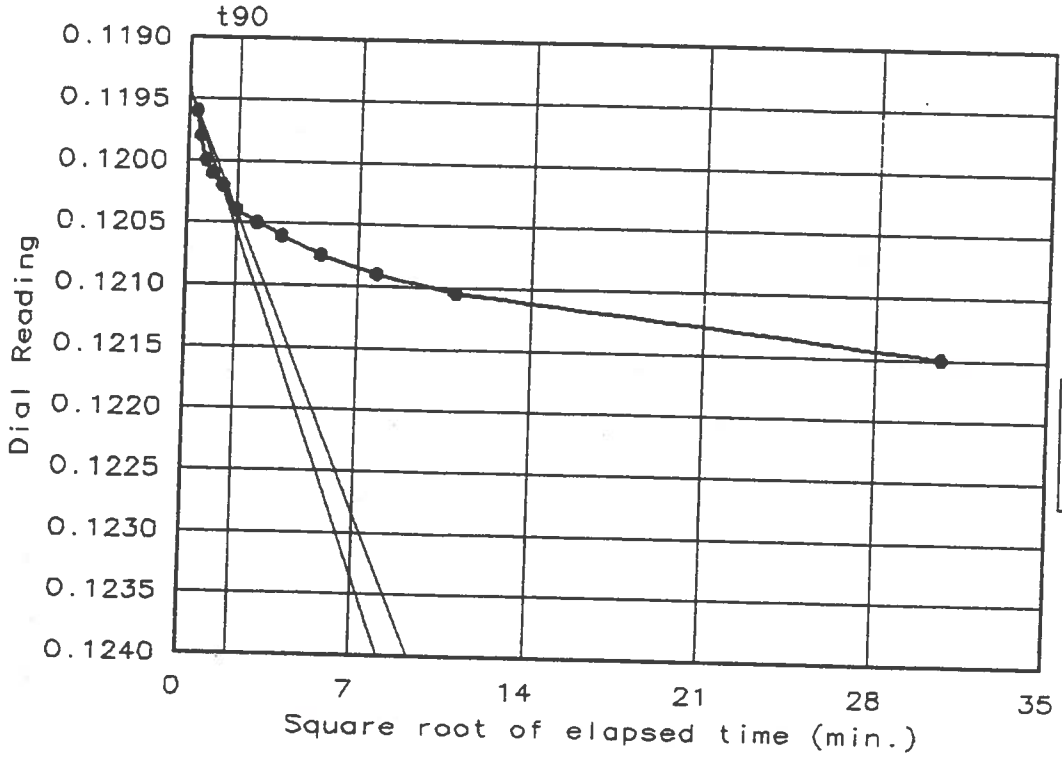


Load No.= 8
Load= 2.56 ksf
D_0 = 0.1139
D_{90} = 0.1144
D_{100}= 0.1144
T_{90}= 3.52 min.

C_v @ T_{90} = .035 $in.^2/min.$

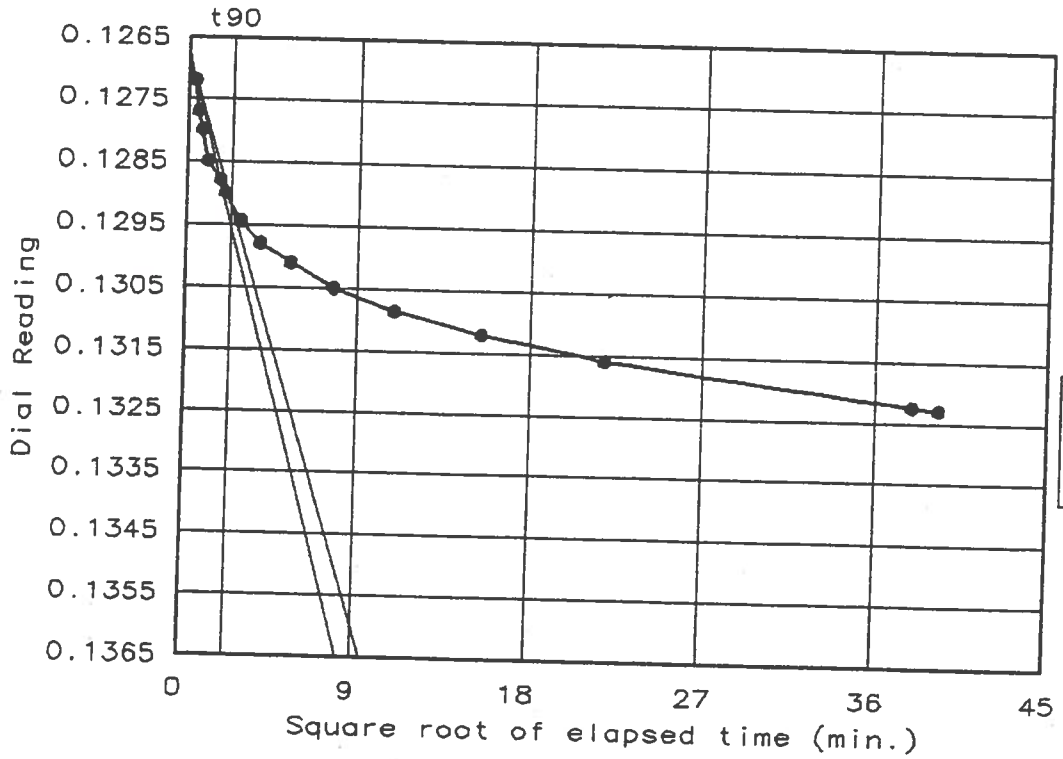
Dial Reading vs. Time

Project No.: 95103007
Project: Salmon Creek WWTP
Location: 2B-6, 5ST
20 to 22 feet
Date: 3-16-95



Load No.= 9
Load= 5.80 ksf
D_0 = 0.1194
D_{90} = 0.1204
D_{100}= 0.1205
T_{90}= 4.02 min.

C_v @ T_{90} =
.030 $in.^2/min.$



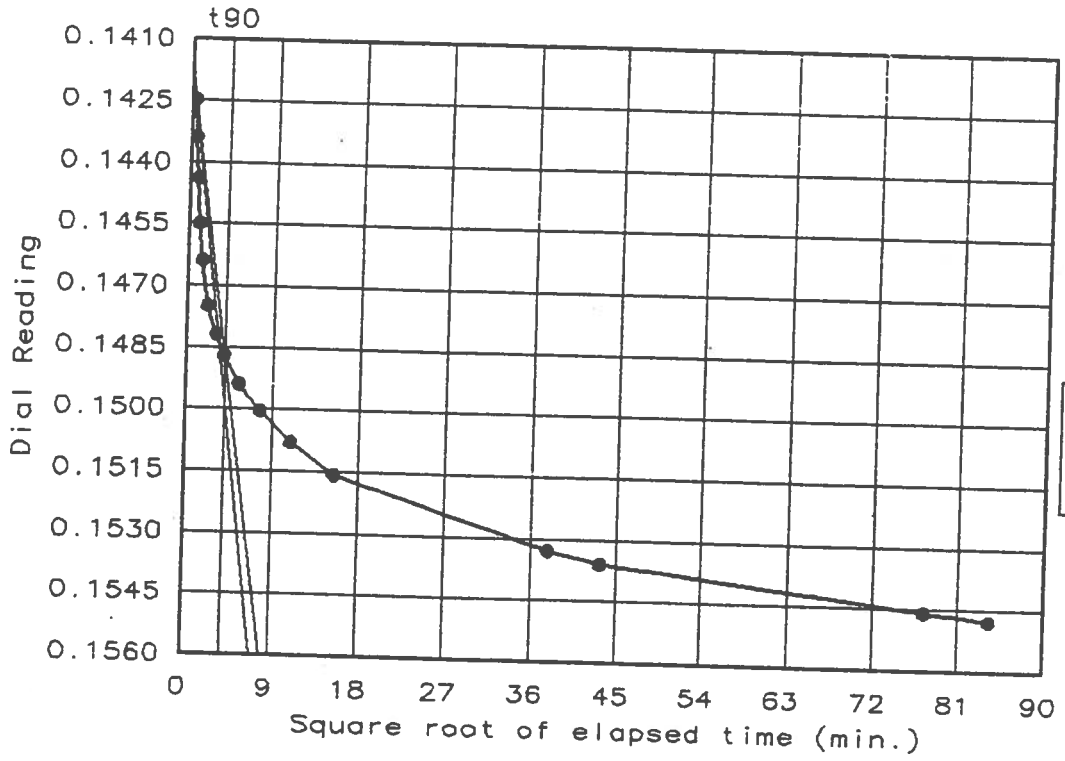
Load No.= 10
Load= 12.27 ksf
D_0 = 0.1268
D_{90} = 0.1292
D_{100}= 0.1294
T_{90}= 5.25 min.

C_v @ T_{90} =
.022 $in.^2/min.$

Foundation Engineering, Inc.

Dial Reading vs. Time

Project No.: 95103007
Project: Salmon Creek WWTP
Location: 2B-6, 5ST
20 to 22 feet
Date: 3-16-95



Load No.= 11

Load= 25.20 ksf

D_0 = 0.1419

D_{90} = 0.1487

D_{100}= 0.1495

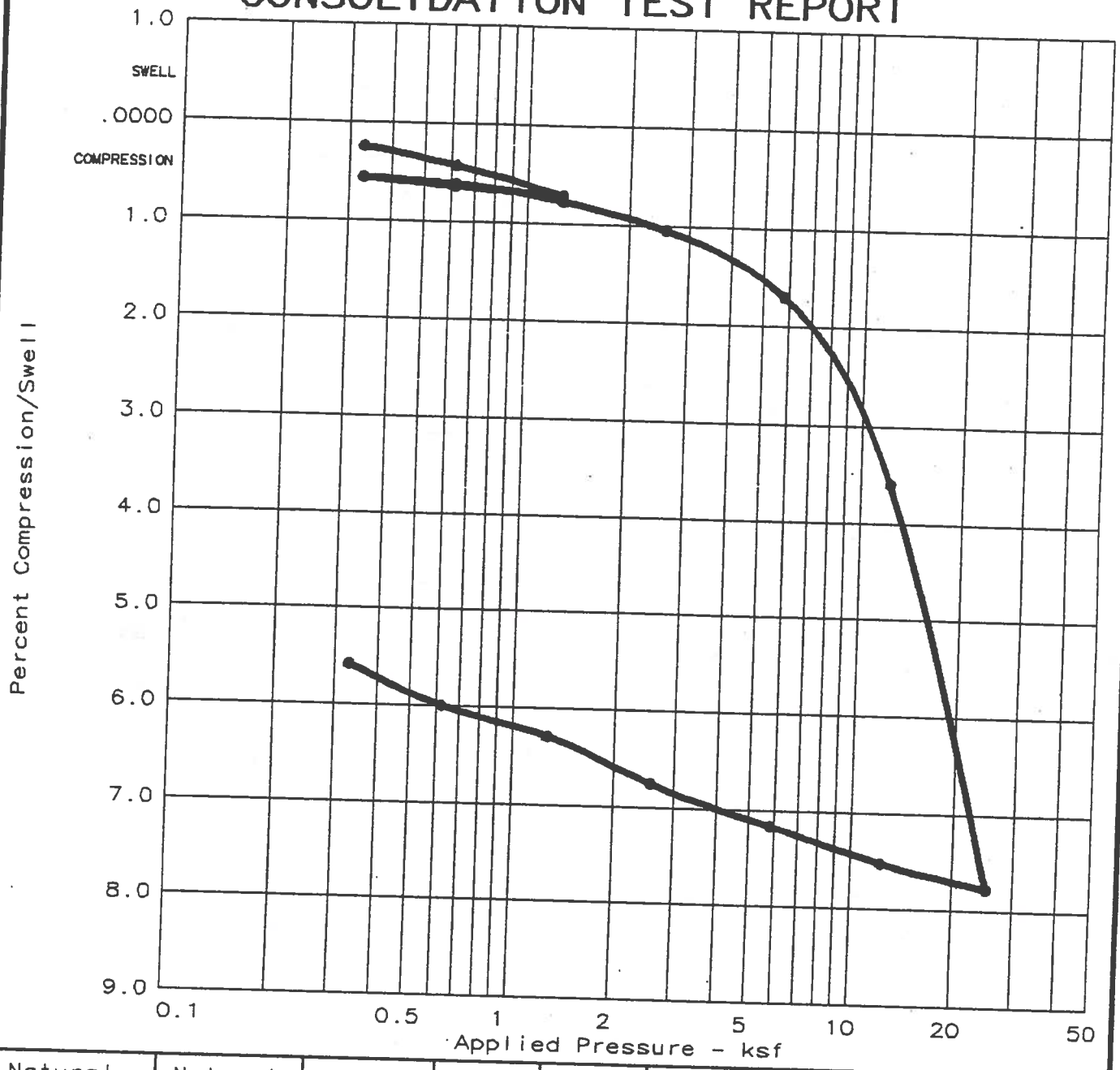
T_{90}= 15.39 min.

C_v @ T_{90} =

.007 $in.^2/min.$

Foundation Engineering, Inc.

CONSOLIDATION TEST REPORT



Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Initial void ratio
99.5 %	25.3	98.8	37	18	2.650	0.6740

TEST RESULTS

MATERIAL DESCRIPTION

Grey, low plasticity clay.

Class: CL

Project No.: 95103007
Project: Salmon Creek WWTP
Location: 2B-7, 2ST
10 to 12 feet
Date: 3-16-95

Remarks:

Loading sequence determined by CH2M Hill personnel.

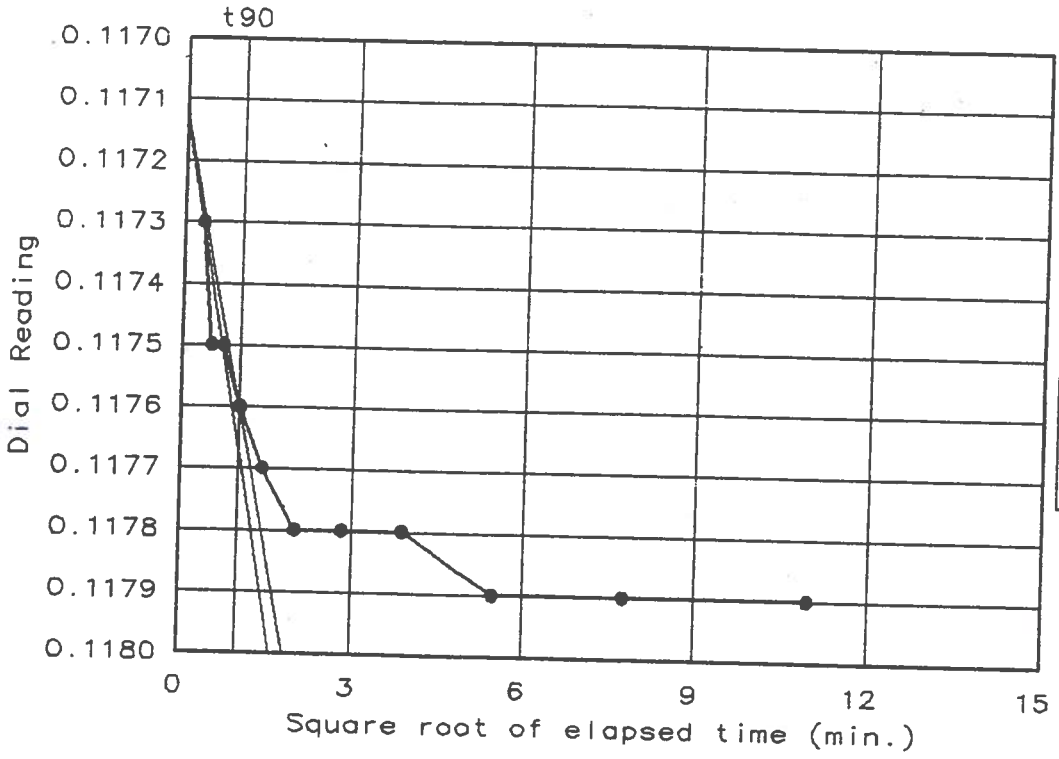
CONSOLIDATION TEST REPORT

Foundation Engineering, Inc.

Fig. No. 5

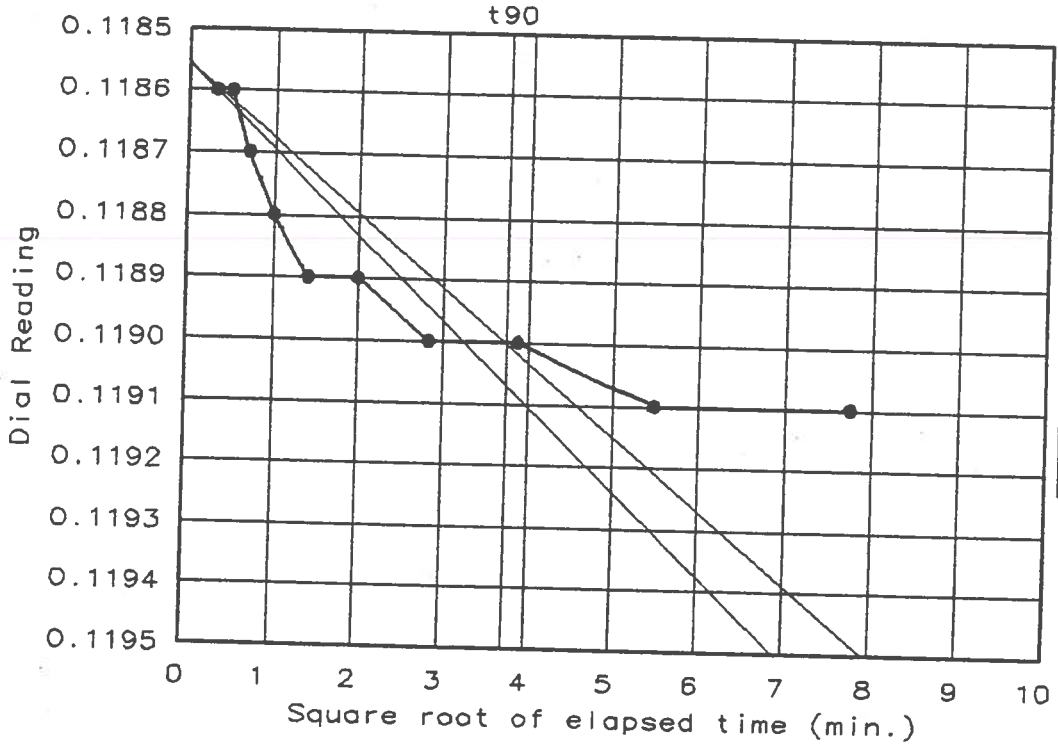
Dial Reading vs. Time

Project No.: 95103007
Project: Salmon Creek WWTP
Location: 2B-7, 2ST
10 to 12 feet
Date: 3-16-95



Load No.= 1
Load= 0.33 ksf
D_0 = 0.1171
D_{90} = 0.1176
D_{100}= 0.1176
T_{90}= 0.96 min.

C_v @ T_{90} =
.133 $in.^2/min.$



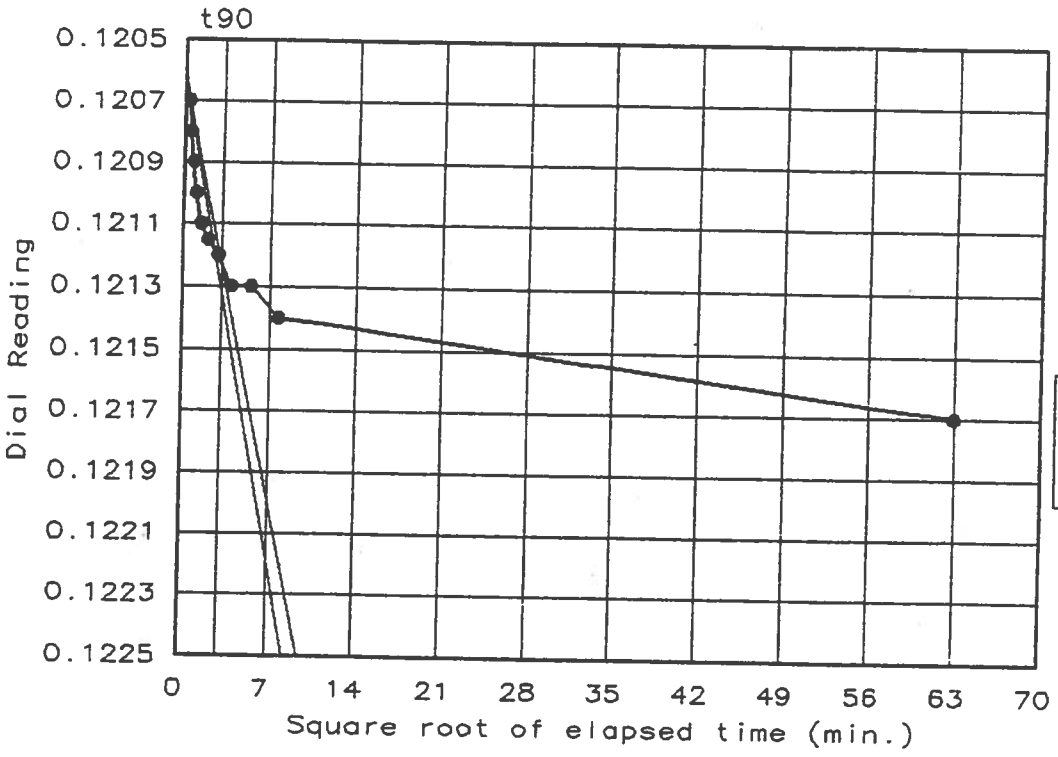
Load No.= 2
Load= 0.62 ksf
D_0 = 0.1186
D_{90} = 0.1190
D_{100}= 0.1190
T_{90}= 13.99 min.

C_v @ T_{90} =
.009 $in.^2/min.$

Foundation Engineering, Inc.

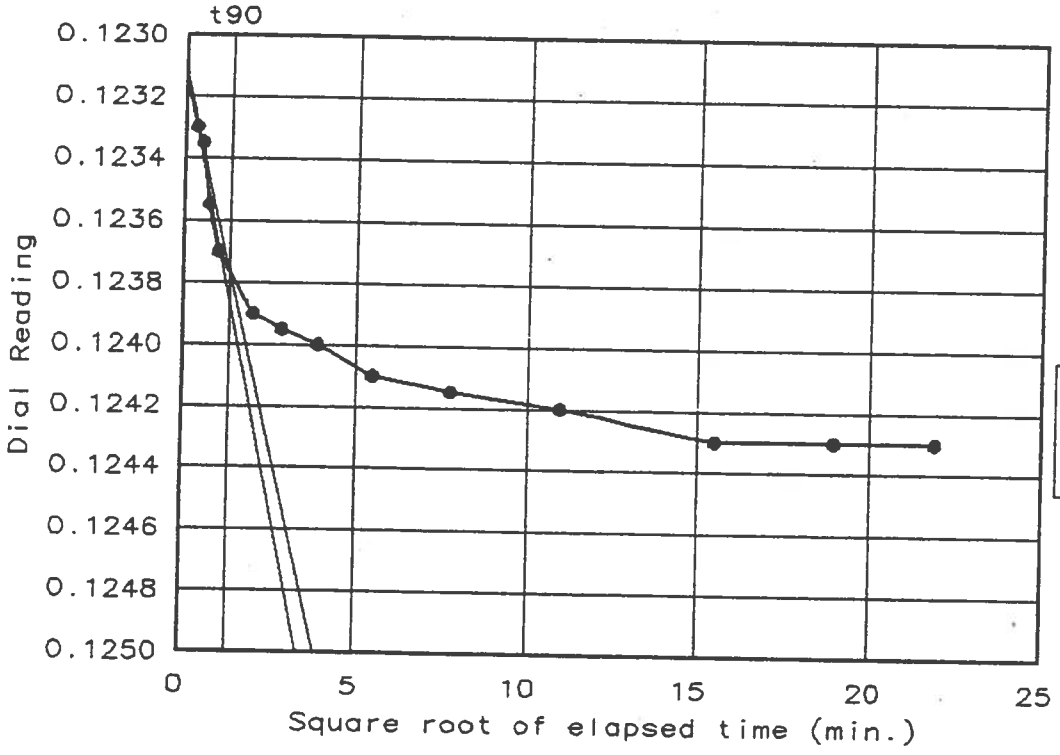
Dial Reading vs. Time

Project No.: 95103007
Project: Salmon Creek WWTP
Location: 2B-7, 2ST
10 to 12 feet
Date: 3-16-95



Load No.= 3
Load= 1.27 ksf
D_0 = 0.1206
D_{90} = 0.1212
D_{100}= 0.1213
T_{90}= 9.51 min.

C_v @ T_{90} = .013 $in.^2/min.$



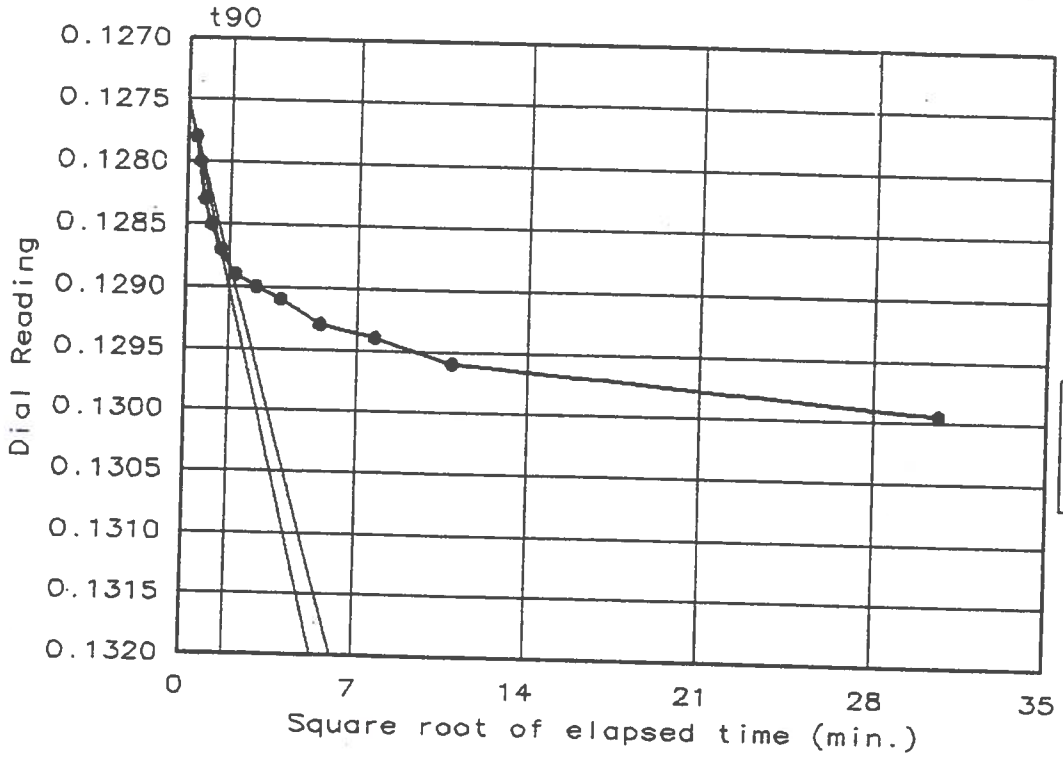
Load No.= 8
Load= 2.56 ksf
D_0 = 0.1231
D_{90} = 0.1238
D_{100}= 0.1238
T_{90}= 1.78 min.

C_v @ T_{90} = .071 $in.^2/min.$

Foundation Engineering, Inc.

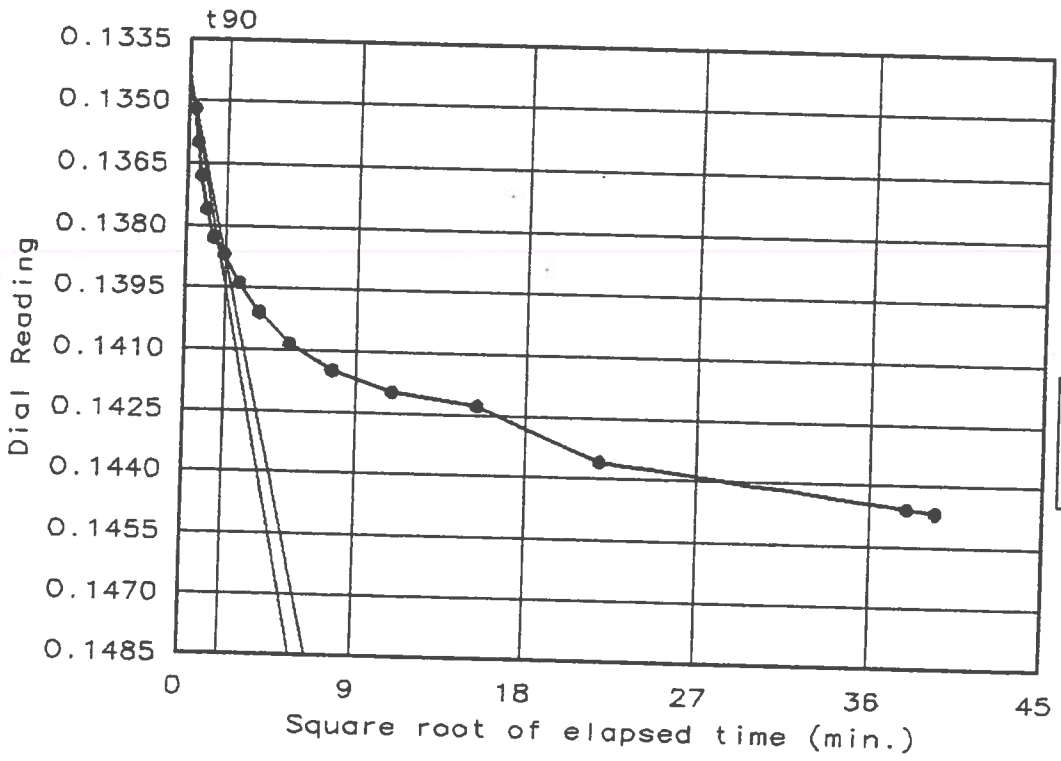
Dial Reading vs. Time

Project No.: 95103007
Project: Salmon Creek WWTP
Location: 28-7, 2ST
10 to 12 feet
Date: 3-16-95



Load No.= 9
Load= 5.80 ksf
D_0 = 0.1275
D_{90} = 0.1288
D_{100}= 0.1290
T_{90}= 3.13 min.

C_v @ T_{90} =
.040 $in.^2/min.$

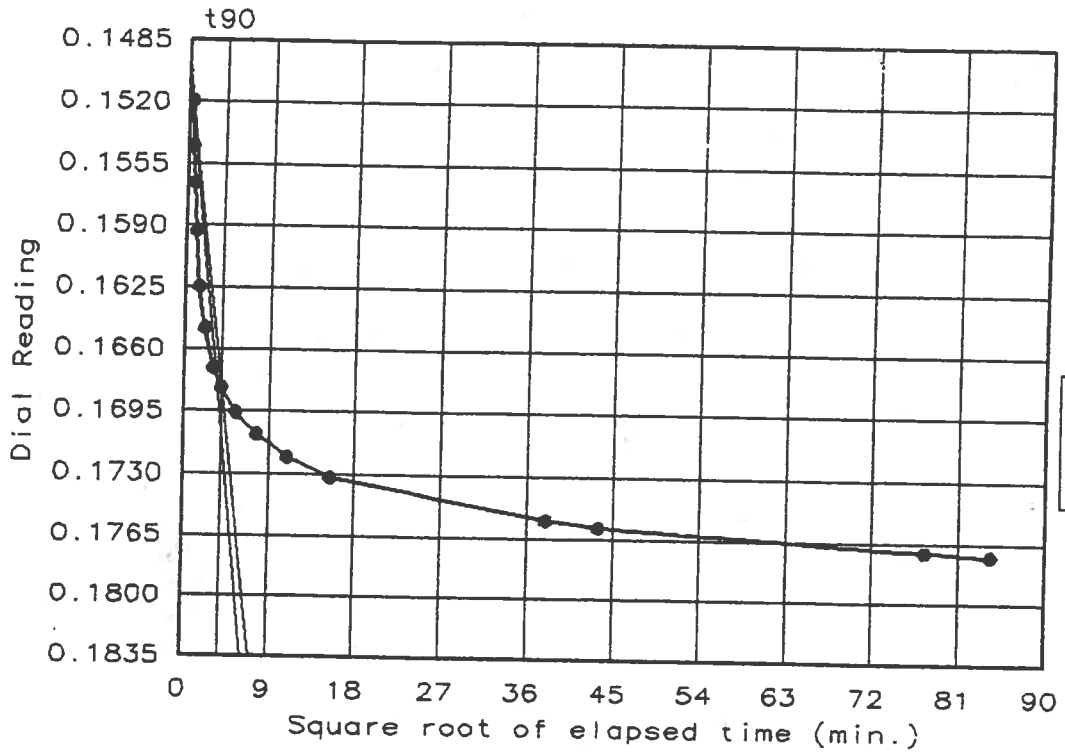


Load No.= 10
Load= 12.27 ksf
D_0 = 0.1344
D_{90} = 0.1387
D_{100}= 0.1392
T_{90}= 4.16 min.

C_v @ T_{90} =
.029 $in.^2/min.$

Dial Reading vs. Time

Project No.: 95103007
Project: Salmon Creek WWTP
Location: 28-7, 2ST
10 to 12 feet
Date: 3-16-95

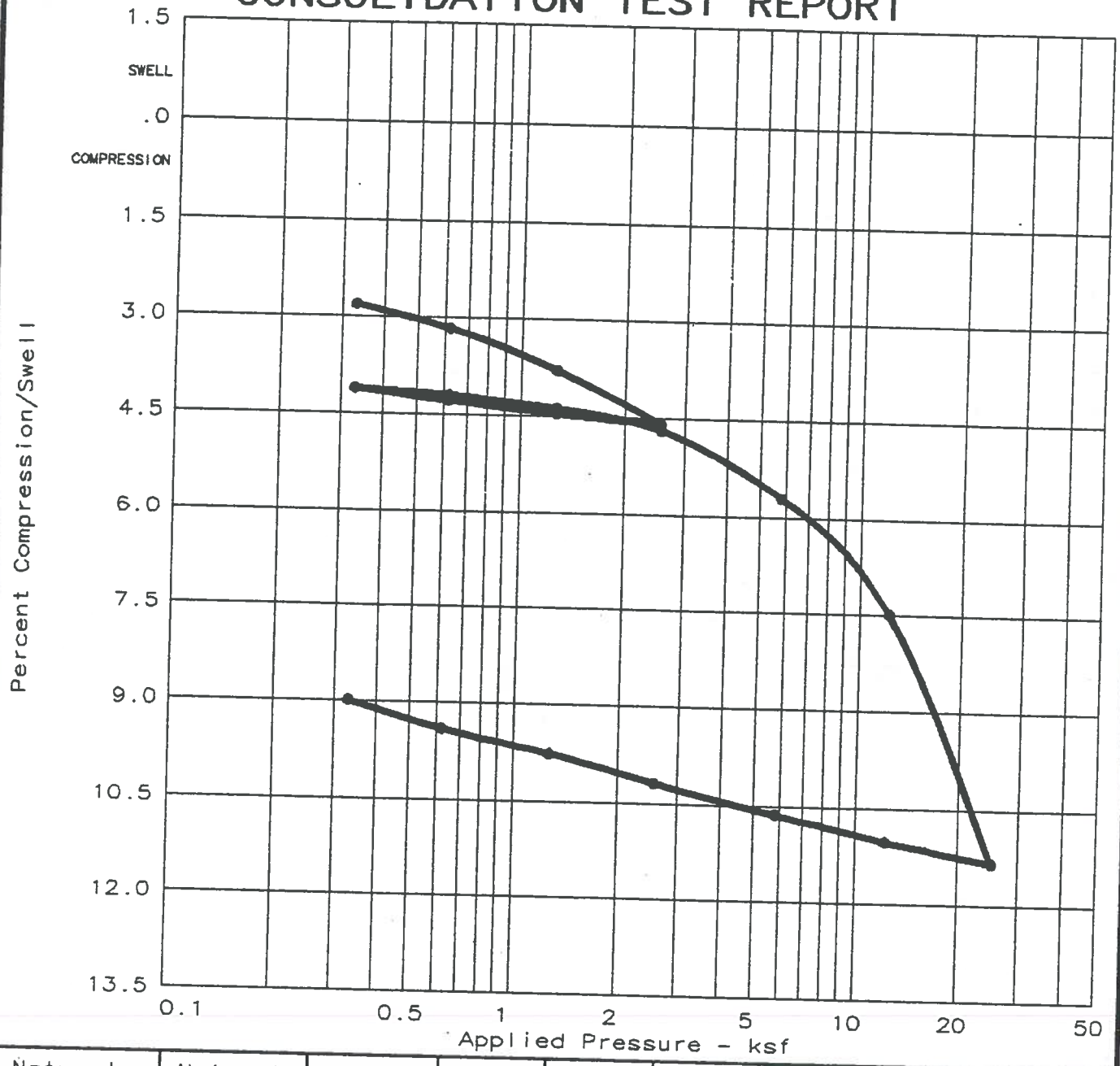


Load No.= 11
Load= 25.20 ksf
D_0 = 0.1503
D_{90} = 0.1682
D_{100}= 0.1702
T_{90}= 15.03 min.

C_v @ T_{90} =
.008 $in.^2/min.$

Foundation Engineering, Inc.

CONSOLIDATION TEST REPORT



Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Initial void ratio
92.7 %	29.9	89.2	32	8	2.650	0.8556

TEST RESULTS

MATERIAL DESCRIPTION

Grey-brown, low plasticity silt.

Class: ML

Project No.: 95103007
Project: Salmon Creek WWTP
Location: 2B-12, 7ST
30 to 32 feet
Date: 3-17-95

Remarks:

Loading sequence determined by CH2M Hill personnel.

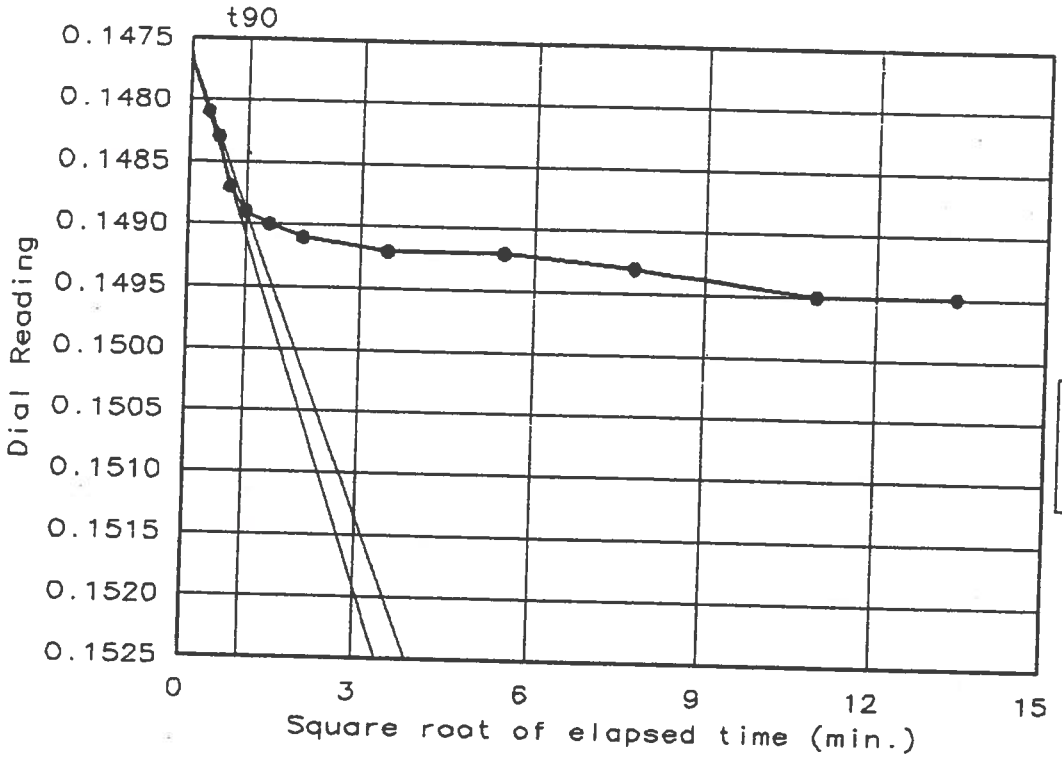
CONSOLIDATION TEST REPORT

Foundation Engineering, Inc.

Fig. No. 6

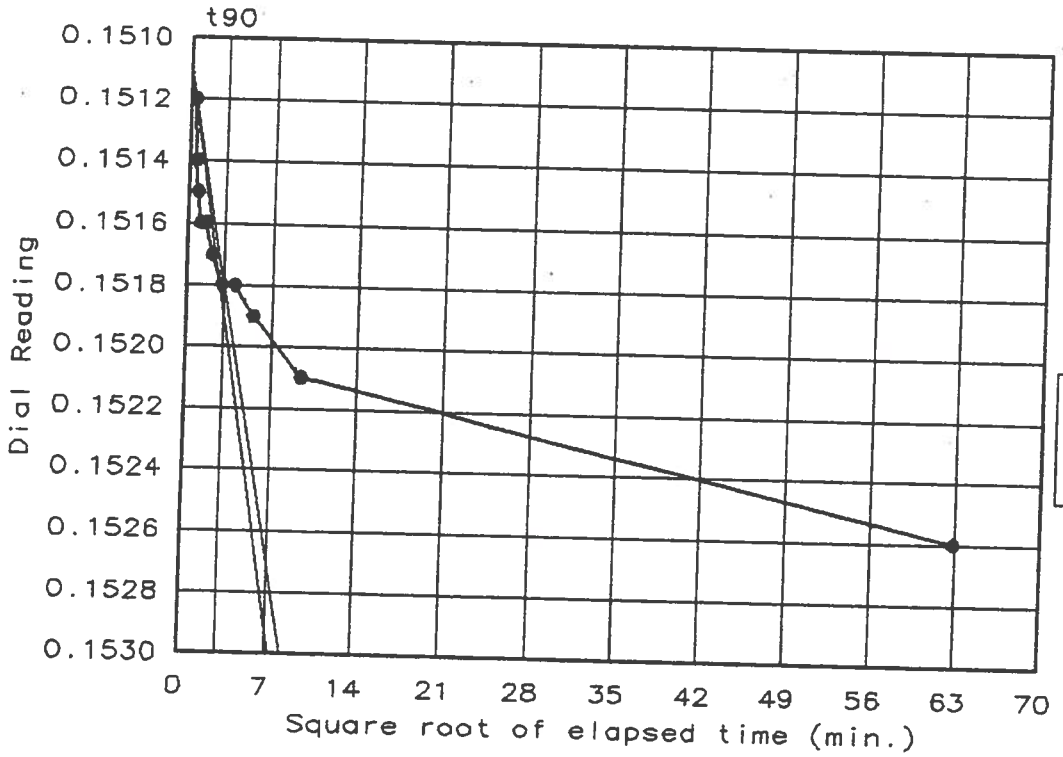
Dial Reading vs. Time

Project No.: 95103007
Project: Salmon Creek WWTP
Location: 28-12, 7ST
30 to 32 feet
Date: 3-17-95



Load No.= 1
Load= 0.33 ksf
D_0 = 0.1477
D_{90} = 0.1489
D_{100}= 0.1490
T_{90}= 1.03 min.

C_v @ T_{90} =
.122 $in.^2/min.$



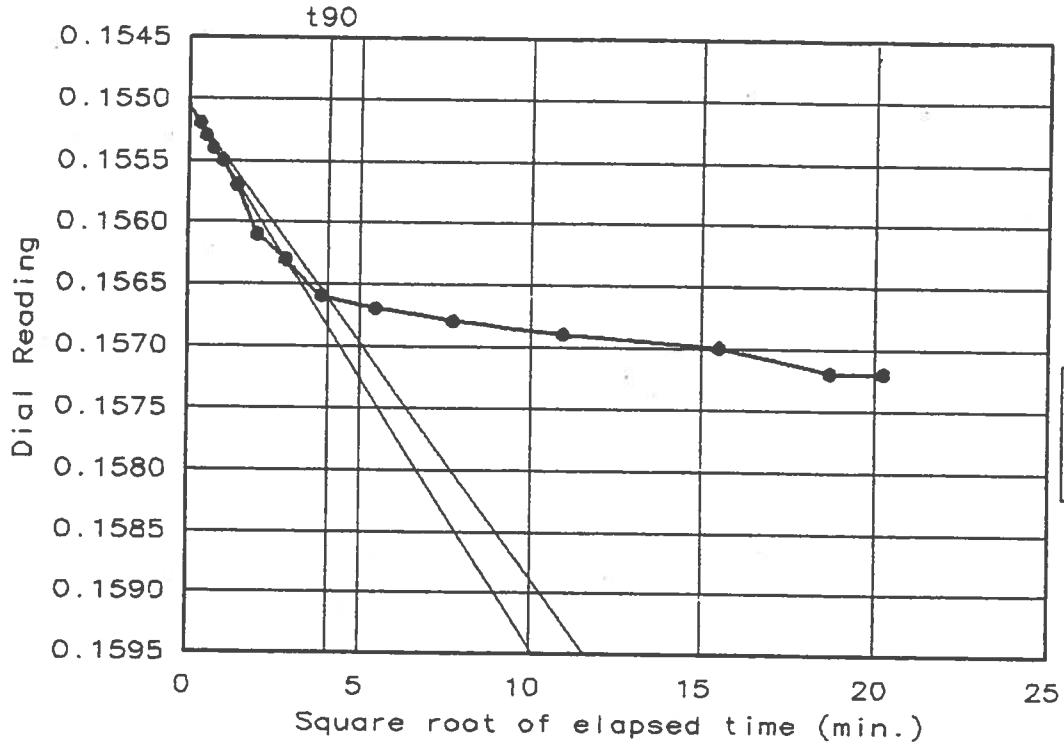
Load No.= 2
Load= 0.62 ksf
D_0 = 0.1511
D_{90} = 0.1518
D_{100}= 0.1519
T_{90}= 9.20 min.

C_v @ T_{90} =
.013 $in.^2/min.$

Foundation Engineering, Inc.

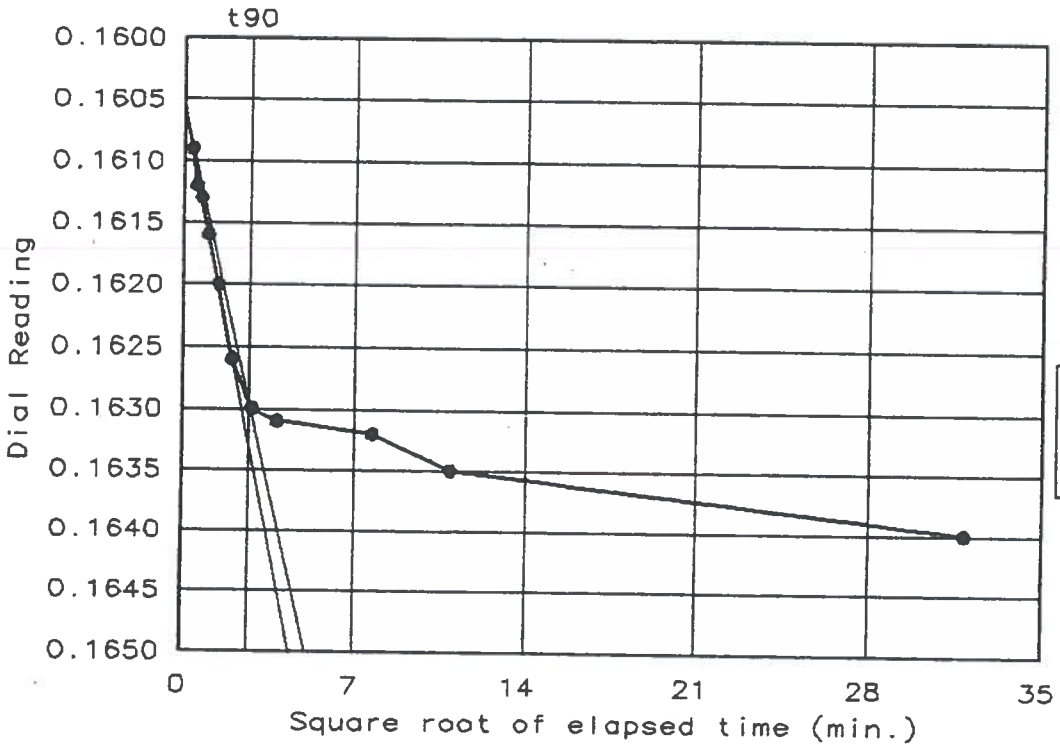
Dial Reading vs. Time

Project No.: 95103007
Project: Salmon Creek WWTP
Location: 28-12, 7ST
30 to 32 feet
Date: 3-17-95



Load No.= 3
Load= 1.27 ksf
D_0 = 0.1551
D_{90} = 0.1566
D_{100}= 0.1568
T_{90}= 16.51 min.

C_v @ T_{90} = .007 $in.^2/min.$



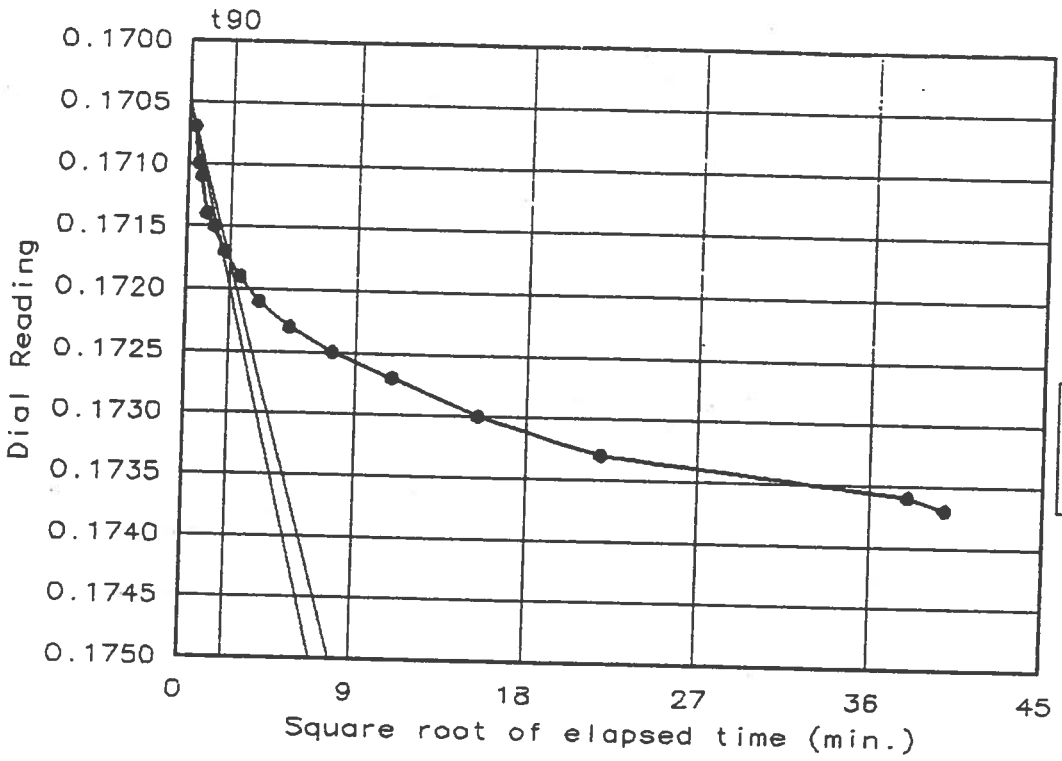
Load No.= 4
Load= 2.56 ksf
D_0 = 0.1606
D_{90} = 0.1629
D_{100}= 0.1632
T_{90}= 7.31 min.

C_v @ T_{90} = .017 $in.^2/min.$

Foundation Engineering, Inc.

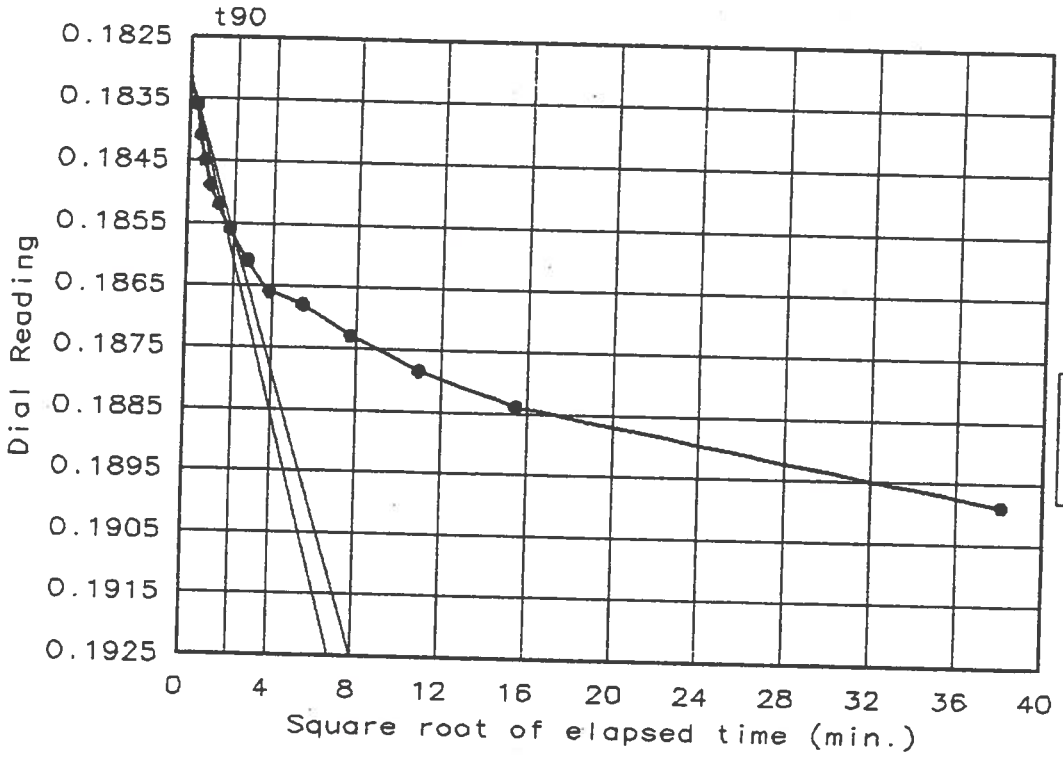
Dial Reading vs. Time

Project No.: 95103007
Project: Salmon Creek WWTP
Location: 28-12, 7ST
30 to 32 feet
Date: 3-17-95



Load No.= 11
Load= 5.80 ksf
D_0 = 0.1705
D_{90} = 0.1718
D_{100}= 0.1719
T_{90}= 4.92 min.

C_v @ T_{90} = .024 $in.^2/min.$



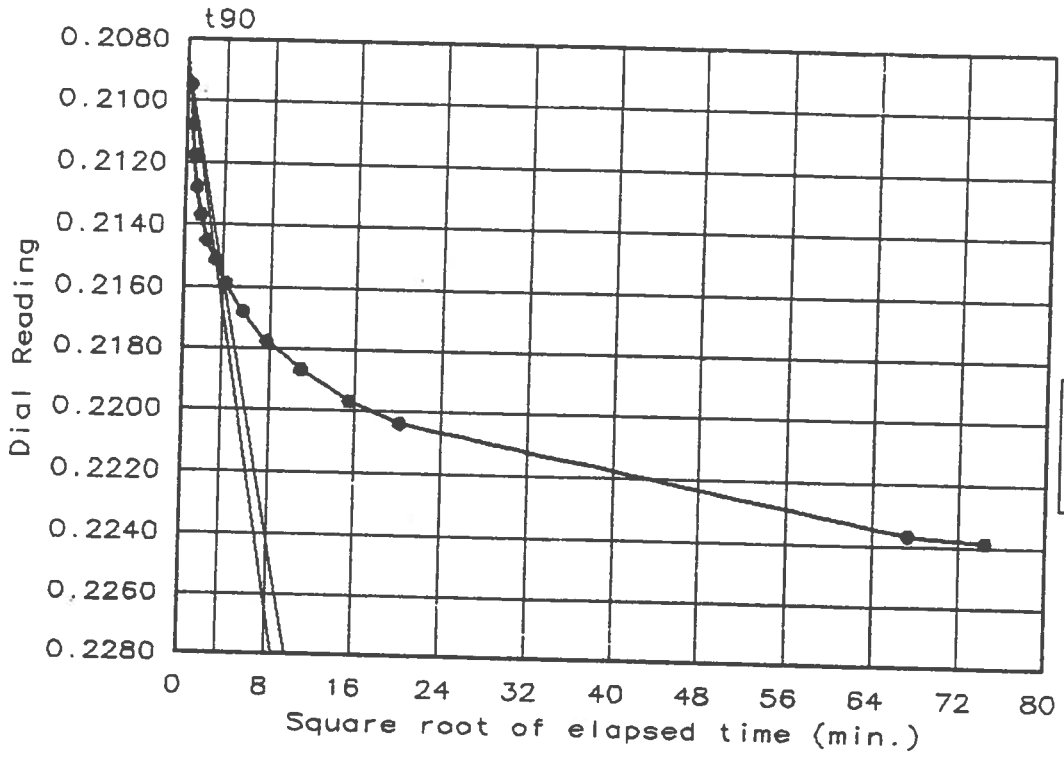
Load No.= 12
Load= 12.27 ksf
D_0 = 0.1832
D_{90} = 0.1857
D_{100}= 0.1860
T_{90}= 4.75 min.

C_v @ T_{90} = .024 $in.^2/min.$

Foundation Engineering, Inc.

Dial Reading vs. Time

Project No.: 95103007
Project: Salmon Creek WWTP
Location: 28-12, 7ST
30 to 32 feet
Date: 3-17-95



Load No.= 13
Load= 25.20 ksf
D_0 = 0.2088
D_{90} = 0.2157
D_{100}= 0.2164
T_{90}= 12.88 min.

C_v @ T_{90} =
.008 $in.^2/min.$

Foundation Engineering, Inc.

Foundation Engineering, Inc.
Professional Geotechnical Services

April 13, 1995

CH2M Hill, Inc.
2300 NW Walnut Blvd.
P.O. Box 428
Corvallis, Oregon 97339-0428

Attn: Joseph M. Lukas

Dear Mr. Lukas:

Project 95103007
Salmon Creek WWTP

This letter summarizes the results of the triaxial shear testing conducted as part of the laboratory testing program for the Salmon Creek Waste Water Treatment Plant project.

Consolidated-undrained tests were run on Sample 2B-4, 7ST from 30 to 32 feet and Sample 2B-7, 2ST from 10 to 12 feet. Three test specimens were trimmed, installed in a triaxial cell and a back-pressure of 40 psi was applied to each. Tests were run at confining pressures of 7, 15, and 30 psi. Pore pressures were monitored throughout the testing.

The results of the tests are shown on the enclosed figures. High negative pore pressures developed in most of the samples during testing which is common for overconsolidated soils. However, in Sample 2B-4, 7ST, the third specimen developed much lower negative pore pressures resulting in a smaller shift between the total and effective stresses. Therefore, the Mohr-Coulomb failure circles shown in Figure 1 are relatively close. Sand lenses noted in the third specimen (or other factors) may have resulted in the lower negative pore pressures.

Rick Thrall, P.E. (in our Portland office) recommended using the p-q plots from the effective stress paths to estimate the undrained strength parameters, c' and ϕ'. Those results are also enclosed. We recommend, however, that you evaluate and interpret the results yourself based on your actual design needs.

5030 SW Philomath Blvd. • Corvallis, OR 97333 • (503) 757-7645 • FAX (503) 757-7650

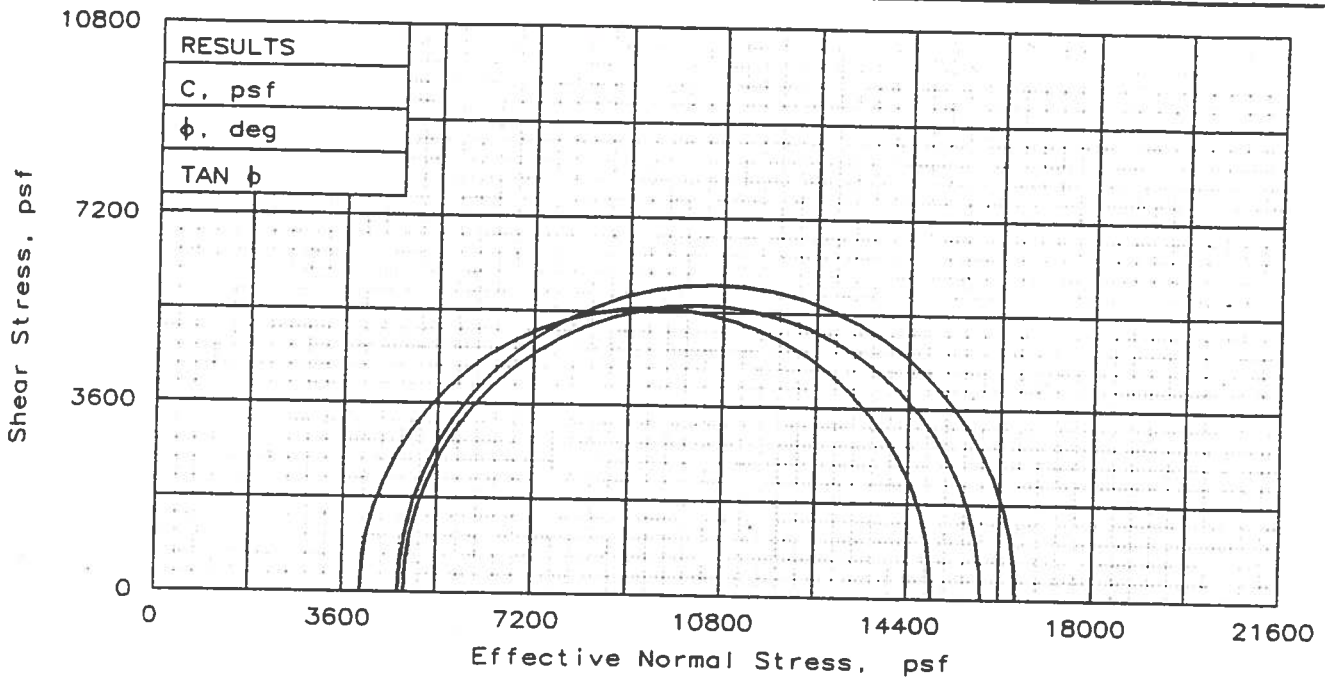
We appreciate the opportunity to work with you on this project. Please call if you have any questions.

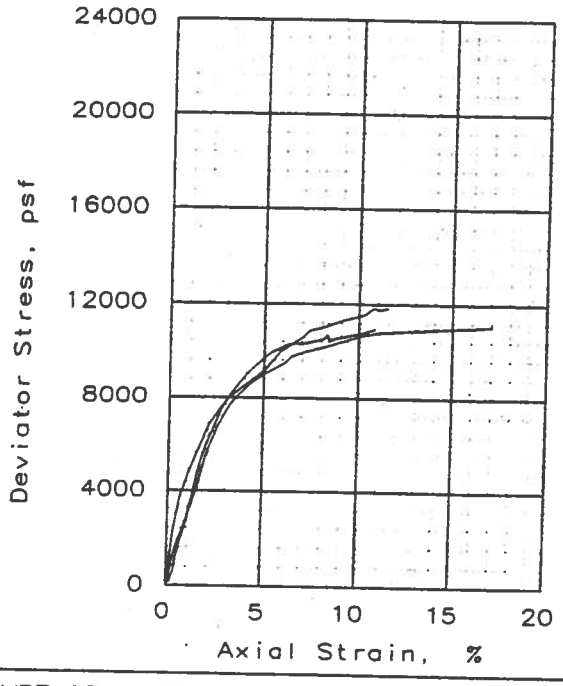
Sincerely,

FOUNDATION ENGINEERING, INC.

Geoffrey C. Hebner, P.E.

GCH/laj
enclosure





SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	26.2	25.4	27.8
	DRY DENSITY, pcf	100.9	100.2	99.1
	SATURATION, %	108.6	103.5	110.3
	VOID RATIO	0.639	0.652	0.669
	DIAMETER, in	2.85	2.87	2.82
	HEIGHT, in	6.02	6.00	6.00
AT TEST	WATER CONTENT, %	26.0	24.8	26.8
	DRY DENSITY, pcf	100.9	100.2	99.1
	SATURATION, %	107.8	101.0	106.1
	VOID RATIO	0.639	0.652	0.669
	DIAMETER, in	2.85	2.87	2.82
	HEIGHT, in	6.02	6.00	6.00
Strain rate, in/min		0.001	0.001	0.001
BACK PRESSURE, psf		5760	5760	5760
CELL PRESSURE, psf		6768	7920	10080
FAILURE STRESS, psf		10946	11072	11848
PORE PRESSURE, psf		2822	3139	5400
ULTIMATE STRESS, psf				11848
PORE PRESSURE, psf				5400
$\bar{\sigma}_1$ FAILURE, psf		14891	15853	16528
$\bar{\sigma}_3$ FAILURE, psf		3946	4781	4680

TYPE OF TEST:
CU with pore pressures
SAMPLE TYPE: Shelby Tube
DESCRIPTION: Grey, low plasticity silt.
LL= 34 PL= 23 PI= 11.0
SPECIFIC GRAVITY= 2.65
REMARKS:

CLIENT: CH2M Hill

PROJECT: Salmon Creek WWTP

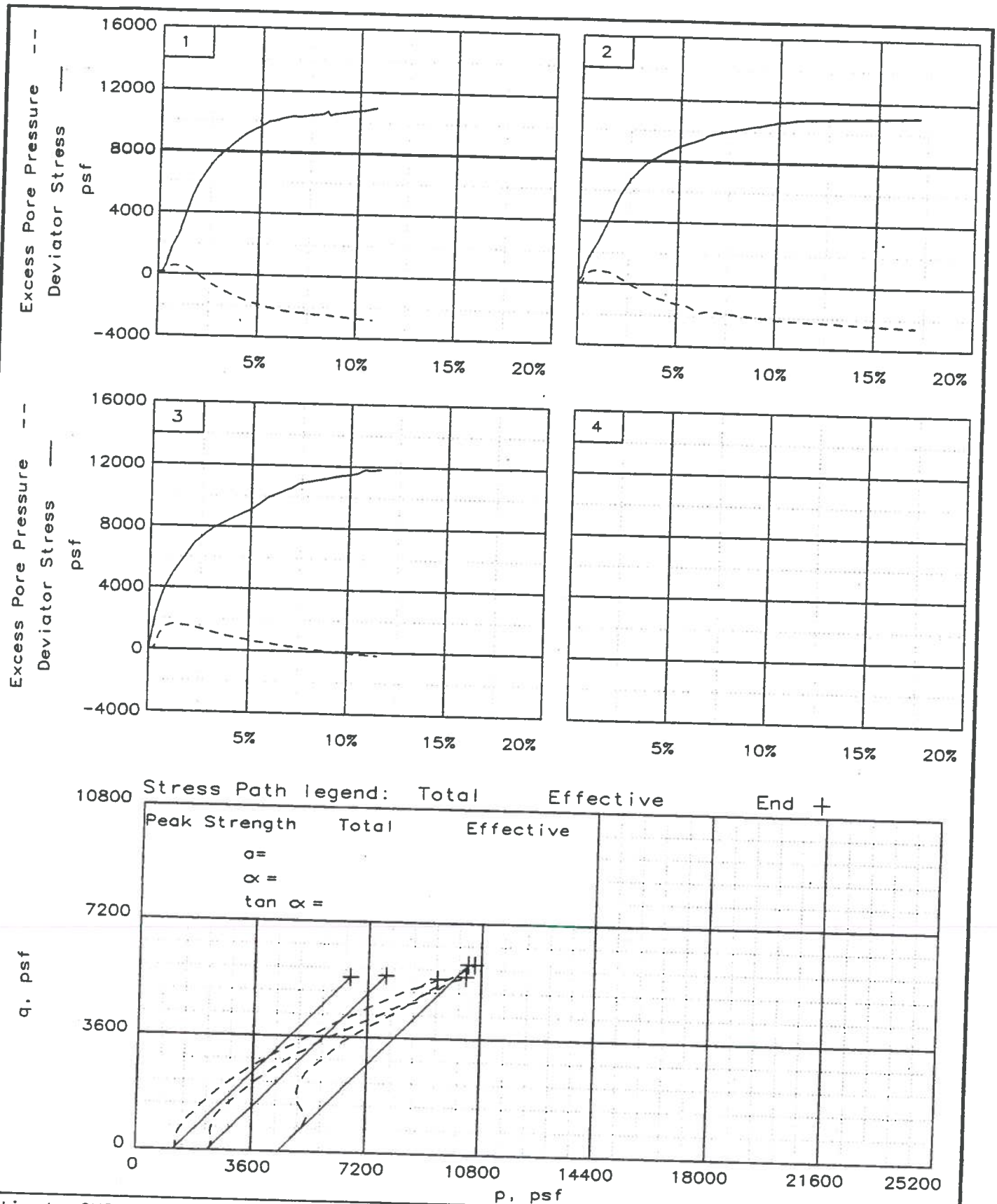
SAMPLE LOCATION: 2B-4, 7ST
30 to 32 feet

PROJ. NO.: 95103007 DATE: 3-24-95

TRIAXIAL SHEAR TEST REPORT

Foundation Engineering, Inc.

FIG. NO. 1

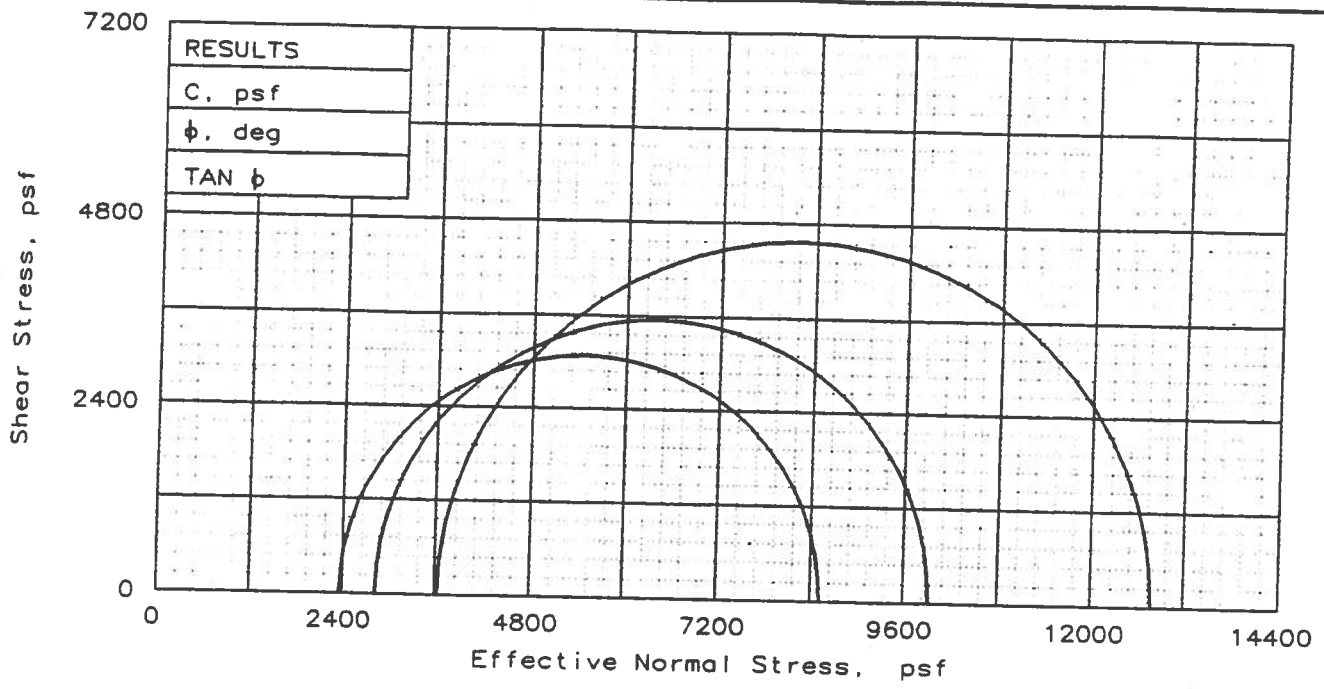


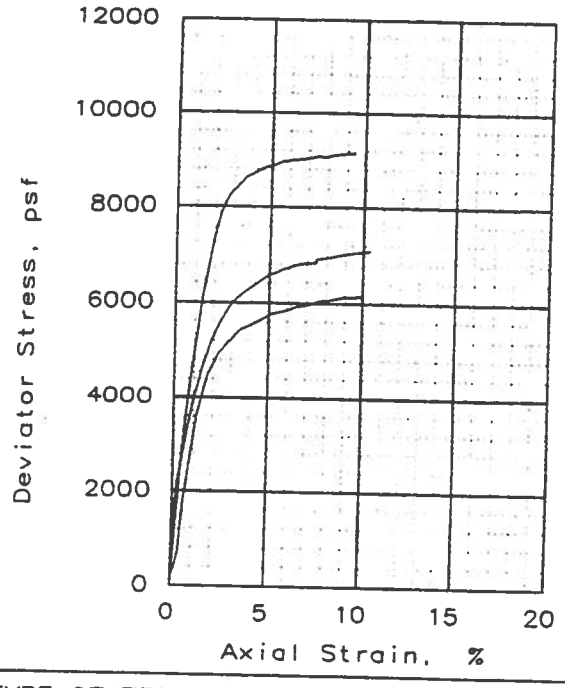
Client: CH2M Hill

Project: Salmon Creek WWTP

Location: 2B-4, 7ST 30 to 32 feet

File: SALMON1 Project No.: 95103007





SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	24.4	23.3	21.2
	DRY DENSITY, pcf	100.9	104.1	102.4
	SATURATION, %	101.0	104.8	91.3
	VOID RATIO	0.640	0.589	0.615
	DIAMETER, in	2.85	2.85	2.85
	HEIGHT, in	6.00	6.00	6.00
AT TEST	WATER CONTENT, %	24.5	23.1	23.3
	DRY DENSITY, pcf	100.9	104.1	102.4
	SATURATION, %	101.6	104.1	100.1
	VOID RATIO	0.640	0.589	0.615
	DIAMETER, in	2.85	2.85	2.85
	HEIGHT, in	6.00	6.00	6.00
Strain rate, in/min		0.001	0.001	0.001
BACK PRESSURE, psf		5760	5760	5760
CELL PRESSURE, psf		6768	7920	10080
FAILURE STRESS, psf		6158	7104	9145
PORE PRESSURE, psf		4406	5098	6451
ULTIMATE STRESS, psf				
PORE PRESSURE, psf				
$\bar{\sigma}_1$ FAILURE, psf		8519	9927	12773
$\bar{\sigma}_3$ FAILURE, psf		2362	2822	3629

TYPE OF TEST:
CU with pore pressures
SAMPLE TYPE: Shelby Tube
DESCRIPTION: Grey, micaceous, low plasticity silt.
LL= 37 PL= 19 PI= 18.0
SPECIFIC GRAVITY= 2.65
REMARKS: Sample 2B-8, 6ST used as substitute in sample 3.

CLIENT: CH2M Hill

PROJECT: Salmon Creek WWTP

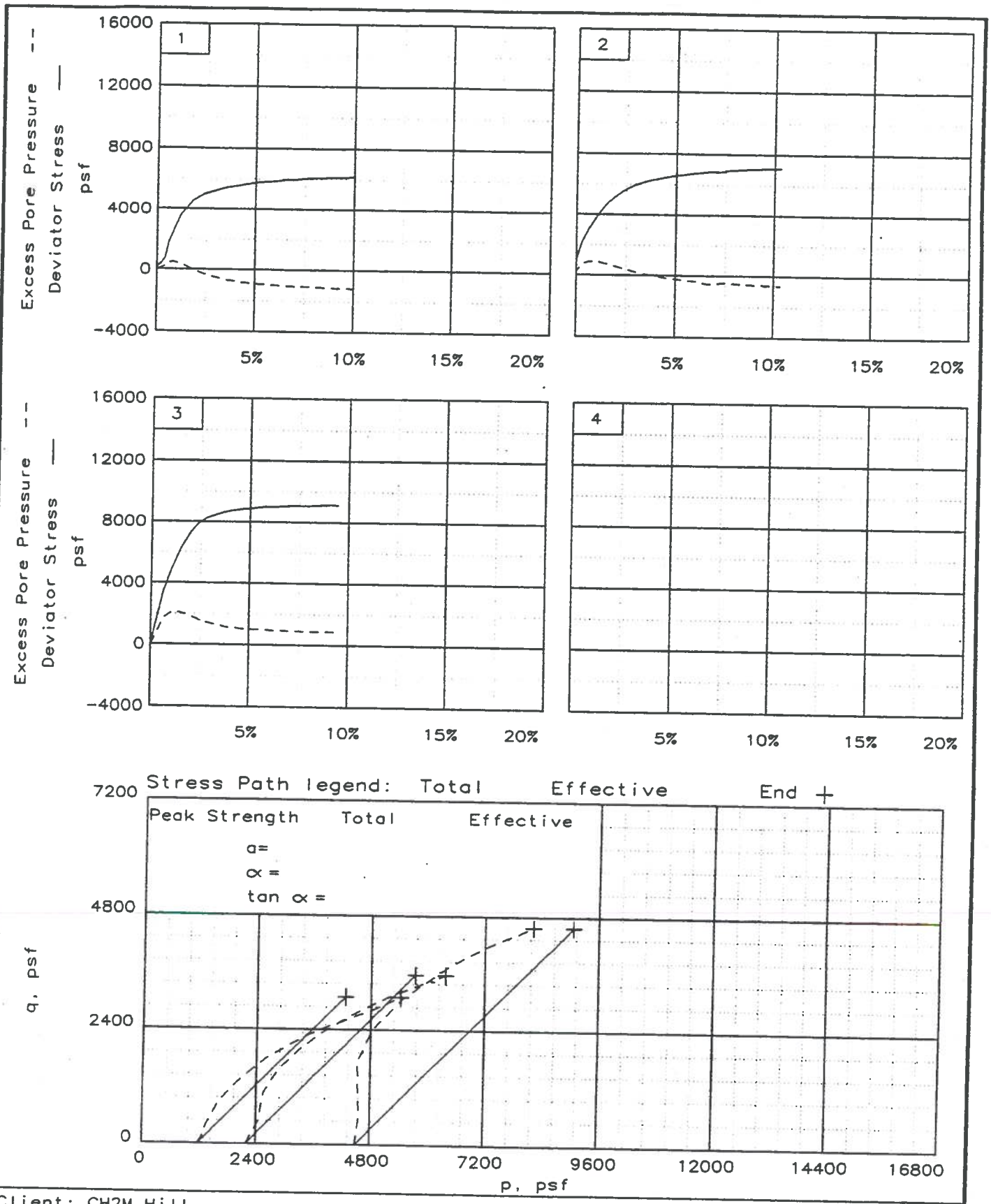
SAMPLE LOCATION: 2B-7, 2ST
10 - 12 feet

PROJ. NO.: 95103007 DATE: 3/30/95

TRIAXIAL SHEAR TEST REPORT

FIG. NO. 2

Foundation Engineering, Inc.



Client: CH2M Hill

Project: Salmon Creek WWTP

Location: 2B-7, 2ST 10 - 12 feet

File: SALMON-A Project No.: 95103007

FOUNDATION ENGINEERING

PROJ. NAME: Salmon Creek NWTP
PROJ. NO.: 95103007
DATE: 9/13/95
BY: FBT/GWH
1 OF 1

TRIAXIAL SHEAR TEST RESULTS

The shear strength parameters (c', ϕ') can be determined based on the effective stress paths (p-q plots). Rick Thrall, PE from our Portland office recommends this procedure and determined the following:

- For sample 2B-7, 2ST the p-q plots yield the values below: based on a K_f line drawn on the plot.

$\alpha = 26.8°$
$a = 530$ psf

where: • α is the angle of the K_f line with respect to the horizontal, in degrees
• a is the intercept on the q-axis, in stress units.

By geometry of the Mohr's circles between the Mohr-Coulomb failure envelope and the K_f line, α relates to ϕ' by the following relationship

$$\sin \phi' = \tan \alpha \quad \text{and} \quad c = \frac{a}{\cos \phi'}$$

From the p-q plots on the following pages, we have estimated

$\phi' = \sin(\tan 26.8)^{-1}$

$\phi' = 30.3°$

$c' = \frac{530 \text{ psf}}{\cos 30.3°}$

$c' = 614 \rightarrow 600$ psf

- For sample 2B-4, 7ST, we estimated:

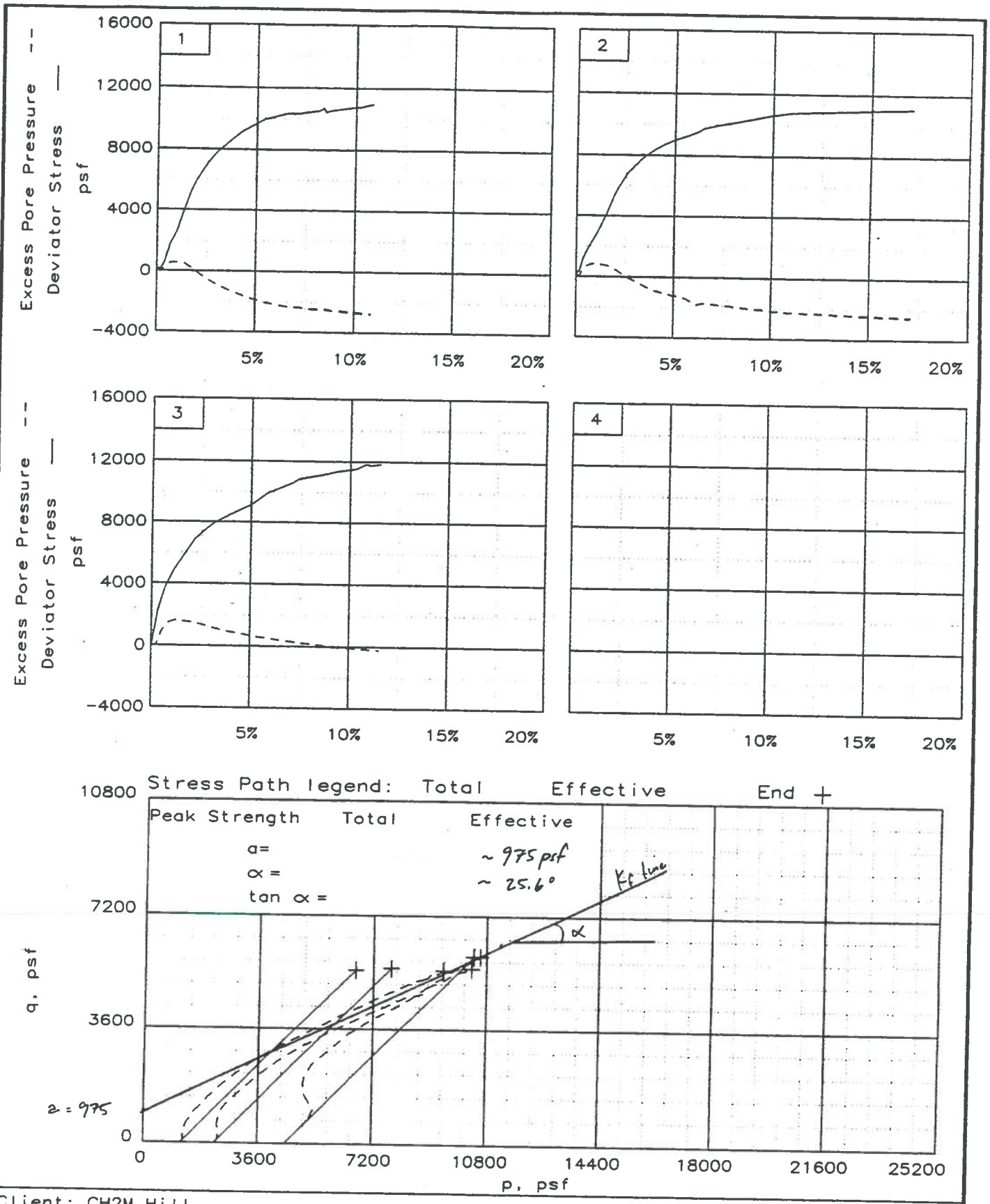
$\alpha = 25.6°$
$a = 975$ psf

$\therefore \quad \phi' = \sin(\tan 25.6°)^{-1}$

$\phi' = 28.6°$

$c' = \frac{975 \text{ psf}}{\cos 28.6°}$

$c' = 1110 \rightarrow 1100$ psf

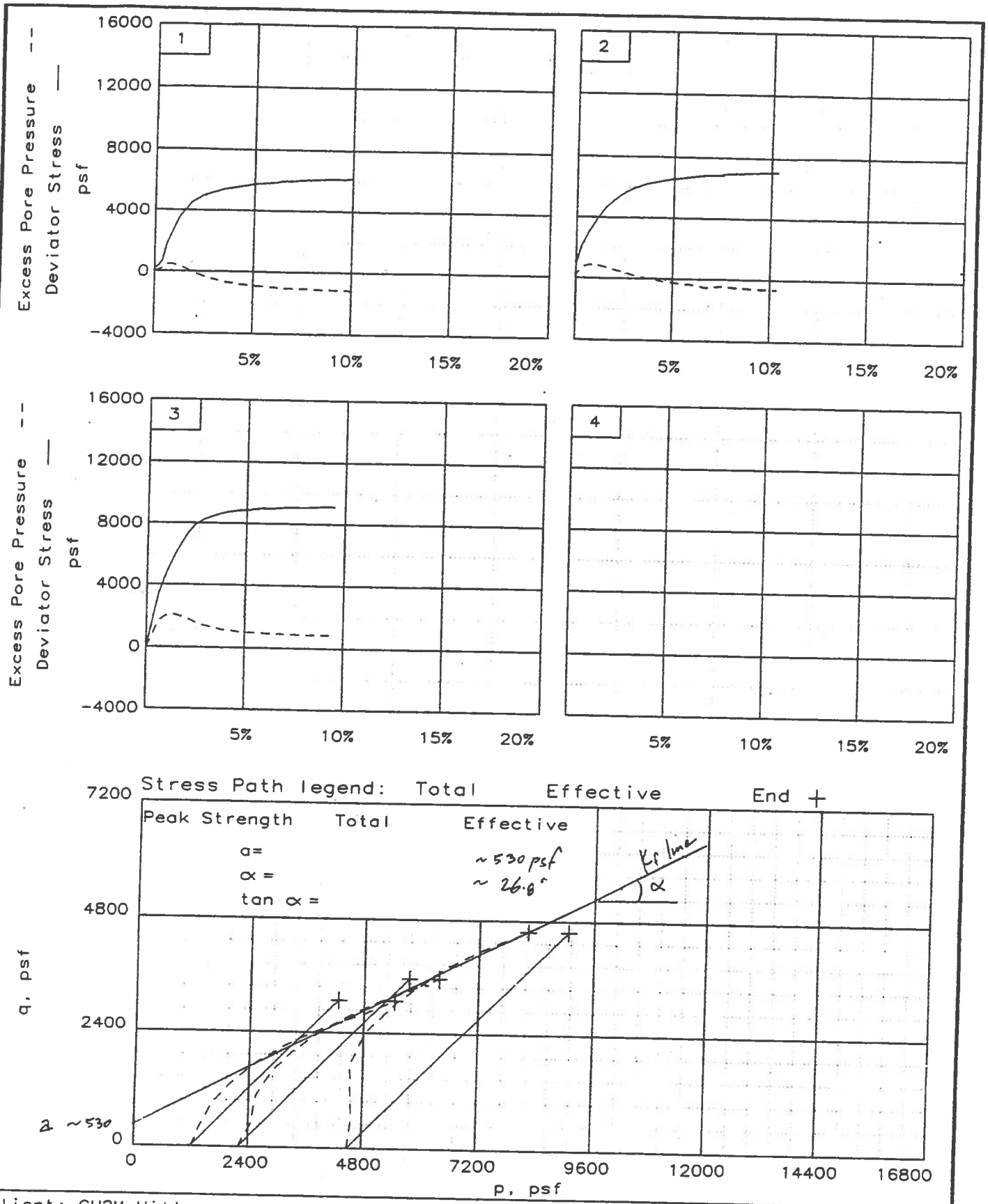


Client: CH2M Hill

Project: Salmon Creek WWTP

Location: 2B-4, 7ST 30 to 32 feet

File: SALMON1 Project No.: 95103007 Page 2/2 Fig. No. 1



Client: CH2M Hill

Project: Salmon Creek WWTP

Location: 2B-7, 2ST 10 - 12 feet

File: SALMON-A Project No.: 95103007

AGI
TECHNOLOGIES

February 24, 1995

CH2M Hill
825 N.E. Multnomah, Suite 1300
Portland, OR 97232-2146
ATTN: Todd Cotton

RE: Soils Laboratory Testing Results
Project Number: OPW35382.EN.03

****

Enclosed you will find the laboratory test data you requested on 02-16-95.

Sincerely,

Roxanne George
Lab Manager/Engineer
AGI Technologies

541 N.E. 20th, Suite 103 ■ Portland, Oregon 97232 ■ (503) 232-1800 ■ FAX (503) 232-9272
WASHINGTON OREGON CALIFORNIA

AGI TECHNOLOGIES

CLASSIFICATION OF UNDISTURBED SAMPLE

Boring/Test Pit 2B2 - SST
Sample No. –
Depth 25.0' - 27.0'
Condition: Good (Fair) Poor (Disturbed)
Recovery: 1.9 ft (ft.)

Job Number 30127.06
Job Name CH2M / OPW 35382.ENO3
Date 2-17-95
Test By: RGG

25.0 BORING DEPTH (FT)

DEPTH (FT.) FROM TOP OF SAMPLE

TARE	STRENGTH (TV or PP) psi	CLASSIFICATION
0.0		
99 γ used For consol, A.L. B		
0.5		
81 P.P.=2.0 T.V.=0.53		medium dense, mottled grey/brown SILT with some fine sand, trace to some clay; damp, trace organics (roots) clay content decreases with depth
1.0 γ saved A		
1.5	P.P.=0.75 T.V.=0.21	
sample 157 broke along contact ↗		Loose, brown SAND with some SILT; damp, predominantly fine to medium sand, trace roots
26.9		
2.0		
2.5		

REMARKS: Saved Jar? (Y) N Saved 2 Tubes

T.V., P.P = torvane, pocket penetrometer, in kg/cm²

NOTE: 1 cubic foot = 1728 cubic inches
1 pound = 453.6 grams
Standard dia. X L = 2.8" x 7.0"
Standard Volume = 0.0249 ft3

MOISTURE CONTENT				
Tare No.	157	81	99	
Wet + Tare	86.8	77.7	72.6	
Dry + Tare	74.4	61.0	59.4	
Wt. Water				
Tare Wt.	14.3	15.8	15.6	
Dry Wt. Soil				
% Moisture	20.6	36.9	30.1	

UNIT WEIGHT	A	B
Dia. x L (in)	Std	Std
Volume (ft³)	"	"
Wet Wt. (g)	1321.2	1311.4
Dry Wt. (g)		
Wet Density (pcf)	116.8	115.9
Dry Density (pcf)	90.7	86.8
% Moisture	28.8%	33.5%

AGI TECHNOLOGIES

ATTERBERG LIMITS DETERMINATION
ASTM D4318

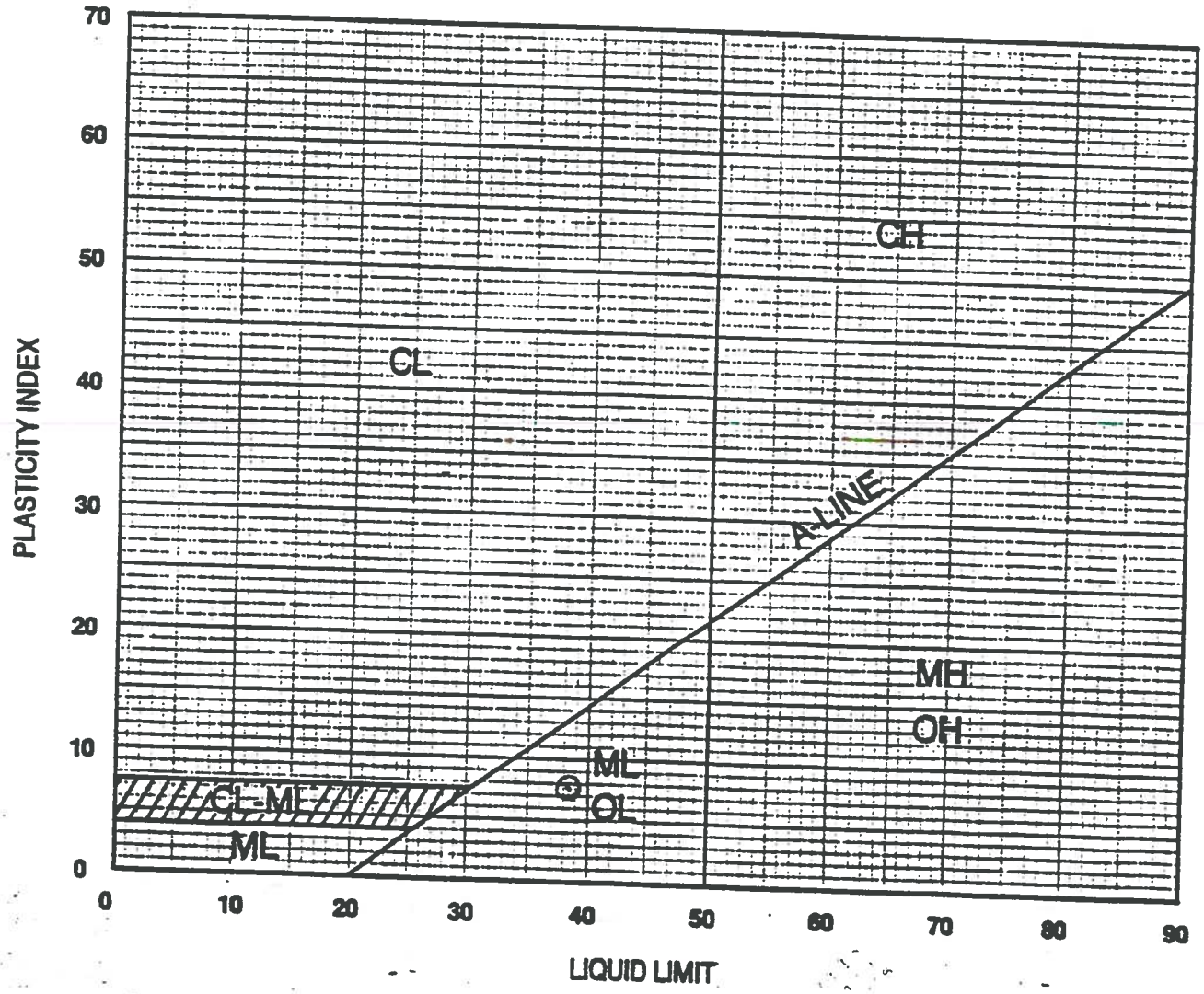
JOB NO. 30127055
JOB NAME CH2M / OPW35382
SAMPLE 2B-2, SST
DATE 2/21/95
TESTED BY [illegible]

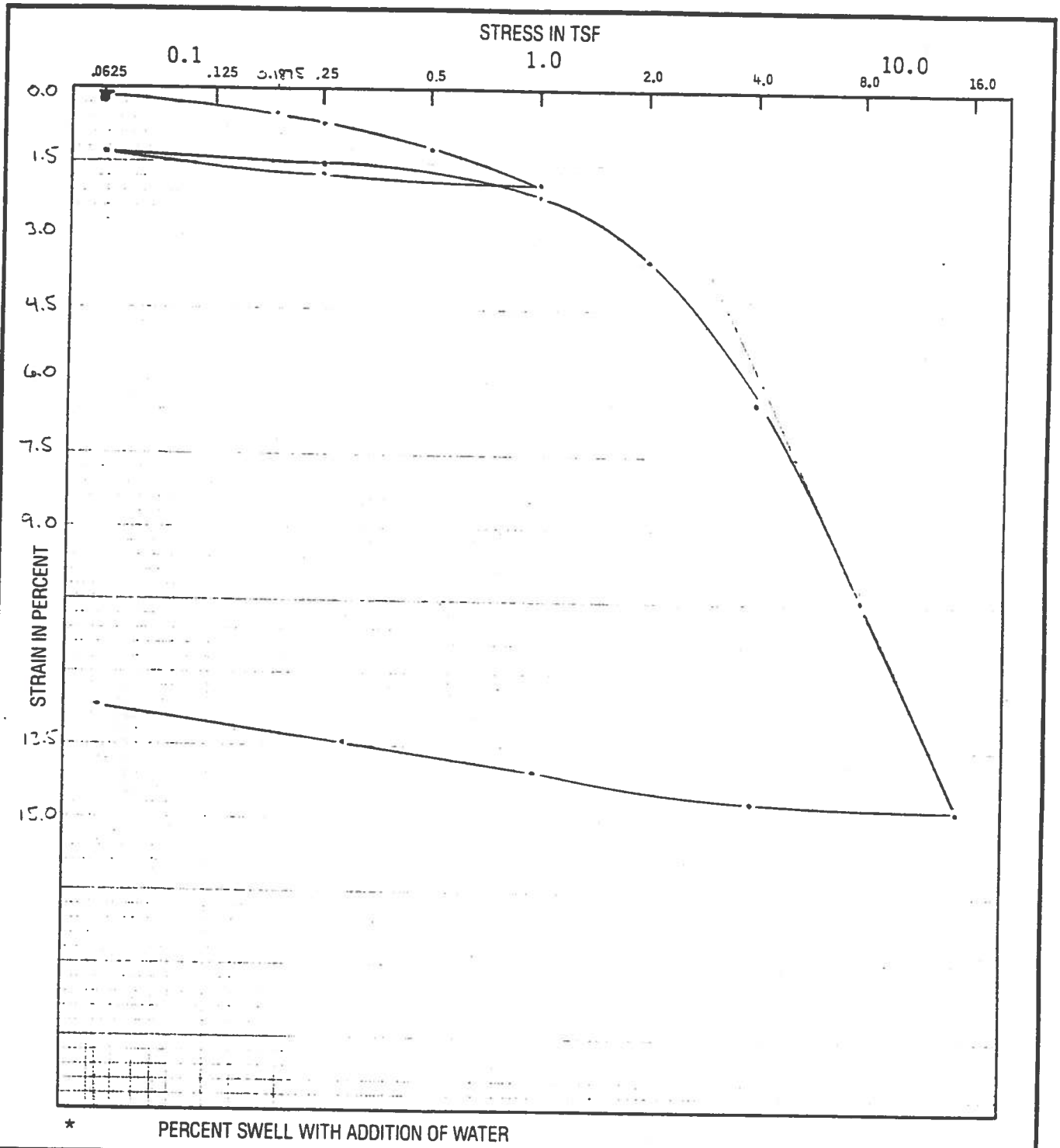
SAMPLE DESCRIPTION Gray Silt

	W_{NAT}	W_L		W_P
Tare No.	119	93	124	130
Wet wt. + tare	28.95	52.14	53.56	26.42
Dry wt. + tare	25.89	41.94	42.90	23.80
Tare wt.	15.68	15.54	15.15	14.94
Water content, %	30.0	38.6	38.4	19.6
No. of blows, N		24	24	
		38.4	38.2	

Liquid Limit, L_L = 38.3
Plastic Limit, L_P = 29.6
Plasticity Index, I_P = 8.7

$L_L = W_L (N/25)^{0.121}$
$I_P = L_L - L_P$





* PERCENT SWELL WITH ADDITION OF WATER

BORING NUMBER	SAMPLE NUMBER	DEPTH IN FEET	WATER CONTENT IN PERCENT		INITIAL UNIT WEIGHT IN PCF		CLASSIFICATION
			NATURAL	FINAL	WET	DRY	
2B-2	5 ST	25.2-25.8	32.1	30.6	111.8	84.7	medium dense, mottled grey-brown SILT with some fine sand, trace to some clay.

Applied Geotechnology Inc.
Geotechnical Engineering
Geology & Hydrogeology

Consolidation Test

FIGURE

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
30,127.066	RGG		2-24-95		

CONSOLIDATION TEST SUMMARY
ASTM 2435

AGI TECHNOLOGIES

Date Started 2-16-95 Job No. 30,127.0660

Date Finished 2-23-95 Job CH2M/OPN35327.EN03

Tested By RGG Sample 2B2, SST

Soil Description Medium dense, mottled grey-brown SILT with some fine sand, trace to some clay

Consolidometer A Depth of test specimen 25.2 - 25.8

SAMPLE INFORMATION		INITIAL WATER CONTENT		FINAL WATER CONTENT	
wt. soil + ring	657.4	container	36	container	C-2
wt. ring	513.3	wet soil + tare	71.5	wet soil + tare	299.0
wt. wet soil	144.1 g	dry soil + tare	58.0	dry soil + tare	266.3
wet density	111.8 pcf	wt. tare	15.9	wt. tare	159.6
dry density	84.7 pcf	% water	32.1%	% water	30.6%

CONSOLIDATION SUMMARY

Load (tsf)	ΔH	ΔH/H	% Consolidation	Load (tsf)	ΔH	ΔH/H	% Consolidation
1/16	0.0026		0.26	4	0.1459		14.59
1/16, H2O	0.0020		0.20	1	0.1406		14.06
1/8 (3/16)	0.0054		0.54	1/4	0.1339		13.39
1/4	0.0072		0.72	1/16	0.1275		12.75
1/2	0.0121		1.21				
1	0.0193		1.93				
1/4	0.0169		1.69				
1/16	0.0135		1.35				
1/4	0.0150		1.50				
1	0.0216		2.16				
2	0.0350		3.50				
4	0.0644		6.44				
8	0.1043		10.43				
16	0.1482		14.82				

CONSOLIDATION TEST

D 4186

Applied Geotechnology Inc.
Geotechnical Engineering
Geology & Hydrogeology

Date Started 2-16-95
Date Finished 2-23-95
Consolidometer A
Soil Description

Job No. 30,127.0666
Job CH2M/OPW35382.EM.0
Sample No. 2B-2, SST

Load 1/16 tsf
Date 2-16-95
Applied By RGG

Clock time & date	Elapsed time (min)	Stone Correction: 1005 Original	Adjusted
5:06	0	1000	
	0.10	1012	
	0.25	1013	
	0.50	1015	
5:07	1	1017	
5:08	2	1019	
5:10	4	1020	
5:14	8	1025	
5:21	15	~~1025~~	
5:36	30		
6:06	60		
	1000	~~1025~~	Δ=26
	Est. rated	1031	

Load 1/16 tsf + H2O + kaowool
Date 2-16-95
Applied By RGG

Clock time & date	Elapsed time (min)	Stone Correction: 1005 Original	Adjusted
5:14	0	1025	
	0.10		
	0.25		
	0.50		
	1		
	2		
	4		
	8		
	15		
	30		
	60		
8:18 am	904	1025	
	1000	1025	Δ=20

Load 1/8 tsf (3/16 tsf)
Date 2-17-95
Applied By RGG

Clock time & date	Elapsed time (min)	Stone Correction: 1008 Original	Adjusted
8:20	0	1025	
	0.10	1049	
	0.25	1050	
	0.50	1052	
8:21	1	1053	
8:22	2	1055	
8:24	4	1056	
8:28	8	-	
8:35	15	-	
8:50	30	1058	
9:20	60	-	
	1000	1062	Δ=54

Load 1/4 tsf
Date 2-17-95
Applied By RGG

Clock time & date	Elapsed time (min)	Stone Correction: 1012 Original	Adjusted
8:50	0	1058	
	0.10	1070	
	0.25	1071	
	0.50	1072	
8:51	1	1073	
8:52	2	1074	
8:54	4	1076	
8:58	8	-	
9:08	15	1078	
9:20	30	-	
9:50	60	1080	
	1000	1084	Δ=72

Applied Geotechnology Inc.
Geotechnical Engineering
Geology & Hydrogeology

CONSOLIDATION TEST
D 4186

Date Started 2-16-95
Date Finished 2-23-95
Consolidometer A
Soil Description

Job No. 30,127.066
Job CH2M/OPW35382.EN.03
Sample No. 282, SST

Load 1/4 tsf, reload
Date 2-21-95
Applied By RGG

Clock time & date	Elapsed time (min)	Stone Correction: 1014 Original	Adjusted
11:49	0	1143	
	0.10	1156	
	0.25	1157	
	0.50	1158	
11:50	1	1159	
11:51	2	1160	
11:53	4	-	
11:57	8	1160	
12:04	15	-	
12:19	30	-	
12:49	60	1162	
	1000	1164	Δ=150

Load 1 tsf, reload
Date 2-21-95
Applied By RGG

Clock time & date	Elapsed time (min)	Stone Correction: 1029 Original	Adjusted
12:43	0	1162	
	0.10	1220	
	0.25	1222	
	0.50	1224	
12:44	1	1230	
12:45	2	1232	
12:47	4	1234	
12:51	8	1235	
12:58	15	-	
13:13:26	30:43	1238	
13:43	60	-	
14:43	120	1241	
	1000	1245	Δ=216

Load 2 tsf * overnite
Date 2-21-95
Applied By RGG

Clock time & date	Elapsed time (min)	Stone Correction: 1043 Original	Adjusted
1450	0	1241	
	0.10	1322	
	0.25	1331	
	0.50	1337	
1451	1	1342	
1452	2	1348	
14545	4.5	1356	
1458	8	1300	
15087	187	1366	
152042	3052	1374	
1580	60	-	
1743	173	1383	
848	1078	1394	
	1000	1393	Δ=350

Load 4 tsf
Date 2-22-95
Applied By RGG

Clock time & date	Elapsed time (min)	Stone Correction: 1062 Original	Adjusted
8:49	0	1394	
	0.10	1565	
	0.25	1585	
	0.50	1598	
8:50	1	1609	
8:51	2	1619	
8:53	4	1629	
8:57	8	1640	
9:0145	186	1648	
9:19	30	1657	
9:49	60	-	
10:27	98	1675	
	1000	1706	Δ=644

Applied Geotechnology Inc.
Geotechnical Engineering
Geology & Hydrogeology

CONSOLIDATION TEST

D 4186

Date Started 2-16-95

Date Finished 2-23-95

Consolidometer A

Soil Description

Job No. 30,127.066

Job OPW/35382.EN.03

Sample No. 2B-2, SST

Load 1/4 tsf, unload
Date 2-23-95
Applied By RGG

Clock time & date	Elapsed time (min)	Stone Correction: 1019 Original	Adjusted
10:25	0	2450	
	0.10	2415	
	0.25	2408	
	0.50	2401	
10:26	1	2395	
10:27	2	2390	
10:29	4	2385	
10:33	8	2381	
10:40	15	2376	
10:55	30	2373	
11:25	60	23	
12:02	87	2368	
	1000	2358	Δ = 1339

Load 1/16 tsf, unload
Date 2-23-95
Applied By RGG

Clock time & date	Elapsed time (min)	Stone Correction: 1010 Original	Adjusted
1203	0	2368	
	0.10	2354	
	0.25	2349	
	0.50	2344	
1204	1	2338	
1205	2	2332	
1207	4	2326	
1211	8	2321	
1218	15	—	
1233	30	—	
1303	60	—	
1324	81	2303	
	1000	2285	Δ = 1275

Load
Date
Applied By

Clock time & date	Elapsed time (min)	Stone Correction: Original	Adjusted
	0		
	0.10		
	0.25		
	0.50		
	1		
	2		
	4		
	8		
	15		
	30		
	60		

Load
Date
Applied By

Clock time & date	Elapsed time (min)	Stone Correction: Original	Adjusted
	0		
	0.10		
	0.25		
	0.50		
	1		
	2		
	4		
	8		
	15		
	30		
	60		

Appendix G
Supplemental Data

Supplementary Data

Additional Soil Borings

An additional soil boring, 2B-13, was advanced at the site on 10/10/95. A copy of the Site Plan showing the approximate location of the soil boring is attached. A copy of the soil boring log is included in Appendix E.

Groundwater Measurements

Groundwater measurements made at the Salmon Creek Wastewater Treatment Plant are summarized in the Table 1, below.

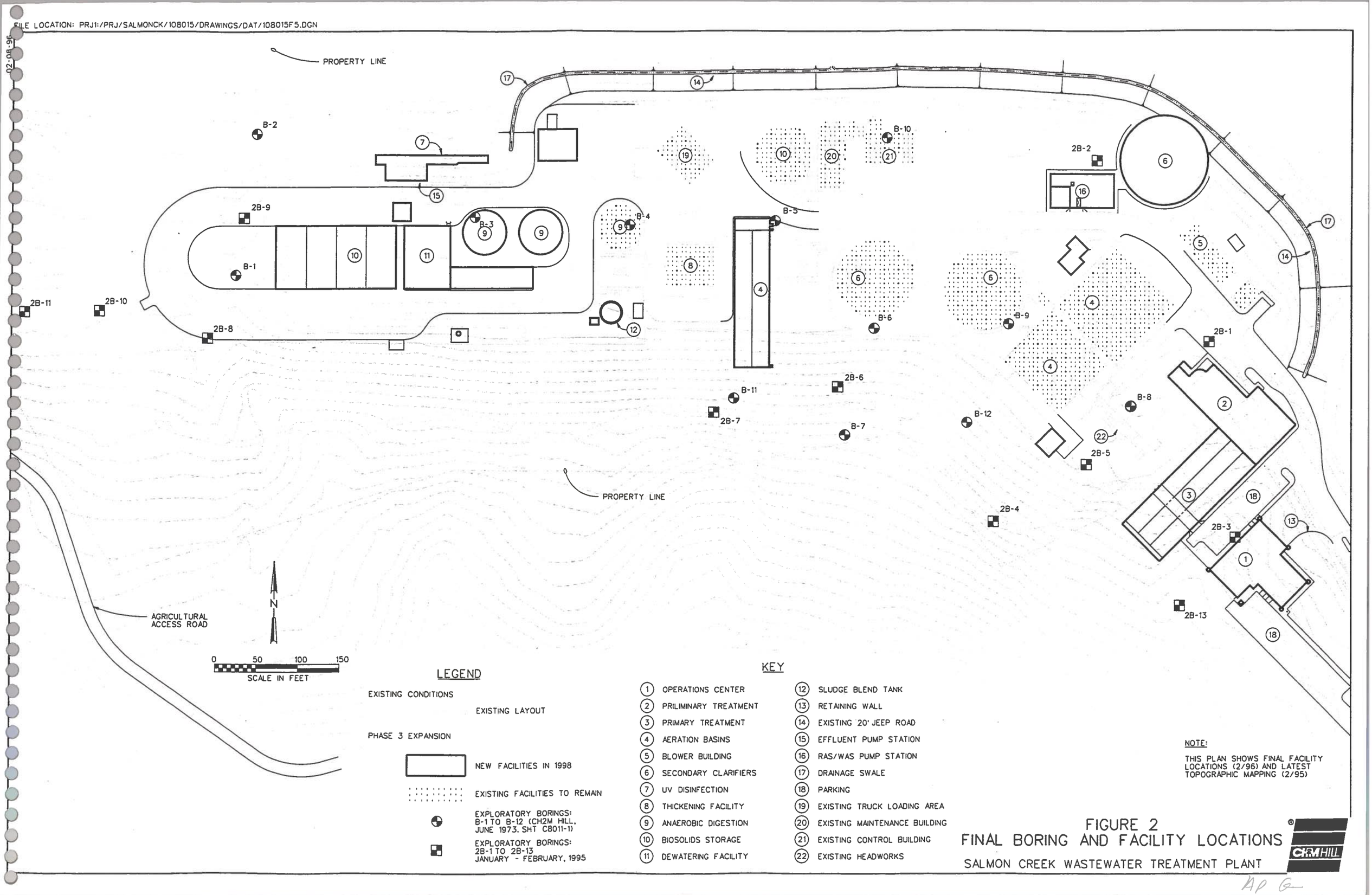
Table 1. Groundwater Depths and Elevations.

Piezometer No.	Ground Elevation (ft)	Date Measured	Groundwater Depth (ft)	Groundwater Elevation (ft)
2B-2	38.9	2/15/95	29.0	9.9
		6/5/95	29.1	9.8
		11/20/95	31.0	7.9
		12/15/95	24.2	14.7
2B-3	72.0	2/23/95	28.8	43.2
		11/20/95	30.1	41.9
		12/15/95	28.9	43.1
2B-5	46.7	2/15/95	15.0	31.7
		6/5/95	14.6	32.1
		11/20/95	13.6	33.1
		12/15/95	12.6	34.1
2B-9	30.4	1/25/95	25.0	5.4
		6/5/95	21.0	9.4
		12/15/95	16.1	14.3
2B-11	44.2	2/23/95	20.5	23.7
		6/5/95	31.0	13.2

Piezometers installed at soil borings 2B-6 and 2B-13 apparently did not function because the piezometer tip was set in the hard , low plasticity clay. Significant flows of groundwater may occur in the upper sand at these boring locations, as noted during drilling of boring 2B-6, on the soil boring log.

FILE LOCATION: PRJ1:/PRJ/SALMONCK/108015/DRAWINGS/DAT/108015F5.DGN

02-08-96



LEGEND

EXISTING CONDITIONS

EXISTING LAYOUT

PHASE 3 EXPANSION

NEW FACILITIES IN 1998

EXISTING FACILITIES TO REMAIN

EXPLORATORY BORINGS: B-1 TO B-12 (CH2M HILL, JUNE 1973. SHT C8011-1)

EXPLORATORY BORINGS: 2B-1 TO 2B-13 JANUARY - FEBRUARY, 1995

KEY

1. OPERATIONS CENTER
2. PRILIMINARY TREATMENT
3. PRIMARY TREATMENT
4. AERATION BASINS
5. BLOWER BUILDING
6. SECONDARY CLARIFIERS
7. UV DISINFECTION
8. THICKENING FACILITY
9. ANAEROBIC DIGESTION
10. BIOSOLIDS STORAGE
11. DEWATERING FACILITY
12. SLUDGE BLEND TANK
13. RETAINING WALL
14. EXISTING 20' JEEP ROAD
15. EFFLUENT PUMP STATION
16. RAS/WAS PUMP STATION
17. DRAINAGE SWALE
18. PARKING
19. EXISTING TRUCK LOADING AREA
20. EXISTING MAINTENANCE BUILDING
21. EXISTING CONTROL BUILDING
22. EXISTING HEADWORKS

NOTE:

THIS PLAN SHOWS FINAL FACILITY LOCATIONS (2/96) AND LATEST TOPOGRAPHIC MAPPING (2/95)

FIGURE 2
FINAL BORING AND FACILITY LOCATIONS
SALMON CREEK WASTEWATER TREATMENT PLANT

CH2MHILL

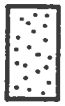
AP G

LEGEND

FILL - MAN-MADE, MODERATELY COMPACT, SAND, SILTY, SLIGHTLY CLAYEY, OCCASIONAL GRAVEL IN UPPER 5 FEET, MOIST TO VERY MOIST, GRAY TO BROWN (AF)

SILT - MEDIUM STIFF TO VERY STIFF, SANDY TO VERY SANDY, OCCASIONAL FINE GRAVELS, SLIGHTLY CLAYEY, MOIST TO SATURATED, BROWN TO GRAY (ML)

SILT - STIFF, SANDY, CLAYEY, OCCASIONAL FINE GRAVELS, TRACES OF ORGANICS, MOIST TO VERY MOIST, BROWN TO GRAY (ML, CL)



SAND - MEDIUM DENSE TO VERY DENSE, CLEAN TO SILTY, WITH SILT LENSES, MOIST TO SATURATED, GRAY - BROWN (SP, SM)

GRAVEL AND COBBLE (POSSIBLE TROUTDALE FORMATION), VERY DENSE, SANDY MATRIX, VERY DIFFICULT DRILLING, MOIST, GRAY (GP, GM)

INDICATES THAT 17 BLOWS OF A 140-lb HAMMER FALLING 30 INCHES ARE REQUIRED TO DRIVE A 2-INCH DIAMETER SAMPLE 12 INCHES

INDICATES DEPTH AT WHICH A SHELBY TUBE SAMPLE WAS OBTAINED

INDICATES THE DEPTH TO THE GROUNDWATER TABLE

MC INDICATES MOISTURE CONTENT OF SAMPLE IN PERCENT

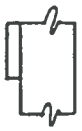
OGDEN SURVEYING EQUIPMENT CO. 84420

FIGURE 4

DESIGN BY	MVH	CHECKED BY	MVH	LEGEND OF BORINGS	APPROVED	CENTURY WEST ENGINEERING CORPORATION
SURVEY BY		SCALE	—	SALMON CREEK WWTP CLARK COUNTY, WA	DATE AUG. 1989	
DRAWN BY	PAM	DWG. NO.	40018.003.01			

LEGEND CONT.

INDICATES DEPTH AT WHICH DRILLING REFUSAL WAS ENCOUNTERED



INDICATES DEPTH TO WHICH A 1-INCH DIAMETER PVC PIPE WAS INSTALLED TO MONITOR GROUND WATER

NOTES:

1. BORING NOS. 1 & 2 WERE DRILLED IN APRIL, 1986 BY CENTURY WEST ENGINEERING AND ARE INCLUDED IN THIS REPORT BECAUSE OF THEIR PROXIMITY TO PROPOSED STRUCTURES.

2. BORING NOS. 3 THROUGH 6 WERE DRILLED ON AUGUST 15 & 16, 1989 WITH A 4-INCH ID HOLLOW-STEM AUGER POWERED BY A MOBILE B-61 DRILLING RIG.

3. BORING LOCATIONS SHOWN IN THIS REPORT ARE APPROXIMATE AND WERE DETERMINED BY PACING OR TAPING FROM KNOWN REFERENCE POINTS.

4. ELEVATIONS ARE APPROXIMATE AND REFER TO TOPOGRAPHIC MAPS PREPARED FOR THE SITE.

5. DRILL LOGS SHOWN ARE SUBJECT TO THE EXPLANATIONS, CONCLUSIONS AND LIMITATIONS OF THE REPORT.

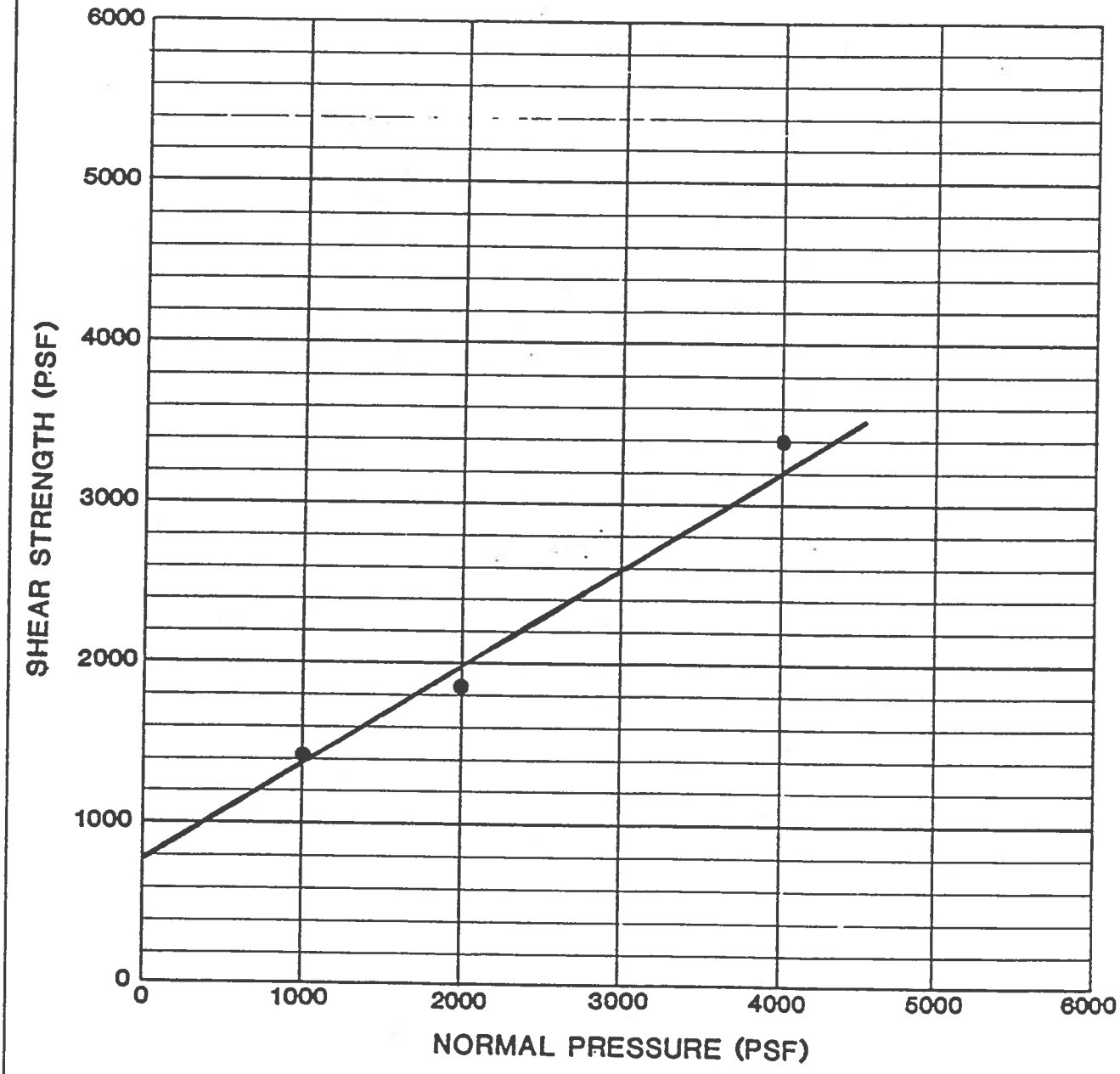
FIGURE 5

DESIGN BY	MVH	CHECKED BY	MVH	LEGEND OF BORINGS	APPROVED
SURVEY BY		SCALE	—	SALMON CREEK WWTP CLARK COUNTY, WA	DATE AUG. 1989
DRAWN BY	PAM	DWG. NO.	40018.003.01		CENTURY WEST ENGINEERING CORPORATION

CENTURY WEST ENGINEERING

DIRECT SHEAR TEST RESULTS

SAMPLE LOCATION: BORING NO. 5 , DEPTH 24'

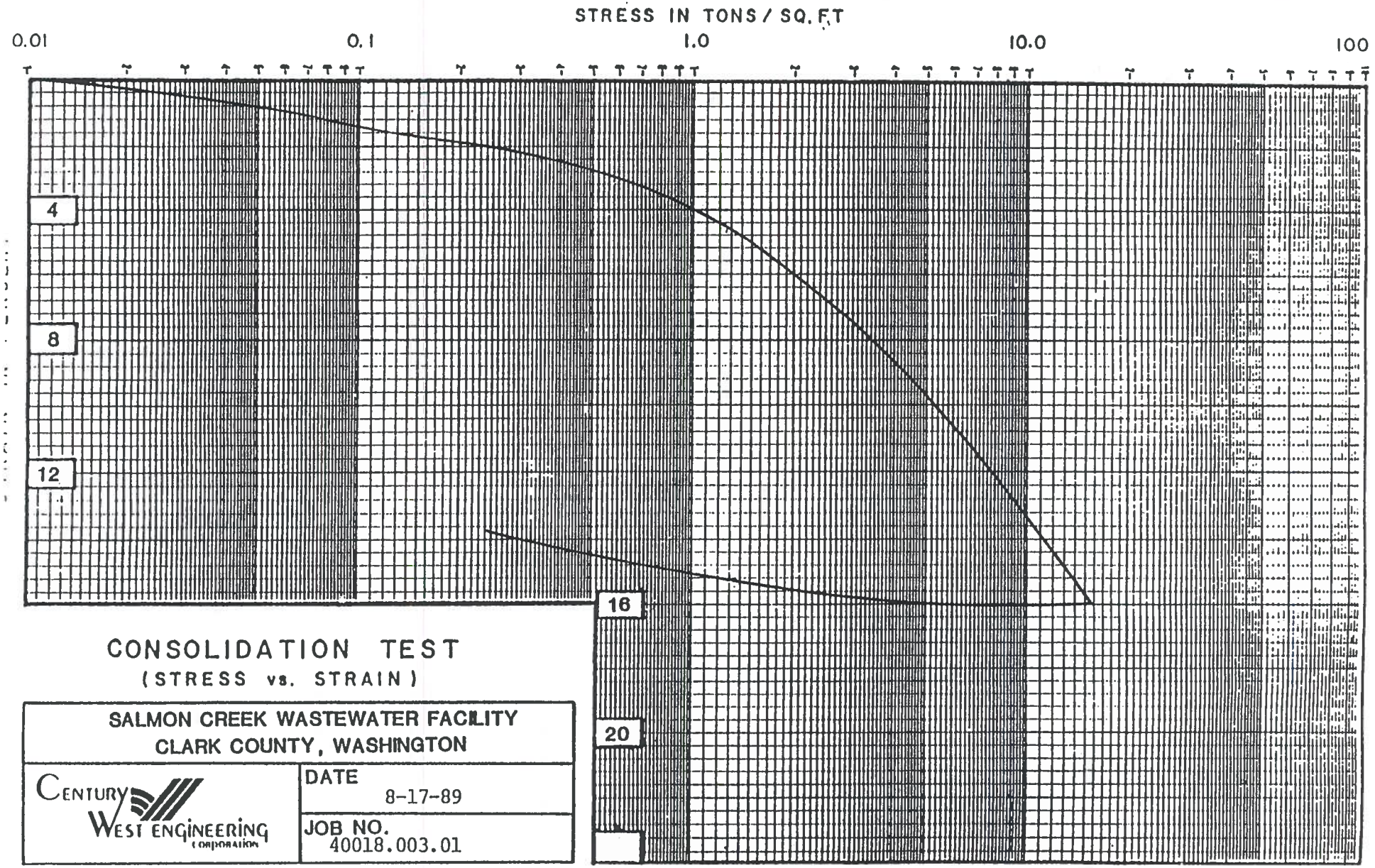


SYMBOL	SAMPLE DESCRIPTION	COHESION (PSF)	FRICTION ANGLE (°)	REMARKS
(ML)	SILT, very sandy, slightly clayey	800	31	Residual shear strengths plotted on graph

PROJECT NO. 4001800301 | CLIENT: Clark County | DATE RECEIVED: 8/18/89

FIGURE 6

BORING	SAMPLE	DEPTH feet	% W.C. BEFORE	% W.C. AFTER	HEIG inches	DIAMETER inches	CLASSIFICATION
No. 4		22.5'	37.2%	30.3	1"	2.44"	SILT, sandy, slightly clayey, brown (ML)



CONSOLIDATION TEST
(STRESS vs. STRAIN)

SALMON CREEK WASTEWATER FACILITY CLARK COUNTY, WASHINGTON	
CENTURY WEST ENGINEERING Corporation	DATE 8-17-89
	JOB NO. 40018.003.01

FIGURE 7

CENT IY WEST ENGINEERING CORPORATION MAIL: PO BOX 1174 BEND, OR 97709 (503) 388-350.

CLIENT Clark County DATE RECEIVED 8/17/89

PROJECT Salmon Creek Wastewater Plant LAB NO. 1099 BORING No. 4 DEPTH 7.5'

MATERIAL DESCRIPTION FILL, man-made, silt, very sandy, gravelly, brown (AF)

LIQUID LIMIT 23 PLASTICITY INDEX 4 REMARKS

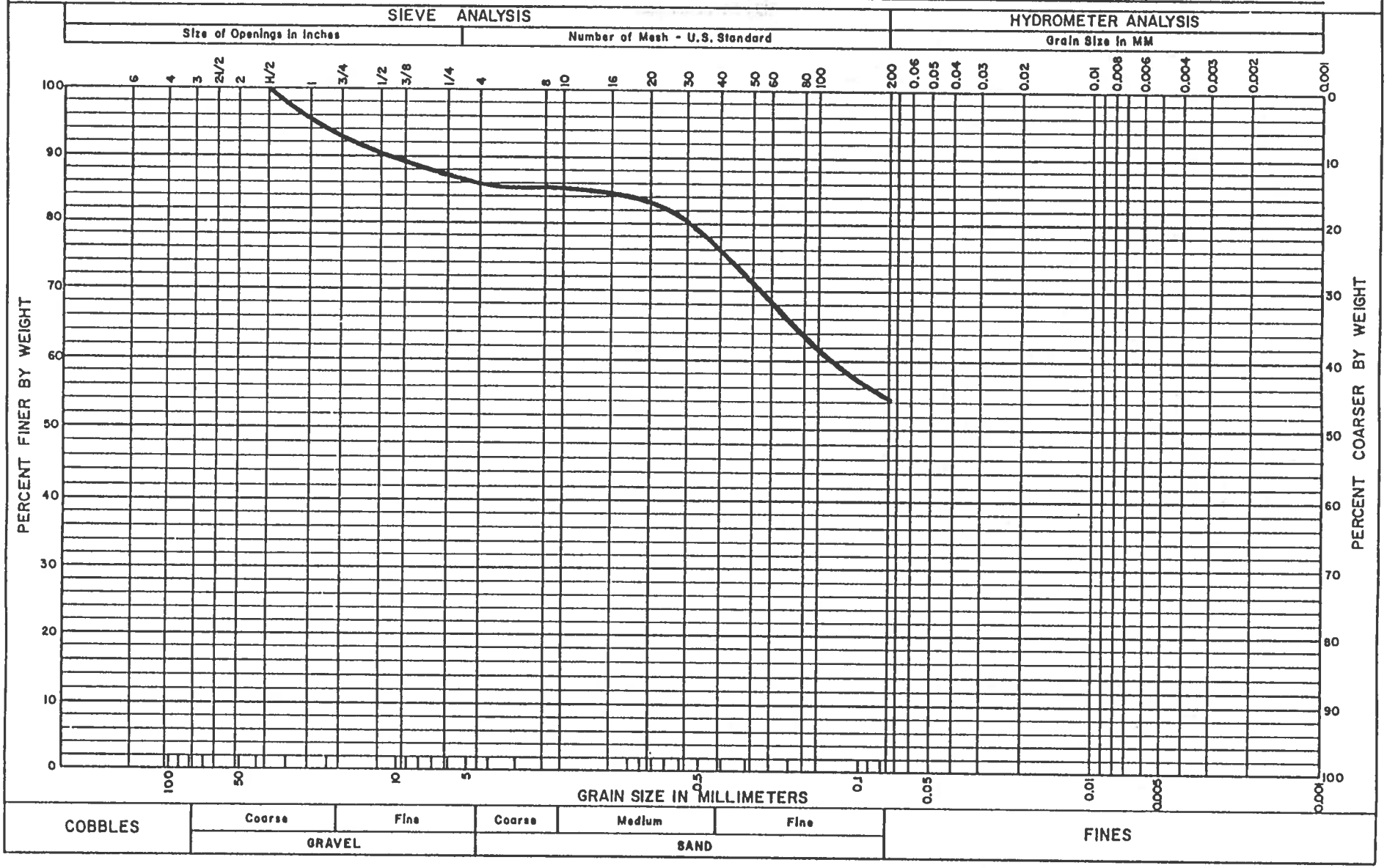


FIGURE 8

GRADATION TEST RESULTS

CENTURY WEST ENGINEERING CORPORATION

MAIL: PO BOX 1174 BEND, OR 97709 (503) 388-3600

CLIENT Clark County DATE RECEIVED 8/17/89

PROJECT Salmon Creek Wastewater Plant LAB NO. 1099 BORING No. 5 DEPTH 12.5'

MATERIAL DESCRIPTION SILT, very sandy, brown (ML)

LIQUID LIMIT 25 PLASTICITY INDEX Non-plastic REMARKS

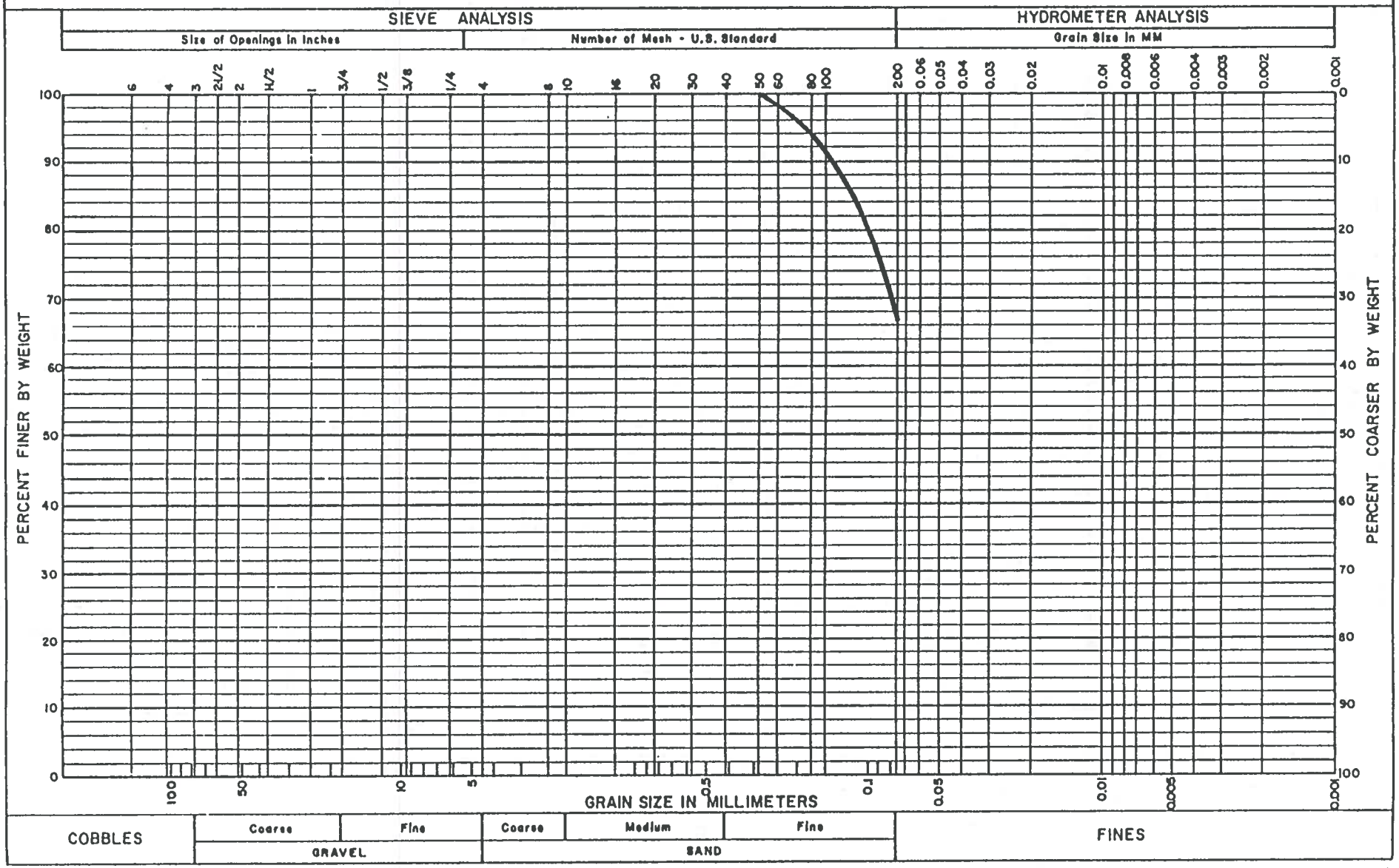
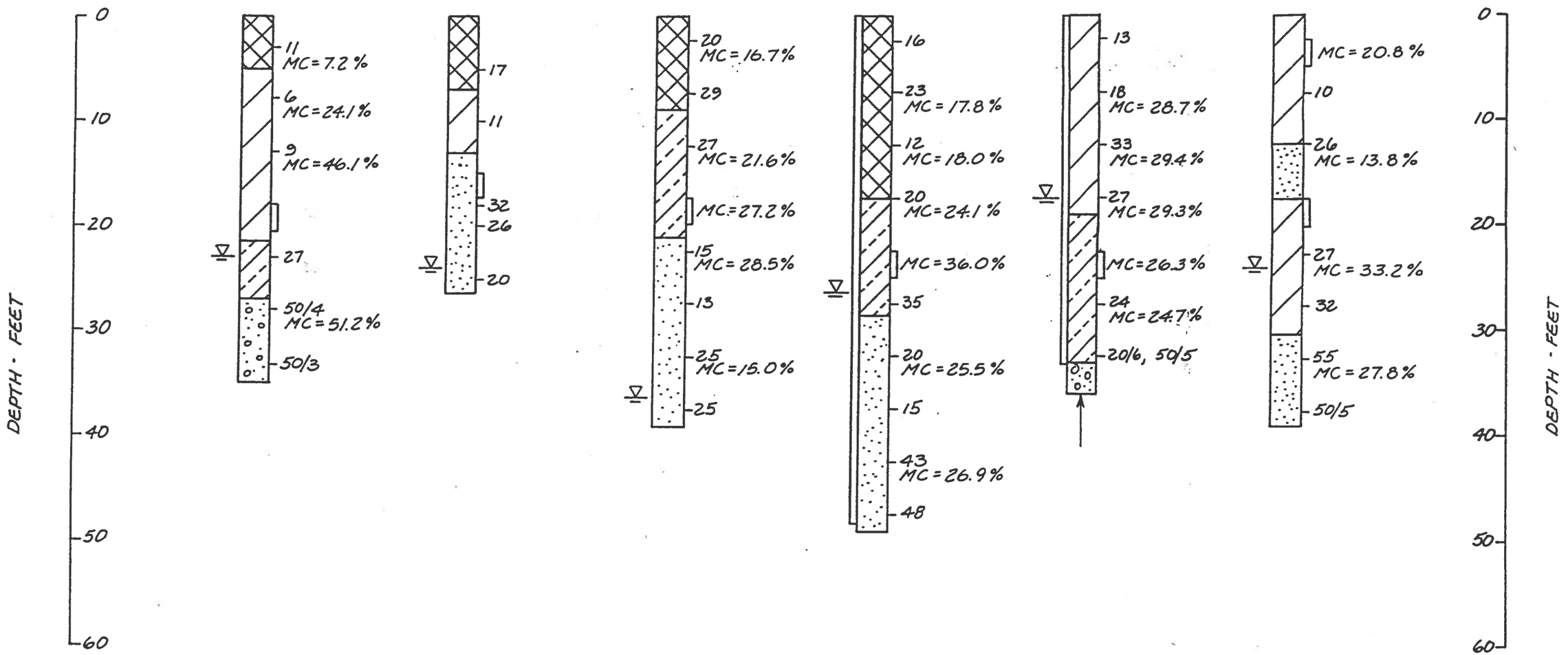


FIGURE 9

GRADATION TEST RESULTS



NOTE: BORING NOS. 1 & 2 WERE DRILLED IN APRIL 1986.

REVISIONS				
NO.	BY	APPVL		DATE

DESIGNED BY MVH	DATE AUG 1989
DRAWN BY PAM	SCALE AS SHOWN
CHECKED BY MVH	SEC.
DRAWING NO.	40018.003.01

LOGS OF EXPLORATORY BORINGS

SALMON CREEK WASTEWATER TREATMENT PLANT
CLARK COUNTY WASHINGTON

CENTURY WEST ENGINEERING CORPORATION

FIGURE 3

ADDITIONAL WORK NOT SHOWN
* MODIFY 36TH AVENUE PUMP STATION

N

SALMON CREEK

PROPOSED ANAEROBIC DIGESTER

CONVERT EXISTING AEROBIC DIGESTER TO SLUDGE STORAGE TANK

INSTALL ADD'L WAS PUMP IN CONTROL BUILDING

EXISTING HUMUS PONDS TO BE CLEANED & FILLED

PROPOSED BLOWER BUILDING/ELECTRICAL EQUIPMENT ROOM

INSTALL EFFLUENT PUMPS IN CHLORINE CONTACT CHAMBER

B-6

PROPOSED SLUDGE STORAGE POND (2 BASINS)

B-4

B-1

B-2

B-3

B-5

PROPOSED SLUDGE THICKENING BUILDING

REPLACE PLANT WATER STATION

RELOCATED PLANT ACCESS ROAD

NORTHERN PACIFIC RAILROAD

EXISTING HILLSIDE

PROPOSED AERATION BASIN ADDITION

MODIFY EXISTING HEADWORKS

SITE PLAN
N.T.S.

BORING LOCATIONS

IB/IIA EXPANSION

CENTURY WEST CAROLLO
A Joint Venture
CENTURY WEST ENGINEERING CORPORATION
JOHN CAROLLO ENGINEERS

PROPOSED EXPANSION IB/IIA IMPROVEMENTS

SITE PLAN, FIGURE 2

SALMON CREEK W.W.T.P.
CLARK COUNTY, WASHINGTON

ApC b

Appendix B
Project-Specific Boring Log

JACOBS

PROJECT NUMBER:	BORING NUMBER:	
708335.03.35.03	B-1-18	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : Salmon Creek 5B — LOCATION : Secondary Clarifier No. 5

ELEVATION : — DRILLING CONTRACTOR : Holt Drilling Services

DRILLING EQUIPMENT AND METHOD : Mud Rotary, Automatic Trip Hammer, Mobile B-60 Drill; Truck Rig 215 — ORIENTATION :

WATER LEVELS : 24.7 ft bgs (1/25/2019) — START : 11/19/2018 — END : 11/19/2018 — LOGGER : P. Davis

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	SAMPLE RECOVERY (ft)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
							Grass/lawn at surface, flat topography.
5	5.0						
	6.5	0.2	1-SS	3-4-4 (8)	**SILT WITH GRAVEL (ML),** brown, wet, firm, (FILL).		SPT performed with auto trip hammer. Low recovery, approximately 20% cobbles.
10	10.0						
	11.5	0.2	2-SS	5-8-7 (15)	**SILT WITH GRAVEL (ML),** as above, except stiff, (FILL).		Approximately 20% cobbles from 1 to about 12 ft. Cobble percentage estimated from nearby test pits.
15	15.0						
	16.5	1.5	3-SS	12-13-18 (31)	**SANDY SILT (ML),** gray-olive, moist, hard, sand is fine to medium-grained.		3-inch sampler 53% fines, 47% sand
20	20.0						
	21.5	1.0	4-SS	3-4-5 (9)	**SANDY LEAN CLAY (CL),** gray-brown, moist, stiff, low plasticity.		w = 28% LL = 32% PI = 12% P200 = 65%
25	25.0						
	26.5	1.5	5-SS	3-4-4 (8)	**SILTY SAND (SM),** gray-brown, wet, loose, sand is fine grained.		w = 34% P200 = 29%
30							

JACOBS

PROJECT NUMBER:	BORING NUMBER:	
708335.03.35.03	B-1-18	SHEET 2 OF 2

SOIL BORING LOG

PROJECT : Salmon Creek 5B — LOCATION : Secondary Clarifier No. 5

ELEVATION : — DRILLING CONTRACTOR : Holt Drilling Services

DRILLING EQUIPMENT AND METHOD : Mud Rotary, Automatic Trip Hammer, Mobile B-60 Drill; Truck Rig 215 — ORIENTATION :

WATER LEVELS : 24.7 ft bgs (1/25/2019) — START : 11/19/2018 — END : 11/19/2018 — LOGGER : P. Davis

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	SAMPLE RECOVERY (ft)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
	30.0 31.5	1.5	6-SS	8-9-9 (18)	**SILTY SAND (SM),** gray-brown, wet, medium dense, sand is medium grained.		w = 25% P200 = 17%
35	35.0						
	36.5	1.5	7-SS	9-11-11 (22)	**SILTY SAND (SM),** as above.		w = 24% P200 = 13%
40	40.0						
	41.5	1.5	8-SS	8-8-11 (19)	**SILTY SAND (SM),** as above.		w = 26% P200 = 17%
45	45.0						
	46.5	1.5	9-SS	8-10-13 (23)	**SILTY SAND (SM),** as above, brown, wet, medium dense, sand is fine grained.		w = 28% P200 = 17%
50	50.0						
	51.5	1.5	10-SS	10-12-15 (27)	**SILTY SAND (SM),** as above.		w = 22% P200 = 14%
55					Bottom of Boring at 51.5 ft bgs on		2-inch diameter piezometer installed to 50 ft, 10 ft screen Flush completion monument
60							

Appendix C
Laboratory Test Results

FEI TESTING & INSPECTION, INC.
Geotechnical & Construction Services

LETTER OF TRANSMITTAL

Date: December 28, 2018

Project No.: 2186002-601
Report No.: C-43098

Re: Salmon Creek WWTP 5B

To: Jacobs Engineering Group
1000 NE Circle Blvd
Suite 10350
Corvallis, Oregon 97330

Attn: Paul Davis, P.E., G.E.

Enclosed are:

- ☐ Report
- ☐ Copy of Letter
- ☐ Other
- ☐ Drawings
- ☐ Specifications
- ☑ Test Results (4 Pages Total Incl. Cover)

These are transmitted as checked below:

- ☑ For your use
- ☑ As requested
- ☐ For your review/approval
- ☐ For your files

Remarks: Requested laboratory testing results attached. Please call if you have any questions.

Copy to:

Signature:

Rachel Ray

Rachel Ray
President

This report and/or enclosed test data is the confidential property of the client to whom it is addressed and pertains to the specific process and/or material evaluated. As such, information contained herein shall not be reproduced in part or full and/or any part thereof be disclosed without FEI Testing & Inspection, Inc.'s written authorization.

Sieve Analysis ASTM D 422

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	12.0	34.7	37.9	15.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	98.5		
#40	88.0		
#60	79.2		
#100	72.8		
#200	53.3		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4737 D_{85}= 0.3614 D_{60}= 0.0944
D_{50}= 0.0653 D_{30}= 0.0234 D_{15}= 0.0046
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Source of Sample: 7426 **Depth:** 15.0-16.5'
Sample Number: B-1-18, 3-SS

Date: 11-19-18

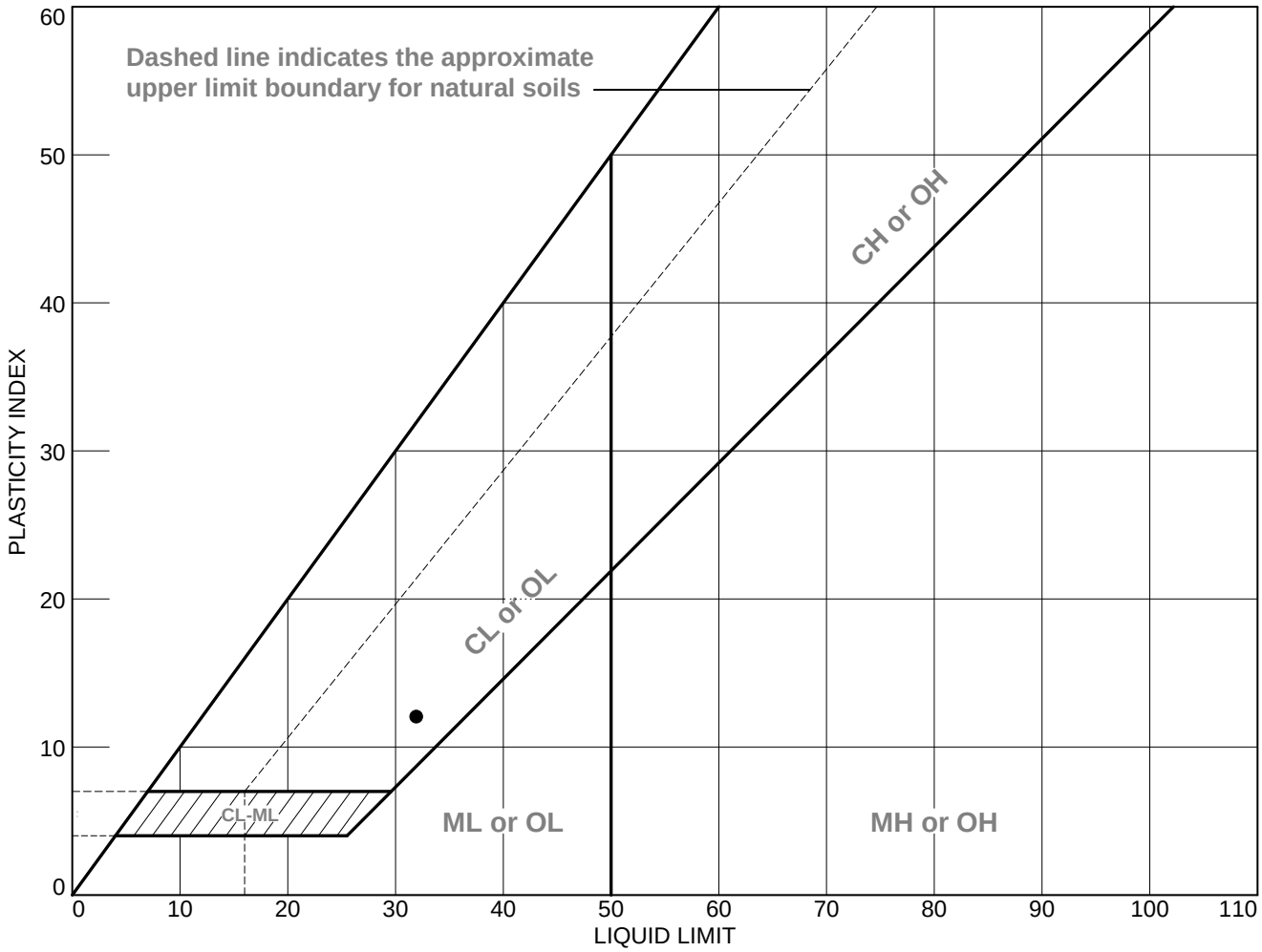
FEI Testing & Inspection, Inc.

Corvallis, OR

Client: Jacobs Engineering Group; Project No. 708335
Project: Salmon Creek WWTP 5B

Project No: 2186002-601 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	7426	B-1-18, 4-SS	20.0-21.5'	27.6	20	32	12	CL

FEI Testing & Inspection, Inc.

Corvallis, OR

Client: Jacobs Engineering Group; Project No. 708335

Project: Salmon Creek WWTP 5B

Project No.: 2186002-601 **Figure**

FEI TESTING & INSPECTION, INC.
Geotechnical & Construction Services

Percent Fines & Water Content Test (ASTM D 1140)

PROJECT NAME	***Salmon Creek WWTP 5B***	*PROJECT NUMBER*	***2186002-601***
RECORDED BY	***CP***	*FEI SAMPLE NUMBER*	***7426***
CLIENT	***Jacobs Engineering Group***	*DATE*	***12/26/2018***
REMARKS		*CLIENT PROJECT NUMBER*	

WATER CONTENT DIR or AUX*	***DIR***	***DIR***	***DIR***	***DIR***	***DIR***	***DIR***	***DIR***
SAMPLE DESIGNATION	**B-1-18,4-SS**	**B-1-18,5-SS**	**B-1-18,6-SS**	**B-1-18,7-SS**	**B-1-18,8-SS**	**B-1-18,9-SS**	**B-1-18,10-SS**
SAMPLE DEPTH	**20.0-21.5'**	**25.0-26.5'**	**30.0-31.5'**	**35.0-36.5'**	**40.0-41.5'**	**45.0-46.5'**	**50.0-51.5'**
Pan Number	63	8	2	19	55	34	51A
Wt. of Wet Soil + Pan (g)	227.31	268.44	288.70	361.79	278.96	337.91	328.15
Wt. of Dry Soil + Pan (g)	195.17	220.25	246.59	305.45	237.89	280.58	283.08
Wt. of Water (g)	32.14	48.19	42.11	56.34	41.07	57.33	45.07
Wt. of Pan (g)	78.74	76.22	76.30	70.66	81.34	78.82	79.80
Wt. of Dry Soil (g)	116.43	144.03	170.29	234.79	156.55	201.76	203.28
Water Content (%)	**27.6%**	**33.5%**	**24.7%**	**24.0%**	**26.2%**	**28.4%**	**22.2%**

TEST SAMPLE DATA							
TEST METHOD A or B	**B**	**B**	**B**	**B**	**B**	**B**	**B**
Length of Time Sample Soaked (hrs)	**4**	**4**	**4**	**4**	**4**	**4**	**4**
Pan Number	63	8	2	19	55	34	51A
Wet Wt. + Pan (g)	227.31	268.44	288.70	361.79	278.96	337.91	328.15
Wet Wt. (g)	148.57	192.22	212.40	291.13	197.62	259.09	248.35
Wt. of Pan (g)	78.74	76.22	76.30	70.66	81.34	78.82	79.80
(A) Dry Soil (g) (Total Sample)	116.43	144.03	170.29	234.79	156.55	201.76	203.28

AFTER WASHING							
Pan Number	63	8	2	19	55	34	51A
Dry Wt. + Pan (g)	119.95	178.54	216.90	275.95	211.24	245.62	255.23
Wt. of Pan (g)	78.74	76.22	76.30	70.66	81.34	78.82	79.80
(B) Wt. of Dry Soil	41.21	102.32	140.60	205.29	129.90	166.80	175.43
(C) Total Loss (g) (No. 200) (C=A-B)	75.22	41.71	29.69	29.50	26.65	34.96	27.85
% Fines (C/A)	**64.6%**	**29.0%**	**17.4%**	**12.6%**	**17.0%**	**17.3%**	**13.7%**

*DIR=Dry mass was determined directly by drying the test specimen

*AUX=Dry mass was determined using an auxiliary water content specimen

Equipment Used

Oven ID #	**6060**
Scale ID #	**6067**
Sieve ID #	**LS30B**

Reviewed By Rachel Ray

Appendix D
Slug Test Data

Falling Head (injection) slug test info													
Time	DTW	Date	Well #	Well/Screen Dia (inches)	Well Depth (feet)	Screen Length (feet)	Top of Screen (feet)	Bottom of Screen (feet)	Starting Water Depth (baseline - feet)	volume of Water (slug) Added (gallon)			
9:55:30	11.72	11/20/2018	B-1	2.047	50	10	40	50	17.6	1			
9:56	11.77												
9:56:30	11.82												
9:57	11.88												
9:57:30	11.92												
9:58	11.95												
9:58:30	11.98												
9:59	12.00												
9:59:30	12.02												
10:00	12.10												
10:00:30	12.14												
10:01	12.18												
10:01:30	12.20												
10:02	12.26												
10:02:30	12.31												
10:03	12.35												
10:03:30	12.38												
10:04	12.41												
10:04:30	12.46												
10:05	12.50												
10:05:30	12.54												
10:06	12.58												
10:06:30	12.63												
10:07	12.66												
10:07:30	12.70												
10:08	12.74												
10:08:30	12.78												
10:09	12.82												
10:09:30	12.85												
10:10	12.89												
10:10:30	12.94												
10:11	12.97												
10:11:30	13.01												
10:12	13.05												
10:12:30	13.10												
10:13	13.13												
10:13:30	13.17												
10:14	13.20												
10:14:30	13.25												
10:15	13.29												
10:15:30	13.32												
10:16	13.35												
10:16:30	13.38												
10:17	13.41												
10:17:30	13.46												
10:18	13.49												
10:18:30	13.52												
10:19	13.57												
10:19:30	13.60												
10:20	13.64												
10:20:30	13.67												
10:21	13.70												
10:22	13.77												
10:23	13.87												
10:24	13.93												

10:25	14.00												
10:26	14.07												
10:27	14.15												
10:28	14.21												
10:29	14.28												
10:30	14.35												
10:31	14.42												
10:32	14.49												
10:33	14.55												
10:34	14.62												
10:35	14.70												
10:36	14.77												
10:37	14.83												
10:38	14.89												
10:39	14.95												
10:40	15.01												
10:41	15.08												
10:42	15.14												
10:43	15.20												
10:44	15.26												
10:45	15.32												
10:46	15.39												
10:47	15.45												
10:48	15.52												
10:49	15.57												
10:50	15.65												
10:51	15.70												
10:52	15.76												
10:53	15.87												
10:54	15.87												
10:55	15.93												
10:56	16.09												
10:57	16.05												
10:58	16.11												
10:59	16.17												
11:00	16.23												
11:01	16.28												
11:02	16.34												
11:03	16.39												
11:04	16.45												
11:05	16.50												
11:06	16.57												
11:07	16.62												
11:08	16.68												
11:09	16.73												
11:10	16.78												
11:11	16.84												
11:12	16.90												
11:13	16.95												
11:14	17.00												
11:15	17.06												
11:16	17.21												
11:17	17.16												
11:18	17.22												
11:19	17.27												
11:20	17.31												
11:21	17.36												

11:22	17.41												
11:23	17.47												
11:24	17.52												
11:25	17.56												
11:26	17.62												
11:31	17.86												
11:36	18.10												
11:41	18.32												
11:46	18.55												
11:51	18.79												
11:56	19.04												
12:01	19.27												
12:06	19.46												
12:22	20.05												
12:27	20.20												
12:32	20.38												
12:37	20.54												
12:42	20.72												
12:47	20.88												
12:52	21.03												
12:57	21.18												
13:02	21.32												
13:07	21.45												
13:12	21.60												
13:17	21.71												
13:22	21.85												
13:27	21.99												
13:32	22.11												
13:37	22.24												
13:42	22.35												
13:47	22.47												
13:52	22.58												