Appendix E

Geotechnical Due-Diligence Investigation and Percolation Study, February 2021

ALBUS & ASSOCIATES
formerly Albus-Keefe & Associates, Inc.

February 3, 2021
J.N.: 2949.00

Mr. Ben Johnson
The Olson Company
3010 Old Ranch Parkway, Suite 100
Seal Beach, California 90740

Subject: **Geotechnical Due-Diligence Investigation and Percolation Study, Proposed Multi-Family Residential Development, 8371-8375 Talbert Avenue, Huntington Beach, California**

Dear Mr. Johnson,

Albus & Associates, Inc. is pleased to present to you our geotechnical due-diligence report for the proposed multi-family residential development at the subject site. This report presents a summary of our literature review, subsurface exploration, laboratory testing, and engineering analyses. Conclusions relevant to the feasibility of the proposed site development are also presented herein based on the findings of our work.

We appreciate this opportunity to be of service to you. If you should have any questions regarding the contents of this report, please do not hesitate to call our office.

Sincerely,

ALBUS & ASSOCIATES, INC.

Paul Kim
Associate Engineer

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of our work was to evaluate the feasibility of proposed site development in order to assist you in your land acquisition evaluation and due-diligence review. The scope of our work for this investigation was focused primarily on the geotechnical issues that we expect could have significant fiscal impacts on future site development. While this report is comprehensive for feasibility purposes, it is not intended for final design purposes. As such, additional geotechnical studies may be warranted based on our review of future rough grading plans and foundation plans. The scope of our work for this investigation included the following:

- Review of published geologic and seismic data for the site and surrounding area
- Exploratory drilling and soil sampling
- Laboratory testing of select soil samples
- Engineering analyses of data obtained from our review, exploration, and laboratory testing
- Evaluate site seismicity, liquefaction potential, and settlement potential
- Preparation of this report

1.2 SITE LOCATION AND DESCRIPTION

The site is located at 8371-8375 Talbert Avenue, city of Huntington Beach, California and spans several properties. The site is bordered by single- and multi-family residences to the north, Newland Street to the east, St. Vincento de Paul Catholic Church to the west, and Talbert Avenue to the south. The location of the site and its relationship to the surrounding area is shown on Figure 1, Site Location Map.

The project site and overall property is relatively flat with elevation ranging from 44 to 45 feet above mean sea level (based on Google Earth). It appears that the site drains generally west away from Newland Street towards an existing storm drain at the western property line. The site is currently occupied by three single family residences. Additional buildings are on site and are either detached garages or storage spaces. There are four driveways covered in asphalt and some hardscaped features within some spaces near the residences. The remainder of the site is covered by grass or vegetation. Vegetation consists of small shrubs to moderate sized trees. The site is largely open along the west, south and east property lines, however, the northern property line is bordered by a masonry block wall shared with properties north of the site.

N

FIGURE 1-SITE LOCATION MAP

The Olson Company
Proposed Residential Development
8371-8375 Talbert Avenue
Huntington Beach, California.

NOT TO SCALE

1.3 PROPOSED DEVELOPMENT

We understand the site is presently developed with several single-family residential buildings and the site will be redeveloped for residential use. We anticipate the proposed site will consist of approximately 34 three-story townhomes, associated interior driveways, perimeter/retaining walls, underground utilities, and a storm water infiltration system.

No grading or structural plans were available in preparing of this report. However, we anticipate that minor rough grading of the site will be required to achieve future surface configuration and we expect the proposed residential dwellings will be 2- to 3-story, wood-framed structures with concrete slabs on grade yielding relatively light foundation loads.

2.0 INVESTIGATION

2.1 RESEARCH

We have reviewed the referenced geologic publications, maps, and historical aerial photos of the vicinity. Data from these sources were utilized to the development of some of our findings and conclusions presented in this report.

We have also reviewed historical aerial photographs for the site and surrounding area from our in-house library. Based on our review, the site has remained relatively unchanged from the 1950's.

2.2 SUBSURFACE EXPLORATION

Subsurface explorations for this investigation were conducted on January 15, 2021 and consisted of drilling 5 soil borings to a maximum depth of approximately 51.5 feet below the existing ground surface (bgs). The borings were drilled using a truck-mounted, continuous-flight, hollow-stem-auger drill rig. A representative of *Albus & Associates, Inc*. logged the exploratory borings. Visual and tactile identifications were made of the materials encountered, and their descriptions are presented on the Exploration Logs in Appendix A. The approximate locations of the borings are shown on the enclosed Geotechnical Map, Plate 1.

Bulk, relatively undisturbed and Standard Penetration Test (SPT) samples were obtained at selected depths for subsequent laboratory testing. Relatively undisturbed samples were obtained using a 3-inch O.D., 2.5-inch I.D., California split-spoon soil sampler lined with brass rings. SPT samples were obtained using a standard SPT soil sampler. During each sampling interval, the samplers were driven 18 inches with successive drops of a 140-pound automatic hammer falling 30 inches. The number of blows required to advance the sampler was recorded for each six inches of advancement. The total blow count for the lower 12 inches of advancement per soil sample is recorded on the exploration log. Samples were placed in sealed containers or plastic bags and transported to our laboratory for analyses and testing. The borings were backfilled with soil cuttings upon completion of drilling and capped with AC cold patch where necessary.

A percolation test well (P-1) was drilled adjacent to exploratory boring B-3 for subsequent percolation testing.

2.3 LABORATORY TESTING

Selected samples of representative earth materials from the borings were tested in our laboratory. Tests consisted of in-situ moisture and dry density, maximum dry density and optimum moisture content, Atterberg limits, expansion index, soluble sulfate content, grain size analysis, consolidation/collapse potential, direct shear, and corrosivity. Descriptions of laboratory testing and a summary of the test results are presented in Appendix B and on the exploration log in Appendix A.

3.0 SUBSURFACE CONDITIONS

3.1 SOIL CONDITIONS

Soil materials encountered on site generally consist of very old marine deposits (Qvom) locally mantled by artificial fill (CDMG 1997). The very old marine deposits deposits were present to the maximum depth explored (51.5 feet).

Artificial fill materials were encountered up to about 8 feet below the existing ground surface only within B-1 and generally consist of light brown to brown silty sand with gravel. These materials are typically dry to damp and medium dense to dense. Artificial fill materials of greater depth may present beneath portions of the site in association with the existing development and underground utilities.

Very old marine deposits (Qvom) underlie below the current grade or the artificial fill within the site. The near surface very old marine materials consist of reddish brown, damp, very stiff to hard clay. Deeper portion of the very old marine deposits consist of brown, olive brown, and grayish brown, damp to wet, medium dense to very dense clay sand, silty sand, sand with silt, and sand.

A more detailed description of the interpreted soil profile at each of the boring locations, based upon the borehole cuttings and soil samples, are presented in Appendix A. The stratigraphic descriptions in the logs represent the predominant materials encountered and relatively thin, often discontinuous layers of different material may occur within the major divisions.

3.2 GROUNDWATER

Groundwater was encountered during this firm’s subsurface exploration at a depth of 38 feet below the existing ground surface. The CDMG Seismic Hazard Zone Report 03 suggest that historical high groundwater for the subject site is deeper than 30 feet.

3.3 ACTIVE FAULTS

Based on our review of the referenced publications and seismic data, no active faults are known to project through or immediately adjacent the subject sites and the sites do not lie within an "Earthquake Fault Zone" as defined by the State of California in Earthquake Fault Zoning Act. Table 3.1 presents a summary of known seismically active faults within 10 miles of the sites based on the 2008 USGS National Seismic Hazard Maps.

TABLE 3.1
Summary of Active Faults

Name	Distance (miles)	Slip Rate (mm/yr.)	Preferred Dip (degrees)	Slip Sense	Rupture Top (km)	Fault Length (km)
Newport Inglewood Connected alt 2	1.81	1.3	90	strike slip	0	208
Newport-Inglewood, alt 1	1.93	1	88	strike slip	0	65
Newport Inglewood Connected alt 1	1.93	1.3	89	strike slip	0	208
San Joaquin Hills	2.78	0.5	23	thrust	2	27
Newport-Inglewood (Offshore)	8.51	1.5	90	strike slip	0	66

4.0 ANALYSES

4.1 SEISMICITY

Following ASCE7-16, Section 21.5.3, we have estimated site-specific Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration PGA_M = 0.719g. Per Section 11.2 (Page 79), this value should be used for evaluation of liquefaction, lateral spreading, seismic settlements, and other soil-related issues. Based on the results of deaggregation analysis performed using USGS Unified Hazard Tool, the mean event associated with a probability of exceedance equal to 2% over 50 years has a moment magnitude of 6.79 and the mean distance to the seismic source is 5.9 miles.

4.2 STATIC SETTLEMENT

Analyses were performed to estimate settlement of footings for the anticipated loading conditions and configurations. Loading conditions for the proposed foundations are not known at this time. Based on previous experience, we have assumed the maximum load will not exceed 3 kips/ft. for continuous loads.

Based on the anticipated foundation loads and provided the existing near-surface materials are removed and recompacted to provide a uniform layer of engineered compacted fill, the total and differential static settlements are not anticipated to exceed 1 inch and ½-inch over 30 feet, respectively, for the proposed residential structures.

4.3 LIQUEFACTION

Engineering research of soil liquefaction potential (Youd, et al., 2001) indicates that generally three basic factors must exist concurrently in order for liquefaction to occur. These factors include:

- A source of ground shaking, such as an earthquake, capable of generating soil mass distortions.
- A relatively loose silty and/or sandy soil.
- A relative shallow groundwater table (within approximately 50 feet below ground surface) or completely saturated soil conditions that will allow positive pore pressure generation.

The site is not located within a State-designated zone of potentially liquefiable soils. Additionally, the site is underlain by very old marine deposits that are of Pleistocene aged and typically not susceptible to liquefaction. As a result, the potential of liquefaction occurring during a seismic event is considered to be very low.

5.0 CONCLUSIONS

5.1 FEASIBILITY OF PROPOSED DEVELOPMENT

From a geotechnical point of view, the proposed site development is considered feasible. Furthermore, it is also our opinion that the proposed development will not adversely impact the stability of adjoining properties. The adequacy and sufficiency of the preliminary findings and conclusions provided herein should be assessed based upon the final grading and structural plans. A supplemental geotechnical investigation report will be required for design, permitting and construction.

5.2 GEOLOGIC HAZARDS

5.2.1 Ground Rupture

From a geotechnical point of view, the proposed site development is considered feasible. Furthermore, it is also our opinion that the proposed development will not adversely impact the stability of adjoining properties. The adequacy and sufficiency of the preliminary findings and conclusions provided herein should be assessed based upon the final grading and structural plans. A supplemental geotechnical investigation report will be required for design, permitting and construction.

5.2.2 Ground Shaking

The site is situated in a seismically active area that has historically been affected by generally moderate to occasionally high levels of ground motion. The site lies in relatively close proximity to several seismically active faults; therefore, during the life of the proposed structures, the property will probably experience similar moderate to occasionally high ground shaking from these fault zones, as well as some background shaking from other seismically active areas of the Southern California region. Potential ground accelerations have been estimated for the site and are presented in Section 4.1 of this report. Design and construction in accordance with the current California Building Code (C.B.C.) requirements is anticipated to adequately address potential ground shaking.

5.2.3 Liquefaction

The site is underlain by very dense Pleistocene-aged very old marine deposits typically not susceptible to the effects of liquefaction. As such the potential for liquefaction at the site is considered to be low. Furthermore, the site is not located within a mapped California Geologic Survey liquefaction hazard zone.

5.3 STATIC SETTLEMENT

The earth materials at the site are generally very stiff/medium dense to hard/very dense and are anticipated to result in minor settlement due to the weight of new foundations. Provided the existing near surface disturbed soils are removed and recompacted, total and differential static settlement can likely be limited to a maximum of 1 inch and ½-inch over 30 feet, respectively. These estimated magnitudes of static settlements are considered within tolerable limits for the proposed residential structures.

5.4 EARTHWORK AND MATERIAL CHARACTERISTICS

In general, the existing upper 3 feet of surface soils and any artificial fill encountered should be removed and recompacted to support proposed structural fills and site development.

Temporary construction slopes and trench excavations can likely be cut vertically up to a height of 4 feet within the onsite materials provided that no surcharging of the excavations is present. Temporary excavations greater than 4 feet in height will likely require side laybacks to 1:1 (H:V) or flatter to mitigate the potential for sloughing. Vertical excavations exposing sandy materials will likely have no tolerance for a vertical cut and require laybacks at a 1.5:1 gradient (H:V). Site materials may be prone to sloughing and possible caving if allowed to dry.

Due to the existing foundation slab and pavement, significant portions of concrete and asphalt debris can likely be reduced in size to less than 4 inches and incorporated within fill soils during earthwork operations.

Onsite disposal systems, clarifiers, and other underground improvements are likely to be present on site. If encountered during future rough grading, these improvements will require proper abandonment or removal.

Off-site improvements exist near and along the property lines. The presence of the existing offsite improvements will limit removals of unsuitable materials adjacent the property lines, particularly along the northwest and south property lines. Special grading techniques, such as slot cutting, will be required adjacent to the property lines were offsite structures are nearby. Additionally, grading along public right-of-ways will require special grading techniques, especially if construction fences are placed inside of the property lines which limit removals. Construction of perimeter site walls will require special consideration so as not to disturb the existing property line walls.

Subsurface soils are anticipated to be relatively easy to excavate with conventional heavy earthmoving equipment. Removal and recompaction of the site materials will result in some moderate shrinkage

and subsidence. Design of site grading will require consideration of this loss when evaluating earthwork balance issues.

The near-surface soils are typically at or slightly above optimum moisture content. In addition, there are variable earth materials consisting of sand and clay. These materials will require mixing to provide a uniform blanket of engineered fill. Some minor addition of water may be required to elevate the moisture content to achieve proper compaction.

5.5 SHRINKAGE AND BULKAGE

Volumetric changes in earth quantities will occur when excavated onsite soil materials are replaced as properly compacted fill. We estimate the existing upper earth materials will shrink up to approximately 5 percent. The estimates of shrinkage and bulkage are intended as an aid for project engineers in determining earthwork quantities. However, these estimates should be used with some caution since they are not absolute values. Contingencies should be made for balancing earthwork quantities based on actual swelling and bulkage that occurs during the grading process.

5.6 SOIL EXPANSION

Based on our laboratory test results and the USCS visual manual classification, the near-surface soils within the site are generally anticipated to possess a **Medium** expansion potential. Additional testing for soil expansion will be required subsequent to rough grading and prior to construction of foundations and other concrete work to confirm these conditions.

5.7 FOUNDATIONS

Considering the **Medium** expansion potential of site soils, some heavier reinforced conventional foundations or a post-tension foundation system may be used to support habitable structures and miscellaneous structures at the site.

5.8 CONCRETE MIX DESIGN

Laboratory testing of onsite soil indicates negligible soluble sulfate content. Concrete designed to follow the procedures provided in ACI 318, Section 4.3, Table 4.3.1 for **negligible** sulfate exposure are anticipated to be adequate for mitigation of sulfate attack on concrete. Upon completion of rough grading, an evaluation of as-graded conditions and further laboratory testing will be required for the site to confirm or modify the conclusions provided in this section.

5.9 CORROSION POTENTIAL

Laboratory testing of onsite soil indicates indicate a minimum resistivity of 1,200 ohm-cm, chloride content of 121 ppm, and a pH of 7. Based on laboratory test results, site soils are **Corrosive** to metals. Structures fabricated from metals should have appropriate corrosion protection if they will be in direct contact with site soils. Under such conditions, a corrosion specialist should provide specific recommendations.

5.10 PAVEMENT SECTIONS

Existing near-surface soils are anticipated to have a small R-value. Based on the assumed R-value of 5 and a traffic index of 5, a preliminary pavement structural section of 3 or 4 inches asphaltic concrete over 11 or 8 inches of aggregate base, respectively, may be used for planning and estimating purpose. R-value testing will be required subsequent to rough grading and prior to construction of interior driveways to confirm these conditions.

5.11 PERCOLATION CHARACTERISTICS

Most of the site is characterized by alternating layers of fined-grained and course-grained soils in the upper 8 to 10 feet that are generally not suitable for infiltration. Below 10 feet the site is underlain by relatively clean sands that provide exceptionally good infiltration characteristics except in proximity to B-1 where the deeper soils have low permeability characteristics. Therefore, infiltration of storm water using either shallow chambers or dry wells is feasible throughout the site except in proximity to B-1. Additional subsurface exploration will be required to establish the specific area of exclusion. Preliminary analyses indicate that a dry well could likely provide a peak measured infiltration flow of approximately 0.29 cfs and empty within 0.24 hours. The typical dry well is estimated to be 20 feet deep. Assuming a factor of safety of 2.5 and an allowable drawdown time of 72 hours, the maximum treatment volume is calculated to be 30,000 ft^3. This volume is anticipated to be well above the required treatment volume for storm water. Assuming the treatment volume is about 6,000 $ft^{3,}$ an additional retention of about 5,700 ft^3 is anticipated and could be accommodated by storage pipes or other systems connected in line with the dry well. If a shallow chamber system is used, the bottom of the system will need to be placed at a depth of about 8 to 10 feet. Preliminary design of a shallow chamber system can be based on a measured infiltration rate of 10 in.hr. Assuming a factor of safety of 2.5, the chamber system would need to cover an area of about 250 square feet. Further percolation testing and/or evaluation may be necessary based on review of preliminary WQMP design plans.

6.0 LIMITATIONS

This report is based on the proposed development and geotechnical data as described herein. The materials described herein and in other literature are believed representative of the total project area, and the conclusions contained in this report are presented on that basis. However, soil materials can vary in characteristics between points of exploration, both laterally and vertically, and those variations could affect the conclusions and recommendations contained herein. As such, observation and testing by a geotechnical consultant prior to and during the grading and construction phases of the project are essential to confirming the basis of this report.

This report summarizes several geotechnical topics that should be beneficial for project planning and budgetary evaluations. *The information presented herein is intended only for a preliminary feasibility evaluation and **is not** intended to satisfy the requirements of a site specific and detailed geotechnical investigation required for further planning and permitting.*

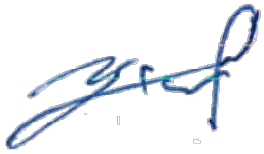
This report has been prepared consistent with that level of care being provided by other professionals providing similar services at the same locale and time period. The contents of this report are professional opinions and as such, are not to be considered a guaranty or warranty.

This report should be reviewed and updated after a period of one year or if the site ownership or project concept changes from that described herein.

This report has been prepared for the exclusive use of **The Olson Company** to assist the project consultants in determining the feasibility of the proposed development. This report has not been prepared for use by parties or projects other than those named or described herein. This report may not contain sufficient information for other parties or other purposes.

Respectfully submitted,

ALBUS & ASSOCIATES, INC



Eung Jin Jeon, Ph.D.
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GE 3096

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GE 3106

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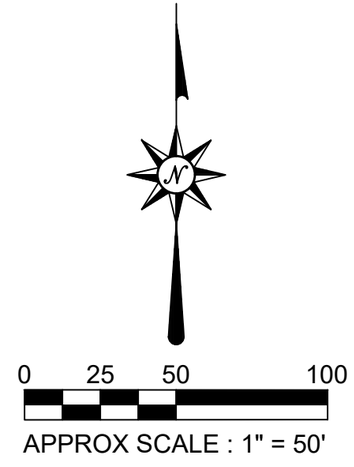


EXPLANATION

(Locations Approximate)

- Exploratory Boring
- Percolation Test Boring

ALBUS ASSOCIATES

GEOTECHNICAL MAP

Job No.: 2949.00	Date: 02/04/2021	Plate: 1

APPENDIX A

EXPLORATION LOGS

Field Identification Sheet

Light gray

Gray

Dark gray

Gray Brown

Light brown

Brown

Dark Brown

Olive brown

Olive

Yellow

Yellowish brown

Yellowish red

Red

Reddish Brown

Tan

Description Order:

Description, Color, Moisture, Density, Grain Size, Additional Description

Description	%	Example
	0-5	Sand
trace	5-15	Sand trace Silt
with	15-30	Sand with Silt
	30+	Silty Sand

More Examples

Sand with Silt trace Clay

Sand trace Silt and Clay

Sand with Silt and Clay

Gravelly Sand with Silt trace Clay

Silty Clay with Sand trace Gravel

Moisture

Dry	absence of water
Damp	below optimum
Moist	near optimum
Very Moist	above optimum
Wet	free water visible

Density (Navfac)

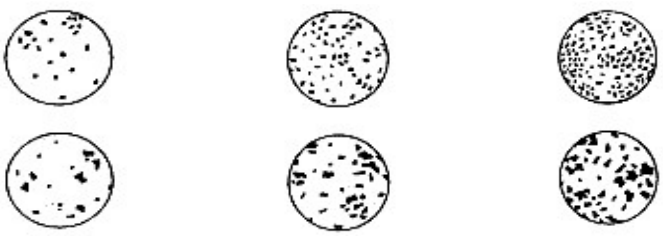
Coarse grained soils	SPT	CA
Very Loose	0-3	0-5
Loose	3-8	5-13
Medium Dense	8-14	13-22
Dense	14-25	22-40
Very Dense	25>	40>
Fine grained soils		
Very Soft	2<	0-3
Soft	2-4	3-6
Medium Stiff	4-8	6-13
Stiff	8-15	13-24
Very Stiff	15-30	24-48
Hard	30>	48>

Grain Size

Description		Sieve Size	Approx. Size
Boulders		>12"	Larger than basketball
Cobbles		3-12"	Fist to basketball
Gravel	coarse	3/4-3"	Thumb to Fist
	fine	#4-3/4"	Pea to Thumb
Sand	coarse	#10-4	Rock Salt to Pea
	medium	#40-10	Sugar to Rock Salt
	fine	#200-40	Flour to Sugar
Fines		Pass #200	Smaller than Flour

Additional Description (ie. roots, pinhole pores, debris, etc.)

Trace 5% Moderate 15% Abundant 30%



EXPLORATION LOG

Project:		Location:
Address:		Elevation:
Job Number:	Client:	Date:
Drill Method:	Driving Weight:	Logged By:

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		EXPLANATION							
		Solid lines separate geologic units and/or material types.							
		Dashed lines indicate unknown depth of geologic unit change or material type change.							
5		**Solid black rectangle** in Core column represents California Split Spoon sampler (2.5in ID, 3in OD).							
		Double triangle in core column represents SPT sampler.							
10		**Vertical Lines** in core column represents Shelby sampler.							
		Solid black rectangle in Bulk column respresents large bag sample.							
		Other Laboratory Tests:							
15		Max = Maximum Dry Density/Optimum Moisture Content							
		EI = Expansion Index							
		SO4 = Soluble Sulfate Content							
		DSR = Direct Shear, Remolded							
		DS = Direct Shear, Undisturbed							
		SA = Sieve Analysis (1" through #200 sieve)							
		Hydro = Particle Size Analysis (SA with Hydrometer)							
20		200 = Percent Passing #200 Sieve							
		Consol = Consolidation							
		SE = Sand Equivalent							
		Rval = R-Value							
		ATT = Atterberg Limits							

EXPLORATION LOG

Project: Huntington Beach (Talbert & Newland)		Location: B-1
Address: 8371 Talbert Ave, Huntington Beach, CA 92647		Elevation: 44.3
Job Number: 2949.00	Client: The Olson Company	Date: 1/15/2021
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: ddalbus

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ARTIFICIAL FILL (Af) Silty Sand (SM): Brown, damp to moist, fine to medium grained sand							
		Silty Sand with Gravel (SM): Light brown, dry to damp, dense, fine to medium grained sand, glass, asphalt, trace root hairs		62			8.6	113.6	
5		@ 4 ft, glass		45			8.1	113.9	
		Silty Sand (SM): Brown, damp to moist, medium dense, fine to medium grained sand, trace pinhole pores and roots, possible glass		20			7.3	111.8	Consol
		VERY OLD MARINE DEPOSIT (Qvom) Silty Sand (SM): Brown, damp to moist, fine to medium grained sand							
10		@ 10 ft, dense		41			8.7	115.5	
15		Silty Sand (SM): Yellow, damp, very dense, fine to coarse grained sand, significant fines		57					
20		@ 20 ft, fine grained sand		39					

EXPLORATION LOG

Project: Huntington Beach (Talbert & Newland)		Location: B-1
Address: 8371 Talbert Ave, Huntington Beach, CA 92647		Elevation: 44.3
Job Number: 2949.00	Client: The Olson Company	Date: 1/15/2021
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: ddalbus

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		@ 25 ft, Light brown, damp to moist		64					
30				38					
35		Sandy Silt (ML): Olive brown, very moist, medium dense, fine grained sand		16					
		Sand with Silt (SP): Grayish brown, wet, medium dense, fine grained sand	▽						
40		@ 40 ft, very dense		53					
45		Silty Sand trace Clay (SM): Grayish brown, wet, very dense, fine grained sand		41					

Albus & Associates, Inc.

Plate A-3

EXPLORATION LOG

Project: Huntington Beach (Talbert & Newland)		Location: B-1
Address: 8371 Talbert Ave, Huntington Beach, CA 92647		Elevation: 44.3
Job Number: 2949.00	Client: The Olson Company	Date: 1/15/2021
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: ddalbus

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Sand with Silt (SP): Grayish brown, wet, very dense, fine grained sand		33					
		Silty Sand trace Clay (SM): Grayish brown, wet, very dense, fine grained sand							
		Total Depth 51.5ft Groundwater at 38ft Boring backfilled with soil cuttings							

EXPLORATION LOG

Project: Huntington Beach (Talbert & Newland)		Location: B-2
Address: 8371 Talbert Ave, Huntington Beach, CA 92647		Elevation: 46.4
Job Number: 2949.00	Client: The Olson Company	Date: 1/15/2021
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: ddalbus

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		VERY OLD MARINE DEPOSIT (Qvom) Clay (CL): Reddish brown, damp, very stiff, weathered, trace pinhole pores and roots, calcium carbonate		41	■		12.1	119.5	
5		Clayey Sand (SC): Light reddish brown, damp, hard, fine to medium grained sand		98	■		11.7	123.9	Consol
		@ 6 ft, less clay, trace pinhole pores and rootlets		35	■		7	111	
		Sand trace Clay (SP): Light reddish brown, damp, medium dense, fine to medium grained sand, trace rootlets							
10		Sand (SP): Light reddish brown to light yellow, damp, medium dense, fine grained sand		17	■		6.2	105.9	
		Total Depth 11.5ft No Groundwater Boring backfilled with soil cuttings							

EXPLORATION LOG

Project: Huntington Beach (Talbert & Newland)		Location: B-3
Address: 8371 Talbert Ave, Huntington Beach, CA 92647		Elevation: 45.4
Job Number: 2949.00	Client: The Olson Company	Date: 1/15/2021
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: ddalbus

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		VERY OLD MARINE DEPOSIT (Qvom)							Max EI SO4 DS ATT pH Resist Ch
		Clay (CL): Reddish brown, damp, weathered, trace pinhole pores and roots, calcium carbonate							
		@ 2 ft, hard		61			13	119.2	
		Clayey Sand (SC): Light reddish brown, damp, hard, fine to medium grained sand, trace rootlets		71			13.4	119	
5		Sand with Clay (SP): Light reddish brown, damp, medium dense, fine to medium grained sand, trace pinhole pores		24			6.3	104.4	
10		Sand (SP): Light reddish brown, damp, medium dense, fine to coarse grained sand		26			2.8	99	200
15		@ 15 ft, very dense		40					
20				42					SA

Albus & Associates, Inc.

Plate A-6

EXPLORATION LOG

Project: Huntington Beach (Talbert & Newland)		Location: B-3
Address: 8371 Talbert Ave, Huntington Beach, CA 92647		Elevation: 45.4
Job Number: 2949.00	Client: The Olson Company	Date: 1/15/2021
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: ddalbus

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Sand trace Silt (SP): Light brown, damp, very dense, fine grained sand		46					
30				30					200
		Total Depth 31.5ft No Groundwater Boring backfilled with soil cuttings Percolation Well (10ft offset): 0-15 ft solid 3" pipe 15-20 ft perforated 3" pipe							

EXPLORATION LOG

Project: Huntington Beach (Talbert & Newland)		Location: B-4
Address: 8371 Talbert Ave, Huntington Beach, CA 92647		Elevation: 44.9
Job Number: 2949.00	Client: The Olson Company	Date: 1/15/2021
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: ddalbus

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		VERY OLD MARINE DEPOSIT (Qvom) Clay (CL): Reddish brown, damp, weathered, trace pinhole pores and roots, calcium carbonate							
		@ 2 ft, hard		53	■		8.8	122.5	
5		Sand with Clay (SC): Light reddish brown, dry to damp, medium dense, fine to coarse grained sand, trace pinhole pores and rootlets		25	■		3.4	110	
		@ 6 ft, trace Clay		16	■		1.7	106.6	Consol
		Sand (SP): Light reddish brown, damp, medium dense, fine to coarse grained sand							
10				35	■		2.4	102.5	
		Total Depth 11.5ft No Groundwater Boring backfilled with soil cuttings							

EXPLORATION LOG

Project: Huntington Beach (Talbert & Newland)		Location: B-5
Address: 8371 Talbert Ave, Huntington Beach, CA 92647		Elevation: 44.9
Job Number: 2949.00	Client: The Olson Company	Date: 1/15/2021
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: ddalbus

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		VERY OLD MARINE DEPOSIT (Qvom) Clay (CL): Reddish brown, damp, weathered, trace pinhole pores and roots, calcium carbonate							
		@ 2 ft, very stiff		23	■		11.8	109.9	
				59	■		10.2	120.1	Consol
5		Clayey Sand (SC): Light brown, dense							
		Sand with Clay (SC): Light reddish brown, damp, medium dense, fine to coarse grained sand, trace rootlets		16	■		2.2	105.5	
		@ 7 ft, trace Clay							
10		Sand (SP): Light reddish brown, damp, medium dense, fine to coarse grained sand		21	■		1.9	106.5	
		Total Depth 11.5ft No Groundwater Boring backfilled with soil cuttings							

APPENDIX B

LABORATORY TEST PROGRAM

LABORATORY TESTING PROGRAM

Soil Classification

Soils encountered within the exploratory borings were initially classified in the field in general accordance with the visual-manual procedures of the Unified Soil Classification System (ASTM D 2487). The samples were re-examined in the laboratory and classifications reviewed and then revised where appropriate. The assigned group symbols are presented on the Exploration Logs provided in Appendix A.

In Situ Moisture and Density

Moisture content and unit dry density of in-place soil materials were determined in representative strata. Test data are summarized in the Boring Logs, Appendix A.

Maximum Dry Density and Optimum Moisture Content

Maximum dry density and optimum moisture content were performed on representative samples of the site materials obtained from our field explorations. The test was performed in accordance with ASTM D 1557. Pertinent test values are given in Table B.

Expansion Potential

An Expansion Index test was performed on a selected sample in accordance with ASTM D 4829. The test result and expansion potential are presented in Table B.

Soluble Sulfate Content

Chemical analysis was performed on selected samples to determine soluble sulfate content. The test was performed in accordance with California Test Method No. 417. The test result is included on Table B.

Particle Size Analyses

Particle size analyses were performed on representative samples of site materials in accordance with ASTM D 422-63. The results are presented graphically on the attached Plates B-1 and B-2.

Consolidation

Consolidation tests were performed for selected soil samples in general conformance with ASTM D 2435. Axial loads were applied in several increments to a laterally restrained 1-inch-high sample. Loads were applied in geometric progression by doubling the previous load, and the resulting deformations were recorded at selected time intervals. Results of the tests are graphically presented on Plates B-3 and B-4.

Direct Shear

The Coulomb shear strength parameters, angle of internal friction and cohesion, were determined for a bulk sample obtained from one our borings. Our laboratory performed the test in general conformance with Test Method ASTM D 3080. The sample was remolded to 90 percent of maximum dry density and 2 percentage points over optimum. Three specimens were prepared for each test,

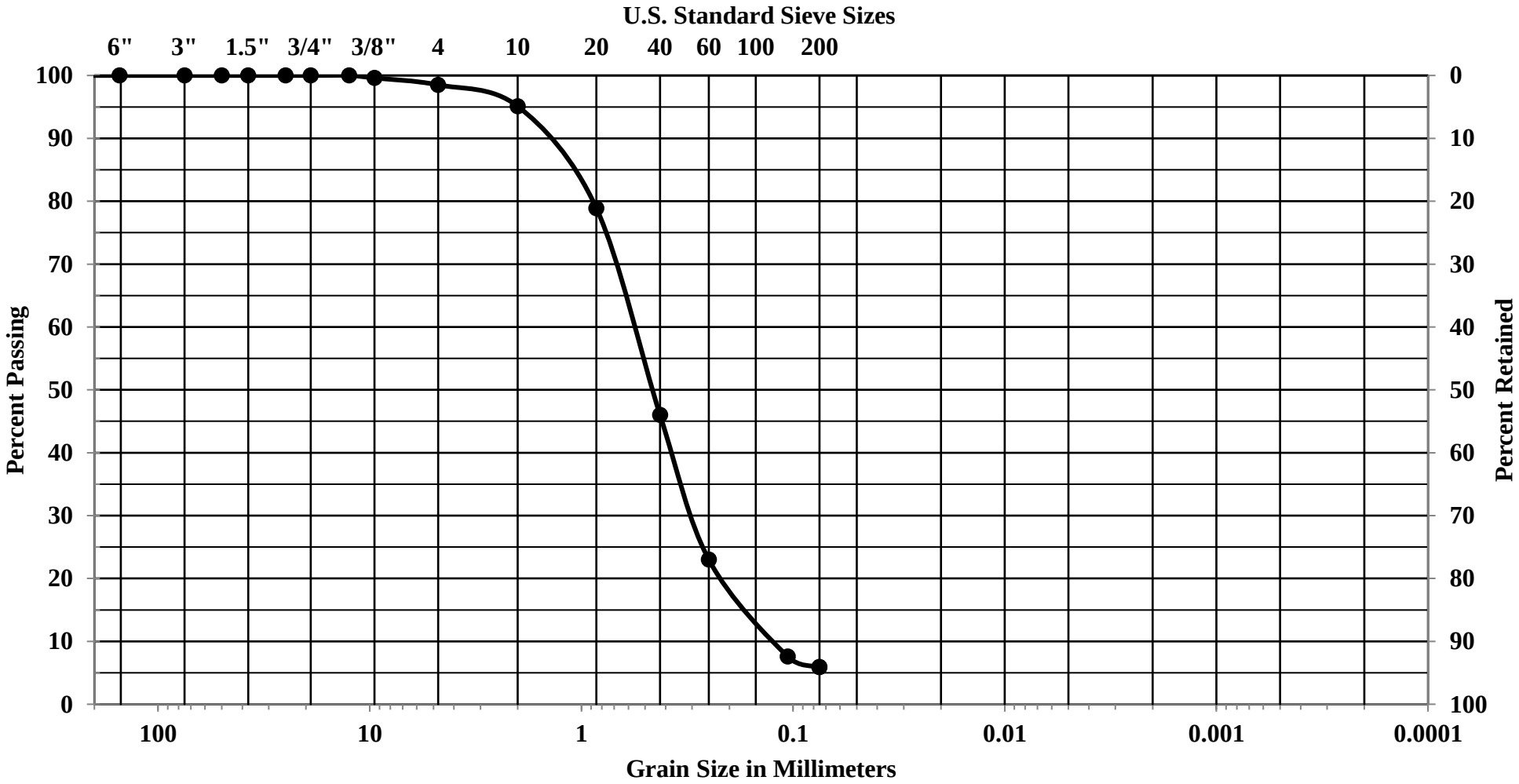
artificially saturated, and then sheared under varied loads at an appropriate constant rate of strain. Results are graphically presented on Plate B-5.

TABLE B
SUMMARY OF LABORATORY TEST RESULTS

Boring No.	Sample Depth (ft)	Soil Description	Test Results	
B-3	0-5	Sandy Clay (CL)	Max. Dry Density (pcf): Opt. Moisture Content (%): Expansion Index: Expansion Potential: Soluble Sulfate Content: Sulfate Exposure: PH: Chloride content (ppm): Resistivity (ohms): Liquid Limit (%): Plasticity Index (%):	124.0 12.0 81 Medium 0.003 % Negligible 7 121 1200 34 19
B-3	10	Sand (SP)	Passing No. 200 Sieve:	4.7
B-3	30	Sand trace Silt (SP)	Passing No. 200 Sieve:	10.3

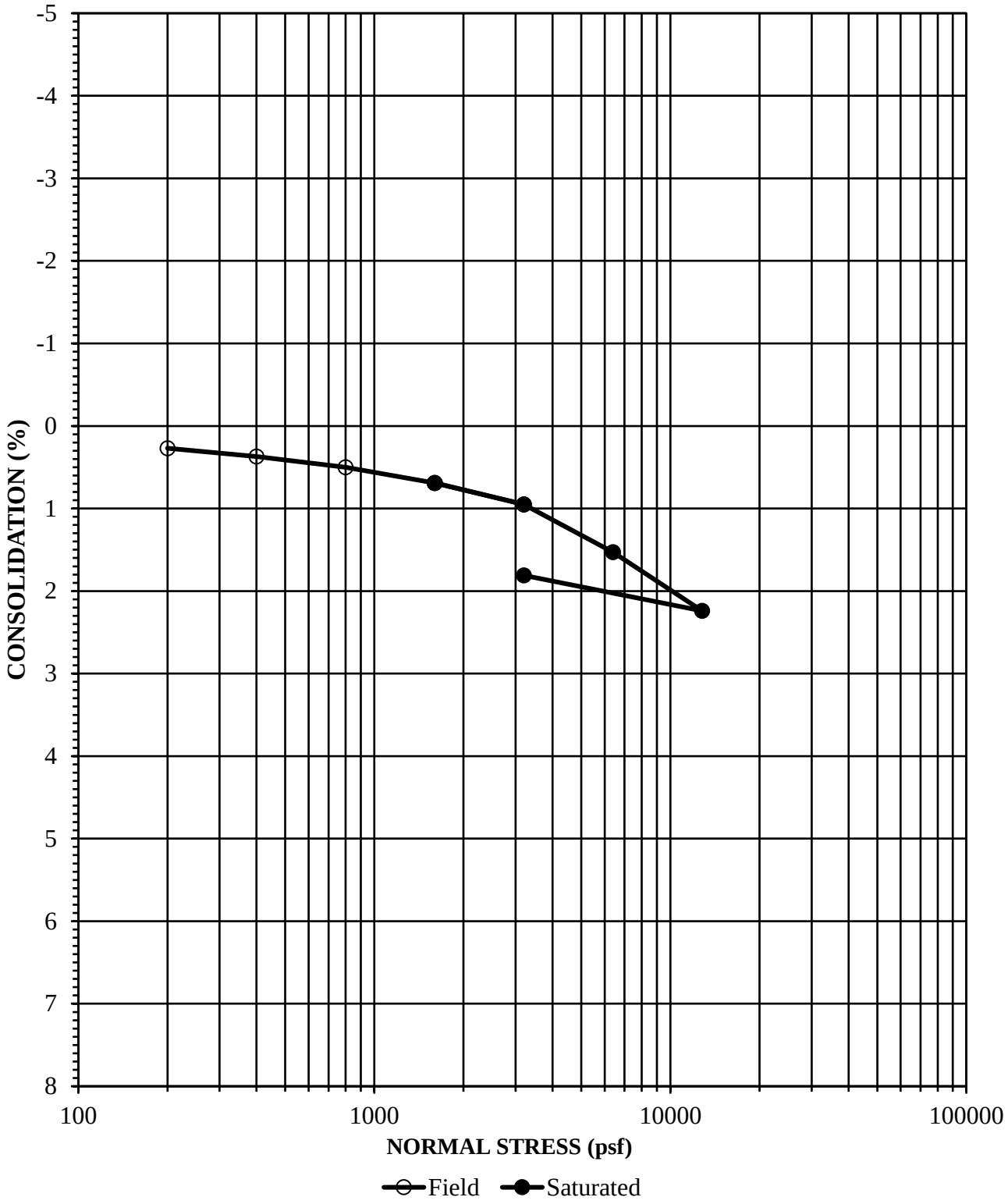
GRAIN SIZE DISTRIBUTION

COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	



Job Number	Location	Depth	Description
2949.00	B-3	20	Sand trace Silt

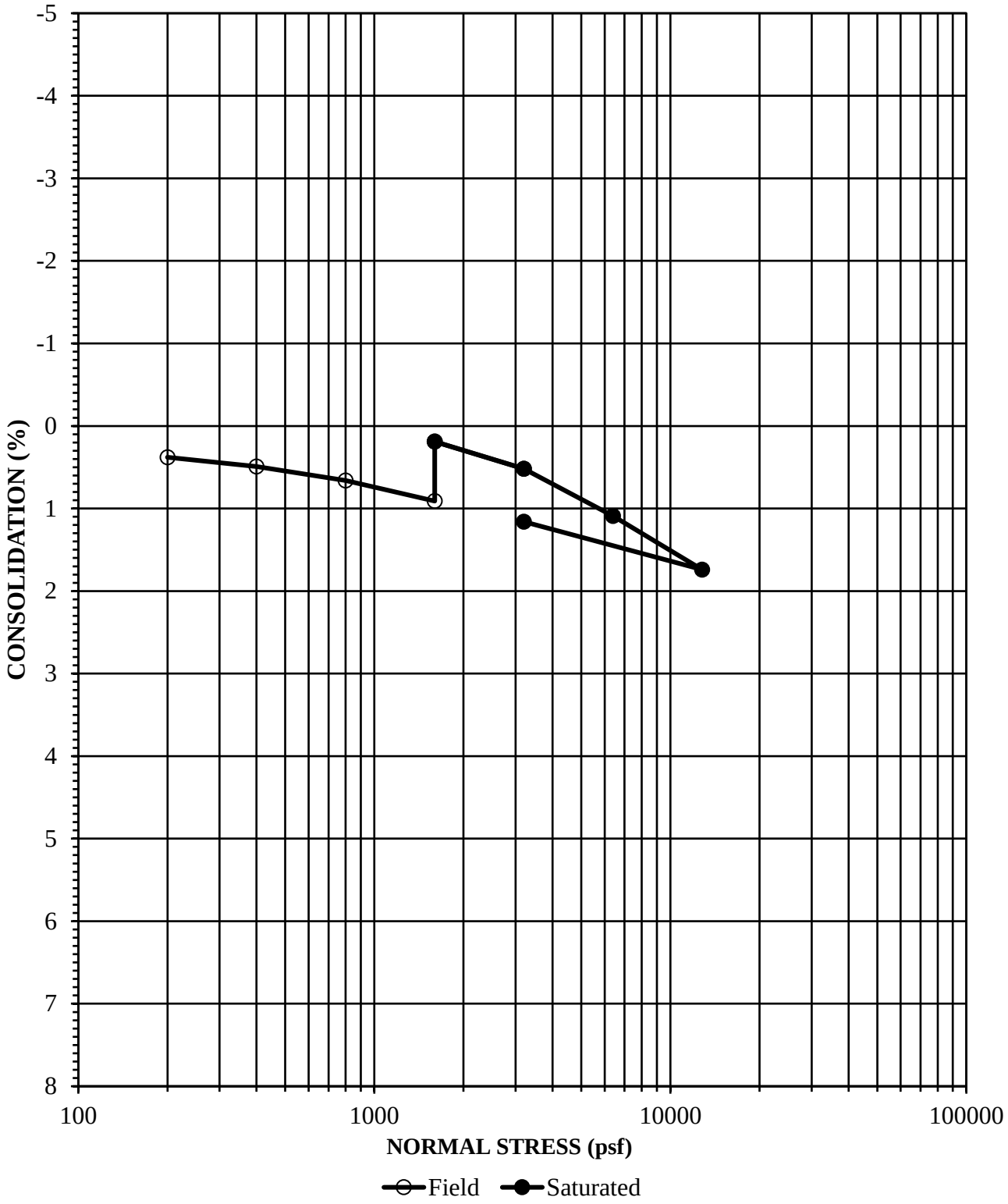
CONSOLIDATION



Job Number	Location	Depth	Description
2949.00	B-1	6	Silty Sand trace Clay

Initial Dry Density (pcf)	Initial Moisture Content (%)	Final Moisture Concent (%)
118.4	6.9	14.5

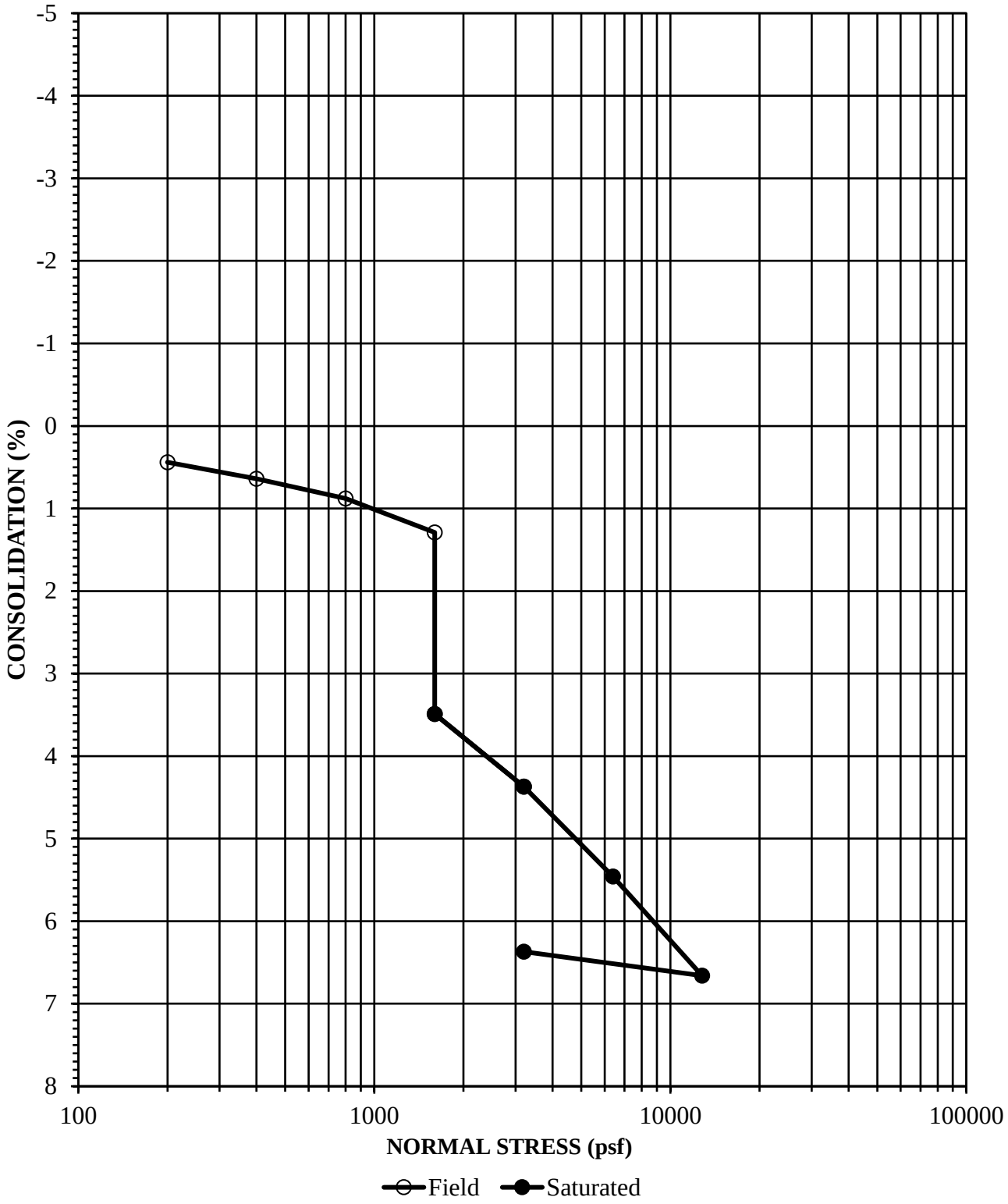
CONSOLIDATION



Job Number	Location	Depth	Description
2949.00	B-2	4	Clayey Sand

Initial Dry Density (pcf)	Initial Moisture Content (%)	Final Moisture Concent (%)
125.2	8.3	12.2

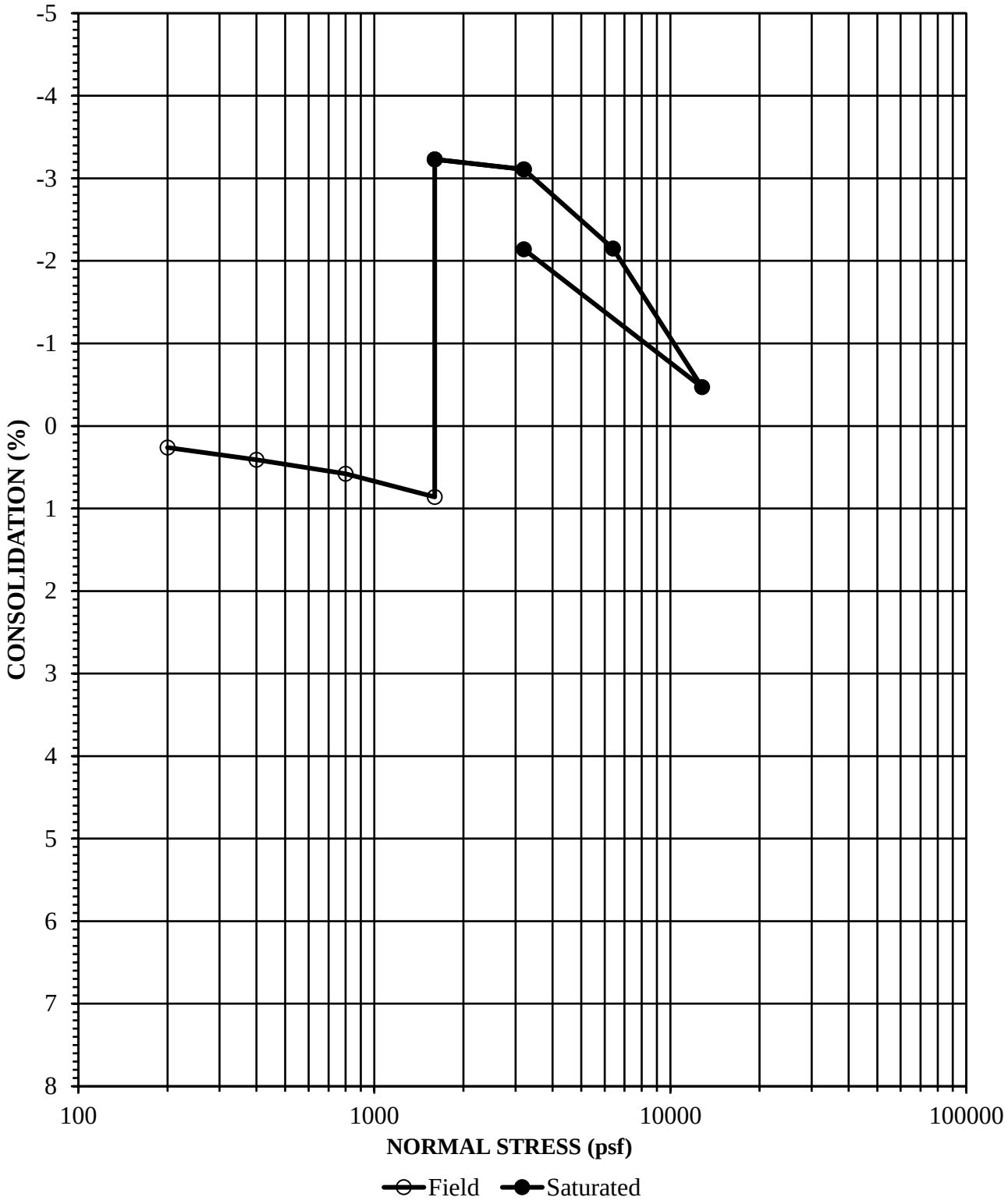
CONSOLIDATION



Job Number	Location	Depth	Description
2949.00	B-4	6	Sand with Clay and Gravel

Initial Dry Density (pcf)	Initial Moisture Content (%)	Final Moisture Concent (%)
100.1	4.1	17.2

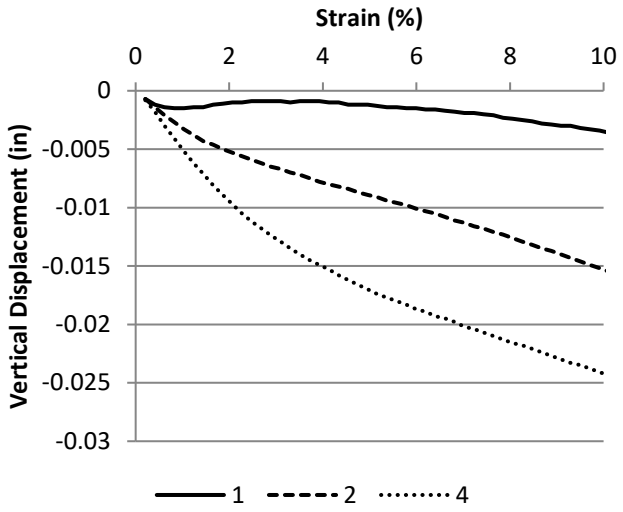
CONSOLIDATION

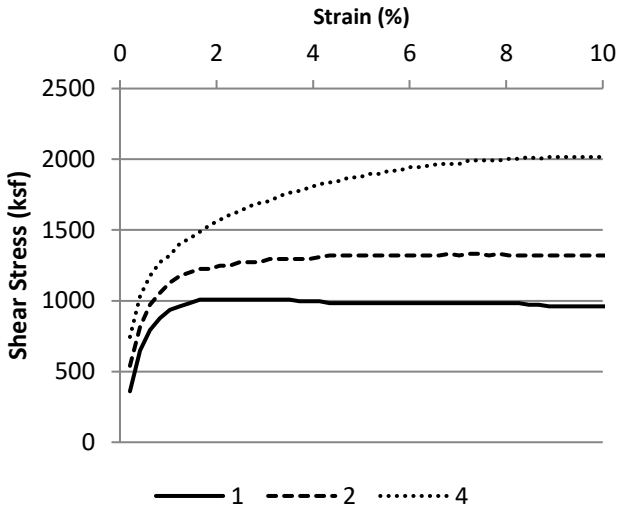


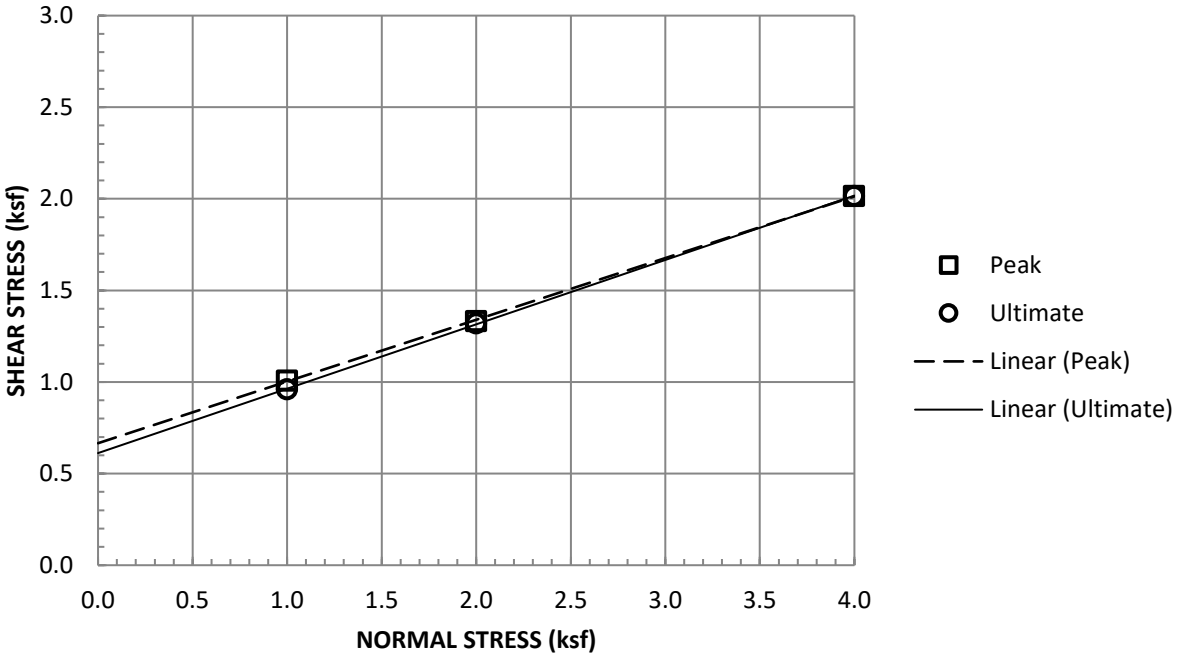
Job Number	Location	Depth	Description
2949.00	B-5	4	Clay

Initial Dry Density (pcf)	Initial Moisture Content (%)	Final Moisture Concent (%)
120.4	13.3	16.8

DIRECT SHEAR







Sample Type:	,		
Normal Stress (ksf)	1	2	4
Peak Shear Stress (ksf)	1.008	1.332	2.016
Peak Displacement (in)	0.004	0.016	0.025
Ultimate Shear Stress (ksf)	0.96	1.32	2.016
Ultimate Displacement (in)	0.25	0.25	0.25
Initial Dry Density (pcf)	112.1	112.1	112.1
Initial Moisture Content (%)	11.5	11.5	11.5
Final Moisture Content (%)	18	17.6	17.4
Strain Rate (in/min)	.005		

Job Number	Location	Depth	Description
2949.00	B-3	0-5	Sandy Clay