

**GEOLOGIC AND GEOTECHNICAL ENGINEERING REPORT,  
PROPOSED MALIBU MEMORIAL CEMETERY,  
Tentative Tract Map 69653,  
4000 Malibu Canyon Road,  
Malibu, California**

for

Green Acres, LLC

January 23, 2015

W.O. 6489

MDN 15710



January 23, 2015  
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GREEN ACRES, LLC  
22837 Pacific Coast Highway, Suite 775  
Malibu, California 90265

Attention: Mr. Bruce McBride

**Subject: Geologic and Geotechnical Engineering Report, Proposed  
Malibu Memorial Cemetery, Tentative Tract Map 69653,  
4000 Malibu Canyon Road, Malibu, California**

Dear Mr. McBride:

As requested, GeoSoils Consultants, Inc. (GSC) has prepared this report for the proposed development for the subject site. The proposed development is shown on Plate 1, Geologic Map. The purpose of this report is to provide geotechnical engineering conclusions and recommendations relative to the newly proposed cemetery design.

GSC has prepared previous reports for the subject site, which addressed a different development concept. The previous development concept addressed in the referenced reports consisted of a hotel and associated structures. All geologic and geotechnical data from the previous studies are included in this report. The referenced geologic and geotechnical reports for the previous development concept were submitted to and approved by the City of Malibu. A copy of the approval letter is attached.

#### **SCOPE OF SERVICES**

Our scope of services consisted of reviewing the referenced reports, transferring available geologic data from the referenced reports, and updating previous/drafting new cross sections for the current development plan.

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Our scope of services during the previous study included excavating, logging, and sampling of numerous borings and test pits across the site. In addition, laboratory testing and engineering analyses were included in the previous reports and have been revised accordingly herein. All previous boring and test pit logs, as well as laboratory test results are included in this report.

### **PROPOSED DEVELOPMENT**

Proposed development of the site will consist of grading to create cemetery property. Access to the site is via Malibu Canyon Road along the west side of the site. One structure is proposed in the center of the site, along with retaining walls, street and parking areas, and hardscape and landscape areas. The plans were prepared by Psomas Engineering and are included herein as Plate 1, Geologic Map. Site grading will include cut/fill operations to create level interment areas, street grades, and other site improvements. Retaining walls to a maximum height of approximately 11 feet are proposed within the development. Grading of the site will consist of flattening the steeper slope areas along the northern and eastern parts of the site to a gradient of 3.2:1. This grading eliminates the slope stability issues previously addressed along the subject slopes.

A series of buried crypts are proposed at the northern slope area on the site, as shown on Section A-A' of the civil drawing (Plate 1). Temporary excavations up to approximately 25 feet high are proposed to provide access to the buried crypts. Slope gradients of 2:1 are proposed between retaining walls in this area.

### **PREVIOUS STUDIES**

Previous studies have been performed on the subject property by GeoSoils Consultants, Inc. (GSC), Leighton and Associates, Inc. (LA) and by Van Beveren and Butelo, Inc. (VBB) (references). GSC excavated, sampled and logged four hollow stem auger borings. Logs of the borings are included in Appendix A, and laboratory data is included in Appendix B. The work by LA included excavating, sampling, and logging of 21 bucket auger borings.

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The locations of the borings are shown on Plate 1 and copies of the boring logs are included in Appendix C. In addition, LA excavated numerous fault trenches across the site. Based on the trenching, Leighton and Associates established a fault setback zone in the southern end of the property for a portion of the Malibu Coast Fault.

Van Beveren and Butelo, Inc. was the last consultant to work on the subject project prior to GSC. VBB excavated, sampled, and logged 8 bucket auger borings across the site. The locations of the borings are shown on Plate 1 and copies of the boring logs and laboratory test results are included in Appendix D.

VBB also excavated trenches across the previously established setback zone by Leighton and Associates. The trench exposed non-marine terrace deposits, which were determined to be continuous and unbroken by faults. The soils within the trenches were observed and dated by Dr. Ron Shlemon. Dr. Shlemon determined that the age of the unbroken sediments were at least 100K years old, and may be as old as 200K. Since these sediments are not affected by fault offset, the previously setback zone was eliminated by VBB. The report by VBB was ultimately approved by the City of Malibu.

Following geotechnical approval from the City of Malibu, GSC performed additional studies on the site in conjunction with In-Situ Engineering, Inc. for the purposes of onsite waste water disposal (References 10 through 17). These reports were also submitted to the City of Malibu for review; however, since the intended use of the site has now changed, these reports are no longer applicable to the project. Subsurface data compiled during OWTS testing can be found in the referenced reports.

As stated above, GeoSoils Consultants, Inc. has reviewed the referenced reports by the previous consultants that have worked on the site. We accept their results and accept geotechnical responsibility for the subject property.

## **SUMMARY OF GEOLOGIC CONDITIONS**

The geologic conditions on the site are discussed in detail in the referenced reports. In summary, the site is underlain by both marine and non-marine terrace deposits, which overlie bedrock of the Monterey, Trancus, Conejo Volcanics, Vasqueros, and Sespe Formations. The terrace deposits underlie the majority of the site and consist of interbedded silts, clays and sands, with occasional gravel and cobbles. Based on review of Appendix D of the VBB report, the terrace deposits on the site are at least 100K years old, and may be as old as 200K years.

Although the reports by LA indicate many different bedrock types on the site, only the Sespe, Vaqueros and a small area of Conejo Volcanics are exposed at the surface. Other bedrock types were encountered in the borings by LA. Geologic structure in the rock, where observed in the borings by the previous consultants, generally dips to the north at steep angles and is favorable relative to the existing slopes and proposed development. However, the bedding is highly variable and dips steeply to the south at the southeastern part of the site. Due to the thickness of the overlying terrace deposits, the structure within the bedrock has little, if any, affect on the proposed development.

A landslide is located along the eastern part of the site. Borings drilled by Leighton and Associates indicates that the base of the landslide extends well below the existing ground surface to the east of the site and is covered with older alluvium. A smaller landslide is mapped at the bottom of the slope along the eastern side of the site, and is well outside the limits of grading.

## **SEISMICITY**

### **Seismic Design Parameters**

Although there are no active faults on or in close proximity to the property, the property, as with all of Southern California, is located in a region subject to periodic earthquake-induced ground shaking. Planned improvements should incorporate earthquake-resistant design. Seismic design criteria are presented in the following section.

**Seismic Design Parameters**

The following are the seismic design parameters for the subject site based on the 2013 California Building Code (CBC), Section 1613.

<b>2013 CBC Section 1613, Earthquake Loads</b>	
Site Class Definition (Table 1613.5.2)	D
Mapped Spectral Response Acceleration Parameter, $S_s$ (Figure 1613.5(3) for 0.2 second)	2.341
Mapped Spectral Response Acceleration Parameter, $S_1$ (Figure 1613.5(4) for 1.0 second)	0.834
Site Coefficient $F_a$ (Table 1613.5.3(1) short period)	1.0
Site Coefficient $F_v$ (Table 1613.5.3(2) 1-second period)	1.5
Adjusted Maximum Considered Earthquake Spectral Response Acceleration Parameter $S_{MS}$ (Eq. 16-37)	2.341
Adjusted Maximum Considered Earthquake Spectral Response Acceleration Parameter $S_{M1}$ (Eq. 16-38)	1.252
Design Spectral Response Acceleration Parameter, $S_{DS}$ (Eq. 16-39)	1.561
Design Spectral Response Acceleration Parameter, $S_{D1}$ (Eq. 16-40)	0.834
Notes:	
1.	Site Class Designation: Class D is recommended based on subsurface condition.
2.	$S_s$ , $S_{MS}$ , and $S_{DS}$ are spectral response accelerations for the period of 0.2 second.
3.	$S_1$ , $S_{M1}$ , and $S_{D1}$ are spectral response accelerations for the period of 1.0 second.

Conformance to the above criteria for seismic design does not constitute any guarantee or assurance that significant structural damage or ground failure will not occur if a maximum level earthquake occurs. The primary goal of seismic design is to protect life and not to avoid all damage, since such design may be economically prohibitive.

**Seismic Hazards**

**Liquefaction**

There are no state-designated liquefaction hazard zones on the site. Underlying material consists of terrace deposits and bedrock and is therefore not subject to liquefaction.

**Earthquake-Induced Landslide Zones**

Based on review of the Seismic Hazard Zone map for the Malibu Beach Quadrangle, the slope areas on the site are located within zones of potential seismic slope instability. As a result, previous slope stability analyses were performed for the slope along Pacific Coast Highway and the results are included in GSC report dated January 27, 2012 (Section J-J').

### **SLOPE STABILITY**

Slope stability analyses have been performed as part of previous studies. The analyses were based on laboratory test results obtained from previous geologic exploration. The site is generally surrounded by descending natural slopes. Proposed grading, as discussed above, will result in final slopes at gradients of 3.2:1. The existing cut slope along the north side of Pacific Coast Highway will remain as is. Stability analyses were previously performed for the slope along the north side of Pacific Coast Highway and the results indicated factors of safety above minimum code values. The results of the analyses were presented in Appendix A of the GSC report dated January 27, 2012.

A series of buried crypts are proposed at the northern slope area on the site, as shown on Section A-A' of the civil drawing (Plate 1). Temporary excavations up to approximately 25 feet high are proposed to provide access to the buried crypts. Slope gradients of 2:1 are proposed between retaining walls in this area.

### **CONCLUSIONS**

It is our professional opinion that proposed development is feasible from a geologic and soil engineering viewpoint. Safe and stable development of this land can be accomplished as long as the recommendations included within this report are incorporated into final tract design and implemented during final grading and construction. Final design and construction should be performed according to City Code and Permits. Most earth materials on the parcel will excavate with moderate to heavy duty ripping using heavy duty grading equipment. Excavated material will produce good quality fill.

### **"111" STATEMENT**

It is GSC's opinion that the building site will be safe from the hazards of landslide, settlement or slippage. Furthermore, the finished development will not adversely affect the stability of the adjacent properties nor be adversely affected by adjacent properties.

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## RECOMMENDATIONS

### 1. Removals/Reprocessing

The on site soils are suitable for structural support, provided that the following recommendations are followed. The upper 5 feet of the terrace deposits on the site are generally loose and should be removed down to competent terrace deposits in areas of proposed structures located within the central part of the site. In addition, all previously placed fault trench backfill shall be removed and recompact. The removals should extend a minimum distance of five feet beyond the building footprints, or a distance equal to the depth of fill placement, whichever is greater. In areas of proposed hardscape, a minimum removal depth of two to three feet is recommended. Removals are not considered necessary in areas of the site to be used as cemetery sites. The proposed grading operation will result in removal of surficial soil along the northern part of the site. As a result, proposed retaining walls in this area may be founded in dense terrace deposits.

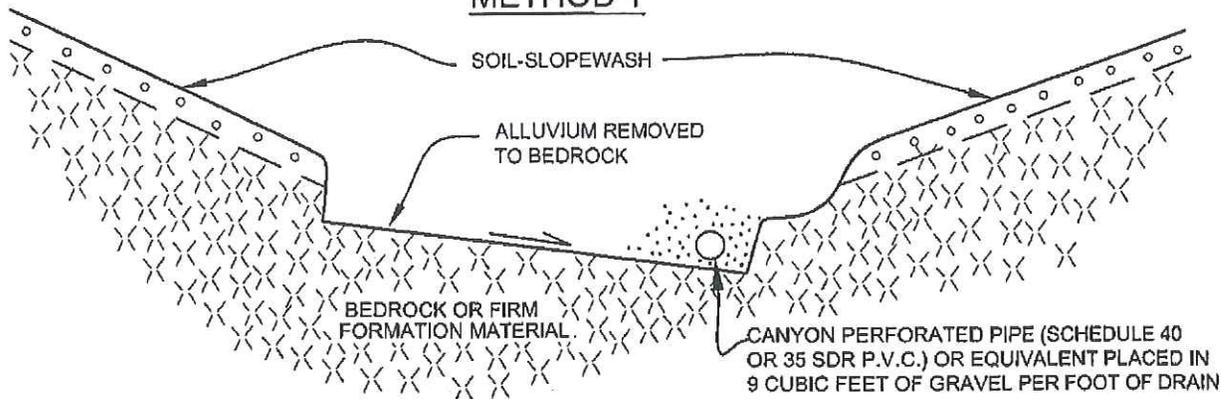
Two landslides are located along the eastern part of the site. Both landslides should be removed during grading. Since the slides extend off-site to the east, removals of the slides should start at the property line and follow a 1:1 project toward the development, as shown on Section 5-5'.

An erosion gully is located on the existing cut slope above Pacific Coast Highway. Their gully should be repaired in accordance with Cross-Section 6-6'.

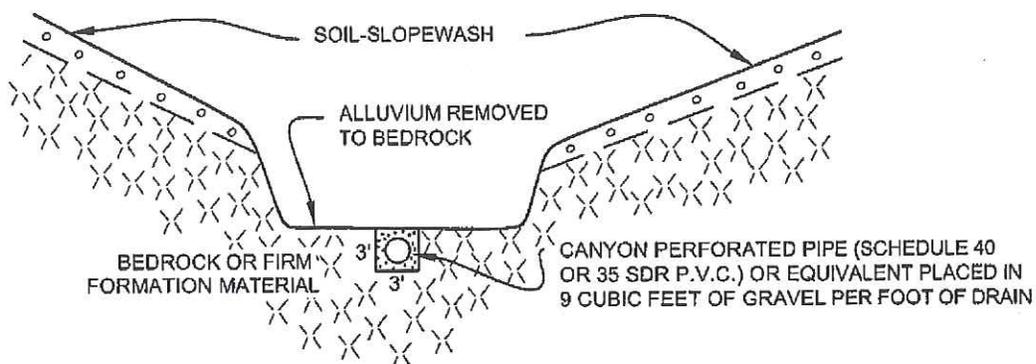
### Subdrains

1. Subdrain systems should be provided in the fill areas at the northern portion of the site and stabilization fills prior to fill placement (see Figure 1).

### METHOD 1

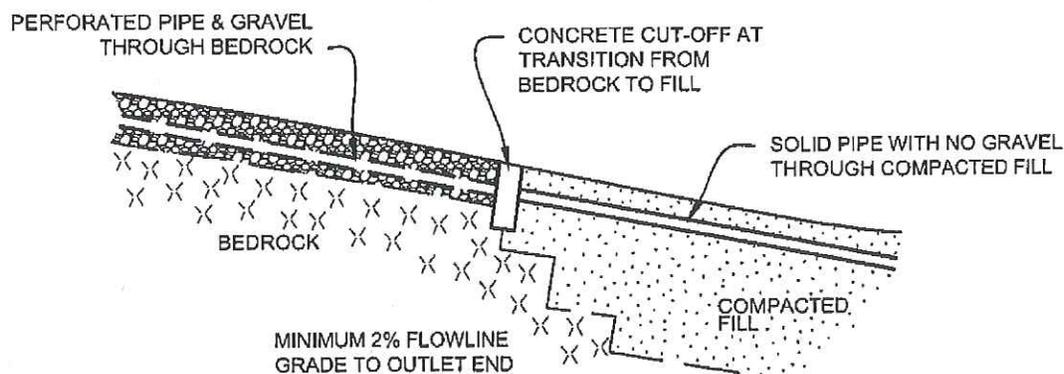


### METHOD 2



GRAVEL TO CONFORM TO STATE OF CALIFORNIA DEPT. OF PUBLIC WORKS STANDARD SPECIFICATIONS FOR CLASS 2 PERMEABLE MATERIAL AS ALTERNATE 3/4" GRAVEL MAY BE USED SURROUNDED WITH GEOTEXTILE FILTER FABRIC APPROVED BY THE GEOTECHNICAL ENGINEER. (NOTE: CITY OF LOS ANGELES DOES NOT ALLOW GEOTEXTILE FABRIS WRAP AROUND SUBDRAIN SYSTEMS.)

### LONGITUDINAL SECTION



**GSC** GeoSoils Consultants Inc.  
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### CANYON SUBDRAIN DESIGN & CONSTRUCTION METHODS

DATE 12/2014

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Geotechnical • Geologic • Environmental FIGURE 1

2. Filter material should be Class 2 permeable filter, or No. 2 and No. 3 concrete aggregate gradations per standard specifications for Public Works construction, or approved equivalent, inspected and tested to verify its suitability. The filter should be clean with a wide range of sizes.
3. Subdrain pipe material should consist of PVC Schedule 40 or D-2729 or an equivalent recommended by the Geotechnical Engineer. "Accordion" type pipe and similar products are not acceptable for use as subdrains or backdrains on this project.
4. Subdrains should be placed in all canyon bottoms. During grading, the Engineering Geologist should evaluate the necessity of additional drain placement.
5. All subdrainage system should be inspected by the Engineering Geologist.

### **Slopes**

#### **Fill Slopes**

- A. Fill slopes are proposed at a maximum slope ratio of 3.2:1 (horizontal:vertical) between benches, to a maximum anticipated height of approximately 90 feet.
- B. Fill slopes should be built in accordance with recommendations included in the Grading Guidelines section of this report.

#### **Cut Slopes**

The following recommendations apply to proposed cut slopes.

- A. All permanent major cut slopes are planned at a gradient of 3.2:1 or flatter.
- B. Cut slopes exposing terrace deposits should not be affected by rock structure. The terrace units are rather massive and bedding is only

represented by lineation of sand to gravel-sized particles. No true bedding planes exist in the terrace deposits (Qt).

### **FOUNDATION RECOMMENDATIONS**

Foundation recommendations in this report are considered preliminary. Final foundation design recommendations should be determined at the completion of grading, based on expansion and chemical testing determined on final grade samples. For convenience, the following preliminary foundation recommendations may be used. These recommendations should be finalized at the end of future final pad and street grading.

Conventional and post-tensioned foundations may be used on the site. All foundations should meet current City of Malibu setback requirements.

#### **Foundation Criteria**

1. An allowable soil bearing pressure of 1,500 pounds per square foot, including dead and real live loads, can be utilized for design of conventional foundations into compacted fill or terrace deposits. The above bearing value may be increased by one-third when considering short duration seismic or wind loads. Footings are recommended to be continuous and should have a minimum width of 18 inches and a minimum embedment depth of 18 inches for one and two story structures.

The allowable bearing value may be increased by 20 percent for each additional foot below the minimum 18 inches depth recommended, plus 7 percent for each additional foot wider than the minimum 18 inches width recommended up to a maximum value of 3,000 pounds per square foot.

2. A friction coefficient for concrete on compacted soil/terrace deposits of 0.3 and a lateral (passive) bearing value of 200 pounds per square foot, per foot of depth, may be employed to resist lateral loads. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third. For design of isolated piles, the allowable passive pressure may be increased by 100 percent (see Table A for other conventional foundation recommendations).
3. In order to minimize the potential effects of seismic activity, expansive soils, secondary settlement and hydroconsolidation or hydrocompression, we recommend the following alternative foundation systems, i.e., post-tensioned slab foundations, be used.

#### **Post-Tensioned Slab Foundation**

Anticipated surficial differential movement across the building pad areas included in this report in the form of settlement or heave could be in the order of 1 to 2 inches. These post-tensioned slabs should be designed in accordance with the recommendations of either the California Foundation Slab Method or Post-Tensioning Institute. The slabs should be designed for at least one inch of surficial differential movement (i.e., at least 1 inch in a 30-foot span) for low expansion index (EI) soil, and at least two inches of surficial differential movement for medium EI soil. Based on review of laboratory data for the on-site materials, the average soil modulus of subgrade reaction, K, to be used for design is 100 pounds per cubic inch. Specific recommendations for the design of *California Foundation Slab* and *Post Tension Institute* methods are presented below.

A surface bearing value of 1,000 pounds per square foot can also be used in design.

1. **California Foundation Slab (Spanability) Method**

It is recommended that slabs be designed for a free span of 15 feet regardless of the expansion index of the soil. From a soil expansion/shrinkage standpoint, a common contributing factor to distress of structures using post-tensioned slabs is fluctuation of moisture in soils underlying the perimeter of the slab, compared to the center, causing a "dishing" or "arching" of the slabs. To mitigate this possibility, a combination of soil presaturation and construction of a perimeter "cut off" wall should be employed.

All slab foundation areas should be moisture conditioned to at least optimum moisture, but no more than 5 percent above optimum moisture for a depth of at least 12 inches below subgrade low EI soil, and 18 inches for medium EI soil. A continuous perimeter curtain wall should extend to a depth of at least 12 inches below exterior grade for low EI soil, and 18 inches for medium EI soil to preserve this moisture. The cut-off walls may be integrated into the slab design or independent of the slab and should be a minimum of 6 (six) inches wide.

2. **Post-Tensioning Institute Method**

Post-tensioned slabs should have sufficient stiffness to resist excessive bending due to non-uniform swell and shrinkage of subgrade soils. The differential movement can occur at the corner, edge, or center of slab. The potential for differential uplift can be evaluated using design specifications of the Post-Tensioning Institute. The following table presents suggested minimum coefficients to be used in the Post-Tensioning Institute design method.

Suggested Coefficients	
Thornthwaite Moisture Index	-20 in/yr
Depth to Constant Soil Suction	9 (feet)
Constant Soil Suction: (pf)	3.8

The coefficients are considered minimums and may not be adequate to represent worst case conditions such as adverse drainage, excess watering, and/or improper landscaping and maintenance. The above parameters are applicable provided structures have gutters and downspouts, yard drains, and positive drainage is maintained away from structure perimeters. Also, the values may not be adequate if the soils below the foundation become saturated or dry such that shrinkage occurs. The parameters are provided with the expectation that subgrade soils below the foundations are maintained in a relatively uniform moisture condition. Responsible irrigation of landscaping adjacent to the foundation must be practiced since over-irrigation of landscaping can cause problems. Therefore, it is important that information regarding drainage, site maintenance, settlements and affects of expansive soils be considered.

Based on the above parameters, the following values were obtained from the Post Tensioning Institute Design manual. If a stiffer slab is desired, higher values of  $y_m$  may be warranted.

Expansion Index of Soil Subgrade	Low EI	Medium EI
$e_m$ center lift	9.0 feet	8.5 feet
$e_m$ edge lift	4.7 feet	4.5 feet
$Y_m$ center lift	0.34 inch	0.56 inch
$Y_m$ edge lift	0.48 inch	0.77 inch

Deepened footings/edges around the slab perimeter must be used as indicated above to minimize non-uniform surface moisture migration (from an outside source) beneath the slab. An edge depth of at least 12 inches should be considered for low EI soil and 18 inches for medium EI soil. The bottom of the deepened footing/edge should be designed to resist tension, using cable or reinforcement per the Structural Engineer.

## **Retaining Walls**

The following recommendations should be followed for retaining wall design and construction:

The equivalent fluid pressures recommended are based on the assumption of a uniform backfill and no build-up of hydrostatic pressure behind the wall. To prevent the build-up of lateral soil pressures in excess of the recommended design pressures, overcompaction of the fill behind the wall should be avoided. This can be accomplished by placement of the backfill above a 45-degree plane projected upward from the base of the wall, in lifts not exceeding eight inches in loose depth and compacting with hand-operated or small, self-propelled vibrating plates. (Note: Placement of free-draining material in this zone could also prevent the build-up of lateral soils pressures). All walls must conform to City of Malibu Building Code setback requirements.

### 1. **Conventional (Yielding) Retaining Walls**

All recommendations for active lateral earth pressures contained herein assume that the anticipated retaining structures are in tight contact with the competent materials that they are supposed to support. The earth support system must be sufficiently stiff to hold horizontal movements in the soil to less than one percent of the height of the vertical face, but should be free-standing to the point that they yield at the top at least 0.1 percent of the height of the wall.

### 2. **Earth Pressure on Conventional Retaining Walls**

The earth pressures of walls retaining self-draining, granular materials, compacted fill or undisturbed bedrock material shall be assumed equal to that exerted by an equivalent fluid having a density not less than shown in the following table:

Backfill Slope (Horizontal to Vertical)	Equivalent Fluid Density (pcf)
Level	45
5:1	46
4:1	47
3:1	48
2:1	50

3. **Restrained (Non-Yielding) Walls**

Earth pressures will be greater on walls where yielding at the top of the wall is limited to less than 1/1000 the height of the wall either by stiffness (i.e., return walls, etc.) or structural floor network prior to backfilling. Utilizing the recommended backfill compaction of 90 percent Modified Proctor Density per ASTM D-1557-12, we recommend the following equivalent fluid density for non-yielding walls:

Backfill Slope (Horizontal to Vertical)	Equivalent Fluid Density (pcf)
Level	65
3.2:1	70

4. **Wall Seismicity**

The current seismic design criteria for this project is as follows:

From NavFac:  $P_{ae} = 3/8\gamma H^2 k_n$   
 $K_n = 0.2$                        $H = \text{Height of wall}$   
 $\gamma = 120 \text{ pcf}$

$P_e = 3/8(120 \text{ pcf})(0.2)H^2 = 9H^2$

$P_e$  acts at 0.6H above the wall base.

5. **General**

- a. Any anticipated, superimposed loading (i.e., upper retaining walls, other structures, etc.) shall be considered in the wall design per Figures 11 and 12 of the NavFac manual.

- b. If water is allowed to saturate the backfill, the lateral pressure could exceed the active pressure recommended. Clayey or expansive soils should not be used for backfilling behind retaining walls.
- c. A vertical component equal to one-third of the horizontal force so obtained may be assumed at the plane of application of force.

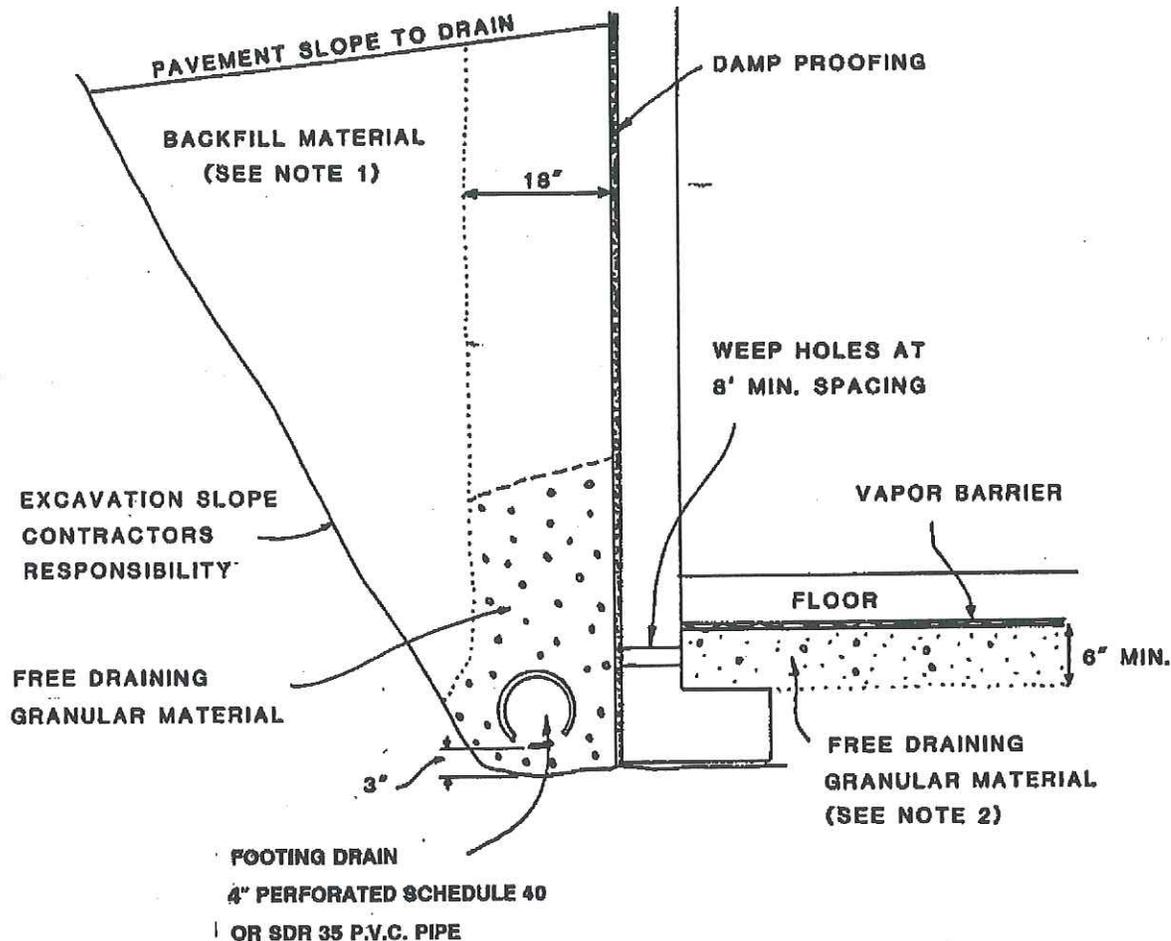
The depth of the retained earth shall be the vertical distance below the ground surface, measured at the wall face for stem design or measured at the heel of the footing for overturning and sliding.

- d. The walls should be constructed with a minimum 4-inch perforated drainpipe in a gravel envelope at the bottom and behind the wall. A one-foot thick zone of crushed gravel should be placed behind the wall to within two feet of the surface. On-site soil may be used for the remainder of the backfill and should be compacted to 90 percent relative compaction as determined by ASTM Test Designation D-1557-12. All proposed subterranean walls should be waterproofed and back drained (see Figure 2).
- e. A concrete-lined swale is recommended to be placed behind retaining walls that can intercept surface runoff from upslope areas. This surface runoff shall be transferred to an approved drainage channel via non-erosive drainage devices.

### **Deepened Foundation**

Deepened foundations may be to meet slope setback requirements for structures located along the top of slopes. The piles should be designed by the Project Structural Engineer.

Setback Requirements: Structures adjacent to slopes shall meet the City of Malibu setback requirements.



**BACKFILLED WALL**

**NOTE NO.1 - IF WET CONDITIONS RENDER ON-SITE SOIL UNSUITABLE FOR REQUIRED DEGREE OF COMPACTION , BACKFILL THE ZONE SHOWN ABOVE WITH FREE DRAINING GRANULAR SOIL WITH NOT MORE THAN 5% (BY WEIGHT BASED ON MINUS 3/4" PORTION PASSING NO.200 SIEVE (BY WET SIEVING) WITH NO PLASTIC FINES.**

**NOTE NO.2 - FREE DRAINING GRANULAR MATERIAL BENEATH FLOOR SLAB SHOULD BE HYDRAULICALLY CONNECTED TO THE FOOTING DRAIN.**



**BACKFILLED WALL DETAIL**

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FIGURE 2

Pile Type: In our opinion, support for the proposed structure may be derived from drilled cast-in-place, reinforced concrete piles (i.e., caissons) designed for frictional resistance.

Bearing Soils and Tip Depths: We recommend that all piles extend a sufficient depth to develop adequate compressive, uplift, and lateral capacity. We recommend that all piles extend a minimum depth of 5 feet below the required setback requirement plane into the underlying terrace deposits. The pile loading for the proposed structures was not available at the time of report submittal; therefore, anticipated pile depths cannot be estimated and should be reviewed by GSC prior to construction.

Pile Capacity - Compressive Frictional Resistance: An allowable frictional resistance of 600 pounds per square foot, per foot of depth into competent terrace deposits should be used for pile design.

Pile Capacity - Lateral (Preliminary): Lateral loads, which may be imposed on the piles by wind or seismic forces, are resisted primarily by the horizontal bearing support of soils adjacent to the pile shafts. The lateral capacity of a pile depends on its length, stiffness in the direction of loading, and degree of fixity at the head, as well as on the adjacent soil properties.

For preliminary design purposes, the passive earth pressures for terrace material may be computed as an equivalent fluid having a density of 200 pounds per cubic foot (pcf), with a maximum earth pressure of 2,000 pounds per square foot (psf). The lateral capacity of each individual pile is a function of the length and diameter; therefore, once the structural engineer has determined the required pile loading for the proposed structures, the lateral pile capacities should be reevaluated by GSC.

Pile Strength: The allowable pile capacities are derived from the supporting strength of the soil, which could exceed the structural strength of the pile itself, therefore, the structural strength of the pile should be considered to pre-empt the allowable soil bearing capacity. The project structural engineer should verify that the compressive and tensile strength of the concrete pile could accommodate the recommended capacities.

Estimated Settlements: We estimate that total post-construction settlements of pile-supported structural elements will not exceed ½ inch. Differential settlements between adjacent piles could approach ¼ inch.

Additional Lateral Resistance: Besides the aforementioned lateral resistance provided by the pile shafts, additional resistance is provided by passive earth pressure acting against other embedded structural elements. We recommend using the values shown in Table I for allowable passive pressure (equivalent fluid weight) and coefficient of friction, which is in addition to the passive lateral pressure. The above values may be increased by one-third for short duration wind and seismic forces.

When combining passive pressure and frictional resistance the passive component should be reduced by one-third. For design of isolated piles, the allowable passive pressure may be increased by 100 percent.

Soil Type	Allowable Passive Pressure (pcf)	Maximum Allowable Passive Pressure (psf/ft)	Coefficient of Friction (Concrete/soil)
Terrace Deposits	200	2000	0.30

Surface Water Control: All surface water should be collected and conducted to the street or approved watercourse via non-erosive devices.

Inspection - General: We recommend that the Geotechnical Engineer or Geologist be present in the field during construction to confirm the soil conditions prior to steel and concrete placement. The City Inspector should also observe the excavation.

Concrete Placement: In lieu of removing standing water in the pile excavation prior to placing concrete (i.e., pumping water), the concrete may be placed by the tremmie method to displace collected water. The solid tremmie tube shall be long enough to reach to bottom of the excavation. When concrete is being placed, the solid tremmie tube must be kept full of concrete at all times, with the lower end emersed in the concrete just deposited. The concrete shall at no time be placed through the water.

When water is present at the bottom of the drilled pile holes to a depth of 3 inches or more, a concrete mix with strength of 1,000 pounds per square inch over the design strength, shall be tremmied up from the bottom. An admixture that reduces the problem of segregation of paste/aggregates and dilution of paste shall be included.

Drilling Safety: The following drilling safety guidelines should be followed during pile installation:

- It is the Contractor's responsibility to provide a safe working area during drilling operations;
- The Geotechnical Engineer should observe all excavations to verify that the caissons are founded at the required depth and recommended bearing material;

- All drilled piles should be adequately covered if the excavation is not poured immediately after excavation.

### **GRADING GUIDELINES**

These specifications present the usual and minimum requirements for grading operations performed under the control of GeoSoils Consultants, Inc.

No deviation from these specifications would be allowed, except where specifically superseded in the preliminary geology and geotechnical report, or in other written communication signed by the Geotechnical Engineer or Engineering Geologist.

#### 1. **General**

- A. The Geotechnical Engineer and Engineering Geologist is the Owner's or Builder's representative on the project. For the purpose of these specifications, supervision by the Geotechnical Engineer or Engineering Geologist includes that inspection performed by any person or persons employed by, and responsible to, the licensed Geotechnical Engineer or Engineering Geologist signing the Geotechnical report.
- B. All clearing, site preparation or earthwork performed on the project should be conducted by the Contractor under the observation of the Geotechnical Engineer or Engineering Geologist.
- C. It is the Contractor's responsibility to prepare the ground surface to receive the fills to the satisfaction of the Geotechnical Engineer or Engineering Geologist and to place, spread, mix, water, and compact the fill in accordance with the specifications of the Geotechnical Engineer or Engineering Geologist. The Contractor should also remove all material considered unsatisfactory by the Geotechnical Engineer or Engineering Geologist.

- D. It is also the Contractor's responsibility to have suitable and sufficient compaction equipment on the jobsite to handle the amount of fill being placed. If necessary, excavation equipment would be shut down to permit completion of compaction. Sufficient watering apparatus would also be provided by the Contractor, with due consideration for the fill material, rate of placement and time of year.
- E. A final report should be issued by the Geotechnical Engineer and Engineering Geologist attesting to the Contractor's conformance with these specifications.
- F. At all times, safety will have precedence over production work. All municipal, State, and Osha Safety guidelines should be allowed beneath unshored vertical cuts, within unshored trenches with vertical walls in excess of four feet high, or in any unsafe working environment. If an unsafe job condition is noted by a GeoSoils Consultants, Inc. representative, it would be brought to the attention of the Grading Contractor's foreman, the on-site developer's representative, or both. Once this condition is noted, it should be corrected as soon as possible, or work related to the unsafe condition may be terminated.

2. **Site Preparation**

- A. All vegetation and deleterious material, such as rubbish, should be disposed of off-site. This removal must be conducted prior to placing fill.
- B. The Contractor should locate all subsurface features (i.e. sewage disposal systems, basements, pipelines, wells, etc.) on the site, or on the grading plan, to the best of his knowledge prior to preparing the ground surface.

- C. Soil or rock materials determined by the Geotechnical Engineer as being unsuitable for placement in compacted fills should be removed and wasted from the site. Any material incorporated as a part of a compacted fill must be approved by the Geotechnical Engineer.
- D. After the ground surface to receive fill has been cleared, it should be scarified, disced, or bladed by the Contractor until it is uniform and free from ruts, hollows, hummocks or other uneven features which may prevent uniform compaction.

The scarified ground surface should then be brought to at least optimum moisture, but not more than 120 percent of optimum moisture, mixed as required, and compacted as specified. If the scarified zone is greater than 12 inches in depth, the excess should be removed and placed in lifts restricted to 6 to 8 inches.

Prior to placing fill, the ground surface to receive fill should be inspected and approved by the Geotechnical Engineer.

- E. Any underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipelines or other not located prior to grading are to be removed or treated in a manner prescribed by the Geotechnical Engineer.

### 3. Compacted Fills

- A. Material imported or excavated on the property may be utilized in the fill, provided such material has been determined to be suitable by the Geotechnical Engineer. Roots, tree branches and other deleterious matter missed during clearing should be removed from the fill as directed by the Geotechnical Engineer.

- B. Unless otherwise prohibited by the governing code, rock, brick, concrete, or asphalt fragments less than six inches in diameter may be utilized in the fill, provided:
1. they are not placed in concentrated pockets;
  2. there is a sufficient percentage of fine-grained material to surround the rocks;
  3. the distribution of the rocks is supervised by the Geotechnical Engineer.
- C. Rocks greater than six inches in diameter should be taken off-site, or placed in accordance with the recommendations of the Geotechnical Engineer in fill areas designated as suitable for rock disposal.
- D. Material that is spongy, subject to decay, or otherwise considered unsuitable should not be used in the compacted fill.
- E. Representative samples of materials to be utilized as compacted fill should be analyzed in the laboratory by the Geotechnical Engineer to determine their physical properties. If any material other than that previously tested is encountered during grading, the appropriate analysis of this material should be conducted by the Geotechnical Engineer as soon as possible.
- F. Material used in the compacting process should be evenly spread in thin lifts not to exceed 6 to 8 inches in thickness, watered, processed and compacted to obtain a uniformly dense layer. The fill should be placed and compacted on a horizontal plane, unless otherwise approved by the Geotechnical Engineer. This includes material placed for slope repairs, and utility trench backfills on slope areas.

- G. Each layer should be compacted to at least a minimum of 90 percent of the maximum density in compliance with the testing method specified by the controlling governmental agency (in general, ASTM D-1557-12 would be used). For all fills greater than 40 feet in vertical thickness, the portion of the fill below a depth of 40 feet should be placed at a relative compaction of at least 95 percent.

If compaction to a lesser percentage is authorized by the controlling governmental agency because of a specific land use or geotechnical condition, the area to receive fill compacted to less than 90 percent should either be delineated on the grading plan or appropriate reference made to the area in the geotechnical report.

- H. All fill must be brought to a moisture content of at least optimum moisture, but should not exceed 120 percent of optimum moisture. If excessive moisture in the fill results in failing tests or an unacceptable "pumping" condition, then the fill should be allowed to dry until the moisture content is within the necessary range to meet above compaction requirements, or should be removed or reworked until acceptable conditions are obtained.
- I. If the moisture content or relative compaction varies from that required by the Geotechnical Engineer, the Contractor should rework the fill until it is in accordance with the requirements of the Geotechnical Engineer. If a compaction test indicates that the fill meets or exceeds the minimum required relative compaction but is below optimum moisture content, then the fill should be reworked until it meets the moisture content requirements.

- J. All fills should be keyed and benched through all topsoils, slopewash, alluvium or creep affected or other unsuitable materials, into sound bedrock or firm material where the slope receiving fill is steeper than a ratio of five horizontal to vertical (i.e., in accordance with the recommendations of the Geotechnical Engineer). The standard acceptable bench height is four feet into suitable material.
- K. The key for sidehill fills should be a minimum of 20 feet within bedrock or firm materials, unless otherwise specified by the Geotechnical Engineer.
- L. Drainage terraces and subdrainage devices should be constructed in compliance with the ordinances of the controlling governmental agency, or with the recommendations of the Geotechnical Engineer and Engineering Geologist.
- M. The Contractor will be required to obtain a minimum relative compaction of 90 percent out to the finish slope face of all fill slopes. This may be achieved by either overbuilding the slope a minimum of five feet, and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment, or by any other procedure which produces the required compaction.

If a method other than overbuilding and cutting back to the compacted core is to be employed, slope tests would be made by the Geotechnical Engineer during construction of the slopes to determine if the required compaction is being achieved. Each day the Contractor will receive a copy of the Geotechnical Engineer's "Daily Field Engineering Report" which will indicate the results of field density tests for that day. Where failing tests occur or

other field problems arise, the Contractor may be notified of such conditions by written communication from the Geotechnical Engineer in the form of a conference memorandum, to avoid any misunderstanding arising from oral communication.

If the method of achieving the required slope compaction selected by the Contractor fails to produce the necessary results, the Contractor should rework or rebuild such slopes until the required degree of compaction is obtained, at no additional cost to the Owner or Geotechnical Engineer.

- N. All fill slopes should be planted or protected from erosion by methods specified in the geotechnical report, or required by the controlling governmental agency.
- O. Fill-over-cut slopes should be properly keyed through topsoil, colluvium or creep material into firm materials, and the transition should be stripped of all soil prior to placing fill. The fill portion of the slope should be founded on a key to be determined by the Geotechnical Engineer.

4. **Cut Slopes**

- A. The Engineering Geologist should observe all cut slopes excavated in rock, lithified, or formation material at vertical intervals not exceeding ten feet.
- B. If any conditions not anticipated in the preliminary report such as perched water, seepage, lenticular or confined strata of a potentially adverse nature, unfavorably inclined bedding, joints or faults planes, or areas of unstable material are encountered during grading, these conditions should be analyzed by the Engineering Geologist and Geotechnical Engineer, and recommendations should be made to treat these problems.

- C. Cut slopes that face in the same direction as the prevailing drainage should be protected by a non-erosive interceptor swale placed at the top of the slope.
- D. Unless otherwise specified in the geotechnical and geological report, no cut slopes should be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies.
- E. Drainage terraces should be constructed in compliance with the ordinances of controlling governmental agencies, or with the recommendations of the Geotechnical Engineer or Engineering Geologist.

5. **Grading Control**

- A. Inspection of the fill placement should be provided by the Geotechnical Engineer during the progress of grading.
- B. In general, density tests should be made at intervals not exceeding two vertical feet of fill height or every 500 to 1000 cubic yards of fill placed. These criteria will vary depending on soil conditions and the size of the job. In any event, an adequate number of field density tests should be made to verify that the required compaction is being achieved.
- C. Density tests should also be made on the surface material to receive fill as required by the Geotechnical Engineer.

- D. All cleanout, processed ground to receive fill, key excavations, subdrains and rock disposal should be inspected by the Geotechnical Engineer prior to placing any fill. It should be the Contractor's responsibility to notify the Geotechnical Engineer when such areas are ready for inspection.

In most jurisdictions, these items must also be inspected by a representative of the controlling governmental agency prior to fill placement.

6. **Construction Considerations**

- A. Erosion control measures, when necessary, should be provided by the Contractor during grading and prior to the completion and construction of permanent drainage controls.
- B. Upon completion of grading and termination of inspections by the Geotechnical Engineer, no further filling or excavating, including that necessary for footings, foundations, large tree wells, retaining walls, or other features should be performed without observation of the Geotechnical Engineer or Engineering Geologist.
- C. Care should be taken by the Contractor during final grading to preserve any berms, drainage terraces, interceptor swales, or other devices of a permanent nature on or adjacent to the property.

**Temporary Excavation**

Where the necessary space is available, temporary unsurcharged embankments may be sloped back without shoring. The slope should not be cut steeper than the following gradient:

Height	Temporary Gradient (Horizontal:Vertical)
0 - 5'	Near-Vertical
>5'	1:1

In areas where soils with little or no binder are encountered, shoring or flatter excavation slopes shall be made.

These recommended temporary excavations do not preclude local raveling or sloughing.

All applicable requirements of the California Construction and General Industry Safety Orders, the Occupational Safety and Health Act, and the Construction Safety Act should be met.

Where sloped embankments are used, the top of the slope should be barricaded to prevent equipment and heavy storage loads within five feet of the top of the slope. If the temporary construction embankments are to be maintained for long periods, berms should be constructed along the top of the slope to prevent runoff water from eroding the slope faces.

Our personnel should observe the soils exposed in the temporary backcut slopes during excavation so that modifications of the slopes can be made if variations in the soil conditions occur.

#### **Drainage/Landscape Maintenance**

Water should not be allowed to pond or seep into the ground, or flow over slopes in a concentrated manner. Roof gutters and yard drains should be provided. Pad drainage should be directed toward the street or any approved watercourse area swale via non-erosive channel, pipe and/or dispersion devices.

Surface water should not be allowed to drain towards a descending slope, as it may locally have an adverse affect on surficial slope stability. Likewise, over watering should also be avoided near slope areas, as it too may have a deleterious effect of surficial slope stability.

### LIMITATIONS

The findings and recommendations of this report were prepared in accordance with generally accepted professional geotechnical engineering principles and practice for the City of Malibu at this time. We make no other warranty, either express or implied. The conclusions and recommendations contained in this report are based on site conditions disclosed in our subsurface investigation and the referenced reports. However, soil/rock conditions can vary significantly between borings, test pits, and natural outcrops, therefore, further refinements of our recommendations contained herein may be necessary due to changes in the building plans or what is encountered during site grading.

The recommendations provided in this report are applicable for preliminary development planning for the subject project provided that surface water will be kept from infiltrating into the subgrade adjacent to the house foundation systems. This may include, but not be limited to rain water, roof water, landscape water and/or leaky plumbing. The site is to be fine graded at the completion of construction to include positive drainage away from the structures and roof water will be collected via gutters, downspouts, and transported to the street in buried drainpipes.

Since our investigation was based on the site conditions observed, selective laboratory testing, and engineering analysis, the conclusions and recommendations contained herein are professional opinions. Further, these opinions have been derived in accordance with standard engineering practices, and no warranty is expressed or implied.

If the conditions encountered during grading are not consistent with the findings presented in this report, or if proposed construction is moved from the location investigated, this office shall be notified immediately so that the condition or change can be evaluated and appropriate action taken.

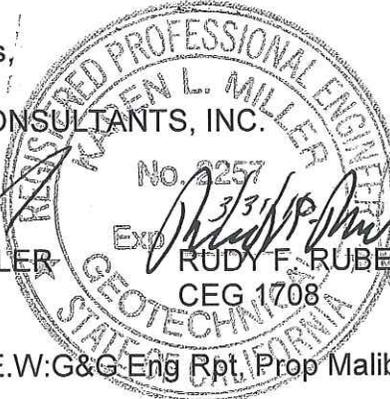
**CLOSURE**

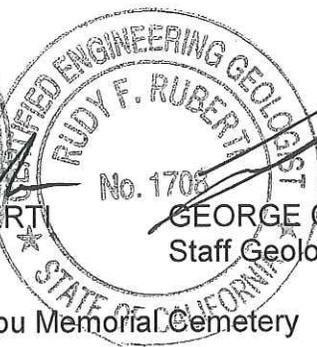
We appreciate this opportunity to be of continued service to you. If you have any questions regarding the content of this report or any other aspects of the project, please do not hesitate to contact us.

Very truly yours,

GEOSOILS CONSULTANTS, INC.

  
KAREN L. MILLER  
GE 2257

  
RUDY F. RUBERTI  
CEG 1708

  
GEORGE C. EDWARDS  
Staff Geologist

KLM.RFR.GCE.W:G&G Eng Rpt Prop Malibu Memorial Cemetery

Encl: References

- City of Malibu Approval Letter dated June 7, 2012
- Plate 1, Geologic Map
- Plate 2, Geologic Cross-Sections
- Table A, Foundation and Slab Recommendations
- Appendix A, Field Exploration Procedures
  - Plates A-1 through A-10, Boring Logs
- Appendix B, Laboratory Test Procedures and Results
  - Plates SH-1 through SH-13, Shear Test Diagrams
  - Plates C-1 through C-6, Consolidation Diagrams
- Appendix C, Boring Logs and Laboratory Test Results by Leighton and Associates
- Appendix D, Boring Logs and Laboratory Test Results by Van Beveren and Butelo
- Appendix E, Temporary Slope Stability Analyses

cc: (5) Addressee

MDN 15710

### REFERENCES

1. Association of Engineering Geologist dated 1982, "*Geologic Maps, Santa Monica Mountains, Los Angeles, California*", compiled by the City of Los Angeles.
2. California Code of Regulations, Title 14, Article 10, Section 3721, Seismic Hazards Mapping, Division of Mines and Geology.
3. Campbell, K.W. and Bozorgnia Y. (1994), Near-Source Attenuation of Peak Horizontal Acceleration from Worldwide Accelerograms Recorded from 1957 to 1993, Proceedings, 5<sup>th</sup> U.S. National Conference on Earthquake Engineering, Volume 3, Earthquake Engineering Research Institute, pp. 283-292.
4. R.F. Yerkes and R.H. Campbell, Department of the Interior, United States Geological Survey. "*Geologic Map of East-Central Santa Monica Mountains, Los Angeles County, California*," Map I-1146, Prepared in Cooperation with Los Angeles County, California
5. Jerome A. Treiman dated February 9, 2007, "*Splays Associated with the Malibu Coast Fault Zone at Winter Mesa*," Malibu, Los Angeles County, California, California Geological Survey, Supplement #1 to Fault Evaluation Report FER-229
6. California Division of Mines and Geology, "*Fault Evaluation Report FER-46*," June 16, 1977
7. Dibblee, T.W., 1993, "*Geologic Map of the Malibu Beach Quadrangle, Los Angeles County, California*"
8. GeoSoils Consultants, Inc. dated September 15, 2011, "Response to Comments of the City of Malibu Geotechnical Review Sheet Dated October 31, 2007, and Updated Geologic and Geotechnical Engineering Report, Rancho Malibu Resort, Tentative Tract Map 69653, 4000 Malibu Canyon Road, Malibu, California"
9. GeoSoils Consultants, Inc., dated January 27, 2012, "Response to City of Malibu Geotechnical Review Sheet dated October 18, 2011, Regarding Rancho Malibu Resort, Tentative Tract Map 69653, 4000 Malibu Canyon Road, Malibu, California"
10. GeoSoils Consultants, Inc., dated April 2, 2012, "Geologic and Geotechnical Engineering Review of Proposed On-Site Waste Water Treatment System, Rancho Malibu Resort, Tentative Tract Map 69653, 4000 Malibu Canyon Road, Malibu, California"

**REFERENCES (cont'd)**

11. GeoSoils Consultants, Inc., dated May 21, 2012, "Response to City of Malibu Geotechnical Review Sheet dated May 7, 2011, Regarding Rancho Malibu Resort, Tentative Tract Map 69653, 4000 Malibu Canyon Road, Malibu, California"
12. GeoSoils Consultants, Inc. dated September 5, 2012, "Groundwater and Geologic Observations for On-Site Sewage Disposal, Rancho Malibu Resort, Tentative Tract Map 69653, 4000 Malibu Canyon Road, Malibu, California"
13. GeoSoils Consultants, Inc., dated November 16, 2012, "Update Geologic and Geotechnical Engineering Report Review of Proposed On-Site Waste Water Treatment System, Rancho Malibu Resort, Tentative Tract Map 69653, 4000 Malibu Canyon Road, Malibu, California"
14. GeoSoils Consultants, Inc., dated February 13, 2013, "Response to City of Malibu Geotechnical and Hydrogeologic Review Sheet dated December 14, 2012, Regarding Onsite Wastewater Treatment System (OWTS), Rancho Malibu Resort, Tentative Tract Map 69653, 4000 Malibu Canyon Road, Malibu, California"
15. GeoSoils Consultants, Inc., dated May 6, 2013, "Response to City of Malibu Geotechnical and Hydrogeologic Review Sheet dated April 26, 2013, Regarding Onsite Wastewater Treatment System (OWTS), Rancho Malibu Resort, Tentative Tract Map 69653, 4000 Malibu Canyon Road, Malibu, California"
16. GeoSoils Consultants, Inc., dated June 20, 2013, "Summary of Geologic and Geotechnical information for RWQCB Review Letter dated April 19, 2013, Regarding Onsite Wastewater Treatment System (OWTS), Rancho Malibu Resort, Tentative Tract Map 69653, 4000 Malibu Canyon Road, Malibu, California"
17. GeoSoils Consultants, Inc., dated July 25, 2013, "Response to City of Malibu Geotechnical and Hydrogeologic Review Sheet Geotechnical Review comments, dated July 9, 2013, Regarding Onsite Wastewater Treatment System (OWTS), Rancho Malibu Resort, Tentative Tract Map 69653, 4000 Malibu Canyon Road, Malibu, California"
18. Leighton and Associates, Inc., dated August 4, 1989, "Report of Geotechnical Investigation, Rancho Malibu Mesa Project, Pacific Coast Highway at Malibu Canyon Road, Malibu, California"

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**REFERENCES (cont'd)**

19. Leighton and Associates, Inc., dated February 6, 1990, "Response to Geologic and Geotechnical Engineering Review Sheets (Grading Plan Check No. 1811), By the Department of Public Works, Land Development Division, For Rancho Malibu Hotel, 3930 Malibu Canyon Road, Malibu, California"
20. Petersen, M.D., Bryant, W.A., Cramer, C.H., Cao, T., Reichle, M.S., Frankel, A.D., Lienkaemper, J.J., McCrory, P.A., and Schwartz, D.P., 1996, "Probabilistic Seismic Hazard Assessment for the State of California," California Division Mines and Geology, Open File Report 96-08.
21. Southern California Earthquake Center dated March 1999, "*Recommended Procedures for Implementation of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Liquefaction in California*", pages 28 - 32.
22. Van Beveren and Butelo, Inc. dated September 27, 2007, "Report of Geologic and Geotechnical Investigation, Proposed Rancho Malibu Resort, Pacific Coast Highway and Malibu Canyon Road, Malibu, California"

MDN 15710



# City of Malibu **PLANNING REVIEW**

23825 Stuart Ranch Road • Malibu, California 90265-4861  
(310) 456-2489 • Fax (310) 317-1950 • www.malibucity.org

## GEOTECHNICAL REVIEW SHEET

<u>Project Information</u>		Review Log #:	3276
Date:	June 7, 2012	Planning #:	CDP 11-028
Site Address:	4000 Malibu Canyon Road	BPC/GPC #:	
Lot/Tract/PM #:	n/a	Planner:	Stefanie Edmondson
Applicant/Contact:	Bruce McBride, <a href="mailto:bmcbride@pda-11c.net">bmcbride@pda-11c.net</a> Fred Gaines, <a href="mailto:fgaines@gaineslaw.com">fgaines@gaineslaw.com</a>		
Contact Phone #:		Fax #:	
Project Type:	Rancho Malibu Resort Development		

<u>Submittal Information</u>	
Consultant(s) / Report Date(s): <i>(Current submittal(s) in Bold.)</i>	GeoSoils Consultants, Inc. (Miller, GE 2257; Ruberti, CEG 1708): <b>5-21-12</b> , 1-27-12, 9-15-11 Van Beveren & Butelo, Inc. (Butelo, CEG 1315; Langhaar, RGE 2647): 9-27-07 Roy J. Shlemon & Associates, Inc.: September 2007 (Included as Appendix D in the referenced Van Beveren & Butelo report) Hotel plans prepared by Hill Glazier Studio dated May 19, 2011.
	References reviewed by the Consultant: Leighton and Associates, Inc.: 3-28-90, 2-6-90, 8-4-89
Previous Reviews:	5-7-12, 10-18-11, Geotechnical Review Referral Sheet dated 6-21-11, 10-21-07; Ref: Los Angeles County reviews dated 3-6-90, 3-1-90, 12-8-89, 11-29-89

<u>Review Findings</u>	
<b><u>Coastal Development Permit Review</u></b>	
<input checked="" type="checkbox"/>	<b>APPROVED</b> from a geotechnical perspective.
<input type="checkbox"/>	<b>NOT APPROVED</b> from a geotechnical perspective. The listed 'Review Comments' shall be addressed prior to approval.
<b><u>Building/Grading Plan-Check Stage Review</u></b>	
<input checked="" type="checkbox"/>	<b>Awaiting Building plan check submittal.</b> Please respond to the listed 'Building Plan-Check Stage Review Comments' AND review and incorporate the attached 'Geotechnical Notes for Building Plan Check' into the plans.
<input type="checkbox"/>	<b>APPROVED</b> from a geotechnical perspective. Please review the attached 'Geotechnical Notes for Building Plan Check' and incorporate into Building Plan-Check submittals.

**NOT APPROVED** from a geotechnical perspective. The listed 'Building Plan-Check Stage Review Comments' shall be addressed prior to Building Plan-Check Stage approval.

**Remarks**

The referenced response report was reviewed by the City from a geotechnical perspective. The project comprises a new hotel resort, consisting of a 167,062 square foot 3-story main hotel building with a basement (includes a spa and fitness center), a 165,259 square foot parking structure, swimming pool/spa, 21 individual casitas totaling 177,736 square feet, retail and surface parking, access roads, drives, and fire lanes, storm drains and utilities, retaining walls, and landscaping/flatwork. Grading will consist of 54,000 yards of R & R; 156,700 yards of exempt understructure grading; 5,120 yards of exempt safety grading for the fire department; and 50,380 yards of non-exempt grading. 189,760 yards will be exported. Shoring will be required for the basement and parking structure excavations.

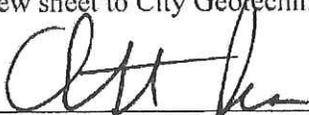
**The applicants have submitted an application for a new OWTS to City geotechnical/hydrogeologic staffs for review. Comments will be provided by City staff in a separate review letter.**

**NOTICE: Applicants shall be required to submit all Geotechnical reports reviewed by City Geotechnical Staff for this specific proposed project as a searchable PDF file on a CD at the time of Building Plan Check application.**

**Building Plan-Check Stage Review Comments:**

1. Please show the Stream Terrace Deposits on Cross-Sections C, D, and G. Are the stream terrace deposits displaced across the landslide?
2. Please depict limits and depths of over-excavation and structural fill to be placed on the grading plan, and cross sectional view of the proposed building area. Cut and fill yardages are to be indicated on the cover sheet of the plans.
3. Two sets of final grading, OWTS, swimming pool, and foundation plans for the proposed hotel, parking structure, and casitas (**APPROVED BY BUILDING AND SAFETY**) incorporating the Project Geotechnical Consultant's recommendations and items in this review sheet must be **reviewed and wet stamped and manually signed by the Project Engineering Geologist and Project Geotechnical Engineer**. City geotechnical staff will review the plans for conformance with the Project Geotechnical Consultants' recommendations and items in this review sheet over the counter at City Hall on Mondays through Thursdays between 8 AM and 10 AM.

Please direct questions regarding this review sheet to City Geotechnical staff listed below.

Engineering Geology Review by:  Date 6/11/12  
 Christopher Dean, C.E.G. #1751, Exp. 9-30-12  
 Engineering Geology Reviewer. (310-456-2489, x306)

Geotechnical Engineering Review by:  Date June 7, 2012  
 Kenneth Clements, G.E. # 2010, Exp. 6-30-14  
 Geotechnical Engineering Reviewer (805-563-8909)  
 Email: kclements@fugro.com

This review sheet was prepared by City Geotechnical Staff contracted with Fugro as an agent of the City of Malibu.

**FUGRO CONSULTANTS, INC. FUGRO**  
 4820 McGrath Street, Suite 100  
 Ventura, California 93003-7778  
 (805) 650-7000 (Ventura office)  
 (310) 456-2489, x306 (City of Malibu)





**TABLE A**

**FOUNDATION AND SLAB RECOMMENDATIONS  
ONE AND TWO-STORY RESIDENTIAL BUILDINGS**

	Expansion Index 0-50 Low Expansion	Expansion Index 51-90 Medium Expansion	Expansion Index 91-130 High Expansion
1-Story Footings	All footings 12" deep. Four No. 4 bars, two top and two bottom; footings continuous.	Exterior footings 18" deep. Interior footings 15" deep. Four No. 4 bars, two top and two bottom; footings continuous.	Exterior footings 24" deep. Interior footings 18" deep. Four No. 4 bars: two top and two bottom. Footings continuous.
2-Story Footings	All footings 18" deep; continuous. Four No. 4 bars, two top and two bottom.	All footings 18" deep; continuous. Four No. 4 bars, two top and two bottom.	All footings 24" deep; continuous. Four No. 4 bars: two top and two bottom.
Garage Door Grade Beam	12" deep. Four No. 4 bars, two top and two bottom.	18" deep. Four No. 4 bars, two top and two bottom.	24" deep. Four No. 4 bars: two top and two bottom.
Living Area Floor Slabs	4" thick. No. 4 bars at 16" both ways at mid-height. Six mil Visqueen vapor barrier sandwiched between, 1" sand layers.	4" thick. No. 4 bars at 16" both ways at mid-height. Slab steel should be doweled into exterior footings. Six mil Visqueen vapor barrier sandwiched between two, 2" sand layers.	4" thick. No. 4 bars at 16" both ways at mid-height. Six mil Visqueen vapor barrier sandwiched between two, 2" sand layers. Slab steel should be doweled into exterior footings.
Garage Floor Slabs	4" thick. No. 4 bars at 16" both ways at mid-height and ¼ slabs. Isolate from stem wall footings. No moisture barrier required. 2" sand base required.	4" thick. No. 4 bars at 16" both ways at mid-height and ¼ slabs. Isolate from stem wall footings. No moisture barrier required. 4" sand base required.	4" thick. No. 4 bars at 16" both ways at mid-height and ¼ slabs. Isolate from stem wall footings. No moisture barrier required. 4" sand base required.
Pre-soaking of Living Area and Garage Slab Soils	No pre-soaking required. Pre-moisten soil prior to pouring concrete.	Soak 18" depth to 5% above optimum moisture content.	Soak to 24" depth to 5% above optimum moisture content.

Note: An allowable soil bearing value of 1500 pounds per square foot, including dead and live loads, may be used for design of footings and foundation founded at the recommended depths. All footings should have a minimum width of 15 inches and should be continuous. A friction coefficient for concrete on natural and compacted soil of 0.4, and a lateral soils bearing value of 250 pounds per square foot, per foot of depth, may be employed to resist lateral loads. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one third.

If wire mesh is provided for slabs under Medium and High expansion soils, then No. 3 bars at 24" on center dowels should be provided in exterior footings and bent 3' into slabs. The bent bars are not allowed between floating slabs and footings.

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**APPENDIX A**

**FIELD EXPLORATION PROCEDURES**

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APPENDIX A

FIELD EXPLORATION PROCEDURES

Our exploratory borings were drilled with a truck-mounted drill rig operated by an independent drilling company working under subcontract to GSC. Four borings were drilled (designated B-1-11 through B-4-11) utilizing an 8-inch diameter hollow stem auger drill rig. Samples were obtained via the California ring sampler.

A geologist from our firm continuously observed the borings and classified the soils encountered by visual examination in accordance with the Unified Soil Classification System, and collected representative soil samples. Ring samples were obtained by driving a ring sampler with the Kelly bar. Soil samples were retained in a series of brass rings, each having an inside diameter of 2.36 (6.0 centimeter) and a height of 1.00 inch (2.54 centimeter). The ring samples were stored in close-fitting, moisture-tight containers and later transported to our laboratory for further visual examination and testing, as deemed necessary. After the boring was completed, the borehole was backfilled with soil cuttings.

The enclosed *Boring Logs* describes the vertical sequence of soils and materials encountered in each boring, based primarily on our field classifications and supported by our subsequent laboratory examination and testing. Where a soil contact was observed to be gradational, our log indicates the average contact depth. Where a soil type changed between sample intervals, we inferred the contact depth. Our log also graphically indicates the blow count, sample type, sample number, and approximate depth of each soil sample obtained from the borings, as well as any laboratory tests performed on these soil samples. If any groundwater was encountered in a borehole, the approximate groundwater depth is depicted on the boring log.

**BORING LOGS**

# GEOTECHNICAL BORING LOG

PROJECT NAME	Green Acres	W.O. NO.	6489
DRILLING COMPANY	Choice	DATE STARTED:	9-8-11
TYPE OF DRILL RIG	LAR	LOGGED BY	RLC
DRILLING METHOD	Hollow Stem	HAMMER WEIGHT (LBS)	140
DIAMETER OF HOLE	8	DROP (IN)	30
BORING LOCATION:		GROUND ELEVATION (FT)	
		GW ELEVATION	

DEPTH (FT)	SAMPLE TYPE	BLOWS/ 6 IN.	GEOTECHNICAL DESCRIPTION	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	OTHER TESTS
			<u>0-2', ALLUVIUM (Qal)</u> Gray-brown, silty SAND, scattered gravel			
			<u>2-36', TERRACE (Qt)</u>			
5						
10	[California Ring]	50	@ 10', Orange-brown, very fine to medium SAND, slightly moist, dense @ 10-20', Occasional pebble-cobbles	5.3	106.6	Cons
15						
20	[California Ring]	34/50	@ 20', Orange-brown, very fine to medium SAND, slightly moist, dense	3.3	117.2	DS
25						

<p style="text-align: center;"><b>LEGEND</b></p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> <li> Standard Penetration Test</li> <li> California Ring</li> <li> Rock Core</li> <li> Bulk Sample</li> </ul> </td> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> <li> Shelby Tube</li> <li> Water Seepage</li> <li> Groundwater</li> </ul> </td> </tr> </table>	<ul style="list-style-type: none"> <li> Standard Penetration Test</li> <li> California Ring</li> <li> Rock Core</li> <li> Bulk Sample</li> </ul>	<ul style="list-style-type: none"> <li> Shelby Tube</li> <li> Water Seepage</li> <li> Groundwater</li> </ul>	<p>SIEVE: GRAIN SIZE ANALYSIS              MAX: MAXIMUM DRY DENSITY              DS: DIRECT SHEAR              CONS: CONSOLIDATION              HYDR: HYDROMETER ANALYSIS              EXPAN: EXPANSION INDEX              CHEM: CHEMICAL TESTS</p>	<p style="font-size: 1.2em; margin: 0;"><b>PLATE A-1</b></p> <p style="font-size: 1.5em; margin: 5px 0;"><b>GeoSoils Consultants, Inc.</b></p> <p style="font-size: 0.8em; margin: 0;">GEOTECHNICAL * GEOLOGIC * ENVIRONMENTAL</p>
<ul style="list-style-type: none"> <li> Standard Penetration Test</li> <li> California Ring</li> <li> Rock Core</li> <li> Bulk Sample</li> </ul>	<ul style="list-style-type: none"> <li> Shelby Tube</li> <li> Water Seepage</li> <li> Groundwater</li> </ul>			

# GEOTECHNICAL BORING LOG

PROJECT NAME	Green Acres	W.O. NO.	6489
DRILLING COMPANY	Choice	DATE STARTED:	9-8-11
TYPE OF DRILL RIG	LAR	LOGGED BY	RLC
DRILLING METHOD	Hollow Stem	HAMMER WEIGHT (LBS)	140
DIAMETER OF HOLE	8	DROP (IN)	30
BORING LOCATION:		GROUND ELEVATION (FT)	
		GW ELEVATION	

DEPTH (FT)	SAMPLE TYPE	BLOWS/ 6 IN.	GEOTECHNICAL DESCRIPTION	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	OTHER TESTS
35		23/37/49	@ 30', Orange-brown, slightly silty, very fine to medium SAND, scattered, very coarse grains, slightly moist to moist, dense	5.9	122.7	Cons
			<b><u>36-50', BEDROCK: Monterey Formation</u></b>			
40		39/50 for 3"	@ 40', Light brown, fine to medium SANDSTONE, slightly moist, dense	1.0	107.4	DS
45						
50		50 for 4"	@ 50', No recovery	-----	-----	
55			T.D. @ 50' No groundwater			

<p style="text-align: center;"><b>LEGEND</b></p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"> Standard Penetration Test</td> <td style="width: 50%;"> Shelby Tube</td> </tr> <tr> <td> California Ring</td> <td> Water Seepage</td> </tr> <tr> <td> Rock Core</td> <td> Groundwater</td> </tr> <tr> <td> Bulk Sample</td> <td></td> </tr> </table>	 Standard Penetration Test	 Shelby Tube	 California Ring	 Water Seepage	 Rock Core	 Groundwater	 Bulk Sample		<p>SIEVE: GRAIN SIZE ANALYSIS          MAX: MAXIMUM DRY DENSITY          DS: DIRECT SHEAR          CONS: CONSOLIDATION          HYDR: HYDROMETER ANALYSIS          EXPAN: EXPANSION INDEX          CHEM: CHEMICAL TESTS</p>	<p style="font-size: 1.2em; font-weight: bold;">PLATE A-2</p> <p style="font-size: 1.5em; font-weight: bold; margin-top: 10px;">GeoSoils Consultants, Inc.</p> <p style="font-size: 0.8em; margin-top: 5px;">GEOTECHNICAL * GEOLOGIC * ENVIRONMENTAL</p>
 Standard Penetration Test	 Shelby Tube									
 California Ring	 Water Seepage									
 Rock Core	 Groundwater									
 Bulk Sample										

# GEOTECHNICAL BORING LOG

PROJECT NAME	Green Acres	W.O. NO.	6489
DRILLING COMPANY	Choice	DATE STARTED:	9-8-11
TYPE OF DRILL RIG	LAR	LOGGED BY	RLC
DRILLING METHOD	Hollow Stem	HAMMER WEIGHT (LBS)	140
DIAMETER OF HOLE	8	DROP (IN)	30
BORING LOCATION:		BORING NO.	B-2-11
		SHEET	1 OF 3
		GROUND ELEVATION (FT)	
		GW ELEVATION	

DEPTH (FT)	SAMPLE TYPE	BLOWS/ 6 IN.	GEOTECHNICAL DESCRIPTION	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	OTHER TESTS
			<u>0-2', ALLUVIUM (Qal)</u> Light brown, very fine to medium, sandy SILT, dry, loose			
			<u>2-60', TERRACE (Qt)</u>			Max Expan
5	[Hatched Box]	23/24/25	@ 5', Orange-brown, very fine to medium SAND with gravel, slightly moist to dry (rock in sampler tip)	3.1	-----	
10	[Hatched Box]	30/32/45	@ 10', Red-brown, fine to very coarse SAND, scattered pebbles, moist, dense	5.0	122.3	DS
15	[Hatched Box]	50 for 5"	@ 15', Red-brown, fine to very coarse SAND, scattered pebbles, moist, dense @ 16-27', Scattered pebbles-cobbles	6.0	-----	
20	[Hatched Box]	50 for 3"	@ 20', No recovery	-----	-----	
25						

LEGEND	
<ul style="list-style-type: none"> <li> Standard Penetration Test</li> <li> California Ring</li> <li> Rock Core</li> <li> Bulk Sample</li> </ul>	<ul style="list-style-type: none"> <li> Shelby Tube</li> <li> Water Seepage</li> <li> Groundwater</li> </ul>

SIEVE: GRAIN SIZE ANALYSIS  
 MAX: MAXIMUM DRY DENSITY  
 DS: DIRECT SHEAR  
 CONS: CONSOLIDATION  
 HYDR: HYDROMETER ANALYSIS  
 EXPAN: EXPANSION INDEX  
 CHEM: CHEMICAL TESTS

PLATE A-3

**GeoSoils Consultants, Inc.**  
 GEOTECHNICAL \* GEOLOGIC \* ENVIRONMENTAL

# GEOTECHNICAL BORING LOG

PROJECT NAME	Green Acres	W.O. NO.	6489
DRILLING COMPANY	Choice	DATE STARTED:	9-8-11
TYPE OF DRILL RIG	LAR	LOGGED BY	RLC
DRILLING METHOD	Hollow Stem	HAMMER WEIGHT (LBS)	140
DIAMETER OF HOLE	8	DROP (IN)	30
BORING LOCATION:		GROUND ELEVATION (FT)	
		GW ELEVATION	

DEPTH (FT)	SAMPLE TYPE	BLOWS/ 6 IN.	GEOTECHNICAL DESCRIPTION	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	OTHER TESTS
35	[Hatched Box]	18/15/20	@ 30', Red-brown, slightly silty, very fine to coarse SAND, moist, dense	10.9	120.6	DS
40	[Hatched Box]	18/33/45	@ 40', Red-brown, slightly silty, very fine to coarse SAND, moist, dense	7.0	130.0	
50	[Hatched Box]	33/50	@ 50', Red-brown, silty, very fine to medium SAND, minor clay, moist, dense	8.2	120.8	
55						

**LEGEND**

<ul style="list-style-type: none"> <li> Standard Penetration Test</li> <li> California Ring</li> <li> Rock Core</li> <li> Bulk Sample</li> </ul>	<ul style="list-style-type: none"> <li> Shelby Tube</li> <li> Water Seepage</li> <li> Groundwater</li> </ul>
--	--

SIEVE: GRAIN SIZE ANALYSIS  
 MAX: MAXIMUM DRY DENSITY  
 DS: DIRECT SHEAR  
 CONS: CONSOLIDATION  
 HYDR: HYDROMETER ANALYSIS  
 EXPAN: EXPANSION INDEX  
 CHEM: CHEMICAL TESTS

**PLATE A-4**

GeoSoils Consultants, Inc.

GEOTECHNICAL \* GEOLOGIC \* ENVIRONMENTAL

# GEOTECHNICAL BORING LOG

PROJECT NAME Green Acres W.O. NO. 6489  
 DRILLING COMPANY Choice DATE STARTED: 9-8-11 BORING NO. B-2-11  
 TYPE OF DRILL RIG LAR LOGGED BY RLC SHEET 3 OF 3  
 DRILLING METHOD Hollow Stem HAMMER WEIGHT (LBS) 140 GROUND ELEVATION (FT) \_\_\_\_\_  
 DIAMETER OF HOLE 8 DROP (IN) 30 GW ELEVATION \_\_\_\_\_

BORING LOCATION: \_\_\_\_\_

DEPTH (FT)	SAMPLE TYPE	BLOWS/ 6 IN.	GEOTECHNICAL DESCRIPTION	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	OTHER TESTS
	▨	21/37/ 50 for 5"	@ 60', Orange-brown, very fine to very coarse SAND, moist, slightly cemented, dense	7.8	123.7	
65			T.D. @ 60' No groundwater			
70						
75						
80						
85						

**LEGEND**

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>▨ Standard Penetration Test</li> <li>▨ California Ring</li> <li>▨ Rock Core</li> <li>■ Bulk Sample</li> </ul> | <ul style="list-style-type: none"> <li>▨ Shelby Tube</li> <li>⤵ Water Seepage</li> <li>≡ Groundwater</li> </ul> |
|--|---|

- SIEVE: GRAIN SIZE ANALYSIS  
 MAX: MAXIMUM DRY DENSITY  
 DS: DIRECT SHEAR  
 CONS: CONSOLIDATION  
 HYDR: HYDROMETER ANALYSIS  
 EXPAN: EXPANSION INDEX  
 CHEM: CHEMICAL TESTS

PLATE A-5

**GeoSoils Consultants, Inc.**  
GEOTECHNICAL \* GEOLOGIC \* ENVIRONMENTAL

# GEOTECHNICAL BORING LOG

PROJECT NAME	Green Acres	W.O. NO.	6489
DRILLING COMPANY	Choice	DATE STARTED:	9-8-11
TYPE OF DRILL RIG	LAR	LOGGED BY	RLC
DRILLING METHOD	Hollow Stem	HAMMER WEIGHT (LBS)	140
DIAMETER OF HOLE	8	DROP (IN)	30
BORING LOCATION:		BORING NO.	B-3-11
		SHEET	1 OF 3
		GROUND ELEVATION (FT)	
		GW ELEVATION	

DEPTH (FT)	SAMPLE TYPE	BLOWS/6 IN.	GEOTECHNICAL DESCRIPTION	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	OTHER TESTS
			<u>0-2', ALLUVIUM (Qal)</u> Gray-brown, sandy SILT, dry, loose			
			<u>2-60', TERRACE (Qt)</u>			
5	[California Ring]	28/30/43	@ 5', Red-brown, silty, fine to medium SAND, scattered, very small gravel, slightly moist to moist, dense	6.6	124.4	Cons
10	[Bulk Sample]					Max Expan
15	[California Ring]	50 for 5"	@ 15', No recovery	----	----	
20	[California Ring]	16/18/27	@ 20', Orange-brown, silty, very fine to medium SAND, moist, dense	7.3	123.7	Cons DS
25	[California Ring]	35/50	@ 25', Orange-brown, silty, very fine to medium SAND, moist, dense	6.8	120.5	

LEGEND	
[Cross-hatch]	Standard Penetration Test
[Diagonal lines]	California Ring
[Dotted]	Rock Core
[Solid black]	Bulk Sample
[Grid]	Shelby Tube
[Wavy line]	Water Seepage
[Inverted triangle]	Groundwater

SIEVE:	GRAIN SIZE ANALYSIS
MAX:	MAXIMUM DRY DENSITY
DS:	DIRECT SHEAR
CONS:	CONSOLIDATION
HYDR:	HYDROMETER ANALYSIS
EXPAN:	EXPANSION INDEX
CHEM:	CHEMICAL TESTS

PLATE A-6

**GeoSoils Consultants, Inc.**  
GEOTECHNICAL \* GEOLOGIC \* ENVIRONMENTAL

# GEOTECHNICAL BORING LOG

PROJECT NAME	Green Acres	W.O. NO.	6489
DRILLING COMPANY	Choice	DATE STARTED:	9-8-11
TYPE OF DRILL RIG	LAR	LOGGED BY	RLC
DRILLING METHOD	Hollow Stem	HAMMER WEIGHT (LBS)	140
DIAMETER OF HOLE	8	DROP (IN)	30
BORING LOCATION:		GROUND ELEVATION (FT)	
		GW ELEVATION	

DEPTH (FT)	SAMPLE TYPE	BLOWS/ 6 IN.	GEOTECHNICAL DESCRIPTION	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	OTHER TESTS
35	[Hatched Box]	29/32/44	@ 35', Orange-brown, very fine to coarse occasional small gravel and very coarse grains, slightly moist to moist, dense	4.1	123.3	Cons DS
45	[Hatched Box]	26/50 for 5"	@ 45', Light brown, very fine to medium SAND, moist, dense	3.3	106.2	
55	[Hatched Box]	36/37/ 50 for 2"	@ 55', Light to medium brown, very fine to medium SAND, caliche veins, moist, dense	7.8	118.6	DS

<p style="text-align: center;"><b>LEGEND</b></p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> <li>[Hatched Box] Standard Penetration Test</li> <li>[Diagonal Lines] California Ring</li> <li>[Dotted Box] Rock Core</li> <li>[Solid Black Box] Bulk Sample</li> </ul> </td> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> <li>[Grid Box] Shelby Tube</li> <li>[Wavy Line] Water Seepage</li> <li>[Inverted Triangle] Groundwater</li> </ul> </td> </tr> </table>	<ul style="list-style-type: none"> <li>[Hatched Box] Standard Penetration Test</li> <li>[Diagonal Lines] California Ring</li> <li>[Dotted Box] Rock Core</li> <li>[Solid Black Box] Bulk Sample</li> </ul>	<ul style="list-style-type: none"> <li>[Grid Box] Shelby Tube</li> <li>[Wavy Line] Water Seepage</li> <li>[Inverted Triangle] Groundwater</li> </ul>	<p>SIEVE: GRAIN SIZE ANALYSIS              MAX: MAXIMUM DRY DENSITY              DS: DIRECT SHEAR              CONS: CONSOLIDATION              HYDR: HYDROMETER ANALYSIS              EXPAN: EXPANSION INDEX              CHEM: CHEMICAL TESTS</p>	<p style="border: 1px solid black; padding: 2px; display: inline-block;">PLATE A-7</p> <p style="margin-top: 10px;"><b>GeoSoils Consultants, Inc.</b>              GEOTECHNICAL * GEOLOGIC * ENVIRONMENTAL</p>
<ul style="list-style-type: none"> <li>[Hatched Box] Standard Penetration Test</li> <li>[Diagonal Lines] California Ring</li> <li>[Dotted Box] Rock Core</li> <li>[Solid Black Box] Bulk Sample</li> </ul>	<ul style="list-style-type: none"> <li>[Grid Box] Shelby Tube</li> <li>[Wavy Line] Water Seepage</li> <li>[Inverted Triangle] Groundwater</li> </ul>			

# GEOTECHNICAL BORING LOG

PROJECT NAME	Green Acres		W.O. NO.	6489
DRILLING COMPANY	Choice	DATE STARTED:	9-8-11	BORING NO.
TYPE OF DRILL RIG	LAR	LOGGED BY	RLC	SHEET 3 OF 3
DRILLING METHOD	Hollow Stem	HAMMER WEIGHT (LBS)	140	GROUND ELEVATION (FT)
DIAMETER OF HOLE	8	DROP (IN)	30	GW ELEVATION

BORING LOCATION:

DEPTH (FT)	SAMPLE TYPE	BLOWS/ 6 IN.	GEOTECHNICAL DESCRIPTION	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	OTHER TESTS
		50 for 3"	@ 60', No recovery	----	----	
65			T.D. @ 60' No groundwater			
70						
75						
80						
85						

### LEGEND

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li> Standard Penetration Test</li> <li> California Ring</li> <li> Rock Core</li> <li> Bulk Sample</li> </ul> | <ul style="list-style-type: none"> <li> Shelby Tube</li> <li> Water Seepage</li> <li> Groundwater</li> </ul> |
|--|--|

- SIEVE: GRAIN SIZE ANALYSIS
- MAX: MAXIMUM DRY DENSITY
- DS: DIRECT SHEAR
- CONS: CONSOLIDATION
- HYDR: HYDROMETER ANALYSIS
- EXPAN: EXPANSION INDEX
- CHEM: CHEMICAL TESTS

PLATE A-8

**GeoSoils Consultants, Inc.**  
GEOTECHNICAL \* GEOLOGIC \* ENVIRONMENTAL

# GEOTECHNICAL BORING LOG

PROJECT NAME	Green Acres	W.O. NO.	6489
DRILLING COMPANY	Choice	DATE STARTED:	9-8-11
TYPE OF DRILL RIG	LAR	LOGGED BY	RLC
DRILLING METHOD	Hollow Stem	HAMMER WEIGHT (LBS)	140
DIAMETER OF HOLE	8	DROP (IN)	30
BORING LOCATION:		BORING NO.	B-4-11
		SHEET	1 OF 2
		GROUND ELEVATION (FT)	
		GW ELEVATION	

DEPTH (FT)	SAMPLE TYPE	BLOWS/ 6 IN.	GEOTECHNICAL DESCRIPTION	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	OTHER TESTS
			<b>0-5', ALLUVIUM (Qal)</b> Medium brown-gray, silty SAND, dry to slightly moist, slightly dense			Max Expan
5		15/17/18	<b>5-30', BEDROCK: Vaqueros Formation</b> @ 5', Orange-gray, silty, fine SANDSTONE, moist, dense	6.7	118.0	
10		13/18/25	@ 10', Orange-gray, sandy SILTSTONE to silty SANDSTONE, moist, dense	17.5	104.6	DS
15		33/36/49	@ 15', Brown-gray, silty SANDSTONE, carbonate veins, slightly cemented, moist, dense	10.3	115.0	Cons
20		31/50 for 5"	@ 20', Gray-black, silty, fine SANDSTONE, carbonate veins, moderate cement, moist, dense	9.5	113.6	DS
25		50	@ 25', Gray-green, very fine to medium SANDSTONE, small gravel, carbonate deposits, moderate cement, moist, very dense	9.1	111.0	

<p style="text-align: center;"><b>LEGEND</b></p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #cccccc; border: 1px solid black; margin-right: 5px;"></span> Standard Penetration Test</li> <li><span style="display: inline-block; width: 15px; height: 10px; background: repeating-linear-gradient(45deg, transparent, transparent 2px, #cccccc 2px, #cccccc 4px); border: 1px solid black; margin-right: 5px;"></span> California Ring</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #cccccc; border: 1px solid black; margin-right: 5px;"></span> Rock Core</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: black; border: 1px solid black; margin-right: 5px;"></span> Bulk Sample</li> </ul> </td> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background: repeating-linear-gradient(-45deg, transparent, transparent 2px, #cccccc 2px, #cccccc 4px); border: 1px solid black; margin-right: 5px;"></span> Shelby Tube</li> <li><span style="display: inline-block; width: 15px; height: 10px; border-bottom: 1px solid black; margin-right: 5px;"></span> Water Seepage</li> <li><span style="display: inline-block; width: 15px; height: 10px; border-bottom: 1px solid black; margin-right: 5px;"></span> Groundwater</li> </ul> </td> </tr> </table>	<ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #cccccc; border: 1px solid black; margin-right: 5px;"></span> Standard Penetration Test</li> <li><span style="display: inline-block; width: 15px; height: 10px; background: repeating-linear-gradient(45deg, transparent, transparent 2px, #cccccc 2px, #cccccc 4px); border: 1px solid black; margin-right: 5px;"></span> California Ring</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #cccccc; border: 1px solid black; margin-right: 5px;"></span> Rock Core</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: black; border: 1px solid black; margin-right: 5px;"></span> Bulk Sample</li> </ul>	<ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background: repeating-linear-gradient(-45deg, transparent, transparent 2px, #cccccc 2px, #cccccc 4px); border: 1px solid black; margin-right: 5px;"></span> Shelby Tube</li> <li><span style="display: inline-block; width: 15px; height: 10px; border-bottom: 1px solid black; margin-right: 5px;"></span> Water Seepage</li> <li><span style="display: inline-block; width: 15px; height: 10px; border-bottom: 1px solid black; margin-right: 5px;"></span> Groundwater</li> </ul>	<p>SIEVE: GRAIN SIZE ANALYSIS          MAX: MAXIMUM DRY DENSITY          DS: DIRECT SHEAR          CONS: CONSOLIDATION          HYDR: HYDROMETER ANALYSIS          EXPAN: EXPANSION INDEX          CHEM: CHEMICAL TESTS</p>	<p style="border: 1px solid black; padding: 2px; display: inline-block;">PLATE A-9</p> <p style="margin-top: 10px;"><b>GeoSoils Consultants, Inc.</b>  <small>GEOTECHNICAL * GEOLOGIC * ENVIRONMENTAL</small></p>
<ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #cccccc; border: 1px solid black; margin-right: 5px;"></span> Standard Penetration Test</li> <li><span style="display: inline-block; width: 15px; height: 10px; background: repeating-linear-gradient(45deg, transparent, transparent 2px, #cccccc 2px, #cccccc 4px); border: 1px solid black; margin-right: 5px;"></span> California Ring</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #cccccc; border: 1px solid black; margin-right: 5px;"></span> Rock Core</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: black; border: 1px solid black; margin-right: 5px;"></span> Bulk Sample</li> </ul>	<ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background: repeating-linear-gradient(-45deg, transparent, transparent 2px, #cccccc 2px, #cccccc 4px); border: 1px solid black; margin-right: 5px;"></span> Shelby Tube</li> <li><span style="display: inline-block; width: 15px; height: 10px; border-bottom: 1px solid black; margin-right: 5px;"></span> Water Seepage</li> <li><span style="display: inline-block; width: 15px; height: 10px; border-bottom: 1px solid black; margin-right: 5px;"></span> Groundwater</li> </ul>			

# GEOTECHNICAL BORING LOG

PROJECT NAME Green Acres W.O. NO. 6489  
 DRILLING COMPANY Choice DATE STARTED: 9-8-11 BORING NO. B-4-11  
 TYPE OF DRILL RIG LAR LOGGED BY RLC SHEET 2 OF 2  
 DRILLING METHOD Hollow Stem HAMMER WEIGHT (LBS) 140 GROUND ELEVATION (FT) \_\_\_\_\_  
 DIAMETER OF HOLE 8 DROP (IN) 30 GW ELEVATION \_\_\_\_\_

BORING LOCATION:

DEPTH (FT)	SAMPLE TYPE	BLOWS/ 6 IN.	GEOTECHNICAL DESCRIPTION	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	OTHER TESTS
		50 for 4"	@ 30', Gray-green, very fine to medium SANDSTONE; small gravel, carbonate deposits, moderate cement, moist, very dense	10.3	105.8	DS
35			T.D. @ 30' No groundwater			
40						
45						
50						
55						

**LEGEND**

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li> Standard Penetration Test</li> <li> California Ring</li> <li> Rock Core</li> <li> Bulk Sample</li> </ul> | <ul style="list-style-type: none"> <li> Shelby Tube</li> <li> Water Seepage</li> <li> Groundwater</li> </ul> |
|--|--|

- SIEVE: GRAIN SIZE ANALYSIS
- MAX: MAXIMUM DRY DENSITY
- DS: DIRECT SHEAR
- CONS: CONSOLIDATION
- HYDR: HYDROMETER ANALYSIS
- EXPAN: EXPANSION INDEX
- CHEM: CHEMICAL TESTS

PLATE A-10

**GeoSoils Consultants, Inc.**  
GEOTECHNICAL \* GEOLOGIC \* ENVIRONMENTAL

January 23, 2015  
W.O. 6489

**APPENDIX B**

**LABORATORY TEST PROCEDURES AND RESULTS**

MDN 15710

**APPENDIX B**

**LABORATORY TEST PROCEDURES AND RESULTS**

**Moisture-Density**

The field moisture content and dry unit weights were determined for each undisturbed ring sample obtained from our subsurface exploration. Once the dry unit weights had been determined, in-place densities of underlying soil profile were estimated. In those cases where ring samples were obtained, the moisture content and dry unit weights are presented on the Boring Logs B-1 through B-4.

**Compaction Tests**

Compaction tests were performed to determine to moisture density relationships of the typical surficial soils encountered on the site. The laboratory standard used was in accordance with ASTM Test Designation D-1557-02. A summary of the compaction test results is shown in Table B-1.

TABLE B-1 COMPACTION TEST RESULTS				
Boring No. And Sample Depth	Description	Maximum Dry Density (psf)	Optimum Moisture (%)	Expansion Index
B-2 @ 5'	Reddish Brown, clayey, sandy SILT with gravel	125.5	11.0	Medium
B-3 @ 8-10"	Reddish brown, clayey, sandy SILT with gravel	124.0	11.0	Medium
B-4 @ 5-10'	Brown, slightly sandy, clayey SILT with gravel	117.0	15.5	Medium

**Direct Shear Tests**

Shear tests were performed in a strain-control type Direct Shear Machine. The samples were sheared under varying confining loads in order to determine the Coulomb shear strength parameters: cohesion (c), and angle of internal friction ( $\phi$ ) for peak and residual strength conditions. The samples were tested in an artificially saturated condition. The

## **Appendix B**

results are plotted and a linear approximation is drawn of the failure curve. Results are shown on the Shear Test Diagrams included with these appendices, as Plates SH-1 through SH-13. Shear tests performed on undisturbed ring samples are presented on Plates SH-1 to SH-10. Shear tests were performed on samples remolded to 90 percent relative compaction and the results are shown in Plates SH-11 through SH-13.

## **Consolidation Test**

Consolidation tests were performed on selected ring samples to develop data for settlement studies. The tests were performed primarily on materials which would be considered to be most susceptible to consolidation under increased loading. Loads were applied to the sample in several increments in geometric progression, and the resulting deformation was recorded at selected time intervals. Porous stones were placed in contact with the top and bottom of each specimen to permit the release and addition of pore fluid. Inundation of the sample was performed at an approximate load one ton per square foot. Results of the consolidation test are shown on Plates C-1 through C-6.

## **Expansion Index Tests**

To determine the expansion potential of the on-site soils, expansion index tests were performed. The results are included in the above table.

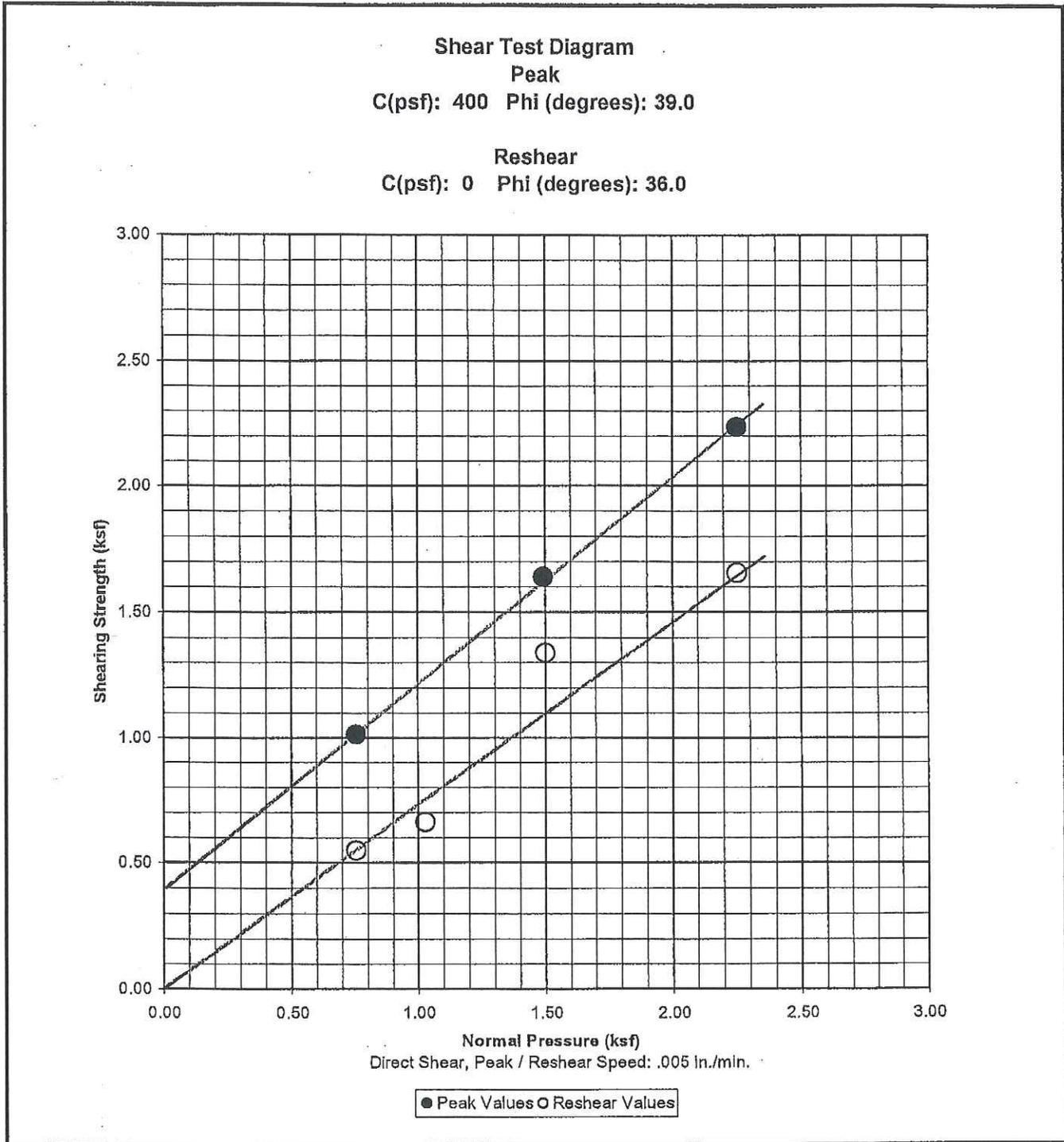
**LABORATORY RESULTS**

# GeoSoils Consultants, Inc.

Date of Test: 9/11

Geotechnical Engineering \* Engineering Geology

Sample: B-1 @ 20.0'



Undisturbed Natural Shear-Saturated

Orange-brown, silty, very fine to fine SAND, w/ some coarse sand.

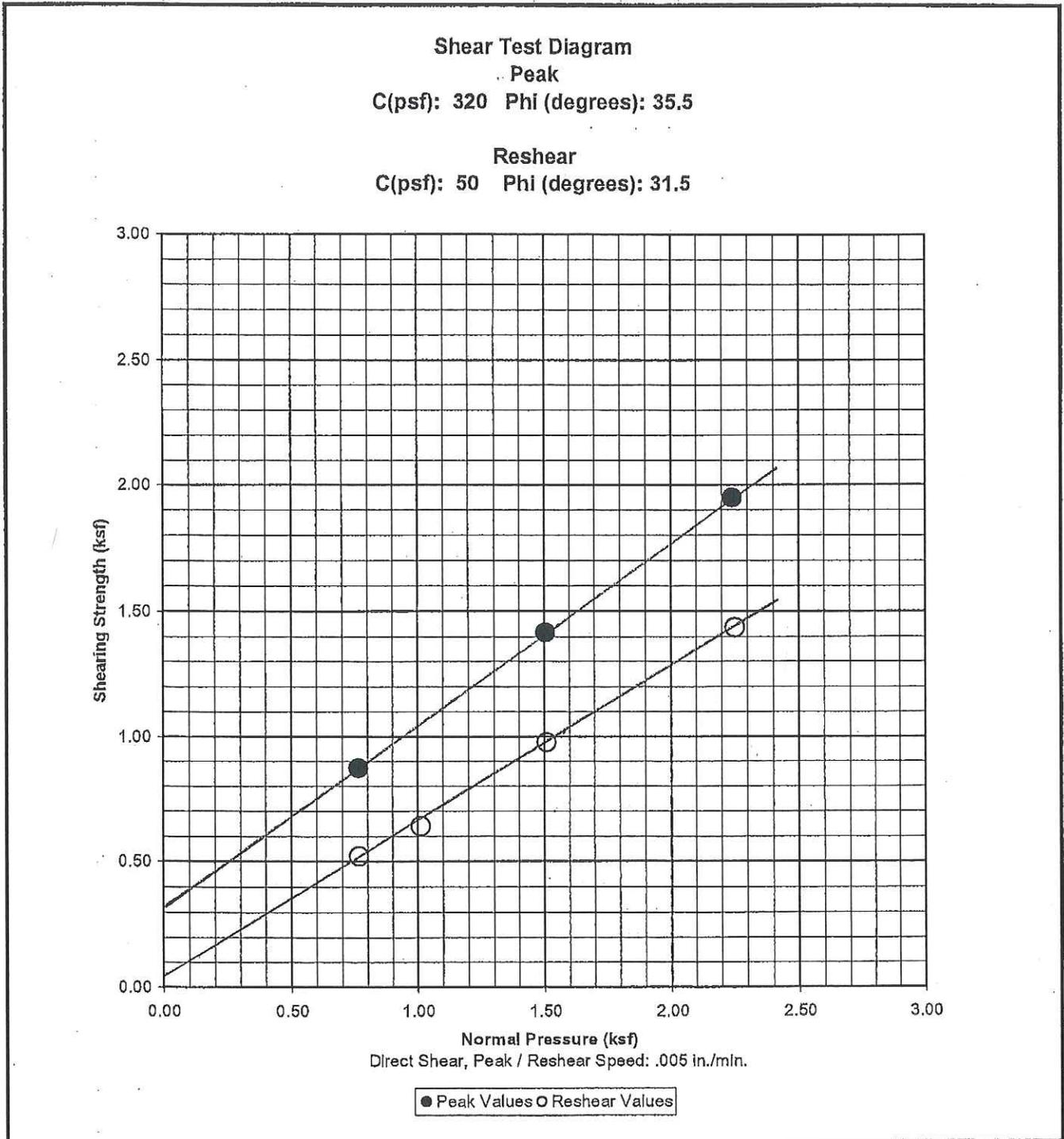
18.9% Saturated Moisture Content

# GeoSoils Consultants, Inc.

Date of Test: 9/11

Geotechnical Engineering \* Engineering Geology

Sample: B-1 @ 40.0'



Undisturbed Natural Shear-Saturated

Light orange-brown, very fine to fine SAND.

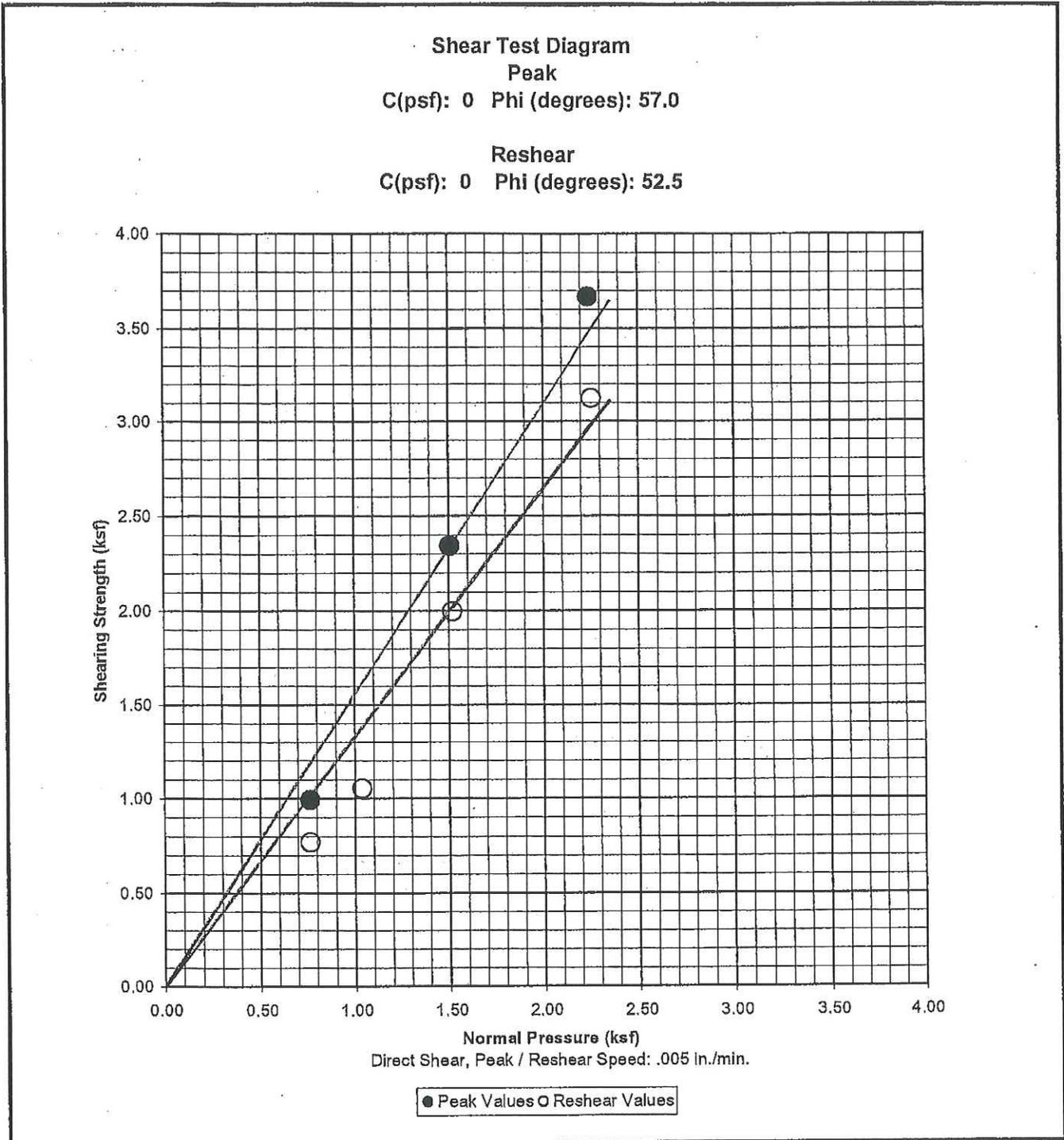
21.9% Saturated Moisture Content

# GeoSoils Consultants, Inc.

Date of Test: 9/11

Geotechnical Engineering \* Engineering Geology

Sample: B-2 @ 10.0'



Undisturbed Natural Shear-Saturated

Red-brown, silty, very fine to coarse SAND, w/ rock fragments.

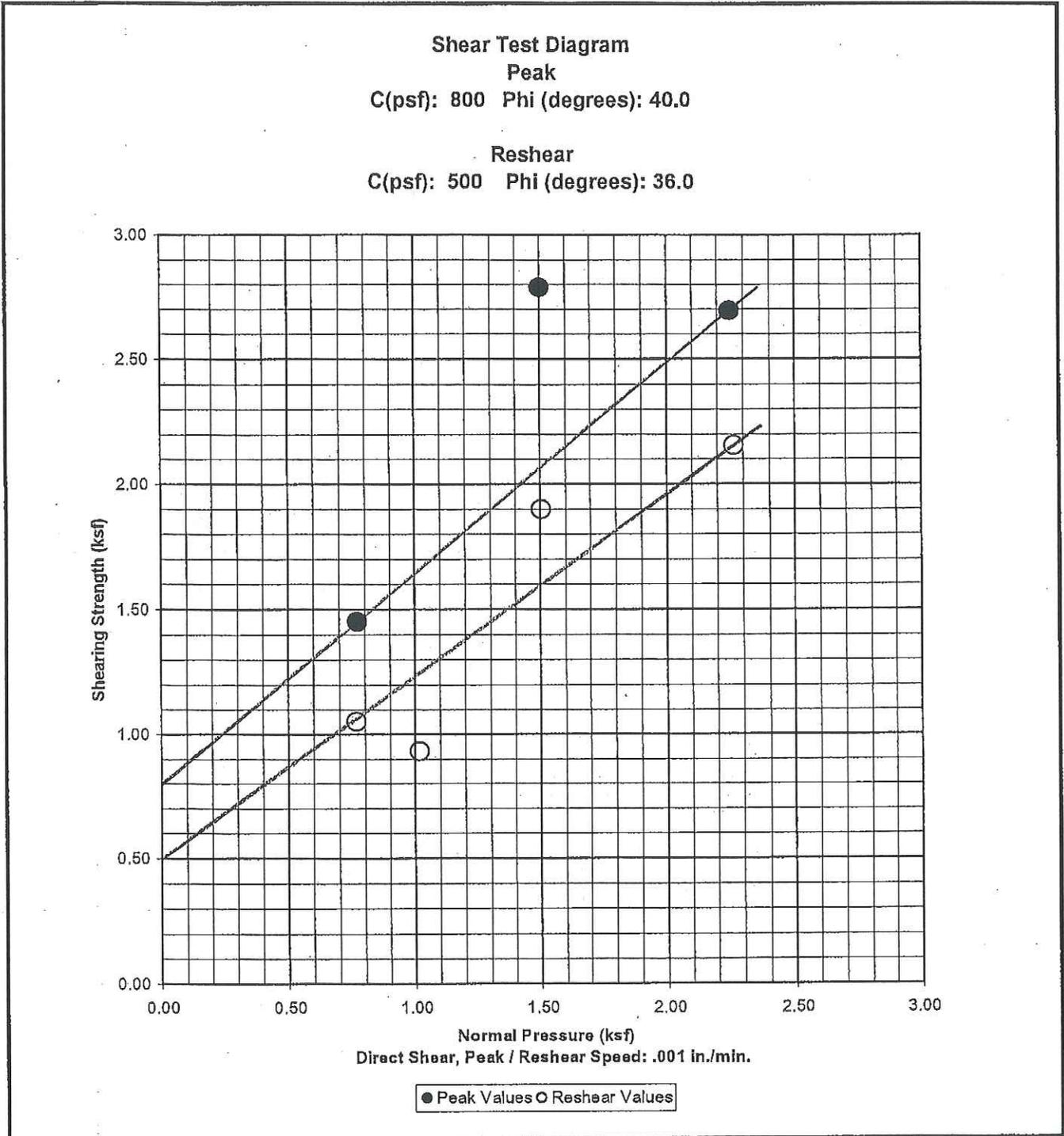
16.7% Saturated Moisture Content

# GeoSoils Consultants, Inc.

Date of Test: 9/11

Geotechnical Engineering \* Engineering Geology

Sample: B-2 @ 30.0'



Undisturbed Natural Shear-Saturated

Orange-brown, silty, sandy CLAY.

19.9% Saturated Moisture Content

# GeoSoils Consultants, Inc.

Date of Test: 9/11

Geotechnical Engineering \* Engineering Geology

Sample: B-3 @ 20.0'

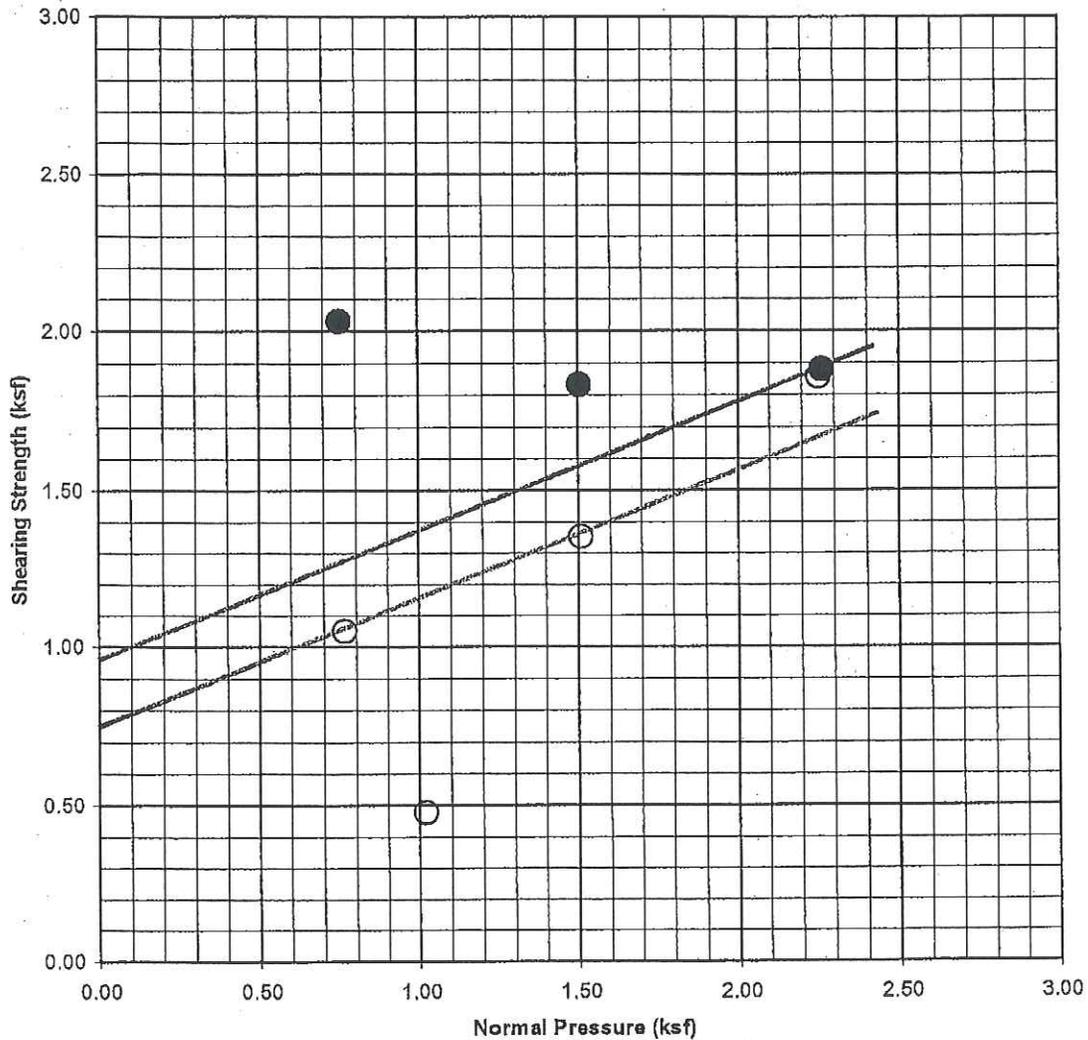
## Shear Test Diagram

Peak

C(psf): 960 Phi (degrees): 22.0

Reshear

C(psf): 750 Phi (degrees): 22.0



Direct Shear, Peak / Reshear Speed: .001 in./min.

● Peak Values ○ Reshear Values

Undisturbed Natural Shear-Saturated

Orange-brown, sandy, slightly clayey SILT.

19.8% Saturated Moisture Content

# GeoSoils Consultants, Inc.

Geotechnical Engineering \* Engineering Geology

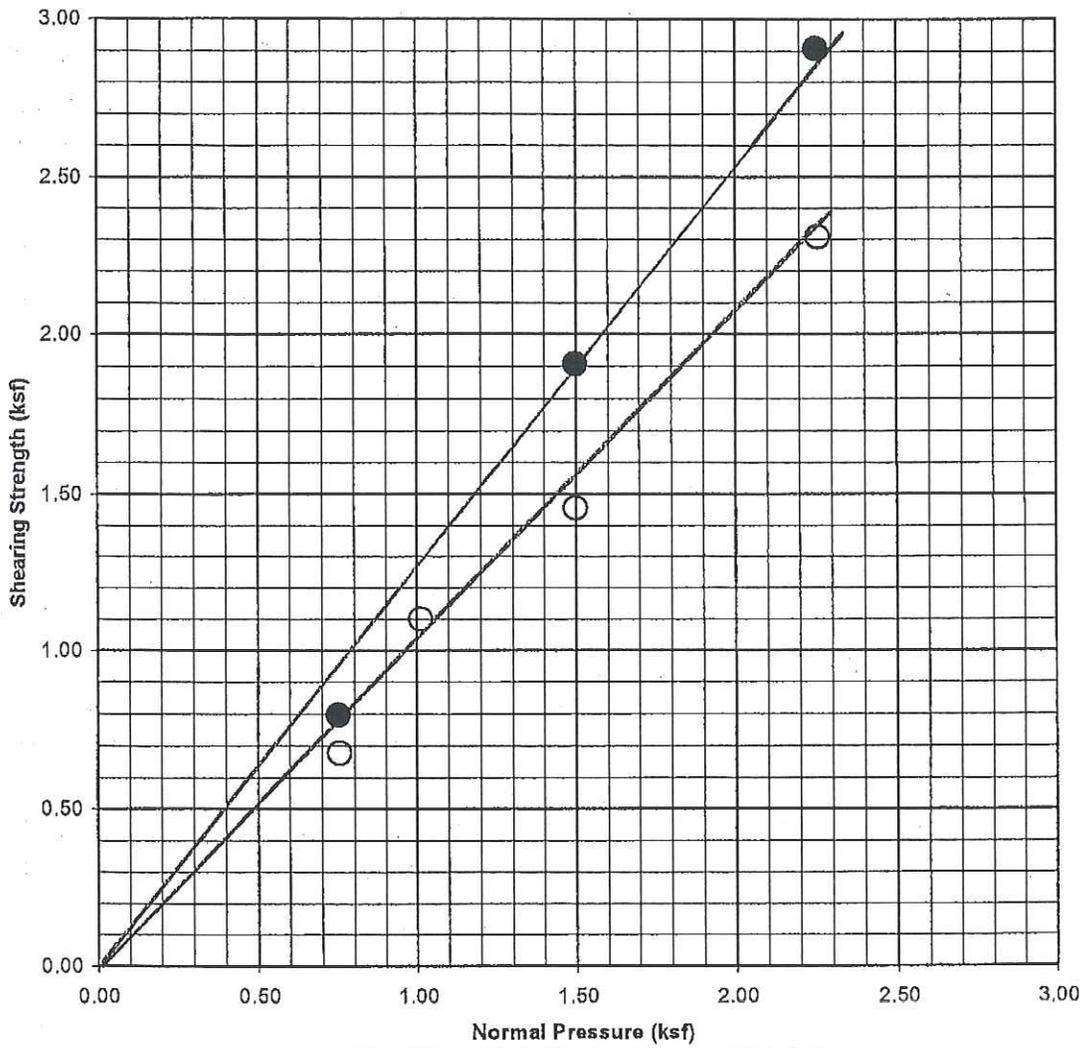
## Shear Test Diagram

Peak

C(psf): 0 Phi (degrees): 51.5

Reshear

C(psf): 0 Phi (degrees): 46.0



Direct Shear, Peak / Reshear Speed: .005 in./min.

● Peak Values ○ Reshear Values

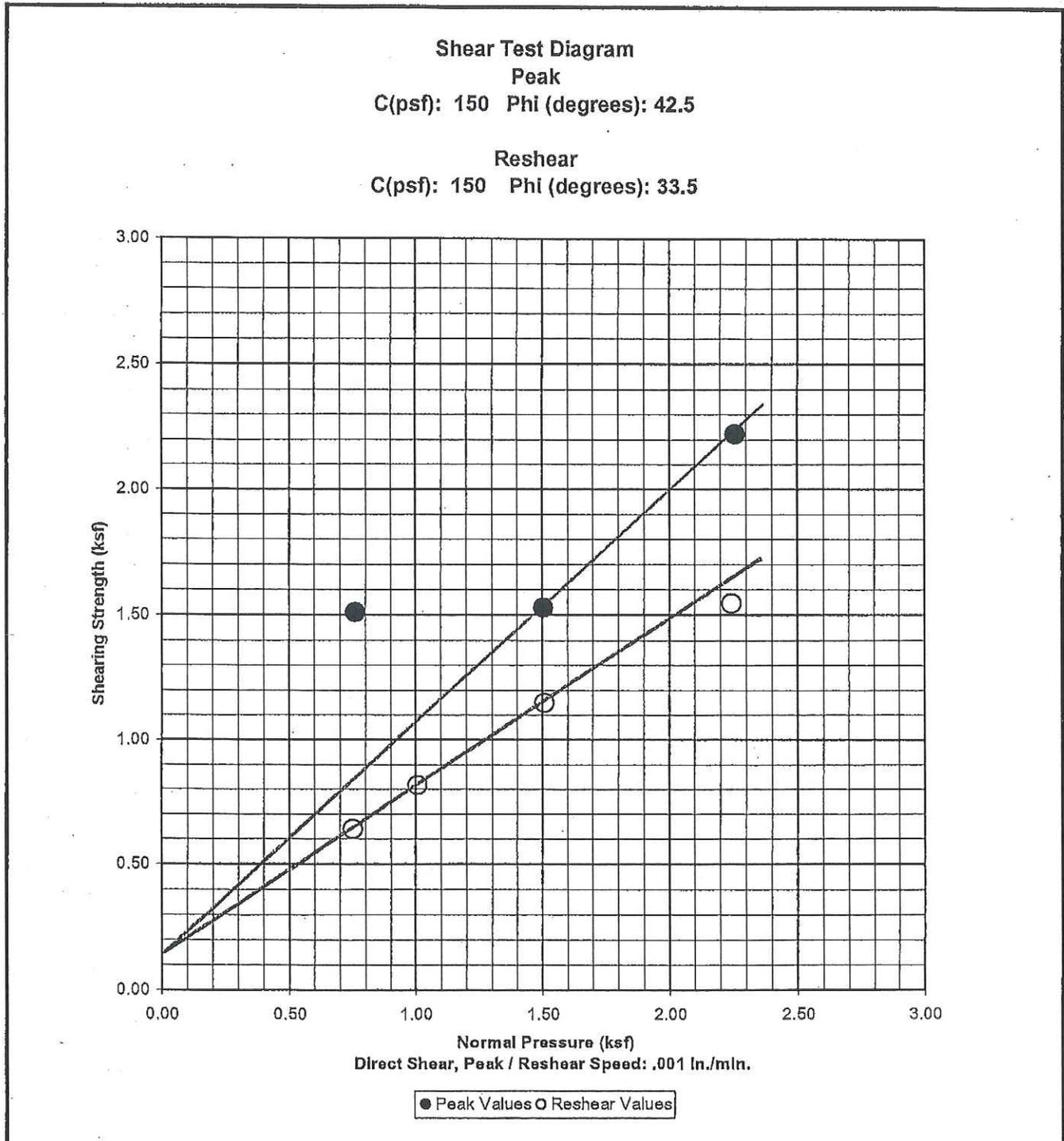
Undisturbed Natural Shear-Saturated

Orange-brown, silty, very fine to coarse SAND.

17.3% Saturated Moisture Content

# GeoSoils Consultants, Inc.

Geotechnical Engineering \* Engineering Geology



Undisturbed Natural Shear-Saturated

Orange-brown, sandy SILT.

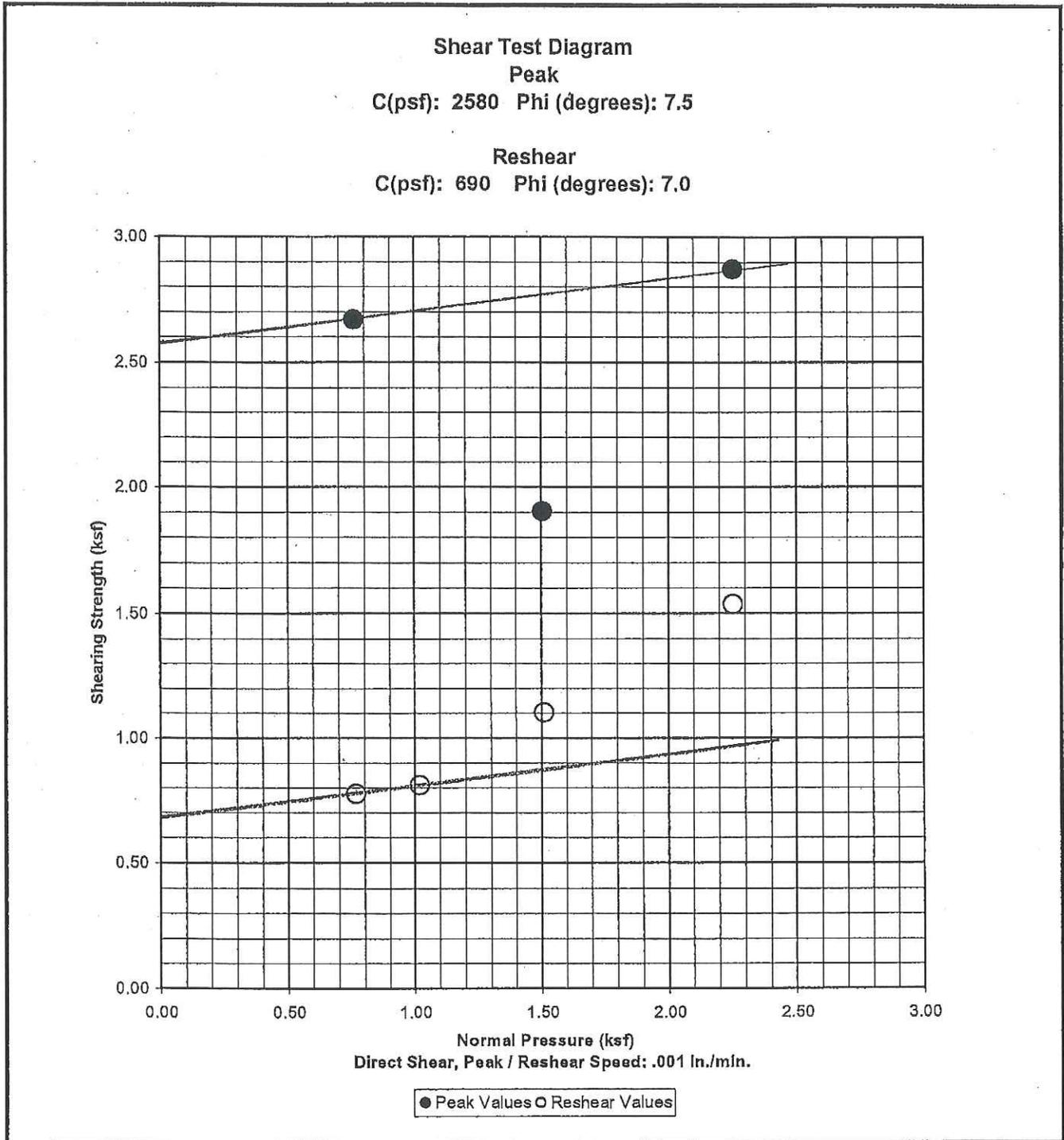
17.1% Saturated Moisture Content

# GeoSoils Consultants, Inc.

Date of Test: 9/11

Geotechnical Engineering \* Engineering Geology

Sample: B-4 @ 10.0'



Undisturbed Natural Shear-Saturated

Orange-brown / green-brown, silty CLAY.

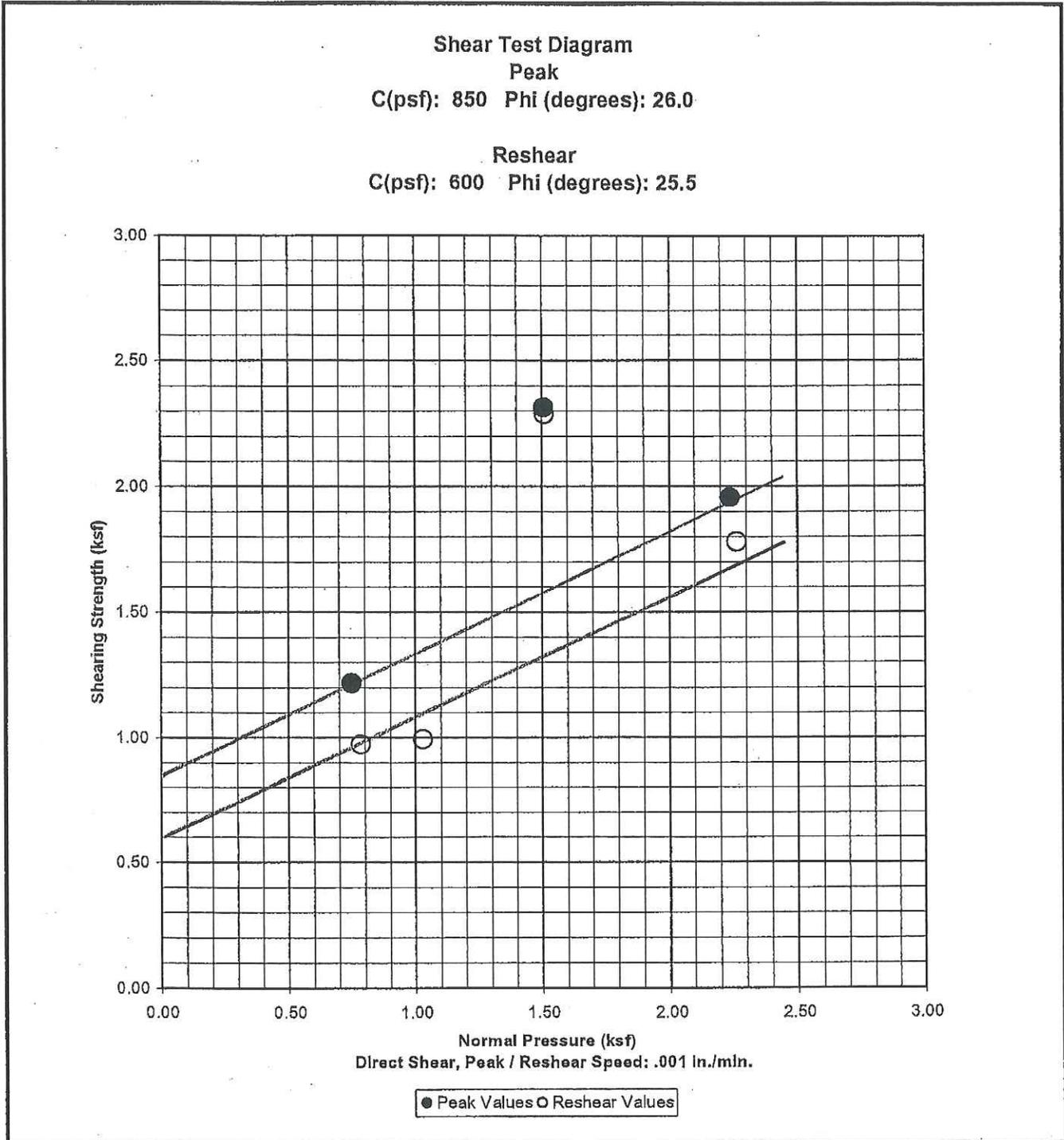
27.2% Saturated Moisture Content

# GeoSoils Consultants, Inc.

Date of Test: 9/11

Geotechnical Engineering \* Engineering Geology

Sample: B-4 @ 20.0'



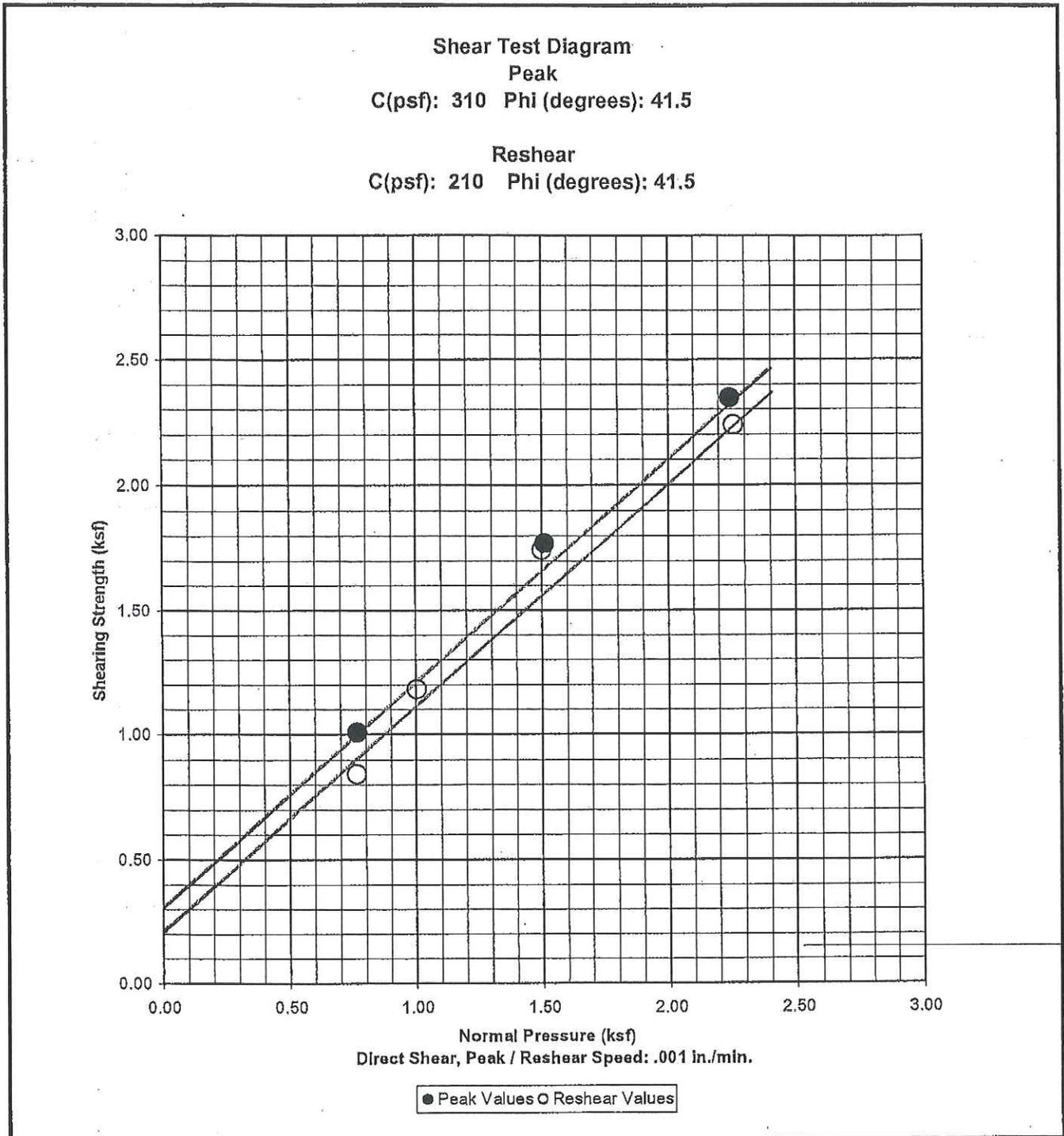
Undisturbed Natural Shear-Saturated  
Brown, sandy SILT, w/ rock fragments.  
25.0% Saturated Moisture Content

# GeoSoils Consultants, Inc.

Geotechnical Engineering \* Engineering Geology

Date of Test: 9/11

Sample: B-4 @ 30.0'



Undisturbed Natural Shear-Saturated

Brown, sandy SILT, w/ rock fragments.

23.2% Saturated Moisture Content

# GeoSoils Consultants, Inc.

Date of Test: 9/11

Geotechnical Engineering \* Engineering Geology

Sample: B-2 @ 0 - 5.0'

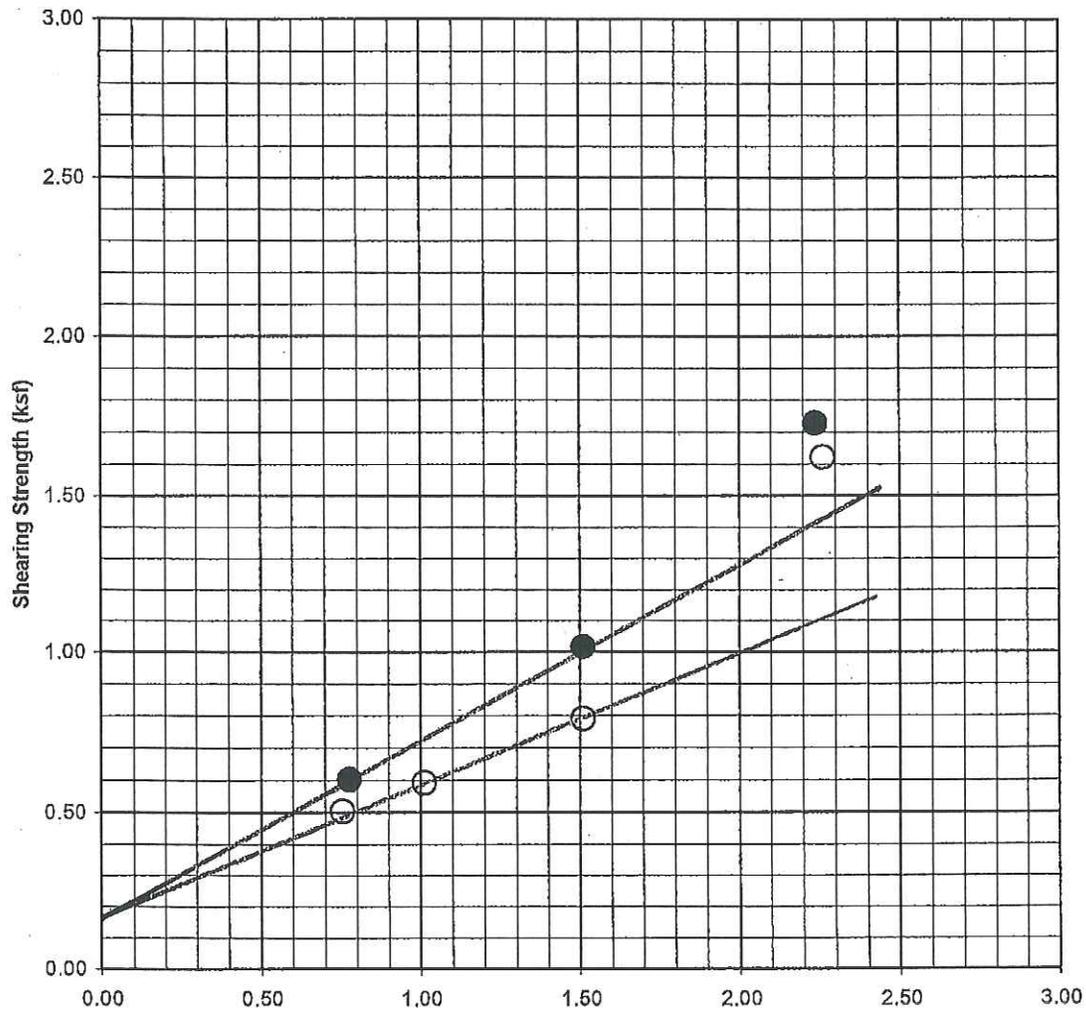
## Shear Test Diagram

Peak

C(psf): 170 Phi (degrees): 29.0

Reshear

C(psf): 170 Phi (degrees): 22.5



Normal Pressure (ksf)  
Direct Shear, Peak / Reshear Speed: .001 in./min.

● Peak Values ○ Reshear Values

Sample Remolded to 90% Relative Density, Saturated.  
Rem. Dry Density = 113.0 PCF

Red-brown, clayey, sandy SILT.

MAX: 125.5 PCF: 11.0%

17.7% Saturated Moisture Content  
6489.11

# GeoSoils Consultants, Inc.

Date of Test: 9/11

Geotechnical Engineering \* Engineering Geology

Sample: B-3 @ 8.0 - 10.0'

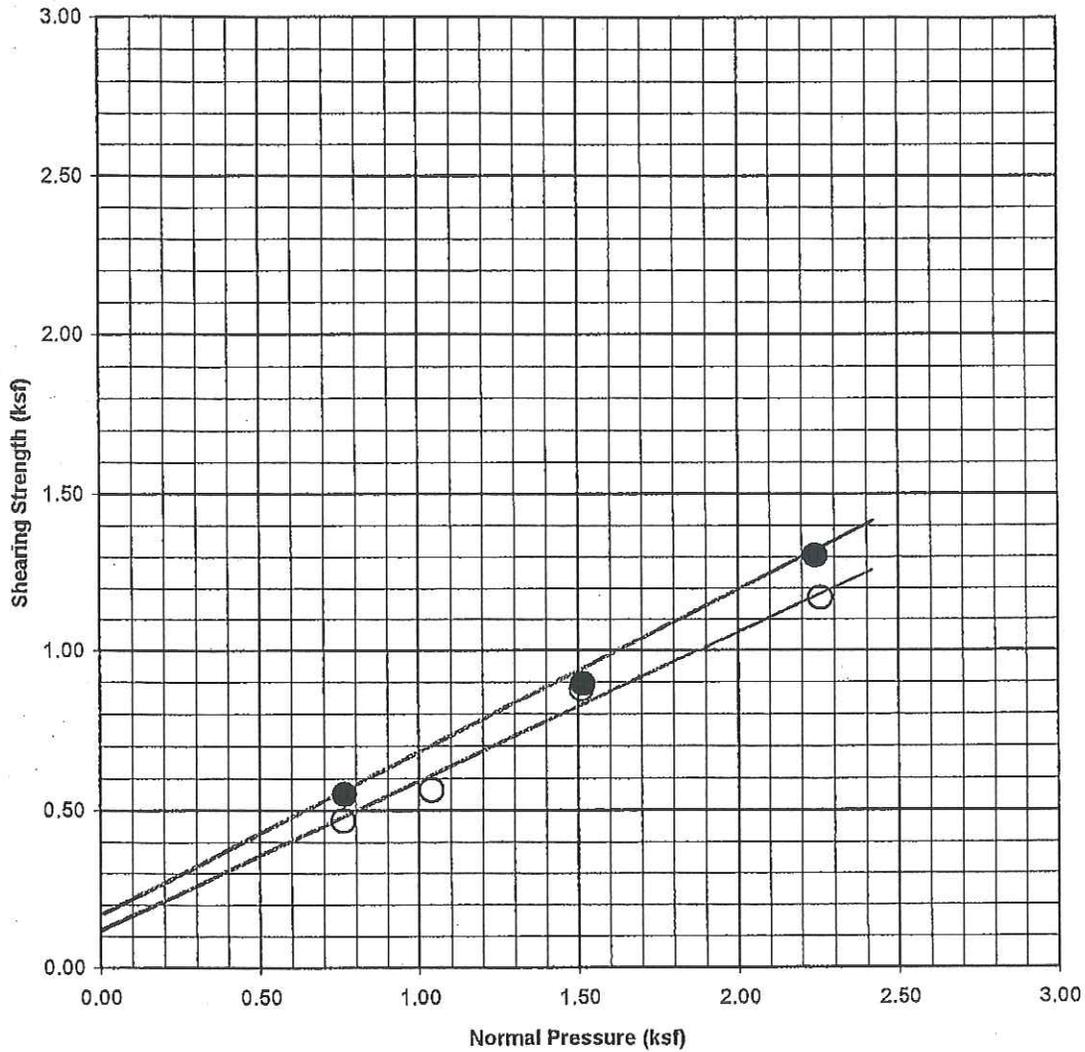
## Shear Test Diagram

Peak

C(psf): 170 Phi (degrees): 27.0

Reshear

C(psf): 120 Phi (degrees): 25.0



Direct Shear, Peak / Reshear Speed: .001 in./min.

● Peak Values ○ Reshear Values

Sample Remolded to 90% Relative Density, Saturated.  
Remolded Dry Density = 111.6 PCF

Orange-brown, clayey, sandy SILT.

MAX: 124.0 PCF: 11.0%

18.6% Saturated Moisture Content  
6489.12

# GeoSoils Consultants, Inc.

Date of Test: 9/11

Geotechnical Engineering \* Engineering Geology

Sample: B-4 @ 5.0 - 10.0'

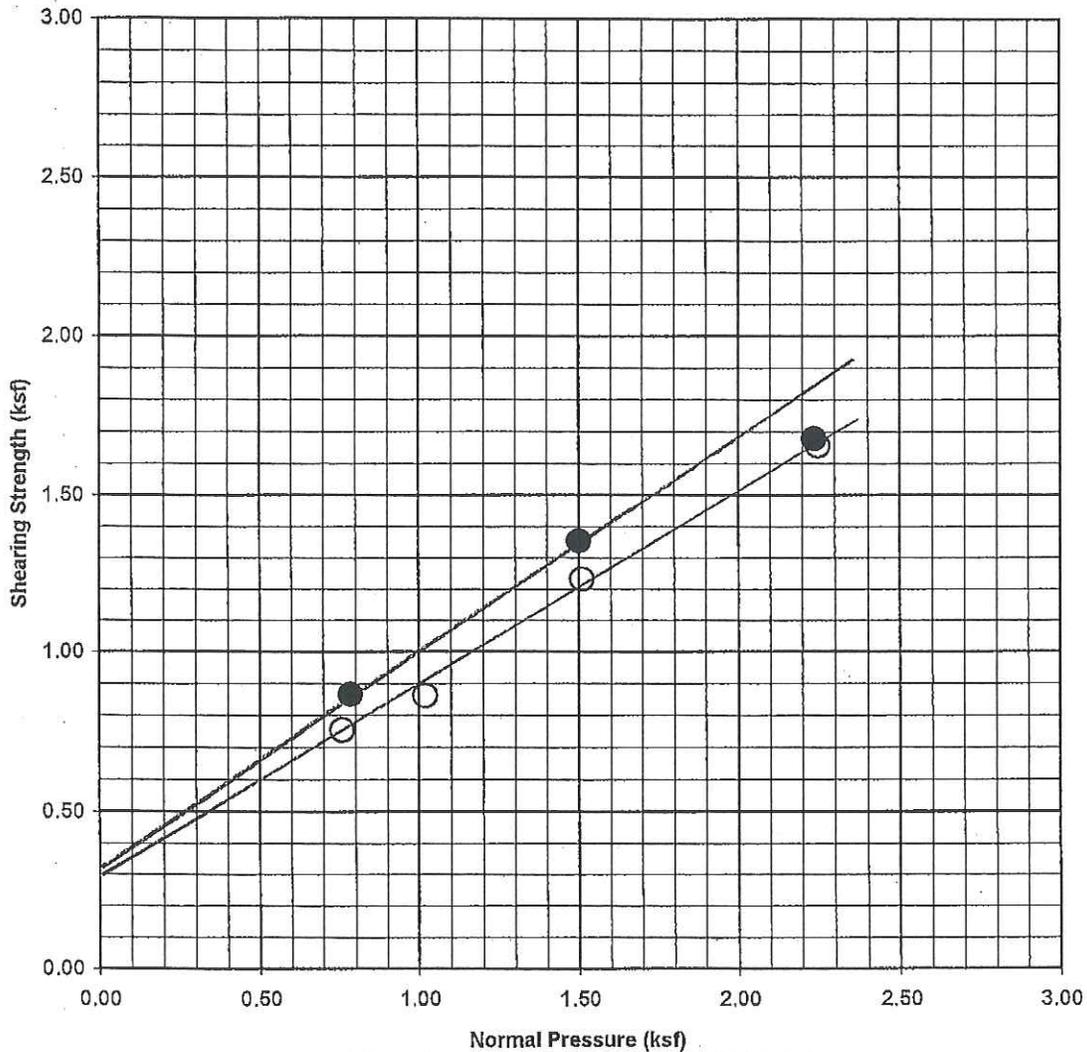
## Shear Test Diagram

Peak

C(psf): 320 Phi (degrees): 34.0

Reshear

C(psf): 300 Phi (degrees): 31.0



Direct Shear, Peak / Reshear Speed: .001 in./min.

● Peak Values ○ Reshear Values

Sample Remolded to 90% Relative Density, Saturated.

Rem. Dry Density = 105.3 PCF

Brown, slightly sandy, clayey, sandy SILT.

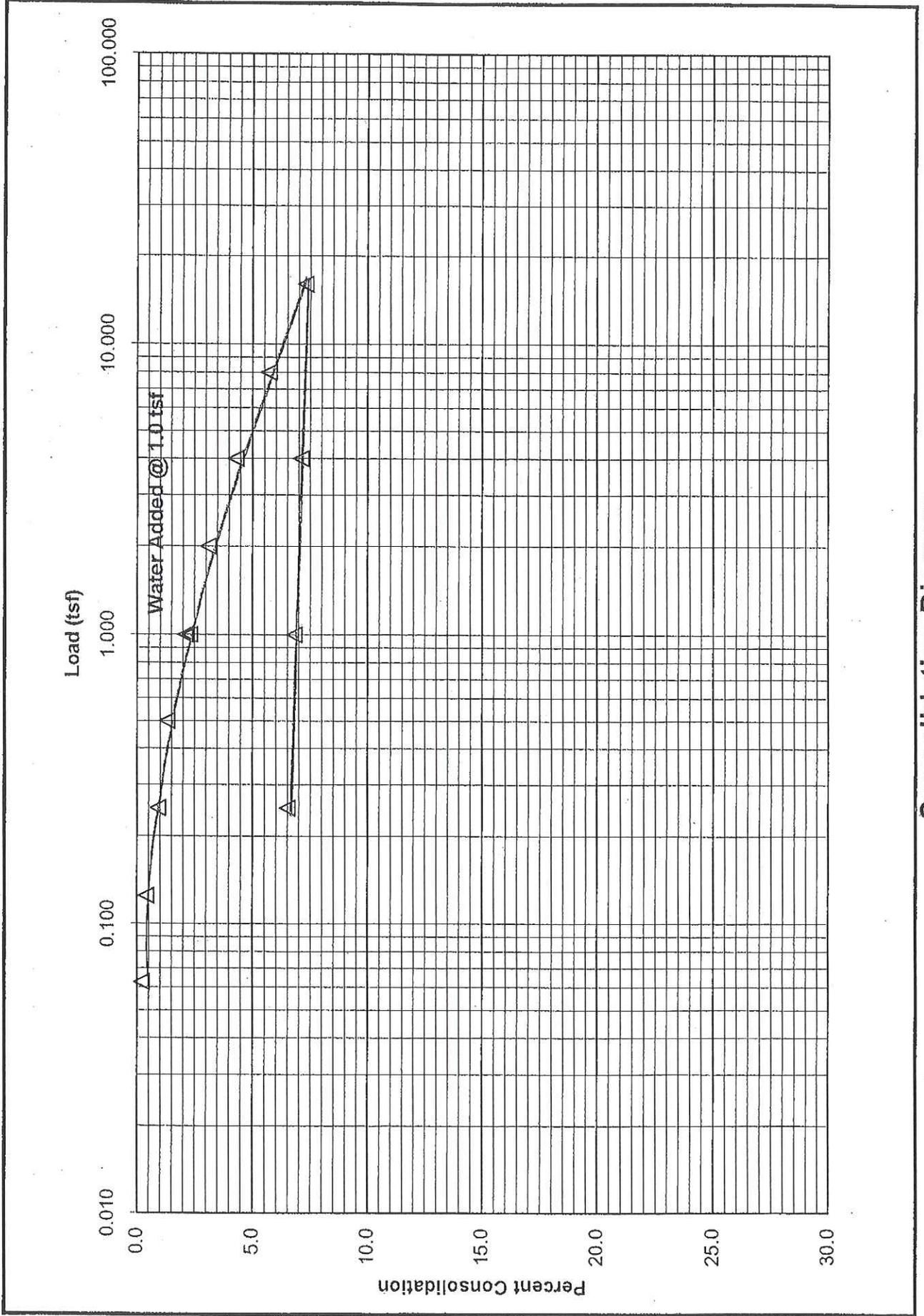
MAX: 117 PCF: 15.5%

23.9% Saturated Moisture Content

6489.13

# GeoSoils Consultants, Inc.

Geotechnical Engineering \* Engineering Geology

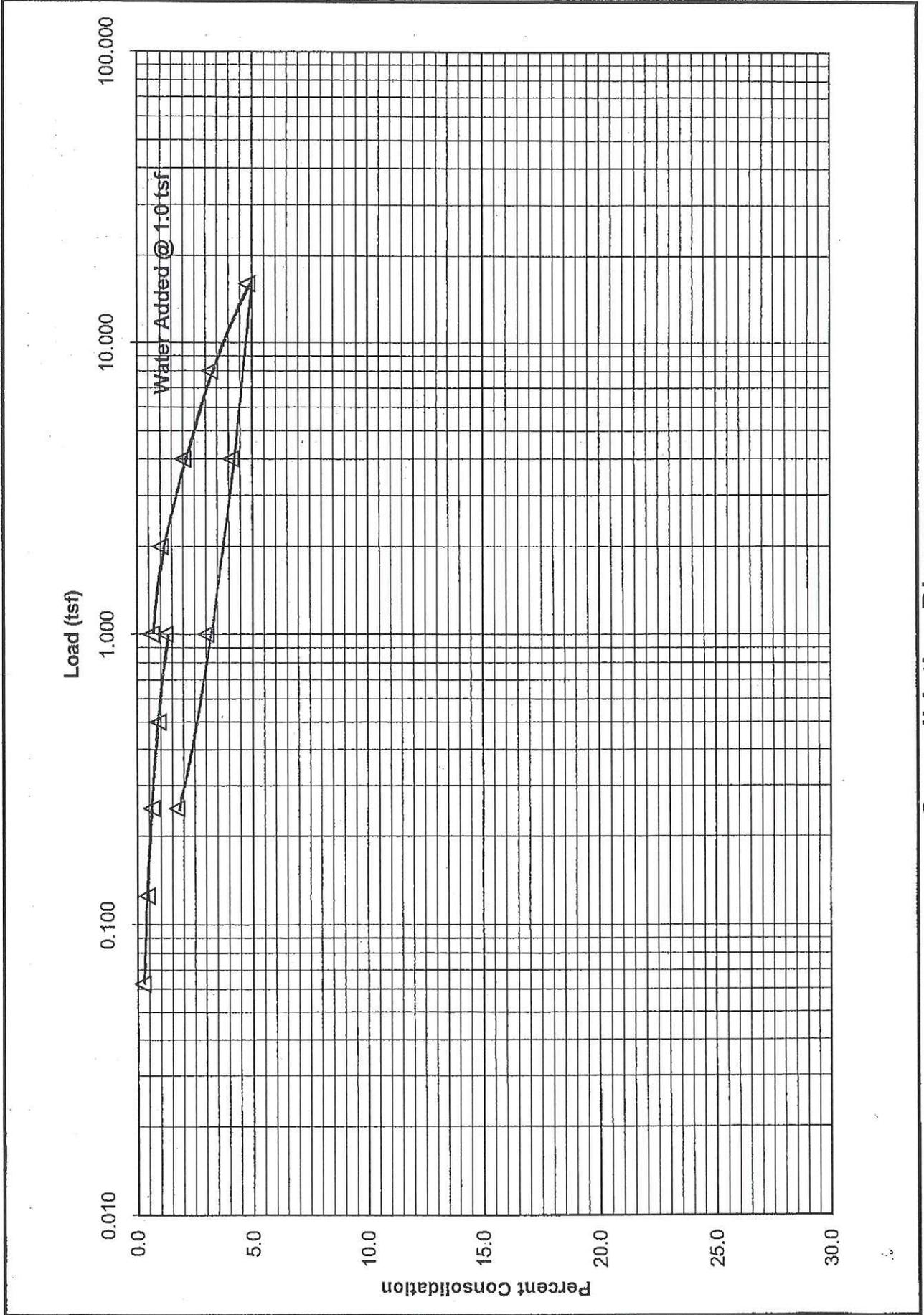


# GeoSoils Consultants, Inc.

Geotechnical Engineering \* Engineering Geology

Moisture (%)  
Before: 5.9 After: 12.4

Sample (in.)  
Height: 1.00 Diameter: 2.36

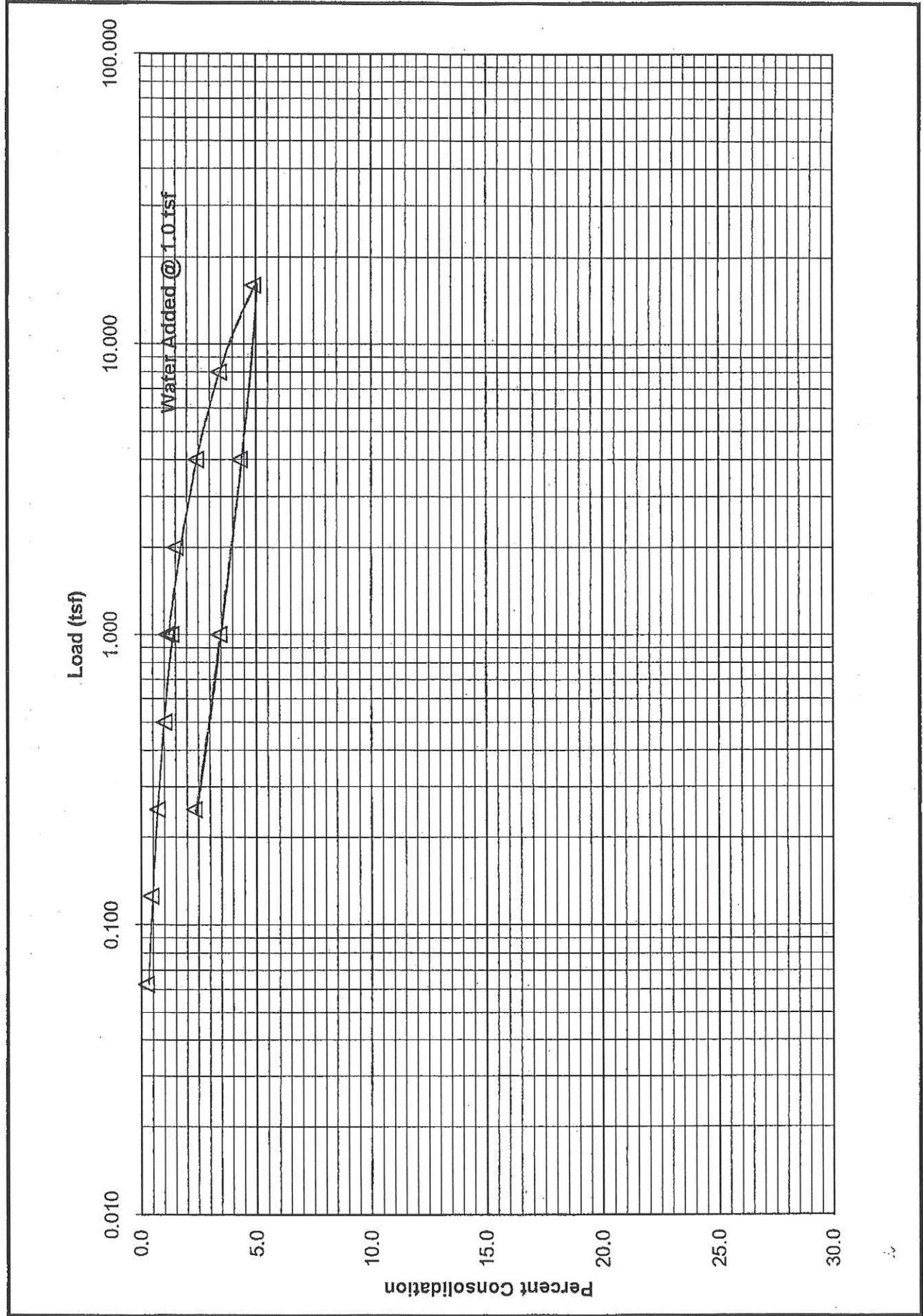


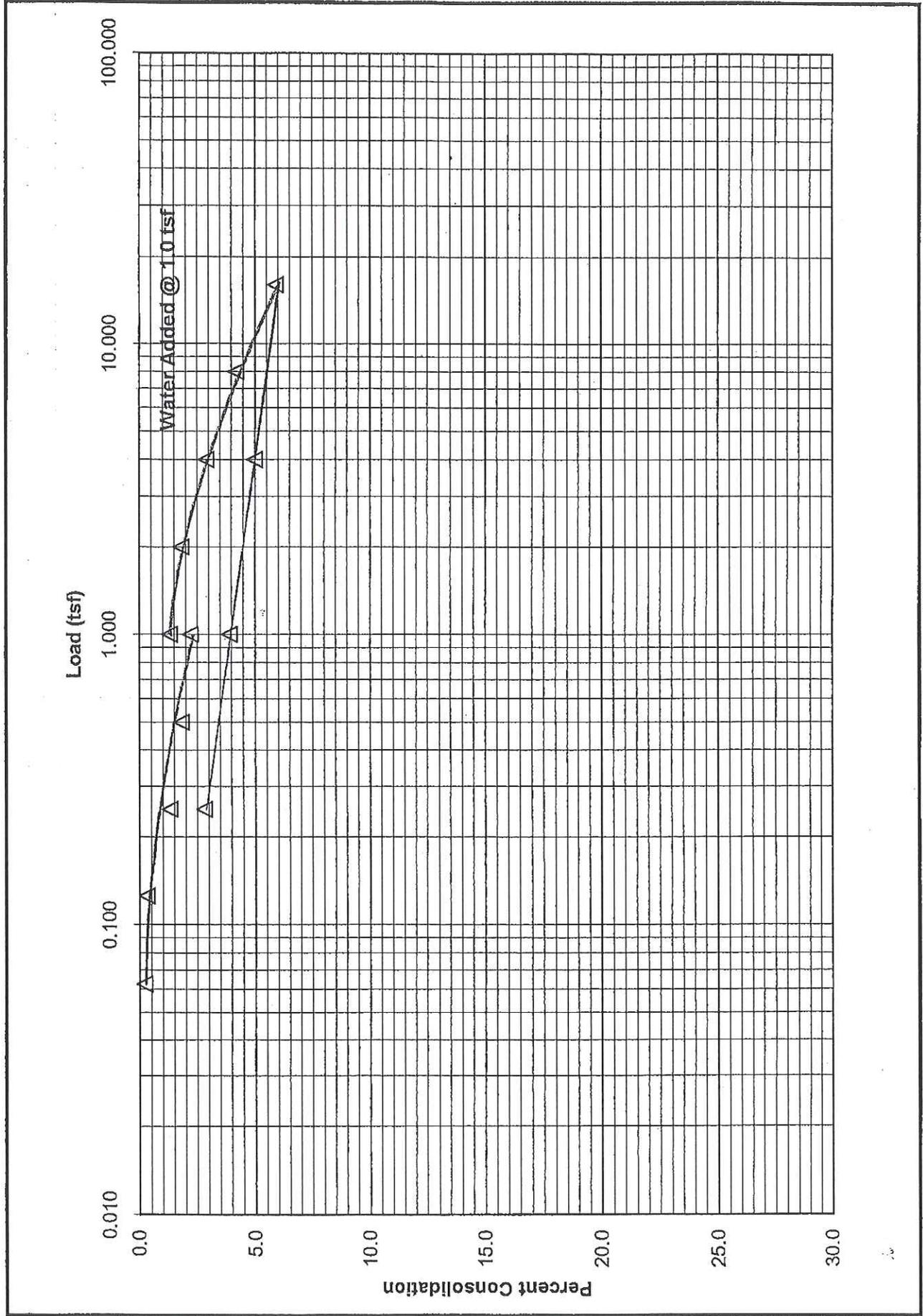
# GeoSoils Consultants, Inc.

Geotechnical Engineering \* Engineering Geology

Moisture(%)  
Before: 6.6 After: 12.3

Sample(h.)  
Height: 1.00 Diameter: 2.36



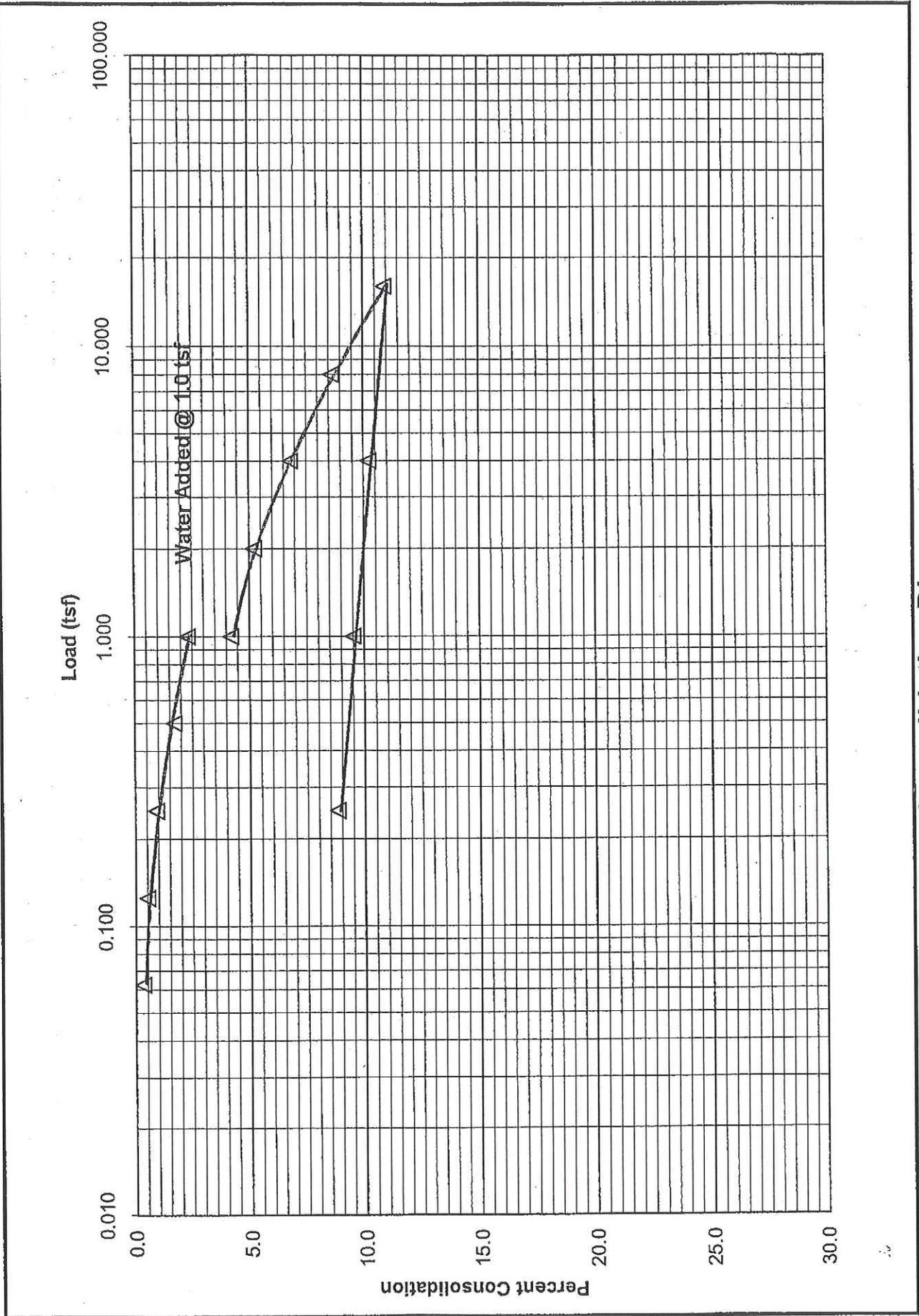


# GeoSoils Consultants, Inc.

Geotechnical Engineering \* Engineering Geology

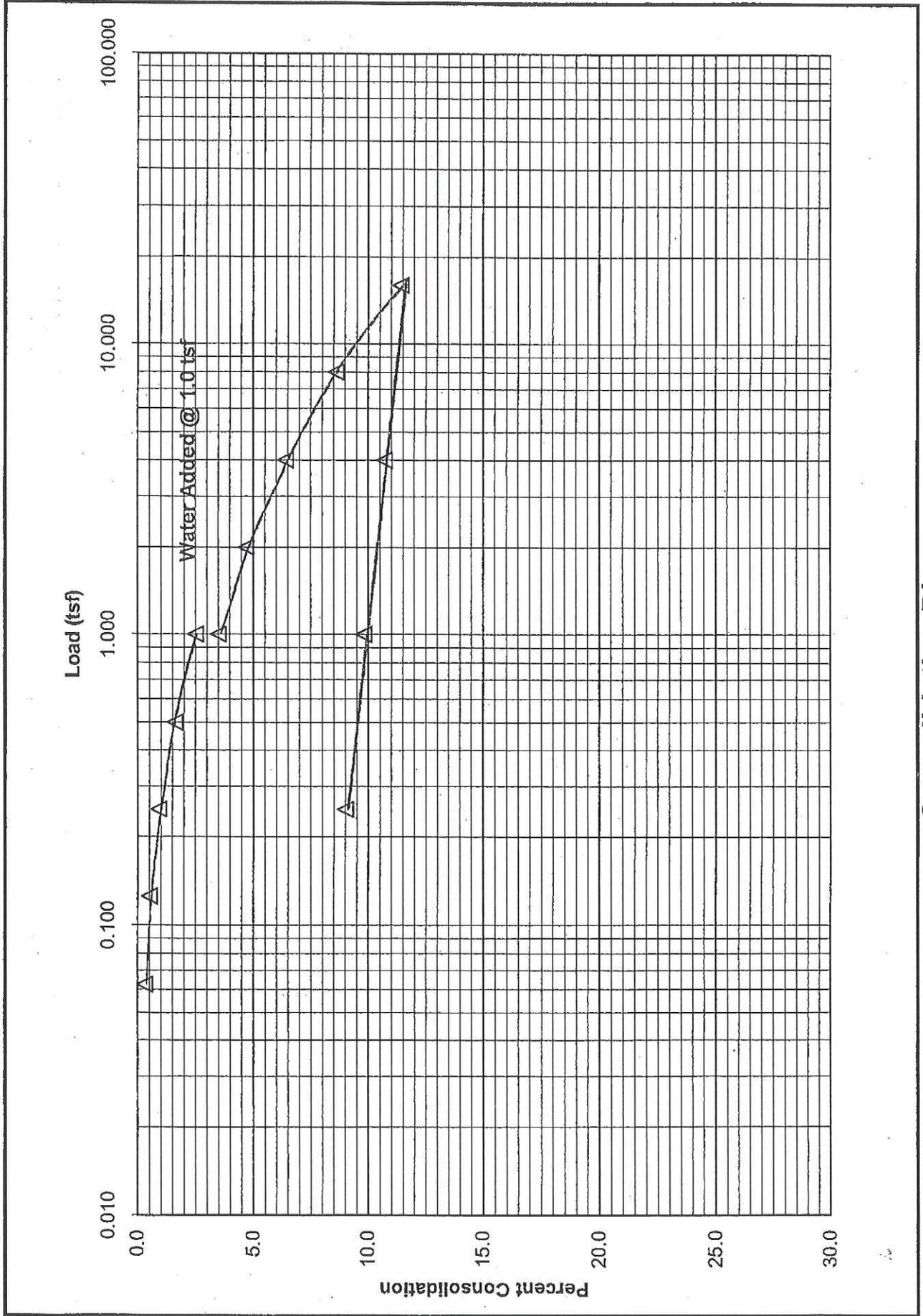
Moisture(%)  
Before: 4.1 After: 14.3

Sample(in.)  
Height: 1.00 Diameter: 2.36



# GeoSoils Consultants, Inc.

Geotechnical Engineering \* Engineering Geology



Consolidation Diagram  
C6489.6

January 23, 2015  
W.O. 6489

**APPENDIX C**

**BORING LOGS AND LABORATORY TEST RESULTS**

**BY LEIGHTON AND ASSOCIATES**

## APPENDIX B

SUMMARY LOGS OF EXPLORATORY EXCAVATIONSBoreholes B-1 through B-6, InclusiveType: 24" diameter bucket-augerContractor: Roy Brothers DrillingLocation: Refer to Revised Geologic MapB-1 Drilled: 12/12/84. Elevation top of hole: 169'<sup>±</sup> (3' below natural grade).0-28' Nonmarine terrace deposits: clayey to silty, fine- to medium-grained sand; rusty brown, damp to moist, some caliche stringers.28'-38' Probable marine terrace deposits: pebbly medium- to coarse-grained sand; light brown, dry to damp, loose and caving. Hole cased from 8' to 38.5'.38'-51' Monterey Formation: siliceous siltstone and silty claystone; gray, brown, iron-stained fracture surfaces, moist, some caliche and sheared clay surfaces. Bedding attitudes: N45E, 60SE @ 39.5'; N45E, 81SE @ 45'. Bulk sample obtained from 50' depth.

Total depth: 51'; no ground water encountered.

B-2 Drilled: 12/14/84. Elevation top of hole: 133'0-2' Soil zone: fine- to medium-grained sandy clay, clayey sand; medium brown, moist.2'-5' Probable marine terrace deposits: gravelly clayey sand; orange-brown, with some rounded cobbles.5'-15' Monterey Formation: interbedded silty fine sandstone and cherty siliceous siltstone, light to dark brown, very fractured, locally weathered. Bedding attitudes: N57E, 62SE @ 6.5'; N52E 68SE @ 10'. Bulk sample obtained from 13' depth.

Total depth: 15'; no ground water or caving.

B-3 Drilled: 12/17/84. Elevation top of hole: 223'0-19' Nonmarine terrace deposits: clayey fine sand, sandy clay, with some gravel and sandstone fragments @ 14'<sup>±</sup>; light brown to red-brown, moist to very moist.19'-30.5' Volcanic bedrock: clayey sandy silt with less weathered fragments of basaltic rock fragments; dark brown, olive-greenish brown, moist to very moist. Probable mixture of volcanic rock and sandstone. Boring not downhole logged due to seepage @ 23' and caving. Bulk sample obtained from 28' depth.

Total depth: 30.5'

**B-4** Drilled: 1/28/85. Elevation top of hole: 176'

- 0-2' Soil zone: Clayey sand, with some gravel and cobbles, dark brown, loose, porous, moist, abundant roots.
- 2'-44'<sup>±</sup> Terrace deposits (nonmarine, grading to marine near base): sandy clay, reddish brown, mottled with dark brown; medium-grained sand with cobbles, loose, very friable @ depth; caving (hole cased from 4.5' to 45').
- 44'-60' Monterey Formation: interbedded clayey and siliceous siltstone; dark gray, black, highly fractured, broken, crudely bedded, with orange-brown iron staining and calcite veins along fractures. Some slickensides along bedding. Bedding/joint attitudes: JN83W, 81N @ 46°; BN36E, 70N @ 49°; JN86W, 68S; BN64E, 73N @ 52°; BN88E, 76N @ 55°.

Total depth: 60'. Water ponding at bottom of hole.

**B-5** Drilled: 2/6/85. Elevation top of hole: 183.5'

- 0'-45' Nonmarine terrace deposits: clayey sand, with horizontal layers or lenses of gravel and cobbles; brown to orange-brown, slightly porous, damp. Fine-grained sand, loose and friable below 15'<sup>±</sup>.
- 45'-55.5' Probable marine terrace deposits: clayey sand; brown to orange-brown, with iron-stain mottling, loose and caving below 45' (hole cased from 14' to 54.5').
- 55.5'-81' Bedrock (probable Conejo\* volcanics): sandy siltstone, siliceous siltstone, clayey siltstone; gray, brown, firm, damp, locally very hard (brecciated siliceous shale). Extensively sheared from 73'-79' on east side of hole; in massive clayey siltstone, with gypsum and calcite veins. Petroliferous odor below 73'. Minor seepage at 55.5'. Bulk samples obtained from 66' to 71' depth.

Total depth: 81'

**B-6** Drilled: 2/23/85. Elevation top of hole: 206'<sup>±</sup>

- 0-58'<sup>±</sup> Nonmarine terrace deposits: clayey to silty sand, with some gravel-size rock fragments; tan to rusty brown, slightly moist to moist, moderately dense.
- 58'-70' Probable marine terrace deposits: relatively cleaner, less moist sand than above, contains some gravel and cobbles; hole cased from 29.5' to 70' due to caving in marine terrace section.
- 70'-80' Bedrock (probable Conejo\* volcanics): clayey siltstone, silty claystone and minor silty sandstone; dark gray, black, light gray (sandy stringers), slightly moist, massive, generally sheared. Boring not downhole logged; bulk sample of bedrock obtained. No apparent ground water encountered.

Total depth: 80'

\* Reclassified as Monterey Formation (current report)



GEOTECHNICAL BORING LOG

DATE 1/4/89 DRILL HOLE No. B-7 SHEET 2 OF 2  
 PROJECT EAI/Malibu PROJECT No. 3831025-04  
 DRILLING Co. Tri-Valley Drilling TYPE OF RIG Bucket Auger  
 HOLE DIAMETER 24" DRIVE WEIGHT 2600 lbs.-25'; 1600 lbs.-45'; 800 lbs.-69' DROP 12 IN.  
 ELEVATION TOP OF HOLE 198' REF. OR DATUM See Geotechnical Map, Plate 1

FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE No.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								LOGGED BY <u>DGS</u>	
								SAMPLED BY <u>DGS</u>	
1			7	3 for 6"	106	17.6	CL	<p>SANDY SILTY CLAY: Mottled medium and dark brownish-gray, moist, firm, plastic, few sandstone, siltstone and fewer volcanic fragments</p> <p>@32.0' - increasing dark brownish-gray</p> <p>@33.0' - medium-brown, sandstone fragments</p> <p>@35.0' - Sandy Silty Clay, medium-brown, firm</p> <p>@40.0' - increased amount of sandstone fragments, some green volcanic fragments, very firm</p>	
2			9	BAG					
3			8	6	120	14.6			
4			10	6	114	14.6			
5			11	BAG					
6							SM		
7			12	27	122	11.3			CLAYEY SILTY SAND: Medium yellow-brown, moist, dense, medium- to coarse-grained (probable soil zone)
8									SANDSTONE: Yellow-gray, mottled greenish-gray and orange, moist, firm, coarse-grained, few pebbles, clayey matrix, few roots (SESPE FORMATION)
9									@48.5' - maroon siltstone bed, thin
10									@49.0' - hard, light yellow-brown, massive
11			13	40 for 7"	108	9.2			
12		14	BAG						
13		15	40 for 8" No Recovery						
14							NOTES: Total Depth - 55.0' No caving No seepage		



DATE 1/4/89 DRILL HOLE No. B-8 SHEET 2 OF 2  
 PROJECT EAI/Malibu PROJECT No. 3831025-04  
 DRILLING Co. Tri-Valley Drilling TYPE OF RIG Bucket Auger  
 HOLE DIAMETER 24" DRIVE WEIGHT 2600 lbs.-25'; 1600 lbs.-45'; 800 lbs.-69' DROP 12 IN.  
 ELEVATION TOP OF HOLE 216' REF. OR DATUM See Geotechnical Map, Plate 1

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE No.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								LOGGED BY	SAMPLED BY
0			7	7	111	11.7	SM	SILTY SAND: Orange-brown, moist, dense, slightly cemented, few rounded pebbles, porous, friable, sand medium-grained, poorly sorted (TERRACE DEPOSITS, NON-MARINE)	DGS
15			8	7	113	6.0		@33.0' - pebble lens, abundant rounded pebbles, mostly sandstone, few quartzite @35.0' - Silty Sand, as above	DGS
0			9	14	106	12.4		@39.0' - carbonate stringers	
5			10	24	101	1.3	SP	SAND: Light yellow-tan, slightly moist, loose, fine-to medium-grained, well sorted, unconsolidated small shell fragments (TERRACE DEPOSITS, MARINE)	
			11	BAG				(continued 1/25/89 with drilling mud, due to caving) @51.0' - rounded pebbles and cobbles	
5		B: dipping 60°	12	62 for 5"	66.7	50.3		SILTSTONE: Light tan to light purple-gray, moist, hard, silicified, fractured, limonite stains on fractures and bedding planes (MONTEREY FORMATION)	
			13	62 for 11"	68.8	48.2		@56.0' - diatomaceous	
			14	60 for 10"	70.6	48.3			
			15	60 for 7"	73.8	49.9			
0								NOTE: Total depth - 58.0' No seepage Caving 45-50' Dip in Monterey Formation from unoriented core	

GEOTECHNICAL BORING LOG

DATE 1/10/89 DRILL HOLE No. B-9 SHEET 1 OF 1  
 PROJECT EAI/Malibu PROJECT No. 3831025-04  
 DRILLING Co. Tri-Valley Drilling TYPE OF RIG Bucket Auger  
 HOLE DIAMETER 24" DRIVE WEIGHT 2600 lbs.-25'; 1600 lbs.-45'; 800 lbs.-69' DROP 12 IN.  
 ELEVATION TOP OF HOLE 244' REF. OR DATUM See Geotechnical Map, Plate 1

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE No.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
								LOGGED BY <u>DGS, TJ</u>
SAMPLED BY <u>DGS</u>								
0							ML	SANDY CLAYEY SILT: Dark medium-brown, moist to slightly moist, firm, porous, rootlets (SOIL)  @ 2.0' - yellowish orange-brown, very firm, few gypsum crystals approx. 1/2" thick  Contact approximately 5', very gradational
5		B:N37W, 17SW	2	7	94.6	18.8		SILTSTONE: Yellowish-orange-brown, slightly moist, very firm, very sheared, highly weathered, random small polished surfaces, gypsum (VAQUEROS FORMATION)  @ 8.0' - volcanic bedding (hard to distinguish), irregular, discontinuous, light brown, clayey, crumbly, 2" to 3" thick limonite staining
10		J:NO2E, 52NW	3	6 4 rings dist.	74.6	23.2		@11.0' - very sheared, striations on random surfaces  @12.0' - increasing gypsum  @13-17' - mineralized zone, 4" to 5" thick dark limonite staining, abundant gypsum, jarosite
15		MZ:N45E, 87NW	4	8	104	18.0		@13.5' - striations more regular, plunging 20°, N80W  @16.0' - surrounding siltstone gray mottled with orange limonite stain, regular pattern of elongated blotches oriented approximately vertical
		J:N70E, 55SE	5	BAG				@16.5' - bedding not detected, striations on joints
20			6	6	99.0	22.3		
25								NOTES: Total Depth - 21.0' No caving No seepage Downhole logged to total depth



DATE 1/10/80 DRILL HOLE No. B-10 SHEET 2 OF 2  
 PROJECT EAI/Malibu PROJECT No. 3831025-04  
 DRILLING Co. Tri-Valley Drilling TYPE OF RIG Bucket Auger  
 HOLE DIAMETER 24" DRIVE WEIGHT 2600 lbs.-25'; 1600 lbs.-45'; 800 lbs.-69' DROP 12 IN.  
 ELEVATION TOP OF HOLE 224' REF. OR DATUM See Geotechnical Map, Plate 1

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE No.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								LOGGED BY	SAMPLED BY
30			7	15	116	5.7	SM	DGS	DGS
35			8	7	107	11.0			
40			9	21	103	2.0	SP		
			10	BAG					
45			11	42	99	3.8			
50								NOTES: Total Depth - 46.0' Caving at bottom No seepage	

LOGGED BY \_\_\_\_\_ DGS  
 SAMPLED BY \_\_\_\_\_ DGS

SILTY SAND: Orange-brown, slightly moist, dense, fine-  
 to medium-grained, slightly cemented, porous,  
 scattered rounded pebbles, friable

@33.0' - moist

@39.0' - sandier

SAND: Yellow-brown, moist, loose, fine- to medium-  
 grained, well sorted, sparse shell fragments  
 (TERRACE DEPOSITS, MARINE)

@41.0' - gravelly

NOTES: Total Depth - 46.0'  
 Caving at bottom  
 No seepage



DATE 1/10/89 DRILL HOLE No. B-11 SHEET 2 OF 2  
 PROJECT EAI / Malibu PROJECT No. 3831025-04  
 DRILLING Co. Tri-Valley Drilling TYPE OF RIG Bucket Auger  
 HOLE DIAMETER 24" DRIVE WEIGHT 2600 lbs.-25'; 1600 lbs.-45'; 800 lbs.-69' DROP 12 IN.  
 ELEVATION TOP OF HOLE 236' REF. OR DATUM See Geotechnical Map, Plate 1

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE No.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								LOGGED BY	SAMPLED BY
								DGS	DGS
0			7	24	118	4.9	SN	SILTY SAND: Orange-brown, slightly moist, dense, slightly cemented, porous, friable, rounded pebbles and cobbles, fine- to coarse-grained, poorly sorted	
5			8	40	112	8.8		@33.0' - siltier	
								@35.0' - Silty Sand, as above	
40			9	33	108	4.3		@40.0' - sand and pebble bed	
								@43.0' - moist	
15			10	50 for 10"	102	9.3		@45.0' - Silty Sand, moist	
50			11	43	105	6.8			
55								NOTE: Total Depth - 51.0' Caving from 26.0' to approx. 30.0' Downhole logged to 26.0' No seepage	



DATE 1/11/89 DRILL HOLE No. B-12 SHEET 2 OF 3  
 PROJECT EAI/Malibu PROJECT No. 3831025-04  
 DRILLING Co. Tri-Valley Drilling TYPE OF RIG Bucket Auger  
 HOLE DIAMETER 24" DRIVE WEIGHT 2600 lbs.-25'; 1600 lbs.-45'; 800 lbs.-69' DROP 12 IN.  
 ELEVATION TOP OF HOLE 233' REF. OR DATUM See Geotechnical Map, Plate 1

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE No.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								LOGGED BY	SAMPLED BY
								DGS	DGS
30			6	17	118	8.6	SM	SILTY SAND: Orange-brown, moist, dense, porous, slightly cemented, friable	
35			7	14	113	8.7		@36.0' - Sandstone cobbles	
								@39.0' - Sandstone boulder, more silt, darker	
40			8	21	115	7.5		@40.0' - Silty Sand, siltier, darker	
45			9	50 for 11"	105	11.0		@45.0' - Silty Sand, orangish-brown	
								@47.0' - sandier, light orange-brown, more pebbles, sand, poorly sorted	
50			10	50 for 11"	108	8.0		@50.0' - Silty Sand, orange-brown	
								@52.0' - caliche stringers	
55			11	45	112	7.2		@55.0' - Silty Sand, few pebbles	
60								@58.0' - Sandstone boulder	

DATE 1/11/89 DRILL HOLE No. B-12 SHEET 3 OF 3  
 PROJECT EAI/Malibu PROJECT No. 3831025-04  
 DRILLING Co. Tri-Valley Drilling TYPE OF RIG Bucket Auger  
 HOLE DIAMETER 24" DRIVE WEIGHT 2600 lbs.-25'; 1600 lbs.-45'; 800 lbs.-69' DROP 12 IN.  
 ELEVATION TOP OF HOLE 233' REF. OR DATUM See Geotechnical Map, Plate 1

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE No.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								LOGGED BY	SAMPLED BY
								DGS, TJ	
								DGS	
60							SM		<p>SILTY SAND: Orange-brown, slightly moist, dense, porous, slightly cemented, rounded pebbles, few cobbles, friable</p> <p>@63.0' - Sandstone boulder</p> <p>@65.0' - Silty Sand, as above</p>
65			12	31	118	11.4			
70							SP		<p>SAND: Light yellow-brown, slightly moist, loose, unconsolidated, fine-medium-grained, well sorted, shell fragments (TERRACE DEPOSITS, MARINE)</p> <p>(1/25/89 - continue with drilling mud)</p> <p>@74.0' - abundant magnetite</p> <p>@78.0' - rounded pebbles, few cobbles</p> <p>@80.0' - abundant cobbles</p>
75									
80									<p>SILTSTONE: Dark greenish-gray, slightly moist, very firm, fissile, small striated surfaces (VAQUEROS FORMATION)</p> <p>@82.0' - reddish-brown translucent mineral coatings on surfaces, possible pyrite mineralization</p> <p>@83.0' - Siltstone/Claystone - very sheared</p>
85			13	47	104.2	23.5			
			14	30	105.7	22.4			
			15	36	105.4	23.4			
			16	32	107.8	21.9			
									<p>NOTE: Total Depth - 85.0'          Caving from 72.0' to 80.0'          No seepage</p>

DATE 1/11/89 DRILL HOLE No. B-13 SHEET 1 OF 2  
 PROJECT EAL/Malibu PROJECT No. 3831025-04  
 DRILLING Co. Tri-Valley Drilling TYPE OF RIG Bucket Auger  
 HOLE DIAMETER 24" DRIVE WEIGHT 2600 lbs.-25'; 1600 lbs.-45'; 800 lbs.-69' DROP 12 IN.  
 ELEVATION TOP OF HOLE 218' REF. OR DATUM See Geotechnical Map, Plate 1

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE No.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								LOGGED BY	SAMPLED BY
0							SM		
0 - 6									SILTY SAND: Orange-brown, (top 6" medium-brown), slightly moist, dense, porous, slightly cemented, fine- to coarse-grained, poorly sorted, friable, rounded pebbles, few cobbles (TERRACE DEPOSITS, NON-MARINE)
6 - 10			1	9	116	7.7			
10 - 15			2	BAG					
15 - 20			3		114	7.0			@10.0' - Silty Sand, as above
20 - 25			4	6	107	6.8			@15.0' - coarse-grained Sand, some silt @15.0'-18.0' - gravelly sand
25 - 30			5	BAG					@19.0' - moist
30 - 35			6	4	114	12.2			@20.0' - Silty Sand, fine- to medium-grained, moist
35 - 40			7	11	106	6.3			@25.0' - Silty Sand, as above
40 - 45									@30.0' - sandier, coarser





DATE 1/26/89 DRILL HOLE No. B-14 SHEET 2 OF 2  
 PROJECT EAI/Malibu PROJECT No. 3831025-04  
 DRILLING Co. Tri-Valley Drilling TYPE OF RIG Bucket Auger  
 HOLE DIAMETER 24" DRIVE WEIGHT 2600 lbs.-25'; 1600 lbs.-45'; 800 lbs.-69' DROP 12 IN.  
 ELEVATION TOP OF HOLE 212' REF. OR DATUM See Geotechnical Map, Plate 1

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE No.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								LOGGED BY	SAMPLED BY
30			6	15	108.1	3.8	SP	LOGGED BY <u>DGS, TJ</u>	SAND: Light orange-brown, slightly moist, slightly firm, loose with depth, fine-grained, well sorted (TERRACE DEPOSITS, MARINE)
35			7	14	101.3	1.2		SAMPLED BY <u>DGS</u>	@33.0' - light yellow-brown, very loose, few small shell fragments
40			8	50 for 10"	94.2	17.2			@37.0' - caving, continue with mud
		B:dipping 62°	9	50 for 10"	94.6	14.6			SILTSTONE: Very light tan, light greenish-gray, light purple gray, slightly moist, hard, thin-bedded, limonite stains along bedding and fractures, silicified, cherty (MONTEREY FORMATION)
			B:dipping 60°	10	18	75.2	44.7		
45			11	27	74.6	44.9			
50									NOTE: Total Depth - 44.0' Caving at 37.0' No seepage Dips in Monterey Formation from unoriented core samples

DATE 1/26/89 DRILL HOLE No. B-15 SHEET 1 OF 2  
 PROJECT EAI/ Malibu PROJECT No. 3831025-04  
 DRILLING Co. Tri-Valley Drilling TYPE OF RIG Bucket Auger  
 HOLE DIAMETER 24" DRIVE WEIGHT 2600 lbs.-25'; 1600 lbs.-45'; 800 lbs.-69' DROP 12 IN.  
 ELEVATION TOP OF HOLE 216' REF. OR DATUM See Geotechnical Map, Plate 1

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE No.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								LOGGED BY	SAMPLED BY
0							SM	LOGGED BY <u>DGS, TJ</u>	SILTY SAND: Orange-brown, slightly moist, very dense, slightly cemented, friable, porous, few small pebbles (TERRACE DEPOSITS, NON-MARINE)
5			1	11				SAMPLED BY <u>DGS</u>	@ 8.0' - sandier, more pebbles
10			2	10	113.9	7.0			@10.0' - less pebbles
15			3	8	111.4	7.6			@18.0' - more moisture
20			4	5	111.5	13.5			@21.0' - siltier
25			5	11	117.3	9.0			@26.0' - sandier
30							SP		SAND: Light orange-brown to light yellow-brown, moist, loose, few shell fragments, fine-grained, well-sorted (TERRACE DEPOSITS, MARINE)

DATE 1/26/89 DRILL HOLE No. B-15 SHEET 2 OF 2  
 PROJECT EAI /Malibu PROJECT No. 3831025-04  
 DRILLING Co. Tri-Valley Drilling TYPE OF RIG Bucket Auger  
 HOLE DIAMETER 24" DRIVE WEIGHT 2600 lbs.-25'; 1600 lbs.-45'; 800 lbs.-69' DROP 12 IN  
 ELEVATION TOP OF HOLE \_\_\_\_\_ REF. OR DATUM See Geotechnical Map, Plate 1

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE No.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								LOGGED BY	_____ DGS
								SAMPLED BY	_____ DGS
30	[Hand-drawn graphic log showing soil texture with dots and circles]		6	11			SP	SAND: Light yellow-brown, moist, loose, medium-grained, well-sorted  @34.0' - rounded pebbles and cobbles  @36.0' - wet, many cobbles, seepage on south side	
35									
40	[Hand-drawn graphic log showing soil texture with vertical lines and dots]		7	47	74.8	28.8		SILTSTONE: Greenish-gray, purple-brown, orange, moist, very firm, very sheared, limonite stains, undulating polished surfaces (VAQUEROS FORMATION)  @39.0' - consistently dark brown	
			8	32	71.6	42.3			
			9	27	78.8	38.6			
			10	21	78.8	34.4			
								NOTE: Total Depth - 42.0' No caving Seepage at 36.0'	





DATE 4/19/89 DRILL HOLE No. B-17 SHEET 1 OF 3  
 PROJECT EAI/Malibu PROJECT No. 3831025-04  
 DRILLING CO. Tri-Valley Drilling TYPE OF RIG Bucket Auger  
 HOLE DIAMETER 24" DRIVE WEIGHT 2550#-22.5'; 1550#-45.5'; 750#-67'; 1050#-86.5' DROP 12 IN.  
 ELEVATION TOP OF HOLE 110' REF. OR DATUM See Geotechnical Map, Plate 1

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE No.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
							SM	SILTY SAND: Reddish-brown, moist, dense, cobbles (ARTIFICIAL FILL)
0		J:N35W, 26SW J:N07E, 66NW GS:N71E, 18SE GS:N75W, 50NE	1	X	BAG			TUFF: Light yellow to white, mottled orange, slightly moist, very firm to hard, sheared, limonite stained of fractures, hydrothermally altered, gypsum crystals up to 2" diameter, random polished surfaces (CONEJO VOLCANICS) @ 3.0' - joints polished @ 5.5' - discontinuous gypsum seam @ 6.5' - gypsum seam with limonite and polished surface @ 8.5' - large gypsum crystals with limonite @10.0' - hard, little limonite @11.0' - abundant limonite, joint with polished surface @15.0' - abundant limonite, random gypsum seams, 1/8" thick inclusions of moist claystone, firm, hard cemented fragments @16.0' - probable fault contact (Fault B)
5		J:N02E, 64NW J:N07E, 25NW	3		10			
10		F:N64W, 24NE F:N35W, 68NE MS:N30E, 54NW	5		4			CLAYSTONE: Bluish-gray, moist, firm, extremely sheared irregular sharp fault contact, undulating polished surfaces (East side approximately horizontal, West side approximately 45 degrees to the west) (TRANCAS FORMATION) @16.5' - striations @18.0' - discontinuous, siliceous zone, 1' thick, 1' long @20.0' - hard, some gypsum @21.5' - plastic clay @24.0' - white mineralized zones 1/8" thick @25.0' - dark bluish-gray, moist, very firm, plastic @29.0' - hard, brittle, siliceous fragments
15		S:N88E, 70NW	6	X	BAG			
20		S:N30E, 44NW	7		4			
25		S:N66E, 34NW	8		7			

DATE 4/19/89 DRILL HOLE No. B-17 SHEET 2 OF 3  
 PROJECT EAI/Malibu PROJECT No. 3831025-04  
 DRILLING Co. Tri-Valley Drilling TYPE OF RIG Bucket Auger  
 HOLE DIAMETER 24" DRIVE WEIGHT 2550#-22.5'; 1550#-45.5'; 750#-67'; 1050#-86.5' DROP 12 III.  
 ELEVATION TOP OF HOLE 110' REF. OR DATUM See Geotechnical Map, Plate 1

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE No.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								LOGGED BY	SAMPLED BY
								DGS, TJ	DGS
0			9	9					CLAYSTONE: Dark bluish-gray, moist, very firm, plastic, very sheared
15			10	6					@33.0' - harder pieces in clayey matrix have polished surfaces @34.0' - fragments 1/8" to 3" @35.0' - light gray mineralization
			11	BAG					@37.0' - matrix contains pods of subrounded to subangular sandstone fragments 1/2" to 1"
40		S:N13W, 46SW	12	8					
45		S:N54E, 36NW J:N18W, 78SW	45 13 46	7					@45.0' - hard silicified bed, minor seepage on top, brittle, jointed
		S:N82W, 74NE	48						@48.0' - polished shear
50		S:N38E, 33SE	50 14	20					@50.0' - thin siliceous zone @51.0' - harder, mottled with light gray, mineralization
		S:N10E, 48SE S:N53E, 33NW	53 54						@53.0' - thin siliceous zone @54.0' - polished surfaces, hard, less plastic
55			15	24					@56.5' - thin siliceous zone, discontinuous
60		S:N20W, 53SW	57						



GEOTECHNICAL DURING LOG

DATE 4/20/89 DRILL HOLE No. B-18 SHEET 1 OF 1  
 PROJECT EAT/Malibu PROJECT No. 3831025-04  
 DRILLING Co. Tri-Valley Drilling TYPE OF RIG Bucket Auger  
 HOLE DIAMETER 24" DRIVE WEIGHT 2550#-22.5'; 1550#-45.5'; 750#-67'; 1050#-86.5' DROP 12  
 ELEVATION TOP OF HOLE 110' REF. OR DATUM See Geotechnical Map, Plate 1

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE No.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								LOGGED BY	SAMPLED BY
0								DGS, TJ	DGS
0 - 14.0'							SM		
14.0' - 15.0'		S: N30E, 65SE							
15.0' - 16.0'		S: N38E, 60SE Striations Plunge 40° trending N89E	16						
16.0' - 19.0'		J: N3E, 86SE	19						
19.0' - 20.0'			1	X BAG					
20.0' - 23.0'		S: Gen. N25E, 45SE	23						
23.0' - 25.0'		Shear: N28E, 70SE Shear: N50E, 62SE	25						
25.0' - 26.0'									
26.0' - 28.0'									
28.0' - 30.0'			2	X BAG					
30.0'									

SILTY SAND: Orange-brown, slightly moist, very dense, scattered rounded pebbles and cobbles (LANDSLIDE DEBRIS)

@14.0' - on west side and 19.0' on east side - shear  
 @15.0' - east side of hole very sharp contact, roots growing along contact, striations  
 @16.0' - MnO stain along shear approximately 1" thick

TUFF: Yellowish-white, mottled-orange, slightly moist, very firm, sheared, altered, limonite, gypsum, spars MnO stain (CONEJO VOLCANICS/LANDSLIDE DEBRIS)

@24.0' on west side of boring and 26.0' on east side - scattered gypsum crystals, polished surfaces, 6" zone of inclusions of claystone above, 6" zone of inclusions of tuff below

CLAYSTONE: Bluish-gray, slightly moist, firm, slightly plastic, very sheared, pulverized (TRANCAS FORMATION/LANDSLIDE DEBRIS)

NOTE: Total Depth - 30.0'  
 No caving  
 No seepage  
 Downhole logged to Total Depth

DATE 4/20/89 DRILL HOLE No. B-19 SHEET 1 OF 3  
 PROJECT EAI/Malibu PROJECT No. 3831025-04  
 DRILLING Co. Tri-Valley Drilling TYPE OF RIG Bucket Auger  
 HOLE DIAMETER 24" DRIVE WEIGHT 2550#-22.5'; 1550#-45.5'; 750#-67'; 1050#-87'; 1350#-89' DROP 12 IN.  
 ELEVATION TOP OF HOLE 215' REF. OR DATUM See Geotechnical Map, Plate 1

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE No.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								LOGGED BY	CH, TJ
							SC	CLAYEY SAND: Medium-brown, moist, dense, root hairs, slightly porous, slightly plastic, fine- to medium grained, rounded pebbles (COLLUVIAL SOIL)	SAMPLED BY CH
5							SM	SILTY SAND: Orangish-brown, moist, loose to moderately dense, fine-grained, slightly plastic, black organic blebs (TERRACE DEPOSITS, NON-MARINE)	
10			1	BAG				@10.0' - dense, cemented, friable, occasional subangular to subrounded gravel to 1"	
			2	4				@12.0' - few subrounded cobbles	
15								@14.0' - gravel and cobbly fine- to coarse grained sand, well sorted	
								@15.0' - medium brown, mottled with olive brown, few reddish-brown soft siltstone fragments	
								@18.0' - very moist, angular cobbles	
								@19.0' - orangish-brown	
20			3	6			SP	SAND: Orangish-brown, moist, dense, very fine-grained, few angular cobbles	
							SM	SILTY SAND: Orangish-brown, moist, medium- to coarse-grained, slightly cemented, friable	
								@21.0'-23.0' - numerous rounded gravels and cobbles	
25								@25.0' - medium-brown, moist to very moist, fine- to medium-grained, slightly plastic	
30								@29.0' - few angular sandstone cobbles	



DATE 4/20/89 DRILL HOLE No. B-19 SHEET 3 OF 3  
 PROJECT EAI /Malibu PROJECT No. 3831025-04  
 DRILLING Co. Tri-Valley Drilling TYPE OF RIG Bucket Auger  
 HOLE DIAMETER 24" DRIVE WEIGHT 2550#-22.5'; 1550#-45.5'; 750#-67'; 1050#-87'; 1350#-89' DROP 12 IN.  
 ELEVATION TOP OF HOLE 215' REF. OR DATUM See Geotechnical Map, Plate 1

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE No.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION		
								LOGGED BY	SAMPLED BY	
								CH, TJ		
								CH		
55			7	33			SM		<p>SILTY SAND: Orange-brown to medium-brown, moist, dense, fine- to medium-grained, carbonate stringers</p> <p>@61.0' - medium-brown, slightly plastic</p> <p>@62.0' - few cobbles</p> <p>@63.0' - medium-grained sand, some gravel</p> <p>@64.0' - medium-brown</p> <p>@65.0' - medium-brown, moist, fine-grained, slightly plastic</p> <p>@66.0' - some gravel and cobbles</p> <p>@68.0' - orange-brown, fine- to medium grained moist</p>	
70			8	11			SP		<p>SAND: Medium-brown, moist, loose, fine- to medium-grained (TERRACE DEPOSITS, MARINE)</p> <p>@75.0' - tan to yellow-brown, fine- to medium-grained, well sorted, unconsolidated</p> <p>@80.0' - abundant cobbles</p>	
85				9	11				<p>SANDSTONE: Light yellow-brown, moist, very firm, clayey matrix, fine- to medium grained, poorly sorted, weathered, 1" thick sheared greenish-gray, clayey siltstone bed (probable VAQUEROS FORMATION)</p> <p>@86.0' - hard, well-cemented</p> <p>@87.0' - few pebbles and gravels</p> <p>@88.0' - 2" thick sheared dark gray to green-gray clayey siltstone bed</p> <p>@89.0' - green-gray</p>	
				10	17					
				11	25					
				12	50					
90										
								<p>NOTE: Total Depth - 89.0'          Caving @ 70.0'          Drilling mud used below 75.0'</p>		

DATE 4/21/89 DRILL HOLE No. B-20 SHEET 1 OF 2  
 PROJECT EAI / Malibu PROJECT No. 3831025-04  
 DRILLING Co. Tri-Valley Drilling TYPE OF RIG Bucket Auger  
 HOLE DIAMETER 24" DRIVE WEIGHT 2550#-22.5'; 1550#-45.5'; 750#-67'; 1050#-87'; 1350#-89' DROP 12 IN.  
 ELEVATION TOP OF HOLE 186' REF. OR DATUM See Geotechnical Map, Plate 1

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE No.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								LOGGED BY	SAMPLED BY
								CH, TJ	
							SM	CH	<p>SILTY SAND: Orange-brown, moist, fine-grained, well sorted (TERRACE DEPOSITS, NON-MARINE)</p> <p>@10.0' - dense, fine- to medium-grained, slightly cemented, friable</p> <p>@13.0' - some angular to rounded gravel and cobbles</p> <p>@17.0' - fine-grained</p> <p>@20.0' - fine-grained sand, few cobbles, slightly porous, slightly plastic, few roots</p> <p>@27.0' - carbonate stringers</p>



DATE 4/21/89 DRILL HOLE No. B-21 SHEET 1 OF 2  
 PROJECT EAI/Malibu PROJECT No. 3831025-04  
 DRILLING Co. Tri-Valley Drilling TYPE OF RIG Bucket Auger  
 HOLE DIAMETER 24" DRIVE WEIGHT 2550#-22.5'; 1550#-45.5'; 750#-67'; 1050#-87'; 1350#-89' DROP 12 IN.  
 ELEVATION TOP OF HOLE 112' REF. OR DATUM See Geotechnical Map, Plate 1

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE No.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								LOGGED BY	SAMPLED BY
								CH, TJ	
								CH	
0							ML		SANDY CLAYEY SILT: Dark-brown, moist, moderately firm, organics, roots and root hairs, occasional pebbles, carbonate stringers (COLLUVIAL SOIL)  @3.5' - Irregular contact dipping 18 degrees east
5							ML		SANDY SILT: Dark red-brown, slightly moist, dense, yellow, red and white mottling, roots, slightly porous, pebbles, cobbles (LANDSLIDE DEBRIS)  @ 8.0' - 2' thick subhorizontal cobble zone @ 9.5' - 4" subhorizontal pebble bed
10							SM		SILTY SAND: Dark red-brown, slightly moist, dense, pebbles and cobbles, slightly porous, roots  @15.0' - dark red-brown, yellow, and white mottling, dense, roots, 1' cobble bed @16.0' - orange to medium-brown, slightly plastic  @20.0' - 6" medium- to coarse-grained, subhorizontal sand bed @21.0' - orange-brown, fine-grained @21.5' - 4" thick erosional channel bed, medium- to coarse sand with pebbles  @25.0' - yellow-brown, coarse grained, cemented, slightly friable, subhorizontal gradational contact @27.0' - dark orange-brown, occasional pebbles @28.0' - red-brown, moist, fine-grained, few gravel and cobbles, slightly plastic
15									
20									
25									
30									

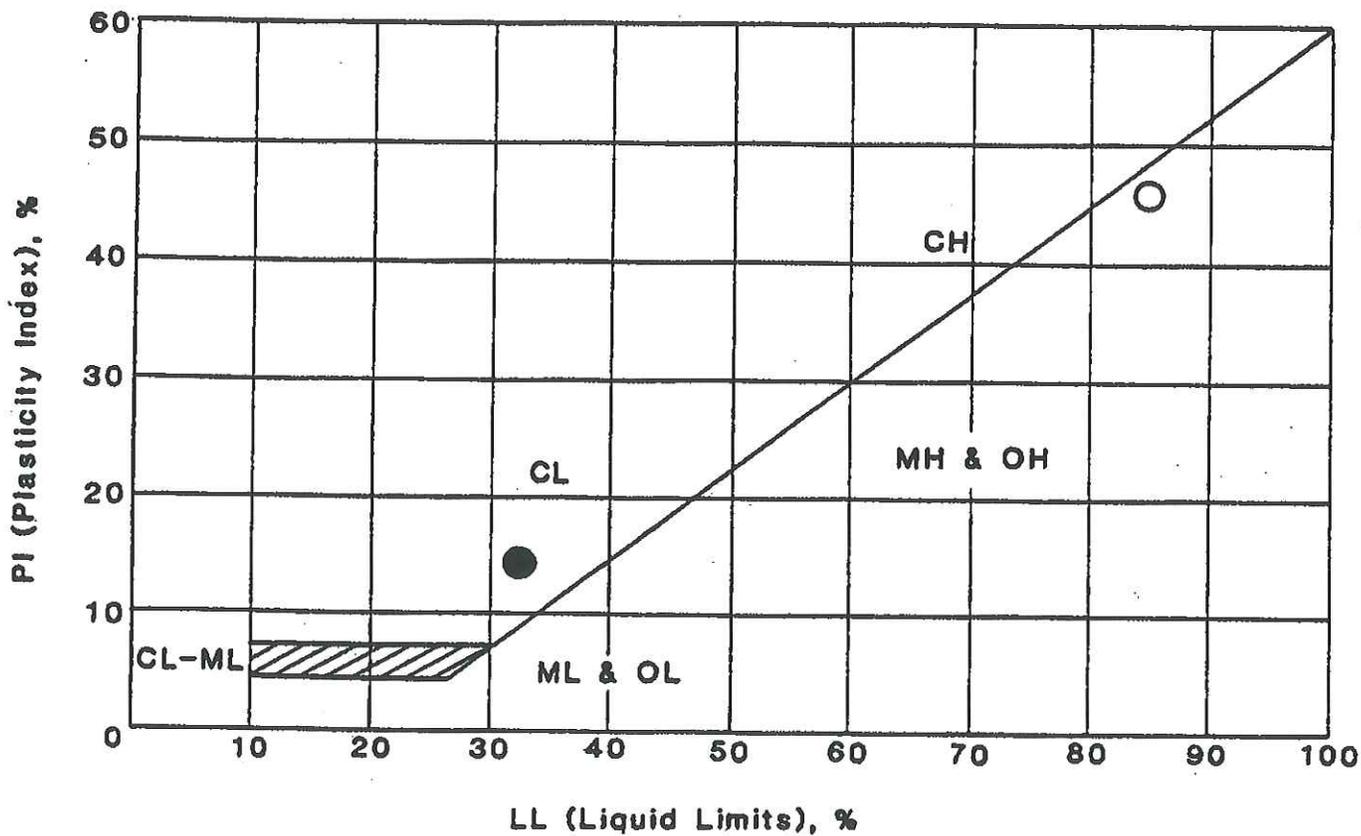
B: N2E, 38SE

GEOTECHNICAL DURING LOG

DATE 4/21/89 DRILL HOLE No. B-21 SHEET 2 OF 2  
 PROJECT EAI/Malibu PROJECT No. 3831025-04  
 DRILLING Co. Tri-Valley Drilling TYPE OF RIG Bucket Auger  
 HOLE DIAMETER 24" DRIVE WEIGHT 2550#-22.5'; 1550#-45.5'; 750#-67'; 1050#-87'; 1350#-89' DROP 12 IN.  
 ELEVATION TOP OF HOLE 112' REF. OR DATUM See Geotechnical Map, Plate 1

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE No.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								LOGGED BY	SAMPLED BY
30							SM	LOGGED BY <u>CH, TJ</u>	SAND: Red-brown, moist, moderately dense, fine-grained, slightly plastic, occasional rounded gravel and cobbles
35								SAMPLED BY <u>CH</u>	@34.0' - numerous volcanic and quartzite pebbles in a coarse-grained sandy matrix, loose and friable to 37'
40		S: N3E, 42SE S: N3E, 44-47SE S: N32W, 55NE	1	7			SP SM	LOGGED BY	@40.0-41.0' - irregular contact clipping, east
45								SAMPLED BY	SAND: Light gray, moist, unconsolidated, fine- to medium-grained, friable, intermixed with silty sand - as above 41.5' TO 42.0' - irregular contact
50								2	SILTSTONE: Mottled with discontinuous light gray sandstone lenses, numerous undulations polished surfaces (TRANCAS FORMATION/LANDSLIDE DEBRIS) @48.0' - pyrite, mineralization @51.0' - light blue @52.0' - plastic, polished surfaces, slightly mottled with sand
55			3	25				NOTE: Total Depth - 53.0' No seepage Caving from 43.0' to 45.0' Downhole logged to 48.0'	

SYMBOL	NO.	SAMPLE LOCATION	MOISTURE (%)	LL (%)	PL (%)	PI (%)	U.S.C.S.
●	11	B-7 @ 43' (Artificial fill)	--	31.7	17.3	14.4	CL
○	5	B-16 @ 47' (Claystone, Monterey Formation)	47.0	85.1	39.2	45.9	MH



**ATTERBERG LIMITS  
TEST RESULTS**

Project No. 3831025-04  
 Project Name EAI/RANCHO MALIBU MESA  
 Date 8/78 Figure No. D-1



SAMPLE LOCATION	SULFATE (PPM)	COMPACTED MOISTURE (%)	COMPACTED DRY DENSITY (pcf)	FINAL MOISTURE (%)	VOLUMETRIC SWELL (%)	EXPANSION INDEX	EXPANSIVE CLASSIFICATION
B-9 @ 18' (Vagueros Formation)	6000	14.7	94.7	32.6	11.7	117	High
B-10 @ 4'-6' (Non-marine Terrace)	180	8.5	115	16.3	1.1	11	Very Low

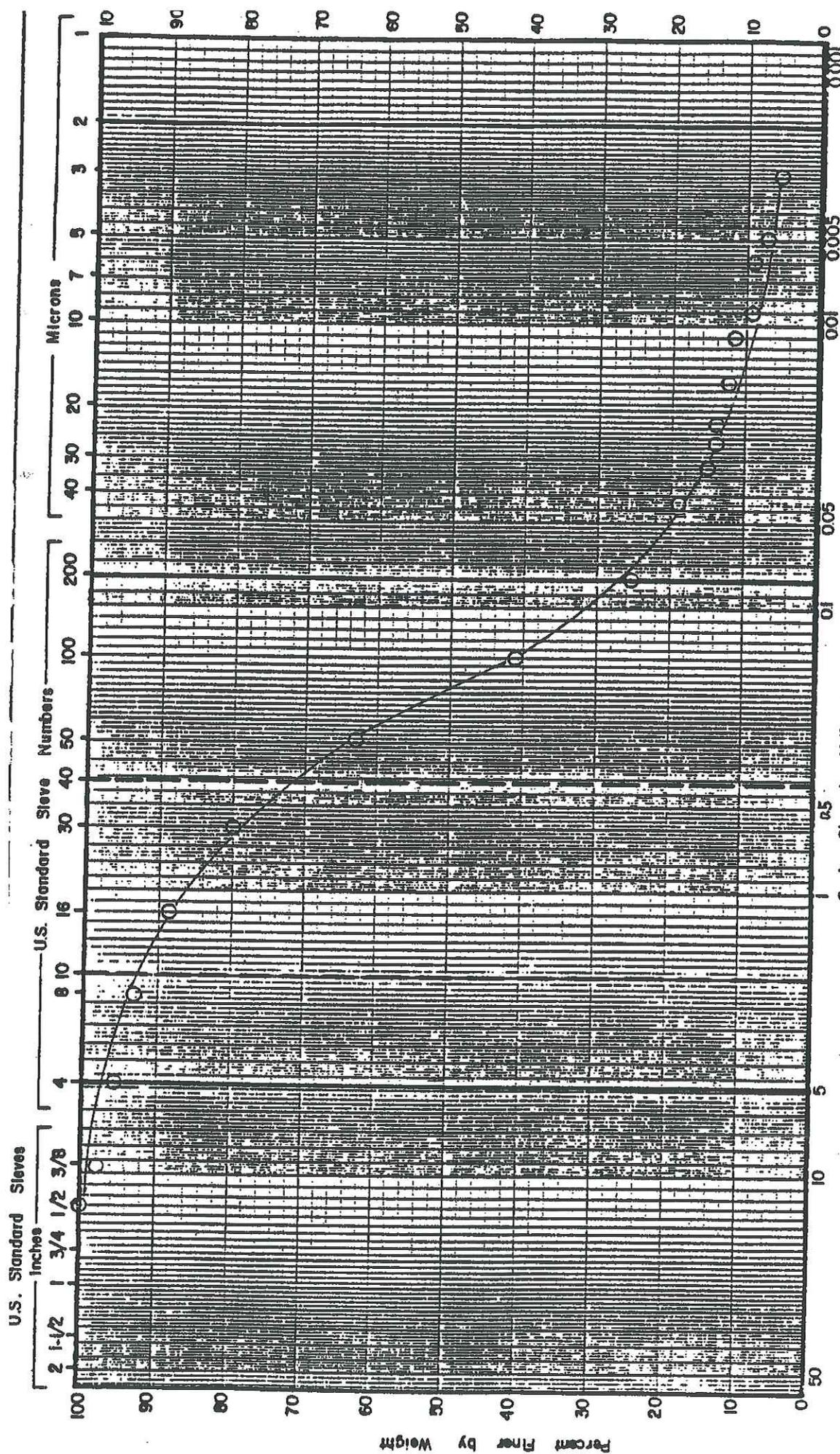
TEST METHOD:

UBC Test Method 29-2

**EXPANSION INDEX AND  
SOLUBLE SULFATE  
TEST RESULTS**

Project No. 3831025-04  
 Project Name EAI/RANCHO MALIBU MESA  
 Date 8/89 Figure No. D-2





Symbol	Location	Gravel			Sand			Fine		U.S.C.S.
		Sample No.	Field Moisture (%)	LL (%)	PI (%)	Activity	Cu	Cc	Percent Passing No. 200	
○	10 @ 25' (Qtn)	6	6.0	---	---	---	19.3	2.4	27	SM

U.S. Standard Sieves: 2, 1-1/2, 3/4, 1/2, 3/8, 4, 8, 10, 16, 30, 40, 50, 100, 200, 400, 600, 800, 1000, 2000, 4000, 8000, 16000, 32000, 63000, 125000, 250000, 500000, 1000000

Microns: 1, 2, 3, 5, 7, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000

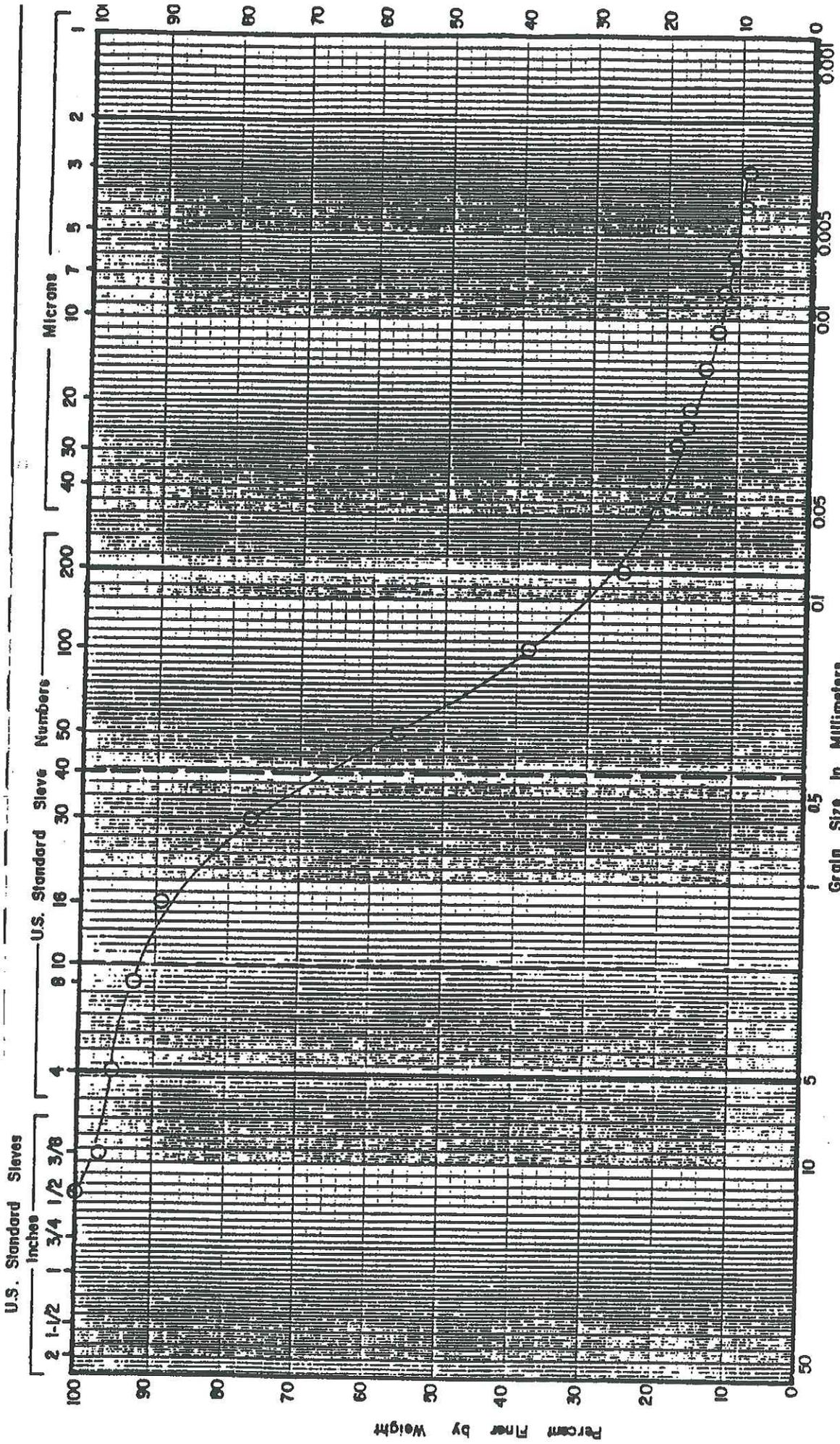
Grain Size in Millimeters: 5, 1, 0.5, 0.25, 0.15, 0.1, 0.075, 0.05, 0.025, 0.01, 0.005, 0.001

Clay

Project No. 3831025-04  
 Project Name EAI/RANCHO MALIBU MESA  
 Date 8/89

# GRADATION TEST RESULTS





Course	Gravel			Sand			Fine				
	Symbol	Sample Location	Sample No.	Field Moisture (%)	LL (%)	PI (%)	Activity PI/-20	Cu $\frac{D_{60}^2}{D_{10}^2}$	Cc $\frac{(D_{30})^2}{D_{10} \cdot D_{60}}$	Percent Passing No. 200	Percent Finer than U.S.C.S. 2 $\mu$
O	B-11 @ 35' (Qtn.)	8	8.8	---	---	---	---	73.3	6.5	27	--
											SM

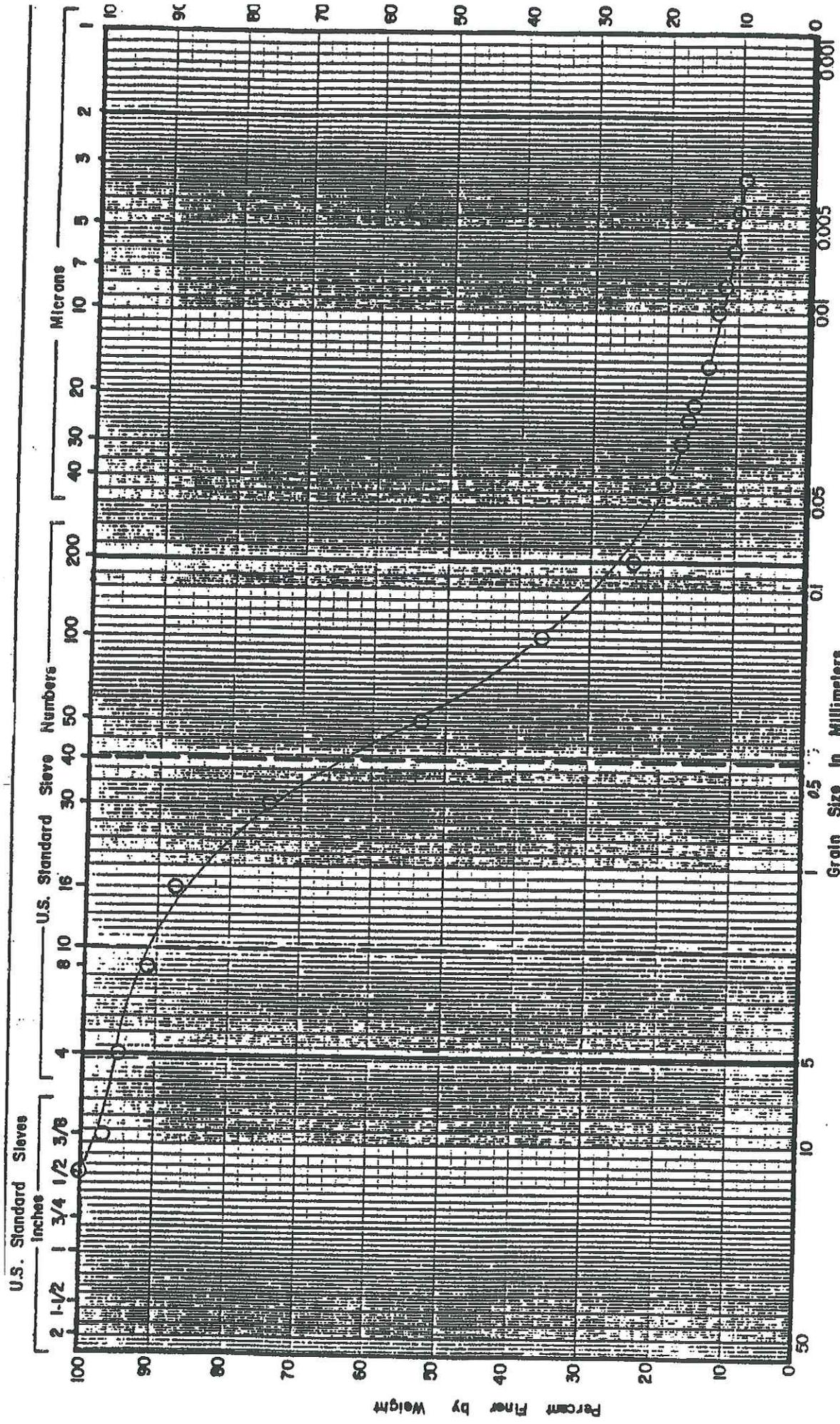
# GRADATION TEST RESULTS

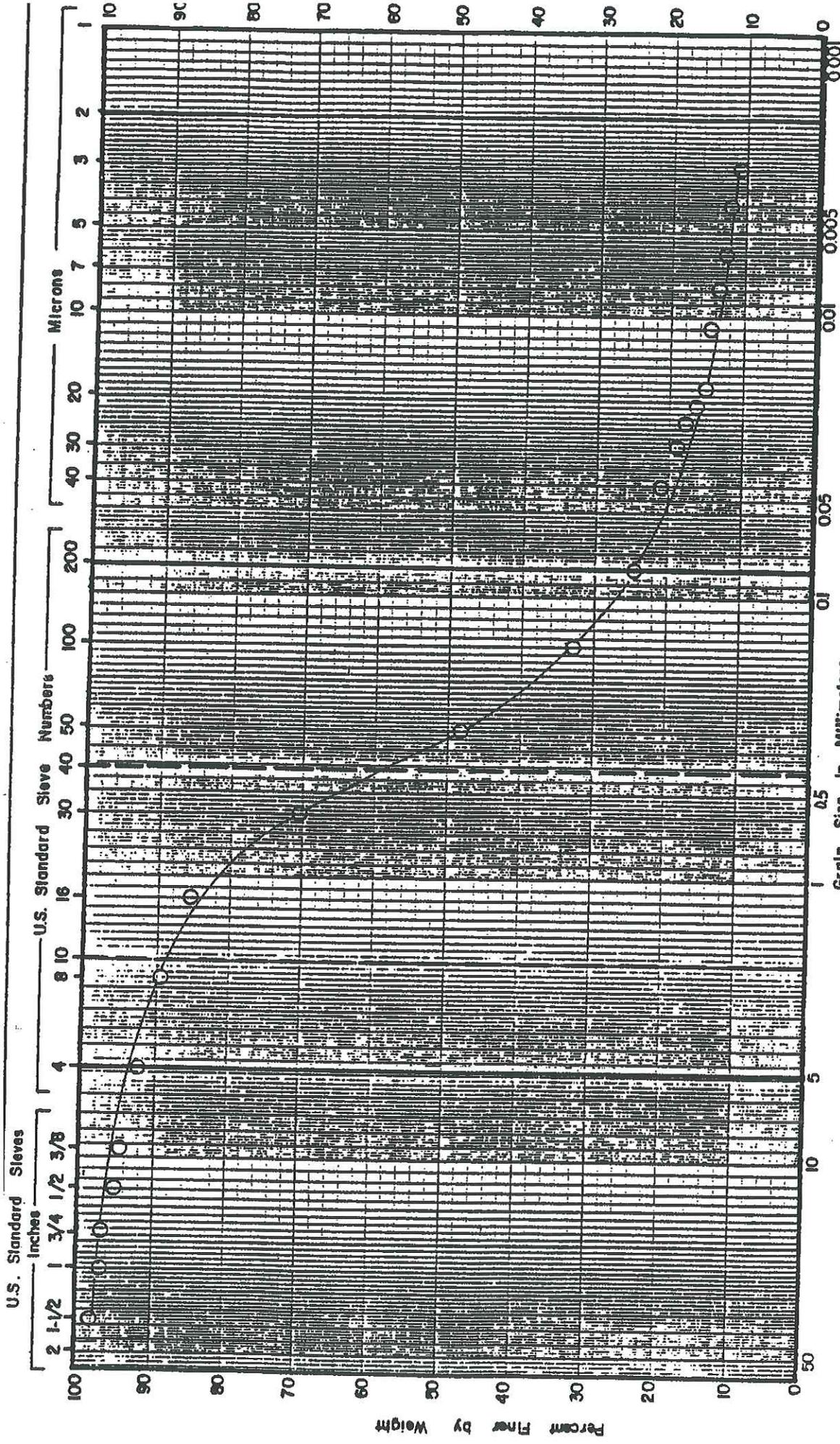
Project No. 3831025-04

Project Name EAL/RANCHO MALIBU MESA

8/89



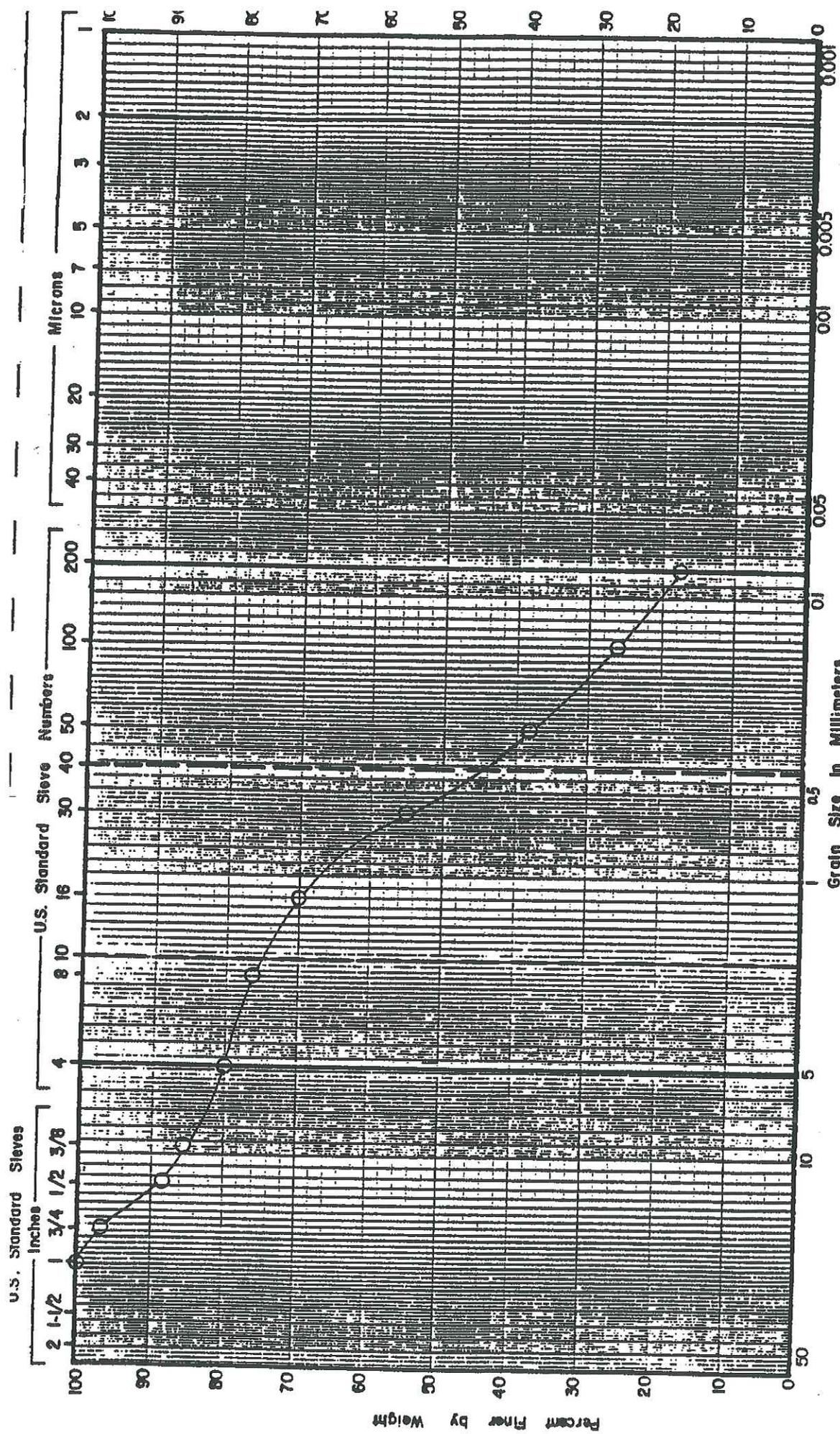




Symbol	Sample Location	Gravel			Sand			Percent Finer than No. 200	Percent Finer than 2 $\mu$	U.S.C.S.
		Coarse	Medium	Fine	Coarse	Medium	Fine			
O	B-13 @ 7 (Qtn.)	2	---	---	LL (%)	PI (%)	Activity PI/-2 $\mu$	Cu %	Cc (D <sub>30</sub> <sup>2</sup> /D <sub>10</sub> D <sub>60</sub> )	SM
								307	25.2	

# GRADATION TEST RESULTS

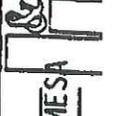
Project No. 3831025-04  
 Project Name EAI/RANCHO MALIBU MESA



Symbol	Sample Location	Gravel			Sand			Fine		Percent Finer than U.S.C.S. 2 $\mu$
		Coarse	Medium	Coarse	Medium	Coarse	Medium	Percent Passing No. 200		
O	B-13 <sup>①</sup> 17 (Qtn.)	5	---	---	---	---	---	---	17.5	SM

# GRADATION TEST RESULTS

Project No. 3831025-04  
 Project Name EAT/RANCHO MALIBU MESA  
 8/89



PRESSURE (kips per Square Foot)

0.05    0.1    0.5    1.0    5.0    10.0    50.0

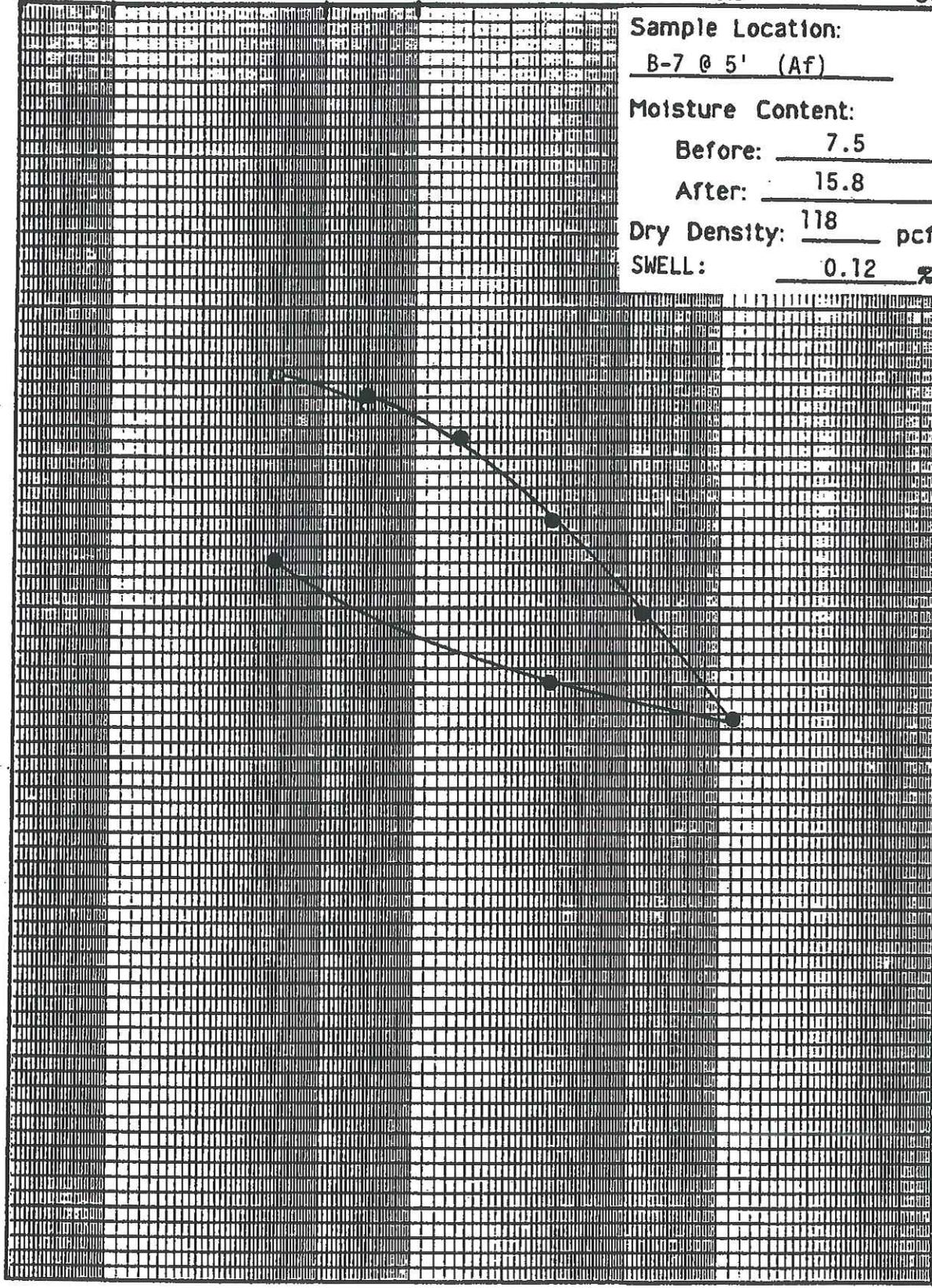
Sample Location:  
B-7 @ 5' (Af)

Moisture Content:  
Before: 7.5  
After: 15.8

Dry Density: 118 pcf  
SWELL: 0.12 %

CONSOLIDATION (Percent of Sample Thickness)

0  
2  
4  
6  
8  
10

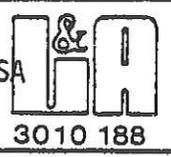


○ Indicates Sample at Field Moisture

● Indicates Sample After Saturation

CONSOLIDATION - PRESSURE CURVE

Project No. 3831025-04  
Project Name EAI/RANCHO MALIBU MESA  
Date 8/89 Figure No. D-8



3010 188

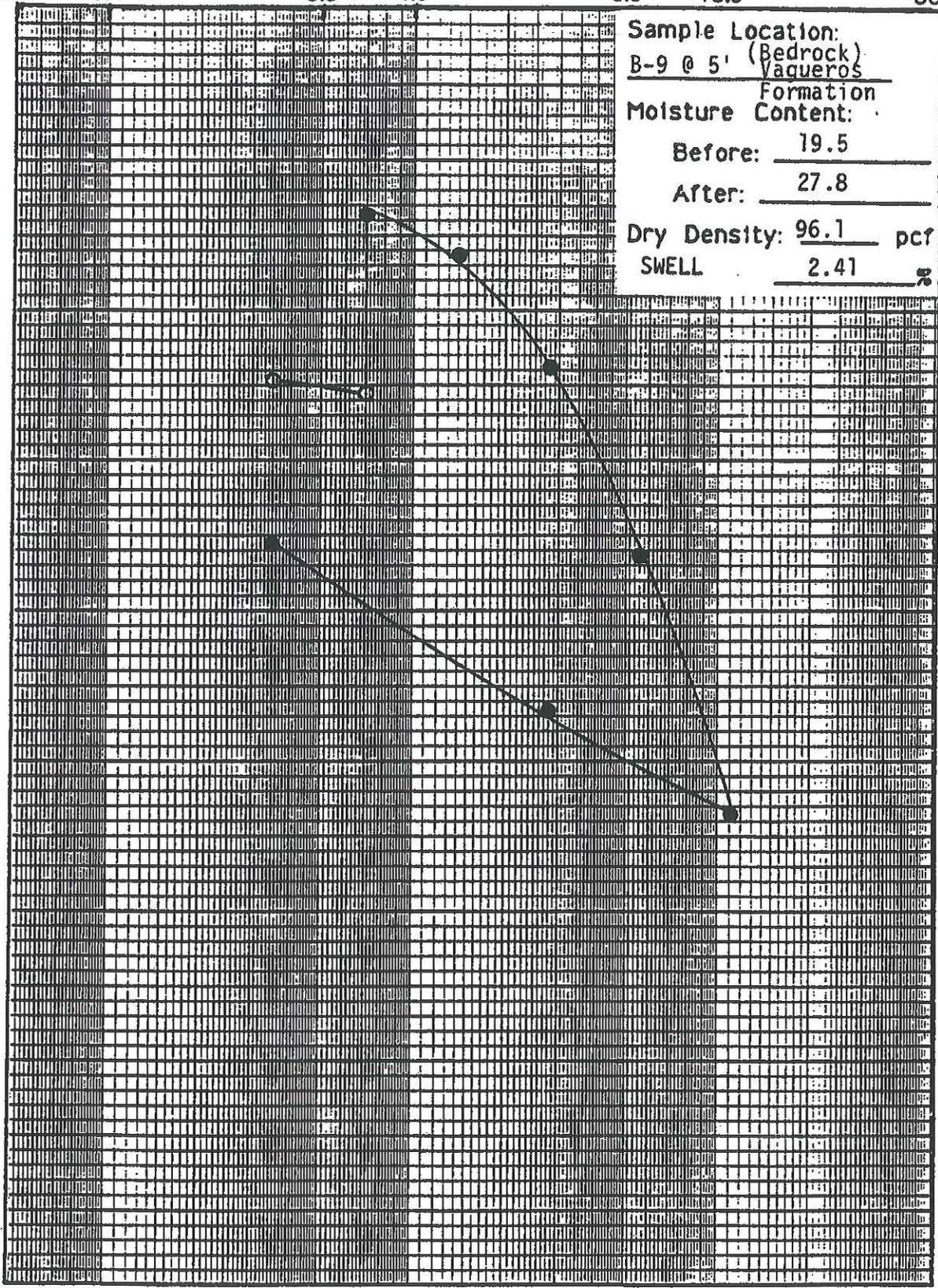
PRESSURE (kips per Square Foot)

0.05 0.1 0.5 1.0 5.0 10.0 50.0

Sample Location:  
 B-9 @ 5' (Bedrock)  
 Vagueros Formation  
 Moisture Content:  
 Before: 19.5  
 After: 27.8  
 Dry Density: 96.1 pcf  
 SWELL 2.41 %

CONSOLIDATION (Percent of Sample Thickness)

-2  
0  
2  
4  
6  
8  
10



○ Indicates Sample at Field Moisture

● Indicates Sample After Saturation

CONSOLIDATION - PRESSURE CURVE

Project No. 3831025-04  
 Project Name EAI/RANCHO MALIBU MESA  
 Date 8/89 Figure No. D-9



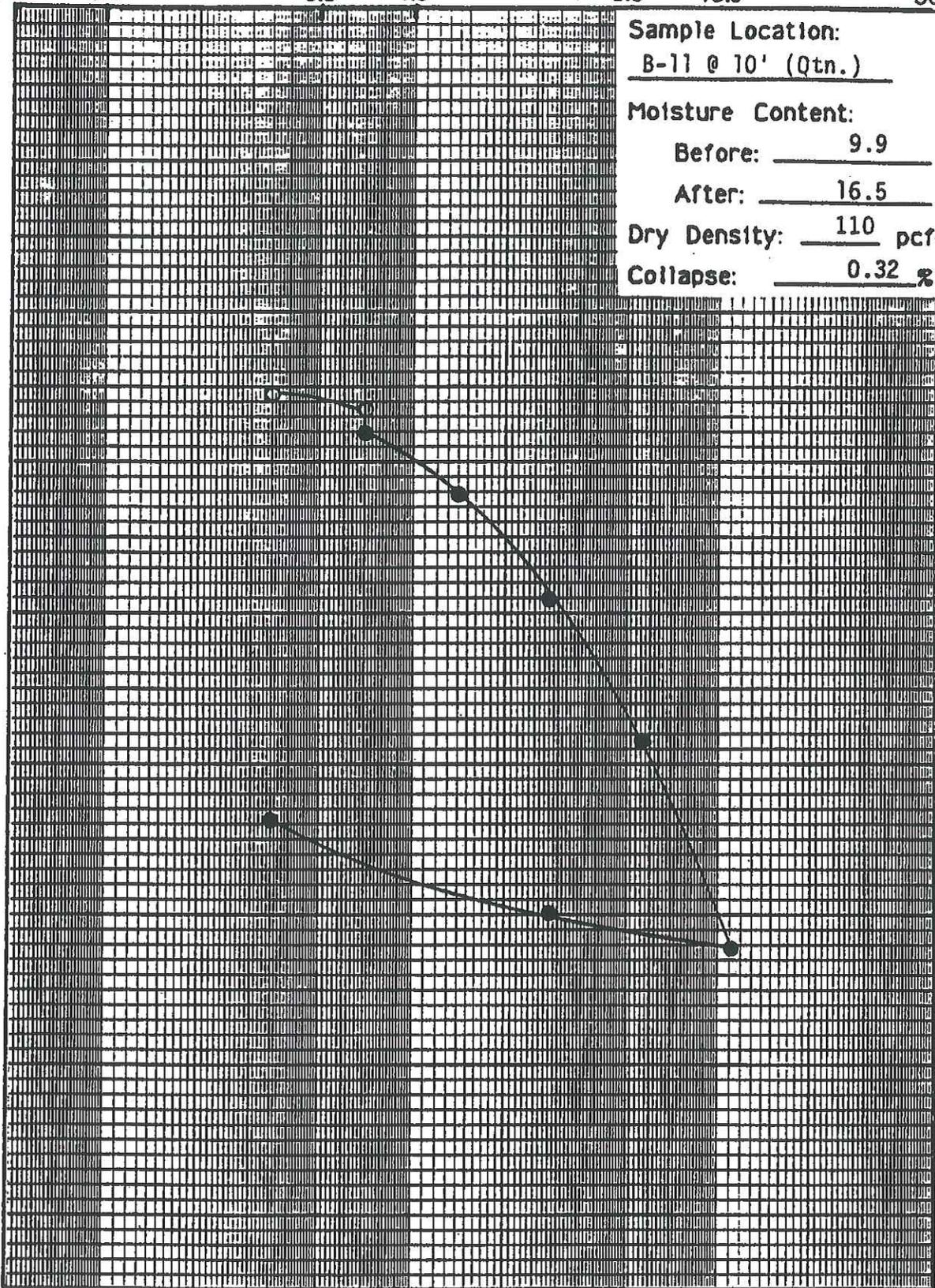
PRESSURE (kips per Square Foot)

0.05    0.1    0.5    1.0    5.0    10.0    50.0

Sample Location:  
B-11 @ 10' (Qtn.)  
 Moisture Content:  
 Before: 9.9  
 After: 16.5  
 Dry Density: 110 pcf  
 Collapse: 0.32 %

CONSOLIDATION (Percent of Sample Thickness)

0  
2  
4  
6  
8  
10



○ Indicates Sample at Field Moisture

● Indicates Sample After Saturation

CONSOLIDATION -  
 PRESSURE CURVE

Project No. 3831025-04

Project Name EAI/RANCHO MALIBU MESA

Date 8/89 Figure No. D-10



3010 188

PRESSURE (kips per Square Foot)

0.05 0.1 0.5 1.0 5.0 10.0 50.0

Sample Location:

B-12 @ 5' (Qtn.)

Moisture Content:

Before: 10.5

After: 16.2

Dry Density: 119 pcf

SWELL: 2.7 %

CONSOLIDATION (Percent of Sample Thickness)

-2

0

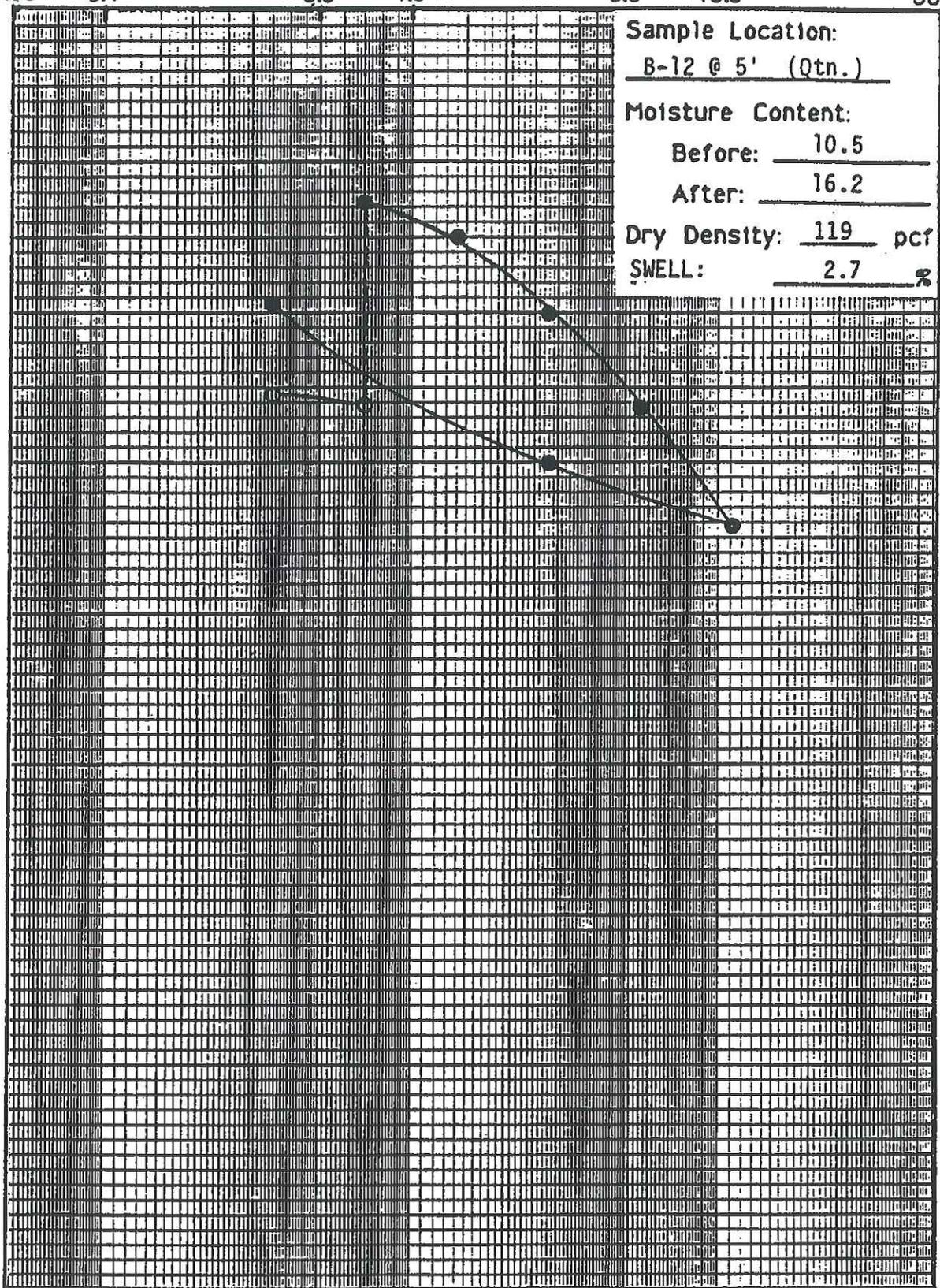
2

4

6

8

10



○ Indicates Sample at Field Moisture

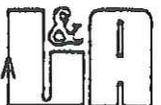
● Indicates Sample After Saturation

CONSOLIDATION - PRESSURE CURVE

Project No. 3831025-04

Project Name EAI/RANCHO MALIBU MESA

Date 8/89 Figure No. D-11



3010 188

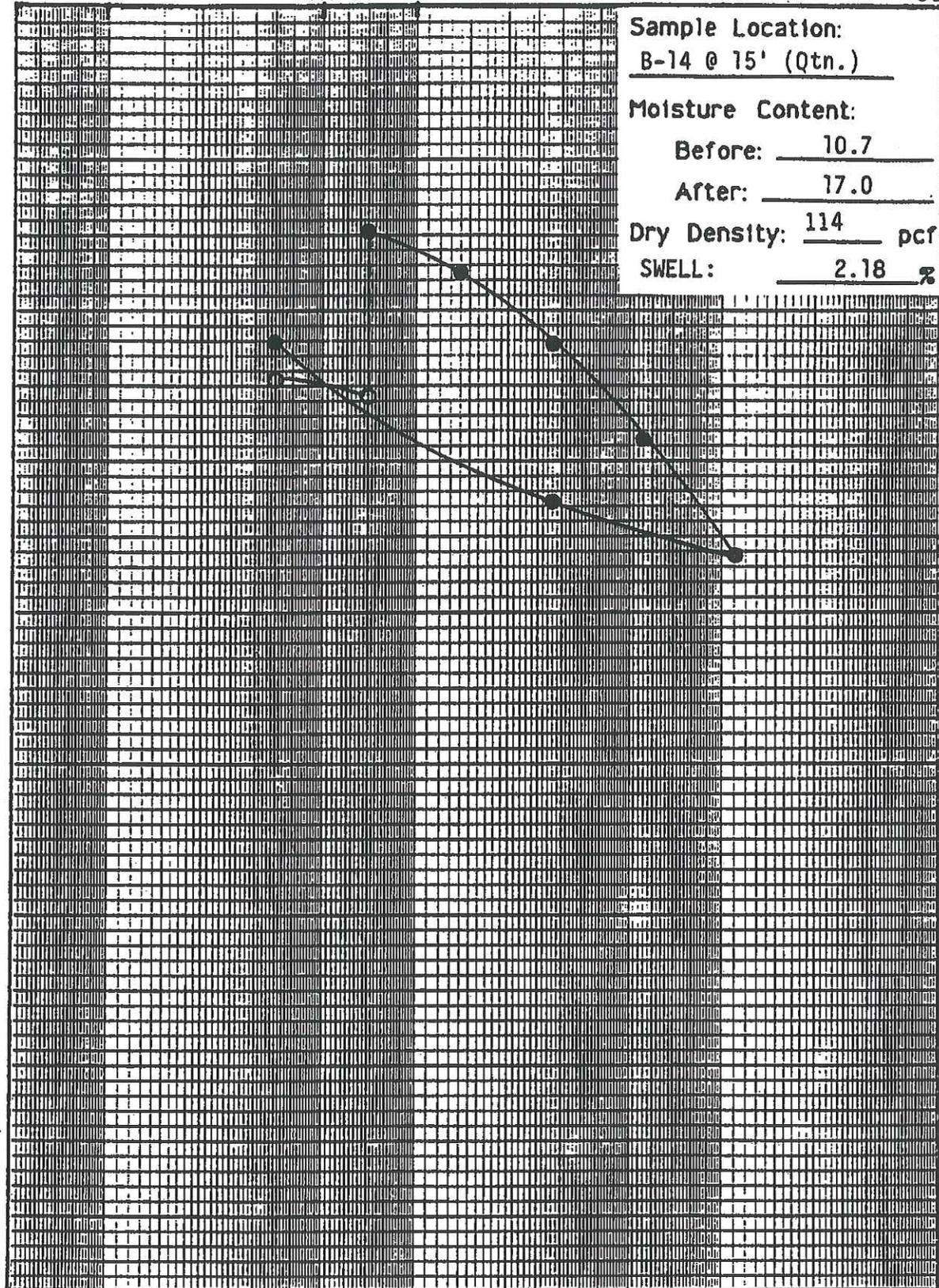
PRESSURE (kips per Square Foot)

0.05    0.1    0.5    1.0    5.0    10.0    50.0

Sample Location:  
B-14 @ 15' (Qtn.)  
 Moisture Content:  
 Before: 10.7  
 After: 17.0  
 Dry Density: 114 pcf  
 SWELL: 2.18 %

CONSOLIDATION (Percent of Sample Thickness)

-2  
0  
2  
4  
6  
8  
10



○ Indicates Sample at Field Moisture

● Indicates Sample After Saturation

CONSOLIDATION - PRESSURE CURVE

Project No. 3831025-04  
 Project Name EAI/RANCHO MALIBU MESA  
 Date 8/89 Figure No. D-12



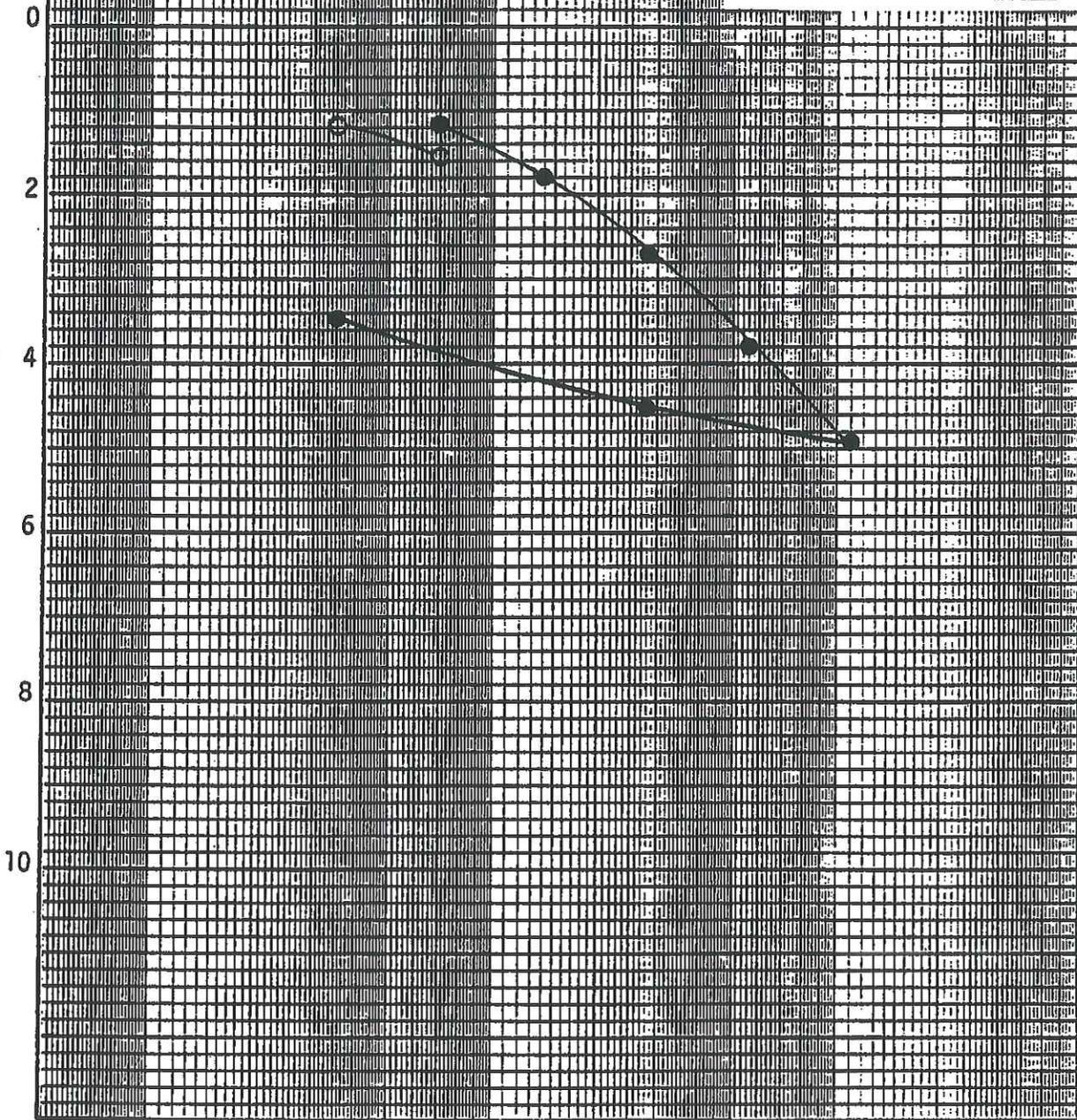
3010 188

**PRESSURE (kips per Square Foot)**

0.05    0.1    0.5    1.0    5.0    10.0    50.0

Sample Location:  
B-16 @ 20' (Qtn.)  
 Moisture Content:  
 Before: 10.9  
 After: 14.8  
 Dry Density: 114 pcf  
 SWELL: 0.37 %

**CONSOLIDATION (Percent of Sample Thickness)**



○ Indicates Sample at Field Moisture

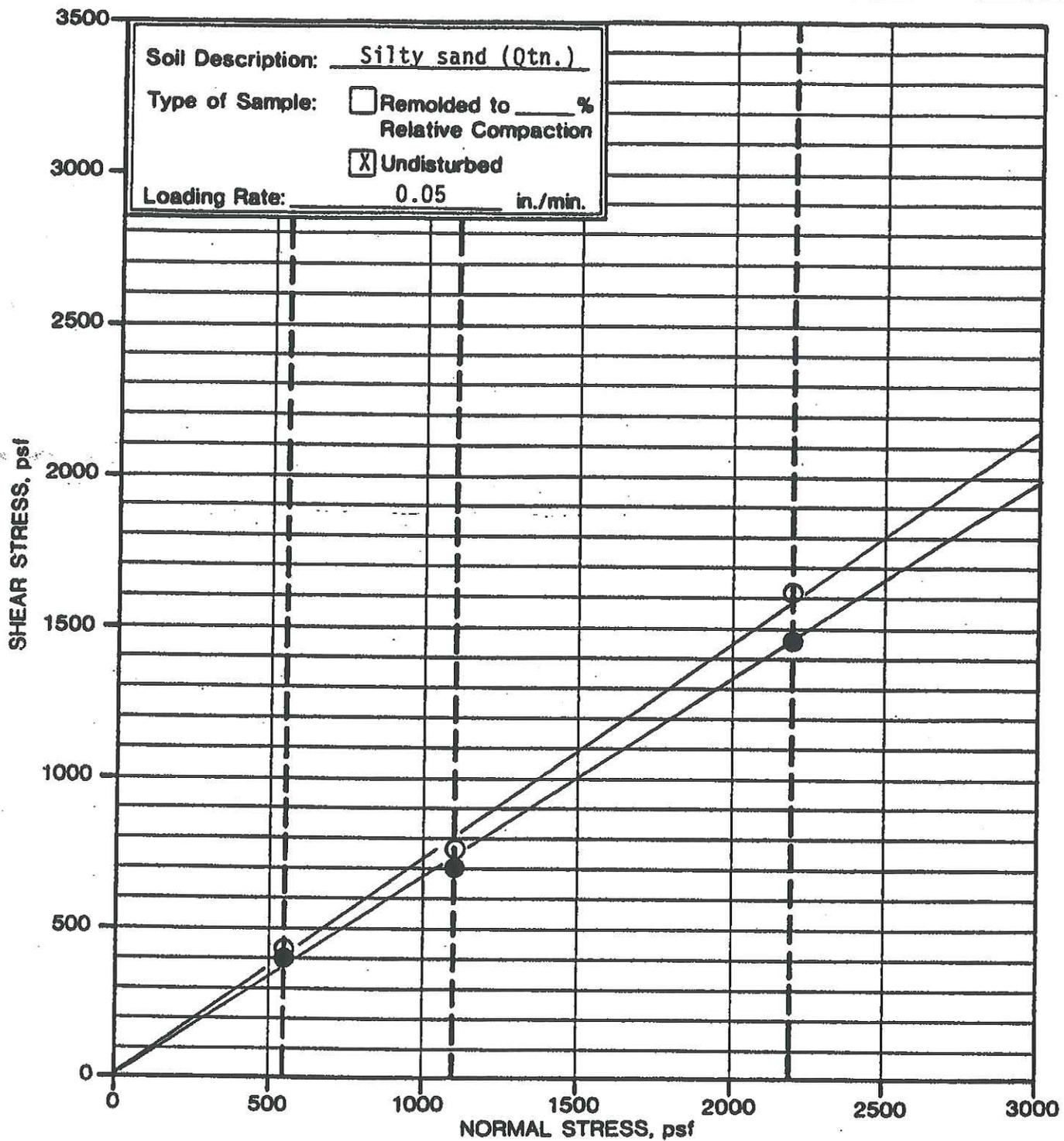
● Indicates Sample After Saturation

**CONSOLIDATION - PRESSURE CURVE**

Project No. 3831025-04  
 Project Name EAI/RANCHO MALIBU MESA  
 Date 8/89 Figure No. D-13



3010 188



Average  
Moisture Contents

Sample Location	Symbol	Before	After	Friction Angle	Cohesion	Remarks
B-8 @ 15'	○	6.7	15.8	36°	10 (psf)	PEAK
B-8 @ 15'	●	6.7	15.8	33.5°	10	ULTIMATE

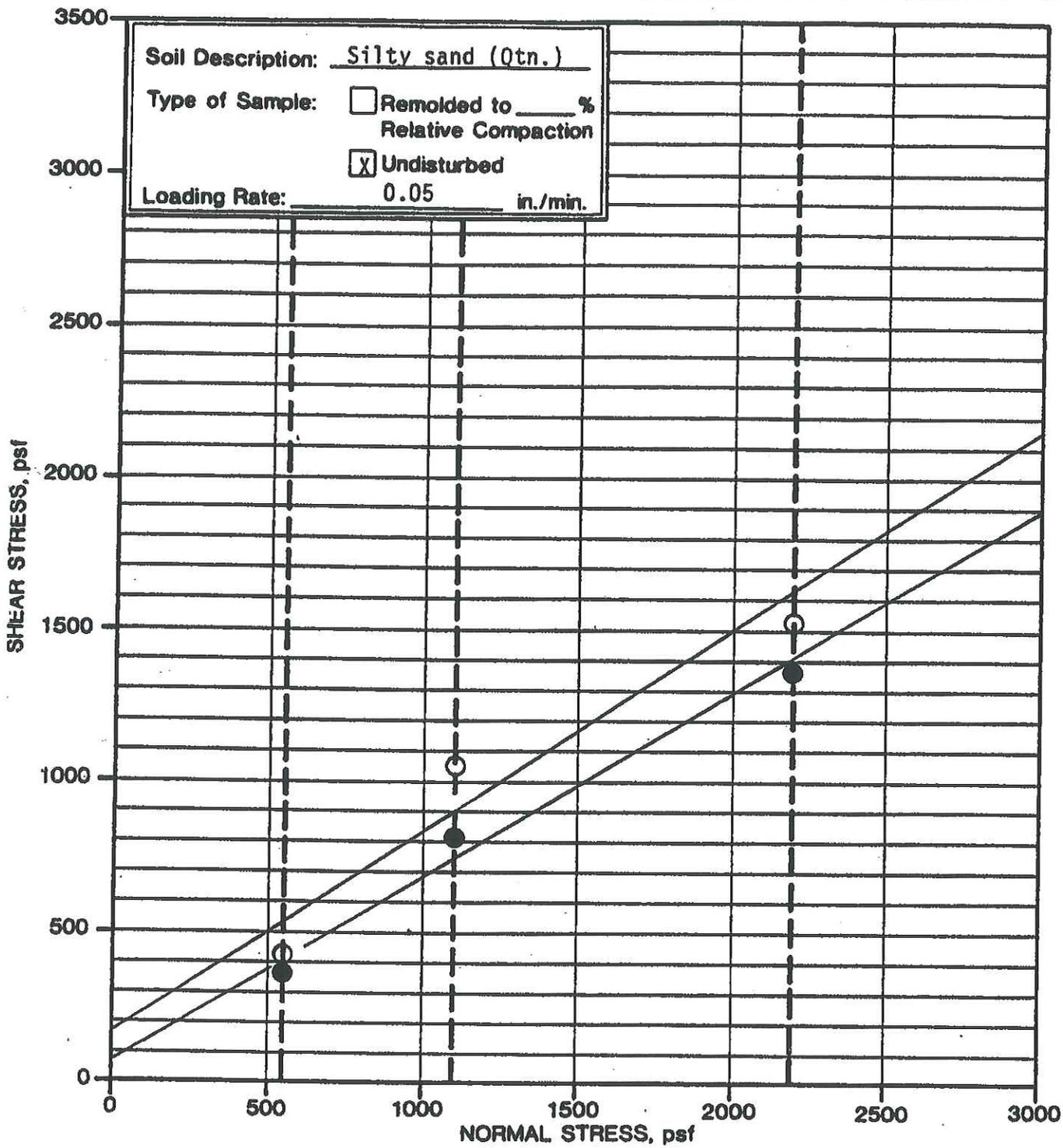
**DIRECT SHEAR TEST RESULTS**

Project No. 3831025-04

Project Name EAI/RANCHO MALIBU MESA

Date 8/89 Figure No. D-14





Sample Location	Symbol	Average Moisture Contents		Friction Angle	Cohesion	Remarks
		Before	After			
B-12 @ 10'	○	9.7	16.5	33°	165 (psf)	PEAK
B-12 @ 10'	●	9.7	16.5	31°	70	ULTIMATE

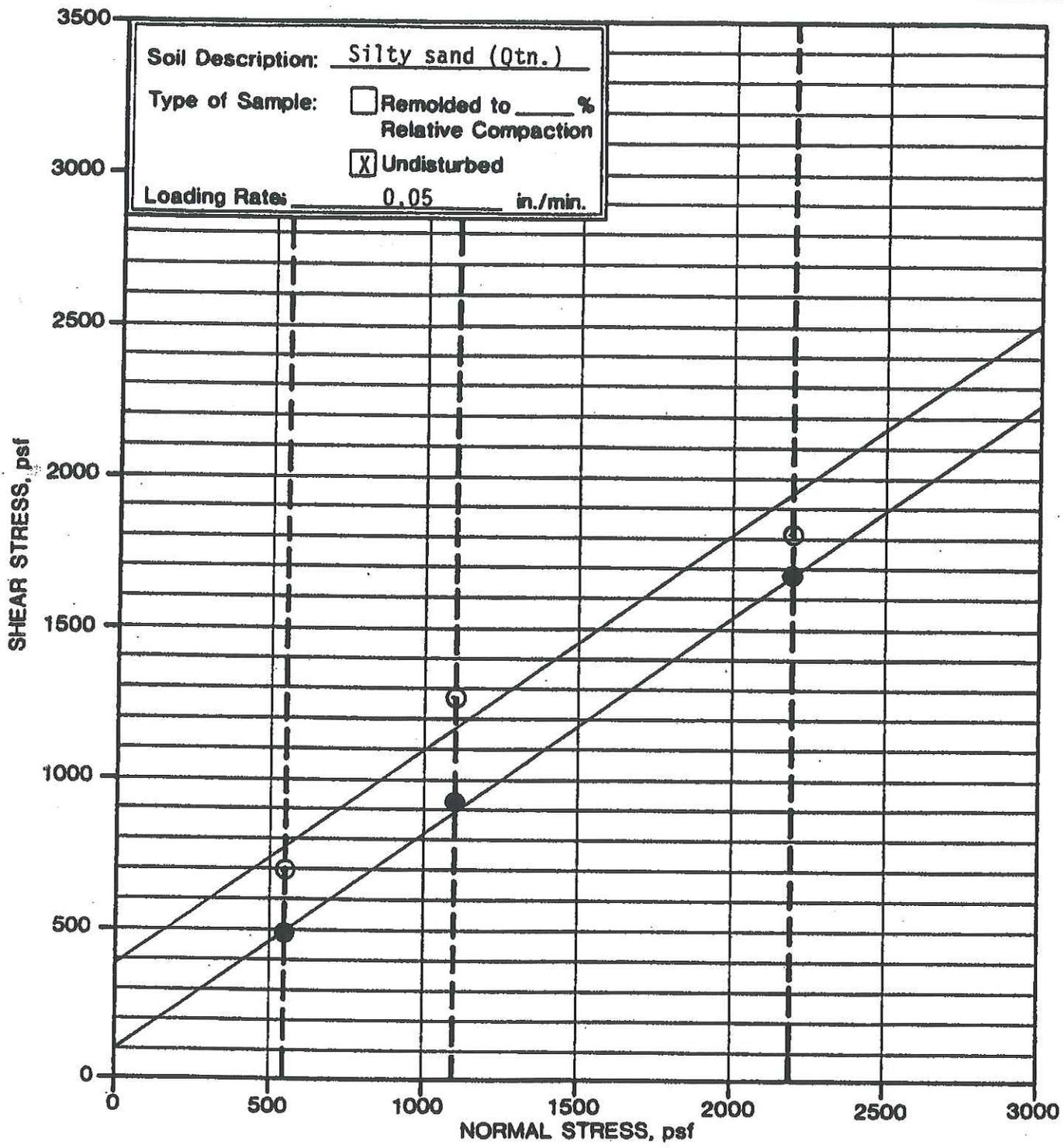
**DIRECT SHEAR TEST RESULTS**

Project No. 3831025-04

Project Name EAI/RANCHO MALIBU MESA

Date 8/89 Figure No. D-15

 3015 1088

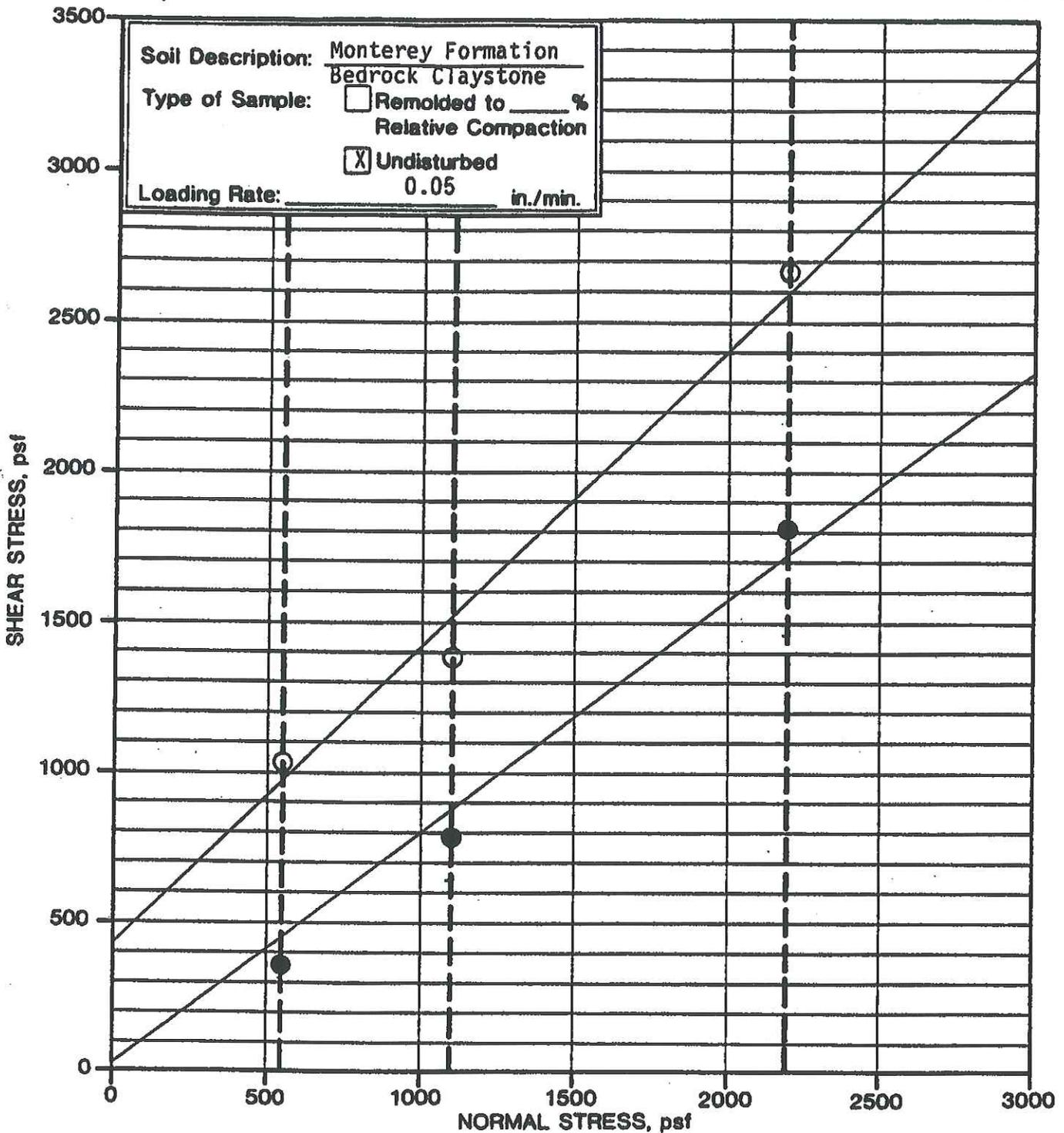


Sample Location	Symbol	Average Moisture Contents		Friction Angle	Cohesion	Remarks
		Before	After			
B-13 @ 20'	○	15.9	18.8	35°	390 (psf)	PEAK
B-13 @ 20'	●	15.9	18.8	35°	100	ULTIMATE

**DIRECT SHEAR TEST RESULTS**

Project No. 3831025-04  
 Project Name EAI/RANCHO MALIBU MESA  
 Date 8/89 Figure No. D-16





Sample Location	Symbol	Average Moisture Contents		Friction Angle	Cohesion	Remarks
		Before	After			
B-16 @ 47'	○	51.3	52.9	44°	440 (psf)	PEAK
B-16 @ 47'	●	51.3	52.9	37°	30	ULTIMATE

**DIRECT SHEAR TEST RESULTS**

Project No. 3831025-04  
 Project Name EAI/RANCHO MALIBU MESA  
 Date 8/89 Figure No. D-17



January 23, 2015  
W.O. 6489

**APPENDIX D**  
**BORING LOGS AND LABORATORY TEST RESULTS**  
**BY VAN BEVEREN AND BUTELO**

MDN 15710

# BORING 1

Date Drilled: June 27, 2007  
 Equipment Used: 24" Diameter Bucket

Depth to Water: Not Encountered  
 Driving Weight & Drop: 2,500 pounds (0 to 25 feet)  
1,000 pounds (> 25 feet)

Job No: 07-023    By: BL    Date: 7-19-2007    Checked: *[Signature]*    Printed: 9-27-07 [LOG FOR FIELD: 07-023.GPJ]

The log of subsurface conditions shown herein applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

ELEVATION (feet)	DEPTH (feet)	MOISTURE (% of dry wt.)	DRY DENSITY (pcf)	N VALUE (SPT)	BLOW COUNT (blows / 12-inches)	SAMPLE LOCATION
						SURFACE ELEVATION: 210 feet MSL*
						<b>TERRACE DEPOSITS</b>
						SM - SILTY SAND - fine, porous, brown
	3.6	105		5	☒	
	9.6	108		8	☒	trace clay, not porous, reddish brown
205	5					[40% Passing No. 200 Sieve]
	9.6	117		6	☒	trace fine gravel
	11.8	122		6	☒	
200	10					
	10.5	107		5	☒	
195	15					
	10.1	121		6	☒	
190	20					
	7.7	119		7	☒	trace cobble (up to 6" in size)
						yellowish brown
185	25					
	12.8	117		5	☒	reddish brown
180	30					
	1.9	101		9	☒	SP - SAND - fine, light yellowish brown
						[3 % Passing No. 200 Sieve]
175	35					
	3.7	112		23	☒	some gravel and cobbles (up to 10" in size)
170	40					END OF BORING AT 39 FEET.

(Continued on next page)

## LOG OF BORING



FIGURE A-2.1a

# BORING 1 (Continued)

Date Drilled: June 27, 2007  
 Equipment Used: 24" Diameter Bucket

Depth to Water: Not Encountered  
 Driving Weight & Drop: 2,500 pounds (0 to 25 feet)  
1,000 pounds (> 25 feet)

ELEVATION (feet)	DEPTH (feet)	MOISTURE (% of dry wt.)	DRY DENSITY (pcf)	N-VALUE (SPT)	BLOW COUNT (blows / 12-inches)	SAMPLE LOCATION
SURFACE ELEVATION: 210 feet MSL*						
Notes:						
1. Fill not encountered.						
2. Some caving from depths of 29 to 39 feet (up to 36 inches in diameter).						
3. Groundwater not encountered.						
4. Boring backfilled with soil cuttings and tamped.						
* Elevations refer to datum of reference survey; see Figure 2.						
165	45					
160	50					
155	55					
150	60					
145	65					
140	70					
135	75					
130	80					

Job No: 07-023 By: EL Date: 7-13-2007 Checked: *[Signature]* Printed: 9-27-07 LOG FOR FIELD: 07-023.GPJ

The log of subsurface conditions shown herein applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

## LOG OF BORING



FIGURE A-2.1b

# BORING 2

Date Drilled: June 27, 2007  
 Equipment Used: 24" Diameter Bucket

Depth to Water: Not Encountered  
 Driving Weight & Drop: 2,500 pounds (0 to 25 feet)  
 1,000 pounds (> 25 feet)

ELEVATION (feet)	DEPTH (feet)	MOISTURE (% of dry wt.)	DRY DENSITY (pcf)	N VALUE (SPT)	BLOW COUNT (blows / 12 inches)	SAMPLE LOCATION
SURFACE ELEVATION: 216 feet MSL*						
215	7.4	113	9	9	☒	TERRACE DEPOSITS SM - SILTY SAND - fine, few rootlets, slightly porous, reddish brown
	6.6	117	10	10	☒	trace clay
5						
210	4.6	97	9	9	☒	not porous
	7.2	106	8	8	☒	
10						
205	3.2	122	16	16	☒	few gravel
15						
200	7.5	101	7	7	☒	some mottling
20						
195	12.3	117	5	5	☒	
25						
190	7.2	114	5	5	☒	porous (up to 1/4 inch)
30						
185	5.2	101	11	11	☒	not porous
35						
180	7.9	117	8	8	☒	
40						

(Continued on next page)

## LOG OF BORING



FIGURE A-2.2a

Printed: 9-27-07 (LOG FOR FIELD; 07-023.GPJ)

Checked: *M*

Date: 7-19-2007

By: BL

Job No: 07-023

The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

# BORING 2

(Continued)

Date Drilled: June 27, 2007  
 Equipment Used: 24" Diameter Bucket

Depth to Water: Not Encountered  
 Driving Weight & Drop: 2,500 pounds (0 to 25 feet)  
1,000 pounds (> 25 feet)

ELEVATION (feet)	DEPTH (feet)	MOISTURE (% at 85% w.c.)	DRY DENSITY (pcf)	N VALUE (SPT)	BLOW COUNT (blows / 12-inches)	SAMPLE LOCATION
175	0.9	101	13			
170	45					
165	50					
160	55					
155	60					
150	65					
145	70					
140	75					
80						

SURFACE ELEVATION: 216 feet MSL\*

**END OF BORING AT 41 FEET.**

Notes:

1. Fill not encountered.
2. Some caving from depths of 39 to 41 feet (up to 38 inches in diameter).
3. Groundwater not encountered.
4. Boring backfilled with soil cuttings and tamped.

Job No: 07-023 By: BL Date: 7-15-2007 Checked: *VC* Printed: 9-27-07 [LOG FOR FIELD; 07-023.GPJ]

The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

## LOG OF BORING



FIGURE A-2.2b

# BORING 3

Date Drilled: June 28, 2007  
 Equipment Used: 24" Diameter Bucket

Depth to Water: Not Encountered  
 Driving Weight & Drop: 2,500 pounds (0 to 25 feet)  
 1,000 pounds (26 to 45 feet)  
 750 pounds (>45 feet)

ELEVATION (feet)	DEPTH (feet)	MOISTURE (% of dry wt.)	DRY DENSITY (pcf)	N VALUE (SPT)	BLOW COUNT (blows / 12-inches)	SAMPLE LOCATION	DESCRIPTION
SURFACE ELEVATION: 234 feet MSL*							
							FILL SM - SILTY SAND
							TERRACE DEPOSITS SM - SILTY SAND - fine, reddish brown
230	7.6	110		12	8		
5	4.8	111		8	8		trace clay
225	4.7	109		8	8		
10	6.8	106		10	8		
220	8.4	119		8	8		
15	11.1	102		8	8		porous
215	7.4	109		8	8		not porous
20	8.9	112		9	8		slightly porous
210	25	9.4	104	6	8		[28% Passing No. 200 Sieve]
205	30	10.5	111	6	8		not porous, few gravel [36% Passing No 200 Sieve]
200	35	9.8	104	8	8		
195	40						

Printed: 9-27-07 (LOG FOR FIELD; 07-023.GPJ)

Checked: *AL*

Date: 7-13-2007

By: BL

Job No: 07-023

The log of subsurface conditions shown herein applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

(Continued on next page)

## LOG OF BORING



FIGURE A-2.3a

# BORING 3 (Continued)

Date Drilled: June 26, 2007  
 Equipment Used: 24" Diameter Bucket

Depth to Water: Not Encountered  
 Driving Weight & Drop: 2,500 pounds (0 to 25 feet)  
1,000 pounds (26 to 45 feet)  
750 pounds (>45 feet)

ELEVATION (feet)	DEPTH (feet)	MOISTURE (% of Dry Wt.)	DRY DENSITY (pcf)	N VALUE (SPT)	BLOW COUNT (blows / 12 inches)	SAMPLE LOCATION
190	12.7	119		6	6	SURFACE ELEVATION: 234 feet MSL* 
185	45			6	6	
180	50			23	23	SP-SM - SAND - fine, some silt, light yellowish brown
175	55					END OF BORING AT 61 FEET. -Notes: 1. Fill encountered to depth of 8". 2. No caving. 3. Groundwater not encountered. 4. Boring backfilled with soil cutting and tamped.
170	60					
165	65					
160	70					
155	75					
150	80					

Job No: 07-023

By: BL

Date: 7-13-2007

Checked:

Printed: 9-27-07 LOG FOR FIELD: 07-023.GPJ

The log of subsurface conditions shown herein applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

## LOG OF BORING



FIGURE A-2.3b

# BORING 4

Date Drilled: June 26, 2007  
 Equipment Used: 24" Diameter Bucket

Depth to Water: Not Encountered  
 Driving Weight & Drop: 2,500 pounds (0 to 25 feet)  
1,000 pounds (> 25 feet)

Printed: 9-27-07 [LOG FOR FIELD: 07-023.GPJ]

Checked: ML

Date: 7-13-2007

By: BL

Job No: 07-023

The log of subsurface conditions shown hereon applies only at the specific boring location and at the data indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

ELEVATION (feet)	DEPTH (feet)	MOISTURE (% of dry wt.)	DRY DENSITY (pcf)	N VALUE (SP <sup>2</sup> )	BLOW COUNT (blows / 2-inches)	SAMPLE LOCATION	SURFACE ELEVATION: 215 feet MSL*
							<b>TERRACE DEPOSITS</b> SM - SILTY SAND - fine, light greyish brown
	7.5	111		7	☒		reddish brown
210	5	3.5	89		☒		some subrounded cobbles to 4" in diameter
	5.8	119		8	☒		Increased gravel up to 3/4" in diameter, slightly darker reddish brown
205	10	4.4	122		☒		Clayey sand layer 4" thick horizontal
200	15	10.3	115		☒		Wet and clayey in 2 foot thick zone
							yellowish to reddish brown
195	20				☒		layer of sandy gravel from 20 to 22 feet
190	25	10.7	109		☒		8" diameter cobbles
185	30	13.1	122		☒		trace clay, color orange to dark yellow brown
							[core bucket used from 32 to 39 feet]
180	35	17.4	111		☒		
175	40						END OF BORING AT 39 FEET.

(Continued on next page)

## LOG OF BORING



FIGURE A-2.4a

# BORING 4 (Continued)

Date Drilled: June 28, 2007  
 Equipment Used: 24" Diameter Bucket

Depth to Water: Not Encountered  
 Driving Weight & Drop: 2,500 pounds (0 to 25 feet)  
1,000 pounds (> 25 feet)

ELEVATION (feet)	DEPTH (feet)	MOISTURE (% of dry wt)	DRY DENSITY (pcf)	N VALUE (SPT)	BLOW COUNT (blows / 12-inches)	SAMPLE LOCATION
SURFACE ELEVATION: 215 feet MSL*						
170	45					
165	50					
160	55					
155	60					
150	65					
145	70					
140	75					
135	80					

**Notes:**

1. Fill not encountered.
2. No caving.
3. Groundwater not encountered.
4. Boring backfilled with soil cuttings and tamped.

Printed: 9-27-07 LOG FOR FIELD: 07-023.GPJ

Checked:

Date: 7-13-2007

By: BL

Job No: 07-023

The log of subsurface conditions shown herein applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

## LOG OF BORING



FIGURE A-2.4b

# BORING 5

Date Drilled: June 29, 2007  
 Equipment Used: 24" Diameter Bucket

Depth to Water: Not Encountered  
 Driving Weight & Drop: 2,500 pounds (0 to 25 feet)  
1,000 pounds (> 25 feet)

ELEVATION (feet)	DEPTH (feet)	MOISTURE (% of dry wt.)	DRY DENSITY (pcf)	N VALUE (SPT)	BLOW COUNT (blows / 12-inches)	SAMPLE LOCATION
SURFACE ELEVATION: 246 feet MSL*						
245						<b>TERRACE DEPOSITS</b> SM - SILTY SAND - fine, some gravel (up to 1/2" in size), reddish brown
	7.1	99		5		
5						
240	7.4	116		7		
	8.7	111		6		few gravel, trace clay, porous
10						
235	9.3	107		8		not porous
	11.2	124		7		
15						
230	10.0	124		7		some gravel
20						
225	7.5	109		4		
25						
220	6.4	106		5		
30						
215	7.2	104		6		
<b>END OF BORING AT 31 FEET.</b>						
<b>Notes:</b>						
1. Fill not encountered.						
2. No caving.						
3. Groundwater not encountered.						
4. Boring backfilled with soil cutting and tamped.						
35						
210						
40						

Printed: 9-27-07 [LOG FOR FIELD: 07-023.GPJ]

Checked: UAC

Date: 7-13-2007

By: BL

Job No: 07-023

The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

## LOG OF BORING



FIGURE A-2.5

# BORING 6

Date Drilled: July 2, 2007  
 Equipment Used: 24" Diameter Bucket

Depth to Water: Not Encountered  
 Driving Weight & Drop: 2,500 pounds (0 to 25 feet)  
1,000 pounds (26 to 45 feet)  
750 pounds (>45 feet)

Job No: 07-023    By: BL    Date: 7-13-2007    Checked: *AL*    Printed: 9-27-07 [LOG FOR FIELD: 07-023.GPJ]

The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

ELEVATION (feet)	DEPTH (feet)	MOISTURE (% of dry wt.)	DRY DENSITY (pcf)	N VALUE (SPT)	BLOW COUNT (above 12 inches)	SAMPLE LOCATION	DESCRIPTION
SURFACE ELEVATION: 252 feet MSL*							
250							<b>TERRACE DEPOSITS</b> SM - SILTY SAND - fine, some gravel (up to 1/2" in size), reddish brown, 14" topsoil, porous in upper 14", rootlets
	6.2	121		7			gravel to 3/4"
5	7.2	113		11			
245							some gravel (up to 1" diameter)
	9.0	116		9			[27% Passing No. 200 Sieve]
10	8.8	112		6			porous, some clay
240							
15	11.4	108		8			CL - SANDY CLAY - reddish brown, manganese stained
235							cobbles to 4 1/2" diameter, subangular to subrounded, rootlets
20	5.6	117		5			SM - SILTY SAND - some clay, yellow brown to red brown
230							
25	4.8	119		9			
225							
30	13.9	107		12			SC - CLAYEY SAND - fine, reddish brown
220							
35	2.1	106		21			SM - SILTY SAND - fine, some gravel (up to 3" in size), reddish brown
215							
40							

(Continued on next page)

## LOG OF BORING



FIGURE A-2.6a

# BORING 6 (Continued)

Date Drilled: July 2, 2007  
 Equipment Used: 24" Diameter Bucket

Depth to Water: Not Encountered  
 Driving Weight & Drop: 2,500 pounds (0 to 25 feet)  
1,000 pounds (26 to 45 feet)  
750 pounds (>45 feet)

Printed: 9-27-07 LOG FOR FIELD: 07-023.GPJ

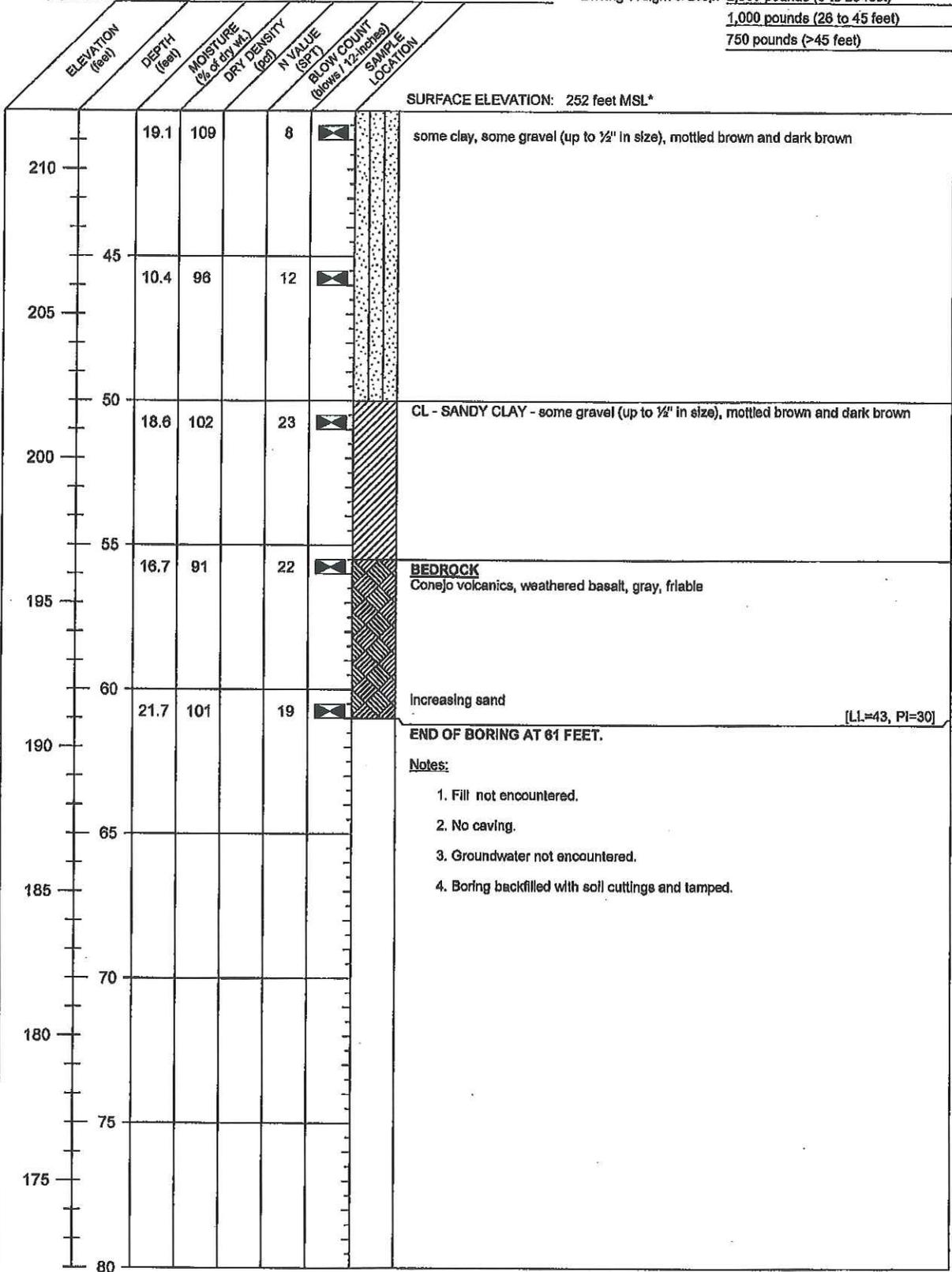
Checked: *VM*

Date: 7-13-2007

By: BL

Job No: 07-023

The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.



## LOG OF BORING



FIGURE A-2.6b

# BORING 7

Date Drilled: July 2, 2007  
 Equipment Used: 24" Diameter Bucket

Depth to Water: Not Encountered  
 Driving Weight & Drop: 2,500 pounds (0 to 25 feet)  
1,000 pounds (26 to 45 feet)  
750 pounds (>45 feet)

Job No: 07-023 By: BL Date: 7-13-2007 Checked: UA Printed: 9-27-07 [LOG FOR FIELD: 07-023.GPJ]

This log of subsurface conditions shown herein applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

ELEVATION (feet)	DEPTH (feet)	MOISTURE (% of dry wt.)	DRY DENSITY (pcf)	N VALUE (SPT)	BLOW COUNT (blows / 12-inches)	SAMPLE LOCATION	DESCRIPTION
SURFACE ELEVATION: 231 feet MSL*							
230							<b>FILL</b> SM - SILTY SAND - fine, abundant gravel and cobbles, greyish brown
							<b>TERRACE DEPOSITS</b> SM - SILTY SAND - fine, reddish brown
	7.3	121		10			
5	8.6	109		5			some gravel (up to 1½" in size), slightly porous
225							
	3.8	104		6			not porous
10	5.2	101		7			some gravel (up to ½" in size)
220							
15	5.0	103		5			porous
215							
20	5.7	112		7			
210							
25	4.8	103		7			
205							
30	5.2	113		13			not porous
200							
35	10.1	103		10			
195							
40							

(Continued on next page)

## LOG OF BORING



FIGURE A-2.7a

# BORING 7 (Continued)

Date Drilled: July 2, 2007  
 Equipment Used: 24" Diameter Bucket

Depth to Water: Not Encountered  
 Driving Weight & Drop: 2,500 pounds (0 to 25 feet)  
1,000 pounds (26 to 45 feet)  
750 pounds (>45 feet)

ELEVATION (feet)	DEPTH (feet)	MOISTURE (% of dry wt.)	DRY DENSITY (pcf)	N VALUE (SPT)	BLOW COUNT (blows / 12-inches)	SAMPLE LOCATION	SURFACE ELEVATION: 231 feet MSL*
190	4.2	116		11	▶	▶	some gravel (up to 1" in size)
185	6.4	104		13	▶	▶	trace clay
180	2.8	103		21	▶	▶	
175	7.0	96		26	▶	▶	porous
170	5.6	102		16	▶	▶	END OF BORING AT 61 FEET.
165							
160							
155							
80							

- Notes:**
1. Fill soils encountered to a depth of 1 foot.
  2. No caving.
  3. Groundwater not encountered.
  4. Boring backfilled with soil cutting and tamped.

Job No: 07-023    By: BL    Date: 7-13-2007    Checked:    Printed: 9-27-07 [LOG FOR FIELD: 07-023.GPJ]

The log of subsurface conditions shown hereon applies only at the specific boring location and at the data indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

## LOG OF BORING



FIGURE A-2.7b

# BORING 8

Date Drilled: July 6, 2007  
 Equipment Used: 24" Diameter Bucket

Depth to Water: Not Encountered  
 Driving Weight & Drop: 2,500 pounds (0 to 25 feet)  
1,000 pounds (28 to 45 feet)  
750 pounds (>45 feet)

ELEVATION (feet)	DEPTH (feet)	MOISTURE (% of dry wt.)	DRY DENSITY (pcf)	N VALUE (SP)	BLOW COUNT (blows / 12-inches)	SAMPLE LOCATION	DESCRIPTION
SURFACE ELEVATION: 184 feet MSL*							
<b>TERRACE DEPOSITS</b>							
SM - SILTY SAND - fine, some cobbles (up to 6" in size), reddish brown							
180	8.8	114	5	5	5		
5	7.6	108	5	5	5		no cobbles, some gravel (up to 1/4" in size)
175	13.0	122	7	7	7		slightly porous
10	3.9	115	8	8	8		not porous
170	15	5.2	108	6	6		some gravel (up to 1" in size)
165	20	6.9	109	9	9		slightly porous
160	25	4.2	114	11	11		not porous
155	30	3.6	118	15	15		
150	35	4.3	105	11	11		some gravel (up to 1/2" in size)
145	40						

(Continued on next page)

## LOG OF BORING

Printed: 9-27-07 LOG FOR FIELD: 07-023.GPJ

Checked: *[Signature]*

Date: 7-13-2007

By: BL

Job No: 07-023

The log of subsurface conditions shown herein applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.



FIGURE A-2.8a

# BORING 8 (Continued)

Date Drilled: July 6, 2007  
 Equipment Used: 24" Diameter Bucket

Depth to Water: Not Encountered  
 Driving Weight & Drop: 2,500 pounds (0 to 25 feet)  
1,000 pounds (26 to 45 feet)  
750 pounds (>45 feet)

ELEVATION (feet)	DEPTH (feet)	MOISTURE (% of dry wt.)	DRY DENSITY (pcf)	N VALUE (SPT)	BLOW COUNT (blows / 12-inches)	SAMPLE LOCATION
SURFACE ELEVATION: 184 feet MSL*						
140	3.2	107		10		
135						
130						
125						
120						
115						
110						
105						
80						

END OF BORING AT 42 FEET.

Notes:

1. Fill not encountered.
2. Some caving at 41 to 42 feet.
3. Groundwater not encountered.
4. Boring backfilled with soil cutting and tamped.

Printed: 9-27-07 [LOG FOR FIELD: 07-023.GPJ]

Checked: *M*

Date: 7-13-2007

By: BL

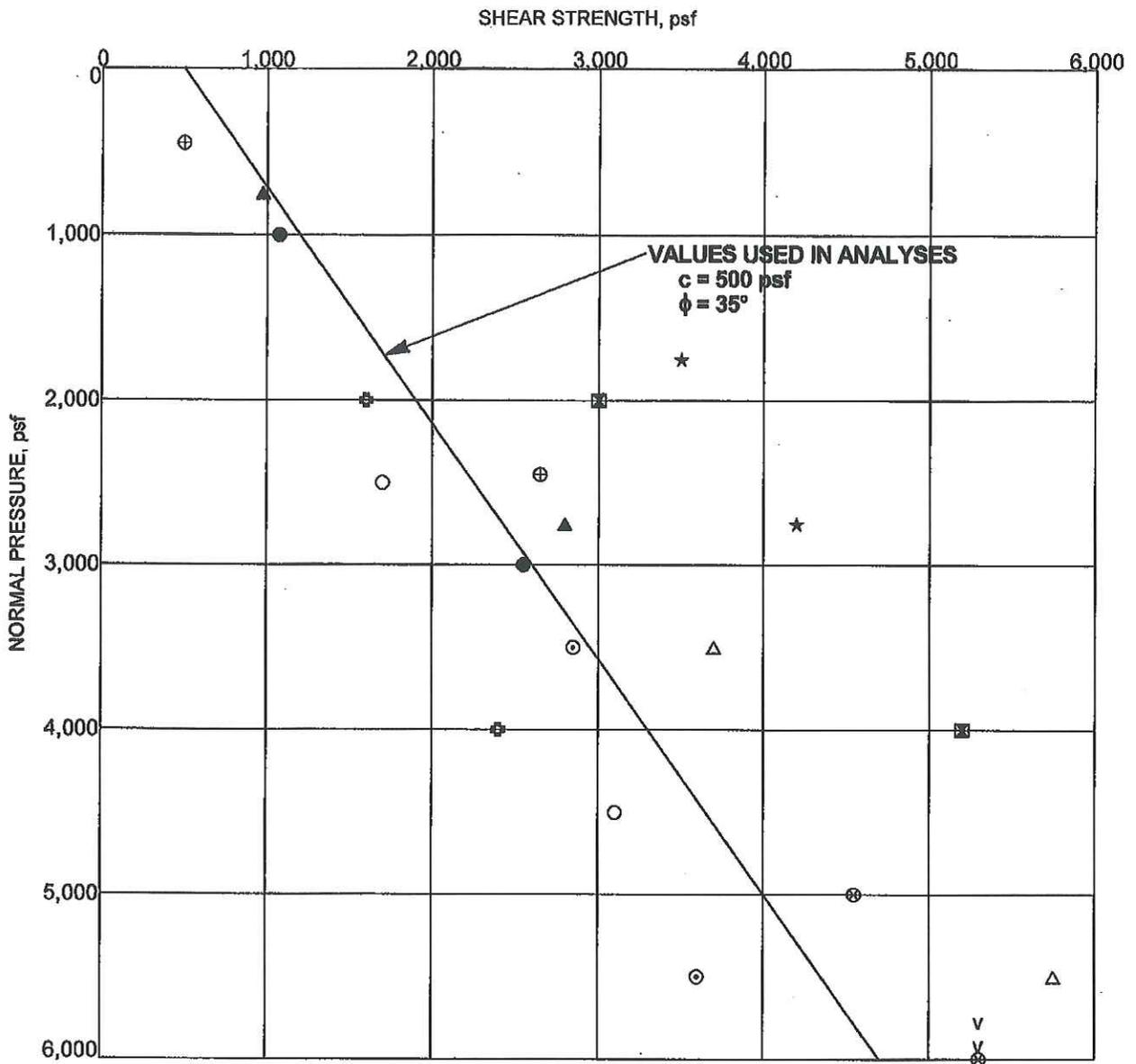
Job No: 07-023

The log of subsurface conditions shown herein applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

## LOG OF BORING



FIGURE A-2.8b



NOTE: "v" indicates sample was soaked to near saturation prior to testing.

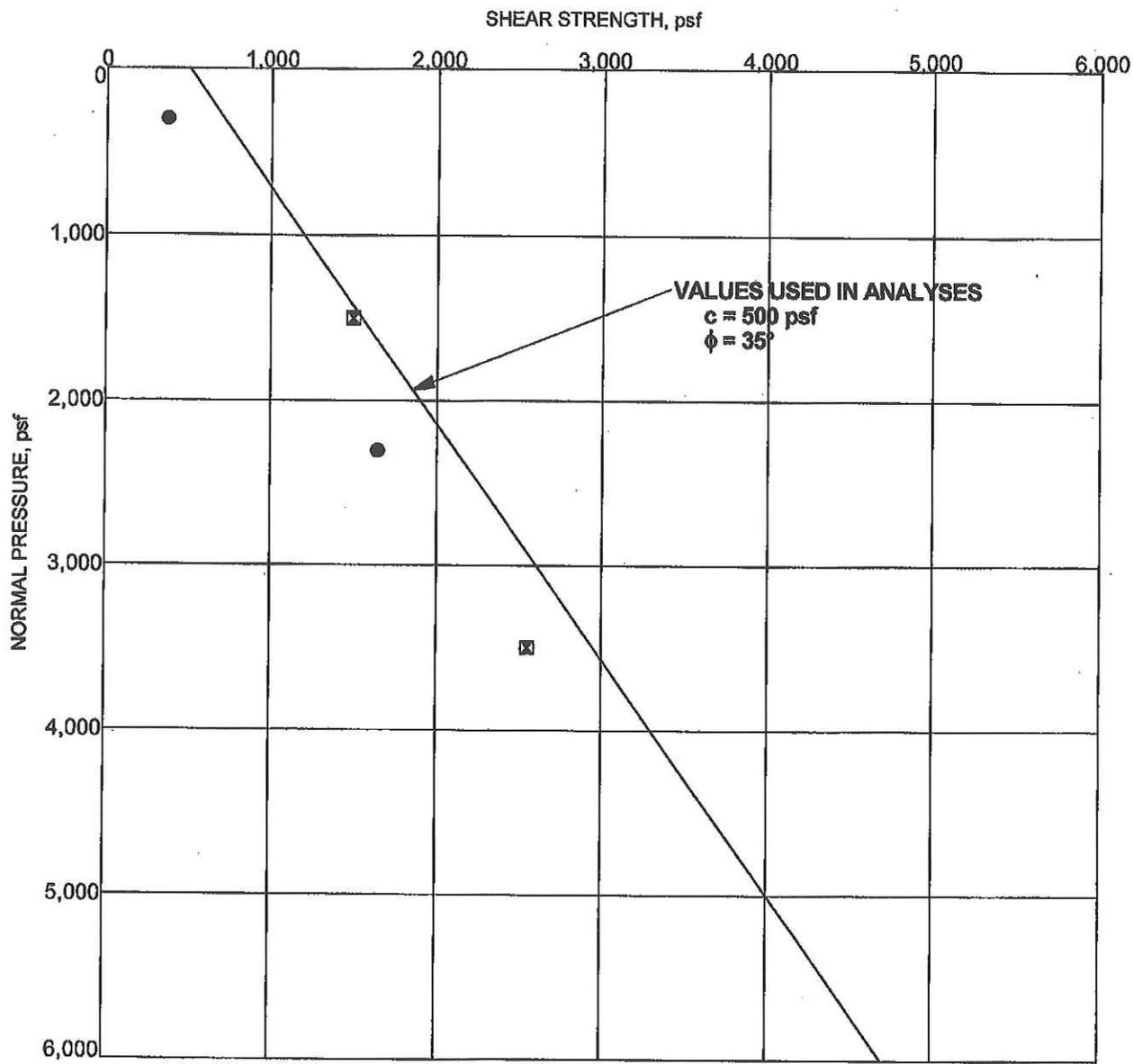
Specimen Identification	Classification	c	$\phi$	
● Boring 1 at 10.5 feet	SILTY SAND	338	36	*
⊠ Boring 1 at 20.5 feet	SILTY SAND	800	48	
▲ Boring 3 at 7.5 feet	SILTY SAND	291	42	*
★ Boring 3 at 17.5 feet	SILTY SAND	2275	35	
⊙ Boring 4 at 35.5 feet	SILTY SAND	1538	21	*
⊕ Boring 5 at 20.5 feet	SILTY SAND	800	22	*
○ Boring 5 at 30.5 feet	SILTY SAND	-50	35	*
△ Boring 6 at 40.5 feet	SANDY SILT	113	46	*
⊗ Boring 6 at 60.5 feet	WEATHERED BASALT	2675	21	*
⊕ Boring 7 at 4.5 feet	SILTY SAND	16	47	*

**DIRECT SHEAR TEST DATA**  
**UNDISTURBED SAMPLES, PEAK STRENGTH**



FIGURE A-4.1a

DIRECT SHEAR 6-10 07-023.GPJ VB B.GDT 9/28/07



NOTE: "☒" indicates sample was soaked to near saturation prior to testing.

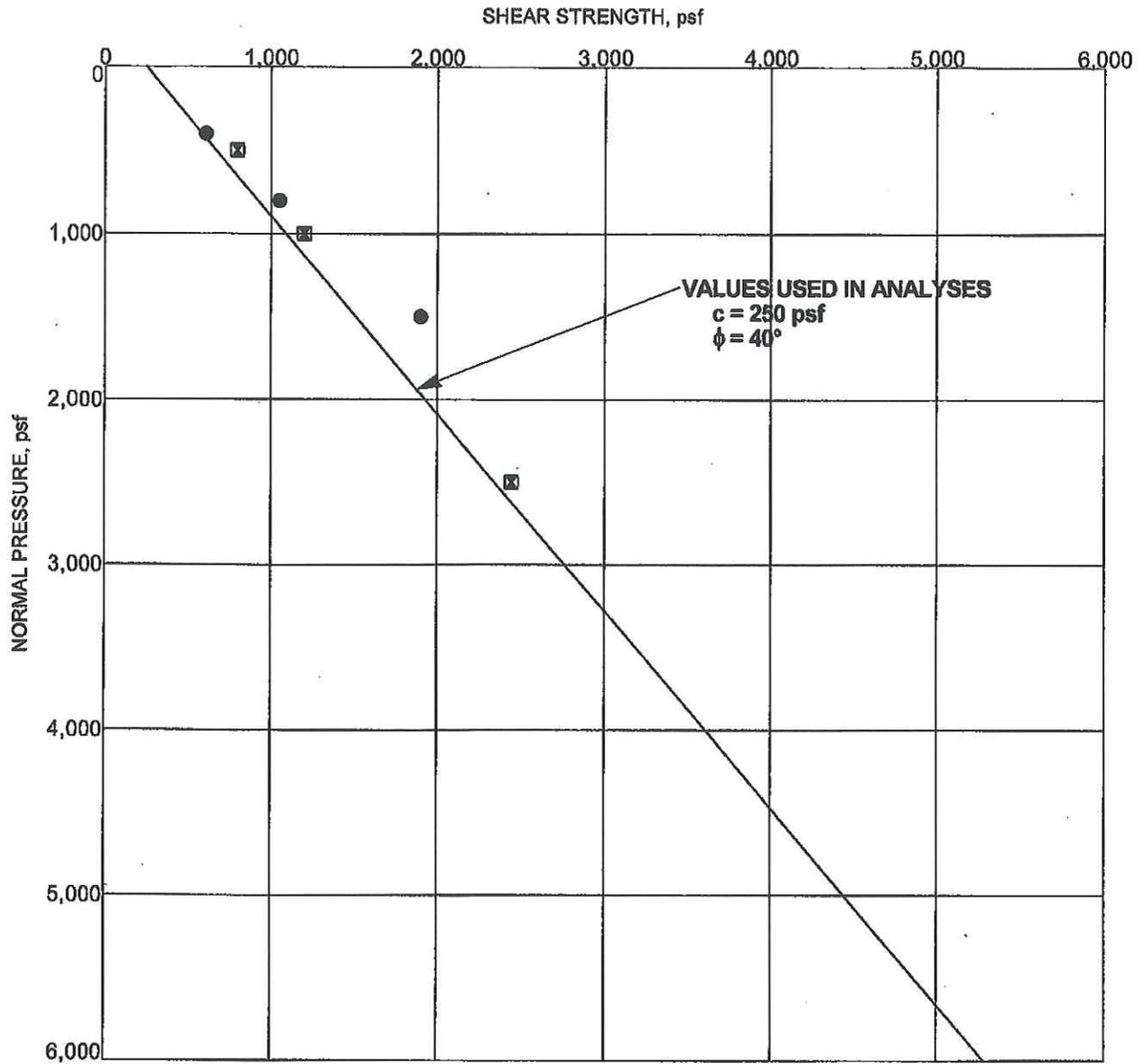
Specimen Identification		Classification	c	$\phi$
●	Boring 8 at 2.5 feet	SILTY SAND	178	33
☒	Boring 8 at 15.5 feet	SILTY SAND	713	28

**DIRECT SHEAR TEST DATA  
 UNDISTURBED SAMPLES, PEAK STRENGTH**



FIGURE A-4.1b

DIRECT SHEAR 6 10 07-023.GPJ VS B.GDT 9/28/07



NOTE: "\*" indicates sample was soaked to near saturation prior to testing.

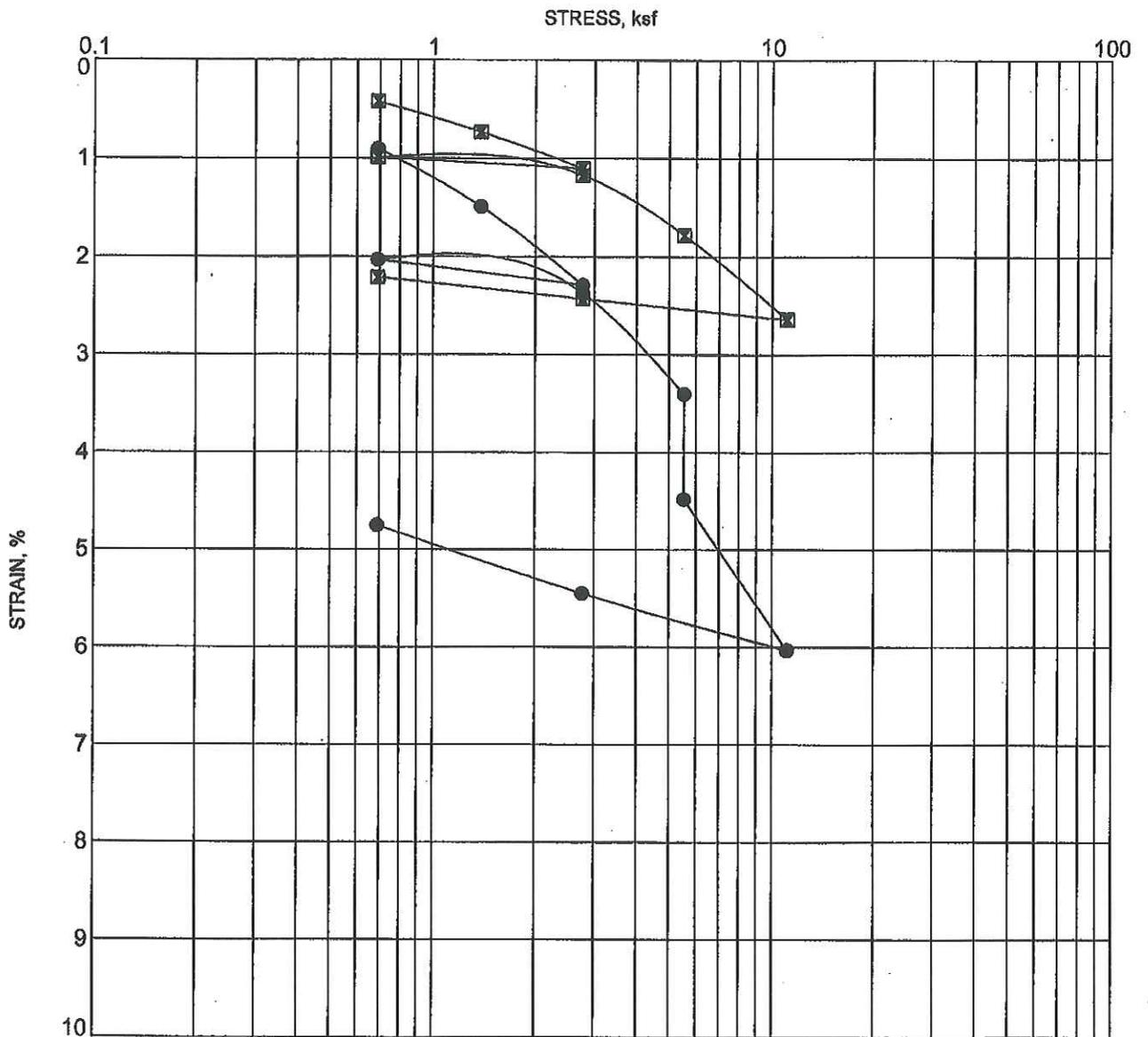
Specimen Identification	Classification	c	φ	
● Boring 1 at 4 to 7 feet	SILTY SAND	127	50	*
☒ Boring 5 at 13 to 15 feet	SILTY SAND	381	40	*

**DIRECT SHEAR TEST DATA**  
**REMOVED SAMPLES (90%), PEAK STRENGTH**



FIGURE A-4.2

DIRECT\_SHEAR\_6\_10\_07-023.GP1\_VB\_B.GDT\_9/27/07



NOTE: Samples tested at field moisture content

Specimen Identification		Classification
●	Boring 1 at 10.5 feet	SILTY SAND
■	Boring 1 at 25.5 feet	SILTY SAND

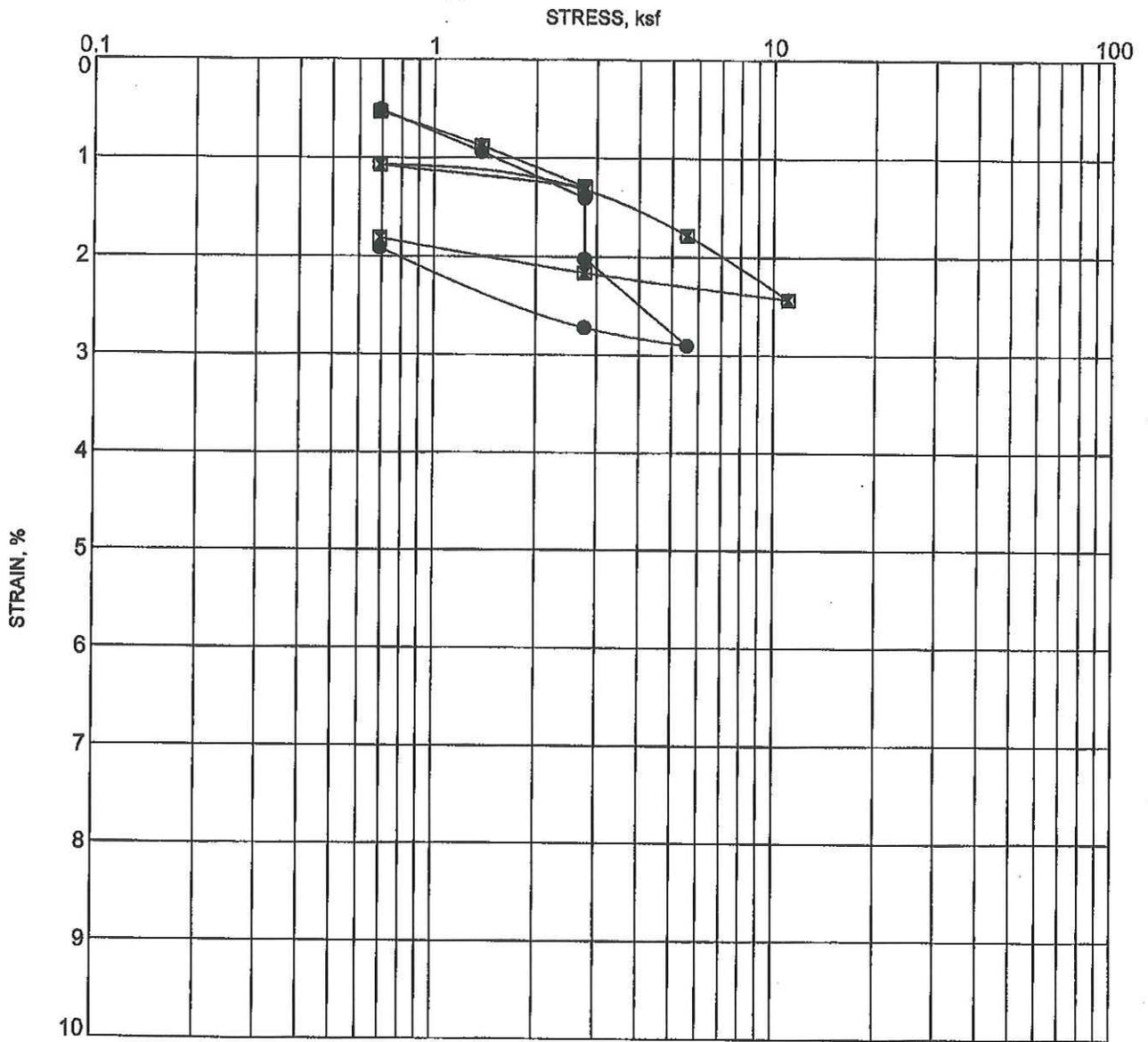
\* 5.54 ksf

**CONSOLIDATION TEST DATA**

CONSOL:10 07-023.GPJ VB B.GDT 9/27/07



FIGURE A-5.1



NOTE: Samples tested at field moisture content

Specimen Identification	Classification
● Boring 2 at 3.5 feet	SILTY SAND
☒ Boring 3 at 17.5 feet	SILTY SAND

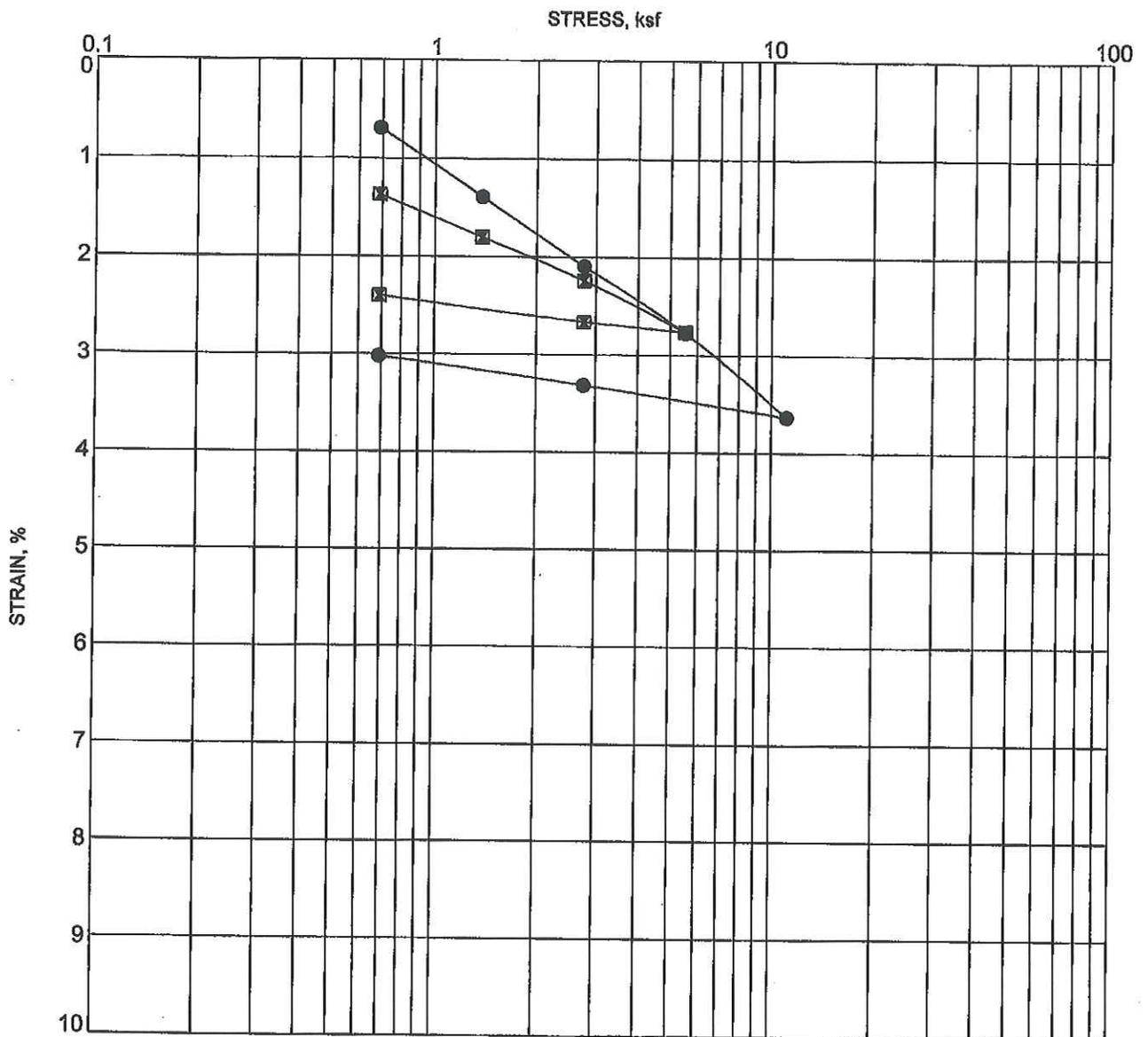
\* 2.77 ksf

**CONSOLIDATION TEST DATA**

CONSOL10 07-023.GPJ VB 8.GDT 9/27/07



FIGURE A-5.2



NOTE: Samples tested at field moisture content

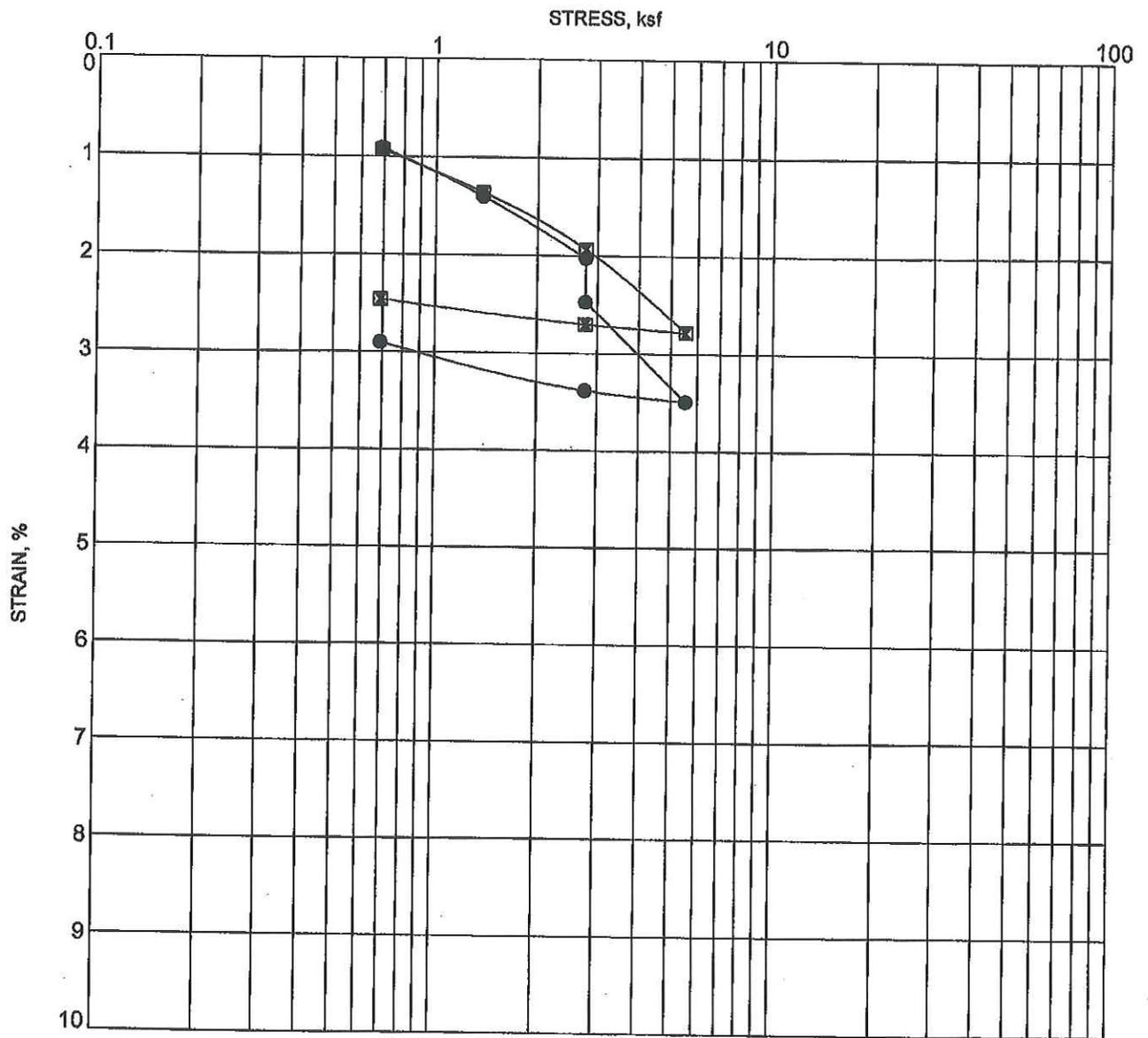
Specimen Identification	Classification
● Boring 3 at 30,5 feet	SILTY SAND
■ Boring 4 at 2.5 feet	SILTY SAND

**CONSOLIDATION TEST DATA**

CONSOL.10 07-023.EPJ VB 8.GDT 9/27/07



FIGURE A-5.3



NOTE: Samples tested at field moisture content

Specimen Identification	Classification
● Boring 1 at 4 to 7 feet	SILTY SAND
■ Boring 3 at 2 to 4 feet	SILTY SAND

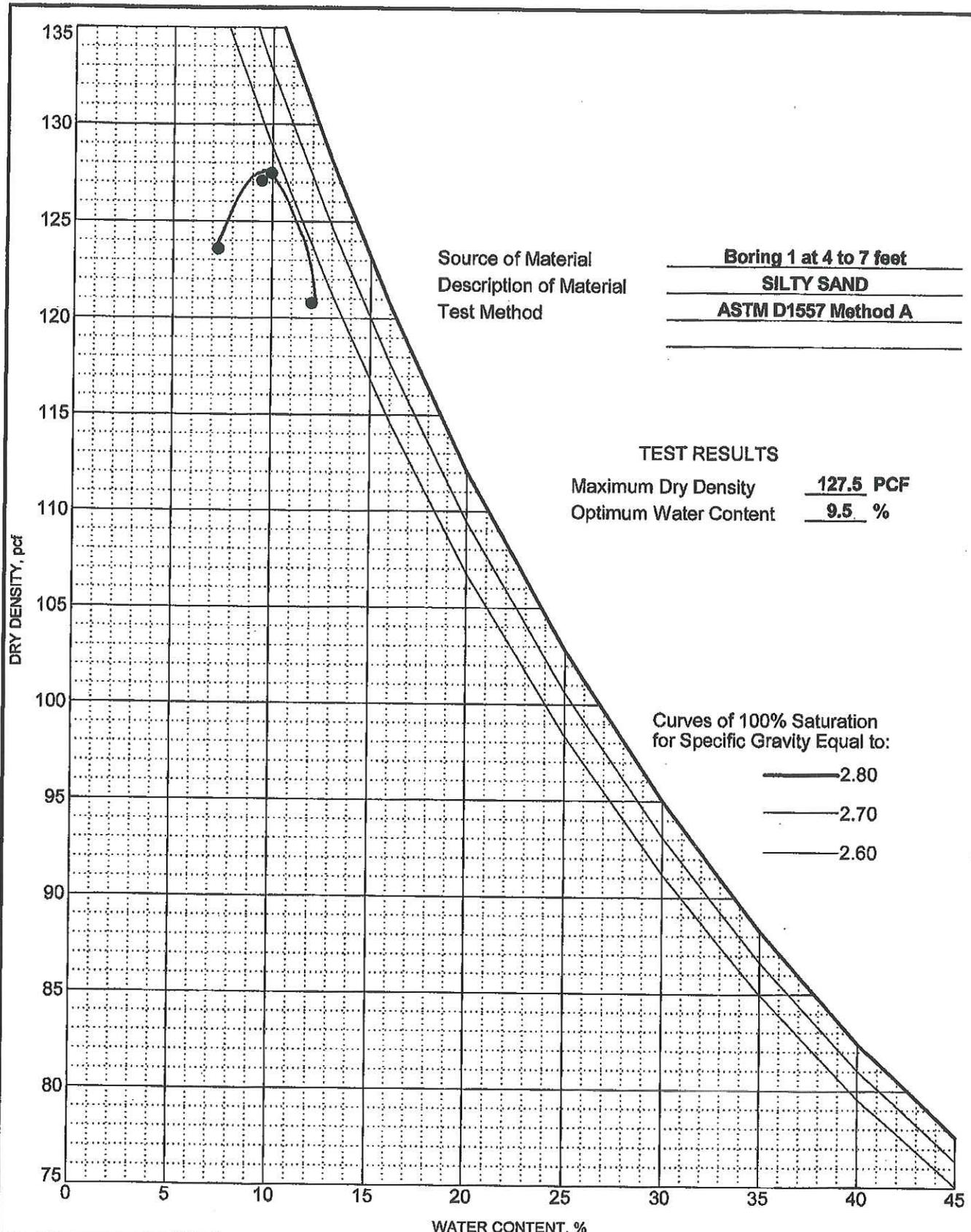
\* 2.77 ksf

**CONSOLIDATION TEST DATA**

CONSOL-10 07-023.GPJ VB 8.GDT 9/27/07



FIGURE A-5.4

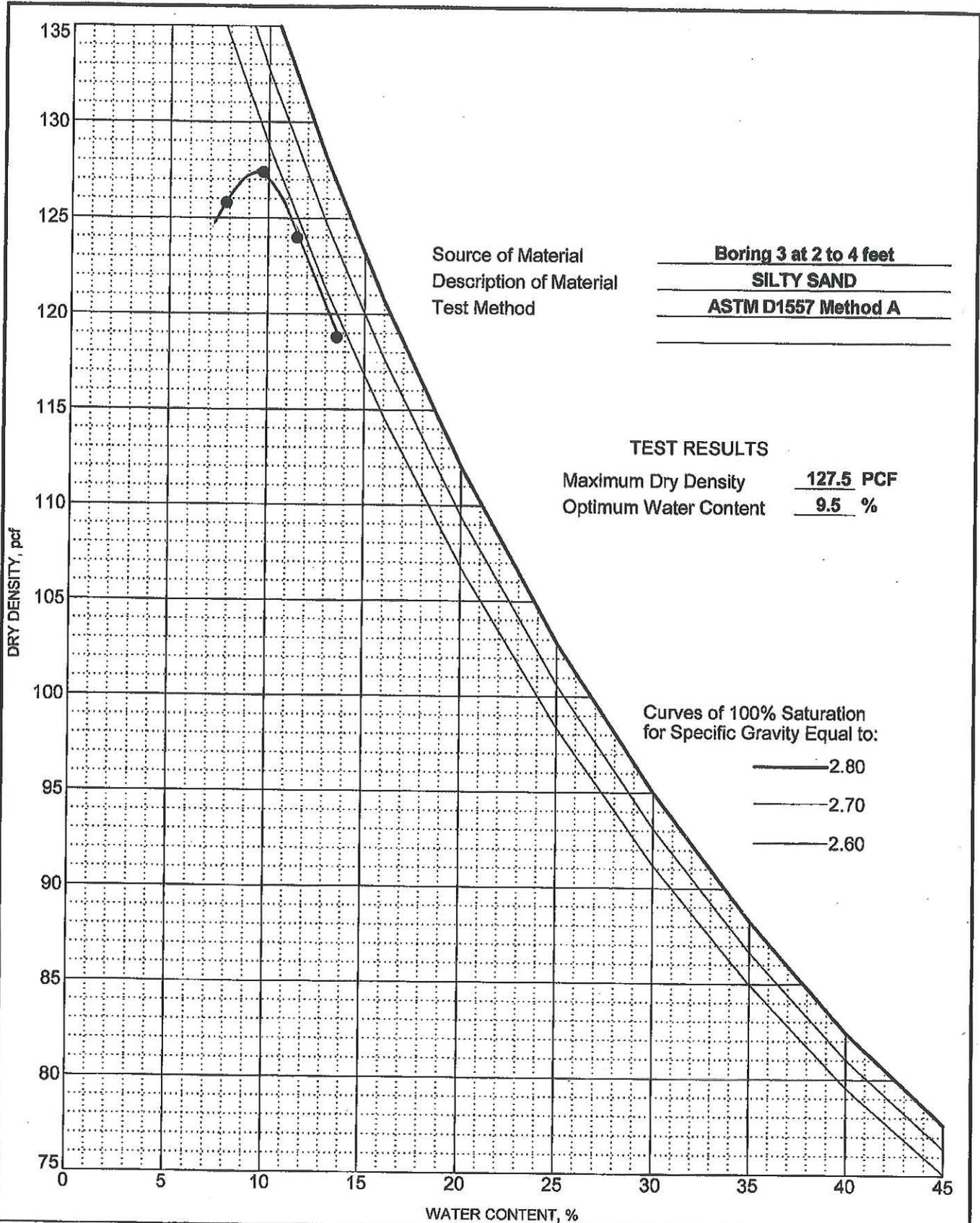


COMPACTION PARA 07-023.GPJ VB B.GDT 9/27/07

**COMPACTION TEST DATA**



FIGURE A-6.1

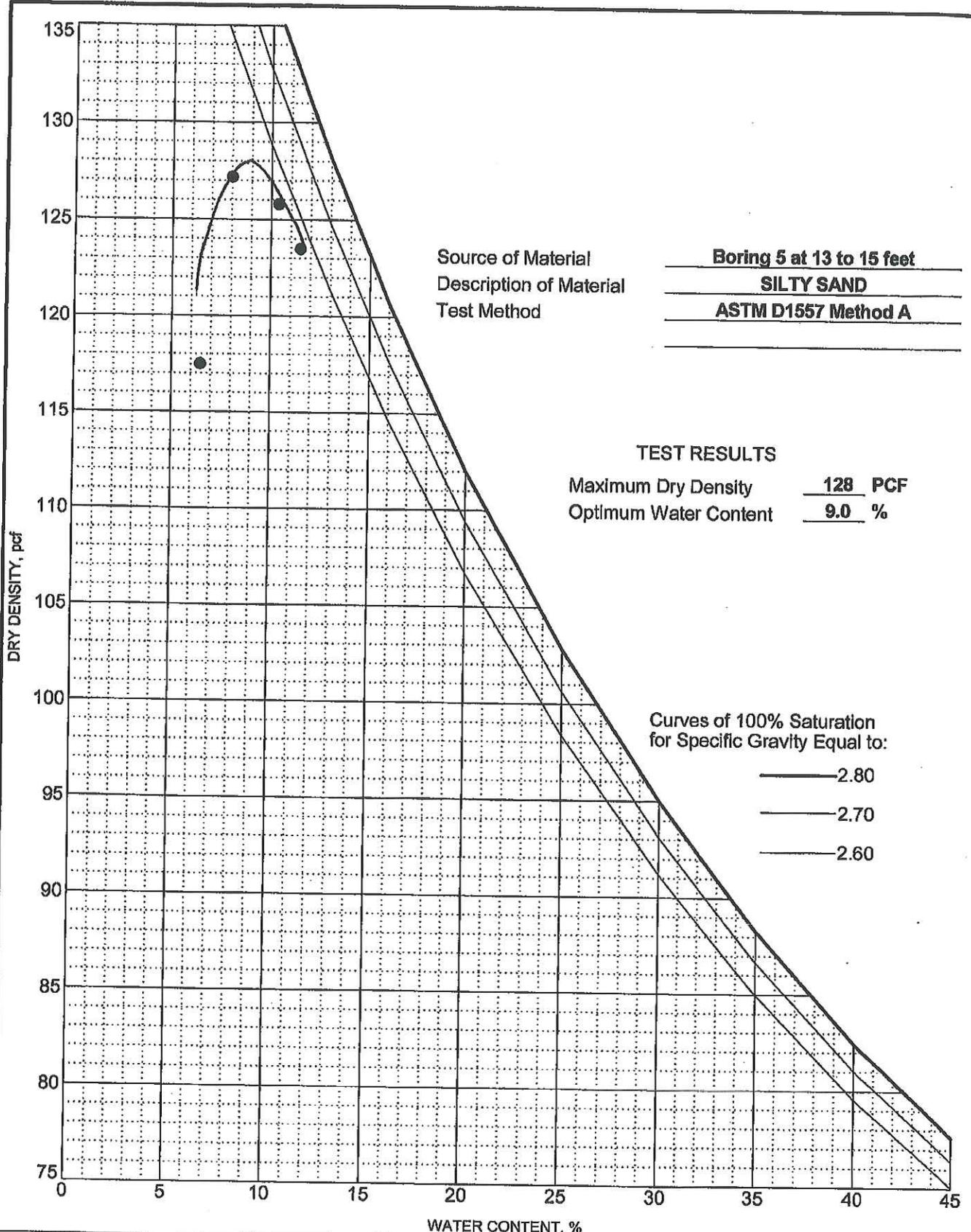


COMPACTION PARA 07-023.GPJ VB B.GDT 9/27/07

**COMPACTION TEST DATA**



FIGURE A-6.2



COMPACTION PARA 07-023.GPJ VB-B.GDT 9/27/07

**COMPACTION TEST DATA**



FIGURE A-6.3

# R - VALUE DATA SHEET

P.N. 07-023  
Rancho Malibu

PROJECT NUMBER 34767 BORING NUMBER: B-1 @ 4'-7'

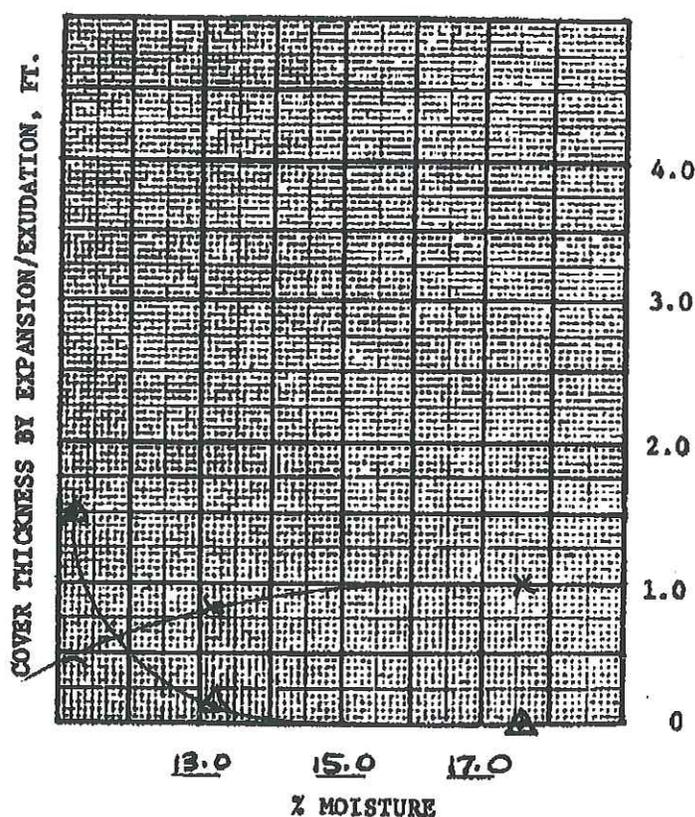
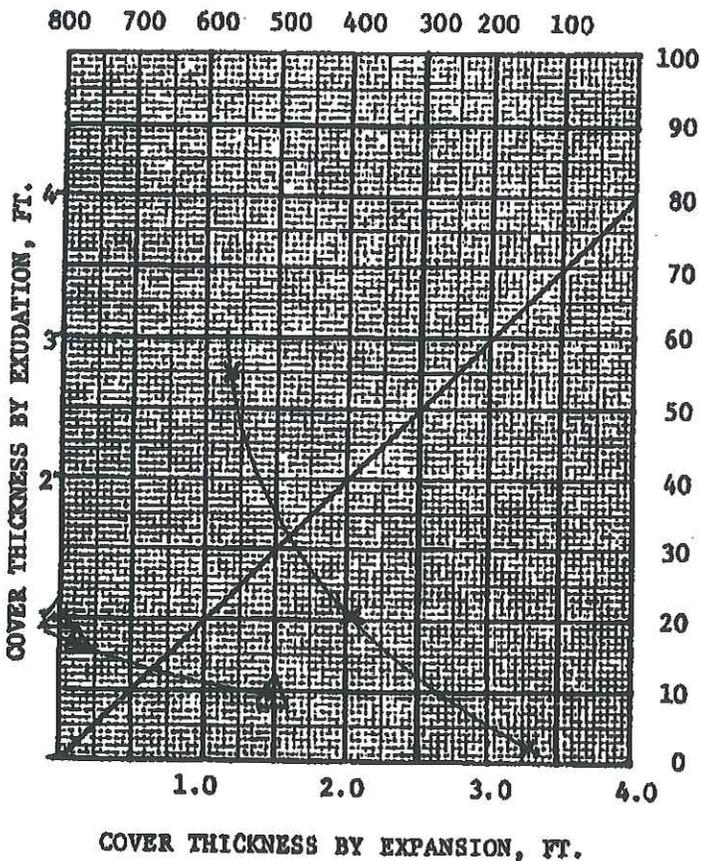
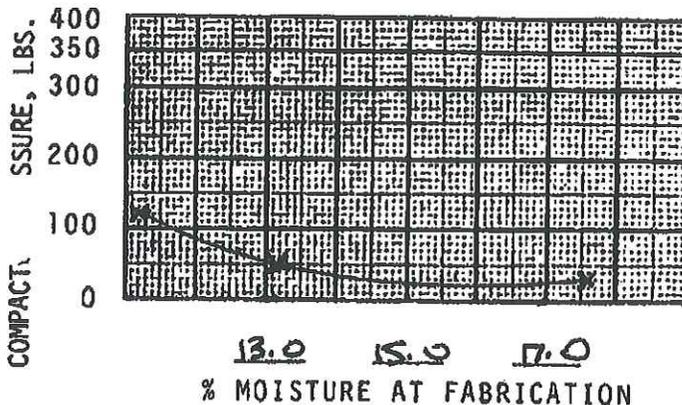
SAMPLE DESCRIPTION: Brown Sandy Clay

Item	SPECIMEN		
	a	b	c
Mold Number	4	5	6
Water added, grams	50	72	122
Initial Test Water, %	11.2	13.2	17.6
Compact Gage Pressure, psi	120	50	30
Exudation Pressure, psi	562	390	141
Height Sample, Inches	2.38	2.59	2.64
Gross Weight Mold, grams	3059	3105	3118
Tare Weight Mold, grams	1977	1975	1976
Sample Wet Weight, grams	1082	1130	1142
Expansion, Inches x 10exp-4	44	4	0
Stability 2,000 lbs (160psi)	22 / 52	52 / 117	70 / 155
Turns Displacement	3.72	3.78	4.47
R-Value Uncorrected	58	20	2
R-Value Corrected	55	21	2
Dry Density, pcf	123.9	116.8	111.4
<b>DESIGN CALCULATION DATA</b>			
Traffic Index	Assumed: 4.0	4.0	4.0
G.E. by Stability	0.46	0.81	1.00
G. E. by Expansion	1.47	0.13	0.00
Equilibrium R-Value	12 by EXUDATION	Examined & Checked: 7 /17/ 07	
REMARKS:	Gf = 1.25		
	0.0% Retained on the		
	3/4" Sieve.		
			
<p>The data above is based upon processing and testing samples as received from the field. Test procedures in accordance with latest revisions to Department of Transportation, State of California, Materials &amp; Research Test Method No. 301.</p>			

# R-VALUE GRAPHICAL PRESENTATION

PROJECT NO. 34767  
 BORING NO. B-1 @ 4'-7'  
 DATE 7-17-07

TRAFFIC INDEX Assume 4.0  
 R-VALUE BY EXUDATION 12  
 R-VALUE BY EXPANSION 12



R-VALUE vs. EXUD. PRES.      T by EXUDATION  
 EXUD. T vs. EXPAN. T      T by EXPANSION

REMARKS \_\_\_\_\_

GF 1.25

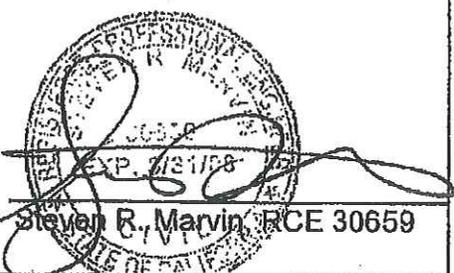
# R - VALUE DATA SHEET

P.N. 07-023

Rancho Malibu

PROJECT NUMBER 34767 BORING NUMBER: B-5 @ 13'-15'

SAMPLE DESCRIPTION: Brown Sandy Clay

Item	SPECIMEN		
	a	b	c
Mold Number	7	8	9
Water added, grams	70	120	41
Initial Test Water, %	14.7	19.2	12.1
Compact Gage Pressure, psi	75	30	160
Exudation Pressure, psi	456	146	631
Height Sample, Inches	2.43	2.67	2.41
Gross Weight Mold, grams	3061	3094	2883
Tare Weight Mold, grams	1968	1964	1789
Sample Wet Weight, grams	1093	1130	1094
Expansion, Inches x 10exp-4	40	0	80
Stability 2,000 lbs (160psi)	45 / 117	65 / 154	29 / 78
Turns Displacement	2.99	4.68	2.94
R-Value Uncorrected	24	2	47
R-Value Corrected	23	2	45
Dry Density, pcf	118.8	107.5	122.7
<b>DESIGN CALCULATION DATA</b>			
Traffic Index	Assumed: 4.0	4.0	4.0
G.E. by Stability	0.79	1.00	0.56
G. E. by Expansion	1.33	0.00	2.67
Equilibrium R-Value	12 by EXUDATION	Examined & Checked: 7 / 17 / 07	
REMARKS:	Gf = 1.25		
	0.0% Retained on the		
	3/4" Sieve.		
<p>The data above is based upon processing and testing samples as received from the field. Test procedures in accordance with latest revisions to Department of Transportation, State of California, Materials &amp; Research Test Method No. 301.</p>			





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July 23, 2007

Van Beveren & Butelo, Inc.  
 Attention: Victor Langharr  
 706 W. Broadway, Suite 201  
 Glendale, CA 91204

Atlantic Job No.: 2007-066

Subject: Soil Chemistry Analysis for Van Beveren & Butelo, Inc. Job # 07-023  
 4 Samples: B-1@ 1-3', B-3@ 2-4', B-7@ 2.5' and B-5@ 2.5' (Rancho Malibu)

Sample Number	As Rec'd Resistivity (ohm-cm)	Minimum Resistivity (ohm-cm)	<sup>2</sup> pH	<sup>3</sup> Sulfate %	<sup>3</sup> Chloride %	(As Rec'd) Description
B-1	93,600	4,800	5.87	0.0044	0.0193	Medium Brown, moist
B-3	2,200	1,000	7.73	0.0130	0.0195	Medium Brown, moist
B-7	72,000	1,800	6.76	0.0082	0.0180	Light Brown Gravelly, dry
B-5	4,400	1,400	7.04	0.0033	0.0213	Medium Brown, moist

NOTE: SAMPLES WERE ANALYZED IN ACCORDANCE WITH THE FOLLOWING METHODS.  
 1. MINIMUM RESISTIVITY DETERMINED BY SOIL BOX METHOD. (PER ASTM G-57)  
 2. PH MEASURED BY POTENTIOMETRIC METHOD USING STANDARD ELECTRODES. (PER CAL TRANS. #043)  
 3. CHLORIDE AND SULFATE WERE ANALYZED IN ACCORDANCE WITH EPA METHODS FOR CHEMICAL ANALYSIS FOR WATER AND WASTE, NO. 300 EPA-800/4-79-020. CONCENTRATION BY WEIGHT OF DRY SOIL.

CONCLUSIONS:

Material	Corrosion Class	Recommendation
Concrete	Negligible for Sulfate exposure and Chloride exposure, pH is neutral to basic. (UBC Table 19-A-4)	- Type II Portland cement for concrete with a maximum water-cement ratio of 0.50 and a minimum of 3 inches of cover over steel reinforcement. It is suggested that a 5 mil polyethylene barrier be placed between concrete slabs and soil to reduce intrusion of moisture, and chlorides into the concrete slabs.
Steel Cast/Ductile Iron Mortar Coated Steel	Moderately to Mildly Corrosive	- Install corrosion monitoring and cathodic protection for buried ferrous metal piping. - Provide electrical continuity along steel and ductile iron piping, to facilitate the installation of corrosion monitoring and cathodic protection, if required in the future. - Electrically isolate underground metal piping from above-grade piping and other metallic structures. - Use separate ground rods for grounding interior piping.
Copper Piping	Corrosive Not tested for Ammonia  NOTE: The soils were not tested for ammonium. Even trace amounts of ammonium can cause failure of copper piping.	- Overhead plumbing is the most effective method of corrosion control. - Copper pipes should not be installed in soils, which may contain ammonia without cathodic protection. - If Copper pipes are installed below ground, the soils should be tested for ammonia and Kjeldahl nitrogen. - Electrical isolation between hot and cold water lines and between buried copper and steel piping and structural steel should be maintained. - If ammonia is present, coat and cathodically protect any buried copper piping.



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The test results and recommendations are based on the samples submitted, which may not be representative of overall site conditions. Additional sampling may be required to more fully characterize soil conditions.

Sincerely,  
ATLANTIC CONSULTANTS, INC.

A handwritten signature in black ink, appearing to read "Karl M. Howell".

Karl M. Howell, P.E.  
President

January 23, 2015  
W.O. 6489

**APPENDIX E**

**TEMPORARY STABILITY ANALYSES**

MDN 15710

**APPENDIX E**

**TEMPORARY STABILITY ANALYSES**

**Soil Parameters:** Soil properties used in our slope stability analyses, which include cohesion, friction angle, and unit weight, are shown on Table E-1 and were obtained from the referenced GSC reports. Shear test summaries for both peak and residual strength parameters were created for Certified Artificial Fill.

<b>Soil Description</b>	<b>Peak Values</b>		<b>Resheared Values</b>		<b>Unit Weight (pcf)</b>
	<b>c (psf)</b>	<b><math>\phi</math> (degrees)</b>	<b>c (psf)</b>	<b><math>\phi</math> (degrees)</b>	
Certified Artificial Fill (Caf)	200	27	150	22.5	130
Qalo	400	30	400	30	130
Qtn/Qtm	300	35	100	34.5	130
Bedrock	310	36.5	100	32.5	130
Slide Plane	395	16	395	16	130

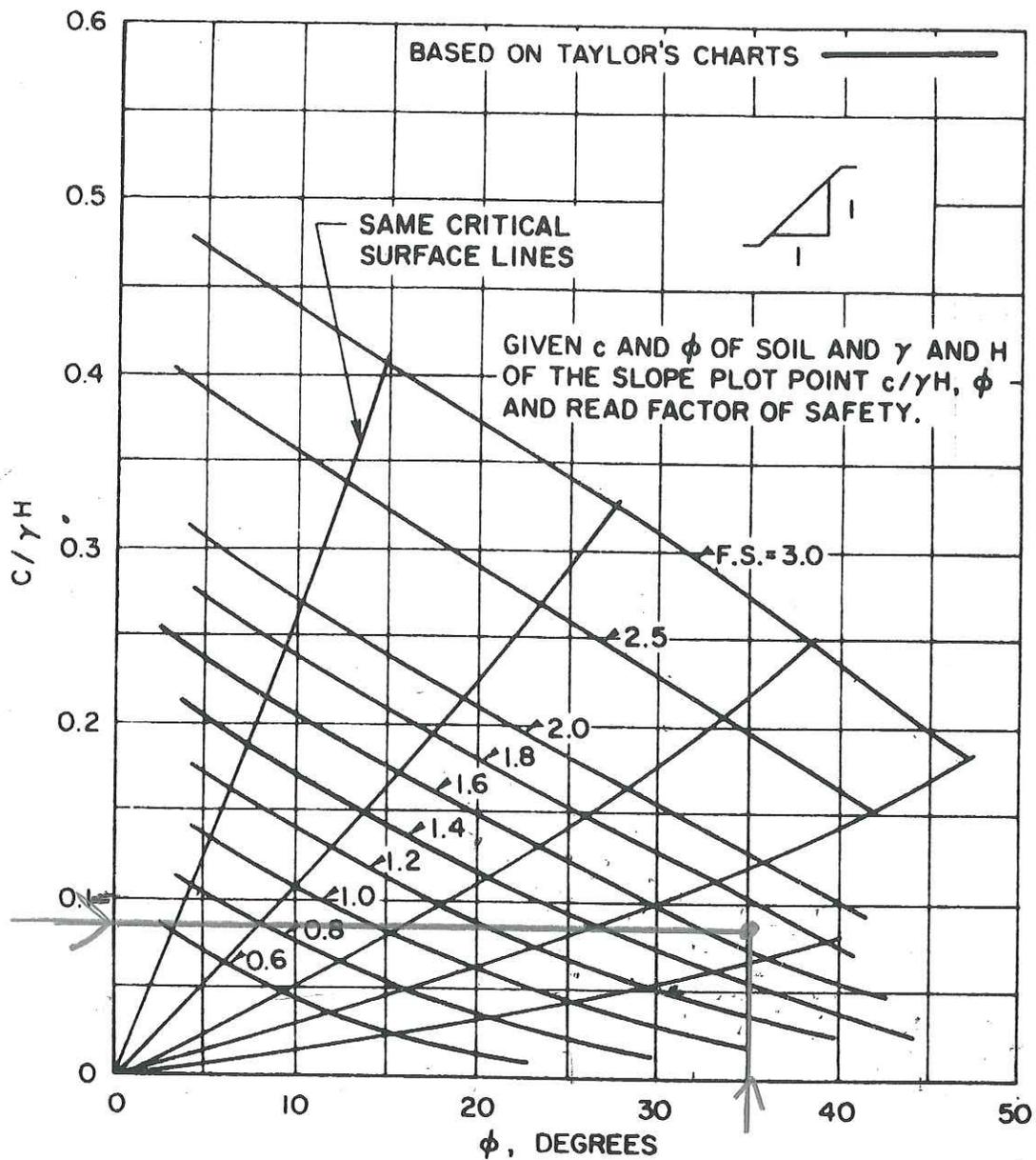


FIG. 10.—F-CONTOURS FOR SLOPE 1:1

$H = 25 \text{ FT}$

$\gamma = 130 \text{ pcf}$

$c = 300 \text{ psf}$

$\phi = 35^\circ$

$c/\gamma H = 0.9$

$FS = 1.65 > 1.25$

OK