GEOTECHNIQUES
1645 Donlon Street, Ste 107
Ventura, California 93003
(805) 658-8952, 456-9585

August 31, 2020
Project No. 1003.039

Moorpark College
Department of Maintenance and Operations
7075 Campus Drive
Moorpark, California 93021
Attention: Mr. John Sinutko

Subject: Geotechnical Update, Tiger Habitat at Moorpark College Zoo
7075 Campus Road, Moorpark, California, Moorpark College, Moorpark, California

Dear Mr. Sinutko:

This geotechnical letter report summarizes site conditions and provides recommendations for the proposed Tiger Habitat at the Zoo at Moorpark College.

PROPOSED PROJECT

The Tiger Habitat improvements will be constructed on an approximately 5h:1v or flatter south-facing slope within approximately 10 vertical feet of the crest, and will consist of short, below-grade retaining walls for the tiger shelter and adjacent spectator walkway/viewing tunnel. Minor grading is planned in order to achieve ADA access gradients. Below-grade retained earth height will not exceed 4 feet. The enclosure will consist of a perimeter mesh screen supported by 35-foot-high poles.

SITE CONDITIONS

The Tiger Habitat site is underlain by native fine sandy silt with clay from the Saugus Formation (Ts) and as encountered during construction of the adjacent alligator water habitat and Exotic Animal Training and Management (EATM) classrooms and facility improvements[1].

Past Grading

No previous site grading is known to have occurred other than minor surficial contouring to accommodate prior zoo use in the proposed Tiger Habitat area.

Subsurface Conditions

Native earth materials encountered during previous exploration for and during construction of the nearby EATM classroom structure[2] and excavations observed for the adjacent alligator pit[3] typically consisted of fine sandy silt with clay derived from the Saugus Formation. Calcium carbonate ("caliche") inclusions are common in the native earth materials which are known to be corrosive to underground steel[4]. Refer to Plate 1 for locations and depths of adjacent exploration borings and excavations.

---

[1] Arroyo Geotechnical (2006), "Report of Geotechnical Study, Exotic Animal Training and Management Facility, Moorpark College, California," Project No. 12149-4000, dated September 29, see boring logs.
[2] *Id.*, see boring logs in Appendix and Geotechniques' field dailies for shoring pile excavation observation between February 22 and 24, 2010.
[3] From Geotechniques' field observations during alligator pit excavation in January 2010.
[4] Arroyo Geotechnical (2006), "Report of Geotechnical Study, Exotic Animal Training and Management Facility, Moorpark College, California," Project No. 12149-4000,p.14, Sec. 4.9, dated September 29

Groundwater

Groundwater was not encountered to a maximum exploration depth of about elevation 700 feet, or about 46 feet below the ground surface at the western end of the adjacent EATM site[1]. Additionally, no groundwater or seeps were encountered in excavations extending to a depth of up to about 12 feet during construction of the adjacent alligator pit[3] nor in the 25- to 40-foot deep shoring piling excavations for the EATM site located immediately southeast of the Tiger Habitat site[2].

FAULT RUPTURE AMD LIQUEFACTION HAZARD POTENTIAL

The Tiger Habitat site is not located within the Alquist-Priolo Special Studies Zone nor lies within a Liquefaction Hazards Zone. Furthermore, the absence of groundwater to an elevation of about El. 700 feet precludes the potential for liquefaction-induced settlement or lateral movement.

SITE SUBGRADE PREPARATION RECOMMENDATIONS

Prior to earthmoving and excavation operations, vegetation including root mat, should be stripped from the surface and wasted offsite. Exposed surfaces from all cuts/excavation bottoms should be observed by the Geotechnical representative prior to scarification and compaction.

Footings for the tiger shelter, site walls, and below-grade walls should be bottomed a minimum of 18 inches below lowest adjacent grade into undisturbed native sandy silt with clay. Footing excavations should be deepened, as needed, so to be bottomed into native, very firm undisturbed soil and to maintain a minimum horizontal setback of 5 feet to daylight on the descending slope face.

Slab-on-Grade Subgrade

Subgrade for on-grade concrete should be scarified to a depth of 9 inches, moisture conditioned to between 0 and 3 percent over optimum moisture content, and compacted to a minimum of 93 percent of the maximum dry density determined by ASTM D1557, latest edition. Scarification should be thorough enough to pulverize the soil into a pea-sized or finer consistency prior to applying compactive effort.

Areas to Receive Fill

No fill, including slurry, should be placed unless the exposed subgrade is observed by the Geotechnical representative.

After clearing vegetation and root mat, areas to receive fill should be scarified to a depth of 9 inches, moisture conditioned and compacted to a minimum of 93 percent of the maximum dry density.

Fill Placement and Compaction

Onsite soils are anticipated to be used as general fill once cleared of organic material, demolition or other debris, and oversized rock. Fill materials placed as subgrade beneath on-grade concrete and placed as retaining wall backfill within a 1h:1v envelope projected up from the wall footing should consist of non-expansive granular “select fill” materials with an Expansion Index less than 20. Fill materials should be compacted to a minimum of 93 percent of the maximum dry density determined from ASTM D1557.

Fill placement and earthwork operations should be performed according to the recommendations of this report. We recommend that, unless otherwise noted, all fill materials be compacted to at least 93 percent relative compaction, based on the maximum dry density determined from ASTM D1557.

Onsite soils used as fill and imported fill materials should be placed and compacted at a moisture content of between 0 and +3 percent of optimum moisture content. Each layer should be spread evenly in loose lifts no thicker than 8 inches and should be thoroughly blade-mixed during the spreading to provide relative uniformity of material within each layer. Fill and backfill materials may need to be placed in thinner lifts to achieve the recommended compaction with the equipment being used. Soft or yielding materials should be removed and be replaced with properly compacted fill material, prior to placing the next layer.

Rock, gravel and other oversized material greater than 4 inches in diameter, should be removed from the fill material being placed. Rock less than 4 inches in diameter should not be nested and voids caused by inclusion of rock in the fill should be filled with sand or other approved material. All roots larger than ½-inch diameter should be removed and discarded.

All fill materials, including scarified materials, should be thoroughly processed to pea-sized or finer consistency or finer prior to applying compactive effort. When the moisture content of the fill material is below that sufficient to achieve the recommended compaction, water should be added to the fill during processing. While water is being added, the soil should be bladed and mixed to provide relatively uniform moisture content throughout the material. When the moisture content of the fill material is excessive, the fill material should be aerated by blading or other methods

Fill Materials

The expansion index of imported materials used as general or select fill should be tested, as necessary during earthmoving operations, to verify that the expansion index of the material is suitable for its use as general or select fill.

Onsite Soils. Onsite soils are generally anticipated to consist of fine sandy silt with clay (ML) that meet the requirements for general fill.

General Fill. General fill materials should have an expansion index less than or equal to 20. General fill may be used in foundation and on-grade concrete areas, and as backfill in utility trenches.

Select Fill. Select fill materials should have an expansion index less than or equal to 20. Select fill should be used as backfill within a 1h:1v envelope behind below-grade retaining walls. Select fill used as wall backfill should have a friction angle of at least 32 degrees. Select fill should be anticipated to be imported, as near surface soils are anticipated to consist of fine-grained sandy silt to silty sand with clay (ML-SM).

Imported Fill. Imported fill to be used as general or select fill should meet the requirements of general or select fill material and should be observed and tested by Geotechniques prior to being brought to the site.

UTILITY TRENCHES

Utility trenches should be braced or sloped in accordance with the requirements of (Cal) OSHA. Utility trench backfill should be governed by the provisions of this report relating to minimum compaction recommendations. Trench backfill should be moisture conditioned between 0 and 3 percent over optimum moisture content prior to placing in trench. Backfill should be compacted to a minimum of 93 percent relative compaction as determined from ASTM D1557.

Rock larger than 4 inches in maximum dimension should be excluded from trench backfill. Jetting of trench backfill materials should not be permitted.

Trench backfill materials should consist of bedding and pipe zone sand placed 4 inches below the pipe invert and to a height of 12 inches above the top of the pipe. Bedding and pipe zone sand should consist of fine to medium or coarse sand with a minimum sand equivalent (SE) of 30. General or select fill or pipe zone sand should be placed as backfill above the pipe zone in 8-inch loose lifts and compacted to the minimum relative compaction summarized above. General backfill materials also should meet the preceding recommendations of this letter report, "Fill Placement and Compaction" and "Fill Materials."

ASCE 7-16 / 2019 CALIFORNIA BUILDING CODE SEISMIC DESIGN PARAMETERS

Seismic design parameters for the Tiger Habitat were generated using site coordinates 34.3013° N, -118.8395° W, and in accordance with 2019 CBC and ASCE 7-16. Soil conditions in the upper 100 feet are based on the generalized conditions summarized above and, in accordance with Table 20.3-1 in Chapter 20 of ASCE 7-16 and Section 1613.2.2 of the 2019 CBC, are anticipated to be consistent with Site Class "D."

The following seismic parameters are recommended for design for Risk Category II and consistent with the 2019 CBC and ASCE 7-16 for Site Class "D" soil profile:

Seismic Parameter	Value	CBC Source	ASCE 7-16 Source
Mapped Spectral Response Acceleration			
S_S	1.992	Figure 1613.2.1 (1)	Figure 22-1
S_1	0.733	Figure 1613.2.1 (2)	Figure 22-2
S_{MS}	1.992	Equation 16-36	Equation 11.4-1
S_{M1}	1.246	Equation 16-37	Equation 11.4-2
Design Spectral Response Acceleration			
S_{DS}	1.335	Equation 16-39	Equation 11.4-3
S_{D1}	0.835	Equation 16-40	Equation 11.4-4
PGA	0.865g		Figure 22-9

[1] S_{M1}, S_{D1} were calculated per Table 1613.2.3(2) in Section 16.4.4 of the 2019 CBC assuming that a site-specific ground motion hazards analysis is not required for the proposed animal enclosure per ASCE 7-16, Sec. 11.4.8.

FOUNDATION DESIGN PARAMETERS AND RECOMMENDATIONS

Shallow Footings

The following recommendations are for shallow footing design for tiger enclosure walls and below-grade and cantilever retaining walls.

Footing Depth. Footings should be bottomed a minimum of 18 inches below lowest adjacent grade and should be deepened, as necessary, to bear entirely on undisturbed native soil and maintain a minimum 5 foot horizontal setback to daylight on any descending slope face.

Allowable Bearing Pressure. Footings bearing on undisturbed native sandy silt may be designed for maximum allowable bearing pressure of 1,500 pounds per square foot (psf). The recommended allowable bearing pressure provides a factor of safety against shear failure in excess of 3. A one-third increase in the allowable bearing pressure may be used for transient loads such as seismic or wind forces.

Estimated Settlement. On the basis of the foregoing, we estimate that post-construction settlement from structural loads should be less than 1 inch. For design purposes, foundations should be designed to accommodate differential settlement of about ½ inch over a distance of 30 feet, or a distortion ratio of about 1/720.

Slabs-on-grade

The following recommendations for on-grade concrete are predicated on subgrade preparation in accordance with the recommendations presented in this report. On-grade concrete slabs should be underlain by a minimum of four inches of sand. The sand should be moistened to optimum moisture content and compacted with a few passes of a vibratory plate or roller.

Sliding and Passive Resistance

Ultimate sliding resistance generated through a sandy silt/concrete interface may be estimated by multiplying the total dead weight structural loads by a coefficient of 0.4. Ultimate passive resistance developed from lateral bearing of footings bearing against native sandy silt below a depth of 1 foot below the lowest adjacent grade may be estimated using an equivalent fluid weight of 300 pounds per cubic foot (pcf). Sliding and passive resistance may be combined without reduction, when used with the safety factors of 1.5 for overturning and 2.0 for sliding. The safety factor for sliding can be reduced to 1.5 if passive resistance is neglected. The factor of safety for transient conditions should be at least 1.1.

RETAINING WALL DESIGN AND CONSTRUCTION

Foundations for cantilever and below-grade (restrained) walls should be bottomed as recommended previously and backfilled with imported select backfill.

Lateral Earth Pressures

Cantilever retaining walls should be designed to resist the following active earth pressures for level and sloping drained backfill conditions, as appropriate. Additionally, below-grade walls should be designed to resist at-rest earth pressures estimated below, for level or sloping drained conditions:

Equivalent Fluid Weights for Estimating Lateral Earth Pressures

Backfill Inclination	Lateral Earth Pressure Condition	Equivalent Fluid Weight (pcf)
Level	Active	35
Level	At-Rest	55
3h:1v	Active	40
3h:1v	At-Rest	60

Drained conditions are based on the assumption that hydrostatic pressures will not develop. The above values do not include hydrostatic forces (for example, standing water in the backfill material). Provisions for drainage should be provided to preclude the buildup of hydrostatic pressures behind the wall. Also, the above values do not include other surcharge loads resulting from foundations, other structure loads, traffic loads, or compaction equipment.

Select backfill should be placed within a 45-degree envelope projected from the heel of the footing to the ground surface behind the wall. Select fill materials should consist predominantly of sand with a minimum angle of internal friction of 32 degrees and should the minimum requirements presented previously in “Fill Materials.”

The lateral pressure distributions should be applied along a vertical plane passing through the heel of the wall footing between the intersection of the line with the ground surface above the wall and a point defined by the elevation of the lowest structural member of the wall.

Seismic Conditions

For restrained walls, the increase in lateral earth pressure due to earthquake loading can be estimated using the Mononobe-Okabe theory, as described by Seed and Whitman (1970). That theory is based on the assumption that sufficient wall movement occurs during seismic shaking to allow active earth pressure conditions to develop. The theory is not directly applicable to restrained walls; however, there is a supporting reference (Nadim and Whitman, “Seismic Analysis and Design of Retaining Walls,” ASME OMAE, Safety and Reliability, vol. 2, 1992) that suggests the Mononobe-Okabe method can be used to estimate dynamic forces for such walls.

In the Mononobe-Okabe approach, the total dynamic pressure can be divided into static and dynamic components. The estimated dynamic lateral force increase (due to seismic loading conditions) for either unrestrained or restrained walls may be taken as 10H pounds per square foot of wall assuming little or no movement of the wall.

The centroid of the dynamic lateral force increase should be applied at a distance of 0.6 x H above the base of the wall. The distribution of the resultant dynamic lateral force can be assumed to be an inverted triangle (base of the triangle at top of the wall).

To estimate the total dynamic lateral force, the dynamic lateral force increase should be added to the static earth pressure force computed using an active (not at-rest) lateral earth pressure of 35 pcf, equivalent fluid weight for level backfill conditions, or the appropriate active earth pressure for sloping conditions.

Pole Foundation Recommendations

Drilled cast-in-place concrete ‘piles’ for the pole foundation for the perimeter mesh screen should be designed to derive all lateral support from undisturbed native soil encountered below a depth of 2 feet below existing grade; i.e., neglecting the upper 2 feet of soils, allowing for the potential for disturbed native and artificial fill at the pole foundation locations. Drilled shafts should be observed by the geotechnical representative during excavation to verify depth to undisturbed native soil at each foundation location and to confirm design assumptions.

Passive and Frictional Resistance. An allowable passive resistance of 300 pounds per square foot per foot of depth (psf/ft) may be used when designing concrete drilled pile foundations, with a maximum value limited to 3,000 psf. This value may be doubled where deflection of ½ inch at the ground surface is allowed under transient lateral loads. Passive resistance in the upper two feet of embedment should be neglected. A coefficient of friction of 0.4 may be combined with the passive resistance provided a one-third reduction in the total resistance is applied.

Allowable Bearing. An allowable bearing capacity of 2,500 psf is recommended for end-bearing on undisturbed native materials at a depth of at least 6 feet below existing grade.

Drilled Shaft Construction Considerations. The bottom of the drilled shaft should consist of native sandy silt that is not disturbed by the drilling auger. This should be achieved by using a bucket auger and/or clean-out bucket for excavating and cleaning the final 18 inches of native undisturbed materials from the shaft excavation bottom. Note that backspinning of flight auger is not an acceptable alternative to use of a bucket auger/clean-out bucket.

All loose slough and disturbed materials accumulated on the shaft bottom should be removed prior to setting pole base and prior to concrete placement. Pole base should be centered securely in shaft to maintain necessary clearances prior to concrete placement.

Caving sidewall conditions should be anticipated during drilling of shafts. Drilled shafts should be concreted the same day as excavation and **should not be left open overnight**. The drilling Contractor should have casing on hand during drilling to help mitigate sidewall caving of any sand layers. The outer diameter of the casing should be at least as large as the diameter of the drilled shaft so that the casing is in contact with the shaft sidewall. Casing should be withdrawn during concrete placement and should not be left in place. Drilled pile construction should be performed in accordance with the latest edition of ACI 336.1, “Standard Specifications for Construction of Drilled Piles.”

Drilled pile excavation and construction should be observed by the Geotechnical representative during both drilling and concreting operations.

CLOSURE

The recommendations in this letter are specific to the scope of the proposed Tiger Habitat. We appreciate the opportunity to be of service to Moorpark College. Please call if you have any questions concerning this letter.

Sincerely,

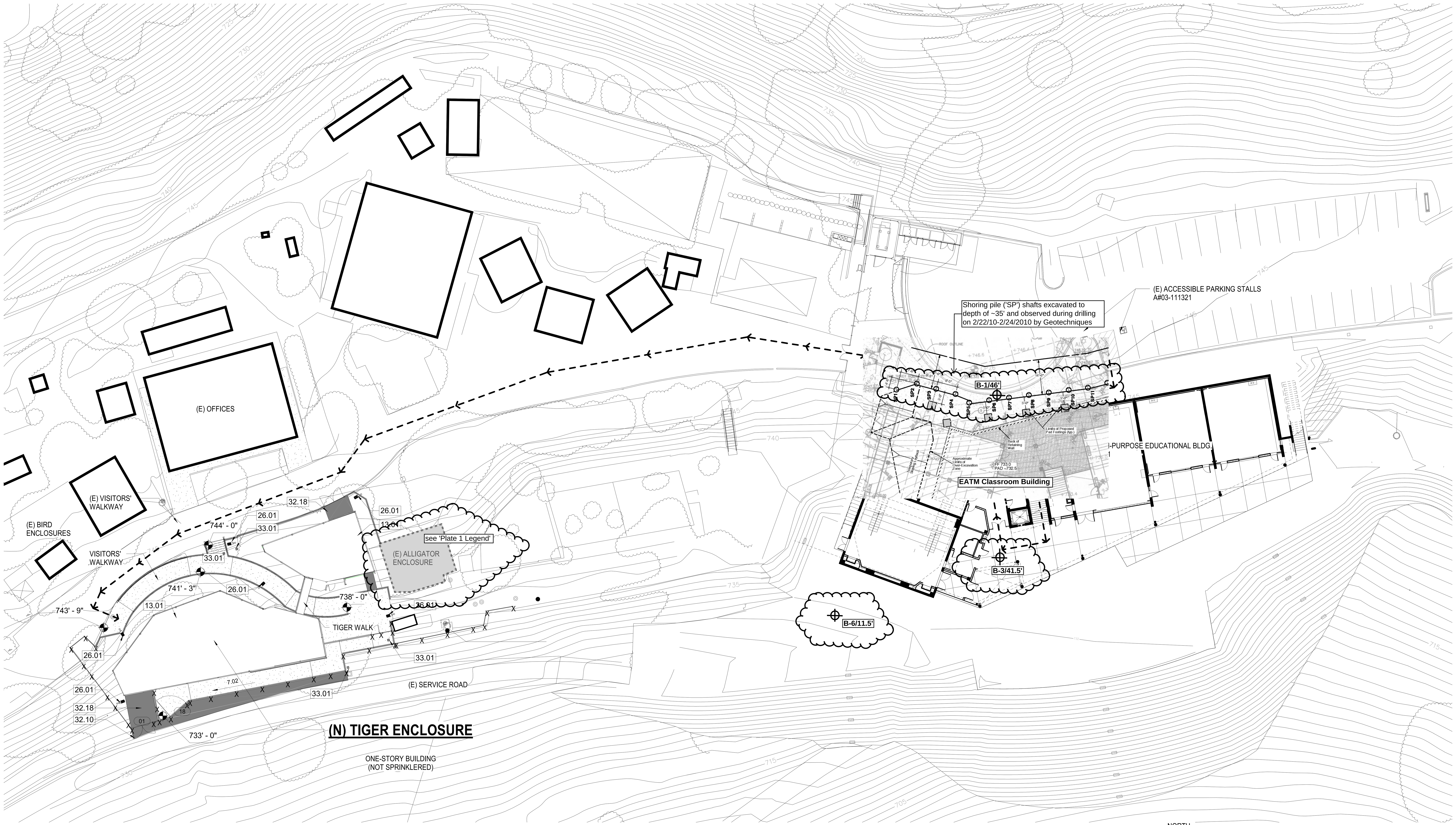
Geotechniques

PROFESSIONAL CIVIL ENGINEER
CAROLE A. WOCKNER
EXP. 09-30-21
No. 74,407
STATE OF CALIFORNIA

Carole Wockner, P.E.
Principal Engineer
R.C. E. No. 74407, exp 09/30/21

Attachments: Plate 1, Referenced Report for EATM Classroom Building by Arroyo Geotechnical

PDF Copies: John Sinutko, Moorpark College
Will Lambert, Orion
Bill Amador, AWA



1 ENLARGED SITE PLAN
1" = 20'-0"

PLATE 1 LEGEND

Area of ~12-foot deep excavation into native fine sandy silt with clay observed by Geotechniques (January 2010) for alligator pond.

B-6/11.5' Approximate boring location and depth from geotechnical study by Arroyo Geotechnical, Proj. No. 12149-4000, dated 9-29-04.

EXISTING KEYNOTES

KEYNOTES

13.01 CABLE WOVEN MESH NETTING
26.01 POLE LIGHT WITH CONCRETE BASE, SEE ELECTRICAL DRAWINGS
32.10 8' HIGH CHAINLINK DOUBLE GATE
32.18 ASPHALT PAVING
33.01 CONCRETE CATCH BASIN PER CIVIL DRAWINGS

LEGEND

4" CONCRETE SLAB, SEE STRUCRAL SHEETS FOR REINFORCEMENTS
WOOD PLANK SUBSTRATE
(E) ASPHALT
2 1/2" CONCRETE TOPPING SLAB WITH ELECTRIC RESISTIVE HEATING ELEMENT OVER 4" CONCRETE SLAB
(N) ASPHALT
PATH OF TRAVEL & ACCESSIBLE ROUTE OF TRAVEL

PARKING ANALYSIS

TABLE 11B-802.2 (2019 CBC)

EXISTING PARKING LOT:

TOTAL PARKING SPACES	35
TOTAL ACCESSIBLE REQUIRED	2
TOTAL ACCESSIBLE PROVIDED	2
TOTAL VAN REQUIRED	1
TOTAL VAN PROVIDED	1

DIVISION OF THE STATE ARCHITECT

PROJECT TITLE AND SCHOOL LOCATION
TIGER ENCLOSURE
EXOTIC ANIMAL TRAINING & MANAGEMENT
7075 CAMPUS ROAD
MOORPARK, CA 93021

COLIN NO. 10369716

COMMISSIONED ARCHITECT
AMADOR WHITTLE ARCHITECTS, INC.
28328 AGOURA ROAD, SUITE 203
AGOURA HILLS, CALIFORNIA 91301
TEL (805) 530-3938 (818) 874-0071

CONSULTANT

STAMPS/SEALS
LICENSED ARCHITECT WILLIAM JORGE AMADOR C-20348 JANUARY 31, 2021 RENEWAL DATE STATE OF CALIFORNIA

BID SET

SHEET TITLE: PLATE 1
ENLARGED SITE PLAN

PROJECT NO: 18-MPC-030 PROJECT ARCH: Designer
DRAWN: SAN CHECKED: WJA
SHEET NUMBER: A101
DATE: 02/10/20 SHEET: ___ OF ___

ARROYO GEOTECHNICAL

REPORT
GEOTECHNICAL STUDY
EXOTIC ANIMAL TRAINING AND MANAGEMENT FACILITY
MOORPARK COLLEGE, CALIFORNIA

Prepared for

Ventura County Community College District
Attn: Project Director, The JCM Group
333 Skyway Drive
Camarillo, California 93010

Prepared by

Arroyo Geotechnical
2125 East Katella Avenue, Suite 200
Anaheim, California 92806

Arroyo Geotechnical Project No. 12149-4000

September 29, 2004

ARROYO
GEOTECHNICAL

1515 South Sunkist Street, Suite E
Anaheim, California 92806
714/634-3318 fax 714/634-3372
www.arroyogeotechnical.com

September 29, 2004

Mr. Dick Jones
Ventura County Community College District
Attn: Project Director, The JCM Group
333 Skyway Drive
Camarillo, California 93010

Subject: **Report of Geotechnical Study**
Exotic Animal Training and Management Facility
Moorpark College, California
Arroyo Geotechnical Project No. 12149-4000

Dear Mr. Jones:

This report presents results of our geotechnical study for the proposed Exotic Animal Training and Management Facility in Moorpark College, California. This report also contains our recommendations for the design and construction of the proposed development. This study was performed in accordance with our proposal dated May 24, 2004 and your authorization dated June 10, 2004.

We appreciate the opportunity to assist you and look forward to future projects. If you have any questions, please do not hesitate to contact us.

Respectfully submitted,

ARROYO GEOTECHNICAL

REGISTERED PROFESSIONAL ENGINEER LIPING YAN No. GE 2554 Exp. 12-31-2004 GEOTECHNICAL STATE OF CALIFORNIA

Liping Yan, GE 2554
Project Manager

REGISTERED PROFESSIONAL ENGINEER ROSS KHIABANI No. 2202 Exp. 6-30-06 GEOTECHNICAL STATE OF CALIFORNIA

Ross Khiabani, GE 2202
Principal-in-Charge

1.0 INTRODUCTION

1.1 PURPOSE

This report presents the findings, conclusions and recommendations of a geotechnical and engineering geology study performed by Arroyo Geotechnical (Arroyo) for the proposed Exotic Animal Training and Management (EATM) Facility located on the campus of Moorpark College in the City of Moorpark, California. The project site is shown in Figure 1, Site Location Map.

The purpose of this study was to evaluate surface and subsurface conditions and develop geotechnical design and construction recommendations in support of project design.

1.2 PROPOSED CONSTRUCTION

The proposed construction consists of several two-story building structures (lecture theater, vet/animal lab, and classroom) and associated parking lot and driveways. The lower level and upper level of the proposed buildings will be at elevations of +731 and +746 feet, respectively. The proposed buildings will have a foundation design of 3,000 pound per LF for continuous footing, a slab design of 150 pound per square foot, and the maximum expected interior column load of 200 kips.

1.3 SCOPE OF WORK

The geotechnical and engineering geology services provided for this project included the following tasks:

- Research and review of readily available published and unpublished geologic and geotechnical maps and documents;
- Field exploration consisting of drilling, sampling, and logging seven exploratory borings;
- Geotechnical laboratory testing of representative bulk and relatively undisturbed soil samples;
- Geotechnical and seismic hazard analyses to develop design and construction recommendations; and
- Preparation of this report presenting our findings, conclusions, and recommendations.

2.0 FIELD INVESTIGATION AND LABORATORY TESTING

2.1 FIELD INVESTIGATION

Field investigation included a site reconnaissance and subsurface exploration. During the reconnaissance, surface conditions were noted, and locations of explorations were determined.

The subsurface exploration consisted of drilling and sampling seven borings (B-1 through and B-7) on September 2, 2004. Boring information, including exploration number, ground surface elevation, and borehole depth is summarized in Table 1. Approximate locations of the exploratory borings are shown in Figure 2. The boring logs are presented in Appendix A.

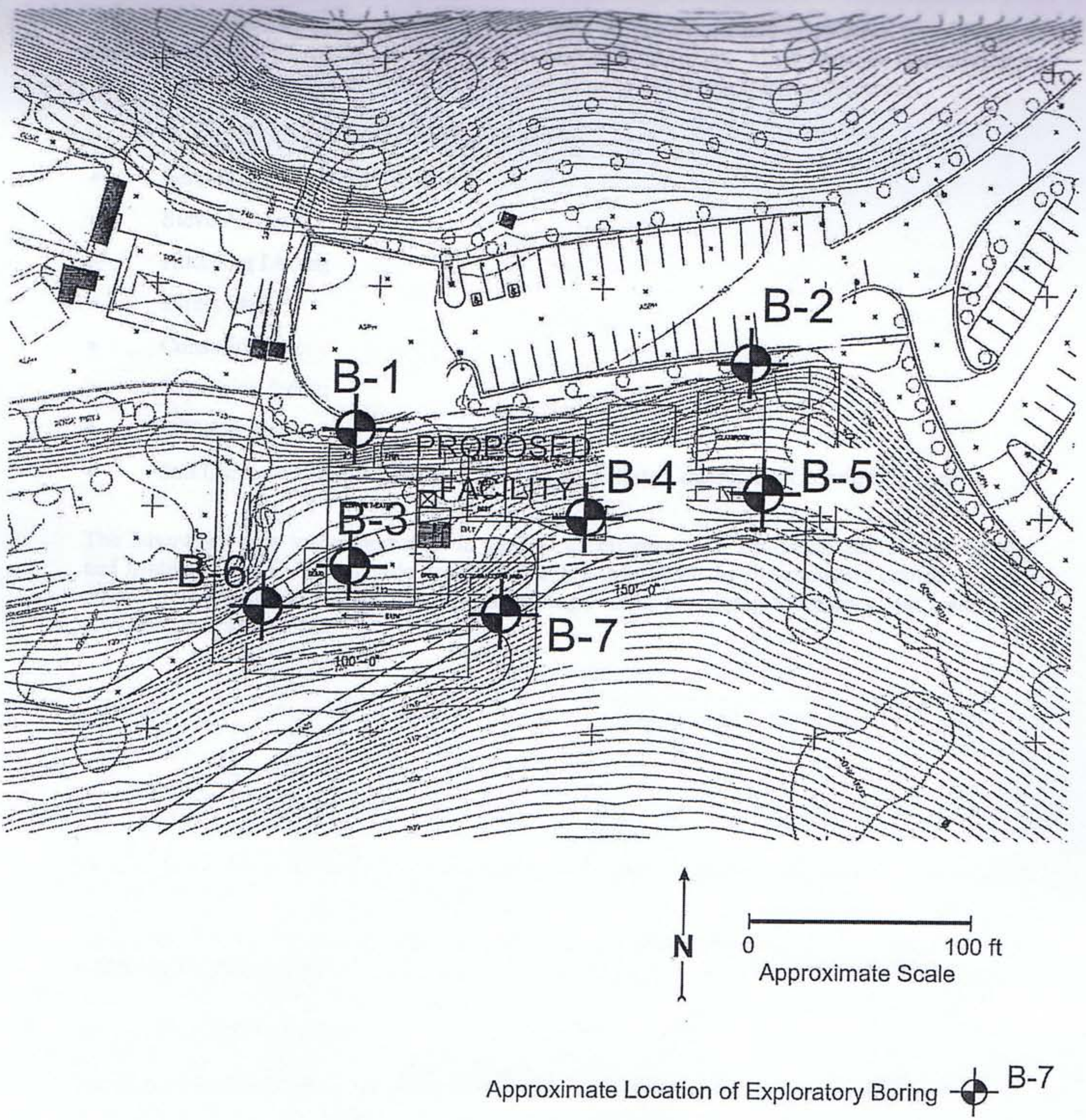
TABLE 1. SOIL EXPLORATION INFORMATION

Boring No.	Approximate GSE (ft)	Depth (ft bgs)
B-1	+746	46.0
B-2	+745	41.0
B-3	+732	41.5
B-4	+727	41.0
B-5	+727	41.5
B-6	+731	11.5
B-7	+720	16.5

Notes: (1) GSE = Ground Surface Elevation; bgs = below ground surface.
(2) Groundwater was not encountered for all borings.

The soil borings were drilled using truck-mounted drill rig (CME 75) equipped with 8-inch diameter hollow-stem augers. Soils were continuously logged and classified in the field by an experienced geologist in accordance with the Unified Soil Classification System. Field descriptions have been modified where appropriate to reflect laboratory test results.

Relatively undisturbed ring samples were obtained using the California split-spoon (drive) sampler, which has an outside diameter of 3.25 inches and is lined inside with 2.42-inch diameter 1-inch long brass rings. Soil samples were also obtained from the Standard Penetration Test (SPT) split-barrel sampler, which has an outside diameter of 2 inches and an inside diameter of 1.4 inches. The soil samples were collected for laboratory tests at frequent intervals of depth, alternating between the California sampler and the SPT sampler. Both samplers were driven with a 140-lb automatic trip hammer falling a distance of 30 inches, 12 inches (or refusal) into the ground for the drive sampler and 18 inches (or refusal) into the ground for the SPT sampler. The numbers of blow to advance the sampler each 6 inches or less of penetration were recorded. In addition, bulk samples of the near surface soils were collected for laboratory tests.



BORING LOCATION MAP - MOORPARK COLLEGE EATM FACILITY

ARROYO GEOTECHNICAL

Project No. 12149-4000

Figure No. 2

2.2 LABORATORY TESTING

Soil samples that were considered representative of the subsurface conditions were tested to obtain or derive relevant physical and engineering soil properties. The following laboratory tests were conducted to supplement the observations recorded in the field investigation:

- In-situ Moisture Content and Dry Density;
- Percent Passing #200 Sieve;
- Sieve Analysis;
- Atterberg Limits;
- Direct Shear;
- Consolidation;
- Expansion Index;
- R-Value; and
- Soil Corrosivity (Minimum Resistivity, pH, Sulfate Content and Chloride Content).

The laboratory tests were conducted in general accordance with American Society for Testing and Materials (ASTM) Standards or California Test Methods. In situ-moisture content and dry density test results are shown on the boring logs. The remaining laboratory test results are provided in Appendix B.

3.0 SITE CONDITIONS

3.1 SITE SETTING

The project site is located in the Ventura Basin of the Transverse Ranges geomorphic province. West-trending valleys and ridges, reflecting a parallel series of anticlines, synclines, and reverse faults characterize this province. Moorpark College lies to the north and adjacent to a tributary to the Arroyo Simi on the southern flank of Big Mountain, between the Simi and Little Simi Valleys.

The site overlies on unconsolidated soils/weathered bedrock that in turn is underlain by older sedimentary bedrock units (Dibblee, 1992).

3.2 SURFACE CONDITIONS

The proposed facility is located on the campus of Moorpark College. It is on a south-facing slope between the approximate elevations of +725 and +745 feet above mean sea level.

3.3 SUBSURFACE AND GROUNDWATER CONDITIONS

Based on the data obtained from the field exploration and laboratory testing, the project site is underlain by a layer of loose to medium dense silty sand overlying on silty sand interbedded with silty clay. The idealized soil profile and design strength parameters are presented in Table 2.

TABLE 2. DESIGN SOIL STRENGTH PARAMETERS

Approximate Depth below Ground Surface (ft)	Predominant Soil Type	Range of Measured and Converted SPT Blowcount (blows/ft)	Total Unit Weight (lbs/ft^3)	Friction Angle (degrees)	Cohesion (psf)
0 to 8	Silty Sand (SM)	4 to 21	110	32	0
8 to 45	Sandy Silt (ML)	12 to > 50	120	30	150

During the field exploration on September 2, 2004, groundwater was not encountered down to a maximum depth of 46 feet.

3.4 SOIL EXPANSION

Based on laboratory tests, the Expansion Index (EI) of one near-surface soil sample is 4. According to Table 18A-I-B in CBC (2001), the expansion potential for the soil can be classified as very low.

3.5 SOIL CORROSIVITY

Two soil samples were tested for pH, minimum resistivity, soluble chloride content and soluble sulfate content. The pH value ranges from 7.19 to 7.52. Minimum resistivity is about 1,000 ohm-cm. Soluble chloride content is between 80 and 120 parts per million (ppm) and soluble sulfate contents varies from 0.022% to 0.037% by weight. Therefore, the on-site soils can be considered to be corrosive. .

3.6 SEISMIC HAZARDS

3.6.1 Faulting and Seismicity

The site area is in the seismically active Southern California region. Known regional active faults that could produce significant ground shaking at the site include Simi-Santa Rosa, Oak Ridge (Onshore), Santa Susana, San Cayetano, Holser, Malibu Coast, Anacapa-Dume, Ventura – Pitas Point, San Gabriel, Santa Ynez (East), Sierra Madre (San Fernando), Santa Monica, among others. The closest of these is the Simi-Santa Rosa fault located approximately 2 km from the site.

3.6.2 Ground Motion

The site is likely to be subjected to strong ground shaking during the life of the proposed structures. To evaluate the ground motion and determine a peak level of ground acceleration that the site is likely to experience, a probabilistic seismic hazard analysis (PSHA) was performed using the computer program FRISKSP (Blake, 2000).

FRISKSP is a modified version of FRISK (McGuire, 1978) created to allow the use of recently developed acceleration-attenuation relations, and to calculate pseudo-relative velocity levels. FRISKSP models earthquake sources as 3-D planes and evaluates the site- specific probabilities of exceedance of given peak horizontal acceleration levels or pseudo-relative velocity levels, for each planar source. The underlying premise is that moderate to large earthquakes occur on mappable Quaternary faults and the occurrence rate of earthquakes on each fault is proportional to slip-rate. The area of the rupture on the fault is accounted for as a function of earthquake magnitude and ground motion estimates are made using the magnitude of the earthquake and the closest distance from the site to the rupture zone. The program sums the expected numbers from all sources and calculates the total average annual expected number of occurrences of ground motion greater than requested values. By assuming earthquake occurrence can be modeled as a Poisson process, the probability of exceedance in a specified exposure period may be estimated. There are numerous attenuation relationships available for use in a PSHA. We used a combination of the Boore, Joyner & Fumal (1997), Bozorgnia, Campbell & Niazi (1999), and Sadigh et al. (1997) attenuation relationships included in FRISKSP for the probabilistic analysis. All results are mean plus one standard deviation.

The analysis results indicate that the average peak horizontal ground acceleration at the site for the design basis earthquake (DBE), defined as an event having 10% probability of exceedance in 50 years, is 0.8g.

3.6.3 Secondary Effects of Seismic Activity

The possible secondary effects of seismic activity include tsunamis, flooding or seiches, landslides, ground rupture and liquefaction. The potential threats from secondary effects are discussed below.

- Tsunamis are tidal waves generated by fault displacement or major ground movement. The geographic location of the site precludes the possibility of damage from tsunamis.
- Flooding may be caused by failure of dams or other water retaining structures due to earthquakes. Seiches are large waves generated in enclosed bodies of water in response to ground shaking. There are no dams or other water retaining structures nearby this site. The potential for damage from seismically induced flooding or seiches is nil.
- The site has only minor relief. The probability of damage to the proposed construction as a result of seismically-induced landslides is considered very low.
- The site is not within a currently designated Alquist-Priolo Special Studies Zone and no known active faults project through the site. No ground rupture is expected.
- No seismic hazards zones for earthquake-induced landslides or liquefaction have been identified (CDMG, 1997).

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 GENERAL CONCLUSIONS

Based on our geotechnical investigation and seismic hazard evaluation study, we conclude that the proposed project is feasible from a geotechnical viewpoint, provided the recommendations contained in this report are implemented in the design and construction of the project.

4.2 EARTHWORK

Earthwork should be performed in accordance with the City of Moorpark Grading Ordinance and the latest edition of the Standard Specifications for Public Works Construction (Greenbook, 2003). Excavations and cuts should be inspected during grading.

4.2.1 Site Preparation

Prior to construction, the proposed facility site should be cleared of all vegetation, debris, loose soils, and any other deleterious material to expose a firm and unyielding ground surface.

Depressions resulting from the removal of buried obstructions and tree roots should be backfilled with properly compacted material.

Manufactured slopes should not be steeper than a gradient of 2H:1V (Horizontal:Vertical). All fills should be benched into competent in-situ materials.

4.2.2 Overexcavation and Recompaction

To minimize differential settlements of building floor slabs or footings, the entire footprint of each building should be overexcavated to a minimum depth of 2 feet below the existing grade or the finish subgrade elevation, whichever is lower. The exposed bottom of the excavation must be inspected by the geotechnical consultant's representative, prior to placement of engineered fill, to ensure that competent bottoms have been exposed and that no additional overexcavation is necessary. Prior to placing engineered fill, the exposed bottom of overexcavations should be scarified to a minimum depth of 6-8 inches, moisture conditioned as necessary to achieve near optimum moisture content, and compacted in place to at least 90 percent relative compaction.

Lateral extent of overexcavation beyond the proposed building pad limits should be at least equal to the depth of fill.

Voids or holes resulting from the removal of trees and other structures should be overexcavated to a depth exposing firm and competent soil.

4.2.3 Compaction Criteria

Cohesive soils should be placed in loose lifts not exceeding six inches, moisture-conditioned to about three to five percentage points above optimum. Granular fill materials should be placed in loose lifts not exceeding six to eight inches, moisture-conditioned to near optimum. Unless stated otherwise, all fill should be compacted to a minimum relative compaction of 90 percent based on densities determined in accordance with ASTM D1557. Compaction should be verified by the observation, probing, and testing by the geotechnical consultant.

4.2.4 Fill Materials

In general, fill materials should not contain organics, rocks greater than four inches in greatest dimension, debris and other deleterious materials.

The soils within the building pad areas may be reused as compacted fill provided they are free of organics, deleterious materials, debris and particles over four inches in largest dimension.

Any import soils should be granular and non-expansive with an Expansion Index less than 30. All import soils, if used, must be tested and approved by the geotechnical consultant. Ideally, import soils should be tested and approved prior to delivery to the project site.

4.2.5 Cuts

To prepare subgrade for the buildings, cuts as deep as 12 feet will be excavated into existing soils or bedrock. These cuts can be achieved with conventional grading and excavation equipment.

4.2.6 Temporary Excavations

Temporary excavations must be properly sloped or shored. If applicable, lateral loads due to surcharges from vehicle traffic or adjacent structures should be added in the shoring design. Excavated soil should not be stockpiled adjacent to the excavation.

Based on the earth materials encountered in our borings, excavation of four feet or less in depth may be performed with vertical side walls. Generally, deeper excavation up to a depth of 20 feet can be accomplished with a back slope of 1.5H:1V ratio. For excavation in the competent bedrock, the back slope can have a ratio of 1H:1V. Temporary cantilever shoring should be designed to resist a lateral earth pressure equivalent to a fluid density of 32 pound per cubic foot (pcf) for level ground and exposed heights no greater than 20 feet.

The contractor is responsible for worker safety in the field during construction. The contractor shall conform to all applicable occupational safety and health standards, rules, regulations, and orders established by the State of California. In addition, other State, County, or Municipal regulations may supercede the recommendations presented in this section.

4.3 SEISMIC DESIGN PARAMETERS

This site is within a California Building Code (CBC, 2001) Seismic Zone 4. The nearest seismic source type A fault is the San Andreas fault located about 52 kilometers from the site. The nearest type B fault is the Simi-Santa Rosa fault which comes within 2 kilometers of the site and has a magnitude of 6.7.

In accordance with the 2001 CBC, the proposed structures can be designed using the following seismic design parameters:

TABLE 3. CBC SEISMIC PARAMETERS

Seismic Zone Factor *Z*	0.4
Soil Profile Type	S_D
Seismic Source Type	*B*
Near-Source Factors	$N_a = 1.3$, $N_v = 1.6$
Seismic Coefficients	$C_a = 0.57$, $C_v = 1.02$
Control Periods	$T_s = 0.716$, $T_o = 0.143$

4.4 FOUNDATIONS

4.4.1 Foundation Type

Based on the soil conditions at the site and anticipated structural load demands, the proposed structures such as buildings and retaining walls can be supported on spread or continuous footings.

4.4.2 Footing Design

Bearing Capacity. Spread or continuous footings should have a minimum embedment of 2 feet below surrounding lowest finished grade. A minimum width of 1 foot for continuous footings and 2 feet for column footings are recommended. Footings with the recommended minimum sizes may be designed for a net allowable vertical bearing pressure of 2,000 psf for dead-plus-live loads. The allowable bearing pressure of foundations may be increased by 260 psf for each additional foot of foundation width or by 730 psf for each additional foot of foundation depth of embedment, up to a maximum allowable bearing pressure of 4,000 psf. The bearing pressure may be increased 33% when considering temporary forces such as seismic or wind.

Maximum anticipated total static settlement designed and constructed in accordance with the above recommendations is estimated to be on the order of 1 inch or less. Differential static settlements are estimated to be on the order of one-half of the total settlements.

Lateral Resistance. Resistance to lateral loads can be provided by friction acting on the base of the footings and by passive earth pressure on the sides of the footings. A coefficient of friction of 0.4 may be assumed with dead-load forces. An allowable passive earth pressure of 240 psf per foot of depth, up to a maximum of 3,000 psf, may be used for the sides of footings poured against properly compacted fill. This allowable passive pressure is applicable for level (ground slope equal to or flatter than 5H:1V) conditions only. For footings near the 2H:1V manufactured slopes, the recommended allowable passive pressure should be reduced by 50%.

All allowable passive pressures may be increased 33% when considering temporary forces such as seismic or wind.

4.5 RETAINING WALLS

4.5.1 Lateral Earth Pressures

Retaining walls should be designed using static lateral earth pressures equivalent to fluids having densities presented in Table 4. Additional lateral loads due to surcharge or live load should be added.

TABLE 4. STATIC LATERAL EARTH PRESSURES

Condition	Equivalent Fluid Density (pcf)	
	Retaining On-site Soils	Backfilled with Non-Expansive Granular Soils [1]
Active	40	35
At-Rest	60	50

Note: (1) Expansion Index is less than 30.

To design an unrestrained retaining wall (such as a cantilever wall), the active earth pressure may be used. For a restrained retaining wall, the at-rest earth pressure should be used.

4.5.2 Subdrain System

All retaining structures should be provided with a subdrain system, which consists of a 4-inch diameter PVC pipe surrounded by free draining gravel or crushed rock. Weepholes may also be needed and waterproofing behind the wall should be considered. If drainage cannot be provided over the full height of the wall, the equivalent fluid pressure given above should be increased by 63 pcf for the undrained zone and beneath the floor subgrade.

4.6 SLABS-ON-GRADE

Conventional 4-inch minimum thickness slabs-on-grade may be constructed for support of nominal ground floor live loads. The slab thickness may be increased per structural engineer's recommendations. A minimum of 6-by-6-inch No. 10 wire mesh should be used in slabs-on-grade. The subgrade should be scarified to a minimum depth of 6 inches, moisture conditioned to 3 percent above optimum moisture content, and compacted to a minimum relative compaction of 90 percent of the maximum dry density as determined by the ASTM D1557 test method. The subgrade should be maintained in a moist condition until the floor slab is poured.

If a moisture sensitive floor covering such as vinyl tile is used, slabs should be underlain by a 6-mil-thick polyethylene plastic vapor barrier. If the barrier is used, it should be covered with 2 inches of sand to prevent punctures and to aid in concrete curing. Joints should be lapped at least 6 inches and taped.

4.7 PAVEMENTS

The surficial soils below the proposed parking lot and driveway pavements consist of silty sands and sandy silts. Laboratory test on one soil sample (see Appendix B) yields an R-value of 32. We used an R-value of 30 to determine preliminary pavement structural sections following the design procedure of Caltrans (1995).

Flexible pavements consisting of asphalt concrete (AC) over Class 2 Aggregate Base (AB) are recommended. The structural sections were computed for four values of Traffic Index (TI): 4.0, 4.5, 5.0, and 5.5. Table 5 presents the recommended flexible structural sections.

TABLE 5. RECOMMENDED FLEXIBLE PAVEMENT STRUCTURAL SECTIONS

Traffic Index	Flexible Pavement Section Thickness (ft)	
	AC	AB
5.0	0.30	0.35
5.5	0.35	0.35
6.0	0.35	0.50
6.5	0.40	0.50
Notes: (1) AC = Asphalt Concrete; (2) AB = Aggregate Base (Class 2)		

Because the subgrade soil has a relatively high R-value, rigid pavements consisting of Portland Cement Concrete Pavement (PCCP) over Cement Treated Permeable Base (CTPB) can be used as an alternative to the flexible pavements. Table 6 presents the recommended rigid structural sections.

All pavement construction should be performed in accordance with the Standard Specification for Public Works Construction (Greenbook, 2003). Field observation and periodic testing, as needed during placement of base course material, should be undertaken to confirm that the requirements of the standard specifications are fulfilled. Prior to placement of aggregate base, the subgrade soils should be processed to a minimum depth of 6 inches, moisture-conditioned, as necessary, and recompacted to a minimum of 90 percent relative compaction. Aggregate base should be placed in thin lifts, moisture-conditioned, as necessary, and compacted to a minimum of 95 percent relative compaction.

TABLE 6. RECOMMENDED RIGID PAVEMENT STRUCTURAL SECTIONS

Traffic Index	Rigid Pavement Section Thickness (ft)	
	PCCP	CTPB
5.0 to 6.5	0.50	0.35
Notes: (1) PCCP = Portland Cement Concrete Pavement; (2) CTPB = Cement Treated Permeable Base		

4.8 SURFACE DRAINAGE

Inadequate control of run-off water and/or heavy irrigation after development of the site may lead to adverse water conditions. Maintaining adequate surface drainage, proper disposal of run-off water, and control of irrigation will help reduce the potential for future moisture-related problems and differential movements from soil heave/settlement.

Surface drainage should be carefully taken into consideration during grading, landscaping and building construction. Positive surface drainage should be provided to direct surface water away from structures and toward the street or suitable drainage devices. Ponding of water is not allowed. Paved areas should be provided with adequate drainage devices, gradients, and curbs to reduce run-off flowing from paved areas onto adjacent unpaved areas.

4.9 CEMENT TYPE AND CORROSION MEASURES

Based on the measured range of soluble sulfate content (see Appendix B) and Table 19A-A-4 of CBC (2001), sulfate resistant cement is not required for concrete in contact with on-site soils. Type I or Type II Portland cement is recommended. However, the chloride contents (80 to 120 ppm) are relatively high and resistivity (1,000 to 1,050 ohm-cms) is relatively low; thus the on-site soils are corrosive to buried ferrous metals. Corrosion mitigation measures, such as the following, are recommended:

- All steel and wire concrete reinforcement should have at least 3 inches of concrete cover where in contact with the native soils.
- Below-grade ferrous metals should be given a high-quality protective coating, such as 18-mil plastic tape, extruded polyethylene, coal-tar enamel, or Portland cement mortar.
- Below-grade metals should be electrically insulated (isolated) from above-grade metals by means of dielectric fittings in ferrous utilities and/or exposed metal structures breaking grade.

4.10 UTILITY TRENCH BEDDING AND BACKFILL

The Greenbook defines bedding as that material supporting, surrounding, and extending 1 foot above the top of the pipe. Bedding must be sand, gravel, crushed aggregate, or free draining granular material having a sand equivalent (SE) of at least 30. The onsite soil is not suitable for bedding material. Soil used for bedding must be inspected and tested by the geotechnical consultant prior to backfilling trenches.

Bedding must be placed on a firm and unyielding subgrade so that the pipe is supported for the full length of the barrel. The trench bottom must be inspected prior to placement of bedding material to ensure that a firm and unyielding subgrade is exposed. If the subgrade is loose or unstable, the unsuitable subgrade soil must be overexcavated and replaced with compacted bedding material. Bedding must be placed uniformly on each side of the pipe and compacted to at least 90 percent relative compaction in accordance with ASTM D1557. Bedding placement must conform with the Greenbook.

The Greenbook defines trench backfill as that material starting 1 foot above the top of the pipe and proceeding to the top of the trench. Onsite native soil is considered suitable for use as trench backfill. Backfill should be placed in loose lifts not exceeding 8 inches in thickness, conditioned to near optimum moisture content, and compacted to a minimum relative compaction of 90 percent in accordance with ASTM D1557. If hand-directed mechanical tampers are used for compaction, the loose lift thickness should not exceed 6 inches.

4.11 REVIEW OF CONSTRUCTION PLANS

Recommendations contained in this report are based on preliminary plans. The geotechnical consultant should review the final construction plans and specifications in order to confirm that the general intent of the recommendations contained in this report have been implemented into the final construction documents. Recommendations contained in this report may require modification or additional recommendations may be necessary based on the final design.

4.12 GEOTECHNICAL OBSERVATION AND TESTING

It is recommended that all grading, excavation, and installation of foundations be performed under the inspection and testing of the geotechnical consultant during the following stages of construction:

- Grading operations, including cuts, overexcavations and placement of compacted fill;
- Preparation of pavement subgrade and placement of aggregate base;
- Footing construction;
- Shoring installation, if necessary;
- Excavations and backfilling for utility trenches; and
- When any unusual subsurface conditions are encountered.

LOG OF BORING 1

Borehole Location:	Approx. Elevation: 746 ft — Sheet 1 of 2
Borehole Coordinates:	Date Started: 09/02/04 — Date Finished: 09/02/04
Drilling Equipment: CME 75	Total Depth: 46.0 ft — Depth to Groundwater: Groundwater Not Encountered
Drilling Method: Hollow Stem Auger	Borehole Diameter: 8 inches
Driller: Martini Drilling	Logged By: SC — Checked By: LY
Hammer Information: 140 lbs. Auto Hammer and 30"	

Elevation (ft)	Depth (ft)	Description	Remarks	Number	Blows/6"	Moisture Content (%)	Dry Density (pcf)	Additional Tests
746	0	(SM) Silty Sand, fine sand, reddish brown.						
								max
740	5			1	9/10	11	101.8	ds
735	10			2	5/8/9	8.9		ma
	14	(ML) Sandy Silt, fine sand, light brown to brown.						
730	15			3	27/50	10.2	111.5	c
	19	with trace of clay						
725	20			4	8/19/33	17.7		LL/PL, chem
	23	(ML) Sandy Silt, fine sand, reddish brown.						
720	25			5	32/50	11.6	115.2	
	27	(ML) Silt, Clayey, reddish brown.						

ARROYO GEOTECHNICAL

Exotic Animal Facility

Project Number: 12149-4000

FIGURE A1a

LOG OF BORING 1

Borehole Location:	Approx. Elevation: 746 ft		Sheet 2 of 2
Borehole Coordinates:	Date Started: 09/02/04		Date Finished: 09/02/04
Drilling Equipment: CME 75	Total Depth: 46.0 ft	Depth to Groundwater: Groundwater Not Encountered	
Drilling Method: Hollow Stem Auger	Borehole Diameter: 8 inches		
Driller: Martini Drilling	Logged By: SC		Checked By: LY
Hammer Information: 140 lbs. Auto Hammer and 30"			

Elevation (ft)	Depth (ft)	Lithology	Description	Remarks	Sampler	Number	Blows/6"	Moisture Content (%)	Dry Density (pcf)	Additional Tests
715	30		(ML) Silt, Clayey, reddish brown.			6	5/10/11	13.7		
			(ML) Sandy Silt, fine sand, reddish light brown.							
710	35					7	36/50	13.4	114.2	
			(ML) Silt, clayey, trace of fine sand, light brown.							
705	40					8	8/19/25	11.7		
700	45					9	33/50	14.1	118.9	
			Total Depth 46.0 ft Groundwater Not Encountered Backfilled with native soil							
695	50									
690	55									

ARROYO GEOTECHNICAL

Exotic Animal Facility

Project Number: 12149-4000

FIGURE A1b

LOG OF BORING 2

Borehole Location:	Approx. Elevation: 745 ft		Sheet 1 of 2
Borehole Coordinates:	Date Started: 09/02/04		Date Finished: 09/02/04
Drilling Equipment: CME 75	Total Depth: 41.0 ft	Depth to Groundwater: Groundwater Not Encountered	
Drilling Method: Hollow Stem Auger	Borehole Diameter: 8 inches		
Driller: Martini Drilling	Logged By: SC		Checked By: LY
Hammer Information: 140 lbs. Auto Hammer and 30"			

Elevation (ft)	Depth (ft)	Lithology	Description	Remarks	Sampler	Number	Blows/6"	Moisture Content (%)	Dry Density (pcf)	Additional Tests
745	0		(SM) Silty Sand, fine to medium sand, brown.							
								6.9		SE
740	5					1	13/15/9	5.3		
			(SM) Silty Sand, fine sand, light brown.							
735	10					2	43/50	7.2	117.3	
730	15					3	7/10/13	6		f
			(ML) Sandy Silt, fine sand, brown.							
725	20					4	46/50	8	107.1	
			(CL-ML) Silty Clay with sand, fine sand, brown.							
720	25					5	14/37/50	11.7		
			(ML) Sandy Silt, with trace of clay, fine sand, light brown.							

ARROYO GEOTECHNICAL

Exotic Animal Facility

Project Number: 12149-4000

FIGURE A2a

LOG OF BORING 2

Borehole Location:	Approx. Elevation: 745 ft		Sheet 2 of 2
Borehole Coordinates:	Date Started: 09/02/04		Date Finished: 09/02/04
Drilling Equipment: CME 75	Total Depth: 41.0 ft	Depth to Groundwater: Groundwater Not Encountered	
Drilling Method: Hollow Stem Auger	Borehole Diameter: 8 inches		
Driller: Martini Drilling	Logged By: SC		Checked By: LY
Hammer Information: 140 lbs. Auto Hammer and 30"			

Elevation (ft)	Depth (ft)	Lithology	Description	Remarks	Sampler	Number	Blows/6"	Moisture Content (%)	Dry Density (pcf)	Additional Tests
715	30		(ML) Sandy Silt, with trace of clay, fine sand, light brown.			6	16/30	15.6	107.0	ds
			(CL-ML) Silty Clay, light brown.							
710	35					7	6/10/13	18.8		
			(ML) Sandy Silt, fine sand,more silty, brown.							
705	40					8	36/50	10.3	110.9	
			Total Depth 41.0 ft Groundwater Not Encountered Backfilled with native soil							
700	45									
695	50									
690	55									

ARROYO GEOTECHNICAL

Exotic Animal Facility

Project Number: 12149-4000

FIGURE A2b

LOG OF BORING MOORPARK COLLEGE.GPJ ARROYO.GDT 9/28/04

LOG OF BORING 3

Borehole Location:	Approx. Elevation: **732 ft**	Sheet 1 of 2	
Borehole Coordinates:	Date Started: **09/02/04**	Date Finished: **09/02/04**	
Drilling Equipment: **CME 75**	Total Depth: **41.5 ft**	Depth to Groundwater: **Groundwater Not Encountered**	
Drilling Method: **Hollow Stem Auger**	Borehole Diameter: **8 inches**		
Driller: **Martini Drilling**	Logged By: **SC**	Checked By: **LY**	
Hammer Information: **140 lbs. Auto Hammer and 30"**			

Elevation (ft)	Depth (ft)	Lithology	Description	Remarks	Sampler	Number	Blows/6"	Moisture Content (%)	Dry Density (pcf)	Additional Tests
	0		(ML) Sandy Silt, fine sand, brown.							
730										
	5					1	5/4	9	93.9	c
725										
			(CL-ML) Silty Clay with sand, fine sand, reddish brown.							
	10					2	5/14/16	9.3		
720										
			(ML) Sandy Silt, fine sand with caliche, yellowish brown.							
	15					3	27/50	19.1	108.9	
			trace of clay, light brown.							
715										
	20					4	4/11/22	18.9		
710			(CL-ML) Silty Clay, fine sand, brown.							
	25					5	38/50	12	112.6	
705										

ARROYO GEOTECHNICAL

Exotic Animal Facility

Project Number: 12149-4000

FIGURE A3a

LOG OF BORING 3

Borehole Location:	Approx. Elevation: 732 ft	Sheet 2 of 2	
Borehole Coordinates:	Date Started: 09/02/04	Date Finished: 09/02/04	
Drilling Equipment: CME 75	Total Depth: 41.5 ft	Depth to Groundwater: Groundwater Not Encountered	
Drilling Method: Hollow Stem Auger	Borehole Diameter: 8 inches		
Driller: Martini Drilling	Logged By: SC	Checked By: LY	
Hammer Information: 140 lbs. Auto Hammer and 30"			

Elevation (ft)	Depth (ft)	Lithology	Description	Remarks	Sampler	Number	Blows/6"	Moisture Content (%)	Dry Density (pcf)	Additional Tests
	30		(CL-ML) Silty Clay, fine sand, brown.			6	4/10/17	20.1		
700			(SM) Silty Sand, fine sand, brown.							
	35					7	28/50	5.5	101.8	
695			fine to medium sand, trace of gravel.							
			(ML) Silt with Sand, fine sand, trace of clay, dark brown.							
	40					8	3/9/12	20.4		
690			Total Depth 41.5 ft Groundwater Not Encountered Backfilled with native soil							
	45									
685										
	50									
680										
	55									
675										

ARROYO GEOTECHNICAL

Exotic Animal Facility

Project Number: 12149-4000

FIGURE A3b

LOG OF BORING MOORPARK COLLEGE.GPJ ARROYO.GDT 9/28/04

LOG OF BORING 4

Borehole Location:	Approx. Elevation: 727 ft	Sheet 1 of 2	
Borehole Coordinates:	Date Started: 09/02/04	Date Finished: 09/02/04	
Drilling Equipment: CME 75	Total Depth: 41.0 ft	Depth to Groundwater: Groundwater Not Encountered	
Drilling Method: Hollow Stem Auger	Borehole Diameter: 8 inches		
Driller: Martini Drilling	Logged By: SC	Checked By: LY	
Hammer Information: 140 lbs. Auto Hammer and 30"			

Elevation (ft)	Depth (ft)	Lithology	Description	Remarks	Sampler	Number	Blows/6"	Moisture Content (%)	Dry Density (pcf)	Additional Tests
	0		(GM) Silty Gravel with sand, fine gravel, fine to coarse sand, brown.							
725								7.7		ma, EI
	5		(ML) Sandy Silt with gravel, fine to coarse sand with caliche, light brown to brown.			1	1/2/2	7		chem
720										
	10		(SM) Silty Sand with gravel, fine sand with some medium to coarse sand, fine gravel, yellowish brown.			2	14/36	7.9	111.4	
715										
	15		(ML) Sandy Silt with clay, fine sand, dark brown.			3	3/7/15	15.3		LL/PL
710										
	20					4	7/21	18	109.4	ds
705			(CL-ML) Silty Clay with sand, fine sand, brown.							
	25					5	3/10/16	14.1		
700			(ML) Sandy Silt, fine sand, traces of clay, reddish brown.							

ARROYO GEOTECHNICAL

Exotic Animal Facility

Project Number: 12149-4000

FIGURE A4a

LOG OF BORING 4

Borehole Location:	Approx. Elevation: 727 ft		Sheet 2 of 2
Borehole Coordinates:	Date Started: 09/02/04		Date Finished: 09/02/04
Drilling Equipment: CME 75	Total Depth: 41.0 ft	Depth to Groundwater: Groundwater Not Encountered	
Drilling Method: Hollow Stem Auger	Borehole Diameter: 8 inches		
Driller: Martini Drilling	Logged By: SC		Checked By: LY
Hammer Information: 140 lbs. Auto Hammer and 30"			

Elevation (ft)	Depth (ft)	Lithology	Description	Remarks	Sampler	Number	Blows/6"	Moisture Content (%)	Dry Density (pcf)	Additional Tests
	30		(ML) Sandy Silt, fine sand, traces of clay, reddish brown.			6	12/17	17.3	110.9	c
695										
			(CL-ML) Sandy Silty Clay, fine sand, reddish brown.							
	35					7	2/5/7	18.1		
690			(ML) Sandy Silt, fine sand, dark brown.							
	40					8	9/20	21.1	103.5	
685			Total Depth 41.0 ft Groundwater Not Encountered Backfilled with native soil							
	45									
680										
	50									
675										
	55									
670										

ARROYO GEOTECHNICAL

Exotic Animal Facility

Project Number: 12149-4000

FIGURE A4b

LOG OF BORING 5

Borehole Location:	Approx. Elevation: **727 ft**		Sheet 1 of 2
Borehole Coordinates:	Date Started: 09/02/04		Date Finished: 09/02/04
Drilling Equipment: **CME 75**	Total Depth: 41.5 ft	Depth to Groundwater: Groundwater Not Encountered	
Drilling Method: **Hollow Stem Auger**	Borehole Diameter: 8 inches		
Driller: **Martini Drilling**	Logged By: SC		Checked By: LY
Hammer Information: 140 lbs. Auto Hammer and 30"			

Elevation (ft)	Depth (ft)	Lithology	Description	Remarks	Sampler	Number	Blows/6"	Moisture Content (%)	Dry Density (pcf)	Additional Tests
	0		(SM) Silty Sand							
725								4.5		f
	5		(ML) Sandy Silt, fine sand, traces of clay, dark brown.			1	13/19	10.5	104.8	
720			(ML) Sandy Silt, fine sand, light brown.							
	10					2	7/12/15	13.3		
715										
	15					3	29/50	7.8	111.3	
710										
	20					4	3/12/18	12.3		
705										
	25					5	35/50	9.2	111.7	
700			(CL) Sandy Lean Clay, fine sand, light brown.							

ARROYO GEOTECHNICAL	**Exotic Animal Facility**	**Project Number:** 12149-4000
		FIGURE A5a

LOG OF BORING 5

Borehole Location:	Approx. Elevation: 727 ft		Sheet 2 of 2
Borehole Coordinates:	Date Started: 09/02/04		Date Finished: 09/02/04
Drilling Equipment: CME 75	Total Depth: 41.5 ft	Depth to Groundwater: Groundwater Not Encountered	
Drilling Method: Hollow Stem Auger	Borehole Diameter: 8 inches		
Driller: Martini Drilling	Logged By: SC		Checked By: LY
Hammer Information: 140 lbs. Auto Hammer and 30"			

Elevation (ft)	Depth (ft)	Lithology	Description	Remarks	Sampler	Number	Blows/6"	Moisture Content (%)	Dry Density (pcf)	Additional Tests
	30		(CL) Sandy Lean Clay, fine sand, light brown.			6	7/17/21	12.8		LL/PL, f
695			(ML) Sandy Silt, fine sand, dark brown.							
	35					7	25/43	13.5	112.2	
690			trace of clay.							
	40					8	9/16/25	13		
685			Total Depth 41.5 ft Groundwater Not Encountered Backfilled with native soil							
	45									
680										
	50									
675										
	55									
670										

ARROYO GEOTECHNICAL

Exotic Animal Facility

Project Number: 12149-4000

FIGURE A5b

LOG OF BORING 6

Borehole Location:	Approx. Elevation: 731 ft	Sheet 1 of 1	
Borehole Coordinates:	Date Started: 09/02/04	Date Finished: 09/02/04	
Drilling Equipment: CME 75	Total Depth: 11.5 ft	Depth to Groundwater: Groundwater Not Encountered	
Drilling Method: Hollow Stem Auger	Borehole Diameter: 8 inches		
Driller: Martini Drilling	Logged By: SC	Checked By: LY	
Hammer Information: 140 lbs. Auto Hammer and 30"			

Elevation (ft)	Depth (ft)	Lithology	Description	Remarks	Sampler	Number	Blows/6"	Moisture Content (%)	Dry Density (pcf)	Additional Tests
730	0		(ML) Sandy Silt, fine sand, trace of clay, dark brown.			1	4/2/1	13.3		R
	5		presence of caliche, light brown.			2	20/24	16.3	106.2	
725			(CL-ML) Sandy Silty Clay, fine sand, gray brown to brown.							
720	10					3	2/7/15	19.1		
			Total Depth 11.5 ft Groundwater Not Encountered Backfilled with native soil							
715	15									
710	20									
705	25									

ARROYO GEOTECHNICAL

Exotic Animal Facility

Project Number: 12149-4000

FIGURE A6

LOG OF BORING 7

Borehole Location:	Approx. Elevation: 720 ft	Sheet 1 of 1	
Borehole Coordinates:	Date Started: 09/02/04	Date Finished: 09/02/04	
Drilling Equipment: CME 75	Total Depth: 16.5 ft	Depth to Groundwater: Groundwater Not Encountered	
Drilling Method: Hollow Stem Auger	Borehole Diameter: 8 inches		
Driller: Martini Drilling	Logged By: SC	Checked By: LY	
Hammer Information: 140 lbs. Auto Hammer and 30"			

Elevation (ft)	Depth (ft)	Lithology	Description	Remarks	Sampler	Number	Blows/6"	Moisture Content (%)	Dry Density (pcf)	Additional Tests
720	0		(SM) Silty Sand, fine sand, dark brown.							
						1	9/9	7.6	102.2	f
			(ML) Sandy Silt, fine sand, trace of clay, light brown.							
715	5					2	19/30/40	14		
710	10					3	26/50	10.7	110.4	
			(CL) Lean Clay with sand, fine sand, light brown.							
705	15					4	11/18/26	16		LL/PL
			Total Depth 16.5 ft Groundwater Not Encountered Backfilled with native soil							
700	20									
695	25									

LOG OF BORING MOORPARK COLLEGE.GPJ ARROYO.GDT 9/28/04

ARROYO GEOTECHNICAL

Exotic Animal Facility

Project Number: 12149-4000

FIGURE A7

TABLE B-1. PERCENT PASSING # 200 SIEVE TEST RESULTS

Boring No.	Sample No.	Depth (ft)	Sample Description	% Passing # 200
B-2	S-3	15	Silty Sand (SM)	34
B-5	Bulk	1 to 5	Silty Sand (SM)	38
B-5	D-7	30	Sandy Clay with Silt (CL)	52
B-7	D-1	2	Silty Sand (SM)	41

TABLE B-2. ATTERBERG LIMITS TEST RESULTS

Boring No.	Sample No.	Depth (ft)	Sample Description	Liquid Limit	Plastic Limit	Plasticity Index
B-1	S-4	20	Sandy Silt (ML)	34	27	7
B-4	S-3	15	Sandy Silt (ML)	25	21	4
B-5	S-6	30	Sandy Lean Clay (CL)	29	20	9
B-5	S-4	15	Lean Clay (CL)	42	24	18

TABLE B-3. EXPANSION INDEX TEST RESULT

Boring No.	Sample No.	Depth (ft)	Sample Description	Expansion Index
B-4	Bulk	1 to 5	Silty Gravel (GM)	4

TABLE B-4. SAND EQUIVALENT TEST RESULT

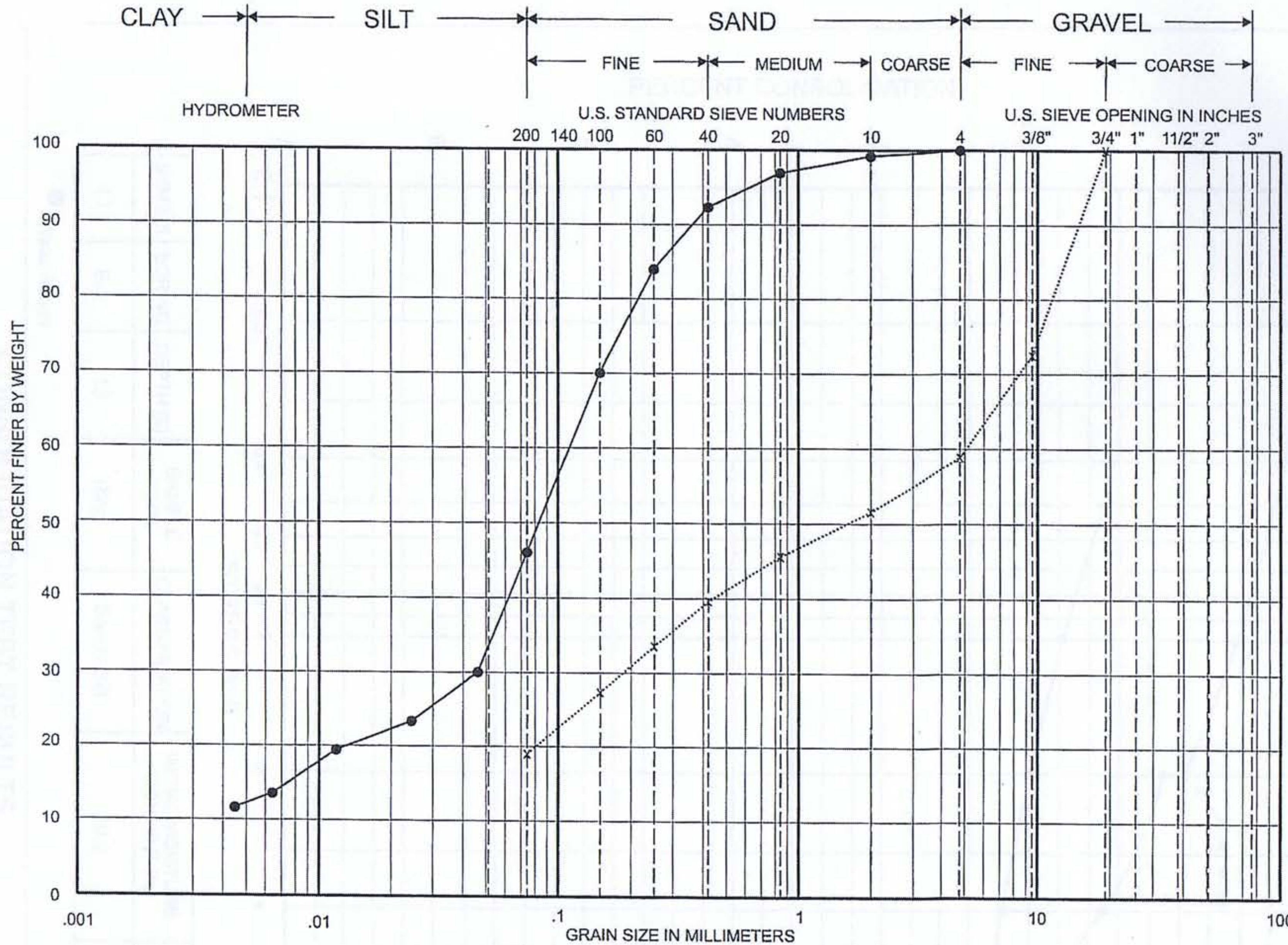
Boring No.	Sample No.	Depth (ft)	Sample Description	Expansion Index
B-2	Bulk	1 to 5	Silty Sand (SM)	92

TABLE B-5. R-VALUE TEST RESULT

Boring No.	Sample No.	Depth (ft)	Sample Description	R-Value
B-6	Bulk	1 to 5	Sandy Silt (ML)	32

TABLE B-6. SOIL CORROSIVITY TEST RESULTS

Boring No.	Sample No.	Depth (ft)	Sample Description	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (% by weight)	Chloride Content (ppm)
B-1	S-4	20	Sandy Silt (ML)	1050	7.19	0.022	80
B-4	S-1	5	Sandy Silt (ML)	1000	7.52	0.037	120



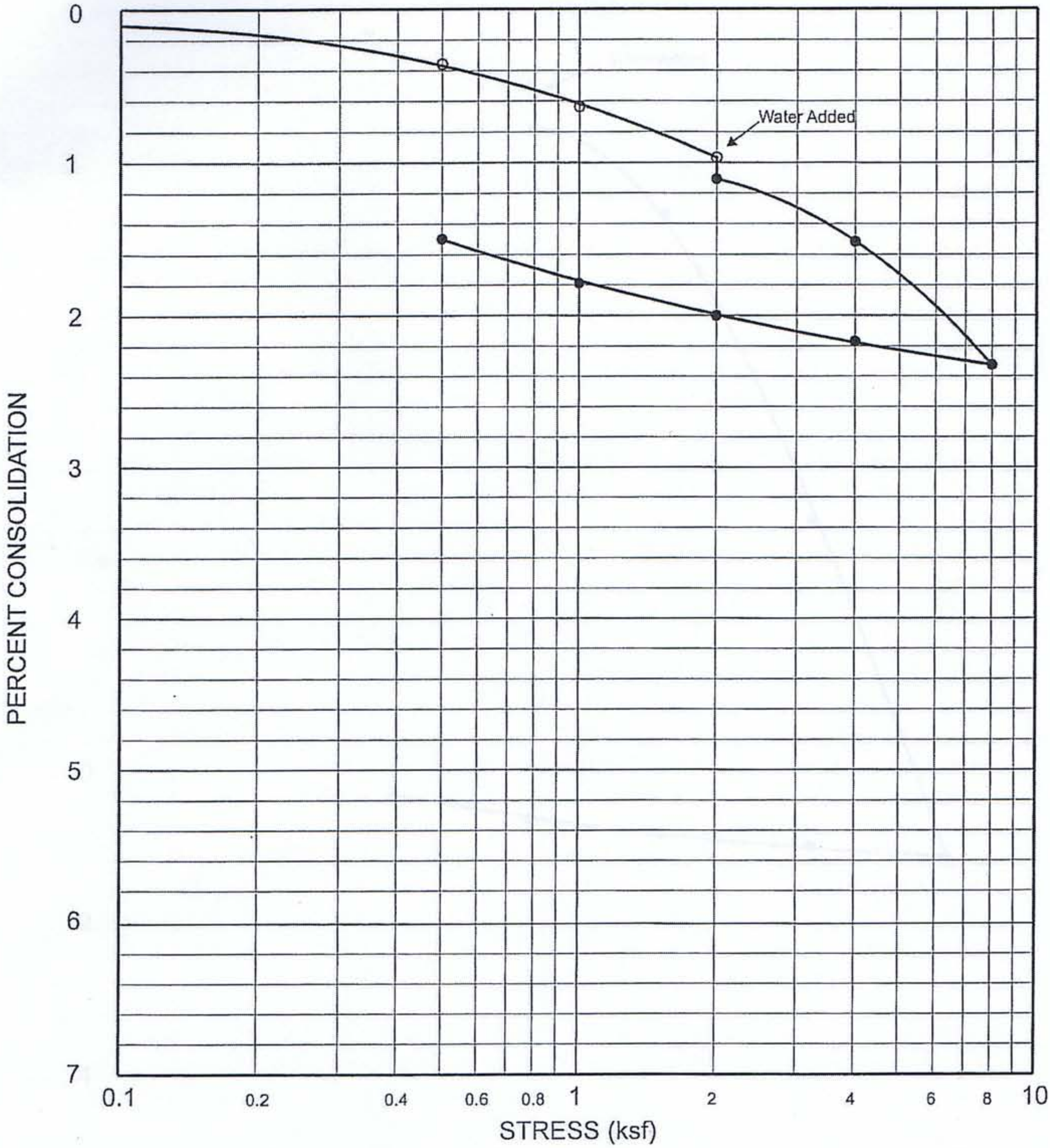
SYMBOL	BORING	DEPTH	CLASSIFICATION
—●—	B-1	10'	(SM) SILTY SAND
·····×·····	B-4	1' - 5'	(GM) SILTY GRAVEL WITH SAND

GRAIN SIZE DISTRIBUTION CHART

ARROYO GEOTECHNICAL

Project No. 12149-4000

Drawing Number B-1



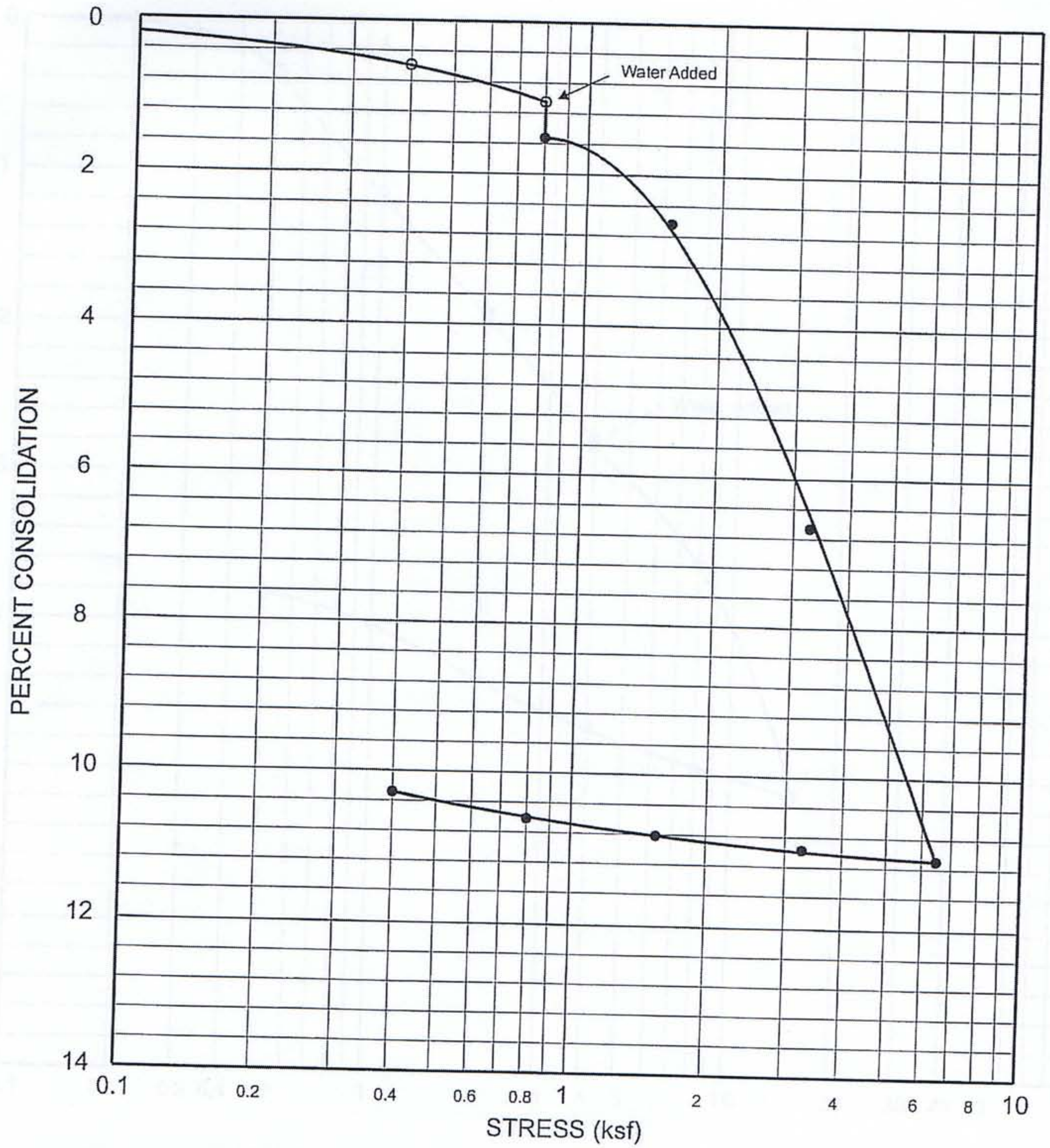
SYMBOL	BORING	DEPTH (ft)	SAMPLE TYPE	CLASSIFICATION	INITIAL MOISTURE CONTENT (%)	INITIAL DRY DENSITY (pcf)
O	B-1	15	Ring	Sandy Silt	10.2	111.5

● Water Added

CONSOLIDATION TEST RESULTS

ARROYO GEOTECHNICAL

Project No.	Drawing No.
12149-4000	B-2



SYMBOL	BORING	DEPTH (ft)	SAMPLE TYPE	CLASSIFICATION	INITIAL MOISTURE CONTENT (%)	INITIAL DRY DENSITY (pcf)
○	B-3	5	Ring	Sandy Silt	9.0	93.9

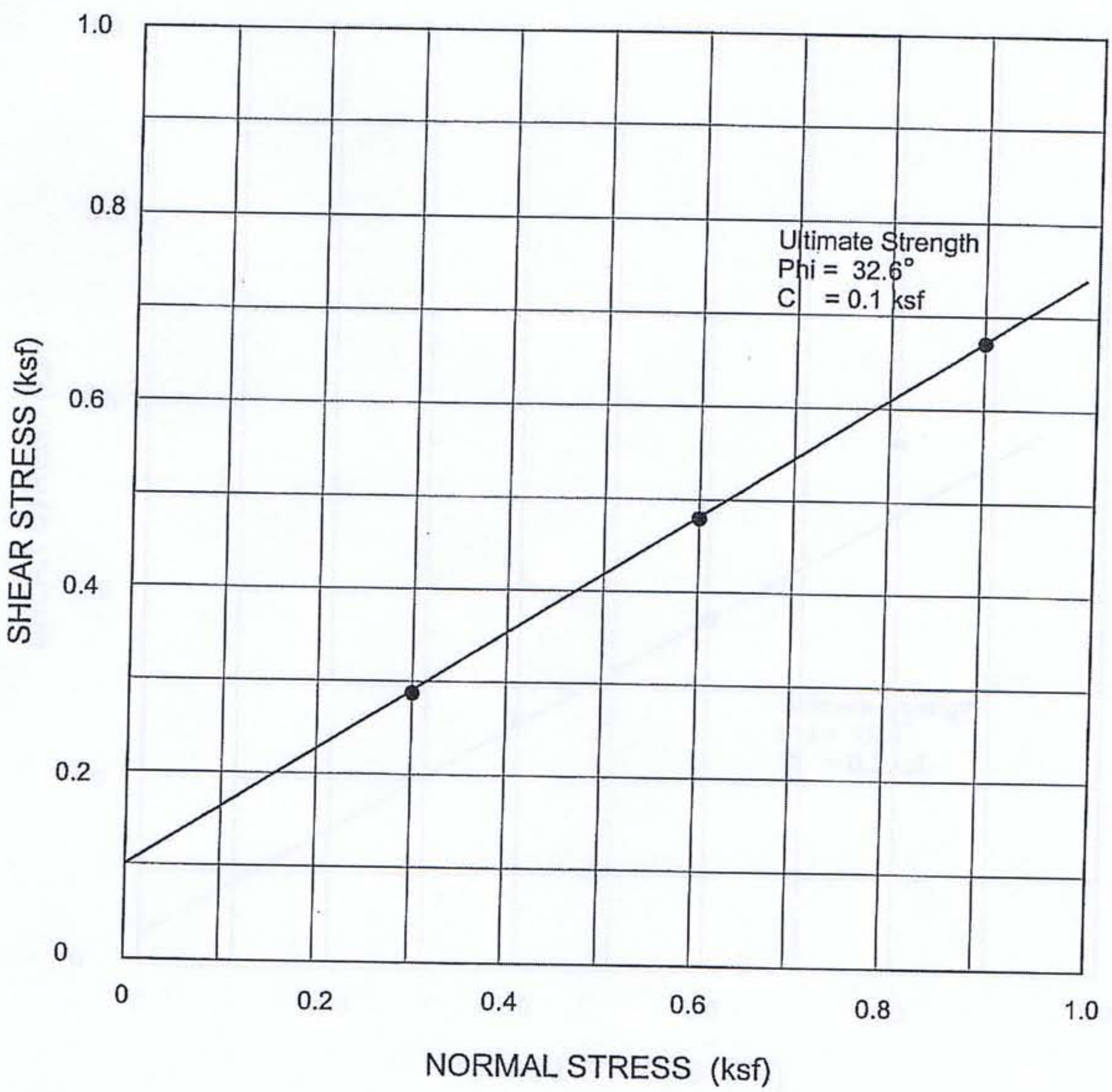
● Water Added

CONSOLIDATION TEST RESULTS

ARROYO GEOTECHNICAL

Project No. 12149-4000

Drawing No. B-3



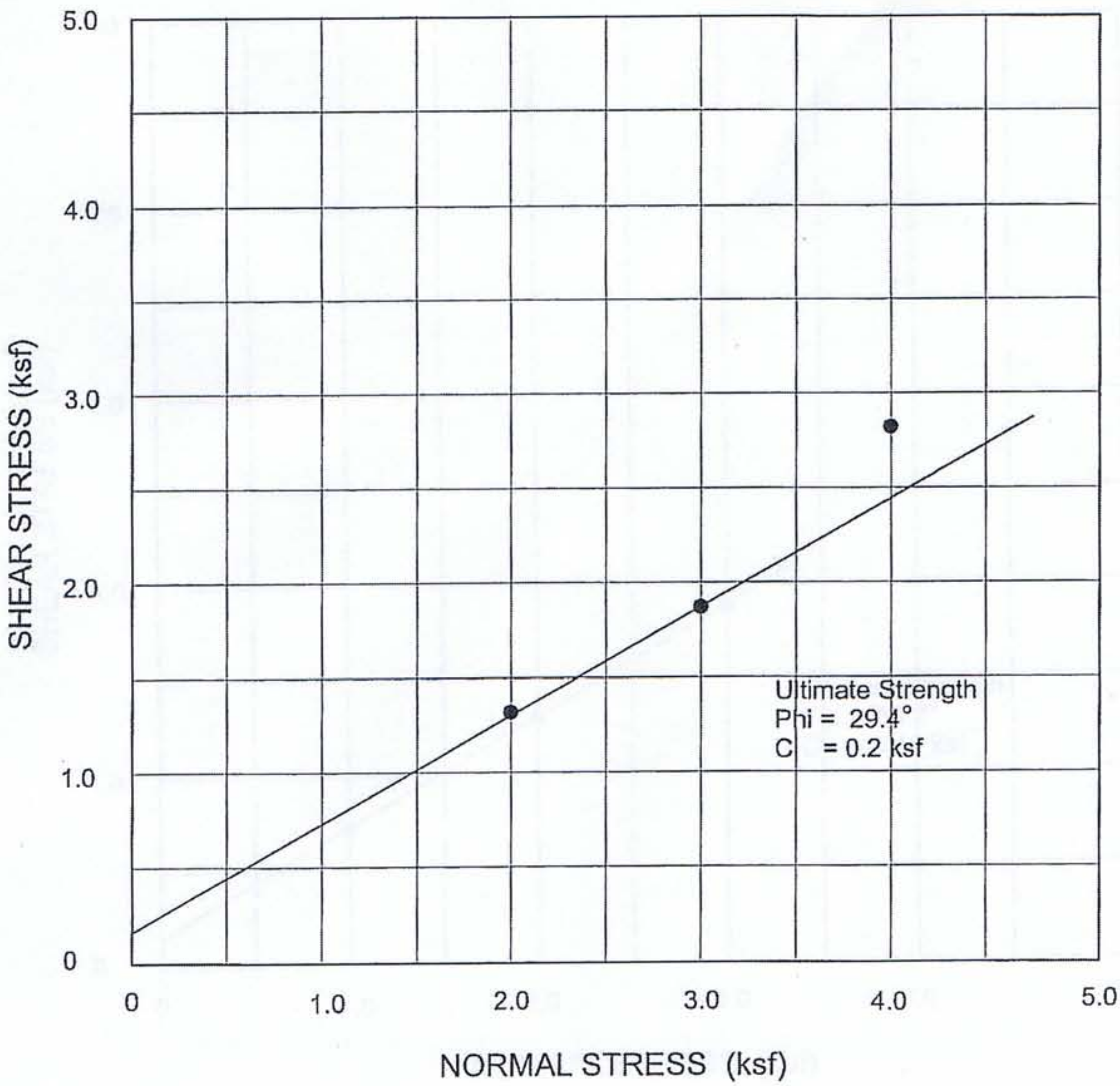
BORING	DEPTH (ft)	SAMPLE TYPE
B - 1	5	Silty Sand

DIRECT SHEAR TEST

ARROYO GEOTECHNICAL

Project No. 12149-4000

Drawing No. B-5



BORING	DEPTH (ft)	SAMPLE TYPE
B - 2	30	Sandy Silt

DIRECT SHEAR TEST

ARROYO GEOTECHNICAL

Project No. 12149-4000

Drawing No. B-6