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

October 6, 2022
Project No. 1003.037.02

Ventura College
Facilities, Maintenance & Operations
4667 Telegraph Road
Ventura, California 93003

Attention: Mr. Jess Sluder, Director of Facilities, Maintenance & Operations

Subject: Geotechnical Update, Ventura College Child Development Center, New Modular Building and Fabric Shade Structure

Dear Mr. Sluder:

This geotechnical letter report summarizes site conditions and provides recommendations for two proposed fabric shade structures to be located in the enclosed Child Development Center yard and a modular classroom building to be located just north of the north fence of that yard at the southwesternmost end of the Ventura College campus. The Child Development Center was constructed in the early 1990s. A geotechnical report was prepared for that site[1], and the data from that report was reviewed and evaluated as a basis for this updated letter report for the proposed construction.

PROPOSED PROJECT

The proposed modular building will be located northwest of the Child Development Center building in an adjacent unpaved storage yard. The approximately 40-foot wide by 48-foot long modular building will be set on-grade on a new asphalt concrete pavement surface. Loads on the pavement from the treated wood supports are not anticipated to exceed 400 pounds per square foot (psf). New asphalt concrete and concrete walkways also are planned in adjacent and nearby areas. Two fabric shades supported by pole foundations also are planned in the playground area located west of the Child Development Center classroom building complex.

SITE CONDITIONS

Surface conditions at the proposed modular building site consist of unpaved clayey silt. A similar modular building once occupied an area adjacent to the easterly end of the proposed modular classroom site, but was removed prior to 2018. The surface conditions at the former modular site consist of the asphalt concrete pavement and an approximate 15-foot wide by 65-foot long strip along the pavement edge where the pavement appears to have been removed to accommodate an access ramp for the former modular building. This unpaved area appears to have been filled in with sandy subgrade material to match adjacent asphalt concrete grades. The rest of the modular site is covered with asphalt concrete pavement or on-grade concrete sidewalk. The fabric shade locations are located in the lawn area of the fenced-in playground west of the Child Development Center classroom/office building.

---

[1] Buena Engineers, Inc. (1990), "Geotechnical Engineering Report for Ventura College Child Development Center, Ventura, California," BEI Report No. 90-1-207, Project No. B-18630-V1, dated January 24.

Past Use of Modular Building Pad Area

The modular building area is located in an asphalt concrete parking lot immediately north of the fence for the rear play yard of the Child Development Center. This parking lot appears to have been constructed in conjunction with the Child Development Center, as its layout was shown on a plan prepared in early 1990 in the Geotechnical Report[1] for the Child Development Center. Surface conditions in this lot show no signs of distress such as longitudinal and transverse cracking of the asphalt concrete pavement.

Subsurface Conditions from Adjacent Boring at Child Development Center

Earth materials encountered in the borings excavated in the adjacent Child Development Center consist of silty clay (CL) and clayey silt (ML). Groundwater was not encountered in any of the four borings advanced to depths between 16 and 41 feet; however, near surface soils are anticipated to be very moist, that is several percentage points over optimum moisture content due heavy rainfall this past winter.

Estimate of Soil Subgrade Modulus

A modulus of subgrade reaction, "k," for onsite clayey silt subgrade is estimated at 100 pounds per cubic inch (pci).

ASCE 7-16 / 2019 CALIFORNIA BUILDING CODE SEISMIC PARAMETERS

Seismic design parameters for the west campus area were generated using site coordinates 34.2759˚ N, -119.2368˚ W, and in accordance with 2019 CBC and ASCE 7-16. Soil conditions are consistent with Site Class D, characterized by undrained shear strengths typically between about 1,000 and 2,000 pounds per square foot (psf) and average (uncorrected) blow counts between 15 and 50 (in accordance with Table 20.3-1 in Chapter 20 of ASCE 7-16 and Section 1613.2.2 of the 2019 CBC).

The following seismic parameters are recommended for design for Risk Category II for Site Class "D" soil profile:

Seismic Parameter[1]	Value	CBC Source	ASCE 7-16 Source
Mapped Spectral Response Acceleration			
S_s	1.991	Figure 1613.2.1 (1)	Figure 22-1
S_1	0.749	Figure 1613.2.1 (2)	Figure 22-2
S_{MS}	1.991	Equation 16-36	Equation 11.4-1
S_{M1}	1.273	Equation 16-37	Equation 11.4-2
Design Spectral Response Acceleration			
S_{DS}	1.327	Equation 16-39	Equation 11.4-3
S_{D1}	0.849	Equation 16-40	Equation 11.4-4
PGA (MCE_G)	0.875g		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 site-specific ground motion hazards analysis is not required for the proposed animal enclosure per ASCE 7-16, Sec. 11.4.8.

POLE FOUNDATION RECOMMENDATIONS

Drilled cast-in-place concrete piers that embed the fabric shade column base should be designed to derive all lateral support from undisturbed native soil encountered below a depth of about 2 feet below existing grade, i.e., neglecting the upper 2 feet of soils. Drilled shafts shall be observed by the geotechnical representative during excavation to verify depth to undisturbed native soil at each foundation location 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 pier 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 2 feet of embedment should be neglected. A coefficient of friction of 0.35 may be combined with the passive resistance without reduction in the total resistance.

Allowable Bearing. An allowable bearing capacity of 3,000 psf is recommended for end-bearing on undisturbed native materials consistent with the embedment criteria presented above.

Drilled Shaft Construction Considerations. Drilled shafts for shade column foundations should be excavated to the minimum design embedment depth determined by others. The bottom of the drilled shaft should consist of clayey silt to silty clay that is not disturbed by the drilling auger. This should be achieved by using a bucket auger and 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. The drilling operation should be observed by Geotechniques.

All loose slough and disturbed materials and any water accumulated on the shaft bottom should be removed prior to setting pole base and/or reinforcement and prior to concrete placement. Pole base/reinforcement should be centered securely in shaft prior to concrete placement.

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 in the event sandy lenses or seepage from perched water are encountered. 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.”

SITE SUBGRADE PREPARATION RECOMMENDATIONS

The modular building is anticipated to be set on asphalt concrete pavement with concrete sidewalks surrounding the perimeter. The upper 1 foot of subgrade in areas to receive asphalt concrete or concrete sidewalks should be prepared as recommended below.

Contractor Awareness

Contractor shall use excavation, transporting, processing, and compaction equipment and methods appropriate for conditions anticipated and encountered in site subgrade materials. Mitigation of adverse subgrade and fill conditions encountered or aggravated by actions of Contractor shall be the responsibility of the Contractor in terms of cost and schedule.

Demolition of Existing Asphalt Concrete

Existing asphalt concrete to be removed should have straight saw-cut edges. Areas to receive new asphalt concrete that abuts existing asphalt concrete should have a level 'T-cut' at least 1½ inches deep (or 3 times the maximum aggregate size in the asphalt concrete mix, whichever is thicker) extending at least 18 inches into existing asphalt concrete.

Aeration of the upper 1 foot of exposed subgrade is recommended at completion of demolition and start of construction activities followed by frequent re-ripping ('turning') of that subgrade to maximize aeration potential. Alternatively, subgrade soils may be spread outside the excavation to aereate or the upper one foot of subgrade treated with 2 to 3 percent (by weight) of cement in accordance with Greenbook procedures (Section 301-3.2, [International Conference of Building Officials (ICBO)], latest edition) to accelerate the drying process, enhance compaction, and bridge over underlying moist soils.

On-Grade Concrete Pad, Sidewalk, and Asphalt Concrete Pavement Areas

The upper 1 foot of subgrade below the aggregate base course for both asphalt concrete pavement and on-grade concrete should be scarified, reduced to pea-sized consistency, and moisture-conditioned to between 0 and 2 percent above the optimum moisture content, and compacted to a minimum of 90 percent of the maximum dry density in accordance with the "Fill Placement and Compaction" section presented subsequently (and the preceding paragraph).

Fill Placement and Compaction

Onsite soils are anticipated to be used as general fill once cleared of organic material, demolition or other debris, and any oversized rock greater than 2 inches in maximum dimension. Earth materials in the upper 1 foot of subgrade should consist of onsite excavated general fill or imported non-expansive granular "fill" materials with an Expansion Index less than 40. The upper 1 foot of subgrade materials should be compacted to a minimum of 90 percent of the maximum dry density determined from ASTM D1557.

Subgrade and onsite soils used as fill and imported fill materials should be aerated, placed and compacted at a moisture content between 0 and 2 percent over optimum. 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 and at dryer moisture contents 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 at dryer moisture contents (to ameliorate impact of underlying wetter materials) prior to placing the next layer or course. Subgrade materials should be firm and unyielding when proof-rolled with a full water truck once finish subgrade elevation is achieved.

Rock, gravel and other oversized material greater than 2 inches in diameter should be removed from the subgrade and fill material being placed. Rock less than 2 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 subgrade and 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, that material should be aerated by blading or other methods, including cement treatment as described in last paragraph of preceding section.

FILL MATERIALS

Fill should be free of organics, oversize material greater than 2 inches in diameter, trash and debris, and other deleterious material. The expansion index of imported materials or clayey onsite materials used as general fill should not exceed 40.

Onsite Soils. Based on the boring log data, onsite soils are generally anticipated to consist of clay to clayey silt that meet the requirements for general fill.

General Fill. General fill materials should have an expansion index less than or equal to 40. If necessary, general fill may be blended with sand, aggregate base, or dry cement to reduce the expansion index.

Clayey onsite general fill materials are anticipated to be at a high moisture content. Aeration and ongoing control of moisture content, compaction layer thickness, and compatibility of equipment type used will be necessary to achieve the recommended compaction.

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

Aggregate Base. Aggregate base materials should consist of imported material conforming to Caltrans Standard Specifications for Class 2 aggregate base, Section 26-1.02B [Caltrans, 2019] or Section 200-2.4 of the “Greenbook” (International Conference of Building Officials [ICBO], latest edition) for Crushed Miscellaneous Base (CMB). Aggregate base materials used in the playground area should not contain recycled asphalt concrete.

Bedding Sand in Utility Trenches. Sand used as bedding and pipe zone sand in utility trenches should conform to Caltrans Standard Specifications for sand bedding, Section 19-3.02C (Type “D” backfill) (2019). The sand should have a gradation that allows the material to maintain a compacted surface condition during construction operations until concrete placement or until pipe and/or subsequent lift placement (i.e., as bedding or pipe zone sand in utility trench).

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 2 percent over optimum moisture content prior to placing in trench. Backfill should be compacted to a minimum of 90 percent relative compaction as determined from ASTM D1557.

Rock larger than 2 inches in maximum dimension should be excluded from 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 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 should meet the preceding recommendations of this report, “Fill Placement and Compaction” and “Fill Materials.”

ON-GRADE CONCRETE PAD

On-grade concrete in the parking lot area should be underlain by a minimum of 4 inches of aggregate base.

The aggregate base course beneath the concrete section should be moisture conditioned to optimum moisture content before placing and spreading should be compacted to a minimum of 95 percent of the maximum dry density. Aggregate base materials should be laterally confined during compaction to achieve the minimum compaction requirements.

On-grade concrete should have a minimum 28-day compressive strength of 3,500 psi, a minimum Modulus of Rupture of 530 psi, and should be reinforced with No. 4 bars at 18 inches each way. Reinforcement should be supported at mid-slab at time of concrete pour. The concrete surface should be sloped to drain and match surrounding grades. Crack control joints should be located to create square, not rectangular, panels and should not exceed spacing intervals of 12 feet in both directions.

ASPHALT CONCRETE IN PARKING LOT

The asphalt concrete placed in the existing parking lot should have a minimum section thickness of 3 inches of asphalt concrete over 6 inches of aggregate base. Both the aggregate base course and the asphalt concrete should be compacted to a minimum of 95 percent of the maximum density. The aggregate base course should be firm and unyielding when proof-rolled with a full water truck prior to the asphalt concrete lay-down.

CLOSURE

The recommendations in this letter are specific to the scope of the proposed Child Development Center modular and fabric shade structures presented herein.

We appreciate the opportunity to be of service to Ventura College and the Ventura County Community College District. Please call if you have any questions concerning this letter.

Sincerely,

Geotechniques

Carole Wockner

Carole Wockner, P.E.
Principal Engineer
R.C. E. No. 74407, exp 09/30/23

Attachment: Referenced Geotechnical Engineering Report by BEI (1990)

GEOTECHNICAL ENGINEERING REPORT

For

Ventura College Child Development Center
Ventura, California

B-18630-V1
January 1990

by

BUENA ENGINEERS, INC.
1731-A WALTER STREET
VENTURA, CALIFORNIA

Buena Engineers, Inc.

AN EARTH SYSTEMS, INC. COMPANY

1731-A WALTER STREET · VENTURA, CALIFORNIA 93003 · (805) 642-6727

January 24, 1990

B-18630-V1
90-1-207

Gilbert Putnam
Ventura County Community College District
71 Day Road
Ventura, CA 93003

Project: Ventura College Child Development Center
Ventura, California
Subject: Geotechnical Engineering Report

As authorized, we have performed a geotechnical study for the subject project. The accompanying Geotechnical Engineering Report presents the results of our subsurface exploration and laboratory testing program, and our conclusions and recommendations for geotechnical engineering aspects of project design. Our services were performed using the standard of care ordinarily exercised in this locality when this report was prepared.

Based on our study, it is our opinion that the site is suitable for the proposed development from a Geotechnical Engineering standpoint provided that the recommendations of this report are successfully implemented. Grading recommendations reflect the presence of soft, compressible soils at bearing depth (see "Site Grading/Development" section of text).

We have appreciated this opportunity to be of service to you on this project. Please call if you have any questions, or if we can be of further service.

Respectfully submitted,

BUENA ENGINEERS, INC.

Carole Wockner
Staff Engineer

Reviewed and Approved

Fred Romani, Ph.D., P.E.
Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER · FRED A. ROMANI · GE 2076 · EXP. 12/31/91 · GEOTECHNICAL · STATE OF CALIFORNIA

CW/RMB/rs

Geo

Copies: 1-Ventura County Community College District
5-Fisher and Wilde Architects
1-Vta file

VENTURA
(805) 642-6727

LANCASTER
(805) 948-7538

BAKERSFIELD (805) 327-5150 · SANTA BARBARA (805) 966-9912 · PALM SPRINGS (619) 345-1588 · SAN LUIS OBISPO (805) 544-6187

TABLE OF CONTENTS

INTRODUCTION

A. Project Description

This report presents results of a Geotechnical Engineering investigation performed for the proposed Ventura College Child Development Center to be located on the southwest corner of the Ventura College Campus in Ventura, California.

1. We anticipate that the site will be developed by minor grading of the site to achieve proper drainage.
2. The proposed 8500 square foot structure will be single story, of wood frame construction .
3. Structural considerations for building column loads of up to 60 kips with maximum wall loads of 3 kips per lineal foot were used as a basis for the recommendations of this report. If actual loads vary significantly from these assumed loads, Buena Engineers, Inc. should be notified since reevaluation of the recommendations contained in this report may be required.

B. Purpose and Scope of Work

The purpose of the geotechnical investigation that led to this report was to evaluate the soil conditions of the site with respect to the proposed child development center. These conditions include surface and subsurface soil types, expansion potential, settlement potential, bearing capacity, the presence or absence of subsurface water and liquefaction potential . The scope of our work included:

1. Reconnaissance of the site.
2. Drilling, sampling and logging of four (4) continuous flight auger borings to investigate soils and groundwater conditions.
3. Laboratory testing of soil samples obtained from the subsurface exploration to determine their physical and engineering properties.
4. Geotechnical analysis of the data obtained.
5. Consultation with owner representatives and design professionals.
6. Preparation of this report.

Contained in the report are:

1. Discussions on local soil and groundwater conditions.
2. Results of laboratory and field tests.
3. Conclusions and recommendations pertaining to site grading and structural design.

C. Site Setting

1. The site of the proposed improvements is located at the extreme southwest corner of the Ventura College Campus on the northwest corner of Telegraph Road and West Campus Way. See the Vicinity Map in Appendix A.
2. The vacant site is currently a landscaped greenbelt.
3. Underground utilities, such as irrigation lines, traverse the site.

SOIL CONDITIONS

A. Evaluation of the subsurface indicates that soils are generally comprised of fine sandy, very clayey silt, and very silty clay.

B. Soils encountered at approximate bearing depths, vary from firm to moderately soft, and are characterized by slightly low to moderately high blowcounts and in-place densities.

C. Site soils exhibit moderate plasticity. Expansion determinations indicate that bearing soils lie in the "medium" expansion range in accordance with Table 29-AR. A copy of this Table is included in Appendix B of this report.

D. Consolidation test results indicate that bearing soils are within the range of relatively non-compressible to compressible.

E. Groundwater was not encountered to a depth of forty-one (41) feet; however, soils below a depth of approximately thirty (30) feet exhibited moisture contents significantly higher than optimum. Additionally, soils in the upper five (5) feet were usually over optimum moisture content.

F. Soils can be cut by normal heavy grading equipment.

LIQUEFACTION

A. Earthquake-induced vibrations can be the cause of several significant phenomena, including liquefaction in fine sands and silty sands. Liquefaction results in a complete loss of strength and can cause structures to settle or even overturn if it occurs in the bearing zone. If liquefaction occurs beneath sloping ground, a phenomenon known as lateral spreading can occur. Liquefaction is typically limited to the upper forty (40) feet of the subsurface soils.

B. Four (4) conditions are generally considered to have the most significance in liquefaction:

1. Fine sands and silty sands that are poorly graded are the soil types most susceptible to liquefaction. Poor gradation can be identified by a Uniformity Coefficient between 2 and 10. Soils that contain a wide range of soil particle sizes and coarse soils that drain freely are not generally susceptible to liquefaction. A diagram illustrating the envelope of potentially liquefiable soils is included in Appendix B.
2. The water table, perched or otherwise, usually must be within the upper forty (40) feet of soils for liquefaction to occur. Soils above the water table cannot liquefy.
3. Liquefaction has been shown to be unlikely where the relative density of the soils is greater than seventy (70) percent. A soil that has relative density less than seventy (70) percent may liquefy depending on a number of factors. The two most important of which are the strength and duration of the seismic shaking and the percentage of soil particles that are silt and clay sized.
4. If the clay content (determined by the percent of particles finer than 0.005 mm) is greater than twenty (20) percent, the soil is usually considered non-liquefiable, unless it is extremely sensitive.

C. An examination of the conditions existing at the site, in relation to the criteria listed above, indicates the following:

1. Groundwater was not encountered at the site to a depth of forty-one (41) feet.
2. Soil types B2, B3, and C2 contain clay contents in excess of twenty (20) percent.

D. Based on the above, it is our opinion that conditions that indicate a potential for liquefaction do not exist at this site.

CONCLUSIONS AND RECOMMENDATIONS

The site is suitable for the proposed development from a Geotechnical Engineering standpoint provided that the recommendations contained in this report are successfully implemented into the project.

1. Due to non uniform bearing conditions and the compressibility of soils encountered in the upper four (4) feet, overexcavation of site soils will be required.
2. A liquefaction potential is virtually non-existent at this site.

A. <u>Grading</u>

1. <u>General Grading</u>
   a. Grading at a minimum should conform to Chapter 70 of the Uniform Building Code and Appendix C, "Standard Grading Specifications", of this report.
   b. The existing ground surface should be initially prepared for grading by removing all vegetation, trees, large roots, debris, non complying fill, and any organic material. Roots from tree removals should be thoroughly extracted. Voids created by removal of such material should be properly backfilled and compacted. No compacted fill should be placed unless the underlying soil has been observed by the Geotechnical Engineer. Specific suggestions for removal and disposal of unsuitable materials are given in Appendix C of this report, "Standard Grading Specifications".
   c. The bottom of all excavations should be observed by a representative of this firm prior to processing or placing fill.
   d. Fill and backfill placed at near optimum moisture in layers with loose thickness not greater than eight (8) inches should be compacted to a minimum of ninety (90) percent of the maximum dry density obtainable by the ASTM D 1557 test method.
   e. Loss due to clearing could be approximately two (2) inches. Shrinkage of soils affected by compaction is estimated to be between ten (10) and fifteen (15) percent, and subsidence of underlying soils is estimated to be about one-tenth (0.1) of a foot.
   f. Import soils used to raise site grade should be equal to, or better than, on-site soils in strength, expansion, and compressibility characteristics. Import soil can be evaluated, but will not be prequalified by the Geotechnical Engineer. Final

comments on the characteristics of the import will be given after the material is at the project site in enough quantity to complete the project.

g. Roof draining systems should be designed so that water is not discharged into bearing soils or near structures. Final site grade could be such that all water is diverted away from the structures, and is not allowed to pond.

h. Foundation soils under floor slabs should be scarified to at least twelve (12) inches, moisture conditioned to at or near optimum content, and recompacted to a minimum of ninety (90) percent of the maximum ASTM D 1557 laboratory density.

i. It is recommended that Buena Engineers, Inc. be retained to provide continuous Geotechnical Engineering services during site development and grading, and foundation construction phases of the work to observe compliance with the design concepts, specifications and recommendations, and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

j. Plans and specifications should be provided to Buena Engineers, Inc. prior to grading. Plans should include the grading plans, foundation plans, and foundation details. Preferably, structural loads should be shown on the foundation plans.

2. Site Grading/Development

a. Due to the variability in density and compressibility of site soils at bearing depth, overexcavation and recompaction of soils in the building area will be necessary to decrease the potential for differential settlement and provide more uniform bearing conditions. Soils should be overexcavated to a depth of three (3) feet below existing grade throughout the entire building area, and to a distance of five (5) feet beyond the perimeter of the building(s).

b. Areas outside of the building area to receive fill, exterior slabs-on-grade, sidewalks or paving should be scarified to a depth of one(1) foot, moisture conditioned, and recompacted.

c. On-site soils may be used for fill once they are cleaned of all organic material, rock, debris, and irreducible material larger than eight (8) inches.

d. If pumping soils, or otherwise unstable soils, are encountered, stabilization of the excavation bottom will be required prior to placing fill. This can be accomplished by drying the soils, working thin lifts of one and one-half (1-1/2)

f. Allowable bearing values are net and are applicable for dead plus reasonable live loads.

g. Bearing values may be increased by one-third when transient loads such as wind and/or seismicity are included.

h. Lateral loads may be resisted by soil friction on floor slabs and foundations and by passive resistance of the soils acting on foundation stem walls. Lateral capacity is based on the assumption that any required backfill adjacent to foundations and grade beams is properly compacted.

i. The recommendations that follow regarding depths, widths, reinforcement and premoistening for footings are generally the same as those given in Table 29-AR of the Uniform Building Code as locally adopted for the "medium" expansion range. It should be noted, however, that these recommendations are minima, and that other, more stringent structural considerations may govern. Actual footing designs, depths, widths and reinforcement should be provided by the Structural Engineer, but should not be less than values recommended herein.

j. Reinforcement of footings bottomed in soils in the "medium" expansion range should be with one (1) No. 4 bar, both top and bottom, with No. 3 bars at twenty four (24) inches in exterior footings bent three (3) feet into slab.

k. Bearing soils in the "medium" expansion range should be premoistened to one hundred thirty (130) percent of optimum moisture content to a depth of twenty-seven (27) inches below lowest adjacent grade. Premoistening should be confirmed by testing.

l. Foundation excavations should be visually observed by a representative of Buena Engineers, Inc. after excavation, but prior to placing of reinforcing steel or concrete.

2. Slabs-on-Grade

a. Concrete slabs should be supported by compacted structural fill as recommended earlier in this report.

b. It is recommended that perimeter slabs (walks, patios, etc.) be designed relatively independent of footing stems (i.e., free floating) so foundation adjustment will be less likely to cause cracking.

c. Slabs should be underlain with a minimum of four (4) inches of sand. Areas where floor wetness would be undesirable should be underlain with a moisture inch (minimum size) float rock into the excavation bottom until stabilization is achieved, or by lime or cement treatment of the soils. Use of geotextiles is another possibility. Based on our experience in this area, we anticipate that stabilization is likely to be necessary and unit prices should be obtained from the Contractor in advance for this work.

3. Utility Trenches

a. Utility trench backfill should be governed by the provisions of this report relating to minimum compaction standards. In general, service lines inside of the property lines may be backfilled with native soils compacted to ninety (90) percent of maximum density. Backfill of offsite service lines will be subject to the specifications of the jurisdictional agency or this report, whichever are greater.

b. Backfill operations should be observed and tested by the Geotechnical Engineer to monitor compliance with these recommendations.

c. Excavated soils are anticipated to be over optimum moisture content and drying may be necessary before replacing as compacted backfill.

B. Structural Design

1. Foundations

a. Conventional continuous footings and/or isolated pad footings may be used with grade beams for support of structure.

b. Footings with a minimum embedment depth of twenty-one (21) inches should bear into firm recompacted soils as recommended earlier in this report.

c. Conventional continuous footings may be designed based on an allowable bearing value of 2100 psf for an assumed footing size of twelve (12) inches wide and twenty-one (21) inches deep (minimum for single story in "medium" expansion category).

d. Isolated pad footings with grade beams may be designed based on an allowable bearing value of 2400 psf for an assumed square footing size of twenty-four (24) inches by twenty-one (21) inches deep.

e. The above bearing values may be increased by 50 psf for each additional six (6) inches of footing width and by 150 psf for each additional six (6) inches of footing depth, to a maximum value of 2700 psf.

barrier to reduce moisture transmission from the subgrade soils to the slab. The membrane should be covered with two (2) inches of the sand. The sand should be lightly moistened just prior to placing concrete.

d. Reinforcement and premoistening recommendations given herein for slabs are the same as those given in Table 29-AR for soils in the "medium" expansion range. It should be noted, however, that these recommendations are minima, and that other, more stringent structural considerations, such as large construction loads, may govern. Actual reinforcement and slab thickness should be determined by the Structural Engineer, but should not be less than values recommended herein.

e. Slabs bottomed on soils in the "medium" expansion range should be reinforced as a minimum with 6 x 6 - 6/6 WWF placed a mid-slab.

f. Soils underlying slabs that at in the "medium" expansion range should be premoistened to one hundred thirty (130) percent of optimum moisture content to a depth of twenty-seven (27) inches below lowest adjacent grade.

g. Premoistening of slab areas should be observed and tested by Buena Engineers, Inc. for compliance with these recommendations prior to placing of sand, reinforcing steel, or concrete.

3. Frictional and Lateral Coefficients

a. Resistance to lateral loading may be provided by friction acting on the base of foundations. A coefficient of friction of 0.50 may be applied to dead load forces. This value does not include a factor of safety.

b. Passive resistance acting on the sides of foundation stems equal to 350 pcf of equivalent fluid weight may be included for resistance to lateral load. This value does not include a factor of safety. When passive resistance is used in conjunction with friction, the coefficient of friction should be reduced by one-third (1/3) in determining the total lateral resistance.

c. A one-third (1/3) increase in the quoted passive value may be used when considering transient loads such as wind and seismicity.

d. Passive resistance of soils against grade beams combined with frictional resistance between the floor slabs and supporting soils may be used provided that a one-third (1/3) reduction in the coefficient of friction to 0.34 is used.

4. Settlement Considerations
   a. Maximum expected settlements of less than one (1) inch is anticipated for foundations and floor slabs designed as recommended.
   b. Differential settlement between adjacent load bearing members should be less than one-half the total settlement.

5. Retaining Walls
   a. Conventional cantilever retaining walls backfilled with compacted on-site soils may be designed for active pressures of 40 pcf of equivalent fluid weight for well-drained, level backfill.
   b. The pressure listed above was based on the assumption that backfill soils will be compacted to ninety (90) percent of maximum dry density as determined by the ASTM D 1557 Test Method.
   c. The lateral earth pressure to be resisted by the retaining walls or similar structures should be increased to allow for surcharge loads. The surcharge considered should include the loads from any structures or temporary loads that would influence the wall design.
   d. A backdrain or an equivalent system of backfill drainage should be incorporated into the retaining wall design. Backfill immediately behind the retaining structure should be a free-draining granular material. Alternately, the back of the wall could be lined with a geodrain system.
   e. Compaction on the uphill side of the wall within a horizontal distance equal to one (1) wall height should be performed by hand-operated or other light weight compaction equipment. This is intended to reduce potential "locked-in" lateral pressures caused by compaction with heavy grading equipment.
   f. Water should not be allowed to pond near the top of the wall. To accomplish this the final backfill site grade should be such that all water is diverted away from the retaining wall.

ADDITIONAL SERVICES

This report is based on the assumption that an adequate program of monitoring and testing will be performed by Buena Engineers, Inc., during construction to check compliance with the recommendations given in this report. The recommended tests and observations should include, but not necessarily be limited to the following:

1. Review of the building and grading plans during the design phase of the project.
2. Observation and testing during site preparation, grading, placing of engineered fill, and foundation construction.
3. Consultation as required during construction.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

The analysis and recommendations submitted in this report are based in part upon the data obtained from the four (4) borings drilled on the site. The nature and extent of variations between the borings may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

The scope of our services did not include any environmental assessment or investigation for the presence or absence of wetlands, hazardous or toxic materials in the soil, surface water, groundwater or air, on, below, or around this site. Any statements in this report or on the soil boring logs regarding odors noted, unusual or suspicious items or conditions observed, are strictly for the information of our client.

Findings of this report are valid as of this date, however, changes in conditions of a property can occur with passage of time whether they be due to natural processes or works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur whether they result from legislation or broadening of knowledge. Accordingly, findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of one (1) year.

In the event that any changes in the nature, design, or location of the structure and other improvements are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

This report is issued with the understanding that it is the responsibility of the Owner, or of his representative to insure that the information and recommendations contained herein are called to the attention of the Architect and Engineers for the project and incorporated into the plan and that the necessary steps are taken to see that the Contractor and Subcontractors carry out such recommendations in the field.

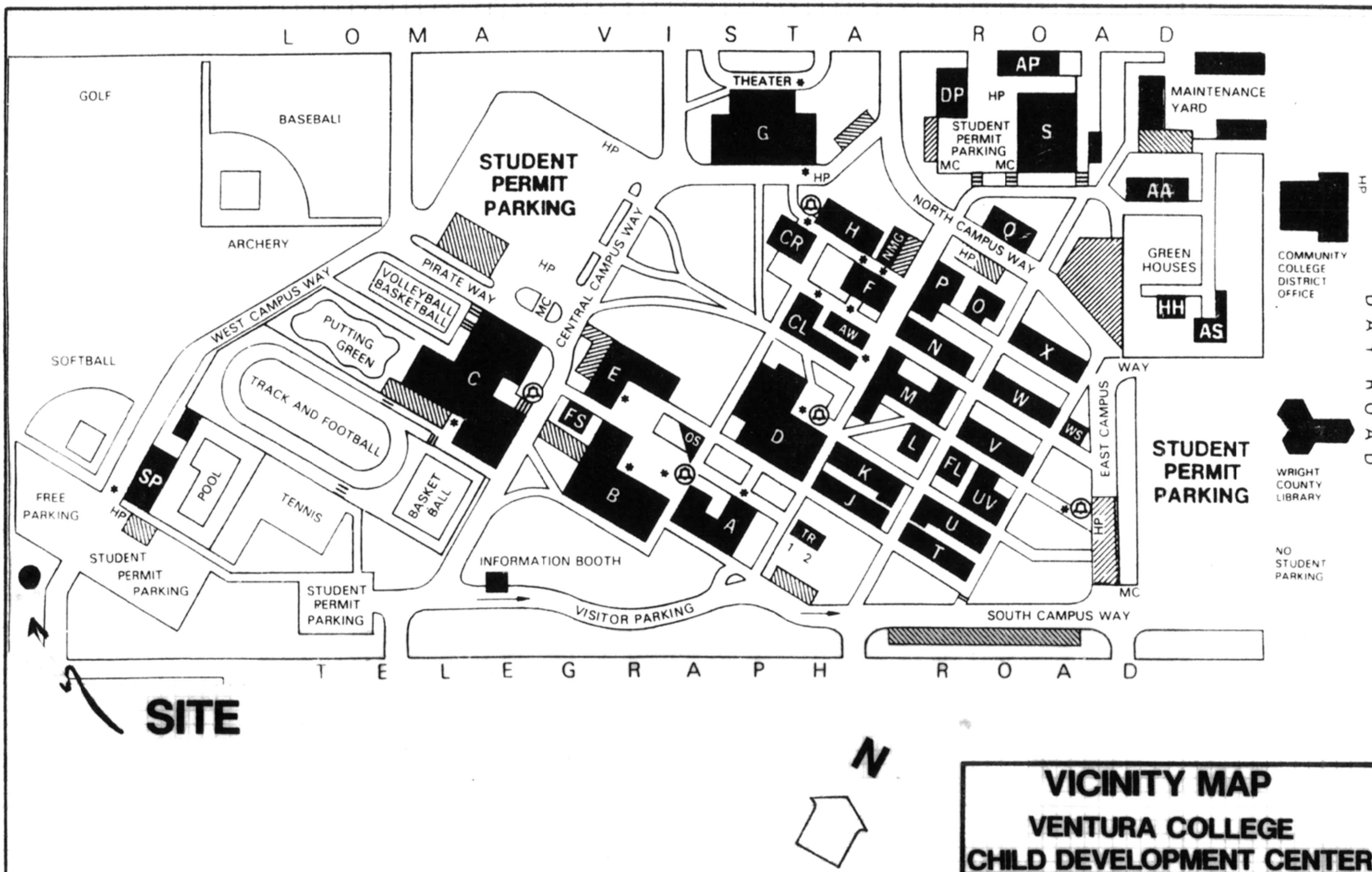
Buena Engineers, Inc. has prepared this report for the exclusive use of the client and authorized agents. This report has been prepared in accordance with generally accepted Geotechnical Engineering practices. No other warranties either expressed or implied are made as to the professional advice provided under the terms of this agreement.

It is recommended that Buena Engineers, Inc. be provided the opportunity for a general review of final design and specifications in order that earthwork and foundation recommendations may be properly interpreted and implemented in the design and specifications. If Buena Engineers, Inc. is not accorded the privilege of making this recommended review, we can assume no responsibility for misinterpretation of our recommendations.

END OF TEXT
Appendixes

APPENDIX A

Vicinity Map
Site Plan
Field Investigation
Boring Logs
Symbols Commonly Used on Boring Logs
Unified Soil Classification
Terms Describing Consistency or Condition

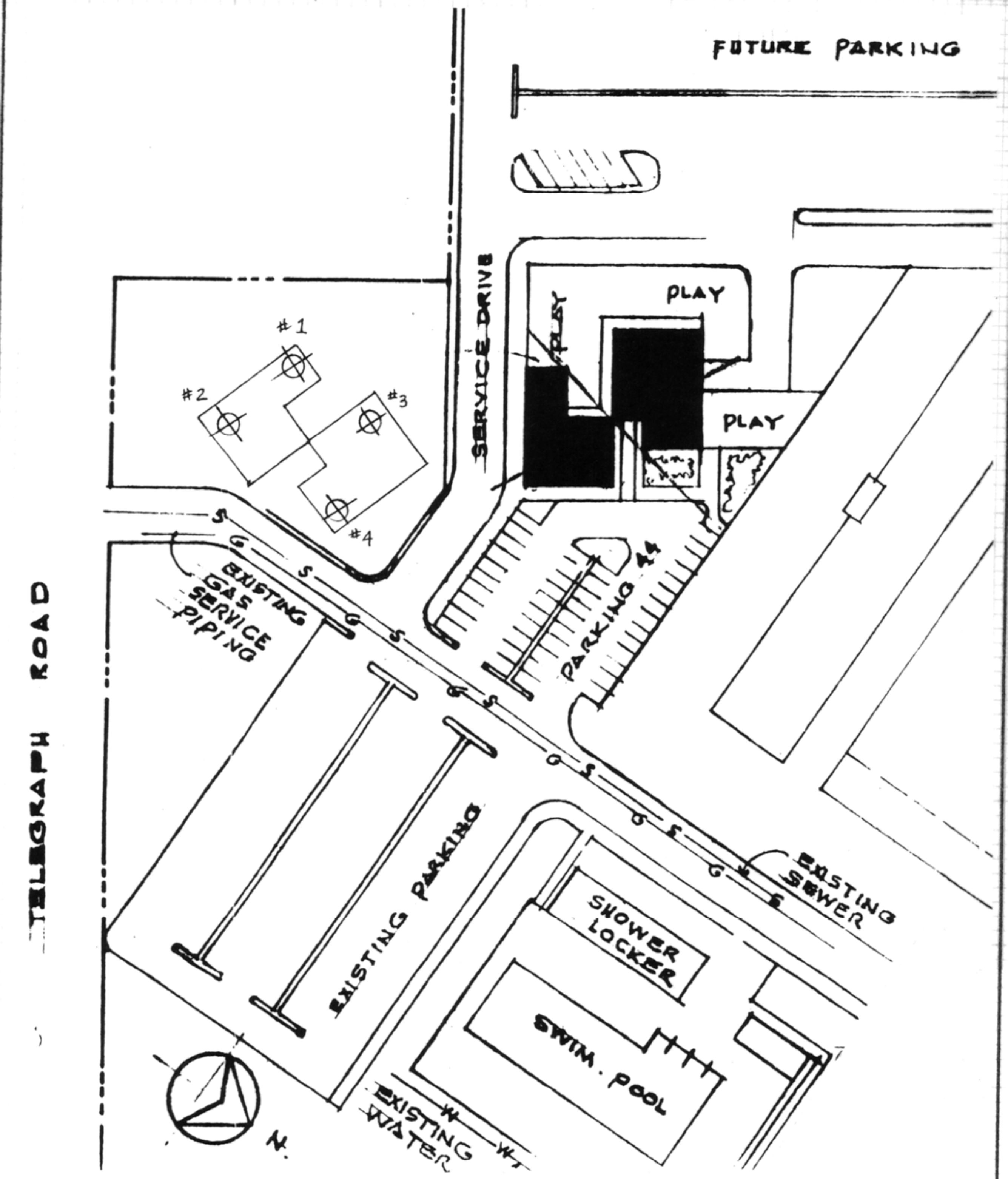


NOT TO SCALE

VICINITY MAP
VENTURA COLLEGE
CHILD DEVELOPMENT CENTER

BUENA ENGINEERS, INC.

DATE **January 1990** FILE NO **B-18630-V1**



⊗ Approximate location of boring

NOT TO SCALE

BORING LOCATION MAP
VENTURA COLLEGE CHILD DEVELOPMENT CENTER

BUENA ENGINEERS, INC.

DATE January 1990 | FILE NO. B-18630-V1

FIELD INVESTIGATION

A. Four (4) borings were drilled to a maximum depth of forty (40) feet below the existing ground surface to observe the soil profile and to obtain samples for laboratory analysis. The borings were drilled on January 2, 1990, using a solid stem six-inch diameter continuous flight auger powered by a CME 55 truck mounted drilling rig. The approximate locations of the test borings were determined in the field by pacing and sighting, and are shown on the Site Plan in this Appendix.

B. Samples were obtained within the test borings with a Modified California (M.C.) ring sampler (ASTM D 3550 with shoe similar to ASTM D 1586). The M.C. sampler has a 3-inch outside diameter and a 2.37-inch inside diameter. The samples were obtained by driving the sampler with a one-hundred and forty pound hammer dropping thirty inches in accordance with ASTM D 1586. Other samples were obtained with the Standard Penetration Sampler in accordance with ASTM D 1586. Other Samples were obtained with the Standard Penetration Sampler in accordance with ASTM D 1586.

C. Bulk samples of the soils encountered were gathered from the auger cuttings.

D. The final logs of the borings represent our interpretation of the contents of the field logs and the results of laboratory testing performed on the samples obtained during the subsurface investigation. The final logs are included in this Appendix.

LOG OF BORING
for
Ventura College Child Development Center

Job No. B-18630-V1
Report No. 90-1-207

DATE January 2, 1990 | BORING NO. 1 | LOCATION Per Plan

Depth (ft)	Symbol	Core	Blows/ft	DESCRIPTION	Unit Dry Wt. (pcf)	Moisture (Percent)	Soil Type	Relative Compaction (Percent)	REMARKS AND ANALYSIS
0			22	B1: Dark yellow-brown fine sandy very clayey silt	110.8	14.7	ML	94	
			14	C1: Yellow-brown fine sandy very silty clay	92.7	9.4	CL	78	
5			15		102.6	8.2		86	
10			19	B2: Yellow-brown fine sandy very clayey silt	100.2	12.6	ML	--	
15			30		105.7	12.9		--	
									Total Depth: 16.0 feet

■ relatively undisturbed ring sample

The stratification lines represent the approximate boundaries between the soil types and the transitions may be gradual.

LOG OF BORING
for
Ventura College Child Development Center

Job No. B-18630-V1
Report No. 90-1-207

DATE January 2, 1990 | BORING NO. 2 | LOCATION Per Plan

Depth (ft)	Symbol	Core	Blows/ft	DESCRIPTION	Unit Dry Wt. (pcf)	Moisture (Percent)	Soil Type	Relative Compaction (Percent)	REMARKS AND ANALYSIS
0				B1: Dark yellow-brown very fine sandy very clayey silt					
		■	11		103.5	21.5	ML	88	
		■	10	C1: Yellow-brown fine sandy very silty clay	103.4	16.6	CL	87	
5		■	11		108.8	13.3		91	
				B2: Yellow-brown fine sandy very clayey silt					
10		■	11		100.4	18.3	ML	--	
15		■	15		105.7	18.2		--	

■ - relatively undisturbed ring sample

Total Depth: 16 feet

No groundwater encountered

The stratification lines represent the approximate boundaries between the soil types and the transitions may be gradual.

LOG OF BORING Job No. B-18630-V1
for Report No. 90-1-207
Ventura College Child Development Center

DATE January 2, 1990 BORING NO. 3 LOCATION Per Plan

Depth (ft)	Blows/ft	DESCRIPTION	Unit Dry Wt. (pcf)	Moisture (Percent)	Soil Type	Relative Compaction (Percent)	REMARKS AND ANALYSIS
0	16	C1: Yellow-brown fine sandy very silty clay	106.1	14.2	CL	89	
	17		98.5	12.0		83	
5	18		100.1	5.4		84	
10	22	B2: Yellow-brown fine sandy very clayey silt	109.1	12.6	ML	--	
15	50		97.7	13.6		--	
20	38		102.6	12.2		--	
25	42		101.0	8.0		--	
30	6/7/11	B3: Dark yellow-brown fine sandy very clayey silt	--	22.9	ML	--	
35	5/7/8	A1: Yellow-brown slightly clayey very silty fine to medium sand	--	20.0	SM	--	
40	7/7/10	C2: Dark yellow-brown fine sandy very silty clay	--	26.6	CL	--	

■ - relatively undisturbed ring sample

◧ - standard penetration test split spoon sample

Total Depth: 14.0 feet

No groundwater encountered

The stratification lines represent the approximate boundaries between the soil types and the transitions may be gradual.

LOG OF BORING
for
Ventura College Child Development Center

Job No. B-18630-V1
Report No. 90-1-207

DATE January 2, 1990 BORING NO. 4 LOCATION Per Plan

Depth (ft)	Symbol	Core	Blows/ft	DESCRIPTION	Unit Dry Wt. (pcf)	Moisture (Percent)	Soil Type	Relative Compaction (Percent)	REMARKS AND ANALYSIS
0			13	B1: Dark yellow-brown very fine sandy very clayey silt	--	--	ML	--	No recovery
			15	C1: Yellow-brown fine sandy very silty clay	97.5	17.0	CL	82	
5			15		111.2	15.9		93	
10			16	B2: Yellow-brown fine sandy very clayey silt	97.2	22.2	ML	--	
15			15		--	15.1		--	

■ - relatively undisturbed ring sample

◩ - disturbed ring sample

Total Depth: 16.0 feet

No groundwater encountered

The stratification lines represent the approximate boundaries between the soil types and the transitions may be gradual.

SYMBOLS COMMONLY USED ON BORING LOGS

Modified California Split Barrel Sampler

Modified California Split Barrel Sampler - No Recovery

Standard Penetration Test (SPT) Sampler

Standard Penetration Test (SPT) Sampler - No Recovery

Perched Water Level

Water Level First Encountered

Water Level After Drilling

Pocket Penetrometer (tsf)

Vane Shear (ksf)

1. The location of borings were approximately determined by pacing and siting from visible features. Elevations of borings are approximately determined by interpolation between plan contours. The location and elevation of the borings should be considered accurate only to the degree implied by the method used.

2. The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

3. Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. This data has been reviewed and interpretations made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, tides, temperature, and other factors at the time measurements were made.

BUENA ENGINEERS, INC.	
DATE:	FILE NO.

E-145
8-89

MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.

UNIFIED SOIL CLASSIFICATION SYSTEM

BUENA ENGINEERS, INC.

DATE: FILE NO.

TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS

(Major Portion Retained in No. 200 Sieve)

Includes (1) clean gravels and sands described as fine, medium or coarse, depending on distribution of grain sizes, and (2) silty or clayey gravels and sands, condition is rated according to relative density as determined by laboratory tests or estimated from resistance to sampler penetration.

Penetration Resistance Blows/Foot*	Descriptive Term	Relative Density
0 - 10	Loose	0 to 40%
10 - 30	Medium Dense	40 to 70%
30 - 50	Dense	70 to 90%
Over 50	Very Dense	90 to 100%

*140 lbs. Hammer - 30-inch Drop

Relative Density is also used to describe condition of low plasticity (PI $<$ 10) fine grained soils such as sandy silts.

FINE GRAINED SOILS

(Major Portion Passing No. 200 Sieve)

Includes (1) inorganic and organic silts and clays, (2) gravelly, sandy or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings or by unconfined compression tests for soils with plasticity index $\geq$ 10.

Descriptive Term	Compressive Strength (Tons/Sq. Ft.)
Very Soft	Less than 0.25
Soft	0.25 to 0.50
Firm or Medium Stiff	0.50 to 1.00
Stiff	1.00 to 2.00
Very Stiff	2.00 to 4.00
Hard	4.00 and higher

NOTE: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above, because of planes of weakness or shrinkage cracks in the soil. The consistency ratings of such soils are based on penetrometer readings.

TERMS CHARACTERIZING SOIL STRUCTURE

Calcareous: containing appreciable quantities of calcium carbonate.

Interbedded: composed of alternate layers of different soil types

Well Graded: having a wide range in grain sizes and substantial amounts of all intermediate particle sizes.

Color: in color description of soil predominant color is stated after modifier; i.e. reddish brown.

Slickensided: having inclined planes of weakness that are slick and glassy in appearance.

Fissured: containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical.

Poorly Graded: predominately of one grain size, or having a range of sizes with some intermediate size missing.

APPENDIX B

Laboratory Testing

Test Results

In-Place Densities

Individual Test Results

Table 29-AR

Footnotes to Table 29-AR

LABORATORY TESTING

A. Samples were reviewed along with field logs to determine which would be analyzed further. Those chosen for laboratory analysis were considered representative of soils that would be exposed and/or used during grading, and those deemed to be within the influence of the proposed structure. Test results are presented in graphic and tabular form in this Appendix.

B. In-situ Moisture Content and Unit Dry Weight for the ring samples were determined in general accordance with ASTM D 2937.

C. The relative strength characteristics of the soils were determined from the results of Direct Shear tests on remolded samples. Specimens were placed in contact with water at least twenty-four (24) hours before testing, and were then sheared under normal loads ranging from 0.5 to 2.0 kips per square foot in general accordance with ASTM D 3080.

D. Settlement characteristics were developed from the results of one dimensional Consolidation tests performed in general accordance with ASTM D 2435. The samples were typically loaded to 0.5 or 1.0 ksf, flooded with water, and then incrementally loaded to 2.0, 4.0 and 8.0 ksf. The samples were allowed to consolidate under each load increment. Rebound was measured under reverse alternate loading. Compression was measured by dial gauges accurate to 0.0001 inch. Results of the consolidation tests in the form of percent consolidation versus log of pressure curves are presented in this Appendix.

E. Expansion index tests were performed on bulk soil samples in accordance with Ventura County and U.B.C. Test Method 29-A. The samples were surcharged under one hundred forty-four (144) pounds per square foot at moisture content of near fifty percent (50%) saturation. Samples were then submerged in water for twenty-four (24) hours and the amount of expansion was recorded with a dial indicator.

F. Maximum density tests were performed to estimate the moisture-density relationship of typical soil materials. The tests were performed in accordance with ASTM designation D 1557-88.

G. The gradation characteristics of selected samples were made by hydrometer and sieve analysis procedures. Selected samples were soaked in water until individual soil particles were separated and then washed on the No. 200 mesh sieve, oven dried, weighed to calculate the percent passing the No. 200 sieve and then mechanically sieved. Additionally, hydrometer analyses were performed to assess the distribution of the minus No. 200 mesh material of selected samples. The hydrometer test was run using sodium hexametaphosphate as a dispersing agent.

TEST RESULTS

BORING/DEPTH	3@0-5'	1@0-2'
SOIL DESIGNATION	C1	B1
USCS	CL	ML
MAXIMUM DENSITY (pcf)	119.0	117.6
OPTIMUM MOISTURE (%)	12.6	11.0
COHESION (psf)	200	200
ANGLE OF INT. FRIC. (°)	30	32
EXPANSION INDEX	57	24
GRAIN SIZE DISTRIBUTION(%)		
GRAVEL	0	--
SAND	15	--
SILT	52	--
CLAY	33	--

SOIL DESCRIPTION:

C1: Yellow-brown fine sandy very silty clay (CL)

C2: Dark yellow-brown fine sandy very silty clay (CL)

B1: Dark yellow-brown very fine sandy very clayey silt (ML)

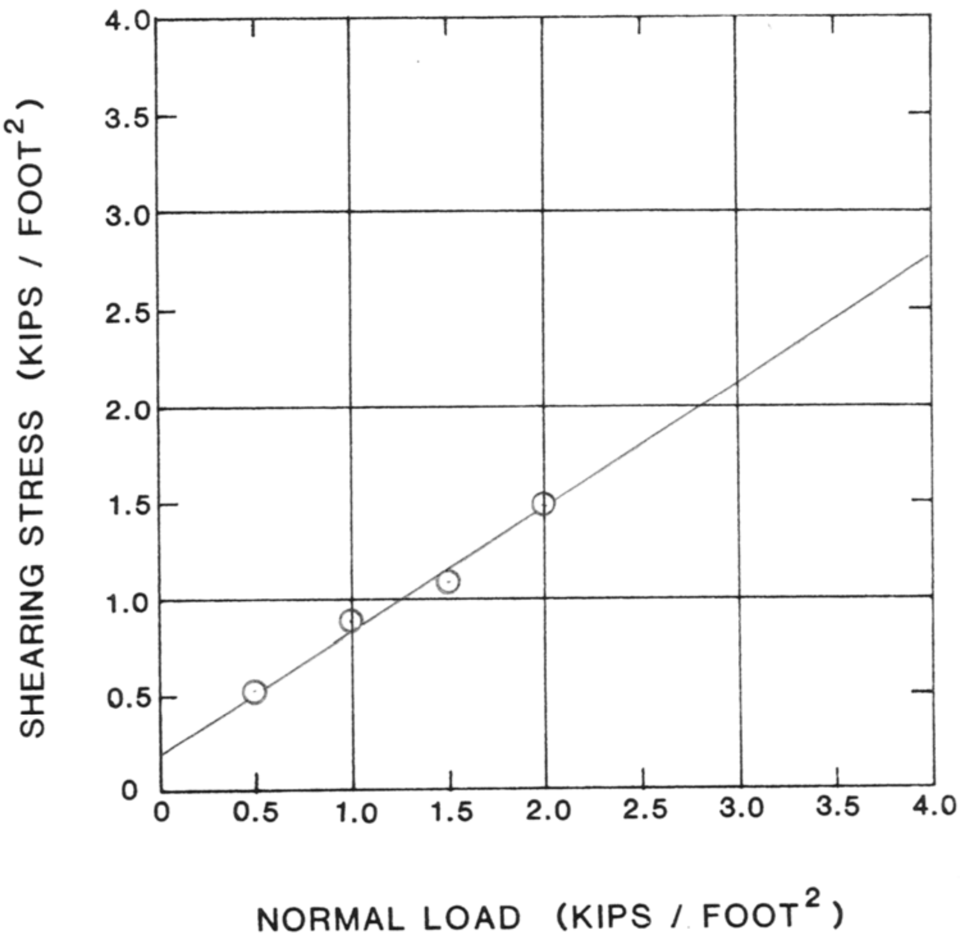
B2: Yellow-brown fine sandy very clayey silt (ML)

B3: Dark yellow-brown fine sandy very clayey silt (ML)

A1: Yellow-brown slightly clayey very silty fine to medium sand (SM)

IN-PLACE DENSITIES

BORING & DEPTH	DRY DENSITY	% MOISTURE	RELATIVE COMPACTION
1 @ 1'	110.8	14.7	94
3'	92.7	9.4	78
5'	102.6	8.2	86
10'	100.2	12.6	--
15'	105.7	12.9	--
2 @ 1'	103.5	21.5	88
3'	103.4	16.6	87
5'	108.8	13.3	91
10'	100.4	18.3	--
15'	105.7	18.2	--
3 @ 1'	106.1	14.2	89
3'	98.5	12.0	83
5'	100.1	5.4	84
10'	109.1	12.6	--
15'	97.7	13.6	--
20'	102.6	12.2	--
25'	101.0	8.0	--
30'	--	22.9	--
35'	--	20.0	--
40'	--	26.6	--
4 @ 3'	97.5	17.0	82
5'	111.2	15.9	93
10'	97.2	22.2	--
15'	--	15.1	--



DIRECT SHEAR DATA

Soil type: B1 (ML)

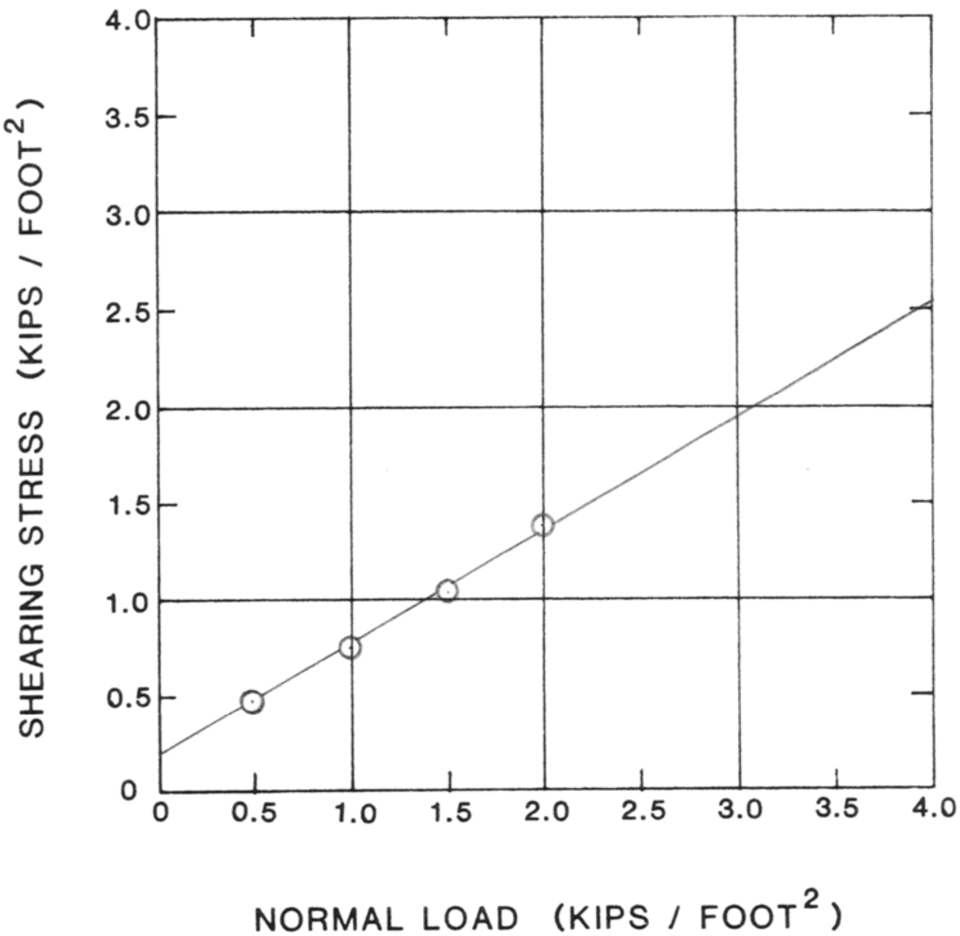
Boring and depth: 1 at 0-2'

Angle of internal friction: 32°

Cohesion: 200 psf

☒ Samples remolded to 90% of maximum density

☐ Samples relatively undisturbed



DIRECT SHEAR DATA

Soil type: Cl (CL)

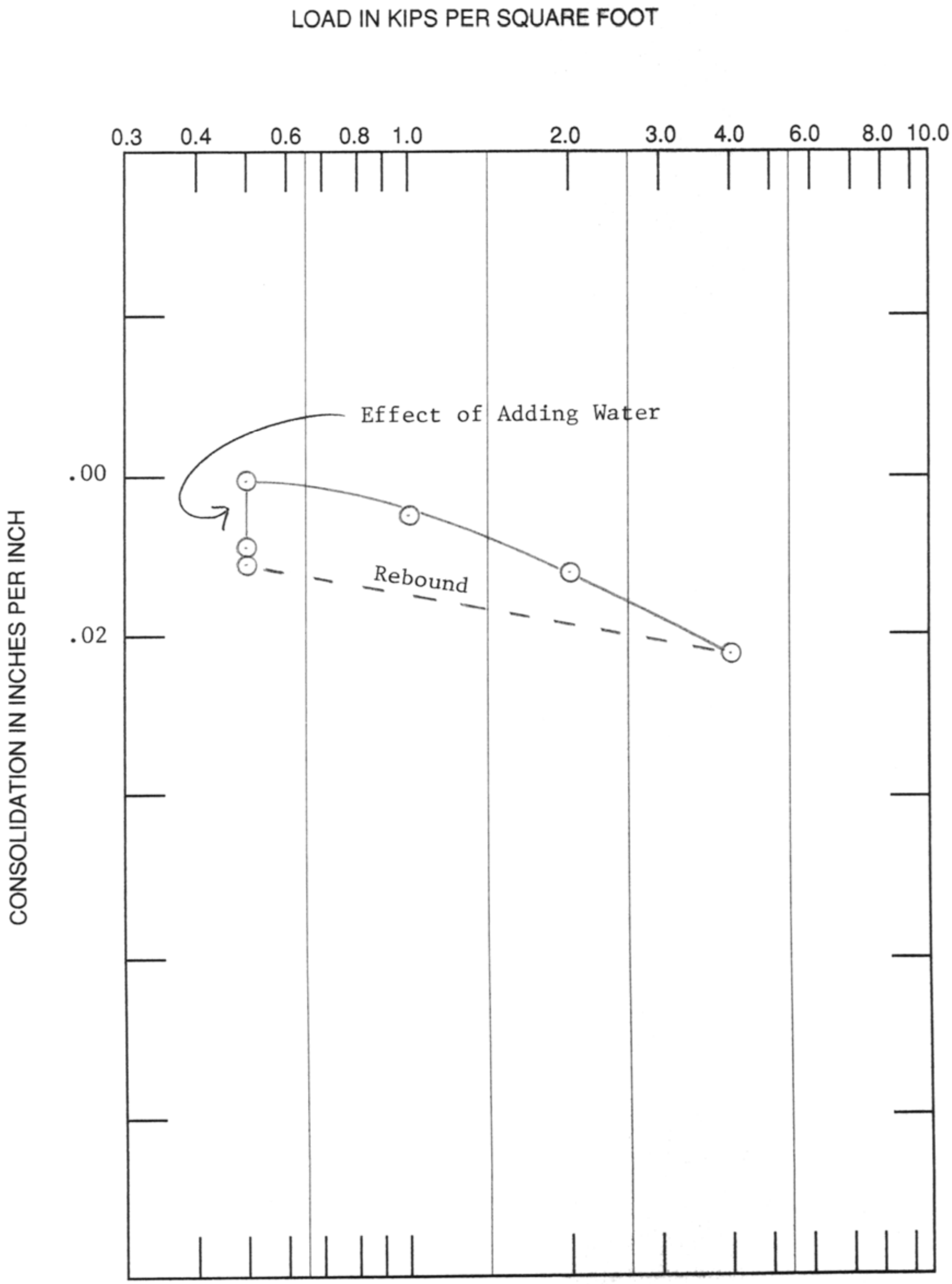
Boring and depth: 3 at 0-5'

Angle of internal friction: 30°

Cohesion: 200 psf

☒ Samples remolded to 90% of maximum density

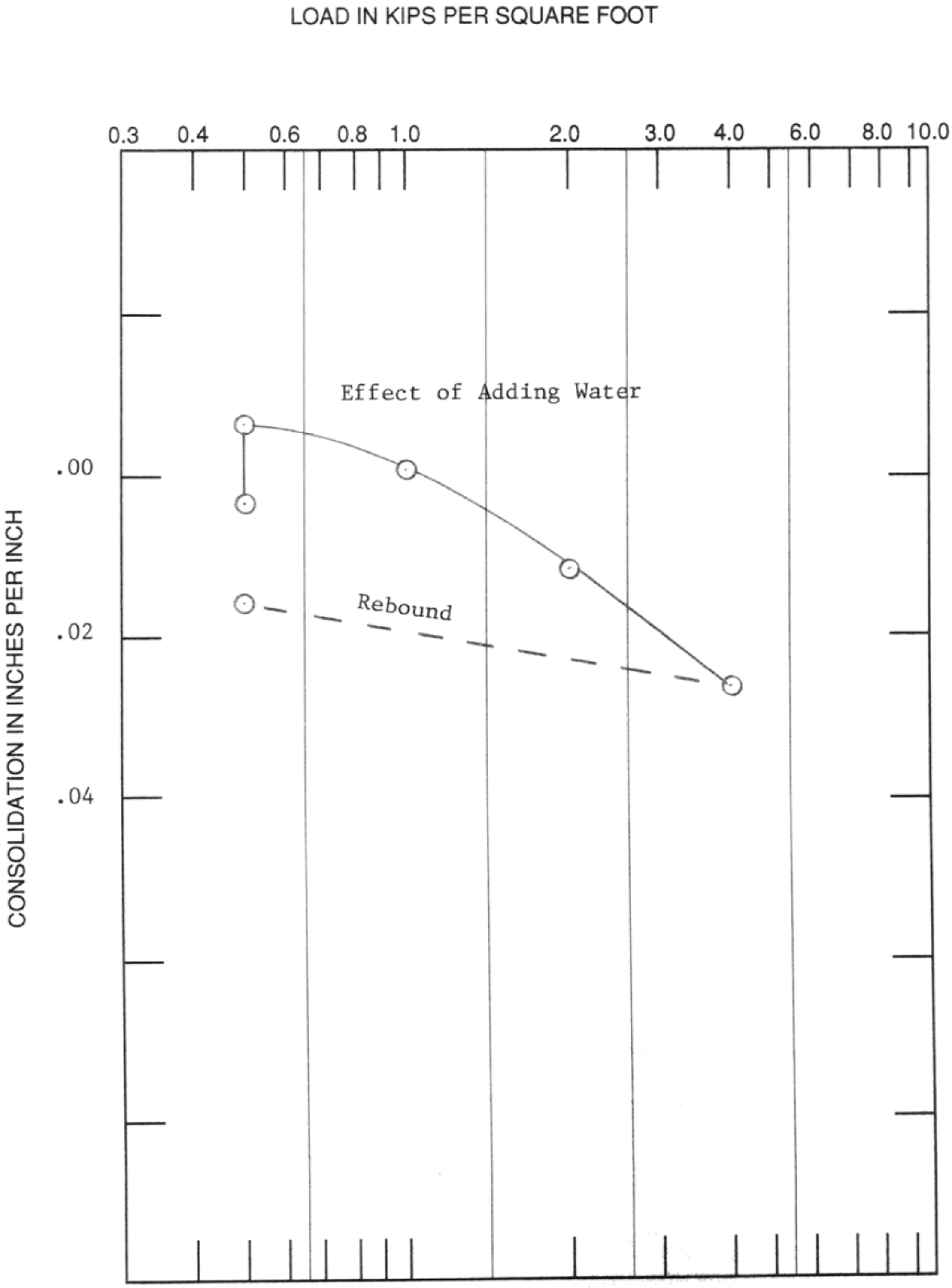
☐ Samples relatively undisturbed



CONSOLIDATION DATA

No. 1 at 3'

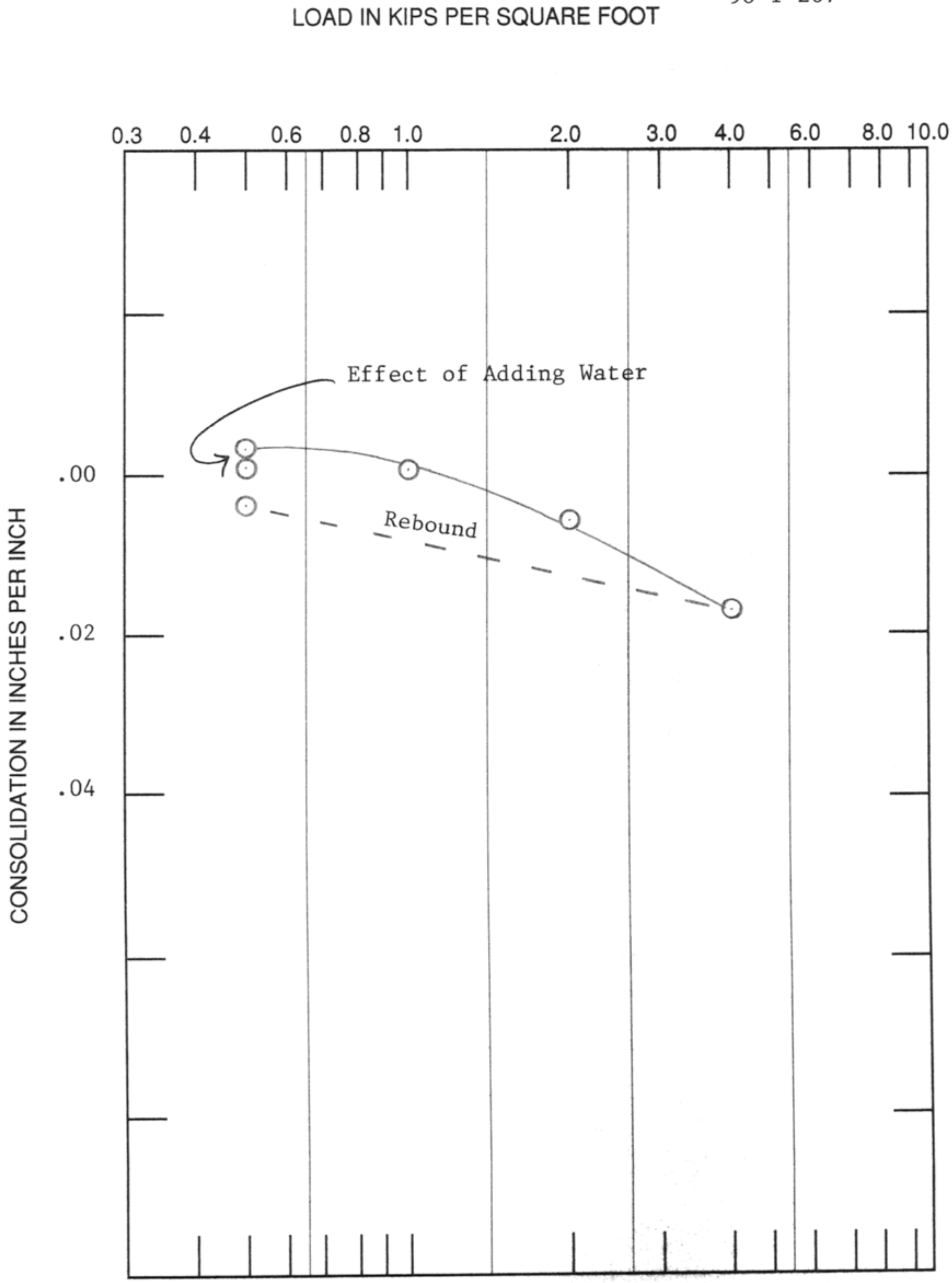
BUENA ENGINEERS INC.



CONSOLIDATION DATA

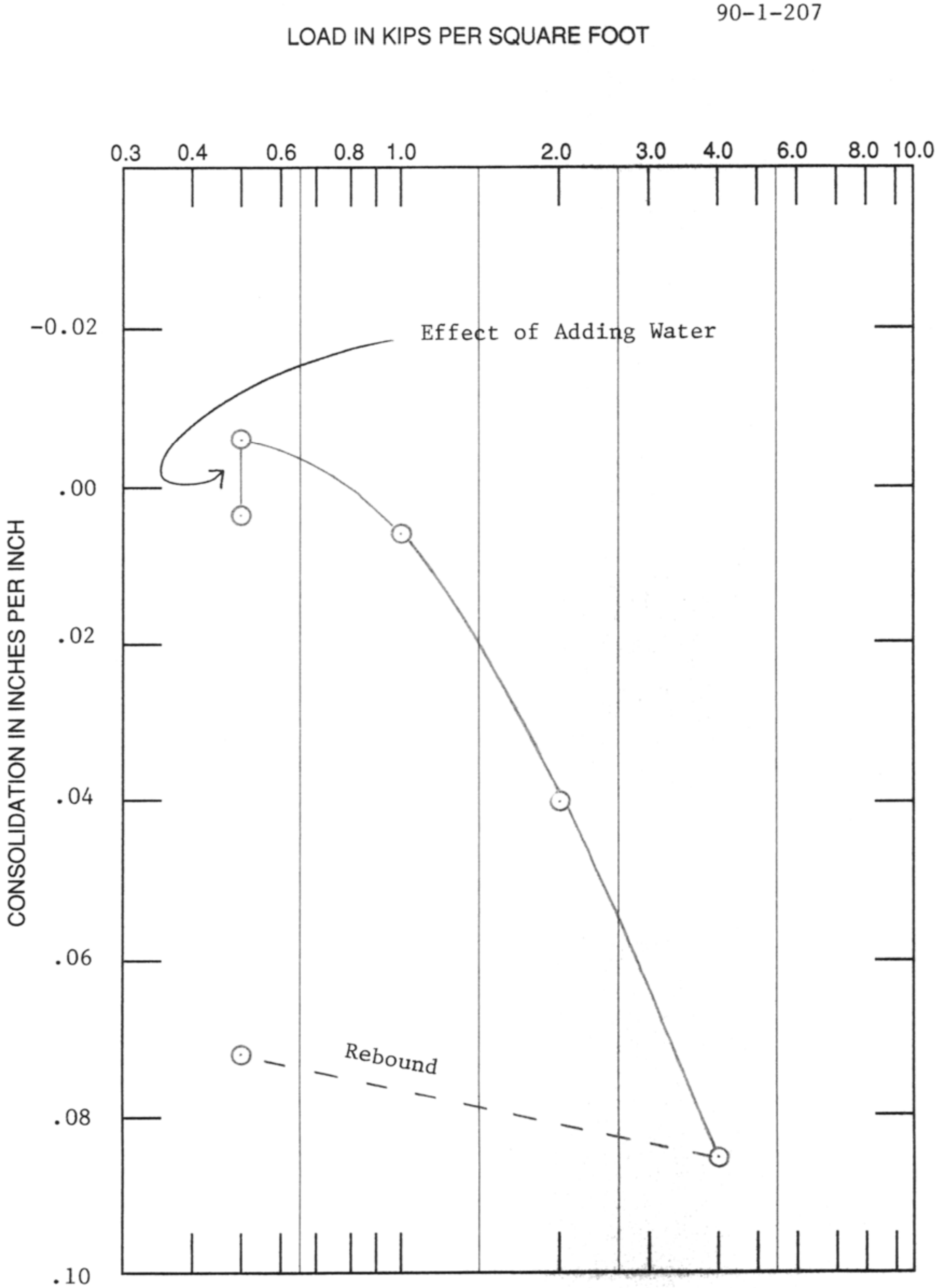
No. 1 at 5'

BUENA ENGINEERS INC.



CONSOLIDATION DATA
No. 2 at 3'

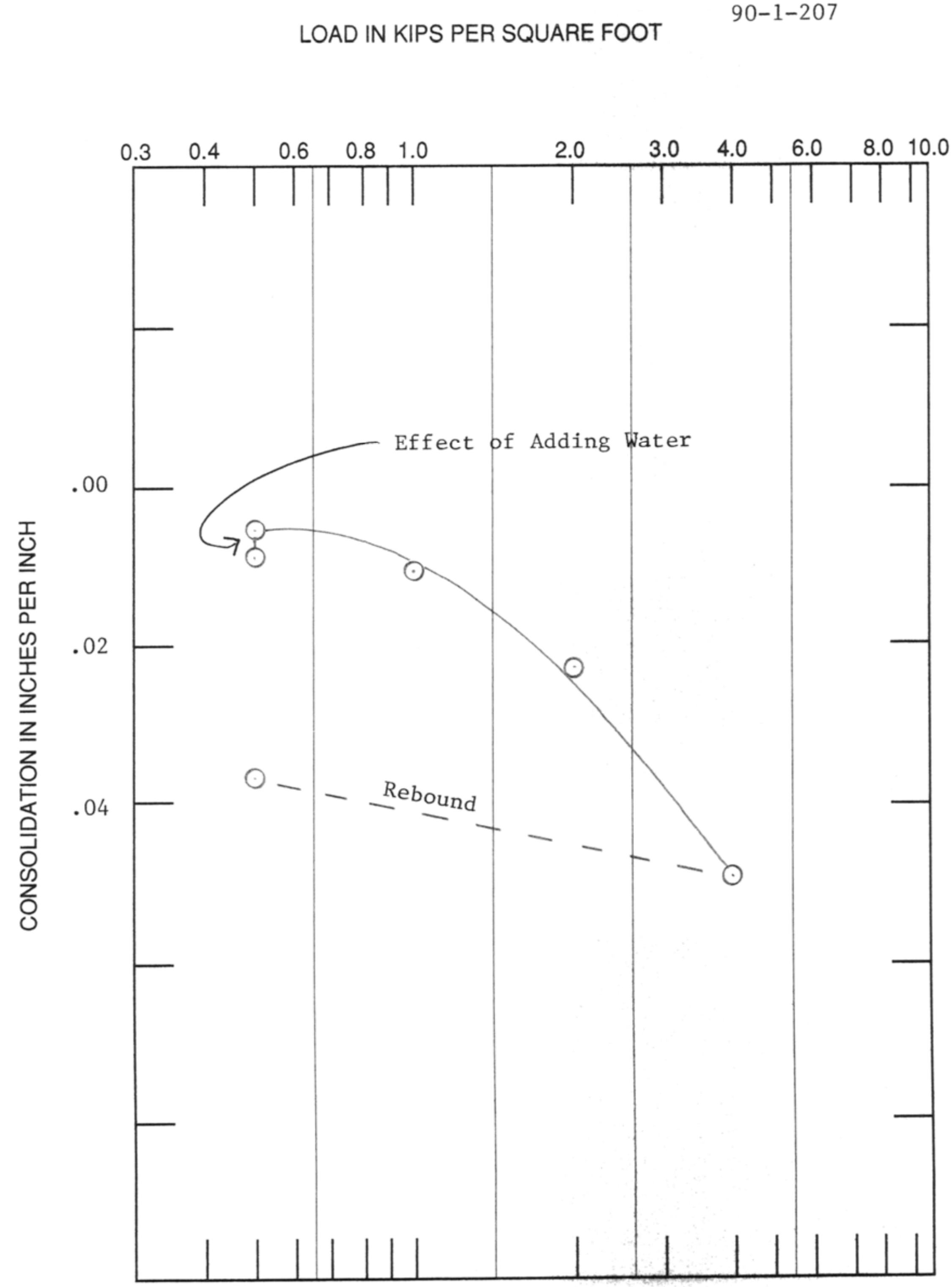
BUENA ENGINEERS INC.



CONSOLIDATION DATA

No. 3 at 3'

BUENA ENGINEERS INC.

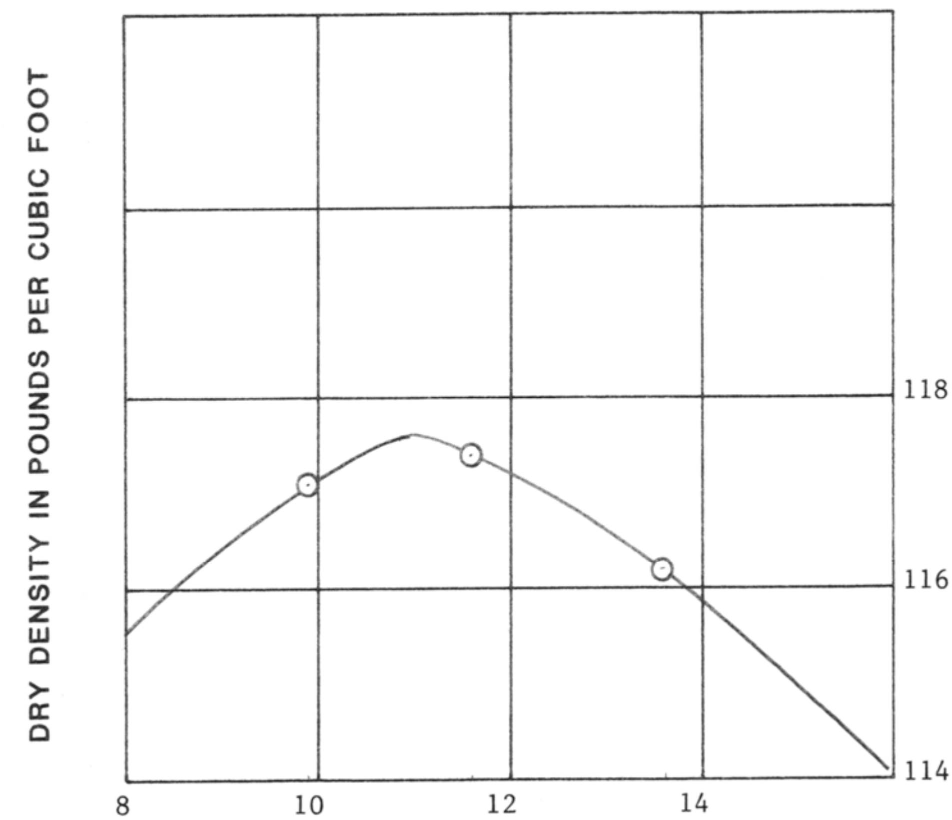


CONSOLIDATION DATA

No. 4 at 3'

BUENA ENGINEERS INC.

MOISTURE CONTENT IN PERCENT OF DRY WEIGHT



METHOD OF COMPACTION

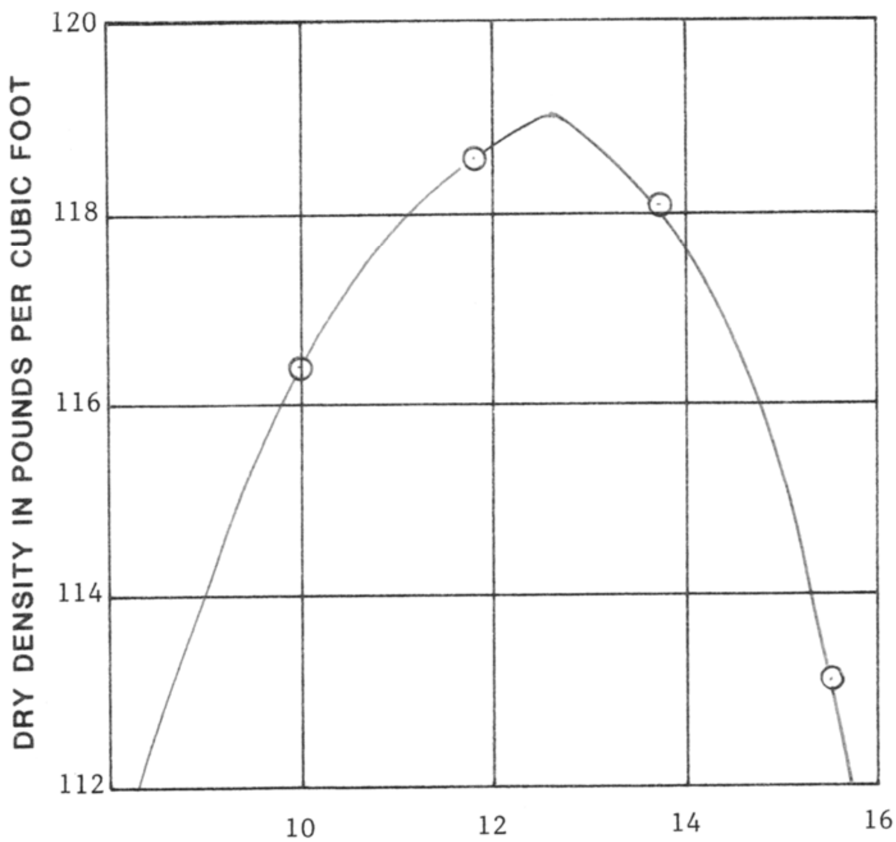
ASTM D-1557-78, METHOD A or C

SOIL TYPE	MAXIMUM DENSITY	OPTIMUM MOISTURE
B1 (ML) 1 at 0-2'	117.6 pcf	11.0%

MAXIMUM DENSITY - OPTIMUM MOISTURE CURVES

B-18630-V1
90-1-207

MOISTURE CONTENT IN PERCENT OF DRY WEIGHT



METHOD OF COMPACTION

ASTM D-1557-78, METHOD A or C

SOIL TYPE	MAXIMUM DENSITY	OPTIMUM MOISTURE
Cl (CL) 3 at 0-5'	119.0 pcf	12.6%

MAXIMUM DENSITY – OPTIMUM MOISTURE CURVES

UBC TABLE NO. 29-AR

MINIMUM FOUNDATION REQUIREMENTS *

Including Expansive Soils Requirements (1), (11)

Weighted Expansion Index	Footings for Slab & Raised Floor Systems (2) (5) (7) (9): No. of stories	Stem Thickness	Footing Width	Footing Thickness	All Perimeter Footings (6) — Depth below natural surface of ground and finish grade (INCHES)	Interior footings for slab and raised floors (6) — Depth below natural surface of ground and finish grade (INCHES)	Reinforcement for continuous footings (3)	Concrete Slabs, 3½" Minimum Thickness: Reinforcement (4)	Concrete Slabs, 3½" Minimum Thickness: Total thickness of sand	Premoistening control for soils under footings, piers and slabs (5) (6)	Piers under raised floors (9)
0-20 Very Low (Non-Expansive)	1 2 3	6 8 10	12 15 18	6 7 8	12 18 24	12 18 24	None Required	6x6-10/10 WWF	2"	Moistening of ground prior to placing concrete recommended	Piers allowed for single floor loads only
21-50 Low	1 2 3	6 8 10	12 15 18	6 7 8	15 18 24	12 18 24	1-#4 top and bottom	6x6-10/10 WWF	4"	120% of optimum moisture content to a depth of 21" below lowest adjacent grade. Tested	Piers allowed for single floor loads only
51-90 Medium	1 2 3	6 8 10	12 12 15	6 8 8	21 21 24	12 18 24	1-#4 top and bottom #3 bars @ 24" in ext. footing and bent 3' into slab (9)	6x6-6/6 WWF or #3 @ 24" e.w.	4"	130% of optimum moisture content to a depth of 27" below lowest adjacent grade. Testing Required	Piers not allowed
91-130 High	1 2 3	6 8 10	12 12 15	8 8 8	27 27 27	12 18 24	1-#5 top and bottom #3 bars @ 24" in ext. footing and bent 3' into slab (10)	6x6-6/6 WWF or #3 @ 24" e.w.	4"	140% of optimum moisture content to a depth of 33" below lowest adjacent grade. Tested by Qualified Soils Lab	Piers not allowed
Above 130 Very High	Special Design by Registered Civil Engineer Who Shall Sign Foundation Plans										

*Refer to next page for footnotes. (1) through (11)

UBC TABLE 29-AR FOOTNOTES

1. Foundation requirements are based on reducing the potential differential vertical movements due to expansive soil by premoistening the soil prior to construction. If premoistening is not desired, a much stronger foundation will be needed or other precautions must be taken as approved by the Building Official.

2. Crawl holes through footings for raised floors shall be installed with curbs extending a minimum of six inches above adjacent grade to prevent surface water from entering under the building.

3. Bottom bar three inches from bottom of footing, top bar within three inches from top of stem.

4. Slab reinforcement shall be placed at slab mid-depth and continue to within two inches of exterior face of exterior footing walls.

5. Moisture content shall be maintained until foundations and piers are poured and a vapor barrier is installed. Tests shall be taken within 24 hours of each slab pour.

6. Except under footings, the area under the raised floor need not be premoistened. Footings not located within a continuous footing or equivalent concrete or masonry moisture barrier per UBC Sec. 2907(a) shall be designed as perimeter footings.

7. A 12-inch minimum width grade beam shall be provided for garage openings. Depth and reinforcement shall be as specified in UBC Table No. 29-AR.

8. Footing widths may be reduced upon submittal of calculations by a registered civil or structural engineer or licensed architect, but shall be a minimum of twelve (12) inches for one and two-story structures and fifteen (15) inches for three-story structures.

9. The ground under the floor may be excavated to the elevation of the top of the footing.

10. Bent steel reinforcement bars are not allowed between floating slabs and footings.

11. Vertical steel reinforcing bars in chimneys shall hook under horizontal steel reinforcing bar mat of #4 bars at 12 inches on center each way located three inches from the bottom of supporting foundation.

APPENDIX C

Standard Grading Specifications

STANDARD GRADING SPECIFICATIONS

PROJECT: **Ventura College Child Development Center**
CLIENT: **Ventura County Community College District**

1. These Standard Grading Specifications have been prepared for the exclusive use of our client for specific application to referenced project in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

2. Buena Engineers, Inc., referred to as the Geotechnical Engineer, should be retained to provide continuous Geotechnical Engineering services during construction of the grading, excavation and foundation phases of the work. This is to observe compliance with the design concepts, specifications or recommendations and to allow design changes in the event that subsurface conditions differ from that anticipated prior to start of construction.

3. The presence of our field representative will be for the purpose of providing observation and field testing. Our work does not include supervision or direction of the actual work of the contractor, his employees or agents. The contractor for this project should be so advised. The contractor should also be informed that neither the presence of our field representative nor the observation and testing by our firm shall excuse him in any way from defects discovered in his work. It is understood that our firm will not be responsible for job or site safety on this project. Job and site safety will be the sole responsibility of the contractor.

4. If the contractor encounters subsurface conditions at the site that (a) are materially different from those indicated in the contract plans or in specifications, or (b) could not have been reasonably anticipated as inherent in the work of the character provided in the contract, the contractor shall immediately notify the owner verbally and in writing within 24 hours. This notification shall be a condition precedent before any negotiations for "changed or differing site conditions" can proceed. If the owner determines that conditions do materially so differ and cause an increase or decrease in the contractor's cost of, or the time required for, performance of any part of the work under this contract, then negotiations shall commence

between owner and contractor to provide equitable adjustment to owner or contractor resulting therefrom.

5. Whenever the words "supervision", "inspection", or "control" appear they shall mean periodic observation of the work and the taking of soil tests as deemed necessary by the Geotechnical Engineer for substantial compliance with plans, specifications and design concepts.

6. These specifications shall be integrated with the Geotechnical Engineering Report of which they are a part. Should conflicting statements be found between these standard specifications and the itemized recommendations contained in the main body of the report, the latter shall govern.

7. These specifications shall consist of clearing and grubbing, preparation of land to be filled, filling of the land, spreading, compaction and control of the fill, and subsidiary work necessary to complete the grading of the filled areas to conform with the lines, grades and slopes as shown on the accepted plans.

8. The standard test used to define minimum density of compaction work shall be the ASTM Test Procedure D 1557. Densities shall be expressed as a relative compaction in terms of the maximum density obtained in the laboratory by the foregoing standard procedure.

9. Field density tests will be performed by the Geotechnical Engineer during grading operations. At least one (1) test shall be made for each five hundred (500) cubic yards or fraction thereof placed with a minimum of two (2) tests per layer in isolated areas. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density tests shall be taken in compacted material below the disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below the required density, the particular layer or portion shall be reworked until the required density has been obtained.

10. Earth-moving and working operations shall be controlled to prevent water from running into excavated areas. Excess water shall be promptly removed and the site kept dry. Fill material shall not be placed, spread or rolled during unfavorable weather conditions. When

the work is interrupted by heavy rain, fill operations shall not be resumed until field tests by the Geotechnical Engineer indicate that the moisture content and density of the fill are as previously specified.

11. Compaction shall be by sheepsfoot rollers, vibrating sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other types of acceptable compacting rollers. Rollers shall be of such design that they will be able to compact the fill to the specified density. Rolling shall be accomplished while the fill material is within the specified moisture content range. Rolling of each layer shall be continuous over its entire area and the roller shall make sufficient trips to insure that the required density has been obtained.

12. Existing structures, foundations, trash, debris, loose fill, trees (not included in landscaping), roots, tree remains and other rubbish shall be removed, piled or burned or otherwise disposed of so as to leave the areas that have been disturbed with a neat and finished appearance free from debris. No burning shall be permitted in the area to be filled.

13. When fill material includes rock, large rocks will not be allowed to nest and voids must be carefully filled with small stones or earth and properly compacted. Rock larger than six (6) inches in diameter will not be permitted in the compacted fill without review as to location by the Geotechnical Engineer.

14. Organic matter shall be removed from the surface upon which the fill, foundations or pavement sections are to be placed. The surface shall then be plowed or scarified to a depth of at least eight (8) inches and until the surface is free from ruts, hummocks or other uneven features which would tend to prevent uniform compaction by the equipment to be used. Specific recommendations pertaining to stripping and minimum depth of recompaction of native soils are presented in the main body of the report.

15. Native soil free from organic material and other deleterious material may be used as compacted fill; however, during grading operations the Geotechnical Engineer will re-examine the native soils for organic content.

16. The Geotechnical Engineer may give a preliminary indication of the quality of proposed import soils by testing samples taken at the source. In general, proposed borrow soils should be free from organic matter and any deletereous substances. Additionally, they should be equal to or better than site soils with regard to gradation, compressibility and strength characteristics. However, final acceptance of import soils will be given only after the materials have been brought to the site in enough quantity to complete the project.

17. Where fills are made on hillsides or exposed slope areas, greater than ten (10) percent horizontal benches shall be cut into firm undisturbed natural ground to provide a horizontal base so that each layer is placed and compacted on a horizontal plane. The initial bench at the toe of the fill shall be at least ten (10) feet in width on firm, undisturbed natural ground at the elevation of the toe stake placed at the natural angle of repose or design slope. The width and frequency of succeeding benches will vary with the soil conditions and the steepness of slope.

18. The selected fill material shall be placed in layers which, when compacted, shall not exceed six (6) inches in thickness. Layers shall be spread evenly and shall be thoroughly blade-mixed during spreading. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to a relative compaction of not less than ninety-five (95) percent. The fill operation shall be continued in six (6) inch compacted layers, as specified above, until the fill has been brought to the finished slopes and graded as shown on the accepted plans.

19. When the moisture content of the fill material is not sufficient to achieve required compaction, water shall be added until the soils attain a moisture content so that thorough bonding is achieved during the compacting process. When the moisture content of the fill material is excessive, the fill material shall be aerated by blading or other satisfactory methods until the moisture content is reduced to an acceptable content to achieve proper compaction.

20. Existing septic tanks and other underground storage tanks must be removed from the site prior to commencement of building, grading or fill operations. Underground tanks, including connecting drain fields and other lines, must be totally removed and the resulting

depressions properly reconstructed and filled. Depressions left from tree removal shall also be properly filled and compacted.

21. The methods for removal of subsurface irrigation and utility lines will depend on the depth and location of the line. One of the following methods may be used: 1) Remove the pipe and compact the soil in the trench according to the applicable portions of these grading recommendations, 2) The pipe shall be crushed in the trench. The trench shall then be filled, compacted according to the applicable portions of these grading specifications, 3) Cap the ends of the line with concrete to mitigate entrance of water. The length of the cap shall not be less than five (5) feet. The concrete mix shall have a minimum shrinkage.

22. Abandoned water wells on the site shall be capped according to the requirements of the appropriate regulatory agency. The strength of the cap shall be at least equal to the adjacent soils. The final elevation of the top of the well casing must be a minimum of thirty-six (36) inches below adjacent grade prior to grading or fill operations.