Geology, Soils & Seismic

APPENDIX E
Ms Tiffany Sukay  
Comstock Crosser & Associates  
321 12th Street  
Manhattan Beach, California 90266

Subject: Geotechnical Design Report, Phase I of The Village at Los Carneros, Goleta, California.

Dear Ms Sukay,

_Albus-Keefe & Associates, Inc._, is pleased to present to you our geotechnical design report for the proposed residential development at the subject site. This report presents a summary of our review of readily available geologic literature and the referenced geotechnical report, subsurface exploration, laboratory testing, and engineering analyses. Conclusions and recommendations relative to the proposed site development are also presented in this report based on the findings of our work.

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

Sincerely,

_ALBUS-KEEFE & ASSOCIATES, INC._

David E. Albus  
Principal Engineer  
GE 2455

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City of Goleta  
Planning & Environmental Svcs.
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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE
The purposes of this investigation were to evaluate the subsurface soil conditions within the project area, to evaluate their engineering characteristics, and to provide geotechnical conclusions and recommendations relevant to design and construction of the proposed site development. The scope of this investigation included the following:

- Review of the referenced geotechnical report
- Review of readily available geologic and seismic data for the area
- Exploratory drilling and soil sampling
- Field percolation testing
- Laboratory testing of selected soil samples
- Performing engineering analyses of data obtained from our review, exploration and laboratory testing
- Development of recommendations for site construction
- Preparation of this report

1.2 SITE LOCATION AND DESCRIPTION
The property comprises about 14.8 acres of land and is located southwest of the intersection of the Union Pacific railroad tracks and Los Carneros Road, city of Goleta, California. The site is bordered by a railroad easement on the north, a vacant lot on the east, commercial properties on the south and an open space/vacant lot on the west. The site in relationship to the surrounding area is shown on the Site Location Map, Figure 1.

The site is currently vacant. Existing site improvements consist of chain link fencing along the south property line, a pad-mounted transformer and a storm water inlet within the eastern portion of the site. and four groundwater monitoring wells across the site.

The site is relatively flat except for a slope ascending to the railroad easement along the northern margin of the site. The slope is inclined at a gradient of approximately 2:1 (H:V) with a vertical height of approximately 10 to 15 feet. Erosion was observed on the slope face during our field exploration. In addition, a large stockpile of soil up to approximately 5 feet in vertical height was observed within the western portion of the site. Surface runoff is directed as sheet flow toward the eastern portion of the site. Vegetation at the site consists of annual weeds across the site and relatively large trees along the northern margin of the site.
FIGURE 1 - SITE LOCATION MAP

Proposed Residential Development
Phase I of The Village at Los Carneros
Goleta, California

USGS 7.5 Minute Goleta Quadrangle
1950 (photo-revised 1988)

NOT TO SCALE
1.3 PROPOSED DEVELOPMENT

As depicted on the referenced plan, the site will be developed for 152 residential housing units, community center and park, interior drives and parking, and landscaping. The residential units will consist of 31 single-family homes and 121 multi-family homes. We also understand that onsite percolation of storm water may be required. Grading plans for the proposed site development are not available at this time. We anticipate grading will consist of minor cuts and fills up to approximately 5 feet from existing grades.

Details of the proposed residential structures are not known at this time. We anticipate the proposed residential dwellings will consist of two- and three-story, wood-framed structures with concrete slab-on-grade yielding relative light structural loads.

2.0 INVESTIGATION

2.1 PREVIOUS INVESTIGATION

We have reviewed the referenced geotechnical report prepared by Fugro West, Inc. (Fugro) for the site. This report was prepared for Bermant Development Company. As presented in Fugro’s report, several geotechnical engineering reports had been prepared for the general site area including the subject site, for various residential and commercial developments. Their investigations consisted of excavating 15 exploratory borings to depths ranging from 16 to 51 feet deep. 15 backhoe test pits to a maximum depth of 4 feet, 5 hand-auger borings to depths ranging from 4 to 8 feet, laboratory testing of selected soil samples, and engineering analyses. Pertinent exploratory and laboratory data presented by Fugro were utilized in developing some of the findings and conclusions presented herein and are appended to this report (Appendix D). The approximate locations of the exploratory excavations completed by Fugro are also indicted on the enclosed Plot Plan, Plate 1.

As presented in Fugro’s report, the site has been previously graded by cut up to 10 feet. The largest cuts apparently occurred in the northern portion of the site adjacent the railroad easement. In addition, a portion of Lot 2 (the eastern half of the site) was graded under observation and testing by Fugro in 2002 for a previously-proposed commercial office building. Grading consisted of overexcavation and recompalement of the existing older alluvium to a depth of about 5 feet below the existing ground surface. The overexcavation extended about 5 feet beyond the proposed building lines. The grading also involved placing about 2 feet of silty sand over the recompalement soils.

2.2 SUBSURFACE EXPLORATION AND WELL INSTALLATION

Four existing groundwater monitoring wells were observed at the site during our subsurface exploration. The depths to groundwater were measured on November 23, 2009, and varied from 19.6 feet within the eastern portion of the site to 25.4 feet within the western portion of the site.

Subsurface exploration for this investigation was conducted on November 23 and 24, 2009. The exploration consisted of drilling four (4) exploratory borings within the proposed recreational area shown on the referenced plan and along the northern margin of the site. These borings were drilled
to depths ranging from approximately 19 to 21 feet below the existing ground surface utilizing a truck-mounted, hollow-stem-auger drill rig. A representative of Albus-Keefe & Associates, Inc., logged the exploratory excavations. Visual and tactile identifications were made of the materials encountered, and their descriptions are presented on the Boring Logs, Plates A-2 through A-5, in Appendix A. The approximate locations of the exploratory excavations are shown on the enclosed Plot Plan, Plate 1.

Bulk and relatively undisturbed samples were obtained at selected depths within the exploratory borings for subsequent laboratory testing. Relatively undisturbed samples were obtained using a 3-inch O.D., 2.5-inch I.D., California split-spoon soil sampler lined with brass rings. During each sampling interval, the sampler was driven 12 inches with successive drops of a 140-pound automatic hammer. The number of blows required to advance the sampler was recorded for each six inches of advancement and the total blow count is recorded on the boring logs. Samples were placed in sealed containers or plastic bags and transported to our laboratory for analyses.

Upon completion of drilling, 2-inch-diameter well screen and casing were installed in each boring for subsequent percolation testing. Well screens were installed near the bottom of each boring to depths of approximately 3 to 4 feet below the existing ground surface. Blank casing was installed above the screened sections. The annular space outside the well screen sections in each boring were filled with Monterey #2 sand to prevent caving. A two-foot-thick bentonite plug was then installed on top of the sand and the remaining space was backfilled with native soils to the existing ground surface. Details of well construction are provided on the attached boring logs. Upon completion of well installation, the casing was filled with water to presoak the hole.

2.3 FIELD PERCOLATION TESTING

A temporary construction water meter was obtained from the Goleta Water District and the water meter was installed at a fire hydrant near the site prior to our percolation testing. Percolation testing was performed on November 25, 2009, using a 4000-gallon water truck. The water truck transported water from the fire hydrant to the test wells. Water was filled to the top of casing then allowed to percolate into the ground. This process was repeated at least twice for each well. The wells were then refilled with water and the depth to water was measured in the casings at intervals varying from 10 seconds to 5 minutes using a water level meter with 1/100-foot divisions. This process was repeated at least twice for each well.

The soils at Boring P-4 exhibited very high percolation rates and as such, we were unable to obtain accurate measurements with the water level meter. In order to further evaluate the percolation rate at Boring P-4, approximately 950 gallons of water was continuously poured into the casing and the water level was generally maintained near the top of casing. Approximately 46 minutes was required to percolate 950 gallons of water at Boring P-4. Results of percolation testing are provided on Plates C-1 through C-4 in Appendix C.

2.4 LABORATORY TESTING

Selected samples of representative earth materials from the borings completed by this firm were tested in our laboratory. Tests consisted of in-situ moisture and dry density, grain-size analysis,
hydrometer analysis and percent passing #200 sieve. Descriptions of laboratory test criteria and test results are presented in Appendix B and on the boring logs in Appendix A.

3.0 SUBSURFACE CONDITIONS

3.1 SOIL CONDITIONS

Based on subsurface exploration completed by this firm and previous investigations completed by Fugro, geologic units encountered at the site consist of artificial fill and older alluvium. Artificial fill consisting of clayey soils were placed within the previously-proposed office building pad to a depth of about 7 feet below the existing ground surface. The building pad was capped with approximately 2 feet of silty sand. The approximate limits of this fill are depicted on the Plot Plan, Plate 1.

Older alluvium underlies the artificial fill and the remainder of the site. The upper 10 to 15 feet of older alluvium consists predominantly of silty clay, sand clay and sandy silt that are damp to moist and stiff to very stiff. This zone also contains occasional layers of clayey sand, silty sand and sand that are damp to moist and dense. Below a depth of approximately 15 feet, the older alluvium consists predominantly of sand and silty sand that are damp to saturated and dense to very dense.

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

3.2 GROUNDWATER

Groundwater was encountered in Boring P-1 at a depth of approximately 20.8 feet below the existing ground surface. The depths to groundwater measured on November 23, 2009, in the existing groundwater monitoring wells at the site varied from 19.6 feet within the eastern portion of the site to 25.4 feet within the western portion of the site. The depths of groundwater measured on November 23, 2009, were similar to the depths of groundwater encountered during the subsurface exploration conducted by Fugro in 2000 and 2001.

4.0 ANALYSES

4.1 SEISMICITY

We have performed integrated historical and deterministic seismic analyses utilizing computer programs EQSEARCH (Blake, 1989, updated 2004) and EQFAULT (Blake, 1989, updated 2002). A brief description of the programs and their functions are discussed below:

EQSEARCH performs historical seismic analyses that estimate ground motions at the site using a catalog of historical earthquake data within a 62-mile (100-km) radius of the site and a selected
attenuation relation to model subsurface earth materials similar to the site. The results of the analyses can be utilized to estimate how historical earthquakes may have shaken the site.

EQFAULT performs deterministic seismic analyses that estimate ground motion of the site using a selected attenuation relation to model earth materials similar to the site, a catalog of up to 222 digitized, 3-D California faults as earthquake sources, and a search of the known faults within a 62-mile (100-km) radius of the site. The results of the analyses can deterministically estimate how future earthquakes may shake the site.

Pertinent results from seismic hazard analyses performed for the site are provided below:

**Historic Event:** Based on the computer program EQSEARCH, the earthquake occurred in 1862 appears to have affected the site the most during the past 206 years. This earthquake was located approximately 2.3 miles (3.7 km) from the site and was estimated to have a magnitude of 5.7. Peak horizontal ground accelerations (PHGA) were estimated for the historical earthquake using Bozorgnia, Campbell and Niazi attenuation equation (1999) for Pleistocene alluvium sites. The largest estimated mean PHGA experienced at the site since 1800 is 0.34g (fraction of gravity) with a standard deviation of 0.22g.

**Deterministic Event:** Based on the computer program EQFAULT and using Bozorgnia, Campbell and Niazi attenuation equation (1999) for Pleistocene alluvium sites, the largest estimated mean PHGA that could occur at the site is 0.68g with a standard deviation of 0.45g, associated with a moment magnitude of 7.2 earthquake along the M. Ridge-Arroyo Parida-Santa Ana fault.

### 4.2 STATIC SETTLEMENT

A very limited number of consolidation tests were performed by Fugro. However, numerous in-place densities and moistures were provided as well as the blow counts of these samples. This data combined with our supplemental data suggests the existing fill and older alluvial soils are generally well over-consolidated. However, the near surface soils are weathered and moderately desiccated. This upper desiccated material is expected to be moderately to highly compressible and subject to hydrocollapse upon wetting. Provided the desiccated materials are recompressed to at least 90% of ASTM D 1557 and at moistures above optimum, foundations supported by site materials are estimated to undergo total and differential settlements of less than 1 inch and ¼-inch over 30 feet, respectively.

### 4.3 PERCOLATION ANALYSES

Based on the results of field percolation testing, site soils have a very high infiltration rate. To develop a percolation rate, field percolation test results obtained from the test well with the lowest infiltration, Boring P-1, were used to calculate a percolation rate. The volume of water that infiltrated during the test was taken as the volume of casing over the distance the water dropped plus 42% of the volume in the annular space outside the casing where the sand is present. The flow rate, Q, was taken as the total volume of infiltrated water divided by the average wetted area divided by the duration (1 or 2 minutes). The percolation rates for each reading period of Borings P-1 are presented on the Percolation Test Result, Plate C-5.
As indicated on Plate C-5, the percolation rates vary from 70.2 to 445 gallons per square foot per day (gallon/sqft/day). These percolation rates are affected by the pressure head of the water and the transmissivity, k, of each individual soil layer. Therefore, these rates do not represent the actual percolation rate of any particular soil layer under a pressure head of unity. To account for the pressure head, we determine the average transmissivity of the wetted perimeter during each reading. The transmissivity is taken as the percolation rate divided by the average wetted area divided by the average pressure head. The calculated values are indicated on Plate C-5. From this, we obtain values that range from about 4 to 34 inches/hour. The transmissivity can then be applied to a full-scale pit of a differing size in order to estimate the percolation rate. The percolation rate of a full-scale pit is taken as the design transmissivity times the anticipated wetted area of the pit times the average depth of the wetted area. From the data presented in Plate C-5, we can assume a conservative transmissivity rate of 4.25 inches/hr obtained when the test boring was substantially full of water. Applying our design transmissivity rate to a pit with a diameter of 6 feet, a depth of 20 feet, and a depth to the water surface of 5 feet (making a wetted depth of 15 feet), we will obtain a percolation rate of 0.25 cubic feet per second.

5.0 CONCLUSIONS

5.1 FEASIBILITY OF PROPOSED DEVELOPMENT

From a geotechnical point of view, the proposed site development is considered feasible, provided that the proposed residential development at the site will be designed and constructed in accordance with the recommendations presented in this report.

5.2 SEISMIC HAZARDS

5.2.1 Ground Rupture

No active faults are known to project through the site nor does the site lie within the bounds of an "Earthquake Fault Zone" as defined by the State of California in the Alquist-Priolo Earthquake Fault Zoning Act. As such, the potential for ground rupture due to fault displacement beneath the site is considered very low.

5.2.2 Ground Shaking

The site is located in a seismically active area that has historically been affected by moderate to occasionally high levels of ground motion. Due to site proximity to several known active faults, the property will likely experience moderate to occasionally high ground shaking during the life of the proposed development. Some background shaking from other seismically active areas of the Southern California region should also be anticipated. Provided that the recommended ground improvement measures are employed at the site, designs in accordance with current version of California Building Code (CBC) requirements are considered suitable to mitigate the effects of the anticipated ground shaking during the design life of the structures.
5.2.3 Liquefaction

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

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

The liquefaction susceptibility of the onsite subsurface soils was evaluated by analyzing the potential concurrent occurrence of the above-mentioned three basic factors. The liquefaction evaluation for the site was completed under the guidance of Special Publication 117: Guidelines for Evaluating and Mitigating Seismic Hazards in California (CDMG, 1997).

Groundwater was measured at depths ranging from 19.6 to 25.4 feet below the existing ground surface. The granular soils below the groundwater table are dense to very dense. As such, the potential for liquefaction at the site is considered to be low to very low.

5.3 STATIC SETTLEMENT

Provided the existing surficial soils within the proposed building pads will be removed and replaced as engineered compacted fill, total and differential static settlements are not anticipated to exceed 1 inch and ½-inch over 30 feet, respectively, for the proposed residential structures at the site.

5.4 MATERIAL CHARACTERISTICS

Surficial soils are anticipated to be relatively easy to excavate with conventional heavy earthmoving equipment. These materials are generally below the optimum moisture content and will likely require processing (adding water and mixing) to achieve the recommended moisture content and compaction requirements. Recommendations for temporary excavation slopes are provided in Section 6.1.5 of this report.

5.5 SHRINKAGE AND SUBSIDENCE

Volumetric changes in earth quantities will occur when excavated onsite soil materials are replaced as properly compacted fill. We estimate the existing artificial fill and alluvium may shrink approximately 0 to 5 percent. Processing of removal bottoms are anticipated to result in negligible subsidence. The estimates of shrinkage and subsidence are intended as an aid for project engineers in determining earthwork quantities. However, these estimates should be used with some caution since they are not absolute values. Contingencies should be made for balancing earthwork quantities based on actual shrinkage and subsidence that occur during the grading process.
5.6 SOIL EXPANSION

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

6.0 RECOMMENDATIONS

6.1 EARTHWORK

6.1.1 General Earthwork and Grading Specifications

All earthwork and grading should be performed in accordance with applicable requirements of Cal/OSHA, applicable specifications of the Grading Codes of City of Goleta, California, in addition to recommendations presented herein.

6.1.2 Pre-Grade Meeting and Geotechnical Observation

Prior to commencement of grading, we recommend a meeting be held between the developer, City inspector, grading contractor, civil engineer, and geotechnical consultant to discuss the proposed grading and logistics. We also recommend that a geotechnical consultant be retained to provide soil engineering and engineering geologic services during site grading and foundation construction. This is to observe compliance with the design specifications and recommendations, and to allow design changes in the event that subsurface conditions differ from those anticipated. If conditions are encountered that appear to be different than those indicated in this report, the project geotechnical consultant should be notified immediately. Design and construction revisions may be required.

6.1.3 Site Clearing

All existing vegetation and other deleterious materials should be removed from the areas to be developed. The existing transformer, associated underground electric lines and the storm drain that will be left in place should be properly protected during site construction. The project geotechnical consultant should be notified at the appropriate times to provide observation services during clearing operations to verify compliance with the above recommendations. Voids created by clearing should be left open for observation by the geotechnical consultant. Should any unusual soil conditions or subsurface structures be encountered during site clearing or grading that are not described or anticipated herein, these conditions should be brought to the immediate attention of the project geotechnical consultant for corrective recommendations as needed.

6.1.4 Ground Preparation

Existing surficial soils are weathered and moderately desiccated. In order to provide adequate and uniform support of the proposed structures, existing surficial soils within the proposed building pads should be removed and replaced as engineered compacted fill. The estimated depth of removal for the areas outside the previously proposed office building pad is on the order of 3 to 4 feet below the existing ground surface or at least 1 foot below the bottom of proposed footings, whichever is deeper. The estimated depth of removal for the previously proposed office building pad is on the
order of 1 to 2 feet below the existing ground surface provided that at least 1 foot of engineering compacted fill will be provided below the bottom of proposed footings. Removal or overexcavation should extend laterally a distance of at least 5 feet beyond the building or wall footprint.

Within future pavement areas, the existing surficial soils should be removed to at least 1.5 feet below the proposed pavement subgrade and replaced with engineered compacted fill.

All removal bottoms should be evaluated by the geotechnical consultant during grading to confirm the exposed conditions are as anticipated and are competent for supporting the proposed structures and fills above. Following removals, the exposed grade should first be scarified to a depth of 6 inches, moisture conditioned to slightly over optimum moisture content, and then re-compacted to at least 90 percent of the laboratory standard.

The grading contractor should take appropriate measures when excavating adjacent existing improvements to avoid disturbing or compromising support of existing structures.

6.1.5 Temporary Excavations

Temporary construction slopes in site soils may be cut vertically up to a height of 4 feet provided that no adverse geologic conditions or surcharging (such as adjacent buildings) of the excavations are present. Temporary slopes over 4 feet in site soils should be laid back at a maximum gradient of 1:1 (H:V) or properly shored. Excavations should not be left open for prolonged periods of time. The project geotechnical consultant should observe all temporary cuts to confirm anticipated conditions and to provide alternate recommendations if conditions dictate.

Where temporary excavations can not accommodate a 1:1 layback or where surcharging occurs, slot cutting, shoring, underpinning, or other methods should be used. Specific recommendations for these options should be provided by the geotechnical consultant after specific design plans have been developed.

6.1.6 Fill Placement

Materials excavated from the site may be used as fill provided they are free of deleterious materials and particles greater than 4 inches in maximum dimension (oversized materials). Fill should be placed in lifts no greater than 8 inches in loose thickness, moisture conditioned to 100 to 125 percent of the optimum moisture content, then compacted in place to at least 90 percent of the laboratory standard. The laboratory standard for maximum dry density and optimum moisture content for each soil type used should be determined in accordance with ASTM D 1557-07. Each lift should be treated in a similar manner. Subsequent lifts should not be placed until the project geotechnical consultants have approved the preceding lift.

6.1.7 Import Material

If imported soils are required to bring the site to proposed grades, imported soils should have a maximum particle size of 4 inches and have an expansion index (EI) less then 51. Potential import soils should be sampled by the geotechnical consultant at the source, if possible. tested for expansion, soluble sulfate content and maximum density, and approved by the geotechnical consultant prior to being used.
6.2 SEISMIC DESIGN PARAMETERS

For design of the project in accordance with Chapter 16 of the 2007 CBC, the following table presents the seismic design factors:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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</thead>
<tbody>
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<td>Site Class</td>
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<td>Mapped MCE Spectral Response Acceleration, short periods, $S_S$</td>
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<td>Mapped MCE Spectral Response Acceleration, at 1-sec. period, $S_1$</td>
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</tr>
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<tr>
<td>Site Coefficient, $F_v$</td>
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<td>Design Spectral Response Acceleration, short periods, $S_{DS}$</td>
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<tr>
<td>Design Spectral Response Acceleration, at 1-sec. period, $S_{DI}$</td>
<td>0.653</td>
</tr>
</tbody>
</table>

MCE = Maximum Considered Earthquake

6.3 PRELIMINARY FOUNDATION DESIGN RECOMMENDATIONS

6.3.1 General

The following recommendations are provided for preliminary design purposes. These recommendations have been based on the site materials exposed during the investigations completed by this firm and Fugro, our understanding of the proposed development, and the assumption that the recommendations presented herein are incorporated into the design and construction of the project. Final recommendations should be provided by the project geotechnical consultant following review of grading and foundation plans as well as observation and testing of site materials during grading. Depending upon the design plans and actual site conditions, the recommendations provided herein may require modification.

6.3.2 Soil Expansion

Expansion potential of soils at the site vary from Very Low (E1<21) to Medium (50<E1<91). The recommendations provided herein are based on soils with a Medium expansion potential. Following site grading, additional testing of site soils should be performed by the project geotechnical consultant to confirm the basis of these recommendations. If site soils with higher expansion potentials are encountered or imported to the site, the recommendations contained herein may require modification. If particular areas of the site exhibit lower expansion potential following grading, alternate recommendations can be provided that are appropriate for the expansion potentials that result.
6.3.3 Settlement
The proposed foundation systems should be designed to tolerate a total and differential settlement of 1 inch and ½-inch over 30 feet, respectively.

6.3.4 Allowable Bearing Value
Provided site grading is performed in accordance with the recommendations presented in this report, a bearing value of 2,000 pounds per square foot (psf) may be used for continuous footings and pad footings/beams having a minimum width of 12 inches and founded at a minimum depth of 12 inches below the lowest adjacent grade. This value may be increased by 250 psf and 500 psf for each additional foot in width and depth, respectively, up to a maximum value of 4,000 psf. Recommended allowable bearing values include both dead and live loads, and may be increased by one-third for wind and seismic forces.

6.3.5 Lateral Resistance
Provided site grading is performed in accordance with the recommendations presented in this report, a passive earth pressure of 300 pounds per square foot per foot of depth up to a maximum value of 1,500 pounds per square foot may be used to determine lateral bearing for footings. This value may be increased by one-third when designing for wind and seismic forces. A coefficient of friction of 0.35 times the dead load forces may also be used between concrete and the supporting soils to determine lateral sliding resistance. No increase in the coefficient of friction should be used when designing for wind and seismic forces.

The above values are based on footings placed directly against compacted fill or competent native soils. In the case where footing sides are formed, all backfill against the footings should be compacted to at least 90 percent of the laboratory standard.

6.3.6 Post-Tensioned Slabs on Grade
Perimeter edge beams for the proposed structures should be founded at a minimum depth of 15 inches below the lowest adjacent final ground surface. Interior beams may be founded at a minimum depth of 12 inches below the tops of the finish floor slabs.

The thickness of the floor slabs should be determined by the project structural engineer; however, we recommend a minimum slab thickness of 4.5 inches.

All dwelling area floor slabs constructed on-grade should be underlain with a moisture vapor retarder such as 10-mil Visqueen or equivalent. A minimum of two (2) inches of clean sand having a SE of 30 or greater should be placed over the membrane to promote uniform curing of the concrete and aid in reducing vapor emissions. This vapor retarder system is anticipated to be suitable for most flooring finishes that can accommodate some vapor emissions. However, this system may emit more than 4 pounds of water per 1000 sq. ft. and therefore, may not be suitable for all flooring finishes. Additional steps should be taken if such vapor emission levels are too high for anticipated flooring finishes.

Pre-saturation of the subgrade below floor slabs will not be required; however, prior to placing concrete, the subgrade below all dwelling and garage floor slab areas should be thoroughly
moistened to achieve a moisture content that is at least 110 percent of the optimum moisture content. This moisture content should penetrate to a minimum depth of 12 inches below the bottoms of the slabs.

Based on the guidelines provided in the “Design of Post-Tensioned Slabs-on-Ground” 3rd Edition by Post-Tensioning Institute, the $e_m$ and $y_m$ values are summarized below:

- Edge Lift Moisture Variation Distance, $e_m$: 4.3 feet
- Edge Lift, $y_m$: 1.80 inches
- Center Lift Moisture Variation Distance, $e_m$: 8.4 feet
- Center Lift, $y_m$: 1.21 inches

### 6.4 RETAINING AND SCREENING WALLS

#### 6.4.1 General

The following recommendations are provided for preliminary design purpose. Final retaining wall designs specific to the site development should be provided to us for review once completed. The structural engineer and architect should provide recommendations for sealing at all joints and applying moisture-proofing material on the back of the walls.

#### 6.4.2 Allowable Bearing Value and Lateral Resistance

Retaining and free-standing wall footings should be founded in engineered compacted fill. Retaining walls may utilize the bearing capacities and lateral resistance values provided in Sections 6.3.4 and 6.3.5. The passive pressure used for lateral bearing should be reduced by 50% for walls that have a descending slope below the face of the wall.

The above values are based on footings placed directly against properly compacted fill or competent native soil. In the case where footing sides are formed, all backfill against the footings should be compacted to at least 90 percent of the laboratory standard.

#### 6.4.3 Active Earth Pressures

Static and seismic earth pressures for level and 2:1 ($H:V$) backfill conditions are provided in the following table. Seismic earth pressures provided herein are based on the method provided by Seed & Whitman (1970) using a peak ground acceleration (PGA) of 0.45g. This acceleration is based on 40 percent of the short period of design spectral response acceleration determined for the site. The values provided in the following table are based on selected, relatively granular site materials with Very Low to Low expansion potential ($0<\overline{E}\leq 51$) to backfill the excavation for wall construction within a plane projected 1:1 ($H:V$) from the rear of the footing and using general site soils to backfill the remaining excavation. In addition, the values are based on drained backfill conditions and do not consider hydrostatic pressure. Furthermore, retaining walls should be designed to support adjacent surcharge loads imposed by other nearby footings or traffic loads in addition to the earth pressure.
TABLE 6.2
EARTH PRESSURES

Pressure Diagram

Pressure Values
Walls Up to 10 Feet in Height

<table>
<thead>
<tr>
<th>Value</th>
<th>Backfill Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level</td>
</tr>
<tr>
<td>A</td>
<td>37.2H</td>
</tr>
<tr>
<td>B</td>
<td>13.9H</td>
</tr>
<tr>
<td>C</td>
<td>25.6H</td>
</tr>
</tbody>
</table>

Note:
H is in feet and resulting pressure is in psf. Design may utilize either the sum of the static component and the seismic component force diagrams or the total force diagram above. SEAOSC has suggested using a load factor of 1.7 for the static component and 1.0 for the seismic component. The actual load factors should be determined by the structural engineer.

6.4.4 Drainage and Moisture-Proofing

Retaining walls should be constructed with a perforated pipe and gravel subdrain to prevent entrapment of water in the backfill. The perforated pipe should consist of 4-inch-diameter, ABS SDR-35 or PVC Schedule 40 with the perforations laid down. The pipe should be embedded in ¾- to 1½-inch open-graded gravel wrapped in filter fabric. The gravel should be at least one foot wide and extend at least one foot up the wall above the footing and drainage outlet. Drainage gravel and piping should not be placed below outlets and weepholes. Filter fabric should consist of Mirafi 140N, or equal. Outlet pipes should be directed to positive drainage devices.
The use of weepholes may be considered in locations where aesthetic issues from potential nuisance water are not a concern. Weepholes should be 2 inches in diameter and provided at least every 6 feet on center. Where weepholes are used, perforated pipe may be omitted from the gravel subdrain.

Retaining walls supporting backfill should also be coated with a moisture-proofing compound or covered with such material to inhibit infiltration of moisture through the walls. Moisture-proofing material should cover any portion of the back of wall that will be in contact with soil and should lap over and cover the top of footing. A drainage blanket such as Mirafi Miracrain should be provided between the soil and the moisture-proofing materials. The drainage blanket should extend from the top of the gravel to within about 12 inches of finish grade. The top of footing should be finished smooth with a trowel to inhibit the infiltration of water through the wall. The project structural engineer should provide specific recommendations for moisture-proofing, water stops, and joint details.

6.4.5 Footing Reinforcement

All continuous footings should be reinforced with a minimum of four No. 4 bars, two top and two bottom. The structural engineer may require different reinforcement and should dictate if greater than the recommendations provided herein. Where recommended removals are limited due to space restrictions, greater reinforcement may be recommended. Specific recommendations should be provided by the geotechnical consultant during grading based on as-built conditions exposed in the field.

6.4.6 Footing Observations

Footing excavations should be observed by the project geotechnical consultant to verify that they have been excavated into competent bearing soils and to the minimum embedment recommended herein. These observations should be performed prior to placement of forms or reinforcement. The excavations should be trimmed neat, level and square. Loose, sloughed or moisture-softened materials and debris should be removed prior to placing concrete.

6.4.7 Wall Backfill

The project geotechnical consultant should approve the backfill used for retaining walls and the backfill should have Very Low to Low expansion potential within a plane projected 1:1 (H:V) from the rear of the footings. Wall backfill should be moisture-conditioned to slightly over the optimum moisture content: placed in lifts no greater than 12 inches in thickness, and then mechanically compacted with appropriate equipment to at least 90 percent of the laboratory standard. Hand-operated compaction equipment should be used to compact the backfill placed immediately adjacent the wall to avoid damage to the wall. Flooding or jetting of backfill material is not recommended.

If free-draining select materials are used as backfill for retaining walls, a minimum of 12 inches of onsite soils should be provided over the select materials to reduce the infiltration of water into the backfill. The 12 inches cap of onsite soils is not required where the finish surface will consist of hardscape such as concrete or asphalt paving.
6.5 EXTERIOR FLATWORK

Exterior flatwork should be a minimum 4 inches thick. Cold joints or saw cuts should be provided at least every 7 feet in each direction. Flatwork more than 7 feet in width across the minimum dimension should be reinforced with 6” by 6”, W2.9 by W2.9 welded wire mesh or No 3 bars spaced 24 inches center to center in both directions. Flatwork that meets the structures at points of entry should be doweled into the footing or grade beam of the structures. Consideration should also be given to doweling flatwork into curbs where they meet. Special jointing detail should be provided in areas of block-outs, notches, or other irregularities to avoid cracking at points of high stress. Subgrade soils below flatwork should be thoroughly moistened to a moisture content of at least 120 percent of the optimum moisture content to a depth of 12 inches. Moistening should be accomplished by lightly spraying the area over a period of a few days just prior to pouring concrete.

Drainage from flatwork areas should be directed to local area drains or other appropriate collection devices designed to carry runoff water to the street or other approved drainage structures. The concrete flatwork should also be sloped at a minimum gradient of 2% away from building foundations and masonry walls.

The geotechnical consultant should observe and verify the density and moisture content of subgrade soils prior to pouring concrete to verify the recommended pre-moistening recommendations have been met.

6.6 CONCRETE MIX DESIGN

Laboratory testing of on-site soils by Fugro indicates negligible soluble sulfate content. We recommend following the procedures provided in ACI 318, Section 4.3, Table 4.3.1 for negligible sulfate exposure. Upon completion of rough grading, an evaluation of as-graded conditions and further laboratory testing should be completed for the site to confirm or modify the recommendations provided in this section.

6.7 SOIL CORROSIVITY

A soil sample of existing surficial soils was tested by Fugro for soluble chloride content, minimum resistivity and pH. Test results are provided in Appendix D. The detected soluble chloride content is 78 ppm. Based on the test result, site soils are not corrosive to metals embedded in concrete such as reinforcing steel. The detected minimum resistivity is 3.086 ohm-cm and pH of 7.4. As such, site soils are moderately corrosive to metals. Structures fabricated from metals should have appropriate corrosion protection if they will be in direct contact with site soils. Under such conditions, a corrosion specialist should provide specific recommendations.

6.8 POST GRADING CONSIDERATIONS

6.8.1 Site Drainage and Irrigation

Positive drainage devices, such as sloping concrete flatwork, graded swales or area drains, should be provided around the new construction to collect and direct all surface water to suitable discharge
areas. No rain or excess water should be directed toward or allowed to pond against structures such as walls, foundations, flatwork, etc.

Excessive irrigation water can be detrimental to the performance of the proposed site development. Water applied in excess of the needs of vegetation will tend to percolate into the ground. Such percolation can lead to nuisance seepage and shallow perched groundwater. Seepage can form on slope faces, on the faces of retaining walls, in streets, or other low-lying areas. These conditions could lead to adverse effects such as the formation of stagnant water that breeds insects, distress or damage of trees, surface erosion, slope instability, discoloration and salt buildup on wall faces, and premature failure of pavement. Excessive watering can also lead to elevated vapor emissions within structures that can damage flooring finishes or lead to mold growth inside the home.

Key factors that can help mitigate the potential for adverse effects of overwatering include the judicious use of water for irrigation, use of irrigation systems that are appropriate for the type of vegetation and geometric configuration of the planted area, the use of soil amendments to enhance moisture retention, use of low-water demand vegetation, regular use of appropriate fertilizers, and seasonal adjustments of irrigation systems to match the water requirements of vegetation. Specific recommendations should be provided by a landscape architect or other knowledgeable professional.

6.8.2 Utility Trenches

Trench excavations should be constructed in accordance with the recommendations contained in Section 6.1.5 of this report. Trench excavations must also conform to the requirements of Cal/OSHA.

Trench backfill materials and compaction criteria should conform to the requirements of the local municipalities. As a minimum, utility trench backfill should be compacted to at least 90 percent of the laboratory standard. Trench backfill should be moistened to slightly over the optimum moisture content, placed in lifts no greater than 12 inches in thickness, and then mechanically compacted with appropriate equipment to at least 90 percent of the laboratory standard. The project geotechnical consultant should perform density testing, along with probing, to test compaction. Site conditions are generally not suitable for jetting of trench backfill and jetting should not be completed without prior approval from the project geotechnical consultant.

Within shallow trenches (less than 18 inches deep) where pipes may be damaged by heavy compaction equipment, imported clean sand having a SE of 30 or greater may be utilized. The sand should be placed in the trench, thoroughly moistened, and then compacted with a vibratory compactor.

Where utility trenches are proposed parallel to any building footing (interior or exterior trenches), the bottom of the trench should not be located below a 1:1 (H:V) plane projecting downward from the outside edge of the adjacent footing base. For utility trenches located below a 1:1 (H:V) plane projecting downward from the outside edge of the adjacent footing base or crossing footing trenches, concrete or slurry should be used as trench backfill.
6.9 PRELIMINARY PAVEMENT DESIGN RECOMMENDATIONS

6.9.1 Subgrade Preparation

Prior to placement of pavement elements, the upper 12 inches of subgrade soils should be moisture-conditioned to at least 110 percent of the optimum moisture content and compacted to at least 90 percent of the laboratory standard. Areas observed to pump or yield under vehicle traffic should be removed and replaced with firm and unyielding compacted soil or aggregate base materials.

6.9.2 Preliminary Pavement Designs

Based on the soil conditions present at the site and estimated traffic indexes, preliminary pavement sections are recommended in the table below. For preliminary design purposes, an "R"-value of 7 was used to determine the pavement design criteria presented below. The sections presented below are for planning purposes only and should be re-evaluated subsequent to site grading. Final pavement sections should be based on actual R-value testing of in-place soils and analysis of anticipated traffic.

Table 6.5
Preliminary Pavement Design

<table>
<thead>
<tr>
<th>Location</th>
<th>Traffic Index</th>
<th>Asphalt Concrete (inches)</th>
<th>Aggregate Base (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Village Way</td>
<td>6.5</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>Secondary Streets</td>
<td>5.0</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Parking Stalls</td>
<td>-</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

6.9.3 Pavement Materials

Aggregate base should be placed in lifts no greater than 6 inches in thickness, moistened to slightly over optimum moisture content, then compacted to at least 95 percent of the laboratory standard. The laboratory standard should be ASTM D1557-07. Aggregate base materials should be Crushed Aggregate Base or Crushed Miscellaneous Base conforming to Section 200-2 of the 2006 Standard Specification for Public Works Construction (Greenbook).

Paving asphalt should be PG 64-10 (or either AR 4000 or AR 8000) conforming to the requirements of Section 203-1 of the Greenbook (2006). Asphalt concrete materials should conform to Section 203-6 and construction should conform to Section 302 of the Greenbook (2006).

6.10 PRELIMINARY PERCOLATION RATE

Details of the proposed storm water infiltration system are not known at this time. Depending on the proposed storm water infiltration system, the design parameters presented herein may require modification.
Based on results of percolation testing and analyses, the maximum percolation rate for a 6-foot-diameter, 20 feet deep percolation pit with inlet at 5 feet below grade is 0.25 cubic foot per second (cfs). Percolation rates for other configuration of percolation pits will be provided upon request.

6.11 PLAN REVIEW AND CONSTRUCTION SERVICES

We recommend Albus-Keefe & Associates, Inc. be engaged to review any future development plans, including civil plans (grading plans), structural plans (foundation plans), and proposed structural loads, prior to construction. This is to verify that the assumptions of this report are valid and that the preliminary conclusions and recommendations contained in this report have been properly interpreted and are incorporated into the project plans and specifications. If we are not provided the opportunity to review these documents, we take no responsibility for misinterpretation of our preliminary conclusions and recommendations.

We recommend that a geotechnical consultant be retained to provide soil engineering services during construction of the project. These services are to observe compliance with the design, specifications or recommendations, and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

If the project plans change significantly from the assumed development described herein, the project geotechnical consultant should review our preliminary design recommendations and their applicability to the revised construction. If conditions are encountered during construction that appear to be different than those indicated in this report or subsequent design reports, the project geotechnical consultant should be notified immediately. Design and construction revisions may be required.
7.0 LIMITATIONS

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

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

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

This report has been prepared for the exclusive use of Comstock Crosser & Associates and its project consultants in the planning and design of the proposed development. This report has not been prepared for use by parties or projects other than those named or described herein. This report may not contain sufficient information for other parties or other purposes.

This report is subject to review by the controlling governmental agency.

Respectfully submitted,

ALBUS-KEEFE & ASSOCIATES, INC

James J.M. Chang
Associate Engineer
G.E. 2180

David E. Albus
Principal Engineer
G.E. 2455
REFERENCES

Publications


REFERENCES (Cont.)

Reports


Plans

Conceptual Site Plan - Los Carneros-Goleta, Goleta, California, Comstock Homes, dated November 6, 2009, prepared by William Hezmalhalch Architects, Inc.
APPENDIX A

EXPLORATION LOGS
## EXPLORATION LOG

**Project:** Phase I of Los Carneros  
**Location:** Goleta  
**Job No.:** 1831.00  
**Client:** Comstock Crossover & Assoc.  
**Date:**  
**Drill Method:** Driving Weight  
**Logged By:**  

<table>
<thead>
<tr>
<th>Depth (Feet)</th>
<th>Lithology</th>
<th>Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
<td>Solid black rectangle in Core column represents California Split-Spoon sampler (2.5 in. ID, 3 in. OD).</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>Double triangle in core column represents SPT sampler.</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>Open circle in Core column represents sample not recovered.</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>Light gray rectangle in Bulk column represents large bag sample.</td>
</tr>
</tbody>
</table>

### EXPLANATION.

- Solid lines separate geologic units and/or material types.
- Dashed lines indicate unknown depth geologic unit change or material type change.

### OTHER LABORATORY TESTS:
- **MAX** = Maximum Dry Density/Optimum Moisture Content
- **SO4** = Soluble Sulfate Content
- **COR** = Corrosion Series
- **DSR** = Direct Shear, Remolded
- **DS** = Direct Shear, Undisturbed
- **SA** = Sieve Analysis (1" through #200 sieve)
- **PSA** = Particle Size Analysis (SA with Hydrometer)
- **-200** = Percent Passing #200 Sieve
- **HYD** = Hydrometer Only
- **CON** = Consolidation
- **SE** = Sand Equivalent
- **RVAL** = R-Value
- **PER** = Permeability.
# Exploration Log

**Project:** Phase I of Los Carneros

**Location:** Goleta

**Job No.:** 1831.00

**Client:** Comstock Crosser & Assoc.

**Boring No.:** P-1

**Date:** 11/23/09

**Logged By:** JC

<table>
<thead>
<tr>
<th>Depth (Ft)</th>
<th>Lithology</th>
<th>Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sandy Silt (ML):</td>
<td>Dark brown; damp to moist; stiff; fine-grained sand.</td>
</tr>
<tr>
<td></td>
<td>Clayey Sand (SC):</td>
<td>Reddish-brown; moist; medium dense; fine-grained sand.</td>
</tr>
<tr>
<td>5</td>
<td>Silty Sand (SM):</td>
<td>Reddish-brown; damp to moist; medium dense; fine-grained sand.</td>
</tr>
<tr>
<td>10</td>
<td>Sandy Clay (CL):</td>
<td>Dark reddish-brown and gray; moist; very stiff; fine-grained sand.</td>
</tr>
<tr>
<td>15</td>
<td>Sandy Silt (ML):</td>
<td>Dark brown; moist; very stiff; fine-grained sand.</td>
</tr>
<tr>
<td>20</td>
<td>Sand (SP-SMT):</td>
<td>Pale gray; dry to damp; very dense; fine- to coarse-grained sand; trace silt.</td>
</tr>
<tr>
<td>20'</td>
<td>becomes fine- to medium-grained sand with trace silt.</td>
<td></td>
</tr>
<tr>
<td>20.8'</td>
<td>groundwater.</td>
<td></td>
</tr>
</tbody>
</table>

**Samples:***

<table>
<thead>
<tr>
<th>Blows Per Foot</th>
<th>CBR</th>
<th>Moisture Content (%)</th>
<th>Dry Density (pcf)</th>
<th>Other Lab Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>6.4</td>
<td>118.4</td>
<td>-200</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>21.1</td>
<td>108.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>12.3</td>
<td>106.9</td>
<td>SA</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>20.5</td>
<td>98.8</td>
<td>PSA</td>
<td></td>
</tr>
</tbody>
</table>

**Well Installation:**

- 2" well screen: 3' - 18'
- 2" casing: +2' - 3'
- Sand: 2' - 18'
- Bentonite: 0' - 2'.

**ALBUS-KEEFE & ASSOCIATES, INC.**

1011 N. Armando St.
Anaheim, CA  92806-2606
(714) 630-1626  fax(714) 630-1916

Plate A-2
**EXPLORATION LOG**

**Project:** Phase I of Los Carneros

**Location:** Goleta

**Job No.:** 1831.00

**Client:** Comstock Crosser & Assoc.

**Date:** 11/23/09

**Boring No.:** P-2

**Logged By:** JC

**Drill Method:** Hollow-Stem Auger

**Driving Weight:** 140 lbs / 30 in

<table>
<thead>
<tr>
<th>Depth (Feet)</th>
<th>Lithology</th>
<th>Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
<td>Sandy Clay (CL): Reddish-brown and dark gray; damp to moist; stiff to very stiff; fine-grained sand.</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>Sand (SP): Reddish-brown; damp; dense; fine- to medium-grained sand; trace silt.</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>Interbedded Sandy Silt, Silty Clay and Clayey Silt (ML/CL/ML): Sandy Silt: reddish brown, damp to moist, very stiff, fine-grained sand; Silty Clay: reddish brown, moist, very stiff; Clayey Silt: gray-brown, moist, very stiff.</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>Sand (SP): Light brown; damp; dense to very dense; fine-grained sand.</td>
</tr>
<tr>
<td>21</td>
<td></td>
<td>Bottom of boring at 21'; becomes less dense.</td>
</tr>
<tr>
<td>22</td>
<td></td>
<td>@ 20', becomes pale-gray, damp, dense sand with trace silt.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Samples</th>
<th>Laboratory Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blows Per Foot</td>
<td>CBR</td>
</tr>
<tr>
<td>34</td>
<td>10.7</td>
</tr>
<tr>
<td>46</td>
<td>10.0</td>
</tr>
<tr>
<td>97</td>
<td>4.2</td>
</tr>
</tbody>
</table>

**Well Installation:**

2" well screen: 4' - 19'
2" casing: +1' - 4'
Sand: 3' - 19'
Bentonite: 0 - 3'.

**ALBUS-KEEFE & ASSOCIATES, INC.**

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(714) 630-1628 Fx(714) 630-1916

Plate A-3
### EXPLORATION LOG

<table>
<thead>
<tr>
<th>Depth (Feet)</th>
<th>Lithology</th>
<th>Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Silty Sand (SM): Light brown; damp; medium dense to dense; fine-grained sand.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>@ 2', becomes reddish brown.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>@ 5', occasional pin-hole pores.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>@ 6', a layer of silty clay about 2' thick.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silty Clay (CL): Reddish-brown and gray; moist; very stiff.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silty Sand (SM): Reddish-brown; moist; dense; fine- to medium-grained sand.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>@ 15', becomes light brown, fine-grained, moist, very dense silty sand.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sand (SP): Pale gray; damp; very dense; fine-grained sand; trace silt.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bottom of boring at 21'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No groundwater.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Well Installation:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2&quot; well screen: 4' - 19'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2&quot; casing: +1' - 4'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sand: 3' - 19'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bentonite: 0 - 3'.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Depth (Feet)</th>
<th>Lithology</th>
<th>Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Samples</th>
<th>Laboratory Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>Moisture Content</td>
</tr>
<tr>
<td>Brows</td>
<td>(%)</td>
</tr>
<tr>
<td>Per Peni</td>
<td></td>
</tr>
</tbody>
</table>

### EXPLORATION LOG

Project: Phase I of Los Carneros
Location: Goleta
Boring No.: P-3
Elevation:
Job No.: 1831.00
Client: Comstock Crosser & Assoc.
Date: 11/24/09
Drill Method: Hollow-Stem Auger
Driving Weight: 140 lbs / 30 in
Logged By: JC

ALBUS-KEFFE & ASSOCIATES, INC.
1011 N. Armando St.
Anaheim, CA 92805-2805
(714) 630-1626  fax(714) 630-1916

Plate A-4
<table>
<thead>
<tr>
<th>Depth (Feet)</th>
<th>Lithology</th>
<th>Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>Silt (SM): Medium brown; dry to damp; medium dense to dense; fine-grained sand.</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>@ 2', becomes reddish brown and dense to very dense.</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Sandy Clay (CL): Reddish-brown; moist; stiff to very stiff; fine-grained sand.</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>Silty Sand (SM): Reddish-brown; moist; dense to very dense; fine-grained sand.</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>Sand (SP): Pale gray; damp to moist; very dense; fine-grained sand; trace silt.</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>Bottom of boring at 19'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No groundwater</td>
</tr>
</tbody>
</table>

Well Installation:
- 2" well screen: 3'-18'
- 2" casing: +2'-3'
- Sand: 2'-18'
- Bentonite: 0'-2'

Blows Per Foot | Samples | Moisture Content (%) | Dry Density (pcf) | Other Lab Tests |
---------------|---------|----------------------|-------------------|-----------------|
50             |         | 5.5                  | 113.4             |                 |
40             |         | 5.8                  | 110.8             |                 |
76             |         | 2.1                  | 92.9              |                 |
63             |         |                      | 91.0              |                 |

Project: Phase I of Los Carneros
Location: Goleta
Job No.: 1831.00
Client: Comstock Crosser & Assoc.
Date: 11/24/09
Boring No.: P-4
Drill Method: Hollow-Stem Auger
Driving Weight: 140 lbs / 30 in
Logged By: JC
APPENDIX B

LABORATORY TESTING PROGRAM
LABORATORY TESTING PROGRAM

Soil Classification

Soils encountered within the exploratory borings were initially classified in the field in general accordance with the visual-manual procedures of the Unified Soil Classification System (ASTM D2487-06). The samples were re-examined in the laboratory and classifications reviewed and then revised where appropriate. The assigned group symbols are presented on the Boring Logs provided in Appendix A.

In-Situ Moisture and Density

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

Particle Size and Hydrometer Analyses

Particle size and hydrometer analyses were performed on representative samples of site materials in accordance with ASTM D 422-63. The results are presented graphically on the attached Plates B-1 through B-4.

Percent Passing the No. 200 Sieve

Percent of material passing the No. 200 sieve was determined on selected samples to verify visual classifications performed in the field. These tests were performed in accordance with ASTM D1140-00. Test results are presented on Table B.

<table>
<thead>
<tr>
<th>Boring No.</th>
<th>Sample Depth (ft)</th>
<th>Soil Description</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-1</td>
<td>5</td>
<td>Silty Sand (SP)</td>
<td>Passing #200 Sieve: 19%</td>
</tr>
<tr>
<td>P-1</td>
<td>15</td>
<td>Silty Sand (SM)</td>
<td>Passing #200 Sieve: 21%</td>
</tr>
<tr>
<td>P-1</td>
<td>20</td>
<td>Sand w/ Silt (SP-SM)</td>
<td>Passing #200 Sieve: 6%</td>
</tr>
<tr>
<td>P-2</td>
<td>5</td>
<td>Sand and Sandy Clay (SP &amp; CL)</td>
<td>Passing #200 Sieve: 32%</td>
</tr>
<tr>
<td>P-2</td>
<td>20</td>
<td>Sand (SP)</td>
<td>Passing #200 Sieve: 4%</td>
</tr>
<tr>
<td>P-3</td>
<td>5</td>
<td>Silty Sand (SM)</td>
<td>Passing #200 Sieve: 25%</td>
</tr>
<tr>
<td>P-3</td>
<td>15</td>
<td>Silty Sand (SM)</td>
<td>Passing #200 Sieve: 28%</td>
</tr>
</tbody>
</table>

Note: Additional laboratory test results are provided on the boring logs provided in Appendix A.
APPENDIX C

PERCOLATION TESTING
# Percolation Test Field Log

**Project Name:** Phase I of Los Carneros  
**Date Tested:** 11/25/2009  
**Location:** Goleta, CA  
**Job No.:** 1831.00  
**Test by:** JJC

## Test Loc. #. P-1

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth to H₂O (ft)</th>
<th>Time</th>
<th>Depth to H₂O (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13:05</td>
<td>0.00</td>
<td>9:53:00</td>
<td>0.00</td>
</tr>
<tr>
<td>13:28</td>
<td>0.00</td>
<td>9:53:15</td>
<td>6.50</td>
</tr>
<tr>
<td>9:53:15</td>
<td>8.50</td>
<td>9:53:30</td>
<td>11.20</td>
</tr>
<tr>
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<td>9:54:00</td>
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<td>9:54:15</td>
<td>14.70</td>
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<tr>
<td>9:54:15</td>
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</tr>
<tr>
<td>9:59:00</td>
<td>18.25</td>
<td>10:01:00</td>
<td>18.90</td>
</tr>
<tr>
<td>10:01:00</td>
<td>18.90</td>
<td>10:03:00</td>
<td>19.20</td>
</tr>
<tr>
<td>10:03:00</td>
<td>19.20</td>
<td>10:05:00</td>
<td>19.35</td>
</tr>
<tr>
<td>10:05:00</td>
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<td>10:07:00</td>
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<tr>
<td>10:11:00</td>
<td>19.70</td>
<td>10:13:00</td>
<td>19.80</td>
</tr>
</tbody>
</table>
# Percolation Test Field Log

**Project Name:** Phase I of Los Cerreros  
**Location:** Goleta, CA  
**Date Tested:** 11/25/2009  
**Depth of Seep. Pit:** 23.1'  
**Depth Bottom of Test:** 19.02'  
**Elev. of Ground Surface:** 8'  
**Diam. of Test Hole:** 1.08'  
**Depth Top of Casing:**  

<table>
<thead>
<tr>
<th>Test Loc. #</th>
<th>P-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td></td>
</tr>
<tr>
<td>11/24/2009</td>
<td></td>
</tr>
<tr>
<td>13:14</td>
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</tr>
<tr>
<td>13:32</td>
<td>0.00</td>
</tr>
<tr>
<td>11/25/2009</td>
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</tr>
<tr>
<td>7:44:00</td>
<td>0.00</td>
</tr>
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</tr>
<tr>
<td>9:00:15</td>
<td>9.00</td>
</tr>
<tr>
<td>9:00:30</td>
<td>12.00</td>
</tr>
<tr>
<td>9:00:45</td>
<td>14.80</td>
</tr>
<tr>
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</tr>
<tr>
<td>9:02:00</td>
<td>18.10</td>
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<td>18.40</td>
</tr>
<tr>
<td>9:03:00</td>
<td>18.75</td>
</tr>
<tr>
<td>9:03:30</td>
<td>18.90</td>
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<tr>
<td>9:05:00</td>
<td>19.15</td>
</tr>
<tr>
<td>9:06:00</td>
<td>19.20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth to H_2O (ft)</th>
<th>Time</th>
<th>Depth to H_2O (ft)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>9:12:15</td>
<td>8.00</td>
</tr>
<tr>
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<td>13.00</td>
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<td>16.10</td>
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<td>9:13:00</td>
<td>16.10</td>
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<td>17.50</td>
</tr>
<tr>
<td>9:13:30</td>
<td>17.50</td>
<td>9:15:00</td>
<td>18.20</td>
</tr>
<tr>
<td>9:15:00</td>
<td>18.20</td>
<td>9:16:00</td>
<td>18.70</td>
</tr>
<tr>
<td>9:16:00</td>
<td>18.70</td>
<td>9:18:00</td>
<td>19.05</td>
</tr>
<tr>
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<td>8.00</td>
</tr>
<tr>
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<td>10.00</td>
</tr>
<tr>
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<td>15.20</td>
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<td>17.90</td>
</tr>
<tr>
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<td>17.90</td>
<td>9:22:30</td>
<td>18.10</td>
</tr>
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</tr>
<tr>
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</tr>
<tr>
<td>9:28:00</td>
<td>19.10</td>
<td>9:30:00</td>
<td>19.15</td>
</tr>
<tr>
<td>9:30:00</td>
<td>19.15</td>
<td>9:35:00</td>
<td>19.30</td>
</tr>
<tr>
<td>9:35:00</td>
<td>19.30</td>
<td>9:40:00</td>
<td>19.45</td>
</tr>
</tbody>
</table>
### Percolation Test Field Log

**Project Name:** Phase I of Los Camaros

**Date Tested:** 11/25/2009

**Location:** Goleta, CA

<table>
<thead>
<tr>
<th>Test Loc. #</th>
<th>P-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth of Seep. Pit:</td>
<td>20.1'</td>
</tr>
<tr>
<td>Depth Bottom of Test:</td>
<td>18.93'</td>
</tr>
<tr>
<td>Elev. of Ground Surface:</td>
<td>117'</td>
</tr>
<tr>
<td>Diam. of Test Hole:</td>
<td>8&quot;</td>
</tr>
<tr>
<td>Depth Top of Casing:</td>
<td>1.17'</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth to H₂O (ft)</th>
<th>Time</th>
<th>Depth to H₂O (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13:20</td>
<td>0.00</td>
<td>13:37</td>
<td>19.90</td>
</tr>
<tr>
<td>13:37</td>
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<td>14:20</td>
<td>19.90</td>
</tr>
<tr>
<td>7:39:00</td>
<td>0.00</td>
<td>8:25:00</td>
<td>19.90</td>
</tr>
<tr>
<td>8:35:00</td>
<td>0.00</td>
<td>8:35:15</td>
<td>8.00</td>
</tr>
<tr>
<td>8:35:15</td>
<td>8.00</td>
<td>8:35:30</td>
<td>12.00</td>
</tr>
<tr>
<td>8:35:30</td>
<td>12.00</td>
<td>8:35:45</td>
<td>16.50</td>
</tr>
<tr>
<td>8:35:45</td>
<td>16.50</td>
<td>8:36:00</td>
<td>17.90</td>
</tr>
<tr>
<td>8:36:00</td>
<td>17.90</td>
<td>8:36:30</td>
<td>19.10</td>
</tr>
<tr>
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</tr>
<tr>
<td>8:40:15</td>
<td>8.00</td>
<td>8:40:30</td>
<td>12.00</td>
</tr>
<tr>
<td>8:40:30</td>
<td>12.00</td>
<td>8:40:45</td>
<td>16.50</td>
</tr>
<tr>
<td>8:40:45</td>
<td>16.50</td>
<td>8:41:00</td>
<td>17.20</td>
</tr>
<tr>
<td>8:41:00</td>
<td>17.20</td>
<td>8:41:30</td>
<td>17.70</td>
</tr>
<tr>
<td>8:41:30</td>
<td>17.70</td>
<td>8:42:00</td>
<td>18.20</td>
</tr>
<tr>
<td>8:42:00</td>
<td>18.20</td>
<td>8:42:30</td>
<td>18.80</td>
</tr>
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<td>18.80</td>
<td>8:43:00</td>
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</tr>
<tr>
<td>8:43:00</td>
<td>19.20</td>
<td>8:44:00</td>
<td>19.65</td>
</tr>
</tbody>
</table>

**Job No.:** 1831.00

**Test by:** JJC

---

*Albus-Keefe Associates, Inc.*
**Percolation Test Field Log**

**Project Name:** Phase I of Los Carreros  
**Date Tested:** 11/25/2009  
**Location:** Goleta, CA  
**Test by:** JJC  

| Test Loc. #: P-4 | Depth of Seep. Pit: 20.0'  
|------------------|------------------------|
|                  | Depth Bottom of Test: 17.92'  
| Elev. of Ground Surface: 8"  
| Diam. of Test Hole: 2.08"  
| Depth Top of Casing: |  

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth to H₂O (ft)</th>
<th>Time</th>
<th>Depth to H₂O (ft)</th>
</tr>
</thead>
</table>
| 11/24/2009  
13:25  
14:10  
  
11/25/2009  
7:35:00  
7:49:00  
7:49:10  
7:49:30  
  
8:15:00  
8:15:10  
8:15:30  
  
8:20:00  
8:20:10  
8:20:30  |
| 0.00  | 13:42  | 19.90  
| 0.00  | 14:23  | 19.80  
| 0.00  | 7:49:00 | 19.85  
| 0.00  | 7:49:10 | 10.00  
| 10.00  | 7:49:30 | 16.00  
| 16.00  | 7:49:45 | 19.00  
| 0.00  | 8:15:10 | 7.00  
| 7.00  | 8:15:30 | 15.00  
| 15.00  | 8:15:45 | 19.00  
| 0.00  | 8:20:10 | 7.00  
| 7.00  | 8:20:30 | 15.00  
| 15.00  | 8:20:45 | 19.00  |

950 gallons of water was reportedly in the water truck. The water was filled into the test well from 10:52 to 11:38. Water level was generally maintained near the top of casing.
## Percolation Test Results

**Project Name:** Phase I of Los Camaros  
**Job No.:** 1831.60  
**Date Tested:** 11/25/09  
**Test by:** JJC  

### Location: Test Pit P-1

<table>
<thead>
<tr>
<th>Depth of Seep Pit</th>
<th>17.03</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth Bottom of Test</td>
<td>20.1</td>
</tr>
<tr>
<td>Elev. of Ground Surface</td>
<td>5.0</td>
</tr>
<tr>
<td>Diam. of Test Hole (in):</td>
<td>8.0</td>
</tr>
<tr>
<td>Diam. of Casing (in):</td>
<td>2.0</td>
</tr>
<tr>
<td>Depth to Top of Screen (ft):</td>
<td>3.0</td>
</tr>
<tr>
<td>Gravel Porosity</td>
<td>0.42</td>
</tr>
<tr>
<td>Ht. to Top of Casing (in):</td>
<td>22.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Elapsed Time (minutes)</th>
<th>Time</th>
<th>Depth to H2O (ft)</th>
<th>Drop (ft)</th>
<th>Q (gal/sec/day)</th>
<th>k (ft/min)</th>
<th>k (in./hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>10:23</td>
<td>12.10</td>
<td>12.10</td>
<td>445.3</td>
<td>5.88E-03</td>
<td>4.24</td>
</tr>
<tr>
<td>1.00</td>
<td>10:24</td>
<td>12.10</td>
<td>3.20</td>
<td>409.6</td>
<td>1.10E-02</td>
<td>8.55</td>
</tr>
<tr>
<td>2.00</td>
<td>10:25</td>
<td>15.30</td>
<td>1.30</td>
<td>126.3</td>
<td>5.74E-03</td>
<td>4.13</td>
</tr>
<tr>
<td>3.00</td>
<td>10:26</td>
<td>16.60</td>
<td>1.00</td>
<td>136.5</td>
<td>8.45E-03</td>
<td>6.06</td>
</tr>
<tr>
<td>4.00</td>
<td>10:27</td>
<td>16.60</td>
<td>0.70</td>
<td>135.3</td>
<td>1.15E-02</td>
<td>8.29</td>
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**Ave. for 3' to 18':** 11.94
APPENDIX D

EXPLORATORY LOGS AND LABORATORY TEST DATA

BY FUGRO WEST, INC.
BASE MAP SOURCE: Modified from Penfield & Smith (8-16-01).

LEGEND

- DH-1 Approximate Drill Hole Location (Fugro, 10/2001)
- DH-1 Approximate Drill Hole Location (Fugro, 4/2001)
- TP-1 Approximate Test Pit Location (Fugro, 4/2001)
- DH-1 Approximate Drill Hole Location (Fugro, 2/2000)
- BP-1 Approximate Backhoe Pit Location (Fugro, 2/2000)

SUBSURFACE EXPLORATION PLAN
The Village at Los Carneros
APPENDIX A
GEOTECHNICAL ENGINEERING REPORT
CAMPUS POINTE BUILDING NO. 2
GOLETA AREA OF SANTA BARBARA COUNTY, CALIFORNIA
FEBRUARY 2000

The following is a listing of plates that have been extracted from the subject report and are presented herein for your use:

a. Logs of Drill Holes
- No. DH-1 .................................................................... Plates A-1a and A-1b
- No. DH-2 .................................................................... Plate A-2
- No. DH-3 .................................................................... Plates A-3a and A-3b
- No. DH-4 .................................................................... Plate A-4
- Key to Terms & Symbols Used on Logs ................................ Plate A-5

b. Backhoe Pit Logs
- Nos. BP-1 through BP-4 .............................................. Plate A-6
- Nos. BP-5 through BP-8 .............................................. Plate A-7
- Nos. BP-9 through BP-12 ............................................ Plate A-8
- Nos. BP-13 through BP-15 ......................................... Plate A-9

c. Laboratory Test Results
- Summary of Laboratory Test Results ......................... Plate B-1
- Plasticity Chart .......................................................... Plate B-2
- Direct Shear Test Results .......................................... Plate B-3
- Compaction Test Results .......................................... Plate B-4
- Consolidation Test Results ....................................... Plate B-5
## MATERIAL DESCRIPTION

**OLDER ALLUVIUM (Qtz)**  
Lean CLAY (CL): very stiff, reddish brown, moist

<table>
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<th>ELEVATION ft</th>
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<th>LOCATION</th>
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<th>SQUEEZE STRENGTH</th>
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<td>113</td>
<td>115</td>
<td>119, 109, 711</td>
</tr>
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</table>

**OTHER MATERIALS**

- Sandy lean CLAY (CL): very stiff, reddish brown
  - with roots, at 5.5"-
  - dry, with clay pockets, at 6"-

- Fine SAND (SP): dense, mottled reddish brown and tan, moist

- Lean CLAY (CL): very stiff to hard, moderate yellowish brown, moist
  - with roots, at 5.5"-
  - with clay, at 22.5"-
  - with gray, at 38"-

- Silty fine SAND (SM): very dense, moderate yellowish brown, wet

**COMPLETION DEPTH**: 51.5 ft  
**DEPTH TO WATER**: 20 ft  
**BACKFILLED WITH**: Native Materials  
**DRILLING DATE**: December 20, 1999  
**LOGGED BY**: J Palmer  
**CHECKED BY**: C A Wockner

LOG OF DRILL HOLE NO. DH-1  
Campus Pointe Building No. 2  
Santa Barbara County, California
<table>
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<th>MATERIAL DESCRIPTION</th>
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<td>-12</td>
<td>42</td>
<td>12</td>
<td>D0S</td>
<td>- moderate yellowish brown, wet, with trace voids, at 40'</td>
</tr>
<tr>
<td>-16</td>
<td>44</td>
<td></td>
<td>30</td>
<td>Fine SAND with SILT (SP/SIM): dense, gray</td>
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<tr>
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<td>46</td>
<td></td>
<td></td>
<td>- with trace voids, from 46' to 46.5'</td>
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<tr>
<td>-20</td>
<td>50</td>
<td></td>
<td>60</td>
<td>- dark gray, at 50'</td>
</tr>
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Note: Caving below 21'.

Completion Depth: 51.5 ft
Depth to Water: 20 ft
Backfilled with: Native Materials
Drilling Date: December 20, 1999

Drilling Method: Hollow Stem Auger
Hammer Type: Automatic Trip
Drilled by: A & R Drilling Inc.
Logged by: J. Palmer
Checked by: C A Workman

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the stated location. Some local conditions may differ at other locations and with the passage of time.
<table>
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<tr>
<th>ELEVATION, ft</th>
<th>DEPTH, ft</th>
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<th>SAMPLER</th>
<th>BLOW COUNT</th>
<th>LOCATION</th>
<th>MATERIAL DESCRIPTION</th>
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<td></td>
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<td>(56)</td>
<td>NE corner of building, per Plate 2</td>
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<tr>
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<td></td>
<td></td>
<td>SURFACE BL. 31 ft +/- (ref. MSL datum)</td>
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<tr>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td>(36)</td>
<td></td>
<td></td>
<td></td>
<td>Fine SAND (SP): dense to very dense, reddish brown, dry, with organic specks</td>
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<tr>
<td></td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- clay bed, at 5.5' to 6'</td>
</tr>
<tr>
<td></td>
<td>20</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>- with clay pockets/partings, at 6.5'</td>
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<td>15</td>
<td></td>
<td>4</td>
<td></td>
<td>(64)</td>
<td></td>
<td>- very dense, moderate reddish brown, dry, with clay, at 10'</td>
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<tr>
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<td>15</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>- light gray to white, at 15'</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- very dense, light moderate yellowish brown, dry, with caliche, at 18'</td>
</tr>
<tr>
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<td>15</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>- very dense, moderate yellowish brown, damp. at 20'</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td></td>
<td>5</td>
<td></td>
<td>50/60°</td>
<td></td>
<td>- caliche, from 20' to 23.5'</td>
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<td></td>
<td>6</td>
<td></td>
<td>50/55°</td>
<td></td>
<td>- with some coarse sand and occasional clay pocket, at 20.2'</td>
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**COMPLETION DEPTH:** 21.5 ft  
**DEPTH TO WATER:** Not Encountered  
**BACKFILLED WITH:** Native Materials  
**DRILLING DATE:** December 20, 1999  
**DRILLING METHOD:** Hollow Stem Auger  
**HAMMER TYPE:** Automatic Trip  
**DRILLED BY:** A & R Drilling Inc  
**LOGGED BY:** J. Palmen  
**CHECKED BY:** C.A. Wockner

---

**LOG OF DRILL HOLE NO. DH-2**  
Campus Pointe Building No. 2  
Santa Barbara County, California  
PLATE A-2
### MATERIAL DESCRIPTION

**OLDER ALLUVIUM (Goal)**

- Fine SAND (SP): very dense, reddish brown, dry, with clay pockets and seams and some organic specks

- Sandy lean CLAY (CL): very stiff, reddish brown, dry, with sand
  - with some coarse sand, from 0' to 3.5'
  - 118 107 10
  - cuttings change to very light brown, at 12'
  - Fine SAND (SP): very dense, very light brown, dry
  - cuttings are moderate yellowish brown, at 23'
  - wet, with trace voids, with clay pockets and seams, at 23'
  - mottled grey and light grey, wet, with trace voids, at 30'
  - not mottled, with clay pockets and seams, no voids, at 35'
  - SILT, from 36' to 36.5'
  - 25
  - 21
  - 21

### LOG OF DRILL HOLE NO. DH-3

**Campus Pointe Building No. 2**
Santa Barbara County, California

**PLATE A-3a**
**LOCATION:** NW corner of building, per Plate 2

**SURFACE EL.** 33 ft +/-. (rel. MSL datum)

<table>
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<th>MATERIAL SYMBOL</th>
<th>BLOW COUNT</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
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<td>10_11</td>
<td>30</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- no voids, with red clay pockets, at 45'</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- with trace voids and red clay pockets, at 50'</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Note: Caving to 22.4'</td>
</tr>
</tbody>
</table>

**Completion Depth:** 51.5 ft

**Depth to Water:** 20 ft

**Backfilled With:** Native Materials

**Drilling Date:** December 20, 1999

**Drilling Method:** Hollow Stem Auger

**Hammer Type:** Automatic Trip

**Drilled By:** A & R Drilling Inc.

**Logged By:** J. Palmer

**Checked By:** C. A. Woxner

The information presented is a simplification of full data presented at the time of drilling. Subsurface conditions may differ at other locations and with the passage of time.

**LOG OF DRILL HOLE NO. DH-3**

Campus Pointe Building No. 2
Santa Barbara County, California
<table>
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<th>DEPTH, ft</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLE NO</th>
<th>SAMPLER</th>
<th>BLOW COUNT</th>
<th>LOCATION</th>
<th>SURFACE EL: 33 ft +/- (rel. MSL datum)</th>
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</tr>
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<td></td>
<td>2</td>
<td>(50)</td>
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<td></td>
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<td></td>
<td>6</td>
<td>(72)</td>
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### MATERIAL DESCRIPTION

**OLDER ALLUVIUM (Goal)**
- Sandy lean CLAY (CL): hard, brown, moist
- with roots, more sand, clay pockets and seams, at 2'

**Fine to Medium SAND (SP): dense, moderate yellowish brown to light brown, moist**

**Lean CLAY (CL): silt, mottled orange/grey, moist**
- mottled brown/violet, at 11'

**Silty fine SAND (SM): very dense, mottled orange and gray**
- oranges, at 20'

<table>
<thead>
<tr>
<th>COMPLETE DEPTH</th>
<th>21.5 ft</th>
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<tbody>
<tr>
<td>DEPTH TO WATER</td>
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<tr>
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<td>Native Materials</td>
</tr>
<tr>
<td>DRILLING DATE</td>
<td>December 20, 1999</td>
</tr>
</tbody>
</table>

**LOG OF DRILL HOLE NO. DH-4**
Campus Pointe Building No. 2
Santa Barbara County, California

**PLATE A-4**
### General Notes

**Soil Texture Symbol**

Sloped line in symbol column indicates transitional boundary

Samplers and sampler dimensions (unless otherwise noted in report text) are as follows:

- **Symbol for**
  1. SPT Sampler, driven 13.28' ID, 2' OD
  2. CA Liner Sampler, driven 23.28' ID, 3' OD
  3. CA Liner Sampler, disturbed 23.28' ID, 3' OD
  4. Thin-walled Tube, pushed 2.78' ID, 3' OD
  5. Bulk Bag Sample (from cuttings)
  6. Hand Auger Sample
  7. CME Core Sample
  8. Lexan Sample
  9. Pitcher Sample
  10. Vibracore Sample
  11. No Sample Recovered

**Sampler Driving Resistance**

Number of blows with 140 lb. hammer, falling 30-in, to drive sampler 1/2-in. after seating sampler 6-in.; for example,

<table>
<thead>
<tr>
<th>Blows/ft</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>25</td>
<td>25 blows drove sampler 12&quot; after initial 6&quot; of seating</td>
</tr>
<tr>
<td>86/11&quot;</td>
<td>After driving sampler the initial 6&quot; of seating, 38 blows drove sampler through the second 8&quot; interval, and 52 blows drove the sampler 5&quot; into the third interval</td>
</tr>
<tr>
<td>50/6&quot;</td>
<td>50 blows drove sampler 6&quot; after initial 6&quot; of seating</td>
</tr>
<tr>
<td>50/5&quot;</td>
<td>50 blows drove sampler 5&quot; during initial 6&quot; seating interval</td>
</tr>
</tbody>
</table>

Blow counts for California Liner Sampler shown in ( )

**Length of sample symbol approximates recovery length**

**Classification of Soils per ASTM D2487 or D2488**

**Geologic Formation noted in bold font at the top of interpreted interval**

**Strength Legend**

- **O** = Unconfined Compression
- **u** = Unconfined Undrained Triaxial
- **t** = Tensile
- **p** = Pocket Penetrometer
- **m** = Miniature Voisey

**Water Level Symbols**

- **S** = Initial or perched water level
- **w** = Final ground water level
- **n** = Seepage encountered

**Rock Quality Designation (RQD)** is the sum of recovered core pieces greater than 4 inches divided by the length of the cored interval

---

### Key to Terms & Symbols Used on Logs

<table>
<thead>
<tr>
<th>Elevation (ft)</th>
<th>Material Symbol</th>
<th>Description</th>
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<td></td>
<td>Well graded GRAVEL (GW)</td>
</tr>
<tr>
<td>-14</td>
<td></td>
<td>Poorly graded GRAVEL (GP)</td>
</tr>
<tr>
<td>-16</td>
<td></td>
<td>Well graded SAND (SW)</td>
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<td>-18</td>
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<td>Poorly graded SAND (SP)</td>
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<td></td>
<td>Silty SAND (SM)</td>
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<td>-22</td>
<td></td>
<td>Clayey SAND (SC)</td>
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<td>-24</td>
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<td>Silty, Clayey SAND (SC-SM)</td>
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<td>Elastic SILT (MH)</td>
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<td>Silty CLAY (CL-ML)</td>
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<td>-50</td>
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<td>Paving and/or Base Materials</td>
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</tbody>
</table>

---

**PLATE A-5**
**BACKHOE PIT LOGS**
Campus Pointe Building No. 2
Santa Barbara County, California

**NOTES:**
1. Refer to Plate 2 for backhoe pit locations.
3. Transitions between soil types are gradual.
4. No groundwater encountered.
BACKHOE PIT NO. BP-5

Older Alluvium (Qoal): Fine sand (SP) with 1/32" voids, well-laminated, 1/8" to 1/16" layers
Older Alluvium (Qoal): Dark reddish-brown clayey fine sand (SC)

TD = 30'

Location: northwestern corner of parking area.

BACKHOE PIT NO. BP-6

Older Alluvium (Qoal): Reddish-brown very sandy clay (CL), weathers gray, very dry
Older Alluvium (Qoal): Reddish-brown fine sandy clay (CL), hard, weathered, dry

TD = 24'

Location: western third of parking area.

BACKHOE PIT NO. BP-7

Older Alluvium (Qoal): Reddish-brown fine sandy clay (CL), very dry
@ 24" very hard

TD = 30'

Location: west-central area of proposed parking lot.

BACKHOE PIT NO. BP-8

Older Alluvium (Qoal): light yellowish-beige sugar sand (SP)
Older Alluvium (Qoal): Reddish-brown fine sandy clay (CL), hard, weathers gray to yellowish-brown with black partings
Well-graded sand (SW) with 15 to 20% pea-sized gravel

TD = 24'

Location: east-central area of proposed parking lot.

NOTES:
1. Refer to Plate 2 for backhoe pit locations.
3. Transitions between soil types are gradual.
4. No groundwater encountered.

BACKHOE PIT LOGS
Campus Pointe Building No. 2
Santa Barbara County, California
BACKHOE PIT NO. BP-9

- Older Alluvium (Qaol): Reddish-brown clayey fine to medium sand (SC)
- TD = 24"

Location: eastern quarter of proposed parking area.

BACKHOE PIT NO. BP-10

- Older Alluvium (Qaol): Reddish-brown clayey fine to medium sand (SC)
- TD = 18"

Location: northeastern corner of proposed parking area.

BACKHOE PIT NO. BP-11

- Older Alluvium (Qaol): Reddish-brown sandy clay (CL)
- Older Alluvium (Qaol): Reddish-brown fine to medium sand (SP)
- TD = 18"

Location: northern end of proposed parking area located east of building.

BACKHOE PIT NO. BP-12

- Older Alluvium (Qaol): Reddish-brown lean clay (CL), hard

Location: southern end of proposed parking area east of building.

NOTES:
1. Refer to Plate 2 for backhoe pit locations.
3. Transitions between soil types are gradual.
4. No groundwater encountered.

BACKHOE PIT LOGS
Campus Pointe Building No. 2
Santa Barbara County, California
NOTES:
1. Refer to Plate 2 for backhoe pit locations.
3. Transitions between soil types are gradual.
4. No groundwater encountered.

BACKHOE PIT LOGS
Campus Pointe Building No. 2
Santa Barbara County, California
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<tr>
<th>DRILL HOLE</th>
<th>DEPTH, ft</th>
<th>MATERIAL DESCRIPTION</th>
<th>UDW</th>
<th>IDW</th>
<th>MCK</th>
<th>FINES, %</th>
<th>ATTERBURG LIMITS</th>
<th>COMPACT. TEST</th>
<th>DIRECT STRENGTH TESTS</th>
<th>CORROSION TESTS</th>
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</tbody>
</table>

SUMMARY OF LABORATORY TEST RESULTS
Campus Pointe Building No. 2
Santa Barbara County, California
Legend:

- DH-4  11.0

Classification:

- Lean Clay (CL)

Atterberg Limits Test Results:

- Liquid Limit (LL): 35
- Plastic Limit (PL): 17
- Plasticity Index (PI): 19

Plasticity Chart

Campus Pointe Building No. 2
Santa Barbara County, California

Plate B-2
DIRECT SHEAR TEST RESULTS
Campus Pointe Building No. 2
Santa Barbara County, California

COHESION, ksf: 1.9
ANGLE OF INTERNAL FRICTION, deg: 35.0

LOCATION: DH-4
DEPTH, ft: 0.5
MOISTURE CONTENT, %: 5.0
UNIT DRY WEIGHT, psf: 111.4
MATERIAL DESCRIPTION: Sandy CLAY (CL), Bulk Sample
SAMPLE CONDITION: Sample compacted to 90% of maximum dry density at optimum moisture content
LEGEND
(location)  depth ft.
0  OH-4  0.0

CLASSIFICATION
Sandy CLAY (CL), Bulk Sample

MAXIMUM UNIT
DRIED WEIGHT,pcf
125.5

OPTIMUM WATER
CONTENT, %
9.0

COMPACITION TEST RESULTS
Campus Pointe Building No. 2
Santa Barbara County, California

PLATE B-4
CONSIDERATION TEST RESULTS
Campus Pointe Building No. 2
Santa Barbara County, California
PLATE B-5
APPENDIX B
GEOTECHNICAL ENGINEERING REPORT
PROPOSED CAMPUS POINTE BUILDING NO. 4
41 SOUTH LOS CARNEROS ROAD
SANTA BARBARA COUNTY, CALIFORNIA
MARCH 2001

The following is a listing of plates that have been extracted from the subject report and are presented herein for your use:

a. Logs of Drill Holes
   - No. DH-1 .................................................................Plate A-1
   - No. DH-2 .................................................................Plate A-2
   - No. DH-3 .................................................................Plates A-3a and A-3b
   - No. DH-4 .................................................................Plate A-4
   - No. DH-5 .................................................................Plate A-5
   - No. DH-6 .................................................................Plate A-6
   - No. DH-7 .................................................................Plates A-7a and A-7b

b. Logs of Test Pits
   - Nos. TP-1 and TP-2 ....................................................Plate A-8
   - Nos. TP-3 and TP-4 ....................................................Plate A-9
   - No. TP-5 .................................................................Plate A-10
   - Key to Terms & Symbols Used on Logs ..................................Plate A-11

c. Laboratory Test Results
   - Summary of Laboratory Test Results ................................Plates B-1a and B-1b
   - Grain Size Curves ......................................................Plate B-2
   - Plasticity Chart .........................................................Plate B-3
   - Direct Shear Test Results ............................................Plates B-4a through B-4c
   - Consolidation Test Results ...........................................Plate B-5
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<tr>
<th>ELEVATION (ft)</th>
<th>MATERIAL DESCRIPTION</th>
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<tr>
<td>20</td>
<td>OLDER ALLUVIUM (Qoa) Sandy lean CLAY (CL): very stiff, light brown, moist, trace gravel, layers of Clayey SAND (SC); moderate to dark brown, at 5'</td>
</tr>
<tr>
<td>22</td>
<td>Silty, clayey SAND (SC-SM): very dense, light brown, moist</td>
</tr>
</tbody>
</table>

LOCATION: Proposed Parking area, see Plate 2

SURFACE EL: 30 ft (rel. VSL datum)

MATERIAL DESCRIPTION

OLDER ALLUVIUM (Qoa)
Sandy lean CLAY (CL): very stiff, light brown, moist, trace gravel, layers of Clayey SAND (SC)

- moderate to dark brown, at 5'

Silty, clayey SAND (SC-SM): very dense, light brown, moist

UNIT WET WEIGHT, pcf
UNIT DRY WEIGHT, pcf
WATER CONTENT, %
% PASSING #200 SIEVE
LIQUID LIMIT, %
PLASTICITY INDEX, %
UNDEFORMED SHEAR STRENGTH, ksf

COMPLETION DEPTH: 28 ft
DEPTH TO WATER: Not Encountered
BACKFILLED WITH: Cuttings
DRILLING DATE: February 7, 2001

DRILLING METHOD: 8-in. dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: S/G Testing
LOGGED BY: C.Welke
CHECKED BY: GSDarling

This log and data presented are a compilation of data recorded and encountered at the time of testing at the point below. Subsequent conditions may differ in other locations and with the passage of time.

LOG OF DRILL HOLE NO. DH-1
Campus Pointe Building No. 4
Santa Barbara, California
PLATE A-1
**LOG OF DRILL HOLE NO. DH-2**

Campus Pointe Building No. 4
Santa Barbara, California

**PLATE A-2**

<table>
<thead>
<tr>
<th>ELEVATION ft</th>
<th>DEPTH ft</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLE NO</th>
<th>SAMPLER BLOW COUNT</th>
<th>LOCATION: Proposed Building area, see Plate 2</th>
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<tbody>
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<td>2</td>
<td>1</td>
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<td>SURFACE EL. 31 ft +/- (rel. MSL datum)</td>
</tr>
</tbody>
</table>

**MATERIAL DESCRIPTION**

**OLDER ALLUVIUM (Qoa)**
- Clayey SAND (SC): very dense, moderate yellowish brown, damp to moist, some gravel, layers of Silty SAND (SM) and Lean CLAY (CL)
- Dark yellowish orange and light grayish brown, moist, at 5'

<table>
<thead>
<tr>
<th>ELEVATION ft</th>
<th>DEPTH ft</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLE NO</th>
<th>SAMPLER BLOW COUNT</th>
<th>LOCATION: Proposed Building area, see Plate 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>2</td>
<td>2</td>
<td>(84)</td>
<td></td>
<td>SURFACE EL. 31 ft +/- (rel. MSL datum)</td>
</tr>
</tbody>
</table>

**Silty SAND (SM)**: very dense, moderate yellowish brown, moist
- Light olive gray, wet, at 20'

**Completion Depth**: 21.5 ft
**Depth to Water**: Not Encountered
**Backfilled with**: Cuttings
**Drilling Date**: February 7, 2001

**Drilling Method**: 8-in. dia. Hollow Stem Auger
**Hammer Type**: Automatic Trip
**Drilled by**: S/G Testing
**Logged by**: CWeke
**Checked by**: GDDeninger

The log and data presented are a simplification of actual conditions encountered at the time of cutting of the drill material. Subsurface conditions may differ at other locations and with the passage of time.
## LOCATION
Proposed Building area, see Plate 2

## SURFACE SL.
30 ft +/- (rel. MSL datum)

## MATERIAL DESCRIPTION

### OLDER ALLUVIUM (Qoa)
- Sandy Lean CLAY (CL): stiff, moderate brown, moist

### Clayey SAND (SC)
- very dense, moderate brown, moist
- moist to wet, at 9'
- trace gravel, at 9'

### Sandy Lean CLAY (CL)
- very stiff, moderate brown and light grayish brown, moist

### Sandy SILT (ML)
- very stiff, dark yellowish orange, moist

### Silty SAND (SM)
- very dense, yellowish gray, wet
- dense, fine grained sand, porous zone, at 25' to 25.5'
- heaving sands, at 25', added water to hole
- very dense, medium and fine grained sand, at 30'

## COMPLETION DEPTH
45.0 ft

## DEPTH TO WATER
20 ft

## BACKFILLED WITH
Cuttings

## DRILLING DATE
February 7, 2001

## LOG OF DRILL HOLE NO. DH-3
Campus Pointe Building No. 4
Santa Barbara, California

## PLATE A-3a
LOCATION: Proposed Building area; see Plate 2

SURFACE EL: 32 ft (+/-) (rest MSL datum)

<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>MATERIAL SYMBOL</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 ft</td>
<td></td>
<td>OLDER ALLUVIUM (Qoa)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sandy Lean CLAY (CL): stiff, moderate yellowish brown, damp to moist, some gravel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- very stiff, lenses of Clayey SAND (SC), at 2'</td>
</tr>
<tr>
<td>28 ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26 ft</td>
<td></td>
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</tr>
<tr>
<td>24 ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22 ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 ft</td>
<td></td>
<td>Silty fine SAND (SM): very dense, very pale orange, damp</td>
</tr>
<tr>
<td>14 ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 ft</td>
<td></td>
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</tr>
<tr>
<td>6 ft</td>
<td></td>
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</tr>
<tr>
<td>4 ft</td>
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</tr>
<tr>
<td>2 ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 ft</td>
<td></td>
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</tr>
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</table>

COMPLETION DEPTH: 21.0 ft
DEPTH TO WATER: 20-1/2 ft
BACKFILLED WITH: Cuttings
DRILLING DATE: February 7, 2001

DRILLING METHOD: 8-in. dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: S/G Testing
LOGGED BY: CWalker
CHECKED BY: GSDenlinger

LOG OF DRILL HOLE NO. DH-4
Campus Pointe Building No. 4
Santa Barbara, California

PLATE A-4
<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>DEPTH (ft)</th>
<th>MATERIAL SYMBOL</th>
<th>MATERIAL DESCRIPTION</th>
<th>SAMPLE NO.</th>
<th>SAMPLER BLOW COUNT</th>
<th>UNIT weight (lb/ft³)</th>
<th>UNDRAIN. WEIGHT (lb/ft³)</th>
<th>WATERS CONTENT (%)</th>
<th>MODULUS (%)</th>
<th>LIQUID LIMIT (%)</th>
<th>PLASTICITY INDEX</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>OLDER ALLUVIUM (Qes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-30</td>
<td>0</td>
<td></td>
<td>Sandy Lean CLAY (CL): stiff, moderate yellowish brown, damp to moist</td>
<td>(60)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>-24</td>
<td>0</td>
<td></td>
<td>- moist, at 2'</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-26</td>
<td>0</td>
<td></td>
<td>- medium stiff, at 5'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-24</td>
<td>0</td>
<td></td>
<td>- hard, at 8'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**LOCATION:** Proposed Parking area, see Plate 2

**SURFACE EL:** 32 ft. +1 (rel. MSL datum)

**MATERIAL DESCRIPTION**

**COMPLETION DEPTH:** 30 ft

**DEPTH TO WATER:** Not Encountered

**BACKFILLED WITH:** Cuttings

**DRILLING DATE:** February 7, 2001

**DRILLING METHOD:** 8-in. dia. Hollow Stem Auger

**HAMMER TYPE:** Automatic Trip

**DRILLED BY:** SIG Testing

**LOGGED BY:** CWalker

**CHECKED BY:** GSDeininger

"The log entries presented are a superset of actual conditions encountered at the time of drilling at the drilled location. Subsequent conditions vary slightly at different locations and with the passage of time.

**LOG OF DRILL HOLE NO. DH-5**

Campus Pointe Building No. 4
Santa Barbara, California

**PLATE A-5**
<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>DEPTH (ft)</th>
<th>MATERIAL SYMBOL</th>
<th>MATERIAL DESCRIPTION</th>
<th>UNIT WET WEIGHT (pcf)</th>
<th>UNIT DRY WEIGHT (pcf)</th>
<th>WATER CONTENT (%)</th>
<th>% PASSING 200 SIEVE</th>
<th>PLASTICITY INDEX</th>
<th>UNDRAINED SHEAR STRENGTH (kSf)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>OLDER ALLUVIUM (Qca)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>32</td>
<td></td>
<td>Sandy Lean CLAY (CL): stiff, moderate yellowish brown, damp</td>
<td>115</td>
<td>108</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>30</td>
<td></td>
<td>Clayey SAND (SC): very dense, moderate yellowish brown, damp</td>
<td>126</td>
<td>116</td>
<td>9</td>
<td></td>
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<td>18</td>
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<td>8</td>
<td>18</td>
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<tr>
<td>6</td>
<td>16</td>
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<tr>
<td>4</td>
<td>14</td>
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<tr>
<td>2</td>
<td>12</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>-2</td>
<td>8</td>
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<td>-4</td>
<td>6</td>
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<td>-6</td>
<td>4</td>
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<td>-8</td>
<td>2</td>
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<td>-10</td>
<td>0</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**LOCATION:** Proposed Parking area, see Plate 2

**SURFACE EL:** 33 ft above MSL datum

**MATERIAL DESCRIPTION:**

- **OLDER ALLUVIUM (Qca):** Sandy Lean CLAY (CL): stiff, moderate yellowish brown, damp
  - Clayey SAND (SC): very dense, moderate yellowish brown, damp
    - Some gravel, lenses of Lean CLAY (CL), weak to moderate calciche cementation, of S'
    - Medium dense, at 9'

**COMPLETION DEPTH:** 9.0 ft

**DEPTH TO WATER:** Not encountered

**BACKFILLED WITH:** Cuttings

**DRILLING DATE:** February 7, 2001

**DRILLING METHOD:** 8-in. dia. Hollow Stem Auger

**HAMMER TYPE:** Automatic Trip

**DRILLED BY:** SIG Testing

**LOGGED BY:** CWelle

**CHECKED BY:** GSDenlinger

The data presented are a compilation of data generated and obtained at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.


LOCATION: Proposed Chiller Building, see Plate 2

SURFACE EL: 36 ft MS (rel MSL datum)

MATERIAL DESCRIPTION

<table>
<thead>
<tr>
<th>ELEVATION/</th>
<th>MATERIAL SYMBOL</th>
<th>MATERIAL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>3</td>
<td>Older Alluvium (Qoa)</td>
<td>Silty sand (SM): medium dense to dense, moderate yellowish brown, damp, fine grained sand increasing with depth, interbedded with Clayey Sand (SC)</td>
</tr>
<tr>
<td>30</td>
<td>3</td>
<td>Clayey Sand (SC)</td>
<td>Very dense, moderate yellowish brown, moist</td>
</tr>
<tr>
<td>26</td>
<td>4</td>
<td>Sandy Clay (CL)</td>
<td>Very stiff, moderate yellowish brown, damp to moist</td>
</tr>
<tr>
<td>26</td>
<td>4</td>
<td>Silty Fine Sand (SM)</td>
<td>Dense, very pale orange, damp</td>
</tr>
<tr>
<td>15</td>
<td>5</td>
<td>- Very dense, moist, medium grained sand, at 20'</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>5</td>
<td>- Moderate yellowish brown, wet, at 30'</td>
<td></td>
</tr>
</tbody>
</table>

UNIT WET WEIGHT (lb/ft³) | DRY WEIGHT (lb/ft³) | WATER CONTENT (% DRY) | % PASSING #200 SIEVE | LIQUID LIMIT (%) | PLASTICITY INDEX | UNDRAINED SHEAR STRENGTH (ksf) |
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1.16</td>
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<td>1.35</td>
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<tr>
<td>1.37</td>
<td>1.22</td>
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<td>1.07</td>
<td>1.03</td>
<td>4</td>
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<td></td>
</tr>
</tbody>
</table>

COMPLETION DEPTH: 50.0 ft
DEPT TO WATER: 22 ft
BACKFILLED WITH: Cuttings
DRILLING DATE: February 7, 2001

DRILLING METHOD: 8-in. dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: G.S. Denlinger
LOGGED BY: C. Weke
CHECKED BY: G.S. Denlinger

LOG OF DRILL HOLE NO. DH-7
Campus Pointe Building No. 4
Santa Barbara, California

PLATE A-7a
<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>MATERIAL SYMBOL</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>G6010</td>
<td>Silty fine SAND (SM); dense, moderate yellowish brown, wet</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
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<td>14</td>
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<tr>
<td>16</td>
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<td></td>
</tr>
<tr>
<td>42</td>
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<td></td>
</tr>
</tbody>
</table>

**LOCATION:** Proposed Chiller Building, see Plate 2

**SURFACE EL:** 36 ft (+/- rel. MSL datum)

**MATERIAL DESCRIPTION:**
- Silty fine SAND (SM); dense, moderate yellowish brown, wet

**UNIT WEIGHT:**
- Wet: 121 lb/ft³
- Dry: 95 lb/ft³

**% PASSING:**
- 20 mesh: 24%

**PLASTICITY INDEX:** 6.5%

**UNREINFORCED SHEAR STRENGTH:** 6.5

**COMPLETION DEPTH:** 50.0 ft

**DEPTH TO WATER:** 22 ft

**BACKFILLED WITH:** Cuttings

**DRILLING DATE:** February 7, 2001

**DRILLING METHOD:** 8-in. dia. Hollow Stem Auger

**HAMMER TYPE:** Automatic Trip

**DRILLED BY:** SIG Testing

**LOGGED BY:** C. Weike

**CHECKED BY:** G. Demminger

*The log and data presented are a compilation of actual conditions encountered in the bore hole at the site location. Subsurface conditions may differ at other locations and units of time.*

**LOG OF DRILL HOLE NO. DH-7**

Campus Pointe Building No. 4
Santa Barbara, California

**PLATE A-7b**
### LOG OF TEST PIT NO. TP-1

**LOCATION:** Proposed Chiller Building, see Plate 2

**SURFACE EL:** 44.0 ft +/− (rel. MSL datum)

**MATERIAL DESCRIPTION**

<table>
<thead>
<tr>
<th>ELEVATION, ft</th>
<th>DEPTH, ft</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLER NO.</th>
<th>SAMPLE NO.</th>
<th>BLOW COUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>2</td>
<td>A</td>
<td>1</td>
<td>1</td>
<td>126</td>
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<td>40</td>
<td>4</td>
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<td>38</td>
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<td>115</td>
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<tr>
<td>36</td>
<td>5</td>
<td>A</td>
<td>4</td>
<td>4</td>
<td>120</td>
</tr>
</tbody>
</table>

**COMPLETION DEPTH:** 8.0 ft

**EXCAVATION DATE:** February 9, 2001

**CHECKED BY:** GSDaniel

**CONTRACTOR:** Mike's Excavating Service

---

### LOG OF TEST PIT NO. TP-2

**LOCATION:** Proposed Chiller Building, see Plate 2

**SURFACE EL:** 41.0 ft +/− (rel. MSL datum)

**MATERIAL DESCRIPTION**

<table>
<thead>
<tr>
<th>ELEVATION, ft</th>
<th>DEPTH, ft</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLER NO.</th>
<th>SAMPLE NO.</th>
<th>BLOW COUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>2</td>
<td>A</td>
<td>1</td>
<td>1</td>
<td>130</td>
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<td>30</td>
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<td>2</td>
<td>117</td>
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<tr>
<td>25</td>
<td>4</td>
<td>A</td>
<td>3</td>
<td>3</td>
<td>119</td>
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</tbody>
</table>

**COMPLETION DEPTH:** 5.0 ft

**EXCAVATION DATE:** February 9, 2001

**CHECKED BY:** GSDaniel

**CONTRACTOR:** Mike's Excavating Service

---

**LOG OF TEST PIT NO. TP-1 AND TP-2**

Campus Pointe Building No. 4
Santa Barbara, California

PLATE A-8
# LOG OF TEST PIT NO. TP-3

<table>
<thead>
<tr>
<th>ELEVATION, ft</th>
<th>DEPTH, ft</th>
<th>MATERIAL SYMBOL (GSL)</th>
<th>SAMPLES</th>
<th>MATERIAL DESCRIPTION</th>
<th>UNIT WET WEIGHT</th>
<th>UNIT DRY WEIGHT</th>
<th>PLASTICITY INDEX</th>
<th>UNIAXIAL STRENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>44</td>
<td>2</td>
<td></td>
<td>1</td>
<td>Older Alluvium (Qoa)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Silty Sand (SM): dense, pale yellowish brown, moist to moderately porous</td>
<td>110</td>
<td>106</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td>- trace to some gravel nodules (oxidized), from 3' to 4'</td>
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<td>Silt to very stiff, moderate yellowish brown, moist</td>
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**LOCATION:** Proposed Retaining Wall, see Plate 2

**SURFACE EL:** 46.0 ft NAD (rel. MSL datum)

---

# LOG OF TEST PIT NO. TP-4

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<th>MATERIAL SYMBOL (GSL)</th>
<th>SAMPLES</th>
<th>MATERIAL DESCRIPTION</th>
<th>UNIT WET WEIGHT</th>
<th>UNIT DRY WEIGHT</th>
<th>PLASTICITY INDEX</th>
<th>UNIAXIAL STRENGTH</th>
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<td>- trace to some gravel nodules (oxidized), pale yellowish brown, from 2' to 4'</td>
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**LOCATION:** Proposed Retaining Wall, see Plate 2

**SURFACE EL:** 42.0 ft NAD (rel. MSL datum)

---

**LOGGED BY:** CWinkle
**CHECKED BY:** GS Denlinger
**EXCAVATION METHOD:** Hollow Stem Auger
**CONTRACTOR:** Mike's Excavating Service

The log and data presented are a simplification of actual conditions encountered at the time of sampling at the explored location. Subsurface conditions may differ at other locations and with the passage of time. (TP-3, TP-4)
**LOG OF TEST PIT NO. TP-5**

**LOCATION:** Proposed Retaining Wall, see Plate 2

**SURFACE EL.:** 39.0 ft +/- (rel. MSL datum)

---

**MATERIAL DESCRIPTION**

<table>
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<th>ELEVATION</th>
<th>DEPTH</th>
<th>SAMPLER</th>
<th>BLOW COUNT</th>
<th>UNIT NET WEIGHT, pcf</th>
<th>UNIT DRY WEIGHT, pcf</th>
<th>WATER CONTENT, %</th>
<th>% PASSING 4000 SIEVE</th>
<th>LIQUID LIMIT, %</th>
<th>PLASTICITY INDEX</th>
<th>UNIAXIAL COMPRESSION STRENGTH, psi</th>
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**COMPLETION DEPTH:** 4.0 ft

**DEPTH TO WATER:** Not encountered

**EXCAVATION DATE:** February 8, 2001

**LOGGED BY:** Chalk

**CHECKED BY:** G. D. Ashley

**EXCAVATION METHOD:** Hollow Stem Auger

**CONTRACTOR:** Mike's Excavating Service

---

*The log and data presented are a simplification of actual conditions encountered at the time of excavating at the explored location. Subsurface conditions may differ at other locations and with the passage of time. (10-28)*

---

*LOG OF TEST PIT NO. TP-5*

*Campus Pointe Building No. 4*

*Santa Barbara, California*

*PLATE A-10*
<table>
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<th>ELEVATION, ft</th>
<th>DEPTH, ft</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLE NO.</th>
<th>BLOW COUNT x REC/DRIVE</th>
<th>LOCATION (The drill hole location referring to local landmarks or coordinates)</th>
<th>SURFACE EL (Using local MSL, MLW, or other datum)</th>
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<td>Paving and/or Base Materials</td>
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**General Notes**

Soil Texture Symbol

Sloped line in symbol column indicates transitional boundary. Samplers and sampler dimensions (unless otherwise noted in report text) are as follows:

- **Symbol for**
  - SPT Sampler, driven
    - 1 3/8" ID, 2" OD
  - CA Liner Sampler, driven
    - 2 3/8" ID, 3" OD
  - CA Liner Sampler, disturbed
    - 2 3/8" ID, 3" OD
  - Thin-walled Tube, pushed
    - 2 7/8" ID, 3" OD
  - Bulk Bag Sample (from cuttings)
  - Hand Auger Sample
  - CME Core Sample
  - Lexan Sample
  - Pitcher Sample
  - Vibracone Sample
  - No Sample Recovered

Sampler Driving Resistance

Number of blows with 140 lb. hammer, falling 30-in., to drive sampler 1-ft. after seating sampler 8-in.; for example:

- **Blow Count Description**
  - 25
  - 50 blows drove sampler 6" after initial 6" of seating
  - 88/11" After driving sampler the initial 6" of seating, 36 blows drove sampler through the second 6" interval, and 50 blows drove the sampler 5" into the third interval
  - 50/6" 50 blows drove sampler 6" after initial 6" of seating
  - Rbf3* 50 blows drove sampler 3" during initial 6" seating interval

Blow counts for California Liner Sampler shown in ( )

Length of sample symbol approximates recovery length

Classification of Soils per ASTM D2487 or D2488

Geologic Formation noted in bold font at the top of interpreted interval

Strength Legend

- **Q** = Unconfined Compression
- **u** = Unconsolidated Undrained Triaxial
- **t** = Tension
- **p** = Pocket Penetrometer
- **m** = Miniature Vane

Water Level Symbols

- **®** Initial or perched water level
- **¥** Final ground water level
- **#** Seepage encountered

Rock Quality Designation (RQD) is the sum of recovered core pieces greater than 4 inches divided by the length of the cored interval.

**KEY TO TERMS & SYMBOLS USED ON LOGS**
<table>
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<tr>
<th>DRILL HOLE</th>
<th>MATERIAL DESCRIPTION</th>
<th>UVW</th>
<th>UDV</th>
<th>MC%</th>
<th>FNS %</th>
<th>CUF</th>
<th>PI</th>
<th>MAX D25</th>
<th>OPT MC%</th>
<th>DIRECT SHEAR</th>
<th>COMpressive Strengths</th>
<th>CORROSION TESTS</th>
<th>EXPANSION TESTS</th>
<th>TEST LISTING</th>
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**Classification Tests**
- C = Classification
- U = Unit Weight
- D = Dry Density
- M = Moisture Content
- F = Field Moisture
- PI = Plasticity Index

**Direct Shear Test**
- CUF = Cyclic Union
- PI = Plasticity Index

**Compressive Strengths**
- C = Compressive Strength
- U = Unit Weight
- D = Dry Density
- M = Moisture Content

**Corrosion Tests**
- R = Resistivity
- S = Sulfate

**Expansion Tests**
- T = Total Expansion

**Test Listings Abbreviations**
- M = Moisture Content
- C = Cyclic Union
- U = Unit Weight
- D = Dry Density
- R = Resistivity

---

**SUMMARY OF LABORATORY TEST RESULTS**
Campus Pointe Building No. 4
Santa Barbara, California
<table>
<thead>
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<th>DRILL HOLE</th>
<th>DEPTH (ft)</th>
<th>MATERIAL DESCRIPTION</th>
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<th>MC%</th>
<th>FILM %</th>
<th>ATTERBERG LIMITS</th>
<th>COMPACTION</th>
<th>DIRECT SHEAR</th>
<th>COMPRESSIVE STRENGTH TESTS</th>
<th>CORROSION TESTS</th>
<th>R-VALUE</th>
<th>EXPANSION INDEX</th>
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<td>T</td>
</tr>
<tr>
<td>TP-5</td>
<td>2.0</td>
<td>Silty SAND (SM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>T</td>
</tr>
<tr>
<td>TP-5</td>
<td>4.0</td>
<td>Sandy Lean CLAY (CL)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>T</td>
</tr>
</tbody>
</table>

**Classification Tests**
- UMW = Unit Wet Weight
- UDW = Unit Dry Weight
- MC = Moisture Content
- FILM = Film Moisture Content
- FILM = Film Moisture Content
- FINES = % Passing No. 200 Sieve
- LIQ = Liquid Limit
- PL = Plasticity Index

**Direct Shear Test**
- C = Assigned Cohesion, kPa
- PHI = Assigned Friction Angle, degrees
- COH = Consolidation Test
- MAX QD = Maximum Dry Density
- OPT MC = Optimum Moisture Content

**Compressive Strength Tests**
- QU = Unconfined Compression
- SU = Unconsolidated Undrained Shear Strength
- EPS = Consolidated Undrained Shear Strength
- P = Pocket Penetrometer
- M = Moisture Vane

**Atterberg Limits**
- C = Clay Content
- PHIL = Plastic Limit
- PI = Plastic Index
- LIQ = Liquid Limit
- MC = Moisture Content
- FILM = Film Moisture Content

**Corrosion Tests**
- R = Resistivity, ohm-m
- pH = pH
- CHL = Chloride, ppm
- SULF = Sulfate, ppm

**Expansion Index**
- T = Total & Dry Unit Weight

**Test List Abbreviations**
- N = Moisture Content
- D = Direct Shear Test
- E = Contraction Test
- S = Sieve Analysis
- FC = % Passing No. 200
- H = Hydrometer Analysis
- A = Atterberg Limit
- P = Compaction Test
- SE = Sand Equivalent

**SUMMARY OF LABORATORY TEST RESULTS**
Campus Pointe Building No. 4
Santa Barbara, California
COHESION, ksf

ANGLE OF INTERNAL FRICTION, deg

LOCATION
DEPTH, ft
MOISTURE CONTENT, %
UNIT DRY WEIGHT, pcf
MATERIAL DESCRIPTION
SAMPLE CONDITION

DIRECT SHEAR TEST RESULTS
Campus Pointe Building No. 4
Santa Barbara, California
COHESION, ksf 0.3

ANGLE OF INTERNAL FRICTION, deg 30.0

LOCATION
DEPTH, ft 2
MOISTURE CONTENT, % 4.0
UNIT DRY WEIGHT, pcf 106.0
MATERIAL DESCRIPTION Silty SAND (SM)
SAMPLE CONDITION

DIRECT SHEAR TEST RESULTS
Campus Pointe Building No. 4
Santa Barbara, California

PLATE B-4b
COHESION, ksf

ANGLE OF INTERNAL FRICTION, deg

LOCATION
DEPTH, ft
MOISTURE CONTENT, %
UNIT DRY WEIGHT, pcf
MATERIAL DESCRIPTION
SAMPLE CONDITION

1.5
33.0
TP-3
6
15.0
105.0
Sandy Lean CLAY (CL)

DIRECT SHEAR TEST RESULTS
Campus Pointe Building No. 4
Santa Barbara, California
CONSORTIATION TEST RESULTS
Campus Pointe Building No. 4
Santa Barbara, California

LOCATION
DEPTH, ft
INITIAL MOISTURE CONTENT, %
UNIT DRY WEIGHT,pcf
MATERIAL DESCRIPTION
SAMPLE CONDITION

DH-4
11.0
16
121
Sandy Lean CLAY (CL)
Driven Ring

PLATE B-5
APPENDIX C
GEOTECHNICAL ENGINEERING REPORT
CAMPUS POINTE RESIDENTIAL DEVELOPMENT
GOLETA, SANTA BARBARA COUNTY, CALIFORNIA
OCTOBER 2001

The following is a listing of plates that have been extracted from the subject report and are presented herein for your use:

a. Logs of Drill Holes
   • No. DH-1 .......................................................... Plate A-1
   • No. DH-2 .......................................................... Plate A-2
   • No. DH-3 .......................................................... Plate A-3
   • No. DH-4 .......................................................... Plate A-4
   • Key to Terms & Symbols Used on Logs .................. Plate A-5

b. Laboratory Test Results
   • Summary of Laboratory Test Results ..................... Plate B-1
   • Plasticity Chart ................................................. Plate B-2
   • Direct Shear Test Results .................................. Plate B-3
   • Consolidation Test Results ................................. Plates B-4a and B-4b
<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>DEPTH TO WATER (ft)</th>
<th>BACKFILLED WITH</th>
<th>DRILLING DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>17</td>
<td>Native Materials</td>
<td>August 16, 2001</td>
</tr>
</tbody>
</table>

**LOG OF DRILL HOLE NO. DH-1**

Campus Pointe Residential Development
Santa Barbara, California

PLATE A-1
**LOG OF DRILL HOLE NO. DH-2**  
Campus Pointe Residential Development  
Santa Barbara, California

**LOCATION:** See Plate 2

### MATERIAL DESCRIPTION

<table>
<thead>
<tr>
<th>ELEVATION &amp; DEPTH</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLE NO.</th>
<th>SAMPLER</th>
<th>BLOW COUNT</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>-22 -19 16 12 -8</td>
<td>5</td>
<td>80</td>
<td></td>
<td></td>
<td>Fine SAND (SP): very dense, light gray to yellowish brown, moist</td>
</tr>
<tr>
<td>-18 -15 -12 -9</td>
<td>4</td>
<td>57</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-24 -20 -16 -12</td>
<td>3</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-25 8</td>
<td>2</td>
<td>(32)</td>
<td></td>
<td></td>
<td>Silty SAND (SM) to Clayey SAND (SC): dense, brown to reddish brown, moist</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- with few Lean CLAY (CL) seams at about 5' to 6'</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- with gray motilles at about 6' to 9'</td>
</tr>
<tr>
<td>-30 2</td>
<td>1</td>
<td>B</td>
<td></td>
<td>37</td>
<td>OLDER ALLUVIUM (Gca): Sandy CLAY (CL), stiff to very stiff, brown to reddish brown, dry to 2.5' then moist, occasional charcoal inclusions</td>
</tr>
</tbody>
</table>

**COMPLETION DEPTH:** 21.5 ft
**DEPTH TO WATER:** 17 ft (estimated)
**BACKFILLED WITH:** Native Materials
**DRILLING DATE:** August 16, 2001

**DRILLING METHOD:** 6-in. dia. Hollow Stem Auger  
**HAMMER TYPE:** Automatic Trip  
**DRILLED BY:** NJ Derbridge  
**LOGGED BY:** NJ Derbridge  
**CHECKED BY:** GS Delinger P.E. G.S.

The log and data presented are a representation of actual conditions encountered at the time of drilling of the site noted. Subsurface conditions may differ at other locations and will the passage of time.
<table>
<thead>
<tr>
<th>Elevation ft</th>
<th>Material</th>
<th>Sample No.</th>
<th>Sampled Material</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>Artificial Fill (af)</td>
<td>(S1)</td>
<td>Silty Sand to Silt (SM to ML)</td>
<td>Very dense, light brown, dry</td>
</tr>
<tr>
<td>32</td>
<td>Older Alluvium (Quat)</td>
<td>53</td>
<td>Silty Sand (SM)</td>
<td>Very dense, brown to reddish brown, moist, with some charcoal inclusions, interlayered with Lean Clay (CL), below 5'</td>
</tr>
<tr>
<td>28</td>
<td>Sand (SP)</td>
<td>(S9F)</td>
<td></td>
<td>Very dense, light gray to moderate yellowish, with iron oxide stains</td>
</tr>
</tbody>
</table>

**Material Description**

- **Artificial Fill (af)**: Silty sand to silt (SM to ML), very dense, light brown, dry.
- **Older Alluvium (Quat)**: Silty sand (SM), very dense, brown to reddish brown, moist, with some charcoal inclusions, interlayered with lean clay (CL), below 5'.
- **Sand (SP)**: Very dense, light gray to moderate yellowish, with iron oxide stains.

**Completion Depth**: 16.5 ft

**Drilling Method**: 6-in. dia. Hollow Stem Auger

**Hammer Type**: Automatic Trip

**Drilled By**: S/G Testing

**Logged By**: NJDermidge

**Checked By**: G.S. Denlinger P.E. G.E.

The log and Hole presented are a compilation of actual conditions encountered at the time of digging at the pilot location. Subsequent conditions may differ as other conditions and with the passage of time.

**Log of Drill Hole No. DH-3**

Campus Pointe Residential Development
Santa Barbara, California

**Plate A-3**
<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>MATERIAL SYMBOL</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2</td>
<td>AF</td>
<td>ARTIFICIAL FILL (af)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silty to Clayey SAND (SM to SC); loose, light brown, dry</td>
</tr>
<tr>
<td>2-10</td>
<td>OA</td>
<td>OLDER ALLUVIUM (Oscl)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clayey SAND (SC) to Sandy CLAY (CL); very stiff to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dense, reddish brown and orange brown, moist, with</td>
</tr>
<tr>
<td></td>
<td></td>
<td>charcoal inclusions, with sand seams</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Interlayered with Silty to Clayey SAND (SM to SC), at</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7'</td>
</tr>
<tr>
<td>10-14</td>
<td>FS</td>
<td>Fine SAND (SP); very dense, light gray to yellowish gray</td>
</tr>
<tr>
<td></td>
<td></td>
<td>moist</td>
</tr>
<tr>
<td>14-18</td>
<td>MS</td>
<td>- medium sand, olive gray, at 20'</td>
</tr>
</tbody>
</table>

LOCATION: See Plate 2

SURFACE EL: 38 ft. (ref. project datum)

MATERIAL DESCRIPTION

UNEQUAL WEIGHT, %  | UNDRAINED \( \text{S}} \), %
--- | ---
123 | 111 |
130 | 115 |
115 | 108 |

COMPLETION DEPTH: 21.5 ft

DEPTH TO WATER: Not Encountered

BACKFILLED WITH: Native Materials

DRILLING DATE: August 18, 2001

DRILLING METHOD: 6'-in. dia. Hollow Stem Auger

HAMMER TYPE: Automatic Trip

DRILLED BY: S/S Testing

LOGGED BY: N.J. Berg

CHECKED BY: G.S. Dansinger P.E. G.E.

LOG OF DRILL HOLE NO. DH-4

Campus Pointe Residential Development
Santa Barbara, California

PLATE A-4
### General Notes

- **Soil Texture Symbol**
  - Slanted line in symbol column indicates transitional boundary.
  - Symbols and sampler dimensions (unless otherwise noted in report text) are as follows:
  - 1. SPT Sampler, driven
  - 2. CA Liner Sampler, driven
  - 3. CA Liner Sampler, disturbed
  - 4. Thin-walled Tube, augered
  - 5. Bulk Bag Sample (from cuttings)
  - 6. Hand Auger Sample
  - 7. CME Core Sample
  - 8. Loan Sample
  - 9. Pickett Sample
  - 10. Vibracore Sample
  - 11. No Sample Recovered

- **Sampler Driving Resistance**
  - Number of blows with 140 lb. hammer. Falling 30-in. to drive sampler 1-ft. after sealing sampler 6-in., for example.
  - Blows/ft Description
  - 25 25 blows drove sampler 12" after initial 5' of sealing
  - 60/11 After driving sampler the initial 6' of sealing, 36 blows drove sampler through the second 6' interval, and 50 blows drove sampler 5' into the third interval
  - 50/50 50 blows drove sampler 5' after initial 5' of sealing
  - Ref3 50 blows drove sampler 3' during initial 6' sealing interval

- **Blow counts for California Liner Sampler shown in ( )**

- **Length of sample symbol approximates recovery length**

- **Classification of Soils per ASTM D2487 or D2489**

- **Geologic Formation noted in bold font at the top of interpreted interval**

- **Strength Legend**
  - U = Unconsolidated Undrained Triaxial
  - T = Torvane
  - P = Pocket Penetrometer
  - M = Miniature Vane

- **Water Level Symbols**
  - 1 = Initial or pasted water level
  - X = Final ground water level
  - 4 = Seepage encountered

- **Rock Quality Designation (RQD) is the sum of recovered core pieces greater than 4 inches divided by the length of the cored interval.**

### Key to Terms & Symbols Used on Logs

- **ELEVATION:** Height above mean sea level
- **DEPTH:** Depth to sample
- **MATERIAL SYMBOL:** Representation of the material
- **SAMPLE NO.:** Identification number of sample
- **LOCATION:** Drilling location coordinates
- **SURFACE EL.:** Surface elevation

**Material Description:**

- **Well graded GRAVEL (GW)**
- **Poorly graded GRAVEL (GP)**
- **Well graded SAND (SW)**
- **Poorly graded SAND (SP)**
- **Silty SAND (SM)**
- **Clayey SAND (SC)**
- **Silty, Clayey SAND (SC-SM)**
- **Elastic SILT (MH)**
- **SILT (ML)**
- **Silty CLAY (CL-ML)**
- **Felt CLAY (CH)**
- **Lean CLAY (CL)**
- **CONGLOMERATE**
- **SANDSTONE**
- **SILTSTONE**
- **MUDSTONE**
- **CLAYSTONE**
- **SILE**
- **SHALE**
- **GRANITE**
- **Paving and/or Base Materials**

---

**Plate A-5**
<table>
<thead>
<tr>
<th>GRILL HOLE</th>
<th>DEPTH 5</th>
<th>MATERIAL DESCRIPTION</th>
<th>UMM</th>
<th>LSS</th>
<th>MOH'S</th>
<th>FINE %</th>
<th>ATTERBERG LIMIT</th>
<th>DIRECT SHEAR</th>
<th>COHESIVE STABILITY</th>
<th>CORROSION TESTS</th>
<th>EVALUATION INDEX</th>
<th>PROJECT 01.42.031</th>
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<tbody>
<tr>
<td>DH-1</td>
<td>2.0</td>
<td>Sandy CLAY (CL)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>DH-2</td>
<td>2.5</td>
<td>Sandy CLAY (CL)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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</tr>
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<td>2.5</td>
<td>Sandy CLAY (CL)</td>
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<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>DH-4</td>
<td>4.0</td>
<td>Sandy CLAY (CL)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DH-5</td>
<td>7.5</td>
<td>Clayey to Silty SAND (SC-SM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>DH-6</td>
<td>15.0</td>
<td>Clayey to Silty SAND (SC-SM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>DH-7</td>
<td>2.0</td>
<td>Sandy CLAY (CL)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DH-8</td>
<td>5.0</td>
<td>Silty SAND (SM) to Clayey SAND (SC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>DH-9</td>
<td>7.5</td>
<td>Silty SAND (SM) to Clayey SAND (SC)</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>DH-10</td>
<td>10.0</td>
<td>Silty SAND (SM) to Clayey SAND (SC)</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DH-11</td>
<td>12.5</td>
<td>Sandy CLAY (SM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DH-12</td>
<td>12.5</td>
<td>Silty SAND (SM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DH-13</td>
<td>10.0</td>
<td>Silty SAND (SM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DH-14</td>
<td>10.0</td>
<td>Clayey SAND (SC) to Sandy CLAY (CL)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DH-15</td>
<td>10.0</td>
<td>Clayey SAND (SC) to Sandy CLAY (CL)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DH-16</td>
<td>20.0</td>
<td>Fine SAND (SP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Summary of Laboratory Test Results

Campus Pointe Residential Development
Santa Barbara, California
COHESION, ksf
ANGULAR OF INTERNAL FRICTION, deg

LOCATION
DEPTH, ft
MOISTURE CONTENT, %
UNIT DRY WEIGHT,pcf
MATERIAL DESCRIPTION
SAMPLE CONDITION

DH-4
5
24.5
102.3
Clayey SAND (SC) to Sandy CLAY (CL)
Driven Ring

DIRECT SHEAR TEST RESULTS
Campus Pointe Residential Development
Santa Barbara, California

PLATE B-3
CONsolidation TEST RESULTS
Campus Pointe Residential Development
Santa Barbara, California

LOCATION
DEPTh, ft
INITIAL MOISTURE CONTENT, %
UNIT DRY WEIGHT, pcF
MATERIAL DESCRIPTION
SAMPLE CONDITION
Saturated

DH-1
2.5
16
114
Sandy CLAY (CL)
Ms Tiffany Sukay  
Comstock Crosser & Associates  
321 12th Street  
Manhattan Beach, California 90266  

Subject: Geotechnical Design Report, Lots 4, 6, and 7, Phase II of The Village at Los Carneros, Goleta, California.

Dear Ms Sukay,

Albus-Keefe & Associates, Inc. is pleased to present to you our geotechnical design report for the proposed residential development at the subject site. This report presents a summary of our review of readily available geologic literature and the referenced geotechnical reports, as well as our engineering analyses. Conclusions and recommendations relative to the proposed site development are also presented in this report based on the findings of our work.

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

Sincerely,

ALBUS-KEEFE & ASSOCIATES, INC.

David E. Albus  
Principal Engineer  
GE 2455
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1.0  INTRODUCTION

1.1  PURPOSE AND SCOPE

The purposes of this investigation were to evaluate the subsurface soil conditions within the project area, to evaluate their engineering characteristics, and to provide geotechnical conclusions and recommendations relevant to design and construction of the proposed site development. The scope of this investigation included the following:

- Review of the referenced geotechnical reports
- Review of readily available geologic and seismic data for the area
- Performing engineering analyses of data obtained from our review
- Development of recommendations for site construction
- Preparation of this report

1.2  SITE LOCATION AND DESCRIPTION

The property comprises 3 parcels of land, Lots 4, 6, and 7 of Tract 14500. Lot 4 is located at the southwest corner of the intersection of railroad tracks and Los Carneros Road. Lot 4 is bordered by railroad tracks on the north, Los Carneros Road on the east and southeast, an existing commercial property on the southwest, and by vacant land (Lot 2) on the west. Lot 6 is located on the north corner of the intersection of Los Carneros Road and Tecolotito Creek. Lot 6 is bordered by an existing commercial property on the northeast and southeast, Los Carneros Road on the south, Tecolotito Creek on the southwest, and Lot 7 on the northwest. Lot 7 is located southeast of the intersection of railroad tracks and Tecolotito Creek. Lot 7 is bordered by vacant land on the northeast and northwest, Lot 6 on the southeast, Tecolotito Creek on the southwest, and railroad tracks on the north. The site in relationship to the surrounding area is shown on the Site Location Map, Figure 1.

Lots 4, 6, and 7 are currently vacant. A storm drain inlet was observed within the central portion of Lot 4. An east-west trending, unlined drainage channel traverses along the southern margin of Lot 7 to Tecolotito Creek. The channel is about 10 feet deep and 40 feet wide. An additional unlined drainage channel exists in the northwestern portion of Lot 7. The channel is about 6 to 8 feet deep and extends from an existing culvert beneath the railroad easement southwest to Tecolotito Creek. Tecolotito Creek is about 10 to 15 feet deep and the banks are inclined at a slope ratio of approximately 1.5:1 (H:V). Portions of the banks incorporate wire revetments and rip rap rock.
FIGURE 1 - SITE LOCATION MAP

Proposed Residential Development
Phase II of The Village at Los Carneros
Goleta, California

USGS 7.5 Minute Goleta Quadrangle
1950 (photo-revised 1988)

NOT TO SCALE
Lot 4 is relatively flat except for a slope ascending to the railroad easement along the northern margin of Lot 4 and a slope ascending to Los Carneros Road along the eastern margin of Lot 4. The slopes are inclined at a gradient of 2:1 (H:V) or flatter to maximum heights of approximately 11 and 19 feet along the northern and eastern margins of Lot 4, respectively. The ascending slope along the eastern margin of Lot 4 is part of the Los Carneros Road embankment. The maximum height of the Los Carneros Road embankment is about 35 feet. A terrace bench with a concrete-lined terrace drain is integrated with the Los Carneros Road embankment. Surface runoff within Lot 4 is directed as sheet flow toward the storm drain inlet within the central portion of Lot 4. Vegetation at Lot 4 consists of annual weeds across the site, relatively dense weeds and brush along the northern margin, and relatively large trees, brush and grass along the eastern margin of Lot 4.

Lots 6 and 7 are relatively flat. Surface runoff is directed as sheet flow toward the south and southwest. Vegetation at these lots consists of annual weeds across the site, relatively large trees along the northern margin of Lot 7, and dense vegetation consisting of willows, brush and trees adjacent Tecolotito Creek.

1.3 PROPOSED DEVELOPMENT

As depicted on the referenced plan, the site will be developed for 254 residential housing units, interior drives and parking, landscaping and open space. The residential units will consist of 33 single-family homes, 103 triplex/fourplex units and 118 apartment units. The northwestern portion of Lot 7 will be designated as an open space area. We also understand that onsite percolation of storm water may be required. Grading plans for the proposed site development are not available at this time. We anticipate grading will consist of minor cuts and up to 10 feet of fill from existing grades. The deepest fill will be placed within the unlined drainage channel along the southern margin of Lot 7.

Details of the proposed residential structures are not known at this time. We anticipate the proposed residential dwellings will consist of two- and three-story, wood-framed structures with concrete slabs on grade yielding relative light structural loads.

2.0 PREVIOUS INVESTIGATION

We have reviewed the referenced geotechnical reports prepared by Fugro West, Inc. (Fugro) for properties that include the subject site. Their investigations consisted of excavating 24 exploratory borings to depths ranging from 9 to 65 feet deep, 15 backhoe test pits to depths ranging from 2 to 13 feet, and 5 hand-dug test pits to depths ranging from 4 to 8 feet within the site. Laboratory testing of selected soil samples and engineering analyses for the proposed site development at that time are also provided in their report. Pertinent exploratory logs and laboratory data presented by Fugro are appended to this report in Appendix A, B, and C. The approximate locations of the exploratory excavations completed by Fugro are also indicated on the enclosed Plot Plan, Plate 1. These data were utilized in developing some of the findings and conclusions presented herein.
As presented in Fugro’s report, the site has been previously graded by cut up to 10 feet. The largest cuts apparently occurred in the northern portion of Lots 4 and 7 adjacent the railroad easement and the unlined drainage channel along the southern margin of Lot 7.

3.0 SUBSURFACE CONDITIONS

3.1 SOIL CONDITIONS

Based on the subsurface exploration completed by Fugro, geologic units encountered at the site consisted of artificial fill, younger alluvium, older alluvium and bedrock of Santa Barbara Formation. In addition, minor topsoil and organic debris cover the northern portion of Lot 7. Artificial fill was encountered within northeast portion of Lot 7 and adjacent Tecolotito Creek. In addition, minor artificial fills were also encountered within the eastern margin of Lot 4. Where encountered, the artificial fill consisted of brown to dark brown, dry to moist, soft to medium stiff silty clay and sandy clay, and medium dense clayey sand. The thickness of artificial fill is on the order of 1 to 3 feet except for the area of Boring DH-8, where the thickness of artificial fill is on the order of 8 feet.

Younger alluvium was encountered within the northwestern portion of Lot 7. Younger alluvium was either encountered at ground surface or beneath the artificial fill. Where encountered, the younger alluvium consisted of yellowish brown to black, moist to very moist, medium stiff to stiff silty clay. Where deep younger alluvium was encountered, the silty clay grades to medium stiff to stiff sandy clay with interbeds of silty sand and clayey sand below a depth of about 15 to 20 feet. The thickness of younger alluvium ranges from approximately 4 to 35 feet within the site. The approximate limits of the younger alluvium are indicated on Plate 1.

Older alluvium underlies the artificial fill or younger alluvium and is exposed in the remainder of the site. The upper 5 to 15 feet of older alluvium consists predominantly of silty clay, sandy clay and sandy silt that are damp to very moist and stiff to very stiff. This zone also contains occasional layers of clayey sand, silty sand and sand that are damp to moist and dense. The deeper portions of older alluvium consists predominantly of sand and silty sand that are damp to saturated and dense to very dense.

Tertiary-age sedimentary bedrock of the Santa Barbara Formation was encountered in two of the borings drilled within Lot 6 at depths of about 23 and 28 feet below the existing ground surface. Where encountered, the bedrock materials consisted of olive gray, very moist, very stiff to hard clayey siltstone with occasional interbeds of sand.

A more detailed description of the interpreted soil profile at each of the boring and test pit locations are presented on the boring and test pit logs in Appendix A. The stratigraphic descriptions in the logs represent the predominate materials encountered and relatively thin, often discontinuous layers of different material may occur within the major divisions.
3.2 GROUNDWATER

As presented in the referenced report, groundwater was encountered at depths ranging from approximately 13 to 22 feet below the existing ground surface during the subsurface exploration conducted in 2001 at the site. Subsequent to completion of subsurface exploration, a total of six (6) groundwater monitoring wells were constructed at the site. Depths to groundwater level were periodically measured in these wells. Based on the well data provided in the referenced report, groundwater rose about 2.3 to 2.5 feet during the period of January 2002 to January 2006.

4.0 ANALYSES

4.1 SEISMICITY

We have performed integrated historical and deterministic seismic analyses utilizing computer programs EQSEARCH (Blake, 1989, updated 2004) and EQFAULT (Blake, 1989, updated 2002). A brief description of the programs and their functions are discussed below:

EQSEARCH performs historical seismic analyses that estimate ground motions at the site using a catalog of historical earthquake data within a 62-mile (100-km) radius of the site and a selected attenuation relation to model subsurface earth materials similar to the site. The results of the analyses can be utilized to estimate how historical earthquakes may have shaken the site.

EQFAULT performs deterministic seismic analyses that estimate ground motion of the site using a selected attenuation relation to model earth materials similar to the site, a catalog of up to 222 digitized, 3-D California faults as earthquake sources, and a search of the known faults within a 62-mile (100-km) radius of the site. The results of the analyses can deterministically estimate how future earthquakes may shake the site.

Pertinent results from seismic hazard analyses performed for the site are provided below:

Historic Event: Based on the computer program EQSEARCH, the earthquake occurred in 1862 appears to have affected the site the most during the past 206 years. This earthquake was located approximately 2.4 miles (3.9 km) from the site and was estimated to have a magnitude of 5.7. Peak horizontal ground accelerations (PHGA) were estimated for the historical earthquake using Bozorgnia, Campbell and Niazi attenuation equation (1999) for Holocene alluvium sites. The largest estimated mean PHGA experienced at the site since 1800 is 0.32g (fraction of gravity) with a standard deviation of 0.21g.

Deterministic Event: Based on the computer program EQFAULT and using Bozorgnia, Campbell and Niazi attenuation equation (1999) for Holocene alluvium sites, the largest estimated mean PHGA that could occur at the site is 0.59g with a standard deviation of 0.39g, associated with a moment magnitude of 7.2 earthquake along the M. Ridge-Arroyo Parida-Santa Ana fault.
4.2 STATIC SETTLEMENT

Proposed grading may result in fills of up to 5 feet over the existing younger alluvial soils. The addition of this fill will cause the underlying alluvium to consolidate. Those portions of the alluvium that are above the ground water level (partially saturated) are anticipated to consolidate during and shortly after fill placement. Those portions that are saturated are anticipated to undergo a long-term process of consolidation. Our analyses indicate the saturated materials are estimated to undergo a total settlement of approximately ½-inch to 1 inch. Most of this settlement will likely occur over a period of years following grading. Differential settlement will be primarily due to the variation in fill thickness across the alluvial areas but will also be effected by variations in soil conditions and the depths of the alluvial soils. We estimate the associated differential settlement will be on the order ¼-inch over 50 feet.

5.0 CONCLUSIONS

5.1 FEASIBILITY OF PROPOSED DEVELOPMENT

From a geotechnical point of view, the proposed site development is considered feasible, provided that the proposed residential development at the site will be designed and constructed in accordance with the recommendations presented in this report.

5.2 SEISMIC HAZARDS

5.2.1 Ground Rupture

No active faults are known to project through the site nor does the site lie within the bounds of an "Earthquake Fault Zone" as defined by the State of California in the Alquist-Priolo Earthquake Fault Zoning Act. As such, the potential for ground rupture due to fault displacement beneath the site is considered very low.

5.2.2 Ground Shaking

The site is located in a seismically active area that has historically been affected by moderate to occasionally high levels of ground motion. Due to site proximity to several known active faults, the property will likely experience moderate to occasionally high ground shaking during the life of the proposed development. Some background shaking from other seismically active areas of the Southern California region should also be anticipated. Provided that the recommended ground improvement measures are employed at the site, designs in accordance with current version of California Building Code (CBC) requirements are considered suitable to mitigate the effects of the anticipated ground shaking during the design life of the structures.

5.2.3 Liquefaction

Engineering research of soil liquefaction potential (Youd, et al., 2001) indicates that generally three basic factors must exist concurrently in order for liquefaction to occur. These factors include:
• A source of ground shaking, such as an earthquake, capable of generating soil mass distortions.
• A relatively loose silty and/or sandy soil.
• A relative shallow groundwater table (within approximately 50 feet below ground surface) or completely saturated soil conditions that will allow positive pore pressure generation.

The liquefaction susceptibility of the onsite subsurface soils was evaluated by analyzing the potential concurrent occurrence of the above-mentioned three basic factors. The liquefaction evaluation for the site was completed under the guidance of Special Publication 117: Guidelines for Evaluating and Mitigating Seismic Hazards in California (CDMG, 1997).

Groundwater was at depths ranging from 10.5 to 17.5 feet below the existing ground surface. The granular soils below the groundwater table are dense to very dense. As such, the potential for liquefaction at the site is considered to be low.

5.3 STATIC SETTLEMENT

The near-surface portions of the older alluvium and alluvium as well as all existing fill are prone to hydrocollapse. These materials would likely cause settlements that are beyond tolerable limits for proposed site development. This condition can be readily mitigated by removal of these materials and replacing them as compacted engineered fill. The remaining older and younger alluvial soils are also compressible and subject to settlement under the weight of footings. Provided these materials are removed to a depth of at least 2 feet below bottom of footing, total and differential settlement due to the weight of footings is not anticipated to exceed ½-inch and ¼-inch over 30 feet, respectively. Areas underlain by younger alluvium are also anticipated to undergo long-term settlement due to the additional weight of fill. This settlement is anticipated to result in total and differential settlement of up to 1 inch and ¼-inch over 50 feet, respectively. The combined settlement potential results in a total and differential settlement of 1 ½ inches and 0.4 inches over 30 feet, respectively. These magnitudes of settlement are generally considered tolerable by proposed site development.

5.4 MATERIAL CHARACTERISTICS

Existing surficial soils are anticipated to be relatively easy to excavate with conventional heavy earthmoving equipment. Recommendations for temporary excavation slopes are provided in Section 6.1.5 of this report. Groundwater may be encountered as shallow as 10 feet below current grades. Wet to saturated soils may be encountered at depths a few feet above the groundwater levels. Because significant portions of site materials are relatively clayey, wet and saturated soils will be difficult to handle and be resistant to drying when preparing them for reuse as compacted fill.

5.5 SHRINKAGE AND SUBSIDENCE

Volumetric changes in earth quantities will occur when excavated onsite soil materials are replaced as properly compacted fill. We estimate the existing artificial fill and younger alluvium may shrink approximately 7 to 12 percent and the existing older alluvium may shrink approximately 0 to 5
percent. Processing of removal bottoms exposing younger alluvium is anticipated to result in a general subsidence of 0.1 feet. Negligible subsidence is anticipated for processing of removal bottom exposing older alluvium. The estimates of shrinkage and subsidence are intended as an aid for project engineers in determining earthwork quantities. However, these estimates should be used with some caution since they are not absolute values. Contingencies should be made for balancing earthwork quantities based on actual shrinkage and subsidence that occur during the grading process.

5.6 SOIL EXPANSION

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

6.0 RECOMMENDATIONS

6.1 EARTHWORK

6.1.1 General Earthwork and Grading Specifications

All earthwork and grading should be performed in accordance with applicable requirements of Cal/OSHA, applicable specifications of the Grading Codes of City of Goleta, California, in addition to recommendations presented herein.

6.1.2 Pre-Grade Meeting and Geotechnical Observation

Prior to commencement of grading, we recommend a meeting be held between the developer, City inspector, grading contractor, civil engineer, and geotechnical consultant to discuss the proposed grading and logistics. We also recommend that a geotechnical consultant be retained to provide soil engineering and engineering geologic services during site grading and foundation construction. This is to observe compliance with the design specifications and recommendations, and to allow design changes in the event that subsurface conditions differ from those anticipated. If conditions are encountered that appear to be different than those indicated in this report, the project geotechnical consultant should be notified immediately. Design and construction revisions may be required.

6.1.3 Site Clearing

All existing vegetation, organic debris and other deleterious materials should be removed from the areas to be developed. The project geotechnical consultant should be notified at the appropriate times to provide observation services during clearing operations to verify compliance with the above recommendations. Voids created by clearing should be left open for observation by the geotechnical consultant. Should any unusual soil conditions or subsurface structures be encountered during site clearing or grading that are not described or anticipated herein, these conditions should be brought to the immediate attention of the project geotechnical consultant for corrective recommendations as needed.
6.1.4 Ground Preparation

Existing artificial fill, upper portions of younger alluvium and weathered older alluvium are unsuitable to support the proposed structures and engineered fills. In order to provide adequate and uniform support of the proposed structures, existing surficial soils within the proposed building pads should be removed and replaced as engineered compacted fill. The estimated depth of removal for the areas underlying older alluvium is on the order of 3 to 4 feet below the existing ground surface or at least 1 foot below the bottom of proposed footings, whichever is deeper. The estimated depth of removal for areas underlying younger alluvium is on the order of 5 to 6 feet below the existing ground surface or at least 2 feet below the bottom of proposed footings, whichever is deeper. Removal or overexcavation should extend laterally a distance of at least 5 feet beyond the building or wall footprint.

Within future pavement areas, all existing artificial fill, upper portions of younger alluvium, and weathered older alluvium should be removed. In addition, all existing soils should be removed to at least 1.5 feet below the proposed pavement subgrade and replaced with engineered compacted fill.

All removal bottoms should be evaluated by the geotechnical consultant during grading to confirm the exposed conditions are as anticipated and are competent for supporting the proposed structures and fills above. Following removals, the exposed grade should first be scarified to a depth of 6 inches, moisture conditioned to slightly over optimum moisture content, and then re-compacted to at least 90 percent of the laboratory standard.

Where wet or soft soils are exposed at the bottom of excavation, methods to stabilize the bottom are recommended. One common method is to place a layer of geofabric, such as Mirafi HP 565 or equivalent at the bottom of excavation. A blanket of ¾-inch gravel having a thickness of at least 1 foot should be placed over the geofabric. Other methods including lime stabilization can be considered.

The grading contractor should take appropriate measures when excavating adjacent existing improvements to avoid disturbing or compromising support of existing structures.

6.1.5 Temporary Excavations

Temporary construction slopes in site soils may be cut vertically up to a height of 4 feet provided that no adverse geologic conditions or surcharging of the excavations are present. Temporary slopes over 4 feet in site soils should be laid back at a maximum gradient of 1:1 (H:V) or properly shored. Excavations should not be left open for prolonged periods of time. The project geotechnical consultant should observe all temporary cuts to confirm anticipated conditions and to provide alternate recommendations if conditions dictate.

Where temporary excavations cannot accommodate a 1:1 layback or where surcharging occurs, slot cutting, shoring, underpinning, or other methods should be used. Specific recommendations for these options should be provided by the geotechnical consultant after specific design plans have been developed.
6.1.6 Fill Placement

Materials excavated from the site may be used as fill provided they are free of deleterious materials and particles greater than 4 inches in maximum dimension (oversized materials). Fill should be placed in lifts no greater than 8 inches in loose thickness, moisture conditioned to 100 to 125 percent of the optimum moisture content, then compacted in place to at least 90 percent of the laboratory standard. Fill materials consisting of clayey soils with **High to Very High** expansion potential that will be placed within the upper 2 feet of finish pad grades should be compacted to between 85 and 90 percent of laboratory standard and at a moisture content of at least 120 percent of optimum. The laboratory standard for maximum dry density and optimum moisture content for each soil type used should be determined in accordance with ASTM D 1557-07. Each lift should be treated in a similar manner. Subsequent lifts should not be placed until the project geotechnical consultants have approved the preceding lift. When placing fill on ground sloping steeper than 5:1 (H:V), vertical benches should be excavated into the adjacent slope.

6.1.7 Import Material

If imported soils are required to bring the site to proposed grades, imported soils should have a maximum particle size of 4 inches and have an expansion index (EI) less than 90. Potential import soils should be sampled by the geotechnical consultant at the source, if possible, tested for expansion, soluble sulfate content and maximum density, and approved by the geotechnical consultant prior to being used.

6.2 SEISMIC DESIGN PARAMETERS

For design of the project in accordance with Chapter 16 of the 2007 CBC, the following table presents the seismic design factors:

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<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Mapped MCE Spectral Response Acceleration, short periods, $S_S$</td>
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</tr>
<tr>
<td>Mapped MCE Spectral Response Acceleration, at 1-sec. period, $S_1$</td>
<td>0.649</td>
</tr>
<tr>
<td>Site Coefficient, $F_a$</td>
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<tr>
<td>Site Coefficient, $F_v$</td>
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<tr>
<td>Adjusted MCE Spectral Response Acceleration, short periods, $S_{MS}$</td>
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<td>Design Spectral Response Acceleration, short periods, $S_{DS}$</td>
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<td>Design Spectral Response Acceleration, at 1-sec. period, $S_{D1}$</td>
<td>0.649</td>
</tr>
<tr>
<td>Site Design Category</td>
<td>D</td>
</tr>
</tbody>
</table>

MCE = Maximum Considered Earthquake
6.3 PRELIMINARY FOUNDATION DESIGN RECOMMENDATIONS

6.3.1 General
The following recommendations are provided for preliminary design purposes. These recommendations have been based on the site materials exposed during the investigations completed by Fugro, our understanding of the proposed development, and the assumption that the recommendations presented herein are incorporated into the design and construction of the project. Final recommendations should be provided by the project geotechnical consultant following review of grading and foundation plans as well as observation and testing of site materials during grading. Depending upon the design plans and actual site conditions, the recommendations provided herein may require modification.

6.3.2 Soil Expansion
Expansion potential of existing site soils varies from Low (20<EI<51) to Very High (EI>130) and plastic indices (PI) that generally vary from 15 to 50. The post-grading distribution of the site soils is not known at this time. Consequently, we are providing various design values for differing conditions that are likely to be exposed following grading. Following site grading, additional testing of site soils should be performed by the project geotechnical consultant to confirm the basis of these recommendations. Depending upon the distribution of soil types and expansion characteristics, differing groups of design values may be developed to better suit the types of conditions present at the site.

6.3.3 Settlement
The proposed residential foundation systems should be designed to tolerate total and differential settlements of 1 ½ inches and ½-inch over 30 feet, respectively.

6.3.4 Allowable Bearing Value
Provided site grading is performed in accordance with the recommendations presented in this report, a bearing value of 2,000 pounds per square foot (psf) may be used for continuous footings and pad footings/beams having a minimum width of 12 inches and founded at a minimum depth of 12 inches below the lowest adjacent grade. This value may be increased by 250 psf and 500 psf for each additional foot in width and depth, respectively, up to a maximum value of 4,000 psf. Recommended allowable bearing values include both dead and live loads, and may be increased by one-third for wind and seismic forces.

6.3.5 Lateral Resistance
Provided site grading is performed in accordance with the recommendations presented in this report, a passive earth pressure of 300 pounds per square foot per foot of depth up to a maximum value of 1,500 pounds per square foot may be used to determine lateral bearing for footings. This value may be increased by one-third when designing for wind and seismic forces. A coefficient of friction of 0.35 times the dead load forces may also be used between concrete and the supporting soils to determine lateral sliding resistance. No increase in the coefficient of friction should be used when designing for wind and seismic forces.
The above values are based on footings placed directly against compacted fill or competent native soils. In the case where footing sides are formed, all backfill against the footings should be compacted to at least 90 percent of the laboratory standard.

6.3.6 Post-Tensioned Slabs on Grade

Perimeter edge beams for the proposed structures should be founded below the lowest adjacent final ground surface at a minimum depth indicated in Table 6.2. Interior beams may be founded at a minimum depth of 12 inches below the tops of the finish floor slabs. The thickness of the floor slabs should be determined by the project structural engineer; however, we recommend a minimum slab thickness as indicated in Table 6.2.

All dwelling area floor slabs constructed on-grade should be underlain with a moisture vapor retarder such as 10-mil Visqueen or equivalent. A minimum of two (2) inches of clean sand having a sand equivalent (SE) of 30 or greater should be placed over the membrane to promote uniform curing of the concrete and aid in reducing vapor emissions. This vapor retarder system is anticipated to be suitable for most flooring finishes that can accommodate some vapor emissions. However, this system may emit more than 4 pounds of water per 1000 sq. ft. and therefore, may not be suitable for all flooring finishes. Additional steps should be taken if such vapor emission levels are too high for anticipated flooring finishes.

Pre-saturation of the subgrade below floor slabs will not be required; however, prior to placing concrete, the subgrade below all dwelling and garage floor slab areas should be thoroughly moistened to achieve a moisture content that is at least 110 percent of the optimum moisture content. This moisture content should penetrate to a minimum depth of 12 inches below the bottoms of the slabs.

Based on the guidelines provided in the “Design of Post-Tensioned Slabs-on-Ground” 3rd Edition by Post-Tensioning Institute, the $e_m$ and $y_m$ values are summarized below:

<table>
<thead>
<tr>
<th>TABLE 6.2 Summary of PT Design Parameters</th>
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<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>15&lt;PI&lt;20</td>
</tr>
<tr>
<td>Edge Lift Moisture Variation Distance, $e_m$ (feet)</td>
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<tr>
<td>Edge Lift, $y_m$ (inches)</td>
</tr>
<tr>
<td>Center Lift Moisture Variation Distance, $e_m$ (feet)</td>
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<tr>
<td>Center Lift, $y_m$ (inches)</td>
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<tr>
<td>Exterior Edge Beam Embedment (feet)</td>
</tr>
<tr>
<td>Minimum Slab Thickness (inches)</td>
</tr>
</tbody>
</table>
6.4 RETAINING AND SCREENING WALLS

6.4.1 General
The following recommendations are provided for preliminary design purpose. Final retaining wall designs specific to the site development should be provided to us for review once completed. The structural engineer and architect should provide recommendations for sealing at all joints and applying moisture-proofing material on the back of the walls.

6.4.2 Allowable Bearing Value and Lateral Resistance
Retaining and free-standing wall footings should be founded in engineered compacted fill. Retaining walls may utilize the bearing capacities and lateral resistance values provided in Sections 6.3.4 and 6.3.5. The passive pressure used for lateral bearing should be reduced by 50% for walls that have a descending slope below the face of the wall.

The above values are based on footings placed directly against properly compacted fill or competent native soil. In the case where footing sides are formed, all backfill against the footings should be compacted to at least 90 percent of the laboratory standard.

6.4.3 Active Earth Pressures
Static and seismic earth pressures for level and 2:1 (H:V) backfill conditions are provided in the following table. Seismic earth pressures provided herein are based on the method provided by Seed & Whitman (1970) using a peak ground acceleration (PGA) of 0.45g. This acceleration is based on 40 percent of the short period of design spectral response acceleration determined for the site. The values provided in the following table are based on selected, relatively granular site materials with Very Low to Low expansion potential (0<EI<51) to backfill the excavation for wall construction within a plane projected 1:1 (H:V) from the rear of the footing and using general site soils to backfill the remaining excavation. In addition, the values are based on drained backfill conditions and do not consider hydrostatic pressure. Furthermore, retaining walls should be designed to support adjacent surcharge loads imposed by other nearby footings or traffic loads in addition to the earth pressure.
### TABLE 6.3
**EARTH PRESSURES**

#### Pressure Diagram

![Pressure Diagram]

**Static Component**  
**Seismic Component**  
**Total Force**

#### Pressure Values  
**Walls Up to 10 Feet in Height**

<table>
<thead>
<tr>
<th>Value</th>
<th>Backfill Condition</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level</td>
<td>2H:1V Slope</td>
</tr>
<tr>
<td>A</td>
<td>37.2H</td>
<td>65.7H</td>
</tr>
<tr>
<td>B</td>
<td>13.9H</td>
<td>13.9H</td>
</tr>
<tr>
<td>C</td>
<td>25.6H</td>
<td>39.8H</td>
</tr>
</tbody>
</table>

**Note:**  
H is in feet and resulting pressure is in psf. Design may utilize either the sum of the static component and the seismic component force diagrams or the total force diagram above. SEAOSC has suggested using a load factor of 1.7 for the static component and 1.0 for the seismic component. The actual load factors should be determined by the structural engineer.

#### 6.4.4 Drainage and Moisture-Proofing

Retaining walls should be constructed with a perforated pipe and gravel subdrain to prevent entrapment of water in the backfill. The perforated pipe should consist of 4-inch-diameter, ABS SDR-35 or PVC Schedule 40 with the perforations laid down. The pipe should be embedded in ¾- to 1½-inch open-graded gravel wrapped in filter fabric. The gravel should be at least one foot wide and extend at least one foot up the wall above the footing and drainage outlet. Drainage gravel and piping should not be placed below outlets and weepholes. Filter fabric should consist of Mirafi 140N, or equal. Outlet pipes should be directed to positive drainage devices.
The use of weepholes may be considered in locations where aesthetic issues from potential nuisance water are not a concern. Weepholes should be 2 inches in diameter and provided at least every 6 feet on center. Where weepholes are used, perforated pipe may be omitted from the gravel subdrain.

Retaining walls supporting backfill should also be coated with a moisture-proofing compound or covered with such material to inhibit infiltration of moisture through the walls. Moisture-proofing material should cover any portion of the back of wall that will be in contact with soil and should lap over and cover the top of footing. A drainage blanket such as Mirafi Miradrain should be provided between the soil and the moisture-proofing materials. The drainage blanket should extend from the top of the gravel to within about 12 inches of finish grade. The top of footing should be finished smooth with a trowel to inhibit the infiltration of water through the wall. The project structural engineer should provide specific recommendations for moisture-proofing, water stops, and joint details.

6.4.5 Footing Reinforcement

All continuous footings should be reinforced with a minimum of four No. 4 bars, two top and two bottom. The structural engineer may require different reinforcement and should dictate if greater than the recommendations provided herein. Where recommended removals are limited due to space restrictions, greater reinforcement may be recommended. Specific recommendations should be provided by the geotechnical consultant during grading based on as-built conditions exposed in the field.

6.4.6 Footing Observations

Footing excavations should be observed by the project geotechnical consultant to verify that they have been excavated into competent bearing soils and to the minimum embedment recommended herein. These observations should be performed prior to placement of forms or reinforcement. The excavations should be trimmed neat, level and square. Loose, sloughed or moisture-softened materials and debris should be removed prior to placing concrete.

6.4.7 Wall Backfill

The project geotechnical consultant should approve the backfill used for retaining walls and the backfill should have an $EI$ less than 50 within a plane projected 1:1 (H:V) from the rear of the footings. While some portions of site materials will meet this requirement, significant portions will not. Wall backfill should be moisture-conditioned to slightly over the optimum moisture content; placed in lifts no greater than 12 inches in thickness, and then mechanically compacted with appropriate equipment to at least 90 percent of the laboratory standard. Hand-operated compaction equipment should be used to compact the backfill placed immediately adjacent the wall to avoid damage to the wall. Flooding or jetting of backfill material is not recommended.

If free-draining select materials are used as backfill for retaining walls, a minimum of 12 inches of onsite soils should be provided over the select materials to reduce the infiltration of water into the backfill. The 12 inches cap of onsite soils is not required where the finish surface will consist of hardscape such as concrete or asphalt paving.
6.5 EXTERIOR FLATWORK

Existing surficial site soils are generally highly expansive and will tend to cause significant heave in exterior flatwork. To help mitigate adverse effects of expansive soils, we are providing the following minimum recommendations. Even with implementation of these recommendations, flatwork may tend to move and crack.

Exterior flatwork should be a minimum 4 inches thick. Cold joints or saw cuts should be provided at least every 5 feet in each direction. Flatwork more than 5 feet in width across the minimum dimension should be reinforced with 6” by 6”, W2.9 by W2.9 welded wire mesh or No 3 bars spaced 18 inches center to center in both directions. Cold joints should be keyed or provided with dowels spaced 18 inches on center. Flatwork that meets the structure at points of entry should be doweled into the footing or grade beam of the structure. Consideration should also be given to doweling flatwork into curbs where they meet. Special jointing detail should be provided in areas of block-outs, notches, or other irregularities to avoid cracking at points of high stress. Subgrade soils below flatwork should be thoroughly moistened to at least 120 percent of optimum moisture content to a depth of 12 inches. Moistening should be accomplished by lightly spraying the area over a period of a few days just prior to pouring concrete.

Drainage from flatwork areas should be directed to local area drains or other appropriate collection devices designed to carry runoff water to the street or other approved drainage structures. The concrete flatwork should also be sloped at a minimum gradient of 3% away from building foundations and masonry walls.

The geotechnical consultant should observe and verify the density and moisture content of subgrade soils prior to pouring concrete to verify the recommended pre-moistening recommendations have been met.

6.6 CONCRETE MIX DESIGN

Laboratory testing of on-site soils by Fugro indicates negligible soluble sulfate content. We recommend following the procedures provided in ACI 318, Section 4.3, Table 4.3.1 for negligible sulfate exposure. Upon completion of rough grading, an evaluation of as-graded conditions and further laboratory testing should be completed for the site to confirm or modify the recommendations provided in this section.

6.7 SOIL CORROSIVITY

A soil sample of existing surficial soils was tested by Fugro for soluble chloride content, minimum resistivity and pH. Test results are provided in Appendix B. The detected soluble chloride content is 161 ppm. Based on the test result, site soils are not corrosive to metals embedded in concrete such as reinforcing steel. The detected minimum resistivity is 3,013 ohm-cm and pH of 7.5. As such, site soils are moderately corrosive to metals. Structures fabricated from metals should have appropriate corrosion protection if they will be in direct contact with site soils. Under such conditions, a corrosion specialist should provide specific recommendations.
6.8 POST GRADING CONSIDERATIONS

6.8.1 Site Drainage and Irrigation

Positive drainage devices, such as sloping concrete flatwork, graded swales or area drains, should be provided around the new construction to collect and direct all surface water to suitable discharge areas. No rain or excess water should be directed toward or allowed to pond against structures such as walls, foundations, flatwork, etc.

Excessive irrigation water can be detrimental to the performance of the proposed site development. Water applied in excess of the needs of vegetation will tend to percolate into the ground. Such percolation can lead to nuisance seepage and shallow perched groundwater. Seepage can form on slope faces, on the faces of retaining walls, in streets, or other low-lying areas. These conditions could lead to adverse effects such as the formation of stagnant water that breeds insects, distress or damage of trees, surface erosion, slope instability, discoloration and salt buildup on wall faces, and premature failure of pavement. Excessive watering can also lead to elevated vapor emissions within structures that can damage flooring finishes or lead to mold growth inside the home.

Key factors that can help mitigate the potential for adverse effects of overwatering include the judicious use of water for irrigation, use of irrigation systems that are appropriate for the type of vegetation and geometric configuration of the planted area, the use of soil amendments to enhance moisture retention, use of low-water demand vegetation, regular use of appropriate fertilizers, and seasonal adjustments of irrigation systems to match the water requirements of vegetation. Specific recommendations should be provided by a landscape architect or other knowledgeable professional.

6.8.2 Utility Trenches

Trench excavations should be constructed in accordance with the recommendations contained in Section 6.1.5 of this report. Trench excavations must also conform to the requirements of Cal/OSHA.

Trench backfill materials and compaction criteria should conform to the requirements of the local municipalities. As a minimum, utility trench backfill should be compacted to at least 90 percent of the laboratory standard. Trench backfill should be moistened to slightly over the optimum moisture content, placed in lifts no greater than 12 inches in thickness, and then mechanically compacted with appropriate equipment to at least 90 percent of the laboratory standard. The project geotechnical consultant should perform density testing, along with probing, to test compaction. Site conditions are generally not suitable for jetting of trench backfill and jetting should not be completed without prior approval from the project geotechnical consultant.

Within shallow trenches (less than 18 inches deep) where pipes may be damaged by heavy compaction equipment, imported clean sand having a SE of 30 or greater may be utilized. The sand should be placed in the trench, thoroughly moistened, and then compacted with a vibratory compactor. For utility trenches located below a 1:1 (H:V) plane projecting downward from the outside edge of the adjacent footing base or crossing footing trenches, concrete or slurry should be used as trench backfill.
Clayey soils present at the site will tend to cause water to collect in trench shading. This water could migrate along the trenches and below homes where excessive moisture conditions could be created. To mitigate this condition, we recommend the sand bedding and shading be omitted for a trench length of 2 feet just outside the house where the trench enters below the home. The bedding and shading should consist of soils similar to the general trench backfill soils.

6.9  PRELIMINARY PAVEMENT DESIGN RECOMMENDATIONS

6.9.1 Subgrade Preparation

Prior to placement of pavement elements, the upper 12 inches of subgrade soils should be moisture-conditioned to at least 110 percent of the optimum moisture content and compacted to at least 90 percent of the laboratory standard. Areas observed to pump or yield under vehicle traffic should be removed and replaced with firm and unyielding compacted soil or aggregate base materials.

6.9.2 Preliminary Pavement Designs

Based on the soil conditions present at the site and estimated traffic indexes, preliminary pavement sections are recommended in the table below. For preliminary design purposes, an “R”-value of 5 was used to determine the pavement design criteria presented below. The sections presented below are for planning purposes only and should be re-evaluated subsequent to site grading. Final pavement sections should be based on actual R-value testing of in-place soils and analysis of anticipated traffic.

<table>
<thead>
<tr>
<th>Location</th>
<th>Traffic Index</th>
<th>Asphalt Concrete (inches)</th>
<th>Aggregate Base (inches)</th>
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</thead>
<tbody>
<tr>
<td>Village Way</td>
<td>6.5</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>Secondary Streets</td>
<td>5.0</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Parking Stalls</td>
<td>-</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

6.9.3 Pavement Materials

Aggregate base should be placed in lifts no greater than 6 inches in thickness, moistened to slightly over optimum moisture content, then compacted to at least 95 percent of the laboratory standard. The laboratory standard should be ASTM D1557-07. Aggregate base materials should be Crushed Aggregate Base or Crushed Miscellaneous Base conforming to Section 200-2 of the 2006 Standard Specification for Public Works Construction (Greenbook).
Paving asphalt should be PG 64-10 conforming to the requirements of Section 203-1 of the Greenbook (2006). Asphalt concrete materials should conform to Section 203-6 and construction should conform to Section 302 of the Greenbook (2006).

6.10 PRELIMINARY PERCOLATION RATE

Details of the proposed storm water infiltration system are not known at this time. Depending on the proposed storm water infiltration system, the design parameters presented herein may require modification. The younger alluvium at the site comprises predominantly clayey soils with very low permeability and is not suitable for percolation. Therefore, storm water infiltration system using percolation pits should be installed in portions of the site underlain by older alluvium.

Based on results of percolation testing and analyses performed for the property bordering the site on the east and provided in our referenced report dated February 8, 2010, the maximum percolation rate for a 6-foot-diameter, 20 feet deep percolation pit with inlet at 5 feet below grade and embedded in older alluvium is 0.25 cubic foot per second (cfs). Percolation rates for other configurations of percolation pits in older alluvium will be provided upon request.

6.11 PLAN REVIEW AND CONSTRUCTION SERVICES

We recommend Albus-Keefe & Associates, Inc. be engaged to review any future development plans, including civil plans (grading plans), structural plans (foundation plans), and proposed structural loads, prior to construction. This is to verify that the assumptions of this report are valid and that the preliminary conclusions and recommendations contained in this report have been properly interpreted and are incorporated into the project plans and specifications. If we are not provided the opportunity to review these documents, we take no responsibility for misinterpretation of our preliminary conclusions and recommendations.

We recommend that a geotechnical consultant be retained to provide soil engineering services during construction of the project. These services are to observe compliance with the design, specifications or recommendations, and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

If the project plans change significantly from the assumed development described herein, the project geotechnical consultant should review our preliminary design recommendations and their applicability to the revised construction. If conditions are encountered during construction that appear to be different than those indicated in this report or subsequent design reports, the project geotechnical consultant should be notified immediately. Design and construction revisions may be required.

7.0 LIMITATIONS

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

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

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

This report has been prepared for the exclusive use of Comstock Crosser & Associates and its project consultants in the planning and design of the proposed development. This report has not been prepared for use by parties or projects other than those named or described herein. This report may not contain sufficient information for other parties or other purposes.

This report is subject to review by the controlling governmental agency.

Respectfully submitted,

ALBUS-KEEFE & ASSOCIATES, INC

James J.M. Chang
Associate Engineer
G.E. 2180

David E. Albus
Principal Engineer
GE 2455
REFERENCES

Publications


REFERENCES (Cont.)

Reports


______, 2001a, Geotechnical Engineering Report, Campus Pointe Building No. 4, 41 South Los Carneros Road, Santa Barbara County, California, dated April 27, 2001 (J.N. 00-42-3423).

Plans

Phase 1 & 2 Conceptual Site Plan, Los Carneros - Goleta, Goleta, California, Comstock Homes, dated February 12, 2010, prepared by William Hezmalhalch Architects, Inc.
APPENDIX A

EXPLORATION LOGS AND LABORATORY DATA

BY FUGRO WEST, INC. (2000)
BACKHOE PIT NO. BP-9

Location: eastern quarter of proposed parking area.

BACKHOE PIT NO. BP-10

Location: northeastern corner of proposed parking area.

BACKHOE PIT NO. BP-11

Location: northern end of proposed parking area located east of building.

BACKHOE PIT NO. BP-12

Location: southern end of proposed parking area east of building.

NOTES:
1. Refer to Plate 2 for backhoe pit locations.
3. Transitions between soil types are gradual.
4. No groundwater encountered.

BACKHOE PIT LOGS
Campus Pointe Building No. 2
Santa Barbara County, California
APPENDIX B

EXPLORATION LOGS AND LABORATORY DATA
BY FUGRO WEST, INC. (MARCH 2001)
MATERIAL DESCRIPTION

OLDER ALLUVIUM (Geo)
Sandy Loam: CLAY (CL): very stiff, light brown, moist, trace gravel, layers of Clayey SAND (SC)

- moderate to dark brown, at 5'

Silty, clayey SAND (SC-SM): very dense, light brown, moist

LOG OF DRILL HOLE NO. DH-1
Campus Pointe Building No. 4
Santa Barbara, California
<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>MATERIAL SYMBOL</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
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<tbody>
<tr>
<td>30</td>
<td></td>
<td>OLDER Alluvium (Qa)</td>
</tr>
<tr>
<td>23</td>
<td></td>
<td>Clayey SAND (SC)</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>- dark yellowish orange and light grayish brown, moist, at 5'</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td>Silty SAND (SM)</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>- light olive grey, wet, at 20'</td>
</tr>
</tbody>
</table>

**LOG OF DRILL HOLE NO. DH-2**

Campus Pointe Building No. 4
Santa Barbara, California

PLATE A-2
LOG OF DRILL HOLE NO. DH-3
Campus Pointe Building No. 4
Santa Barbara, California

PLATE A-3a
LOCATION: Proposed Building area, see Plate 2

SURFACE EL.: 32 ft (rel. MSL Datum)

MATERIAL DESCRIPTION

OLDER ALLUVIUM (Oa)
Sandy loam CLAY (CL): stiff, medium yellowish brown, damp to moist, some gravel
- very stiff, lenses of Clayey SAND (SC), at 2'

<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>DEPTH</th>
<th>MATERIAL SYMBOL</th>
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<th>UNCONSOLIDATED</th>
<th>UNCONSOLIDATED</th>
<th>WATER</th>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td>16</td>
<td>0</td>
<td></td>
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<td>5</td>
<td>(C5)</td>
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<td></td>
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<tr>
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<td>0</td>
<td></td>
<td>6</td>
<td>6</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>0</td>
<td></td>
<td>7</td>
<td>7</td>
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</tr>
<tr>
<td>10</td>
<td>0</td>
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<td>12</td>
<td>12</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

SUDDEN FINE SAND (SM): very dense, very pale orange, damp

COMPLETION DEPTH: 21.0 ft
DEPTH TO WATER: 20-1/2 ft
BACKFILLED WITH Cuttings
DRILLING DATE: February 7, 2001

DRILLING METHOD: 8 in. dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: SIG Testing
LOGGED BY: CWinda
CHECKED BY: GSDT Agtec

LOG OF DRILL HOLE NO. DH-4
Campus Pointe Building No. 4
Santa Barbara, California

PLATE A-4
LOG OF DRILL HOLE NO. DH-5
Campus Pointe Building No. 4
Santa Barbara, California
### Material Description

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Location</th>
<th>Surface El. (ft)</th>
<th>Sample Description</th>
<th>Unit Weight, Lb/ft³</th>
<th>Unit Density, ft³/ton</th>
<th>Water Content, %</th>
<th>% Passing 200 Mesh</th>
<th>Liquid Limit</th>
<th>Plastic Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>35 ft.</td>
<td>Silty Sand (SM): medium dense to dense, moderate yellowish brown, damp, fine-grained sand increasing with depth, interbedded with Clayey Sand (SC)</td>
<td>118</td>
<td>110</td>
<td>6</td>
<td>26</td>
<td>N0</td>
<td>N1</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>31 ft.</td>
<td>Clayey Sand (SC): very dense, moderate yellowish brown, moist</td>
<td>138</td>
<td>127</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>27 ft.</td>
<td>Sandy Clay (CH): very stiff, moderate yellowish brown, damp to moist</td>
<td>137</td>
<td>122</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>22 ft.</td>
<td>Silty fine Sand (SM): dense, very dark orange, damp</td>
<td>137</td>
<td>105</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>16 ft.</td>
<td>- very dense, moist, medium grained sand, at 20'</td>
<td>137</td>
<td>105</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>20 ft.</td>
<td>- moderate yellowish brown, wet, at 30'</td>
<td>137</td>
<td>105</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Completion Depth:** 50.0 ft

**Drilling Method:** 8-in. Hallow Stem Auger

**Hammer Type:** Automatic Trip

**Drilled by:** SG Testing

**Logged by:** G. Wester

**Checked by:** G. Bohners

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**LOG OF DRILL HOLE NO. DH-7**

Campus Pointe Building No. 4
Santa Barbara, California

PLATE A-7a
# LOG OF TEST PIT NO. TP-1

**LOCATION:** Proposed Chiller Building, see Plate 2

**SURFACE EL.:** 44.0 ft. [ref. MSL datum]

## MATERIAL DESCRIPTION

### OLDER ALLUVIUM (Oa)

- Sandy Loam CLAY (CL): stiff, medium yellowish brown, damp, slightly pitted, moist
- stiff to very stiff, at 2

### Clayed SAND (Rb)

- dense, grayish brown, damp to moist
- slightly loose sand content, fine grained sand, at 5

<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>UNIT VOLT.</th>
<th>UNIT DRY</th>
<th>WATER</th>
<th>% PASSING</th>
<th>LIQUID</th>
<th>PLASTICITY INDEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>186</td>
<td>114</td>
<td>11</td>
<td>115</td>
<td>105</td>
<td>17</td>
</tr>
<tr>
<td>0.50</td>
<td>135</td>
<td>103</td>
<td>11</td>
<td>115</td>
<td>103</td>
<td>17</td>
</tr>
<tr>
<td>1.00</td>
<td>120</td>
<td>113</td>
<td>8</td>
<td>115</td>
<td>115</td>
<td>17</td>
</tr>
</tbody>
</table>

**COMPLETION DEPTH: 0.5 ft.**

**DEPTH TO WATER:** Not encountered

**EXCAVATION DATE:** February 1, 2001

*The log and data presented are a simplification of actual conditions encountered at the time of excavating of the exploratory boring. Subsurface conditions may differ at other locations and with the passage of time [PAS].

## LOG OF TEST PIT NO. TP-2

**LOCATION:** Proposed Chiller Building, see Plate 2

**SURFACE EL.:** 41.0 ft. [ref. MSL datum]

## MATERIAL DESCRIPTION

### OLDER ALLUVIUM (Oa)

- Clayey SAND (Rc): loose to medium dense, moist to wet
- Silty SAND (SM): loose to medium dense, pale yellowish brown, wet, moldy, lens pinholes on wet side of test pit
- Sandy Loam CLAY (CL): stiff to very stiff, medium yellowish brown, moist

<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>UNIT VOLT.</th>
<th>UNIT DRY</th>
<th>WATER</th>
<th>% PASSING</th>
<th>LIQUID</th>
<th>PLASTICITY INDEX</th>
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<tr>
<td>0.00</td>
<td>136</td>
<td>107</td>
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<td>106</td>
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<tr>
<td>0.50</td>
<td>117</td>
<td>106</td>
<td>10</td>
<td>119</td>
<td>103</td>
<td>10</td>
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</tbody>
</table>

**COMPLETION DEPTH: 0.5 ft.**

**DEPTH TO WATER:** Not encountered

**EXCAVATION DATE:** February 9, 2001

*The log and data presented are a simplification of actual conditions encountered at the time of excavating of the exploratory boring. Subsurface conditions may differ at other locations and with the passage of time [PAS].

**LOGGED BY:** CW/We

**CHECKED BY:** OS/DIP

**EXCAVATION METHOD:** Hole-in-Skim Auger

**CONTRACTOR:** Mikes Excavating Service

---

**LOG OF TEST PIT NOS. TP-1 AND TP-2**

Campus Pointe Building No. 4
Santa Barbara, California

PLATE A-8

TP 00-17233 17-01/07/01 12:37:33 000703/01/17-02/01/023001/07/01 12:37:33 000703
**LOG OF TEST PIT NO. TP-5**

**LOCATION:** Proposed Retaining Wall, see Plate 2

**SURFACE EL.:** 39.0' NAD 83 (feet MSL datum)

<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>MATERIAL</th>
<th>SAMPLE NO.</th>
<th>SAMPLER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td><strong>ARTIFICIAL FILL (AF)</strong></td>
<td></td>
<td></td>
<td>Clayey SAND w/gravel (SC) - loose, moderate brown, clumpy, concrete fragments, at 1'</td>
</tr>
<tr>
<td>12.5</td>
<td><strong>SLUDGY ALLUVIUM (LA)</strong></td>
<td></td>
<td></td>
<td>Silty SAND (SM) - dense, pale yellowish brown, moist, w/gravel, very fine rounded</td>
</tr>
<tr>
<td>13.5</td>
<td><strong>Silty CLAY (CL)</strong></td>
<td></td>
<td></td>
<td>Sandy Lean CLAY (CL) - stiff, very stiff, moderate yellowish brown, moist</td>
</tr>
</tbody>
</table>

| ELEVATION (ft) | UNIT WT. | DRY WT. | WET WT. | WATER CONTENT | Silt Index | Plasticity Index | % PASSING 4250 G SIEVE | LOOSE LIMIT | PLASTICITY | UC INDEX | UNDRAINED SHEAR STRENGTH (ksi) |
|----------------|----------|---------|---------|---------------|------------|------------------|-------------------------|-------------|------------|----------|---------------------------------
| 12             | 125      | 118     |         | 7             |            |                  |                         |             |            |          |                                  |
| 12.5           | 125      | 113     |         | 3             |            |                  |                         |             |            |          |                                  |

**COMPLETION DEPTH:** 14.0 ft

**DEPTH TO WATER:** Not encountered

**EXCAVATION DATE:** February 9, 2001

The log and data presented were a simplification of actual conditions encountered at the time of excavating at the exposed location. Subsurface conditions may differ at other locations and over the course of time. (T-48)

**LOGGED BY:** CWelke

**CHECKED BY:** GLDeninga

**EXCAVATION METHOD:** Shallow Stern Auger

**CONTRACTOR:** Mikes Excavating Service

---

**LOG OF TEST PIT NO. TP-5**

**Campus Pointe Building No. 4**

**Santa Barbara, California**

**PLATE A-10**
### General Notes

**Soil Texture Symbols:**
- Slipped line in symbol column indicates transitional boundary.
- Samples and sampler dimensions (unless otherwise noted in report text) are as follows:
  1. SP - Sampled, driven: 2.58' ID, 3' OD
  2. CA Liner Sampled, driven: 2.36' ID, 3' OD
  3. CA Liner Sampled, disturbed: 2.36' ID, 3' OD
  4. Thin-walled tube, pushed: 2.28' ID, 3' OD
  5. Bulk Bag Sample (from cuttings):
  6. Hand Auger Sample
  7. ONE Core Sample
  8. Leaxan Sample
  9. Pitzer Sample
  10. Vibrasonic Sample
  11. No Sample Recovered

**Sampler Driving Resistance:**
- Number of blows with 146 lb hammer, falling 36 in, to drive sampler 1.5 ft after seating sampler 6 in. For example, 2958 Blow/Description

**Other Notes:**
- After driving sampler the initial 6" of sample, 35 blows drive sampler through the second 5" interval, and 35 blows drive the sampler 8.5" into the third interval.

**Clay Index:**
- 35' Blow counts for California Liner Sampler shown in [ ]
- Length of sample symbol approximates recovery length.
- Classification of Soils per ASTM D2487 or D2488
- Geologic Formation noted in hole font at the top of interpreted interval.

**Strength Legend:**
- G = Graded Compaction
- U = Uncompacted Ungraded Triaxial
- T = Tertiary
- P = Poorly Drained
- M = Medium Wet

**Water Level Symbols:**
- Initial or finished water level
- Field ground water level
- Subgrade encountered

**Rock Quality Designation (RQD):**
- Sum of reporved core pieces greater than 4 inches divided by the length of the core interval.

### Key to Terms & Symbols Used on Logs

<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION</th>
<th>SOIL TEXTURE</th>
<th>COARSE-GRAINED</th>
<th>FINE-GRAINED</th>
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<tbody>
<tr>
<td>Well graded GRAVEL (GW)</td>
<td>roadside</td>
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<td>12</td>
</tr>
<tr>
<td>Poorly graded GRAVEL (GP)</td>
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<tr>
<td>Well graded SAND (SW)</td>
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<tr>
<td>Poorly graded SAND (SP)</td>
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<td>12</td>
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<td>Silty SAND (SM)</td>
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<tr>
<td>Clayey SAND (SC)</td>
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<td>Silty. Clayey SAND (SC-SM)</td>
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SUMMARY OF LABORATORY TEST RESULTS
Campus Pointe Building No. 4
Santa Barbara, California
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<th>MATERIAL DESCRIPTION</th>
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<th>ATTENUATION</th>
<th>COMPACTION</th>
<th>GREEN</th>
<th>COMPRESSIVE</th>
<th>DISPLACEMENT</th>
<th>CORROSION</th>
<th>Tester</th>
<th>C VALUE</th>
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<tr>
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<td>106</td>
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<td>T.O.</td>
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<td>105</td>
<td>16</td>
<td></td>
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<td>118</td>
<td>7</td>
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<tr>
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<td>Sandy Lean CLAY (CL)</td>
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<td>123</td>
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<td>T.O.</td>
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</table>

**SUMMARY OF LABORATORY TEST RESULTS**

Campus Pointe Building No. 4  
Santa Barbara, California
GRAIN SIZE CURVES
Campus Pointe Building No. 4
Santa Barbara, California

PLATE B-2
COHESION, ksf: 0.9

ANGLE OF INTERNAL FRICTION, deg: 28.0

LOCATION: DH 4

DEPTH, ft: 6

MOISTURE CONTENT, %: 7.5

UNIT DRY WEIGHT, pcf: 119.0

MATERIAL DESCRIPTION: Sandy Lean CLAY (CL)

SAMPLE CONDITION: Driven Ring

DIRECT SHEAR TEST RESULTS
Campus Pointe Building No. 4
Santa Barbara, California

PLATE B-1a
DIRECT SHEAR TEST RESULTS
Campus Pointe Building No. 4
Santa Barbara, California

COHESION, ksf

ANGLE OF INTERNAL FRICTION, deg

LOCATION

DEPTH, ft

MOISTURE CONTENT, %

UNIT DRY WEIGHT, pcf

MATERIAL DESCRIPTION

SAMPLE CONDITION

0.3

30.0

TP-3

2

4.0

100.0

Silty SAND (SM)
COHESION, ksf

1.5

ANGLE OF INTERNAL FRICTION, deg

33.0

LOCATION

TP-3

DEPTH, ft

6

MOISTURE CONTENT, %

16.0

UNIT DRY WEIGHT,pcf

105.6

MATERIAL DESCRIPTION

Sandy Lean CLAY (CI)

SAMPLE CONDITION

DIRECT SHEAR TEST RESULTS

Campus Pointe Building No. 4
Santa Barbara, California

PLATE B-4c
CONsolidation Test Results
Campus Pointe Building No. 4
Santa Barbara, California

Plate 8-5
APPENDIX C

EXPLORATION LOGS AND LABORATORY DATA
BY FUGRO WEST, INC. (OCTOBER 2001)
**LOG OF DRILL HOLE NO. DH-1**

Campus Pointe Residential Development  
Santa Barbara, CA

---

**LOCATION:** San Pointe 2  
**ELEVATION:** 30 ft +/- (1st project datum)  
**MATERIAL DESCRIPTION:**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>OLDER ALLUVIUM (Qa)</td>
</tr>
<tr>
<td></td>
<td>Sandy CLAY (CL), stiff to very stiff, reddish and orange brown, dry to 2&quot;, then moist, with few roots from 0&quot; to 5&quot;, occasional charcoal inclusions</td>
</tr>
<tr>
<td>20</td>
<td>Clayey to Silty SAND (SC-SM), very dense, brown to yellowish brown, moist, below 5'</td>
</tr>
<tr>
<td></td>
<td>- light gray poorly graded coarse SAND (SP), at 10'</td>
</tr>
<tr>
<td></td>
<td>- grades to fine SAND (SP), very dense, light gray to yellow, moist, with iron oxide stains, below about 10.5'</td>
</tr>
<tr>
<td>-2</td>
<td>- seepage noted, at 17'</td>
</tr>
</tbody>
</table>

Hole caved at 17' after augers were removed.

---

**COMPLETION DEPTH:** 21.5 ft  
**DEPTH TO WATER:** 17 ft  
**BACKFILLED WITH:** Native Materials

**DRILLING METHOD:** 6" dia. Hollow Stem Auger  
**HAMMER TYPE:** Automatic  
**DRILLED BY:** SIG Testing  
**LOGGED BY:** NJ Dobridge  
**CHECKED BY:** GSD anchinger

---

**PLATE A-1**
LOCATION: See Plate 2

SURFACE EL: 32 ft M (est. project datum)

MATERIAL DESCRIPTION

OLDER ALLUVIUM (Clay)
Sandy CLAY (CL): stiff to very stiff, brown to reddish brown, dry to 2% then moist, occasional charcoal inclusions

-Silty SAND (SM) to Clayey SAND (SC): dense, brown to reddish brown, moist
  - with few Lean CLAY (CL) seams at about 5' to 6'
  - with gray matting at about 8' to 9'

Tine SAND (SP): very dense, light gray to yellowish brown, moist and wet below 17'

Hole caved to 17' after augers were removed.

LOG OF DRILL HOLE NO. DH-2

Campus Pointe Residential Development
Santa Barbara, CA

DRILLING DATE: August 16, 2001

DRILLING METHOD: 8-in. dia, Hollow Stem Auger
HAMMER TYPE: Automatic Trip
LOGGED BY: G. Darbridge
CHECKED BY: G. Dettlinger

PLATE A-2
**LOG OF DRILL HOLE NO. DH-3**
Campus Pointe Residential Development
Santa Barbara, CA

**ELEVATION M** | **DEPTH ft** | **MATERIAL SYMBOL** | **SAMPLE NO.** | **SAMPLE DESCRIPTION**
---|---|---|---|---
34 | 3.52 | 1 | (01) | ARTIFICIAL FILL (at)
32 | 4.34 | 2 | 03 | Silty SAND to SILT (SM to ML): very dense, light brown, dry
30 | 5.16 | 3 | (06) | OLDER ALLUVIUM (Coal)
28 | 6.02 | 4 | 03 | Silty SAND (SM): very dense, brown to reddish brown, moist, with some charcoal inclusions
26 | 6.81 | 5 | 03 | Interlayered with Lean CLAY (CL), below 5'  
24 | 7.64 | 6 | 03 | SAND (SP): very dense, light gray to moderate yellowish, with iron oxide stains
22 | 8.45 | 7 | 03 |  
20 | 9.15 | 8 | 03 |  
18 | 9.92 | 9 | 03 |  
16 | 10.68 | 10 | 03 |  
14 | 11.40 | 11 | 03 |  
12 | 12.07 | 12 | 03 |  
10 | 12.72 | 13 | 03 |  
8 | 13.36 | 14 | 03 |  
6 | 14.04 | 15 | 03 |  
4 | 14.70 | 16 | 03 |  
2 | 15.38 | 17 | 03 |  
0 | 16.00 | 18 | 03 |  

**DRILLING METHOD:** 6-in. dia. Hollow Stem Auger
**HAMMER TYPE:** Automatic Trip
**DRILLED BY:** SIG Testings
**LOGGED BY:** J.Derbidge
**CHECKED BY:** GSDentinger

**COMPLETION DEPTH:** 16.5 ft
**DEPTH TO WATER:** Not Encountered
**BACKFILLED WITH:** Native Materials
**DRILLING DATE:** August 16, 2001

October 2001
Project No. C1-42-0131

PLATE A-3
**LOG OF DRILL HOLE NO. DH-4**
Campus Pointe Residential Development
Santa Barbara, CA

**DATE:** October 2001
**PROJECT NO.:** 01-42-0131

### LOCATION
See Plate 2

**GROUND LEVEL:** 26 ft (+6 ft, rel. project datum)

### MATERIAL DESCRIPTION

<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>DEPTH</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLE NO.</th>
<th>SAMPLER</th>
<th>DRILL COUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>6</td>
<td>Silty Clayey SAND (SM to SC)</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>26</td>
<td>6</td>
<td>OLDER ALLUVIUM (Oriel)</td>
<td>(56)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>10</td>
<td>Clayey SAND (SC) to Sandy CLAY (CL)</td>
<td>(11)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>14</td>
<td>Fine SAND (SP)</td>
<td>(57)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>14</td>
<td>- medium sand, olive gray, at 20&quot;</td>
<td>(58)</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>20</td>
<td>-</td>
<td>(59)</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

**MATERIAL:**
- Silty Clayey SAND (SM to SC): loose, light brown, dry
- OLDER ALLUVIUM (Oriel) Clayey SAND (SC) to Sandy CLAY (CL): very stiff to dense, reddish brown and orangish brown, moist, with charcoal inclusion, with sand seams
- Interlayered with Silty to Clayey SAND (SM to SC), at 7'
- Fine SAND (SP): very dense, light gray to yellowish gray, moist
- Medium sand, olive gray, at 20'

**COMPLETION DEPTH:** 21.5 ft

**DEPTH TO WATER:** Not Encountered

**BACKFILLED WITH:** Native Materials

**DRILLING DATE:** August 16, 2003

**DRILLING METHOD:** 8-in. dia. Hollow Stem Auger
**HOUR TYPE:** Automatic Trip
**DRILLED BY:** J. Wright
**LOGGED BY:** N. Gerbera
**CHECKED BY:** G. Benninger

**PLATE A-4**
LOG OF DRILL HOLE NO. DH-5
Campus Pointe Residential Development
Santa Barbara, CA

October 2001
Project No. 01-42-0131

LOCATION: See Plate 2

SURFACE EL: 32.1 ft. (rel. project datum)

ELEVATION FT. MATERIAL SYMBOL CORE SAMPLED MATERIAL DESCRIPTION
-30 1 A
-28 2 D
-26 3 B
-24 4 B
-22 5 B
-20 6 B
-18 7 B
-16 8 B
-14 9 B
-12 10 B
-10 11 B
-8 12 B
-6 13 B
-4 14 B
-2 15 B
-0 16 B
2 17 B
4 18 B
6 19 B
8 20 B
10 21 B
12 22 B
14 23 B
16 24 B
18 25 B
20 26 B
22 27 B
24 28 B
26 29 B
28 30 B
30 31 B

MATERIAL DESCRIPTION

ARTIFICIAL FILL (af)
Sanitary CLAY (CL): soft, brown, dry

OLDER ALLUVIUM (Coal)
Sandy CLAY (CL) to Fat CLAY (CH): stiff to very stiff, brown to reddish brown, moist, with frequent charcoal inclusions, fine roots down to about 5'

sand layer, from 14.5' to 15'

Fine SAND (SP): dense to very dense, light gray to yellow gray to olive, wet

Note: Groundwater measured at 20 ft during drilling, water to augers was added below 20', therefore final water level not measured

COMPLETION DEPTH: 56.5 ft
DEPTH TO WATER: Not Measured
BACKFILLED WITH: Native Materials
DRILLING DATE: August 18, 2001

DRILLING METHOD: 8-in. dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: SIG Testing
LOGGED BY: AJD'Alfred
CHECKED BY: GS/Dealing

PLATE A-5
**LOCATION:** See Plate 2

**SURFACE EL:** 31 ft. +/- (for project datum)

**MATERIAL DESCRIPTION**

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARTIFICIAL FILL (af)</td>
<td>Sandy CLAY (CL): loose to medium stiff, brown to moderate reddish brown moss.</td>
</tr>
<tr>
<td>YOUNGER ALLUVIUM (Ca)</td>
<td>For CLAY (CH): stiff, dark brown to black, moist, with voids and roots up to about 1/16&quot; in 1/8&quot; diameter.</td>
</tr>
<tr>
<td></td>
<td>- fewer voids, no roots below about 7'</td>
</tr>
<tr>
<td></td>
<td>- stiff, dark brown to black, moist, with abundant gypsum pockets to approximately 1/8&quot; x 1/2&quot;, at 9'</td>
</tr>
<tr>
<td></td>
<td>- dark brown with gray and dull yellow brown matter, gypsum absent, at 15'</td>
</tr>
<tr>
<td></td>
<td>grades to Sandy CLAY (CL): stiff, brown with light gray pockets, wet</td>
</tr>
<tr>
<td>OLDER ALLUVIUM (Coal)</td>
<td>SAND (SP): dense, moderate yellowish and reddish brown, wet, with iron oxide streaks</td>
</tr>
</tbody>
</table>

**COMPLETION DEPTH:** 31.5 ft

**DEPTH TO WATER:** Not Encountered

**BACKFILLED WITH:** Native Materials

**DRILLING DATE:** August 17, 2001

**DRILLING METHOD:** 8-in. dia. Hollow Stem Auger

**HAMMER TYPE:** Automatic Trip

**LOGGED BY:** N. Darger

**CHECKED BY:** G. Daninger

**LOG OF DRILL HOLE NO. DH-6**

Campus Pointe Residential Development
Santa Barbara, CA

PLATE A-6
**LOG OF DRILL HOLE NO. DH-7**

**Campus Pointe Residential Development**

**Santa Barbara, CA**

**PLATE A-7a**

---

### MATERIAL DESCRIPTION

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 ft</td>
<td>OLDER ALLUVIUM (Ool)</td>
</tr>
<tr>
<td></td>
<td>Lean CLAY (CL): stiff, moderately orange brown and brown, dry to 2.5% then moist, minor sand</td>
</tr>
<tr>
<td>20 ft</td>
<td>Clayey to Silty SAND (SC to SM); medium dense, moderate orange brown, moist, with iron oxide stains</td>
</tr>
<tr>
<td></td>
<td>- grades to predominantly SILT (ML) to Silty fine SAND (SM); dense, orange brown, with light gray pockets, wet, with iron oxide stains, with few sand layers</td>
</tr>
<tr>
<td>10 ft</td>
<td>SAND (SP); dense, reddish brown and gray, wet, with iron oxide stains</td>
</tr>
<tr>
<td></td>
<td>- driller adds drilling mud down augers to establish pressure head and reduce sand from flowing up into augers</td>
</tr>
<tr>
<td>5 ft</td>
<td>SANTA BARBARA FORMATION (Qbar)</td>
</tr>
<tr>
<td></td>
<td>Clayey SILT (ML); very stiff to hard, greenish olive, wet</td>
</tr>
<tr>
<td></td>
<td>- with sand lenses, at 30'</td>
</tr>
</tbody>
</table>

**COMPLETION DEPTH**: 51.5 ft

**DEPTH TO WATER**: 15.5 ft

**BACKFILLED WITH**: Native Materials

**DRILLING DATE**: August 17, 2007

**DRILLING METHOD**: 6 in. dia. Hollow Stem Auger

**HANGER TYPE**: Automatic Trip

**DRILLED BY**: S&G Testing

**LOGGED BY**: NJDermidge

**CHECKED BY**: GSDeminger
LOG OF DRILL HOLE NO. DH-7
Campus Pointe Residential Development
Santa Barbara, CA

DRILLING METHOD: 3-in. dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: S/G Testing
LOGGED BY: NDorridge
CHECKED BY: GSBelinger

LOCATION: See Plate 2
SURFACE EL. 23 ft +/-. (rel project datum)

MATERIAL DESCRIPTION
SANTA BARBARA FORMATION (Qsb)
Clayey Silt (ML): very stiff to hard, greenish olive, wet

COMPLETION DEPTH: 51.5 ft
DEPTH TO WATER: 15.5 ft
BACKFILLED WITH: Native Materials
DRILLING DATE: August 17, 2001

The log was developed at the location where the sample was taken. The log was processed at the time of drilling at the drill site location. Subsurface conditions may vary at other locations and within the passage of time.
**LOG OF DRILL HOLE NO. DH-8**

**Campus Pointe Residential Development**
Santa Barbara, CA

**PLATE A-8a**

---

**MATERIAL DESCRIPTION**

**ARTIFICIAL FILL (af)**
- Mixture of Sandy Leam CLAY (CL) and Fat CLAY (CH): medium stiff, moderate reddish brown and black, dry to 2' then moist, with few pea size gravel
  - piece of asphalt concrete pavement, at about 5'

**YOUNGER ALLUVIUM (aql)**
- Silty Lean CLAY with sand (CL-M): medium stiff, moderate reddish brown, moist, with iron oxide stains

**Fat CLAY (CH):** stiff, black, with fine roots and voids, transitions to mottled gray and reddish brown below 15'5'
  - no recovery (clay on center bit), at 20'

**Older Alluvium (Qoa):**
- Grades to grayish brown Sandy CLAY (CL) to Clayey SAND (SC), by 27'
  - reddish brown with gray mottles, at 35' (possible Older Alluvium (Qoa)), below about 35'

---

**COMPLETION DEPTH:** 51.5 ft
**DEPTH TO WATER:** 18 ft
**BACKFILLED WITH:** Native Materials
**DRILLING DATE:** August 17, 2001

---

**DRILLING METHOD:** 8-in. dia. Hollow Stem Auger
**HAMMER TYPE:** Automatic Trip
**DRILLED BY:** SIG Testing
**LOGGED BY:** NUde-ridge
**CHECKED BY:** GSDentinger
LOCATION: See Plate 2
SURFACE EL: 28 ft (+- ft project datum)

MATERIAL DESCRIPTION
OLDER ALLUVIUM (Qua)
Fat CLAY (CH), stiff, dark brown to reddish brown, dry to approximately 3" then moist, with some sand lenses

Silty to Clayey Fine SAND (SM to SC): medium dense, reddish brown, moist, with some clay seams
- interlayered with fastened clay with white silt infilling at about 8'
- with iron oxide stains, below 9'

- layer of medium SAND (SP) with subrounded to rounded pea size gravel from 15.5' to at least 18.5'
- wet, below 21'
- with gray layers at about 25'

UNIT WET VOLUME (cu ft)
UNIT DRY VOLUME (cu ft)
WATER CONTENT (wt %)
\%
PENETRATING FORCE
lb

to

COMPLETION DEPTH: 26.5 ft
DEPTH TO WATER: 17 ft
BACKFILLED WITH: Native Materials
DRILLING DATE: August 20, 2001

The log reflects property and surrounding soil conditions encountered at the site and includes soil samples taken to characterize the subsurface conditions. The log provides a basis for identifying soil characteristics and the possible extent of groundwater.

LOG OF DRILL HOLE NO. DH-9
Campus Pointe Residential Development
Santa Barbara, CA

PLATE A-9
**LOG OF DRILL HOLE NO. DH-10**

*Campus Pointe Residential Development*

*Santa Barbara, CA*

**URGILLOG DOCUMENT**  RIEHMAN DEVELOPMENT COMPANY  0025051 310-805-7677  10/01/99  11:48:54 AM  11/30/99  01-42-0131  SGP# DH-10 RED 58

**PLATE A-10**

---

### MATERIAL DESCRIPTION

**OLDER ALLUVIUM (Goal)**

- Leaky to Fat CLAY (CL): stiff, brown, dry to approximately 2' then moist, with gypsum pockets, blocky structure
- Mottled olive and reddish brown, gypsum absent below about 3'
- Gradually to Sandy Leaky CLAY (CL): stiff, yellow brown, moist, with light gray mottling, few charcoal pieces

**Fine SAND to Silty fine SAND (SP to SM):**

- Medium dense to dense, light brown to gray brown, moist, wet, below approximately 18'

**Silty fine SAND (SM):** dense, bluish gray, wet (possible Santa Barbara Formation (CSs))

---

**LOCATION:** See Plate 2

**SURFACE EL:** 2; ft (+) (rel. project datum)

---

**DEPTHI** | **MATERIAL SYMBOL** | **SAMPLE NO.** | **SAMPLER** | **BLOW COUNT** | **UNIT DRY WEIGHT** | **UNIT DRY VOLUME** | **WATER CONTENT%** | **% PASSING 20-MESH** | **LIQUID LIMIT** | **PLASTICITY INDEX**
---|---|---|---|---|---|---|---|---|---|---
20 | G | (16) | | | | | | | | |
16 | 2 | | 6 | | | | | | | |
12 | 3 | | (16) | | | | | | | |
8 | 4 | | (3) | | | | | | | |
4 | 5 | | (45) | | | | | | | |
0 | 6 | | | | | | | | | |
-2 | 7 | | (55) | | | | | | | |
-4 | | | | | | | | | | |
-6 | | | | | | | | | | |
-8 | | | | | | | | | | |
-10 | | | | | | | | | | |
-12 | | | | | | | | | | |
-14 | | | | | | | | | | |
-16 | | | | | | | | | | |
-18 | | | | | | | | | | |
-20 | | | | | | | | | | |
-22 | | | | | | | | | | |
-24 | | | | | | | | | | |
-26 | | | | | | | | | | |
-28 | | | | | | | | | | |
-30 | | | | | | | | | | |
-32 | | | | | | | | | | |
-34 | | | | | | | | | | |
-36 | | | | | | | | | | |
-38 | | | | | | | | | | |
-40 | | | | | | | | | | |
-42 | | | | | | | | | | |
-44 | | | | | | | | | | |
-46 | | | | | | | | | | |
-48 | | | | | | | | | | |
-50 | | | | | | | | | | |
-52 | | | | | | | | | | |
-54 | | | | | | | | | | |
-56 | | | | | | | | | | |
-58 | | | | | | | | | | |
-60 | | | | | | | | | | |
-62 | | | | | | | | | | |
-64 | | | | | | | | | | |
-66 | | | | | | | | | | |
-68 | | | | | | | | | | |
-70 | | | | | | | | | | |
-72 | | | | | | | | | | |
-74 | | | | | | | | | | |
-76 | | | | | | | | | | |
-78 | | | | | | | | | | |
-80 | | | | | | | | | | |
-82 | | | | | | | | | | |
-84 | | | | | | | | | | |
-86 | | | | | | | | | | |
-88 | | | | | | | | | | |
-90 | | | | | | | | | | |
-92 | | | | | | | | | | |
-94 | | | | | | | | | | |
-96 | | | | | | | | | | |
-98 | | | | | | | | | | |
-100 | | | | | | | | | | |
**MATERIAL DESCRIPTION**

- **YOUGHER ALLUVIUM (CAL)**: Fat CLAY (CH): stiff, dark brown to approximately 2 ft, then black, dry to approximately 1.5 then moist, with fine roots

- **abundant gypsum pockets below about 17 ft**

- **gypsum absent below about 9 ft**

- **Sandy Lean CLAY (CL)**: stiff, gray brown, wet

- **interlayered with Silty to Clayey SAND (SM to SC) layer below approximately 25 ft**

**LOG OF DRILL HOLE NO. DH-11**

**Campus Pointe Residential Development**

**Santa Barbara, CA**

**PLATE A-11a**
LOG OF DRILL HOLE NO. DH-12
Campus Pointe Residential Development
Santa Barbara, CA

LOCATION: See Plate 2

SURFACE CLAY: 25 ft +/- (rel. project datum)

MATERIAL DESCRIPTION

YOUNGER ALLUVIUM (Qol)
Fat CLAY (CH): stiff to very stiff, dark brown to black, dry to approximately 2", then moist, with fine roots and roots
with sand particles, at 4'

OLDER ALLUVIUM (Qol)
Silty to clayey fine SAND (SW to SW); dense to very dense, dark yellowish brown to reddish brown, moist

COMPLETION DEPTH: 26.5 ft
DEPTH TO WATER: Not Encountered
BACKFILLED WITH: Native Materials
DRILLING DATE: August 21, 2001

DRILLING METHOD: 3" dia Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: SIG Testing
LOGGED BY: NDerbeiss
CHECKED BY: GS Bentinger

PLATE A-12
LOG OF DRILL HOLE NO. DH-13
Campus Pointe Residential Development
Santa Barbara, CA

<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLE NO.</th>
<th>SAMPLER</th>
<th>BLOW COUNT</th>
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<td>20</td>
<td>J</td>
<td>1</td>
<td>1</td>
<td>67</td>
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<tr>
<td>21</td>
<td>K</td>
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<td>22</td>
<td>(O1)</td>
<td>3</td>
<td>(O1)</td>
<td>113</td>
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<td>G</td>
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<td>(G1)</td>
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</tr>
<tr>
<td>27</td>
<td>J</td>
<td>8</td>
<td>(J7)</td>
<td>244</td>
</tr>
</tbody>
</table>

**MATERIAL DESCRIPTION**

**YOUNGER ALLUVIUM (Gel)**
- Fat CLAY (CH): stiff to very stiff, dark dusty brown to black, dry to about 6' then moist, with fine (up to approximately 1/8") roots and voids
- FINE SAND (S): dense, reddish brown to light grey, moist
- With few clay pockets, at 12.5'

**OLDER ALLUVIUM (Gel)**
- Sand Lean CLAY (O1) interlayered with Silty to Clayey SAND (SM to SC), stiff to dense, reddish brown to dark grey, moist, with iron oxide stains

**SURFACE EL. 29 ft. 6", (rel. project datum)**

**LOCATION:** See Plate 2

**UNITS:**
- Weight for moisture content
- Percent passing 1/4" sieve
- Liquid limit
- Plasticity index

**DRILLING METHOD:** Hit, dia. Hollow Stem Auger
**HAMMER TYPE:** Automatic Trip
**DRILLED BY:** SIG Testing
**LOGGED BY:** NJ Darby
**CHECKED BY:** GSDenlinger

**COMPLETION DEPTH: 26.5 ft.**
**DEPTH TO WATER: 16 ft.**
**BACKFILLED WITH:** Native Materials

**DRILLING DATE:** August 21, 2001

The log and data presented in this profile are subject to normal errors and omissions. The data are not intended to be used for foundation design or site selection.

**PLATE A-13**
<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>MATERIAL</th>
<th>SYMBOL</th>
<th>SAMPLE NO.</th>
<th>LOCATION</th>
<th>SURFACE EL.: 27 ft +4.3 (rel. project datum)</th>
</tr>
</thead>
<tbody>
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<td>YOUNGER ALLUVIUM (CaI)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fat CLAY (CH): medium stiff to stiff, dusky brown to black, dry to approximately 1&quot; then moist, with roots and voids up to approximately 1/16&quot;</td>
<td></td>
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<tr>
<td>26</td>
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<tr>
<td>4</td>
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<tr>
<td>0</td>
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<td></td>
</tr>
<tr>
<td>- with abundant gysum pockets at about 7.5'</td>
<td>- roots absent below 7.5'</td>
<td>- gysum absent, below about 9.5'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
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<td></td>
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<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- with sand, at 20'</td>
<td>- grades to Sandy Lean CLAY (CL): medium stiff, dark yellowish brown, wet, at 25'</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>12</td>
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</table>

**COMPLETION DEPTH:** 26.5 ft
**DEPTH TO WATER:** 10 ft
**BACKFILLED WITH:** Native Materials

**LOG OF DRILL HOLE NO. DH-14**

**Campus Pointe Residential Development**

Santa Barbara, CA

**DRILLING METHOD:** 8-in. dia. Hollow Stem Auger
**HAMMER TYPE:** Automatic Trio
**DRILLED BY:** SIG Testing
**LOGGED BY:** WJD
**CHECKED BY:** GSDenlinger
LOG OF DRILL HOLE NO. DH-16
Campus Pointe Residential Development
Santa Barbara, CA

LOCATION: See Plate 2

SURFACE EL: 29 ft. ~ (ref. project datum)

MATERIAL DESCRIPTION

OLDER ALLUVIUM (Qaql)
Clayey SAND (SC), medium dense, slightly moist to moist, moderate brown

- very dense, medium to well sorted, at 4'

- some calcite, slightly porous, interbedded with thin layers of Silty fine SAND (SM), SILT (ML) and Lean CLAY (CL)

Sandy CLAY (CL): very stiff, moderate brown, slightly moist

Silty fine SAND (SM): very dense, moderate yellowish brown, slightly moist

- dark yellow lenses of medium grained SAND (SP), zones of oxidation, at 20'

SANTA BARBARA FORMATION (Qsb)
Lean CLAY with sand (CL): very stiff, olive gray, moist

Clayey Silt with sand (ML): very dense, olive gray, wet, with shell up to approximately 3/8" diameter at about 35, with sand lenses

UNIT VOLUME WEIGHT,pcf
UNIT VOLUME DENSITY, g/cc
WATER CONTENT, %
% PASSING 200 MESH
LIQUID LIMIT
PLASTICITY INDEX
SHEAR STRENGTH, kPa

130
117
111
111
121
121
121

<table>
<thead>
<tr>
<th>ELEVATION, ft</th>
<th>DEPTH, ft</th>
<th>MATERIAL SYMBOL</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>-12</td>
<td>11</td>
<td></td>
<td>Clayey SILT with sand (ML): very dense, olive gray, wet, with shell up to approximately 3/8&quot; diameter at about 39', with sand lenses</td>
</tr>
<tr>
<td>-12</td>
<td>11</td>
<td></td>
<td>Fine SAND (SF) layer, dense to very dense, light olive brown, moist at 45'</td>
</tr>
</tbody>
</table>

LOCATION: See Plate 2
SURFACE EL: 77.4 ft; (see project datum)

MATERIAL DESCRIPTION:
Clayey SILT with sand (ML): very dense, olive gray, wet, with shell up to approximately 3/8" diameter at about 39', with sand lenses
Fine SAND (SF) layer, dense to very dense, light olive brown, moist at 45'

COMPLETION DEPTH: 51.5 ft
DEPTH TO WATER: 18 ft
BACKFILLED WITH: Native Materials
DRILLING DATE: August 22, 2001

LOGGED BY: SWilke/WJDatacle
CHECKED BY: GS Dentinger

LOG OF DRILL HOLE NO. DH-16
Campus Pointe Residential Development
Santa Barbara, CA

PLATE A-16b
LOG OF DRILL HOLE NO. DH-18
Campus Pointe Residential Development
Santa Barbara, CA

DEPTH TO WATER: 24 ft
BACKFILLED WITH: Sand/Cement Slurry
DRILLING DATE: August 27, 2001

The log shows 18 sample locations in a single borehole of 24 inches diameter. The locations are at 10-foot intervals, with the top sample at 31.5 feet. The water table is at 24 feet. The backfill material is Sand/Cement Slurry. The drilling method used is S.G. Testing.

DRILLING METHOD: S.G. Testing
HAMMER TYPE: Automatic Trip
LOGGED BY: N.J. Haase
CHECKED BY: C.S. Dentinger

PLATE A-18a
**LOG OF DRILL HOLE NO. DH-18**  
Campus Pointe Residential Development  
Santa Barbara, CA

<table>
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<tr>
<th>ELEVATION (ft)</th>
<th>MATERIAL (ft)</th>
<th>LOCATION</th>
<th>SURFACE EL.</th>
<th>MATERIAL DESCRIPTION</th>
<th>UNIT WET WEIGHT</th>
<th>UNIT DRY WEIGHT</th>
<th>GRAVITY</th>
<th>PLUSS</th>
<th>ILUSS</th>
<th>LOSS</th>
<th>BLASTING</th>
<th>HAMMER TYPE</th>
<th>DRILLER CHECKED</th>
<th>CHECKED BY</th>
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<tbody>
<tr>
<td>~6</td>
<td>6</td>
<td></td>
<td></td>
<td>blocky structure at 40'</td>
<td>116</td>
<td>112</td>
<td>16</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>~22</td>
<td>22</td>
<td></td>
<td></td>
<td>with organics and sand layers at about 45'</td>
<td>21</td>
<td></td>
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<tr>
<td>~34</td>
<td>34</td>
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<td>OLDER ALLUVIUM (Gravel)</td>
<td>132</td>
<td>112</td>
<td>16</td>
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</tr>
<tr>
<td>~46</td>
<td>46</td>
<td></td>
<td></td>
<td>Fine to medium SAND (SP): dense to very dense, light gray to yellowish gray, wet</td>
<td>132</td>
<td>112</td>
<td>16</td>
<td></td>
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<td></td>
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<tr>
<td>~65</td>
<td>65</td>
<td></td>
<td></td>
<td>- greenish gray in hole at 65'</td>
<td></td>
<td>112</td>
<td>16</td>
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</table>

**COMPLETION DEPTH:** 31.5 ft  
**DEPTH TO WATER:** 24 ft  
**BACKFILLED WITH:** Sand/Concrete Slurry  
**DRILLING DATE:** August 27, 2001

**DRILLING METHOD:** 8 in. dia. Hollow Stem Auger  
**HAMMER TYPE:** Automatic Trip  
**DRILLED BY:** N/A  
**LOGGED BY:** N/A  
**CHECKED BY:** G. Stenberger
### General Notes

**Soil Texture Symbol**

Sloped line in column indicates transitional boundary.

Sample and sampler dimensions to be shown (unless otherwise noted in report). Shall be as follows:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>CPT Sampler, driven</td>
</tr>
<tr>
<td>2</td>
<td>CA Liner Sampler, driven</td>
</tr>
<tr>
<td>3</td>
<td>CA Liner Sampler, disturbed</td>
</tr>
<tr>
<td>4</td>
<td>Drilled Tube, pushed</td>
</tr>
<tr>
<td>5</td>
<td>Bulk Bag Sample (from cuttings)</td>
</tr>
<tr>
<td>6</td>
<td>Hand Auger Sample</td>
</tr>
<tr>
<td>7</td>
<td>Core Cone Sample</td>
</tr>
<tr>
<td>8</td>
<td>Leman Sample</td>
</tr>
<tr>
<td>9</td>
<td>Pitcher Sample</td>
</tr>
<tr>
<td>10</td>
<td>Vibracore Sample</td>
</tr>
<tr>
<td>11</td>
<td>No Sample Recovered</td>
</tr>
</tbody>
</table>

**Sample Driving Resistance**

Number of blows with 140 lb. hammer, falling 30 in. to drive sampler 1 ft. after seating sampler. For example, 400/10 indicates 400 blows, 10 ft. being driven, 25 blow counts for California Liner sampler shown in brackets.

Length of sample symbol approximates recovery length.

**Classification of Soils per ASTM D2487 or D2486**

Geologic Formation noted in bold font at the top of interpreted interval.

**Strength Legend**

- C = Compressed Compaction
- U = Unconsolidated Undrained Triaxial
- T = Toughness
- P = Point Load Test
- M = Miniature Vane

**Water Level Symbols**

- W = Initial or recorded water level
- F = Final ground water level
- S = Seepages encountered

**Rock Quality Designation (RQD)** is the sum of recovered core lengths greater than 4 inches divided by the length of the bored interval.

---

### KEY TO TERMS & SYMBOLS USED ON LOGS

<table>
<thead>
<tr>
<th>Elevation</th>
<th>Depth</th>
<th>Sample No.</th>
<th>Borehole</th>
<th>Reception</th>
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<td>2</td>
<td>1</td>
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<tr>
<td>11</td>
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<tr>
<td>40</td>
<td>40</td>
<td>11</td>
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</tbody>
</table>

**MATERIAL DESCRIPTION**

- Well graded GRAVEL (GW)
- Poorly graded GRAVEL (GP)
- Well graded SAND (SW)
- Poorly graded SAND (SP)
- Silty SAND (SM)
- Clayey SAND (SC)
- Silty, Clayey SAND (SC-SM)
- Elastic SILT (MH)
- SILT (ML)
- Silty CLAY (CL-ML)
- Fat CLAY (CL-I)
- Lean CLAY (CL)
- CONGLOMERATE
- SANDSTONE
- SILTSTONE
- MUDSTONE
- CLAYSTONE
- SHALE
- GRANITE
- Paving and/or Base Materials
### LOG OF TEST PIT NO. TP-7

**LOCATION:** See Plate 2

**SURFACE EL:** 21.0 ft (+) (top project datum)

**MATERIAL DESCRIPTION**

- **ARTIFICIAL FILL (AF):**
  - Very soft, grey brown, dry, concrete pieces, plastic, soil厉害

- **YOUNGER ALLUVIUM (Y):**
  - Soft, greyish black, metal, few pieces, roots
  - Grading into **SANDY CLAY (SC):**
  - Very soft, mixed and greyish black with moderate brown, wet

- **OLDER ALLUVIUM (OL):**
  - Sandy Clay (SC): very soft, light brown to reddish brown, slightly moist, with occasional dark gray streaks/stratifications

**COMPLETION OF PIT:** 6 ft

**DEPTH TO WATER:** Not Encountered

**EXCAVATION DATE:** Aug 17, 01

---

### LOG OF TEST PIT NO. TP-8

**LOCATION:** See Plate 2

**SURFACE EL:** 20.0 ft (+) (top project datum)

**MATERIAL DESCRIPTION**

- **ALUMINUM (AL):**
  - Fat CLAY (CH): laminated, light brown, slightly moist, with loads and organic
  - Fat CLAY (CH): medium, stiff to stiff, dark gray, moist, pores, loose like
  - Melts to very moist, below approximately 4 ft
  - Decreasing pores with depth, no visible pores, by about 5 ft

**COMPLETION OF PIT:** 6 ft

**DEPTH TO WATER:** Not Encountered

**EXCAVATION DATE:** Aug 17, 01

---

**LOG OF TEST PITS**

**Campus Pointe Residential Development**

**Santa Barbara, CA**

**PLATE A-23**
### LOG OF TEST PIT NO. TP-9

<table>
<thead>
<tr>
<th>ELEV.</th>
<th>DEPTH</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLE NO.</th>
<th>SURFACE EL: 27.0 ft (+6 ft project datum)</th>
</tr>
</thead>
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<tr>
<td>1</td>
<td>0</td>
<td>YOUNGER ALLUVIUM (Ca)</td>
<td>1</td>
<td>Fat CLAY with sand (CH): stiff, grayish brown, slightly moist, numerous voids, some structure, porous.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>- light brown soil, at 0&quot;</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>- grading darker, at 3&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- few pores by 5&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- few light gray silt pockets, at 6&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- moist, numerous gypsum/calcite pockets, at 7&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- very moist, below approximately 9 and 10&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- grading to medium stiff, moist, grayish brown and moderate brown, very moist, at approximately 11&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- no gypsum/pockets at 11&quot;</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>- water seepage, at 13&quot;</td>
</tr>
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</table>

**LOCATION:** See Plate 2

**LOGGED BY:** GSDenlinger

**CHECKED BY:** GSDenlinger

**EXCAVATION METHOD:** Backhoe

**CONTRACTOR:** Carroll Backhoe

---

### LOG OF TEST PIT NO. TP-10

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<th>SAMPLE NO.</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>OLDER ALLUVIUM (Ca)</td>
<td>1</td>
<td>Clayey Silt (ML): grayish-brown, dry, very porous, pores up to approximately 1/16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- light gray, dry, porous, at 2&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fall CLAY (CH): very stiff, moderate yellowish brown, moist, blocky, polished surfaces</td>
</tr>
</tbody>
</table>

**LOCATION:** See Plate 2

**LOGGED BY:** GSDenlinger

**CHECKED BY:** GSDenlinger

**EXCAVATION METHOD:** Backhoe

**CONTRACTOR:** Carroll Backhoe

---

**LOG OF TEST PITS**

Campus Pointe Residential Developement

Santa Barbara, CA
LOG OF TEST PIT NO. TP-11

LOG OF TEST PIT NO. TP-12

LOG OF TEST PITS
Campus Pointe Residential Development
Santa Barbara, CA

PLATE A-25
LOG OF TEST PITS
Campus Pointe Residential Development
Santa Barbara, CA
<table>
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<th>DRILL HOLE</th>
<th>DEPTH</th>
<th>MATERIAL DESCRIPTION</th>
<th>UNV</th>
<th>UVD</th>
<th>XCS</th>
<th>PINES</th>
<th>LL</th>
<th>ATTERBERG LIMITS</th>
<th>MAX. COMP.</th>
<th>OFT</th>
<th>M.G.</th>
<th>DIRECT SHEAR</th>
<th>D. CONSTRUCTION</th>
<th>COMPRESSION STRENGTH</th>
<th>CORROSION TESTS</th>
<th>R</th>
<th>pH</th>
<th>CL</th>
<th>SO4</th>
<th>EXPANSION INDEX</th>
<th>TEST METHOD</th>
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<tr>
<td>DH-1</td>
<td>2.0</td>
<td>Sandy CLAY (CL)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>133</td>
<td>14</td>
<td>18</td>
<td>50</td>
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<td>DH-1</td>
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<td>Clayey to Silty SAND (SC-SM)</td>
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<td>DH-2</td>
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<td>Silty SAND (SM) to Clayey SAND (SC)</td>
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<td></td>
<td></td>
<td>123</td>
<td>117</td>
<td>47</td>
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<td>DH-2</td>
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<td>Silty SAND (SM) to Clayey SAND (SC)</td>
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<td>128</td>
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<td>117</td>
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<tr>
<td>DH-3</td>
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<td>123</td>
<td>117</td>
<td>6</td>
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<tr>
<td>DH-3</td>
<td>13.0</td>
<td>SAND (SP)</td>
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<tr>
<td>DH-4</td>
<td>5.5</td>
<td>Clayey SAND (SC) to Sandy CLAY (CL)</td>
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<td></td>
<td></td>
<td>123</td>
<td>117</td>
<td>6</td>
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**SUMMARY OF LABORATORY TEST RESULTS**

Campus Pointe Residential Development, Santa Barbara, CA
| DRILL HOLE | DEPTH (ft) | MATERIAL DESCRIPTION | MOIST. | LF | CI | FC | C | DIRECT SHEAR | P | PLUG COMPRESSIBILITY TEST | P | CORROSION TESTS | LF | CI | CL | SI | IK | TX | TEST LISTING |
|------------|-----------|---------------------|--------|---|----|---|---|---|----------------|---|-------------------------|---|-----------------|---|---|---|---|---|---|-----------|
| DH-7       | 2.5       | Lean CLAY (CL)      |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-7       | 4.0       | Lean CLAY (CL)      |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-7       | 7.3       | Clayey to Silty SAND (SC to SW) |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-7       | 13.0      | Clayey to Silty SAND (SC to SW) |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-8       | 5.0       | Sandy Lean CLAY (CL) and Fat CLAY (CH) |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-8       | 13.0      | Fat CLAY (CH)       |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-8       | 27.0      | Fat CLAY (CH)       |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-8       | 33.0      | Fat CLAY (CH)       |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-9       | 12.0      | Fat CLAY (CH)       |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-9       | 45.0      | SAND (SP)          |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-9       | 52.0      | SAND (SP)          |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-9       | 2.0       | Fat CLAY (CH)       |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-9       | 5.0       | Fat CLAY (CH)       |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-9       | 7.5       | Clayey to Silty SAND (SM to SC) |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-10      | 8.5       | Lean to Fat CLAY (CL-CH) |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-10      | 10.0      | Lean to Fat CLAY (CL-CH) |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-10      | 2.5       | Lean to Fat CLAY (CL-CH) |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-10      | 4.0       | Lean to Fat CLAY (CL-CH) |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-10      | 5.5       | Sandy Lean CLAY (CL) |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-10      | 7.0       | Sandy Lean CLAY (CL) |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-10      | 13.0      | Fine SAND to Silty fine SAND (SP to SM) |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-11      | 2.3       | Fat CLAY (CH)       |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-11      | 4.0       | Fat CLAY (CH)       |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-11      | 7.5       | Fat CLAY (CH)       |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-11      | 9.0       | Fat CLAY (CH)       |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-11      | 15.0      | Fat CLAY (CH)       |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-11      | 25.0      | Sandy Lean CLAY (CL) |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |
| DH-12      | 2.5       | Fat CLAY (CH)       |        |   |    |    |    |    |                |   |                        |   |                 |   |    |    |    |    |    |          |

**SUMMARY OF LABORATORY TEST RESULTS**

Campus Pointe Residential Development, Santa Barbara, CA
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DIRECT SHEAR TEST RESULTS
Campus Pointe Residential Development
Goleta, California

PLATE B-4a

COHESION, ksf

ANGLE OF INTERNAL FRICTION, deg

LOCATION
DEPT, ft
MOISTURE CONTENT, %
UNIT DRY WEIGHT, pcf
MATERIAL DESCRIPTION
SAMPLE CONDITION

0.2
44
DH-4
5
24
102
Clayey SAND (SC) to Sandy CLAY (CL)
Ring Sample
COHESION, ksf  0.3

ANGLE OF INTERNAL FRICTION, deg  31

LOCATION  DH 10
DEPTH, ft  2.5
MOISTURE CONTENT, %  21
UNIT DRY WEIGHT,pcf  98
MATERIAL DESCRIPTION  Lean to Fat CLAY (CL CH)
SAMPLE CONDITION  Ring Sample

DIRECT SHEAR TEST RESULTS
Campus Pointe Residential Development
Santa Barbara, California

PLATE B-4b
Mohr-Coulomb Envelope

MOISTURE CONTENT, %

UNIT DRY WEIGHT, pcf

LEGEND
(location) depth ft
C 3.0

CLASSIFICATION
Sandy CLAY (CL) to Fat CLAY (CH)

MAXIMUM UNIT DRY WEIGHT, pcf
115.0

OPTIMUM WATER CONTENT, %
14.5

COMPACTED TEST RESULTS
Campus Pointe Residential Development
Goleta, California

PLATE B-5a
COMPACTION TEST RESULTS
Campus Pointe Residential Development
Goleta, California

PLATE B-5b
CONSORTIUM TEST RESULTS
Campus Pointe Residential Development
Santa Barbara, CA

LOCATION
DEPTH, "H"  2.5
INITIAL MOISTURE CONTENT, %  11
UNIT DRY WEIGHT, "p'"  119
MATERIAL DESCRIPTION  Sandy CLAY (CL)
SAMPLE CONDITION  Ring Sample
CONSOLIDATION TEST RESULTS
Campus Pointe Residential Development
Santa Barbara, CA

LOCATION
DEPARTMENT
INITIAL MOISTURE CONTENT, %
UNIT DRY WEIGHT,pcf
MATERIAL DESCRIPTION
SAMPLE CONDITION

DH-8
2.5
23
163
Fat CLAY (CH)
Ring Sample

PLATE B-6b
LOCATION
DEPTH, "ft"
INITIAL MOISTURE CONTENT, %
UNIT DRY WEIGHT, "pcf"
MATERIAL DESCRIPTION
SAMPLE CONDITION

CH-11
15.0
27
97
Fat CLAY (CH)
Ring Sample

CONSOLIDATION TEST RESULTS
Campus Pointe Residential Development
Santa Barbara, CA

PLATE B-6c
CONSOLIDATION TEST RESULTS
Campus Pointe Residential Development
Santa Barbara, CA

LOCATION
DEPTH, "H"
INITIAL MOISTURE CONTENT, %
UNIT DRY WEIGHT, "pcf"
MATERIAL DESCRIPTION
SAMPLE CONDITION

DH 14
7.5
20
101
Fat CLAY (CH)
Ring Sample

PLATE B-6d
Introduction
We have reviewed the subject Geotechnical Design Reports prepared by Albus-Keefe & Associates (consultant) for Comstock Cresser & Associates concerning the proposed Village at Los Carneros development project. The full report citations are:

Albus-Keefe & Associates, 2010, Geotechnical Design Report, Phase I of The Village at Los Carneros, Goleta, California, dated February 8, 2010 (J.N. 1831.00)

Albus-Keefe & Associates, 2010, Geotechnical Design Report, Lots 4, 6, and 7, Phase II of The Village at Los Carneros, Goleta, California, dated March 3, 2010 (J.N. 1831.01)

Wilson Geosciences Inc. engaged Jon Irvine (Irvine Geotechnical Inc.), a California Registered Geotechnical Engineer (No. 2891), to review the reports for their general completeness and qualitative accuracy with regard to the geotechnical (soils) information provided to support the EIR. This technical memorandum is designed to provide a summary listing of the main review comments.

Summary of Review Comments
While we agree with the general conclusions of the reports, further substantiation of the conclusions may be necessary, as recommended below:

1. COMBINE INTO ONE COMPREHENSIVE REPORT: The Phase I and II reports should be combined into a single report that removes redundancies and integrates the analysis and explanation of the conditions in Lots 6 and 7 on the west with Lot 4 on the east correlating these through Lots 2 and 5 in the center of the project site. Analyses should refer to the 1-11-2011 version of the project plans.

2. ENGINEERING GEOLOGY ELEMENT: We believe there should be an engineering geology element to the report to establish the overall geologic setting of the site within the local geologic context, for example, what are the units involved, what are their ages, what are the lateral/vertical extents and variability across the project site (depicted on a geologic cross-section(s)), are the units tectonically deformed, what are the typical lithologies, and what hazards are associated with the units. This information and references to faulting and seismicity should be made and/or reviewed by a Certified Engineering Geologist familiar with this geographic area and the activity levels/characteristics of the faults. The Certified Engineering Geologist should sign and stamp the report.

Based on our review, the primary recommendation is that a California Certified Engineering should provide input to the report for geologic and seismic conditions. This should provide additional confidence regarding the distribution and identification of material properties across the entire project site, and integration of the material properties into the various geotechnical analyses. Additional geologic hazard input consistent with the thresholds of significance will be
useful for the preparation of the EIR. In our opinion these suggestions do not affect project feasibility.

3. **FAULTS AND EARTHQUAKES:** Faults and historic earthquakes considered most significant to the project seismic design (EQFAULT and EQSEARCH results) should be shown in tables and on maps in the report. There should be at least a brief description of the most important faults discussed in the text and shown in tables. The USGS Ground Motion Parameter Calculator is referenced, but there is no citation in the report indicating what was determined.

4. **GEOLOGIC MAP:** The report should have a project site geologic map showing the distribution of geologic units (older and young alluvium) and artificial fill.

5. **P1-P4 BORINGS:** The P-1 through P-4 boring logs should be revised to name the formations, and differentiate between artificial fill and older alluvium.

6. **EXPANSIVE SOILS:** In general, the expansion potential of the older alluvium has been reported to be low to moderate. However, Expansion Index and Plasticity Index tests indicate that the older alluvium is also highly to critically expansive. Thus, differential settlement and heaving of paved surfaces and shallow conventional foundations would be expected. Based on the current report recommendations expansive soils are expected to have an impact on the performance of roads, sidewalks, paving and slabs. Consideration of avoidance and/or blending is recommended.

   The Report recommends moisture conditioning the soil to at least 120 percent of optimum moisture content (ASTM 1557-09) and then compacting the soils to 85 to 90 percent of the maximum dry density (ASTM 1557-09). This is an outdated method and represents a compaction standard less than the minimum allowed in the 2010 California Building Code (CBC). This should be updated.

7. **CONSOLIDATION POTENTIAL:** The consultant has recommended removal and recompaition of the near surface soils to reduce the consolidation potential. However, very little laboratory testing data are contained in the reports to quantify the magnitude and depth of the consolidation potential. Anticipated building sizes and foundation loads, especially for the heavier structures such as the apartment building, are not provided or evaluated. The removal depths for the remedial grading may be underestimated unless the Report is amended to include a more complete assessment.

   In addition, the lower compaction standard recommended by the consultant to mitigate the soil expansion hazard appears to be in conflict with the mitigation of settlement hazard. A lower compaction standard will increase the consolidation and settlement potentials. The basis for this recommendation should be explained. The Report should verify the lower compaction standard will not be adversely impacted by onsite infiltration or excessive settlement as a result of structural loading.

8. **SURFACE WATER INFILTRATION EFFECTS:**

   *Hydrocollapse* - It appears there may not be enough geotechnical information to evaluate the impact that the proposed onsite infiltration of stormwater runoff will have on hydrocollapse of the soils. The Report should evaluate whether onsite infiltration of surface runoff will cause hydrocollapse and settlement to onsite and offsite structures. If potential hazards will be created, then the consultant should provide recommendations to mitigate the hazard to an acceptable level.
If calculations are not provided, the consultant should describe the basis for any findings regarding the hydrocollapse impact due to stormwater infiltration.

The Report should evaluate the hazards, if any, relating the potential for hydrocollapse and settlement of the soils near the infiltration basins.

**Liquefaction** - The Report should evaluate whether the infiltration basins will adversely affect the liquefaction potential of the site if depths to groundwater are reduced.

**Infiltration Testing and Related Impacts** - Infiltration testing does not appear to have been performed within the younger alluvium, which contains fat clays. No infiltration testing was performed near the western infiltration pit. The consultant should evaluate the infiltration rate and suitability of the younger alluvium. The Report should evaluate whether storm flows in Tecolotito Creek will adversely affect the infiltration ability of the younger alluvium beneath a portion of the westerly basin.

The Penfield & Smith Preliminary Drainage Report should be considered with regard to the location of detention and retention basins in order to determine if these locations and the nature of near surface flow will have a detrimental impact on foundations.

9. **CORROSIVITY:** The Report should indicate what materials (older alluvium or artificial fill) were tested for corrosivity.

10. **LAB TESTING:** The Report should indicate whether the testing laboratory is approved and certified for testing related to City of Goleta projects.

11. **CALIFORNIA BUILDING CODE:** California Building Code Seismic Design Parameters
    The consultant has cited the 2007 Building Code, which is outdated. The consultant should verify that the seismic parameters conform to the 2010 CBC. Also, it appears that the recent alluvium may be seismic Site Class E. From the data, it appears that the Plasticity Index is more than 20 for 10’ foot or more thick sections of “fat clay.” This could result in different spectral accelerations for the design of the proposed structures. This issue does not have an impact on whether or not the project is feasible. However, the seismic Site Class should be properly determined and evaluated.

12. **ASTM STANDARDS:** Provide the ASTM standard for the field percolation testing.

13. **REFERENCES:** All references (publications) cited should be shown in the body of the Report where they are relied upon. For example, the City of Goleta General Plan (the 2009 updated version) can be relied in part for geologic hazard information.
February 20, 2012
IC 12014-I

Kenneth Wilson, Principal Geologist
Wilson Geosciences Inc.
1910 Pinecrest Drive
Altadena, California 91001-2117

Subject:  GEOTECHNICAL PEER REVIEW: For the Village at Los Carneros (Lots 2, 4, 5, 6 and 7) at APN 073-033-026, -028 and -029. City of Goleta, California

Dear Mr. Wilson:

OVERVIEW AND SUMMARY

Based on two separate geotechnical reports by Albus-Keefe & Associates\(^1\) (consultant), which includes four borings and related testing, and on extensive previous geotechnical borings and laboratory testing by Fugro\(^2\), the geotechnical conditions across the study area are described. Conditions are variable and generally the majority of the site is underlain by a thin and scattered veneer of fill over older alluvium. The upper portion of the older alluvium is reported to consist of lean clay and admixtures of silt, sand and clay. The older alluvium becomes sandier and dense to very dense with depth. The western portion of the study area is underlain by young (Holocene) alluvium. The upper portion of the younger alluvium is reported to consist of fat clay and admixtures of clayey and silty sand with depth.

The primary geotechnical issues of concern at the site appear to be:

\(^{1}\) Albus-Keefe & Associates, 2010, Geotechnical Design Report, Phase I of The Village at Los Carneros, Goleta, California, dated February 8, 2010 (J.N. 1831.00)

\(^{2}\) Fugro West, Inc., 2000, Geotechnical Engineering Report, Campus Pointe Building No. 2, Goleta area of Santa Barbara County, California, dated April 10, 2000 (J.N. 98-92-7693)

\(^{1}\), 2001a, Geotechnical Engineering Report, Campus Pointe Building No. 4, 41 South Los Carneros Road, Santa Barbara County, California, dated April 27, 2001 (J.N. 00-42-3423).

\(^{1}\), 2001b, Geotechnical Engineering Report, Campus Pointe Residential Development, Santa Barbara County, California, dated October 15, 2001 (J.N. 01-42-0131).
Remedial grading has been recommended to improve site conditions to create suitable building sites, roads and infrastructure. The recommended remedial grading is relatively shallow, mostly involving high clay content alluvium.

It is likely that some of the potential geotechnical hazards at the site are low to negligible or this can be determined with additional analysis. Other hazards can be mitigated through building and grading plan design.

SPECIFIC ISSUES AND SOLUTIONS

1. Expansive Soils

In general, the expansion potential of the older alluvium has been reported to be low to moderate. However, Expansion Index and Plasticity Index tests indicate that the older alluvium is also highly to critically expansive. Based on the data and text within the geotechnical report, the soil expansion potential ranges from Low to Very High for soils derived from both older and younger alluvium. Thus, the entire project is potentially impacted by some degree of soil expansion. Soil expansion can cause heaving and damage to slabs, foundations, pavement and create high lateral pressures on retaining walls. The magnitude, depth and lateral extent of heaving is a function in the expansive potential, the in-situ density and the change in moisture content.

When possible, the best engineering practice is to avoid using highly expansive soils in fill and natural deposits that are intended are to support engineered structures, slabs and paving. When avoidance it is not feasible, expansive soils can be blended with non-expansive soils to reduce the overall expansion potential to an acceptable level. Some expansive soils can also be treated to chemically reduce the clay swelling and expansion potential.

The consultant has recommended not using expansive soils to backfill retaining walls in order to mitigate the impact of excessively high lateral soil pressures. Avoidance or blending have not been recommended for this project to create the building pads and streets. To mitigate the hazard on graded building sites and within the streets, the consultant has recommended
moisture conditioning the soil to at least 120 percent of optimum moisture content (ASTM 1557-09) and then compacting the soils to 85 to 90 percent of the maximum dry density (ASTM 1557-09). This is an archaic method and represents a compaction standard less than the minimum allowed in the 2010 California Building Code (CBC). Testing of the as-graded conditions is then recommended to quantify the expansion potential for slab, paving and foundation design. The grading specifications will likely result in finished sites with highly variable expansion and heaving potentials. Thus, differential settlement and heaving of paved surfaces and shallow conventional foundations would be expected.

Based on the current report recommendations expansive soils are expected have an impact on the performance of roads, sidewalks, paving and slabs. Consideration of avoidance and/or blending are recommended.

2. Soil Consolidation and Settlement - (Non Seismic)

The near surface deposits are reported to be subject to hydrocollapse and excessive consolidation. Settlement of structures and infrastructure is controlled by consolidation of soils as a result in increase in pressure (foundation or fill embankment loading) and/or an increase in moisture content (hydrocollapse). The hydrocollapse hazard is typically mitigated through removal and then recompaction of the poor quality, near surface soils. Removal and recompaction is also typically used to reduce the consolidation potential of soils exposed to an increase in pressure. The thickness of the compacted fill caps are generally a function of the structural loads and consolidation characteristics of the soils. The ultimate thickness is typically verified through calculations that model the site conditions relative to the proposed loading conditions.

The consultant has recommended removal and recompaction of the near surface soils to reduce the consolidation potential. However, very little laboratory testing data are contained in the reports to quantify the magnitude and depth of the consolidation potential. Anticipated building sizes and foundation loads, especially for the heavier structures such as the apartment building, are not provided or evaluated. The removal depths for the remedial grading may be under-estimated unless the consultant performs a more complete assessment.

Also, it appears there may not be enough geotechnical information to evaluate the impact that the proposed onsite infiltration of stormwater runoff will have on hydrocollapse of the soils. The consultant should evaluate whether onsite infiltration of surface runoff will cause hydrocollapse and settlement to onsite and offsite structures. If potential hazards will be created, then the consultant should provide recommendations to mitigate the hazard to an
acceptable level. If calculations are not provided, the consultant should describe the basis for any findings regarding the hydrocollapse impact due to stormwater infiltration.

In addition, the lower compaction standard recommended by the consultant to mitigate the soil expansion hazard appears to be in conflict with the mitigation of settlement hazard. A lower compaction standard will increase the consolidation and settlement potentials. The basis for this recommendation should be explained. The consultant should verify the lower compaction standard will not be adversely impacted by onsite infiltration or excessive settlement as a result of structural loading.

The depth of the required remedial grading and the impacts of potential settlements cannot be evaluated adequately at this time. The total and allowable settlements cited as a design target by the consultant appear to be reasonable and should result in a low hazard to structures and infrastructure. Specific laboratory testing and calculations appear necessary to model the proposed standard.

3. Liquefaction Potential – Site Specific Seismic Hazards

Chapter 18 of the California Building Code requires sites within Seismic Design Category D, E or F to be evaluated for the following potential hazards from earthquake motions: slope instability, liquefaction and surface rupture due to faulting or lateral spreading. The consultant has identified the site within Seismic Design Category D. Thus, the Code requires that all appropriate seismic hazards be evaluated.

Hazard zones and official maps were developed by the California Geologic Survey (CGS) under the requirements of the seismic Hazards Mapping Act and the Alquist-Priolo Earthquake Fault Zoning Act of the State of California. The CGS has not evaluated the Seismic Hazards of the Goleta Quadrangle and the consultant should refer to the City of Goleta General Plan Safety Element as well as recent geologic hazard reports. The consultant should make a finding as to the hazards associated with seismically induced landsliding and/or lateral spreading. If these hazards are present, mitigation recommendations should be presented.

The consultant has not performed a quantitative analysis of the liquefaction potential of the site. The consultant’s qualitative finding of the liquefaction potential of the site is a “low potential,” which may be accurate. However, the screening evaluation is incomplete. The density of the soils below the water table is cited as the primary reason why the liquefaction potential is low. Other screening factors including age of the deposit, stress history, and plasticity are not cited. It is not clear if the density alone is sufficient to rule out liquefaction for the Holocene alluvial deposits. As a minimum, the consultant should provide a screening

The consultant has not made a finding on the dynamic settlement potential of the site. An estimate of the potential dynamic total and differential settlements should be provided. It is not currently possible at this time to evaluate all seismic hazards and impacts at the site.

4. California Building Code Seismic Design Parameters

The consultant has cited the 2007 Building Code, which is obsolete. The consultant should verify that the seismic parameters conform to the 2010 CBC. Also, it appears that the recent alluvium may be seismic Site Class E. From the data, it appears that the Plasticity Index is more than 20 for 10-foot or more thick sections of “fat clay.” This could result in different spectral accelerations for the design of the proposed structures. This issue does not have an impact on whether or not the project is feasible. However, the seismic Site Class should be properly determined and evaluated.

5. Infiltration of Storm Water Runoff

It is proposed to collect and infiltrate storm runoff into the alluvial soils. The geotechnical consultant has performed infiltration testing of the older alluvium and provided average infiltration rates from four borings. The Grading and Drainage Plans\(^3\) and associated calculations\(^4\) indicate that two infiltration basins will be required for the project. One of the basins is planned in the central portion of the site, west of the proposed recreation center and north of an existing offsite development. The other basin is planned on the western portion of the study area and just east of Tecolotito Creek. The easterly basin is underlain by older alluvium and the western basin may be underlain by both younger and older alluvium. Both basins are proposed beneath streets and near proposed structures and/or existing structures. Both basins were sized assuming an infiltration rate of 4.25 in/hr at the bases.

As discussed above, the geotechnical consultant should evaluate the hazards, if any, relating the hydrocollapse and settlement of the soils near the infiltration basins. Recommended minimum depths of fill cover and/or recommendations to prevent infiltration into near surface soils should be provided. The consultant should also provide information regarding the anticipated flow paths and whether the downstream subsurface flows would adversely affect

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\(^3\) Penfield & Smith, 2011, Grading and Drainage Plans, Sheets, C-1, C-2 & C-4
offsite properties, basements and infrastructure. In screening for the liquefaction hazard at the site, the consultant has indicated that the depth of groundwater is sufficient for liquefaction to not be a hazard. The consultant should evaluate whether the infiltration basins will adversely affect the liquefaction potential of the site if these depths are reduced.

Infiltration testing does not appear to have been performed within the younger alluvium, which contains fat clays. No infiltration testing was performed near the western infiltration pit. The consultant should evaluate the infiltration rate and suitability of the younger alluvium. The consultant should evaluate whether storm flows in Tecolotito Creek will adversely affect the infiltration ability of the younger alluvium beneath a portion of the westerly basin.

SUMMARY AND CONCLUSIONS

In order to adequately quantify geotechnical hazards at the site and potential impacts from the proposed development, we believe additional analysis is needed. Within the Specific Issues and Solutions subsection comments and recommendations are made. It is the consultant’s decision whether additional field investigation, testing and analysis are required, or if additional data can be pulled from existing studies. In our opinion any additional work products should be presented in one comprehensive report that a) combines all of the data and results for the current project site and b) considers the latest development plans, regulatory guidelines, and City requirements.

We believe the proposed development can be feasible at the proposed site and the design techniques can be implemented to reduce potential adverse impacts to acceptable levels.

LIMITATIONS

All properties and projects are subject to some element of risk and the risk cannot be entirely eliminated. Properties are subject to hazards including, but not limited to seepage, erosion, concentrated drainage, differential settlement, and heaving. The damage from these hazards can be reduced by proper design and construction as well as future maintenance of the sites and drainage facilities. It is not possible to eliminate all hazards. This limited geotechnical peer review is not based on independent subsurface exploration and testing, but relies on the data contained in the referenced reports, plans and calculations. Engineering judgment and experience were relied upon in reviewing the data. However, exploration was only performed on portions of the sites, and the geologic and geotechnical conditions can vary between borings.

This report is issued and made for your sole use and benefit and is not transferable and is of the
observation date. Any liability in connection herewith shall not exceed our fee for the evaluation. No warranties expressed or implied is made or intended in connection with the above observations or by the furnishing of this report or by any other oral or written statement.

Irvine Geotechnical appreciates the opportunity to provide our service on this project. Any questions concerning the data or interpretation of this report should be directed to the undersigned.

Respectfully submitted,
Irvine Geotechnical, Inc.

Jon A. Irvine
G.E. 2891
Mr. Pete Perea  
Comstock Crosser & Associates  
321 12th Street  
Manhattan Beach, California 90266

Subject: Geotechnical Grading Plan Review, Proposed Residential Development, Village at Los Carneros, Goleta, California.

Dear Mr. Perea,

Pursuant to your request, Albus-Keefe & Associates, Inc. is pleased to present to you our geotechnical grading plan review report for the subject development. This report presents our review of the referenced grading plans, engineering analyses, as well as geotechnical recommendations for the subject development.

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

Sincerely,

ALBUS-KEEFE & ASSOCIATES, INC.

David E. Albus  
Principal Engineer
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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of our geotechnical grading plan review was to review the proposed development shown on the referenced grading plans with respect to the investigated geotechnical conditions in order to provide recommendations for site development. The scope of our work included:

- Review of the referenced geotechnical reports
- Review of readily available geologic and seismic data for the area
- Exploratory drilling and soil sampling
- Laboratory testing of selected soil samples
- Engineering and geologic analyses
- Development of recommendations for site construction
- Preparation of this report

1.2 SITE LOCATION AND DESCRIPTION

The site is located at the southwest corner of the intersection of the Los Carneros Road and Highway 1 within the city of Goleta, California. The site is bordered by Los Carneros Road on the east and southwest, existing commercial properties on the south, Tecolotito Creek on the west, and the Union Pacific railroad easement on the north. The location of the site and its relationship to the surrounding area is shown on Figure 1, Site Location Map.

Overall the site gently sheet flow drains down toward the west-south-west. Throughout this generally level area are various stockpiles of materials that locally slope the ground up to about 10 to 12 feet above the general landform. A slope ascends to the railroad easement along the northern margin of the site and a slope ascends to Los Carneros Road along the eastern margin of the site. The slopes are inclined at a gradient of 2:1 (H:V) or flatter to maximum heights of about 12 feet and 20 feet along the northern and eastern margins of the site, respectively.

An east-west trending, unlined drainage channel traverses the western portion of the site to Tecolotito Creek. The channel is about 10 feet deep and 40 feet wide. An additional unlined drainage channel exists in the northwestern portion of the site. The channel is about 6 to 8 feet deep and extends from an existing culvert beneath the railroad easement southwest to Tecolotito Creek. Tecolotito Creek is about 10 to 15 feet deep and the banks are inclined at a slope ratio of approximately 2:1 (H:V) or flatter. Portions of the banks incorporate wire revetments and rip rap rock. Erosion was observed on the slope face along the northern margin of the site. The site is currently vacant.
FIGURE 1 - SITE LOCATION MAP

Proposed Residential Development
Village at Los Carneros
Southwest Corner of Los Carneros Road and Railroad Tracks
Goleta, California

NOT TO SCALE
Existing site improvements consist of chain link fencing along the south property line, and a pad-mounted transformer and a storm water inlet within the eastern portion of the site. Vegetation at the site consists of relatively large trees and brush along the northern, eastern and western margins of the site and light to dense growth of weeds across the site.

### 1.3 PROPOSED DEVELOPMENT

Review of the referenced grading plans indicates that the site will be developed for single-family and multi-family residential use. Associated recreation area, open space, interior drives, parking areas and landscaping areas are also proposed. In addition, walls retaining up to about 7 feet of soils will be constructed along the northern and eastern margins of the site. Other site improvements are anticipated to include utility services, relatively short retaining walls, and a storm water infiltration system. Details of the proposed storm water infiltration system are not known at the time of this report and will be addressed in a separate report.

Cut and fill grading will be completed to achieve the proposed surface configuration for future development. For civil engineering design, maximum depths of proposed cuts and fills are on the order of 10 and 5.5 feet, respectively. These estimated grading depths do not include remedial geotechnical grading recommendations specified in Section 6.1.4. Slopes are proposed at a slope ratio of 2:1 (H:V) or flatter, to a maximum height of approximately 13 feet along the northern margin of the site.

Details of the proposed residential structures are not known at the time of this report. We anticipate the proposed residential dwellings will be 2- to 3-story, wood-framed structures with concrete slabs on grade yielding relatively light foundation loads. However, consideration is being given to construct a podium-style product for Building Pads 42 and 43 in Lot 9. These structures may include a complete or partial tuck under parking area.

### 2.0 INVESTIGATION

#### 2.1 PREVIOUS INVESTIGATION

We have reviewed the referenced geotechnical reports prepared by Fugro West, Inc. (Fugro) for the site. These reports were prepared for Bermant Development Company. As presented in Fugro’s reports, several geotechnical engineering reports had been prepared for the general site area including the subject site. Their investigations consisted of excavating 29 exploratory borings to depths ranging from 9 to 65 feet deep, 28 backhoe test pits to depths ranging from 2 to 13 feet, and 5 hand-auger borings to depths ranging from 4 to 8 feet within the site. Laboratory testing of selected soil samples and engineering analyses for the proposed site development at that time are also provided in their reports. Pertinent exploratory logs and laboratory data presented by Fugro are appended to this report in Appendices C, D and E. The approximate locations of the exploratory excavations completed by Fugro are also indicted on the enclosed Plot Plan, Plates 1 through 8.
As presented in Fugro’s report, the site has been previously graded by cut up to 10 feet. The largest cuts apparently occurred in the northern portion of the site adjacent the railroad easement and the unlined drainage channel within the western portion of the site. In addition, a portion of site within the eastern half of the site was graded under observation and testing by Fugro in 2002 for a previously-proposed commercial office building. Grading consisted of overexcavation and recompaction of the existing older alluvium to a depth of about 5 feet below the existing ground surface. The overexcavation extended about 5 feet beyond the proposed building lines. The grading also involved placing about 2 feet of silty sand over the recompacted soils. Approximate limits of these fills are depicted on the attached Plot Plan, Plates 1 through 8.

2.2 SUBSURFACE EXPLORATION

Subsurface exploration for this investigation was conducted on November 23 and 24, 2009. The exploration consisted of drilling four (4) exploratory borings within the previously proposed recreational area and along the northern margin of the site. These borings were drilled to depths ranging from approximately 19 to 21 feet below the existing ground surface utilizing a truck-mounted, hollow-stem-auger drill rig. A representative of Albus-Keefe & Associates, Inc. logged the exploratory excavations. Visual and tactile identifications were made of the materials encountered, and their descriptions are presented on the Boring Logs, Plates A-2 through A-5, in Appendix A. The approximate locations of the exploratory excavations are shown on the enclosed Plot Plan, Plates 1 through 8.

Bulk and relatively undisturbed samples were obtained at selected depths within the exploratory borings for subsequent laboratory testing. Relatively undisturbed samples were obtained using a 3-inch O.D., 2.5-inch I.D., California split-spoon soil sampler lined with brass rings. During each sampling interval, the sampler was driven 12 inches with successive drops of a 140-pound automatic hammer falling 30 inches. The number of blows required to advance the sampler was recorded for each six inches of advancement and the total blow count is recorded on the boring logs. Samples were placed in sealed containers or plastic bags and transported to our laboratory for analyses.

2.3 LABORATORY TESTING

Selected samples of representative earth materials from the borings completed by this firm were tested in our laboratory. Tests consisted of in-situ moisture and dry density, grain-size analysis, hydrometer analysis and percent passing #200 sieve. Descriptions of laboratory test criteria and test results are presented in Appendix B and on the boring logs in Appendix A.

3.0 SUBSURFACE CONDITIONS

3.1 SOIL CONDITIONS

Based on the subsurface exploration completed by this firm and previous investigations completed by Fugro, geologic units encountered at the site consisted of engineered artificial fill, non-engineered artificial fill, younger alluvium, older alluvium and bedrock of Santa Barbara Formation.
addition, minor topsoil and organic debris cover the northwestern corner of the site. The estimated distribution of those materials exposed at the ground surface is depicted on the Plot Plan, Plates 1 through 8. A summary of the materials are provided below.

Engineered artificial fill was placed within a previously-proposed office building pad to a depth of about 7 feet below the existing ground surface. Fill soils in the building pad consist of clayey soils capped with approximately 2 feet of silty sand. The approximate limits of this fill are depicted on the Plot Plan, Plate 1 through 8.

Non-engineered artificial fill is present throughout the site but is predominately located in the western half of the site as various generations of stockpiles. Relatively little exploration was performed in these materials. Where encountered, the artificial fill consisted of clayey sand and sandy clay that is light brown to dark brown, dry, and soft to very stiff. The thickness of non-engineered artificial fill is estimated to be up to approximately 12 feet in thickness. Not all occurrences of non-engineered artificial fill is depicted on the Plot Plan. These materials are present up to about 2 feet in thickness in some areas of the site beyond the limits indicated on the Plot Plan.

Younger alluvium was encountered along the western boundary of the site. Younger alluvium was either encountered at ground surface or beneath the artificial fill. Where encountered, the younger alluvium consisted of yellowish brown to black, moist to very moist, medium stiff to stiff silty clay. Where deep younger alluvium was encountered, the silty clay grades to medium stiff to stiff sandy clay with interbeds of silty sand and clayey sand below a depth of about 15 to 20 feet. The thickness of younger alluvium ranges from approximately 4 to 35 feet within the site.

Older alluvium underlies the artificial fill and younger alluvium and is exposed in the remainder of the site. The upper 5 to 15 feet of older alluvium consists predominantly of silty clay, sandy clay and sandy silt that are damp to very moist and stiff to very stiff. This zone also contains occasional layers of clayey sand, silty sand and sand that are damp to moist and dense. The deeper portions of older alluvium consists predominantly of sand and silty sand that are damp to saturated and dense to very dense.

Tertiary-age sedimentary bedrock of the Santa Barbara Formation was encountered in two of the borings drilled within the southwest portion of the site at depths of about 23 and 28 feet below the existing ground surface. Where encountered, the bedrock materials consisted of olive gray, very moist, very stiff to hard clayey siltstone with occasional interbeds of sand.

A more detailed description of the interpreted soil profile at each of the boring and test pit locations are presented on the boring and test pit logs in Appendix A, C, D and E. The stratigraphic descriptions in the logs represent the predominate materials encountered and relatively thin, often discontinuous layers of different material may occur within the major divisions.

3.2 GROUNDWATER

As presented in the referenced reports, groundwater was encountered at depths ranging from approximately 13 to 22 feet below the existing ground surface during the subsurface exploration conducted in 2001 at the site. Subsequent to completion of subsurface exploration, a total of six (6)
groundwater monitoring wells were constructed at the site. Depths to groundwater level were periodically measured in these wells. Based on the well data provided in the referenced reports, groundwater rose about 2.3 to 2.5 feet during the period of January 2002 to January 2006.

### 3.3 FAULTING

Geologic literature and field exploration do not indicate the presence of active faulting within the site. Based on our review of the referenced publications and seismic data, no faults are known to project through or immediately adjacent the site and the site does not lie within an "Earthquake Fault Zone" as defined by the State of California in the Alquist-Priolo Earthquake Fault Zoning Act.

Several large active fault systems are located in relative close proximity to the site. Seismic activity on these fault systems has for the most part controlled the geologic structure in the region. The closest known active faults, according to the referenced Geologic Hazards Map by City of Goleta, are an unnamed fault and More Ranch fault located approximately 1000 feet and 4080 feet from the site, respectively.

### 4.0 ANALYSES

#### 4.1 SEISMICITY

We have performed probabilistic seismic analyses utilizing the computer program OpenSHA developed by Field, E.H., T.H. Jordan, and C.A. Cornell (2003). OpenSHA is an open-source, Java-based platform for conducting seismic hazard analysis. As an object-oriented framework, OpenSHA can accommodate arbitrarily complex (e.g., physics based) earthquake rupture forecasts (ERFs), ground-motion models, and engineering-response models.

The computer program OpenSHA predicts the peak ground acceleration (PGA) having a 10 percent chance of being exceeded in 50 years is approximately 0.33g when averages of three attenuation relationships are used (Sadigh et al 1997, Abrahamson & Silva 1997, and Campbell & Bozorgnia 2003). The program also predicts the PGA having a 2 percent chance of being exceeded in 50 years is approximately 0.62g when averages of three attenuation relationships are used (Sadigh et al 1997, Abrahamson & Silva 1997, and Campbell & Bozorgnia 2003).

#### 4.2 LIQUEFACTION

Liquefaction evaluation for this site was completed in accordance with Special Publication 117A: Guidelines for Evaluating and Mitigating Seismic Hazards in California (CGS 2008). Groundwater was at depths ranging from 10.5 to 19.5 feet below the existing ground surface. Soil materials present at or below the groundwater level consist of older and younger alluvium. Based on our analyses, the \((N_1)_{60-cc}\) values for the older alluvial soils are greater than 30. Based on SP 117A, such materials are not considered liquefiable due to the dense conditions of these materials. From laboratory testing and visual observations, the younger alluvial soils are comprised of soils with a plastic index (PI) of 12 or greater and an in-situ moisture content that is less than 85% of the liquid limit. Based on SP 177A, such fine-grained soils are not considered liquefiable.
4.3 STATIC SETTLEMENT

Proposed grading may result in fills of up to 5 feet over the existing younger alluvial soils. The addition of this fill will cause the underlying alluvium to consolidate. Those portions of the alluvium that are above the groundwater table (partially saturated) are anticipated to consolidate during and shortly after fill placement. Those portions that are saturated are anticipated to undergo a long-term process of consolidation. Our analyses indicate the saturated materials are estimated to undergo a total settlement of approximately ½-inch to 1 inch. Most of this settlement will likely occur over a period of years following grading. Differential settlement will be primarily due to the variation in fill thickness across the alluvial areas but will also be affected by variations in soil conditions and the depths of the alluvial soils. We estimate the associated differential settlement will be on the order ¼-inch over 50 feet.

5.0 CONCLUSIONS

5.1 FEASIBILITY OF PROPOSED DEVELOPMENT

From a geotechnical point of view, the proposed site development is considered feasible, provided that the proposed residential development at the site will be designed and constructed in accordance with the recommendations presented in this report.

5.2 SEISMIC HAZARDS

5.2.1 Ground Rupture

No active faults are known to project through the site nor does the site lie within the bounds of an "Earthquake Fault Zone" as defined by the State of California in the Alquist-Priolo Earthquake Fault Zoning Act. As such, the potential for ground rupture due to fault displacement beneath the site is considered very low.

5.2.2 Ground Shaking

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

5.2.3 Liquefaction

Liquefaction is a condition whereby soils located below groundwater lose strength during strong ground shaking. The loss of strength can lead to ground subsidence, spreading of the ground...
surface, tilting of structures, and sand boils. Soils that are susceptible to liquefaction are generally comprised of loose sands and silts. As indicated in Section 4.2, soils located below groundwater at the site are not comprised of soils with these characteristics. As such, the potential for liquefaction at the site is considered to be low.

5.3 SLOPE STABILITY
Existing and proposed slopes at the site will have a ratio of 2:1 (H:V) or flatter, and a maximum height of 35 feet. Based on our experience with earth materials encountered at the site, the existing and proposed cut and fill slopes at the site are anticipated to be grossly stable under static and pseudo-static conditions. The existing and proposed cut and fill slopes are anticipated to be surficially stable provided that the slopes will be maintained in accordance with the recommendations provided in Section 6.9 of this report.

5.4 STATIC SETTLEMENT
Portions of the near-surface older alluvium and alluvium as well as all existing non-engineered artificial fill are prone to hydrocollapse. These materials would likely cause settlements that are beyond tolerable limits for proposed site development. This condition can be readily mitigated by removal of these materials and replacing them as compacted engineered fill. The remaining younger alluvial soils are also compressible and subject to settlement under the weight of footings. Provided these materials are removed to a depth of at least 2 feet below bottom of footings, total and differential settlement due to the weight of footings is not anticipated to exceed ½-inch and ¼-inch over 30 feet, respectively. Areas underlain by younger alluvium are also anticipated to undergo long-term settlement due to the additional weight of fill. This settlement is anticipated to result in total and differential settlement of approximately ¾ inches and ¼-inch over 50 feet, respectively. The combined settlement potential from footing loads and fill loads results in a total and differential settlement of 1 ¼ inches and 0.4 inches over 30 feet, respectively. These magnitudes of settlement are generally considered tolerable by proposed site development.

5.5 MATERIAL CHARACTERISTICS
Existing surficial soils are anticipated to be relatively easy to excavate with conventional heavy earthmoving equipment. Recommendations for temporary excavation slopes are provided in Section 6.1.6 of this report. Groundwater may be encountered as shallow as 10 feet below current grades. Wet to saturated soils may be encountered at depths a 2 to 3 feet above the groundwater levels. Because significant portions of site materials are relatively clayey, wet and saturated soils will be difficult to handle and be resistant to drying when preparing them for reuse as compacted fill.

5.6 GROUNDWATER
As indicated previously, groundwater was encountered at depths that varied from 13 to 22 feet below the existing ground surface during the subsurface exploration conducted in 2001. Monitoring wells indicated the groundwater rose by about 2½ feet following the heavy rains of the 2005 winter season. Exploration by this firm suggests that in 2009 the groundwater levels had returned to near
the levels in 2001. The data suggests that groundwater is now generally present at an elevation of between 11 and 14 feet above MSL throughout most of the site. The groundwater is somewhat lower at the southwest corner at an elevation of about 8 feet above MSL and somewhat higher near the northwest corner at an elevation of about 17 feet above MSL. Based on the proposed finish site grades, nearly all of the site will be at least 20 feet above groundwater levels. In proximity to the southwestern portion of the site, groundwater will likely be less than 20 feet below finish grade. The shallowest condition will likely occur in proximity to Building Pads 42 and 43 where proposed cuts for the tuck-under parking will bring groundwater to within about 11 to 12 feet of the finish ground surface.

Given the anticipated depths to groundwater and proposed site grades, site development is unlikely to be adversely affected by shallow groundwater. Consideration of existing groundwater conditions will require consideration during design of onsite infiltration systems to avoid creating locally shallow groundwater conditions in proximity to infiltration systems.

5.7 SHRINKAGE AND SUBSIDENCE

Volumetric changes in earth quantities will occur when excavated onsite soil materials are replaced as properly compacted fill. We estimate the younger alluvium may shrink approximately 7 to 12 percent and the existing engineered fill and older alluvium may shrink approximately 0 to 5 percent. Very little exploration has been performed within the stockpiles of non-engineered artificial fill and as such, we have insufficient data to calculate the shrinkage of these materials. Based on previous experience with similar materials, we would anticipate they could shrink on the order of 15% to 25%. Additional site exploration and testing could be performed to better estimate the shrinkage of these materials. Processing of removal bottoms exposing younger alluvium is anticipated to result in a general subsidence of 0.1 feet. Negligible subsidence is anticipated for processing of removal bottoms exposing older alluvium.

The estimates of shrinkage and subsidence are intended as an aid for project engineers in determining earthwork quantities. However, these estimates should be used with some caution since they are not absolute values. Contingencies should be made for balancing earthwork quantities based on actual shrinkage and subsidence that occur during the grading process.

5.8 SOIL EXPANSION

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

6.1 EARTHWORK

6.1.1 General Earthwork and Grading Specifications

All earthwork and grading should be performed in accordance with applicable requirements of Cal/OSHA, applicable specifications of the Grading Codes of City of Goleta, California, in addition to recommendations presented herein.

6.1.2 Pre-Grade Meeting and Geotechnical Observation

Prior to commencement of grading, we recommend a meeting be held between the developer, City inspector, grading contractor, civil engineer, and geotechnical consultant to discuss the proposed grading and logistics. We also recommend that a geotechnical consultant be retained to provide soil engineering and engineering geologic services during site grading and foundation construction. This is to observe compliance with the design specifications and recommendations, and to allow design changes in the event that subsurface conditions differ from those anticipated. If conditions are encountered that appear to be different than those indicated in this report, the project geotechnical consultant should be notified immediately. Design and construction revisions may be required.

6.1.3 Site Clearing

All existing vegetation, organic debris, stockpiled soils and other deleterious materials should be removed from the areas to be developed. The project geotechnical consultant should be notified at the appropriate times to provide observation services during clearing operations to verify compliance with the above recommendations. Voids created by clearing should be left open for observation by the geotechnical consultant. Should any unusual soil conditions or subsurface structures be encountered during site clearing or grading that are not described or anticipated herein, these conditions should be brought to the immediate attention of the project geotechnical consultant for corrective recommendations as needed.

6.1.4 Ground Preparation

All existing non-engineered artificial fill, upper portions of younger alluvium, weathered engineered artificial fill, and weathered older alluvium are unsuitable to support the proposed structures and engineered fills. These materials should be removed from all areas of site development. The thickness of non-engineered fills will vary across the site but is estimated to be up to approximately 12 feet. The thickness of unsuitable younger alluvium is anticipated to generally vary from the upper 3 to 4 feet. The thickness of weathered engineered artificial fill and weathered older alluvium is anticipated to generally vary from 1 to 2 feet.

In addition to the general removals above, younger alluvial soils should be over-excavated to a minimum depth of 2 feet below footings for the residential structures and site walls to limit settlement of the structures. The over-excavation should extend at least 5 feet beyond the building pad limits. The younger alluvial soils should also be over-excavated to at least 2 feet below street subgrade and replaced as compacted fill.
All removal bottoms should be evaluated by the geotechnical consultant during grading to confirm the exposed conditions are as anticipated and are competent for supporting the proposed structures and fills above. Following removals, the exposed grade should first be scarified to a depth of 6 inches, moisture conditioned to slightly over optimum moisture content, and then re-compacted to at least 90 percent of the laboratory standard.

Where wet or soft soils are exposed at the bottom of excavation, methods to stabilize the bottom are recommended. One common method is to place a layer of geofabric, such as Mirafi HP 565 or equivalent at the bottom of excavation. A blanket of \(\frac{3}{4}\)-inch gravel having a thickness of at least 1 foot should be placed over the geofabric. Other methods including lime stabilization can be considered. Specific recommendations should be provided by the geotechnical consultant during grading based on conditions exposed in the field.

### 6.1.5 Building Pad Capping

Proposed rough grading will create thin fills and cut conditions in some building pads. Due to the potential variability of natural materials beneath the site, the thin fill and cut portions of pads may result in foundations supported by materials with different engineering characteristics. Pads that will have less than 3 feet of fill after completion of removals and cut pads should be observed by the geotechnical consultant prior to scarification to evaluate the need for lot capping. If significant different materials are exposed, the pad should be overexcavated and replaced with a fill blanket. Generally, the overexcavation will be at least 3 feet below finish grade but may be greater depending upon the exposed conditions. The actual depth of lot capping should be determined by the geotechnical consultant based on conditions exposed grading. Lot capping should extend across the entire pad and extend at least 5 feet beyond the outside edge of the proposed footings.

### 6.1.6 Temporary Excavations

Temporary construction slopes in site soils may be cut vertically up to a height of 4 feet provided that no adverse geologic conditions or surcharging of the excavations are present. Temporary slopes over 4 feet in site soils should be laid back at a maximum gradient of 1:1 (H:V) or properly shored. Excavations should not be left open for prolonged periods of time. The project geotechnical consultant should observe all temporary cuts to confirm anticipated conditions and to provide alternate recommendations if conditions dictate.

Where temporary excavations cannot accommodate a 1:1 layback or where surcharging occurs, slot cutting, shoring, underpinning, or other methods should be used. Specific recommendations for these options should be provided by the geotechnical consultant after specific design plans have been developed.

### 6.1.7 Fill Placement

Materials excavated from the site may be used as fill provided they are free of deleterious materials and particles greater than 4 inches in maximum dimension (oversized materials). Fill should be placed in lifts no greater than 8 inches in loose thickness, moisture conditioned to 100 to 125 percent of the optimum moisture content, then compacted in place to at least 90 percent of the laboratory standard. Fill materials consisting of clayey soils with High to Very High expansion potential that will be placed within the upper 2 feet of finish pad grades should be compacted to between 85 and
90 percent of laboratory standard and at a moisture content of at least 120 percent of optimum. The laboratory standard for maximum dry density and optimum moisture content for each soil type used should be determined in accordance with ASTM D 1557-07. Each lift should be treated in a similar manner. Subsequent lifts should not be placed until the project geotechnical consultants have approved the preceding lift. When placing fill on ground sloping steeper than 5:1 (H:V), vertical benches should be excavated into the adjacent slope.

6.1.8 Fill Slopes
Where practical, fill slopes should be constructed by over filling and trimming back to a compacted core. The face of slopes that are not over-built should be backrolled with a sheepsfoot roller at least every 4 vertical feet of slope construction. This process should provide compacted fill to within 12 inches of the slope face. Finished slopes should be track-walked with a small dozer or rolled with a vibratory compactor and grid roller in order to compact the slope face. The slope face materials will tend to dry out prior to final face compaction. As such, the addition of water to the slope face will likely be required prior to compaction to achieve the required compaction at the time of slope face compaction.

6.1.9 Cut Slopes
All cut slopes should be observed by an engineering geologist during rough grading to evaluate the competency of the slope.

6.1.10 Import Material
If imported soils are required to bring the site to proposed grades, imported soils should have a maximum particle size of 4 inches and have an expansion index (EI) less than 90. Potential import soils should be sampled by the geotechnical consultant at the source, if possible, tested for expansion, soluble sulfate content and maximum density, and approved by the geotechnical consultant prior to being used.

6.2 SEISMIC DESIGN PARAMETERS
For design of the project in accordance with Chapter 16 of the 2010 CBC, Table 6.1 presents the seismic design factors.

6.3 PRELIMINARY FOUNDATION DESIGN RECOMMENDATIONS

6.3.1 General
The following recommendations are provided for preliminary design purposes. These recommendations have been based on the site materials exposed during the investigations, our understanding of the proposed development, and the assumption that the recommendations presented herein are incorporated into the design and construction of the project. Final recommendations should be provided by the project geotechnical consultant following review of final foundation plans as well as observation and testing of site materials during grading. Depending upon the design plans and actual site conditions, the recommendations provided herein may require modification.
**TABLE 6.1**  
**CBC SEISMIC DESIGN PARAMETERS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Class</td>
<td>D</td>
</tr>
<tr>
<td>Mapped MCE Spectral Response Acceleration, short periods, $S_S$</td>
<td>1.681</td>
</tr>
<tr>
<td>Mapped MCE Spectral Response Acceleration, at 1-sec. period, $S_1$</td>
<td>0.651</td>
</tr>
<tr>
<td>Site Coefficient, $F_a$</td>
<td>1.0</td>
</tr>
<tr>
<td>Site Coefficient, $F_v$</td>
<td>1.5</td>
</tr>
<tr>
<td>Adjusted MCE Spectral Response Acceleration, short periods, $S_{MS}$</td>
<td>1.681</td>
</tr>
<tr>
<td>Adjusted MCE Spectral Response Acceleration, at 1-sec. period, $S_{M1}$</td>
<td>0.977</td>
</tr>
<tr>
<td>Design Spectral Response Acceleration, short periods, $S_{DS}$</td>
<td>1.120</td>
</tr>
<tr>
<td>Design Spectral Response Acceleration, at 1-sec. period, $S_{D1}$</td>
<td>0.651</td>
</tr>
</tbody>
</table>

MCE = Maximum Considered Earthquake

**6.3.2 Soil Expansion**

Expansion potential of existing site soils varies from **Low** ($20 < EI < 51$) to **Very High** ($EI > 130$) and plastic indices (PI) that generally vary from 15 to 50. The post-grading distribution of the site soils is not known at this time. Consequently, we are providing various design values for differing conditions that are likely to be exposed following grading. Following site grading, additional testing of site soils should be performed by the project geotechnical consultant to confirm the basis of these recommendations. Depending upon the distribution of soil types and expansion characteristics, differing groups of design values may be developed to better suit the types of conditions present at the site.

**6.3.3 Settlement**

The proposed residential foundation systems should be designed to tolerate total and differential settlements of $1 \frac{1}{4}$ inches and $\frac{1}{2}$-inches over 30 feet, respectively.

**6.3.4 Allowable Bearing Value**

Provided site grading is performed in accordance with the recommendations presented in this report, a bearing value of 2,000 pounds per square foot (psf) may be used for continuous footings and pad footings/beams having a minimum width of 12 inches and founded at a minimum depth of 12 inches below the lowest adjacent grade. This value may be increased by 250 psf and 500 psf for each additional foot in width and depth, respectively, up to a maximum value of 4,000 psf. Recommended allowable bearing values include both dead and live loads, and may be increased by one-third for wind and seismic forces.

**6.3.5 Lateral Resistance**

Provided site grading is performed in accordance with the recommendations presented in this report, a passive earth pressure of 300 pounds per square foot per foot of depth up to a maximum value of 1,500 pounds per square foot may be used to determine lateral bearing for footings. This value may
be increased by one-third when designing for wind and seismic forces. A coefficient of friction of 0.30 times the dead load forces may also be used between concrete and the supporting soils to determine lateral sliding resistance. No increase in the coefficient of friction should be used when designing for wind and seismic forces.

The above values are based on footings placed directly against compacted fill or competent native soils. In the case where footing sides are formed, all backfill against the footings should be compacted to at least 90 percent of the laboratory standard.

### 6.3.6 Post-Tensioned Slabs on Grade

Perimeter edge beams for the proposed structures should be founded below the lowest adjacent final ground surface at a minimum depth indicated in Table 6.2. Interior beams may be founded at a minimum depth of 12 inches below the tops of the finish floor slabs. The thickness of the floor slabs should be determined by the project structural engineer; however, we recommend a minimum slab thickness as indicated in Table 6.2.

All dwelling area floor slabs constructed on-grade should be underlain with a moisture vapor retarder such as 10-mil Visqueen or equivalent. A minimum of two (2) inches of clean sand having a sand equivalent (SE) of 30 or greater should be placed over the membrane to promote uniform curing of the concrete and aid in reducing vapor emissions. This vapor retarder system is anticipated to be suitable for most flooring finishes that can accommodate some vapor emissions. However, this system may emit more than 4 pounds of water per 1000 sq. ft. and therefore, may not be suitable for all flooring finishes. Additional steps should be taken if such vapor emission levels are too high for anticipated flooring finishes.

Pre-saturation of the subgrade below floor slabs will not be required; however, prior to placing concrete, the subgrade below all dwelling and garage floor slab areas should be thoroughly moistened to achieve a moisture content that is at least 120 percent of the optimum moisture content. This moisture content should penetrate to a minimum depth of 12 inches below the bottoms of the slabs.

Based on the guidelines provided in the “Design of Post-Tensioned Slabs-on-Ground” 3rd Edition by Post-Tensioning Institute, the $e_m$ and $y_m$ values are summarized in Table 6.2.

| TABLE 6.2 |
| SUMMARY OF PT DESIGN PARAMETERS |

<table>
<thead>
<tr>
<th>Design Parameter</th>
<th>15&lt;PI&lt;20</th>
<th>21&lt;PI&lt;35</th>
<th>36&lt;PI&lt;50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edge Lift Moisture Variation Distance, $e_m$ (feet)</td>
<td>4.3</td>
<td>3.9</td>
<td>3.2</td>
</tr>
<tr>
<td>Edge Lift, $y_m$ (inches)</td>
<td>1.80</td>
<td>2.72</td>
<td>3.55</td>
</tr>
<tr>
<td>Center Lift Moisture Variation Distance, $e_m$ (feet)</td>
<td>8.4</td>
<td>6.8</td>
<td>5.5</td>
</tr>
<tr>
<td>Center Lift, $y_m$ (inches)</td>
<td>1.21</td>
<td>2.05</td>
<td>2.94</td>
</tr>
<tr>
<td>Exterior Edge Beam Embedment (feet)</td>
<td>15</td>
<td>21</td>
<td>24</td>
</tr>
<tr>
<td>Minimum Slab Thickness (inches)</td>
<td>4.5</td>
<td>5</td>
<td>5.5</td>
</tr>
</tbody>
</table>
6.3.7 Foundation Setback

The bottom outer edge of foundations located adjacent a top of slope should be setback from the slope face a horizontal distance of at least $\frac{1}{3}$ the height of the slope. The horizontal distance should not be less than 7 feet but need not exceed 40 feet. The above setbacks may be accomplished through the use of deepened footings or caissons below the foundation. If caissons are required, this office should provide specific recommendations.

Building adjacent the toe of a slope should be set back a horizontal distance equal to one-half the vertical height of the slope. The minimum and maximum clearances are 5 feet and 15 feet, respectively.

6.3.8 Foundation Observations

Foundation excavation should be observed by the project geotechnical consultant to verify that they have been excavated into competent bearing soils and to the minimum embedment recommended above. These observations should be performed prior to placement of forms or reinforcement. The excavations should be trimmed neat, level and square. Loose, sloughed or moisture-softened materials and debris should be removed prior to placing concrete.

6.4 RETAINING AND SCREENING WALLS

6.4.1 General

The following recommendations are provided for preliminary design purpose. Final retaining wall designs specific to the site development should be provided to us for review once completed. The structural engineer and architect should provide recommendations for sealing at all joints and applying moisture-proofing material on the back of the walls.

6.4.2 Allowable Bearing Value and Lateral Resistance

Retaining and free-standing wall footings should be founded in engineered compacted fill. Retaining walls may utilize the bearing capacities and lateral resistance values provided in Sections 6.3.4 and 6.3.5. The passive pressure used for lateral bearing should be reduced by 50% for walls that have a descending slope below the face of the wall.

The above values are based on footings placed directly against properly compacted fill or competent native soil. In the case where footing sides are formed, all backfill against the footings should be compacted to at least 90 percent of the laboratory standard.

6.4.3 Active Earth Pressures

Static and seismic earth pressures for level and 2:1 (H:V) backfill conditions are provided in Table 6.3. Seismic earth pressures provided herein are based on the method provided by Seed & Whitman (1970) using a peak ground acceleration (PGA) of 0.45g. This acceleration is based on 40 percent of the short period of design spectral response acceleration determined for the site. The values provided in the following table are based on selected, relatively granular site materials with Very Low to Low expansion potential ($0<\text{EI}<51$) to backfill the excavation for wall construction within a plane projected 1:1 (H:V) from the base of the wall stem and using general site soils to backfill the
remaining excavation. In addition, the values are based on drained backfill conditions and do not consider hydrostatic pressure. Furthermore, retaining walls should be designed to support adjacent surcharge loads imposed by other nearby footings or traffic loads in addition to the earth pressure.

**TABLE 6.3**
**EARTH PRESSURES**

**Pressure Diagram**

<table>
<thead>
<tr>
<th>Pressure Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walls Up to 10 Feet in Height</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Value</th>
<th>Backfill Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level</td>
</tr>
<tr>
<td>A</td>
<td>37.0H</td>
</tr>
<tr>
<td>B</td>
<td>13.9H</td>
</tr>
<tr>
<td>C</td>
<td>25.5H</td>
</tr>
</tbody>
</table>

Note: 
H is in feet and resulting pressure is in psf. Design may utilize either the sum of the static component and the seismic component force diagrams or the total force diagram above. SEAOSC has suggested using a load factor of 1.7 for the static component and 1.0 for the seismic component. The actual load factors should be determined by the structural engineer.

6.4.4 Drainage and Moisture-Proofing

Retaining walls should be constructed with a perforated pipe and gravel subdrain to prevent entrapment of water in the backfill. The perforated pipe should consist of 4-inch-diameter, ABS SDR-35 or PVC Schedule 40 with the perforations laid down. The pipe should be embedded in ¾-to 1½-inch open-graded gravel wrapped in filter fabric. The gravel should be at least one foot wide and extend at least one foot up the wall above the footing and drainage outlet. Drainage gravel and
piping should not be placed below outlets and weepholes. Filter fabric should consist of Mirafi 140N, or equal. Outlet pipes should be directed to positive drainage devices.

The use of weepholes may be considered in locations where aesthetic issues from potential nuisance water are not a concern. Weepholes should be 2 inches in diameter and provided at least every 6 feet on center. Where weepholes are used, perforated pipe may be omitted from the gravel subdrain.

Retaining walls supporting backfill should also be coated with a moisture-proofing compound or covered with such material to inhibit infiltration of moisture through the walls. Moisture-proofing material should cover any portion of the back of wall that will be in contact with soil and should lap over and cover the top of footing. A drainage blanket such as Mirafi Miradrain should be provided between the soil and the moisture-proofing materials. The drainage blanket should extend from the top of the gravel to within about 12 inches of finish grade. The top of footing should be finished smooth with a trowel to inhibit the infiltration of water through the wall. The project structural engineer should provide specific recommendations for moisture-proofing, water stops, and joint details.

6.4.5 Footing Reinforcement

All continuous footings should be reinforced with a minimum of four No. 4 bars, two top and two bottom. The structural engineer may require different reinforcement and should dictate if greater than the recommendations provided herein. Where recommended removals are limited due to space restrictions, greater reinforcement may be recommended. Specific recommendations should be provided by the geotechnical consultant during grading based on as-built conditions exposed in the field.

6.4.6 Footing Observations

Footing excavations should be observed by the project geotechnical consultant to verify that they have been excavated into competent bearing soils and to the minimum embedment recommended herein. These observations should be performed prior to placement of forms or reinforcement. The excavations should be trimmed neat, level and square. Loose, sloughed or moisture-softened materials and debris should be removed prior to placing concrete.

6.4.7 Wall Backfill

The project geotechnical consultant should approve the backfill used for retaining walls and the backfill should have an **EI less than 50** within a plane projected 1:1 (H:V) from the bottom of the wall stem. While some portions of site materials will meet this requirement, significant portions will not. Wall backfill should be moisture-conditioned to slightly over the optimum moisture content; placed in lifts no greater than 12 inches in thickness, and then mechanically compacted with appropriate equipment to at least 90 percent of the laboratory standard. Hand-operated compaction equipment should be used to compact the backfill placed immediately adjacent the wall to avoid damage to the wall. Flooding or jetting of backfill material is not recommended.

If free-draining select materials are used as backfill for retaining walls, a minimum of 12 inches of onsite soils should be provided over the select materials to reduce the infiltration of water into the backfill. The 12 inches cap of onsite soils is not required where the finish surface will consist of hardscape such as concrete or asphalt paving.
6.5 EXTERIOR FLATWORK

Existing surficial site soils are generally highly expansive and will tend to cause significant heave in exterior flatwork. To help mitigate adverse effects of expansive soils, we are providing the following minimum recommendations. Even with implementation of these recommendations, flatwork may tend to move and crack.

Exterior flatwork should be a minimum 4 inches thick. Cold joints or saw cuts should be provided at least every 5 feet in each direction. Flatwork more than 5 feet in width across the minimum dimension should be reinforced with 6” by 6”, W2.9 by W2.9 welded wire mesh or No 3 bars spaced 18 inches center to center in both directions. Cold joints should be keyed or provided with dowels spaced 18 inches on center. Flatwork that meets the structure at points of entry should be doweled into the footing or grade beam of the structure. Consideration should also be given to doweling flatwork into curbs where they meet. Special jointing detail should be provided in areas of block-outs, notches, or other irregularities to avoid cracking at points of high stress. Subgrade soils below flatwork should be thoroughly moistened to at least 120 percent of optimum moisture content to a depth of 12 inches. Moistening should be accomplished by lightly spraying the area over a period of a few days just prior to pouring concrete.

Drainage from flatwork areas should be directed to local area drains or other appropriate collection devices designed to carry runoff water to the street or other approved drainage structures. The concrete flatwork should also be sloped away from building foundations and masonry walls.

The geotechnical consultant should observe and verify the density and moisture content of subgrade soils prior to pouring concrete to verify the recommended pre-moistening recommendations have been met.

6.6 CONCRETE MIX DESIGN

Laboratory testing of on-site soils by Fugro indicates negligible soluble sulfate content. We recommend following the procedures provided in ACI 318, Section 4.3, Table 4.3.1 for negligible sulfate exposure. Upon completion of rough grading, an evaluation of as-graded conditions and further laboratory testing should be completed for the site to confirm or modify the recommendations provided in this section.

6.7 SOIL CORROSIVITY

Soil samples of existing surficial soils were tested by Fugro for soluble chloride content, minimum resistivity and pH. Test results are provided in Appendix C and E. The detected soluble chloride contents range from 78 to 278 ppm. Based on the test result, site soils are not corrosive to metals embedded in concrete such as reinforcing steel. The detected minimum resistivity ranges from 853 to 3,013 ohm-cm and pH ranges from of 7.37 to 8.0. As such, site soils are moderately to severely corrosive to metals. Structures fabricated from metals should have appropriate corrosion protection if they will be in direct contact with site soils. Under such conditions, a corrosion specialist should provide specific recommendations.
6.8 POST GRADING CONSIDERATIONS

6.8.1 Site Drainage and Irrigation

Positive drainage devices, such as sloping concrete flatwork, graded swales or area drains, should be provided around the new construction to collect and direct all surface water to suitable discharge areas. No rain or excess water should be directed toward or allowed to pond against structures such as walls, foundations, flatwork, etc. The ground immediately adjacent to foundations should be provided with positive drainage away from the structures in accordance with 2010 CBC, Section 1804.3.

Excessive irrigation water can be detrimental to the performance of the proposed site development. Water applied in excess of the needs of vegetation will tend to percolate into the ground. Such percolation can lead to nuisance seepage and shallow perched groundwater. Seepage can form on slope faces, on the faces of retaining walls, in streets, or other low-lying areas. These conditions could lead to adverse effects such as the formation of stagnant water that breeds insects, distress or damage of trees, surface erosion, slope instability, discoloration and salt buildup on wall faces, and premature failure of pavement. Excessive watering can also lead to elevated vapor emissions within structures that can damage flooring finishes or lead to mold growth inside the home.

Key factors that can help mitigate the potential for adverse effects of overwatering include the judicious use of water for irrigation, use of irrigation systems that are appropriate for the type of vegetation and geometric configuration of the planted area, the use of soil amendments to enhance moisture retention, use of low-water demand vegetation, regular use of appropriate fertilizers, and seasonal adjustments of irrigation systems to match the water requirements of vegetation. Specific recommendations should be provided by a landscape architect or other knowledgeable professional.

6.8.2 Utility Trenches

Trench excavations should be constructed in accordance with the recommendations contained in Section 6.1.6 of this report. Trench excavations must also conform to the requirements of Cal/OSHA.

Trench backfill materials and compaction criteria should conform to the requirements of the local municipalities. As a minimum, utility trench backfill should be compacted to at least 90 percent of the laboratory standard. Trench backfill should be moistened to slightly over the optimum moisture content, placed in lifts no greater than 12 inches in thickness, and then mechanically compacted with appropriate equipment to at least 90 percent of the laboratory standard. The project geotechnical consultant should perform density testing, along with probing, to test compaction. Site conditions are generally not suitable for jetting of trench backfill and jetting should not be completed without prior approval from the project geotechnical consultant.

Within shallow trenches (less than 18 inches deep) where pipes may be damaged by heavy compaction equipment, imported clean sand having a SE of 30 or greater may be utilized. The sand should be placed in the trench, thoroughly moistened, and then compacted with a vibratory compactor. For utility trenches located below a 1:1 (H:V) plane projecting downward from the outside edge of the adjacent footing base or crossing footing trenches, concrete or slurry should be used as trench backfill.
Clayey soils present at the site will tend to cause water to collect in trench shading. This water could migrate along the trenches and below homes where excessive moisture conditions could be created. To mitigate this condition, we recommend the sand bedding and shading be omitted for a trench length of 2 feet just outside the house where the trench enters below the home. The bedding and shading should consist of soils similar to the general trench backfill soils.

6.9 SLOPE MAINTENANCE

The long-term performance and stability of slopes can be greatly affected by maintenance. Initially, slopes should be provided with erosion resistance in the form of an herbaceous plant material, jute matting, polymer coating, or other suitable method as recommended by the landscape architect. Slopes should also be planted with deep-rooting, drought-tolerant, woody vegetation material as recommended by the landscape architect. The initial protection should be maintained until the woody material has become fully mature. Areas of slopes where vegetation becomes particularly distressed or dies should be replaced promptly. Watering of slopes should make judicious use of water by providing only that amount required to support the vegetation and adjusting the watering seasonally. Over watering must be avoided. Excessive drying of the soils is also detrimental to long-term slope performance and stability. The moisture content of soils should be maintained at a relatively uniform level. Rodent activity should be monitored and kept to a minimum. Excessive rodent burrowing can be detrimental to long-term slope performance and stability and should be repaired promptly. Drainage devices, such as V-ditches and backdrain outlet pipes installed on the slope face, should be periodically inspected to confirm they are clear and functional. Any accumulated debris should be removed promptly.

6.10 PRELIMINARY PAVEMENT DESIGN RECOMMENDATIONS

6.10.1 Subgrade Preparation

Prior to placement of pavement elements, the upper 12 inches of subgrade soils should be moisture-conditioned to at least 110 percent of the optimum moisture content and compacted to at least 90 percent of the laboratory standard. Areas observed to pump or yield under vehicle traffic should be removed and replaced with firm and unyielding compacted soil or aggregate base materials.

6.10.2 Preliminary Pavement Designs

Based on the soil conditions present at the site and estimated traffic indexes, preliminary pavement sections are recommended in the table below. For preliminary design purposes, an “R”-value of 5 was used to determine the pavement design criteria presented in Table 6.4. The sections presented below are for planning purposes only and should be re-evaluated subsequent to site grading. Final pavement sections should be based on actual R-value testing of in-place soils and analysis of anticipated traffic.
### TABLE 6.4
PRELIMINARY PAVEMENT DESIGN

<table>
<thead>
<tr>
<th>Location</th>
<th>Traffic Index</th>
<th>Asphalt Concrete (inches)</th>
<th>Aggregate Base (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Village Way</td>
<td>6.5</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>Cortona Drive</td>
<td>6.0</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Secondary Streets</td>
<td>5.0</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Parking Stalls</td>
<td>-</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

### 6.10.3 Pavement Materials

Aggregate base should be placed in lifts no greater than 6 inches in thickness, moistened to slightly over optimum moisture content, then compacted to at least 95 percent of the laboratory standard. The laboratory standard should be ASTM D 1557-07. Aggregate base materials should be Crushed Aggregate Base or Crushed Miscellaneous Base conforming to Section 200-2 of the 2012 Standard Specification for Public Works Construction (Greenbook).

Paving asphalt should be PG 64-10 conforming to the requirements of Section 203-1 of the Greenbook. Asphalt concrete materials should conform to Section 203-6 and construction should conform to Section 302 of the Greenbook.

### 6.11 PERCOLATION CHARACTERISTICS

Recommendations for design and construction of the proposed storm water infiltration system will be provided in a separate report.

### 6.12 PLAN REVIEW AND CONSTRUCTION SERVICES

We recommend *Albus-Keefe & Associates, Inc.* be engaged to review any future development plans, including changes to the grading plans, structural plans (foundation plans), and retaining wall plans, prior to construction. This is to verify that the assumptions of this report are valid and that the preliminary conclusions and recommendations contained in this report have been properly interpreted and are incorporated into the project plans and specifications. If we are not provided the opportunity to review these documents, we take no responsibility for misinterpretation of our preliminary conclusions and recommendations.

We recommend that a geotechnical consultant be retained to provide soil engineering services during construction of the project. These services are to observe compliance with the design, specifications or recommendations, and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.
If the project plans change significantly from the assumed development described herein, the project geotechnical consultant should review our preliminary design recommendations and their applicability to the revised construction. If conditions are encountered during construction that appear to be different than those indicated in this report or subsequent design reports, the project geotechnical consultant should be notified immediately. Design and construction revisions may be required.

7.0 LIMITATIONS

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

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

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

This report has been prepared for the exclusive use of Comstock Crosser & Associates and its project consultants in the planning and design of the proposed development. This report has not been prepared for use by parties or projects other than those named or described herein. This report may not contain sufficient information for other parties or other purposes.

This report is subject to review by the controlling governmental agency.

Respectfully submitted,

ALBUS-KEEFE & ASSOCIATES, INC

James J.M. Chang     David E. Albus
Associate Engineer     Principal Engineer
G.E. 2180      GE 2455
REFERENCES

Publications


City of Goleta General Plan, Geologic Hazards Map, dated November 2009.


REFERENCES (Cont.)


Reports


______, 2001a, Geotechnical Engineering Report, Campus Pointe Building No. 4, 41 South Los Carneros Road, Santa Barbara County, California, dated April 27, 2001 (J.N. 00-42-3423).


Plans

APPENDIX A

EXPLORATION LOGS
## EXPLORATION LOG

<table>
<thead>
<tr>
<th>Project:</th>
<th>Phase 1 of Los Carneros</th>
<th>Boring No.: Legend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location:</td>
<td>Goleta</td>
<td>Elevation:</td>
</tr>
<tr>
<td>Job No.:</td>
<td>1831.00</td>
<td>Date:</td>
</tr>
<tr>
<td>Drill Method:</td>
<td>Driving Weight:</td>
<td>Logged By:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Depth (Feet)</th>
<th>Lithology</th>
<th>Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>EXPLANATION.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Solid lines separate geologic units and/or material types.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dashed lines indicate unknown depth geologic unit change or material type change.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Solid black rectangle in Core column represents California Split-Spoon sampler (2.5in. ID, 3in. OD).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Double triangle in core column represents SPT sampler.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Open circle in Core column represents sample not recovered.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Light gray rectangle in Bulk column represents large bag sample.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Other Laboratory Tests:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MAX = Maximum Dry Density/Optimum Moisture Content</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SO4 = Soluble Sulfate Content</td>
</tr>
<tr>
<td></td>
<td></td>
<td>COR = Corrosion Series</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DSR = Direct Shear, Remolded</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DS = Direct Shear, Undisturbed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SA = Sieve Analysis (1&quot; through #200 sieve)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PSA = Particle Size Analysis (SA with Hydrometer)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-200 = Percent Passing #200 Sieve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HYD = Hydrometer Only</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CON = Consolidation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SE = Sand Equivalent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RVAL = R-Value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PER = Permeability</td>
</tr>
</tbody>
</table>

**ALBUS-KEEFF & ASSOCIATES, INC.**
1011 N. Armado St.
Anaheim, CA 92806-2606
(714) 630-1026 fax(714) 630-1016

Plate A-1
**EXPLORATION LOG**

<table>
<thead>
<tr>
<th>Depth (Feet)</th>
<th>Lithology</th>
<th>Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Sandy Silt (ML): Dark brown; damp to moist; stiff; fine-grained sand.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Clavey Sand (SC): Reddish-brown; moist; medium dense; fine-grained sand.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Silty Sand (SM): Reddish-brown; damp to moist; medium dense; fine-grained sand.</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Sandy Clay (CL): Dark reddish-brown and gray; moist; very stiff; fine-grained sand.</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Sandy Silt (ML): Dark brown; moist; very stiff; fine-grained sand.</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Sand (SP-SM): Pale gray; dry to damp; very dense; fine- to coarse-grained sand; trace silt.</td>
<td></td>
</tr>
<tr>
<td>20'</td>
<td>@ 20', becomes fine- to medium-grained sand with trace silt.</td>
<td></td>
</tr>
<tr>
<td>20.8'</td>
<td>@ 20.8', groundwater.</td>
<td></td>
</tr>
</tbody>
</table>

**Laboratory Tests**

<table>
<thead>
<tr>
<th>Samples</th>
<th>Blows Per Foot</th>
<th>Core Bulk</th>
<th>Moisture Content (%)</th>
<th>Dry Density (pcf)</th>
<th>Other Lab Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>21</td>
<td></td>
<td>6.4</td>
<td>118.4</td>
<td>-200</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td></td>
<td>21.1</td>
<td>108.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>42</td>
<td></td>
<td>12.3</td>
<td>106.9</td>
<td>SA</td>
</tr>
<tr>
<td></td>
<td>58</td>
<td></td>
<td>20.5</td>
<td>98.8</td>
<td>PSA</td>
</tr>
</tbody>
</table>

**Notes:**

- Bottom of boring at 21'
- Groundwater at 20.8'
- Boring backfilled to 18'

**Well Installation:**

- 2" well screen: 3' - 18'
- 2" casing: +2' - 3'
- Sand: 2' - 18'
- Bentonite: 0 - 2'

**ALBUS-KEEFE & ASSOCIATES, INC.**

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**Plate A-2**
**EXPLORATION LOG**

<table>
<thead>
<tr>
<th>Project:</th>
<th>Phase I of Los Carneros</th>
<th>Boring No.:</th>
<th>P-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location:</td>
<td>Goleta</td>
<td>Elevation:</td>
<td></td>
</tr>
<tr>
<td>Job No.:</td>
<td>1831.00</td>
<td>Date:</td>
<td>11/23/09</td>
</tr>
<tr>
<td>Client:</td>
<td>Comstock Crosser &amp; Assoc.</td>
<td>Logged By:</td>
<td>JC</td>
</tr>
<tr>
<td>Drill Method:</td>
<td>Hollow-Stem Auger</td>
<td>Driving Weight:</td>
<td>140 lbs / 30 in</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Depth (Ft)</th>
<th>Lithology</th>
<th>Material Description</th>
<th>Water Blows Per Foot</th>
<th>Core Bulk</th>
<th>Moisture Content (%)</th>
<th>Dry Density (pcf)</th>
<th>Other Lab Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Sandy Clay (CL): Reddish-brown and dark gray; damp to moist; stiff to very stiff; fine-grained sand.</td>
<td>34</td>
<td>10.7</td>
<td>103.3</td>
<td>-200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Sand (SP): Reddish-brown; damp; dense; fine- to medium-grained sand; trace silt.</td>
<td>46</td>
<td>10.0</td>
<td>123.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Interbedded Sandy Silt, Silty Clay and Clayey Silt (ML &amp; CL ML); Sandy Silt: reddish brown, damp to moist, very stiff, fine-grained sand; Silty Clay: reddish brown, moist, very stiff; Clayey Silt: gray-brown, moist, very stiff.</td>
<td>97</td>
<td></td>
<td></td>
<td>PSA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Sand (SP): Light brown; damp; dense to very dense; fine-grained sand. @ 17', becomes less dense.</td>
<td>30</td>
<td>4.2</td>
<td>98.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Bottom of boring at 21' No groundwater. Well Installation: 2&quot; well screen: 4' - 19'; 2&quot; casing: +1' - 4'; Sand: 3' - 19'; Bentonite: 0 - 3'.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**EXPLORATION LOG**

<table>
<thead>
<tr>
<th>Project:</th>
<th>Phase I of Los Carneros</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location:</td>
<td>Goleta</td>
</tr>
<tr>
<td>Job No.:</td>
<td>1831.00</td>
</tr>
<tr>
<td>Client:</td>
<td>Comstock Crosser &amp; Assoc.</td>
</tr>
<tr>
<td>Driving Weight:</td>
<td>140 lbs / 30 in</td>
</tr>
<tr>
<td>Logged By:</td>
<td>JC</td>
</tr>
<tr>
<td>Boring No.:</td>
<td>P-3</td>
</tr>
<tr>
<td>Date:</td>
<td>11/24/09</td>
</tr>
<tr>
<td>Elevation:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Depth (Ft)</th>
<th>Lithology</th>
<th>Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 2'</td>
<td>Silty Sand (SM)</td>
<td>Light brown; damp; medium dense to dense; fine-grained sand. @ 2', becomes reddish brown.</td>
</tr>
<tr>
<td>5'</td>
<td></td>
<td>@ 5', occasional pin-hole pores.</td>
</tr>
<tr>
<td>6'</td>
<td></td>
<td>@ 6', a layer of silty clay about 2&quot; thick.</td>
</tr>
<tr>
<td>10'</td>
<td>Silty Clay (CL)</td>
<td>Reddish-brown and gray; moist; very stiff.</td>
</tr>
<tr>
<td>15'</td>
<td>Silty Sand (SM)</td>
<td>Reddish-brown; moist; dense; fine- to medium-grained sand. @ 15', becomes light brown, fine-grained, moist, very dense silty sand.</td>
</tr>
<tr>
<td>20'</td>
<td>Sand (SP)</td>
<td>Pale gray; damp; very dense; fine-grained sand; trace silt. Bottom of boring at 21' No groundwater</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Samples</th>
<th>Laboratory Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Blows Per Foot</td>
<td>Moisture Content (%)</td>
</tr>
<tr>
<td>39</td>
<td>7.8</td>
</tr>
<tr>
<td>38</td>
<td>14.1</td>
</tr>
<tr>
<td>74</td>
<td>11.9</td>
</tr>
<tr>
<td>94</td>
<td>2.9</td>
</tr>
</tbody>
</table>

Well Installation:
2" well screen: 4' - 19'
2" casing: +1' - 4'
Sand: 3' - 19'
Bentonite: 0 - 3'.

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Plate A-4
**EXPLORATION LOG**

**Project:** Phase I of Los Carneros  
**Location:** Goleta

**Job No.:** 1831.00  
**Client:** Comstock Crosser & Assoc.

**Boring No.:** P-4  
**Date:** 11/24/09

**Drill Method:** Hollow-Stem Auger  
**Driving Weight:** 140 lbs / 30 in

**Logged By:** JC

<table>
<thead>
<tr>
<th>Depth (Feet)</th>
<th>Lithology</th>
<th>Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Silty Sand (SM): Medium brown; dry to damp; medium dense to dense; fine-grained sand. @ 2', becomes reddish brown and dense to very dense.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Sandy Clay (CL): Reddish-brown; moist; stiff to very stiff; fine-grained sand.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Silty Sand (SM): Reddish-brown; moist; dense to very dense; fine-grained sand.</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Sand (SP): Pale gray; damp to moist; very dense; fine-grained sand; trace silt.</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Bottom of boring at 19'. No groundwater</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Water Blows Per Foot</th>
<th>Core Bulk</th>
<th>Laboratory Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Moisture Content (%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>40</td>
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<td></td>
<td></td>
<td></td>
<td>76</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>63</td>
</tr>
</tbody>
</table>

**Well Installation:**  
2" well screen: 3' - 18'  
2" casing: +2' - 3'  
Sand: 2' - 18'  
Bentonite: 0 - 2'.

**ALBUS-KEEFE & ASSOCIATES, INC.**  
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(714) 630-1626  fax(714) 630-1916

Plate A-5
APPENDIX B

LABORATORY TESTING PROGRAM
LABORATORY TESTING PROGRAM

Soil Classification
Soils encountered within the exploratory borings were initially classified in the field in general accordance with the visual-manual procedures of the Unified Soil Classification System (ASTM D2487-06). The samples were re-examined in the laboratory and classifications reviewed and then revised where appropriate. The assigned group symbols are presented on the Boring Logs provided in Appendix A.

In-Situ Moisture and Density
Moisture content and dry density of in-place soil materials were determined in representative strata. Test data are presented on the Boring Logs provided in Appendix A.

Particle Size and Hydrometer Analyses
Particle size and hydrometer analyses were performed on representative samples of site materials in accordance with ASTM D 422-63. The results are presented graphically on the attached Plates B-1 through B-4.

Percent Passing the No. 200 Sieve
Percent of material passing the No. 200 sieve was determined on selected samples to verify visual classifications performed in the field. These tests were performed in accordance with ASTM D1140-00. Test results are presented on Table B.

TABLE B
Summary of Laboratory Test Results

<table>
<thead>
<tr>
<th>Boring No.</th>
<th>Sample Depth (ft.)</th>
<th>Soil Description</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-1</td>
<td>5</td>
<td>Silty Sand (SP)</td>
<td>Passing #200 Sieve:</td>
</tr>
<tr>
<td>P-1</td>
<td>15</td>
<td>Silty Sand (SM)</td>
<td>Passing #200 Sieve:</td>
</tr>
<tr>
<td>P-1</td>
<td>20</td>
<td>Sand w/ Silt (SP-SM)</td>
<td>Passing #200 Sieve:</td>
</tr>
<tr>
<td>P-2</td>
<td>5</td>
<td>Sand and Sandy Clay (SP &amp; CL)</td>
<td>Passing #200 Sieve:</td>
</tr>
<tr>
<td>P-2</td>
<td>20</td>
<td>Sand (SP)</td>
<td>Passing #200 Sieve:</td>
</tr>
<tr>
<td>P-3</td>
<td>5</td>
<td>Silty Sand (SM)</td>
<td>Passing #200 Sieve:</td>
</tr>
<tr>
<td>P-3</td>
<td>15</td>
<td>Silty Sand (SM)</td>
<td>Passing #200 Sieve:</td>
</tr>
</tbody>
</table>

Note: Additional laboratory test results are provided on the boring logs provided in Appendix A.
UNIFIED SOIL CLASSIFICATION

U.S. STANDARD SIEVE SIZES

PERCENT PASSING

PERCENT RETAINED

GRAIN SIZE DISTRIBUTION

LOCATION | DEPTH | SYMBOL | LL | PI | CLASSIFICATION
-----|------|--------|----|----|------------------
P-1   | 20'   | •      |    |    | Poorly Graded Sand w/ Silt (SP-SM)
# Unified Soil Classification

<table>
<thead>
<tr>
<th>COBBLES</th>
<th>GRAVEL</th>
<th>SAND</th>
<th>SILT AND CLAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>COARSE</td>
<td>FINE</td>
<td>COARSE</td>
<td>MEDIUM</td>
</tr>
</tbody>
</table>

## U.S. Standard Sieve Sizes

<table>
<thead>
<tr>
<th>PERCENT PASSING</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>100.0000</th>
<th>10.0000</th>
<th>1.0000</th>
<th>0.1000</th>
<th>0.0100</th>
<th>0.0010</th>
<th>0.0001</th>
</tr>
</thead>
<tbody>
<tr>
<td>100.0000</td>
<td>10.0000</td>
<td>1.0000</td>
<td>0.1000</td>
<td>0.0100</td>
<td>0.0010</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

## Grain Size Distribution

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>DEPTH</th>
<th>SYMBOL</th>
<th>LL</th>
<th>PI</th>
<th>CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-3</td>
<td>15'</td>
<td></td>
<td></td>
<td></td>
<td>Silty Sand (SM)</td>
</tr>
</tbody>
</table>

### Legend
- ●
- □
- △
- ▲
- ◆
APPENDIX C

EXPLORATION LOGS AND LABORATORY DATA
BY FUGRO WEST, INC. (2000)
<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>DEPTH (ft)</th>
<th>MATERIAL STATION</th>
<th>SAMPLE NO.</th>
<th>MATERIAL</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>2</td>
<td>1 (38)</td>
<td></td>
<td></td>
<td>Older Alluvium (Goal)</td>
</tr>
<tr>
<td>20</td>
<td>4</td>
<td>2a</td>
<td></td>
<td></td>
<td>Lean CLAY (CL): very stiff, reddish brown, moist</td>
</tr>
<tr>
<td>24</td>
<td>6</td>
<td>3a (44)</td>
<td></td>
<td></td>
<td>Fine SAND (SP): dense, mottled reddish brown and tan, moist</td>
</tr>
<tr>
<td>22</td>
<td>8</td>
<td>3b</td>
<td></td>
<td></td>
<td>Sandy lean CLAY (CL): very stiff, reddish brown</td>
</tr>
<tr>
<td>20</td>
<td>10</td>
<td>4a (30)</td>
<td></td>
<td></td>
<td>- with roots, at 5.5'</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- dry, with clay pockets, at 6'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4b</td>
<td></td>
<td></td>
<td>- fine SAND, from 10' to 10.5'</td>
</tr>
<tr>
<td>18</td>
<td>12</td>
<td>5a (53)</td>
<td></td>
<td></td>
<td>Lean CLAY (CL): very stiff to hard, moderate yellowish brown, moist</td>
</tr>
<tr>
<td>16</td>
<td>14</td>
<td>5b</td>
<td></td>
<td></td>
<td>- moderate reddish brown, moist, coarse sand to fine gravel layer, at 15.5'</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fine SAND (SP): very dense, light gray-white, dry</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 (40)</td>
<td></td>
<td></td>
<td>- moderate yellowish brown, wet (as seen on sampler tip), at 21'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7a (65)</td>
<td></td>
<td></td>
<td>- gray-moderate yellowish brown, wet, with clay pockets and occasional fine gravel, at 22.5'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7b</td>
<td></td>
<td></td>
<td>- with clay, at 23.5'</td>
</tr>
<tr>
<td>4</td>
<td>26</td>
<td>8 (36)</td>
<td></td>
<td></td>
<td>Silty fine SAND (SM): very dense, moderate yellowish brown, wet</td>
</tr>
<tr>
<td>-8</td>
<td>36</td>
<td>10a (55/6')</td>
<td></td>
<td></td>
<td>- gray, at 36'</td>
</tr>
<tr>
<td>-10</td>
<td>36</td>
<td>10b (55/6')</td>
<td></td>
<td></td>
<td>23 21</td>
</tr>
</tbody>
</table>

**Completion Depth:** 51.5 ft
**Depth to Water:** 20 ft
**Backfilled With:** Native Materials
**Drilling Date:** December 20, 1999

**Drilling Method:** Hollow Stem Auger
**Hammer Type:** Automatic Trip
**Drilled By:** A & R Drilling Inc.
**Logged By:** J Palmer
**Checked By:** C A Wockner

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the selected location. Subsurface conditions may vary at other locations and with the passage of time.

**LOG OF DRILL HOLE NO. DH-1**
Campus Pointe Building No. 2
Santa Barbara County, California

**PLATE A-1a**
<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>DEPTH (ft)</th>
<th>MATERIAL</th>
<th>SAMPLE NO.</th>
<th>SAMPLER</th>
<th>TIGER COUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>-16</td>
<td>46</td>
<td>Fine SAND with SILT (SP/SM); dense, gray</td>
<td>13</td>
<td>X</td>
<td>36</td>
</tr>
<tr>
<td>-16</td>
<td>48</td>
<td>- with trace voids, from 46' to 46.5'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-20</td>
<td>50</td>
<td>- dark gray, at 50'</td>
<td>14</td>
<td>(60)</td>
<td></td>
</tr>
<tr>
<td>-22</td>
<td>52</td>
<td>Note: Caving below 21'</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MATERIAL DESCRIPTION**

- moderate yellowish brown, wet, with trace voids, at 40'

**COMPLETION DEPTH:** 51.5 ft

**DEPTH TO WATER:** 20 ft

**BACKFILLED WITH:** Native Materials

**DRILLING DATE:** December 20, 1996

**LOG OF DRILL HOLE NO. DH-1**

Campus Pointe Building No. 2
Santa Barbara County, California

**PLATE A-1b**
<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLE NO.</th>
<th>CORE LENGTH (IN)</th>
<th>LOCATION: NE corner of building, per Plate 2</th>
</tr>
</thead>
</table>
| 30        | 7               | 1          | 2a               | SURFACE EL: 31 ft
            | 28              | 2b         | (59)             | (rel. MSL datum)                             |
| 28        | 26              | 3a         | (36)             |                                               |
| 26        | 24              | 3b         | (26)             |                                               |
| 24        | 22              | 4          | (64)             |                                               |
| 22        | 20              | 5          | 505*             |                                               |
| 20        | 18              | 6          | 505*             |                                               |
| 18        | 16              | 7          | 40               |                                               |
| 16        | 14              |            |                  |                                               |
| 14        | 12              |            |                  |                                               |
| 12        | 10              |            |                  |                                               |
| 10        | 8               |            |                  |                                               |
| 8         | 6               |            |                  |                                               |
| 6         | 4               |            |                  |                                               |
| 4         | 2               |            |                  |                                               |
| 2         | 0               |            |                  |                                               |

MATERIAL DESCRIPTION

OLDER ALLUVIUM (Qool)
Fine SAND (SP): dense to very dense, reddish brown, dry, with organic specks
- clay bed, at 5.5' to 6'
- with clay pockets/partings, at 6.5'
- very dense, moderate reddish brown, dry, with clay, at 10'
- very dense, light to moderate yellowish brown, dry, with calcite, at 18'
- very dense, moderate yellowish brown, clumpy, at 20'
- calcite, from 20' to 20.5'
- with some coarse sand and occasional clay pocket, at 20.5'

<table>
<thead>
<tr>
<th>UNIT WEIGHT, wet</th>
<th>UNIT DRY WEIGHT</th>
<th>WATER CONTENT</th>
<th>% PASSING #200 SCREEN</th>
<th>LIQUID LIMIT</th>
<th>UNPLANNED SHEAR STRENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>119</td>
<td>107</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>116</td>
<td>105</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>126</td>
<td>117</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>97</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>16</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COMPLETION DEPTH: 21.5 ft
DEPTH TO WATER: Not Encountered
BACKFILLED WITH: Native Materials
DRILLING DATE: December 20, 1999

DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: Automatic Top
DRILLED BY: A & P.Drilling Inc.
LOGGED BY: J Palmer
CHECKED BY: C A Wacker

LOG OF DRILL HOLE NO. DH-2
Campus Pointe Building No. 2
Santa Barbara County, California

PLATE A-2
**LOCATION:** N.W. corner of building, per Plate 2

**SURFACE EL:** 33 ft +/- (rel. MSL datum)

### MATERIAL DESCRIPTION

<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>DEPTH</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLE NO</th>
<th>SAMPLER</th>
<th>BLOW COUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>33.5</td>
<td>31.5</td>
<td></td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>30</td>
<td>30</td>
<td></td>
<td>2</td>
<td>(58)</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>28</td>
<td></td>
<td>3</td>
<td>(40)</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>26</td>
<td></td>
<td>4</td>
<td>(25)</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>24</td>
<td></td>
<td>5</td>
<td>(60/5&quot;)</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>22</td>
<td></td>
<td>6</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>20</td>
<td></td>
<td>7</td>
<td>(51)</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>18</td>
<td></td>
<td>8</td>
<td>(65)</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>16</td>
<td></td>
<td>9</td>
<td>(50/6&quot;)</td>
<td></td>
</tr>
</tbody>
</table>

**OLDER ALLUVIUM (Silt):**
- Fine SAND (SP); very dense, reddish brown, dry, with clay pockets and seams and some organic specks
- Sandy-clay CLAY (CL); very stiff, reddish brown, dry, with sand
  - with some coarse sand, from 6' to 6.5'
- Cuttings change to very light brown, at 12'
- Fine SAND (SP); very dense, very light brown, dry

- Cuttings are moderate yellowish brown, at 23'
  - Wet, with trace voids, with clay pockets and seams, at 25'
  - Mottled gray and light gray, wet, with trace voids, at 30'
- Not mottled, with clay pockets and seams, no voids, at 35'
  - SILT, from 36' to 36.5'

### UNREMAINED SHEAR STRENGTH, ksf

<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>DEPTH</th>
<th>BLOW COUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>33.5</td>
<td>31.5</td>
<td>2</td>
</tr>
<tr>
<td>30</td>
<td>30</td>
<td>7</td>
</tr>
<tr>
<td>28</td>
<td>28</td>
<td>118</td>
</tr>
<tr>
<td>26</td>
<td>26</td>
<td>107</td>
</tr>
<tr>
<td>24</td>
<td>24</td>
<td>130</td>
</tr>
<tr>
<td>22</td>
<td>22</td>
<td>113</td>
</tr>
<tr>
<td>20</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>18</td>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td>14</td>
<td>14</td>
<td>21</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>21</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>21</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>21</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>21</td>
</tr>
</tbody>
</table>

**DRILLING METHOD:** Hollow Stem Auger
**HAMMER TYPE:** Automatic Trip
**DRILLED BY:** A & R Drilling Inc.
**LOGGED BY:** J. Palmer
**CHECKED BY:** C. A. Wackner

The log and data presented are a representation of subsurface conditions as determined in the time of drilling at the site location. Subsurface conditions may differ at other locations and with the passage of time.

**LOG OF DRILL HOLE NO. DH-3**
Campus Pointe Building No. 2
Santa Barbara County, California

**PLATE A-3a**
<table>
<thead>
<tr>
<th>ELEVATION ft</th>
<th>MATERIAL SYMBOL</th>
<th>MATERIAL DESCRIPTION</th>
<th>SAMPLER BLOW COUNT</th>
<th>UNDRAINED S. STRENGTH %</th>
</tr>
</thead>
<tbody>
<tr>
<td>-8</td>
<td></td>
<td>Fine SAND [SP]: dense to very dense, very light brown, dry, with trace voids</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>-12</td>
<td></td>
<td>- no voids, with red clay pockets, at 45°</td>
<td>50(3°)</td>
<td></td>
</tr>
<tr>
<td>-16</td>
<td></td>
<td>- with trace voids and red clay pockets, at 50°</td>
<td>63</td>
<td></td>
</tr>
</tbody>
</table>

Note: Caving to 22.4°

LOCATION: NW corner of building, per Plate 2
SURFACE EL: 33 ft +/- (rel. MSL datum)

COMPLETION DEPT: 51.5 ft
DEPTH TO WATER: 20 ft
BACKFILLED WITH: Native Materials
DRILLING DATE: December 20, 1999

DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: A & R Drilling Inc.
LOGGED BY: J. Palmer
CHECKED BY: C.A. Woeker

PLATE A-3b

LOG OF DRILL HOLE NO. DH-3
Campus Pointe Building No. 2
Santa Barbara County, California
<table>
<thead>
<tr>
<th>ELEVATION, ft</th>
<th>DEPTH, ft</th>
<th>MATERIAL SYMBOL</th>
<th>MATERIAL DESCRIPTION</th>
<th>UNI. WET WEIGHT, lb/ft³</th>
<th>UNI. DRY WEIGHT, lb/ft³</th>
<th>WATER CONTENT, %</th>
<th>% PASSING 400 MU</th>
<th>LIQUID LIMIT, %</th>
<th>PLASTICITY INDEX, %</th>
<th>UN-DAMAGED SHEAR STRONGTH, lb/ft²</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>2</td>
<td>2</td>
<td>OLDER ALLUVIUM (Qual)</td>
<td>118</td>
<td>110</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sandy lean CLAY (CL); hard, brown, moist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- with roots, more sand, clay pockets and seams, at 2'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>4</td>
<td>3</td>
<td>Fine to Medium SAND (SP); dense, moderate yellowish brown to light brown, moist</td>
<td>110</td>
<td>104</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>6</td>
<td>4</td>
<td>Lean CLAY (CL); stiff, motiled orange/gray, moist</td>
<td>133</td>
<td>113</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- motiled brown/gray, at 11'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>8</td>
<td>5</td>
<td>Silty fine SAND (SM); very dense, motiled orange and gray</td>
<td>164</td>
<td>98</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- orange, at 20'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COMPLETION DEPTH: 21.5 ft
DEPTH TO WATER: Not Encountered
BACKFILLED WITH: Native Materials
DRILLING DATE: December 20, 1999

LOG OF DRILL HOLE NO. DH-4
Campus Pointe Building No. 2
Santa Barbara County, California

PLATE A-4
### Key to Terms & Symbols Used on Logs

**Location:** The drill hole location referencing local landmarks or coordinates

**Surface EL:** Using local, MSL, MLW or other datum

<table>
<thead>
<tr>
<th>Elevation</th>
<th>Depth, ft.</th>
<th>Material Symbol</th>
<th>Sample No.</th>
<th>Bulk Count Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>-12</td>
<td>2</td>
<td></td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>-14</td>
<td>4</td>
<td></td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>-16</td>
<td>8</td>
<td></td>
<td>3</td>
<td>(25)</td>
</tr>
<tr>
<td>-18</td>
<td>8</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>-20</td>
<td>10</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>-22</td>
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<td>-24</td>
<td>14</td>
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</tr>
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<td>-26</td>
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<td>11</td>
<td></td>
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<td>-34</td>
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</tr>
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<td>-36</td>
<td>26</td>
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<td></td>
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<td>-38</td>
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</tr>
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<td>-40</td>
<td>30</td>
<td></td>
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<td>-42</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-44</td>
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</tr>
<tr>
<td>-46</td>
<td>36</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Material Description:**

- Well graded GRANITE (GW)
- Poorly graded GRANITE (GP)
- Well graded SAND (SW)
- Poorly graded SAND (SP)
- Silty SAND (SM)
- Clayey SAND (SC)
- Silty, Clayey SAND (SC-SM)
- Elastic SILT (MH)
- SILT (ML)
- Silty CLAY (CL-ML)
- Fet CLAY (CH)
- Lean CLAY (CL)
- CONGLOMERATE
- SANDSTONE
- SILTSTONE
- MUDSTONE
- CLAYSTONE
- SHALE
- GRANITE
- Paving and/or Base Materials

**General Notes:**

**Soil Texture Symbol**

- Slotted line in symbol column indicates transitional boundary

- Samplers and sampler dimensions (unless otherwise noted in report text) are as follows:
  - Symbol for:
    1. SP1 Sampler, driven
    2. CA Liner Sampler, driven
    3. CA Liner Sampler, disturbed
    4. Thin-walled Tube, pushed
    5. Bulk Bag Sample (from cuttings)
    6. Hand Auger Sample
    7. CME Core Sample
    8. Lexan sampler
    9. Pitcher Sample
    10. Vibrosone Sample
    11. No Sample Recovered

**Sampler Driving Resistance**

- Number of blows with 140 lb. hammer, falling 36-in. to drive sampler. 1 ft. after seating sample 1%, for example.

**Blow/ft:**

- Description
- 25 / 38" blows drove sampler 12" after initial 5" of seating
- 55 / 60" after driving sampler the initial 6" of seating, 25 blows drove sampler through the second 6" interval, and 50 blows drove the sampler 5" into the third interval
- 55 / 60" after initial 6" of seating
- 55 / 60" blows drove sampler 6" after initial 6" of seating

**Blow counts for California Liner Sampler shown in ( )**

**Length of sample symbol approximates recovery length**

**Classification of Soils per ASTM D2487 or D2485**

**Geologic Formation noted in bold font at the top of interpreted interval**

**Strength Legend:**

- Q = Unconfined Compression
- u = Undrained Unconfined Triaxial
- t = Torvane
- p = Pocket Penetrometer
- m = Miniature Vane

**Water Level Symbols:**

- Σ = Initial or perched water level
- Π = Final ground water level
- Ψ = Geospeed encountered

**Rock Quality Designation (ROD):**

- The sum of recovered core pieces greater than 4 inches divided by the length of the cored interval.
BACKHOE PIT NO. BP-1

Older Alluvium (Qoal): Reddish-brown, fine sandy clay (CL)

Older Alluvium (Qoal): Reddish-brown clayey fine sand (SC)

TD = 36"  

Location: Southeastern corner of proposed building.

BACKHOE PIT NO. BP-2

Older Alluvium (Qoal): Reddish-brown clayey fine to medium sand (SC), dry

Older Alluvium (Qoal): Reddish-brown clayey fine to medium sand (SC), dry

TD = 24"  

Location: Northeastern corner of proposed building.

BACKHOE PIT NO. BP-3

Older Alluvium (Qoal): Reddish-brown very clayey fine sand (SC)

Older Alluvium (Qoal): Dark reddish-brown fine sandy clay (CL), weathered gray surfaces

TD = 24"  

Location: Northwestern corner of proposed building.

BACKHOE PIT NO. BP-4

Older Alluvium (Qoal): Dark reddish-brown sandy clay (CL), slightly weathered

Older Alluvium (Qoal): Finely laminated yellowish-brown to reddish-brown fine sand (SP)

TD = 18"  

Location: Western pavement area near proposed motorcycle parking area.

NOTES:
1. Refer to Plate 2 for backhoe pit locations.
3. Transitions between soil types are gradual.
4. No groundwater encountered.

BACKHOE PIT LOGS
Campus Pointe Building No. 2
Santa Barbara County, California
BACKHOE PIT NO. BP-5

Older Alluvium (Qaat): Fine sand (SP) with 1/32" voids, well-laminated, 1/8" to 1/16" layers

Older Alluvium (Qoa): Dark reddish-brown clayey fine sand (SC)

TD = 30'

Location: northwestern corner of parking area.

BACKHOE PIT NO. BP-6

Older Alluvium (Qoa): Reddish-brown very sandy clay (CL), weathers gray, very dry

Older Alluvium (Qoa): Reddish-brown fine sandy clay (CL), hard, weathered, dry

TD = 24'

Location: western third of parking area.

BACKHOE PIT NO. BP-7

Older Alluvium (Qoa): Reddish-brown fine sandy lean clay (CL), very dry

@ 24" very hard

TD = 30'

Location: west-central area of proposed parking lot.

BACKHOE PIT NO. BP-8

Older Alluvium (Qoa): light yellowish-beige sandy sand (SP)

Older Alluvium (Qoa): Reddish-brown fine sandy clay (CL), hard, weathers gray to yellowish-brown with black partings

Well-graded sand (SW) with 15 to 20% pea-sized gravel

TD = 24'

Location: east-central area of proposed parking lot.

NOTES:
1. Refer to Plate 2 for backhoe pit locations.
3. Transitions between soil types are gradual.
4. No groundwater encountered.

BACKHOE PIT LOGS
Campus Pointe Building No. 2
Santa Barbara County, California
**BACKHOE PIT LOGS**

Campus Pointe Building No. 2
Santa Barbara County, California

**NOTES:**

1. Refer to Plate 2 for backhoe pit locations.
3. Transitions between soil types are gradual.
4. No groundwater encountered.
<table>
<thead>
<tr>
<th>DRILL HOLE</th>
<th>DEPTH ft</th>
<th>MATERIAL DESCRIPTION</th>
<th>UWV</th>
<th>UDW</th>
<th>MC%</th>
<th>Press %</th>
<th>A TERRING TESTS</th>
<th>DIRECT SHEAR TESTS</th>
<th>COHESION TESTS</th>
<th>CORROSIIVITY TESTS</th>
<th>R</th>
<th>pH</th>
<th>Cl</th>
<th>Se</th>
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<th>TEST LIMITS</th>
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<td>Lean CLAY (CL)</td>
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<td>107</td>
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</tbody>
</table>

**Classification Tests**
- UWV = Unit Wet Weight
- UDW = Unit Dry Weight
- MC = Moisture Content
- PI = Plasticy Index
- LL = Liquid Limit

**Direct Shear Test**
- C = Coefficient of Friction
- FI = Friction Angle, degrees

**Compressive Strength Tests**
- Qu = Undrained Shear Strength
- Cu = Undrained Shear Strength

**Cohesion Tests**
- R = Resilient, ohm-cm. satur.
- pH = pH
- Cl = Chloride, ppm
- Se = Sulfate, ppm

**Cementation and Absorption Tests**
- M = Moisture Content
- F = Total & Dry Unit Weight
- C = Consolidation Test
- FC = Fine Passing #200 Sieve
- M = Moisture Equivalent
- L = Liquefaction
- R = R-value

**Summary of Laboratory Test Results**
Campus Pointe Building No. 2
Santa Barbara County, California
COHESION, ksf
1.9

ANGLE OF INTERNAL FRICTION, deg
35.0

LOCATION
DH-4

DEPTH, ft
0.5

MOISTURE CONTENT, %
6.0

UNIT DRY WEIGHT,pcf
111.4

MATERIAL DESCRIPTION
Sandy CLAY (CL), Bulk Sample

SAMPLE CONDITION
Sample compacted to 90% of maximum dry density at optimum moisture content

DIRECT SHEAR TEST RESULTS
Campus Pointe Building No. 2
Santa Barbara County, California
COMPACTION TEST RESULTS
Campus Pointe Building No. 2
Santa Barbara County, California

LEGEND
(location)  depth, ft
DH-4      0.0

CLASSIFICATION
Sandy CLAY (CL), Bulk Sample

MAXIMUM UNIT DRY WEIGHT,pcf  OPTIMUM WATER CONTENT, %
125.5  9.0

PLATE B-4
CONsolidation TEST RESULTS
Campus Pointe Building No. 2
Santa Barbara County, California
APPENDIX D

EXPLORATION LOGS AND LABORATORY DATA
BY FUGRO WEST, INC. (APRIL 2001)
LOCATIONS: Proposed Parking area, see Plate 2
SURFACE EL: 30 ft +\( \pm \) (rel. MSL datum)

MATERIAL DESCRIPTION

OLDER ALLUVIUM (Qoa)
Sandy Lean CLAY (CL): very silty, light brown, moist, trace gravel, layers of Clayey SAND (SC)

- moderate to dark brown, at 5'

Silty, clayey SAND (SC-SM): very dense, light brown, moist

<table>
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<tr>
<th>ELEVATION</th>
<th>DEPTH</th>
<th>MATERIAL</th>
<th>SAMPLE NO</th>
<th>SAMPLER</th>
<th>BLOW COUNT</th>
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<td>38</td>
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</table>

COMPLETION DEPTH: 9.0 ft
DEPTH TO WATER: Not Encountered
BACKFILLED WITH: Cuttings
DRILLING DATE: February 7, 2003

LOG OF DRILL HOLE NO. DH-1
Campus Pointe Building No. 4
Santa Barbara, California

PLATE A-1
**LOG OF DRILL HOLE NO. DH-2**
Campus Pointe Building No. 4
Santa Barbara, California

**PLATE A-2**

---

**LOCATION:** Proposed Building area, see Plate 2

**SURFACE EL:** 31 ft. +/-. (re. MSL datum)

**MATERIAL DESCRIPTION**

<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>DEPTH</th>
<th>MATERIAL</th>
<th>SAMPLE NO.</th>
<th>SAMPLER</th>
<th>BLOW/COUNT</th>
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<tbody>
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<td>1</td>
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<td>25</td>
<td>4</td>
<td>OLDER ALLUVIUM (Qoa)</td>
<td>(77)</td>
<td></td>
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</tr>
<tr>
<td>20</td>
<td>6</td>
<td>Clayey SAND (SC): very dense, moderate yellowish brown, damp to moist, some gravel, layers of Silty SAND (SM) and Lean CLAY (CL)</td>
<td>(94)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>10</td>
<td>- dark, yellowish orange and light grayish brown, moist, at 5'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>12</td>
<td>Silty SAND (SM): very dense, moderate yellowish brown, moist</td>
<td>(90)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>14</td>
<td>- light olive gray, wet, at 20'</td>
<td>(94)</td>
<td></td>
<td></td>
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</table>

**UNBROKEN SLEEVE:** 20' ft.

**COMPLETION DEPTH:** 21.5 ft.

**DEPTH TO WATER:** Not Encountered

**BACKFILLED WITH:** Cuttings

**DRILLING DATE:** February 7, 2001

**DRILLING METHOD:** 6 in. Hollow Stem Auger

**HAMMER TYPE:** Automatic Trip

**DRILLED BY:** GV Trenching

**LOGGED BY:** C. Welke

**CHECKED BY:** GSDentering

The log entries presented are a simplification of actual conditions encountered at the time of drilling at the site. Conditions may differ from those noted at the time they were encountered. Conditions observed may differ from those noted at the time they were encountered.
LOCATION: Proposed Building area; see Plate 2

SURFACE EL. 30 ft + A (ref. MSL datum)

MATERIAL DESCRIPTION

OLDER ALLUVIUM (Qoa)
Sandy Lean CLAY (CL): stiff, moderate brown, moist

Clayey SAND (SC): very dense, moderate brown, moist

- moist to wet, at 5'
- trace gravel, at 5'

Sandy Lean CLAY (CL): very stiff, moderate brown and light grayish brown, moist

Sandy SILT (ML): very stiff, dark yellowish orange, moist

Silty SAND (SM): very dense, yellowish gray, wet

- dense, fine grained sand, porous zone, at 25' to 25.5'
- heaving sands, at 25', added water to hole

- very dense, medium and fine grained sand, at 30'

UNRECORDED SHEAR STRENGTH 56 ksf

COMPLETION DEPTH: 45.0 ft
DEPTH TO WATER: 20 ft
BACKFILLED WITH: Cuttings
DRILLING DATE: February 7, 2001

LOG OF DRILL HOLE NO. DH-3
Campus Pointe Building No. 4
Santa Barbara, California

PLATE A-3a
| ELEVATION | 45.0 ft | | MATERIAL NO. | | SAMPLES | | SAMPLER | | BLOW COUNT | |
|-----------|--------|---|-----------|---|---------|---------|
| 0 | 10 | | | | | | | |
| -12 | 42 | | | | | | | |
| -14 | 44 | | | | | | | |
| -16 | 46 | | | | | | | |
| -18 | 48 | | | | | | | |
| -20 | 50 | | | | | | | |
| -22 | 52 | | | | | | | |
| -24 | 54 | | | | | | | |
| -26 | 56 | | | | | | | |
| -28 | 58 | | | | | | | |
| -30 | 60 | | | | | | | |
| -32 | 62 | | | | | | | |
| -34 | 64 | | | | | | | |
| -36 | 66 | | | | | | | |
| -38 | 68 | | | | | | | |
| -40 | 70 | | | | | | | |
| -42 | 72 | | | | | | | |
| -44 | 74 | | | | | | | |
| -46 | 76 | | | | | | | |
| -48 | 78 | | | | | | | |
| -50 | 80 | | | | | | | |

**LOCATION:** Proposed Building area, see Plate 2

**SURFACE EL:** 30 ft + /- (rel. MSL datum)

**MATERIAL DESCRIPTION:**
- Moderate yellowish brown, medium to fine grained sand, at 40°

**ELEVATION:** 45.0 ft
**DEPTH TO WATER:** 20 ft
**BACKFILLED WITH:** Cuttings
**DRILLING DATE:** February 7, 2001

**LOG OF DRILL HOLE NO. DH-3**
Campus Pointe Building No. 4
Santa Barbara, California

**Plate A-3b**
**LOG OF DRILL HOLE NO. DH-4**
Campus Pointe Building No. 4
Santa Barbara, California

---

**LOCATION:** Proposed Building area, see Plate 2
**SURFACE EL:** 32 ft +/ (rel. MSL datum)

<table>
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<tr>
<th>ELEVATION</th>
<th>DEPTH</th>
<th>MATERIAL</th>
<th>SAMPLE NO.</th>
<th>SAMPLER</th>
<th>BLOW COUNT</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>OLDER ALLUVIUM (Qea)</td>
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<tr>
<td>10</td>
<td>10</td>
<td>Sandy Lean CLAY (CL): stiff, moderate yellowish brown, damp to moist, some gravel - very stiff, lenses of Clayey SAND (SC), at 2'</td>
<td>500/5’</td>
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<td></td>
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<tr>
<td>20</td>
<td>20</td>
<td>Silty fine SAND (SM): very dense, very pale orange, damp</td>
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<td></td>
<td></td>
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<tr>
<td>30</td>
<td>30</td>
<td>507/5’</td>
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**MATERIAL DESCRIPTION**

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<tr>
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<th>UNIT DRY WEIGHT</th>
<th>WATER CONTENT</th>
<th>% PASSING 200-MESH</th>
<th>LIQUID LIMIT</th>
<th>PLASTICITY INDEX</th>
<th>UNDRAINED SHEAR STRENGTH</th>
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<td></td>
<td></td>
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<tr>
<td>140</td>
<td>121</td>
<td>16</td>
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<td>126</td>
<td>105</td>
<td>20</td>
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</table>

**DRILLING METHOD:** 8-in. dia. Hollow Stem Auger
**HAMMER TYPE:** Rotary
**DRILLED BY:** G. Deitering
**LOGGED BY:** C. Weikel
**CHECKED BY:** G. Deitering

The log and data presented are a compilation of data recorded during construction at the time of boring of the drill holes. Subsequent conditions may differ in some situations and with the passage of time.

---

**COMPLETION DEPTH:** 21.0 ft
**DEPTH TO WATER:** 20 1/2 ft
**BACKFILLED WITH:** Cuttings
**DRILLING DATE:** February 7, 2001
**LOG OF DRILL HOLE NO. DH-5**

**Campus Pointe Building No. 4**  
Santa Barbara, California

**COMPLETION DEPTH:** 9.0 ft  
**DEPTH TO WATER:** Not Encountered  
**BACKFILLED WITH:** Coblings  
**DRILLING DATE:** February 7, 2001

**LOCATION:** Proposed Parking area, see Plate 2

**SURFACE EL:** 32 ft +/-(ret MSL datum)

**MATERIAL DESCRIPTION**

<table>
<thead>
<tr>
<th>ELEVATION ft</th>
<th>DEPTH ft</th>
<th>MATERIAL</th>
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<th>SAMPLER COUNT</th>
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<td>(1)</td>
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</tr>
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<td>4</td>
<td>(2)</td>
<td>(50)</td>
<td></td>
</tr>
<tr>
<td>-20</td>
<td>6</td>
<td>(3)</td>
<td>(47)</td>
<td></td>
</tr>
<tr>
<td>-20</td>
<td>8</td>
<td>(4)</td>
<td>(50/5')</td>
<td></td>
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**OLDER ALLUVIUM (Qoa)**

- Sandy Lean CLAY (CL): stiff, moderate yellowish brown, damp to moist  
  - moist, at 2'
  - medium stiff, at 5'
  - hard, at 8'

**UNIT WEIGHT**  
- 126  
- 129  
- 129

**UNIT DRY WEIGHT**  
- 100  
- 111  
- 115

**WATER CONTENT %**  
- 15  
- 17  
- 12

**% PASSING 200 MESH**  
- 51  
-  
-  

**PLASTICITY INDEX %**  
-  
-  
-  

**UNSATURATED STRENGTH S_kf**  
-  
-  
-  

**DRILLING METHOD:** 8-in. the Hollow Stem Auger  
**HAMMER TYPE:** Automatic Trip  
**DRILLED BY:** SJC Testing  
**LOGGED BY:** C.Welke  
**CHECKED BY:** GSDenlinger

The log is not designed to be a formidable record of historical events on the site, but rather as a tool to assist in the design of the building. Subsequent conditions may differ from this data and should be verified by physical tests.
<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>MATERIAL SYMBOL</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>S</td>
<td>OLDER ALLUVIUM (Ga)</td>
</tr>
<tr>
<td>1</td>
<td>50/60</td>
<td>Sandy Lean CLAY (CL): stiff, moderate yellowish brown, damp</td>
</tr>
<tr>
<td>20</td>
<td>60/60</td>
<td>Clayey SAND (SC): very dense, moderate yellowish brown, damp</td>
</tr>
<tr>
<td>10</td>
<td>50/90</td>
<td>- some gravel, lenses of Lean CLAY (CL), weak to moderate caliche cementation, at 5'</td>
</tr>
<tr>
<td>4</td>
<td>(47)</td>
<td>- medium dense, at 8'</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LOCATION: Proposed Parking area, see Plate 2
SURFACE EL: 33 ft. 4" (rel. MSL datum)

MATERIAL DESCRIPTION

- Older Alluvium (Ga)
  Sandy Lean CLAY (CL): stiff, moderate yellowish brown, damp
- Clayey SAND (SC): very dense, moderate yellowish brown, damp
- Some gravel, lenses of Lean CLAY (CL), weak to moderate caliche cementation, at 5'
- Medium dense, at 8'

UNIT WET WEIGHT: 115
UNIT DRY WEIGHT: 106
WATER CONTENT: 7%
% PASSING NO. 200 SIEVE: 9
LIQUID LIMIT: 15
PLASTICITY INDEX: %
UNDRAINED SHEAR STRENGTH: 52

COMPLETION DEPTH: 9.0 ft
DEPTH TO WATER: Not Encountered
BACKFILLED WITH: Cuttings
DRILLING DATE: February 7, 2001

DRILLING METHOD: 8-in. dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: Sig Testing
LOGGED BY: CWK
CHECKED BY: GDDenzinger

LOG OF DRILL HOLE NO. DH-6
Campus Pointe Building No. 4
Santa Barbara, California
PLATE A-6
<table>
<thead>
<tr>
<th>ELEVATION ft</th>
<th>DEPTH ft</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLE NO</th>
<th>MATERIAL DESCRIPTION</th>
<th>UNIT WET WEIGHT, g/L</th>
<th>UNIT DRY WEIGHT, g/L</th>
<th>% WATER CONTENT</th>
<th>% PASSING 425-MICRON</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>30.0</td>
<td>2.0</td>
<td></td>
<td>1</td>
<td>OLDER ALLUVIUM (Qaa)</td>
<td>296</td>
<td>212</td>
<td>5.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28.0</td>
<td>4.0</td>
<td></td>
<td>2</td>
<td>Silty SAND (SM): medium dense to dense, moderate yellowish brown, damp, fine grained sand increasing with depth, interbedded with Clayey SAND (SC)</td>
<td>216</td>
<td>210</td>
<td>5.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26.0</td>
<td>6.0</td>
<td></td>
<td>3</td>
<td>Clayey SAND (SC): very dense, moderate yellowish brown, moist</td>
<td>135</td>
<td>127</td>
<td>7.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24.0</td>
<td>8.0</td>
<td></td>
<td>4</td>
<td>Sandy CLAY (CL): very soft, moderate yellowish brown, damp to moist</td>
<td>137</td>
<td>122</td>
<td>12.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.0</td>
<td>10.0</td>
<td></td>
<td>5</td>
<td>Silty fine SAND (SM): dense, very pale orange, damp</td>
<td>107</td>
<td>103</td>
<td>4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.0</td>
<td>12.0</td>
<td></td>
<td>6</td>
<td>- very dense, moist, medium grained sand, at 20'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.0</td>
<td>14.0</td>
<td></td>
<td>7</td>
<td>- moderate yellowish brown, wet, at 30'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COMPLETION DEPTH: 30.0 ft
DEPT TO WATER: 22 ft
BACKFILLED WITH: Cuttings
DRILLING DATE: February 7, 2001

LOG OF DRILL HOLE NO. DH-7
Campus Pointe Building No. 4
Santa Barbara, California

PLATE A-7a
LOCATION: Proposed Chiller Building, site Plate 2

SURFACE EL. 36 ft (+/- rel. MSL datum)

MATERIAL DESCRIPTION

<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>DEPTH</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLE NO.</th>
<th>SAMPLER BLOCK COUNT</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>-24</td>
<td>62</td>
<td>B</td>
<td>800/01</td>
<td></td>
<td>Silty fine SAND (SM); dense, moderate yellowish brown; wet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT WEIGHT</th>
<th>WET WEIGHT</th>
<th>WET VOLUME</th>
<th>DENSITY</th>
<th>WATER CONTENT</th>
<th>% passing #200 sieve</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>UNSTRENGTHENED S STRENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>121</td>
<td>98</td>
<td>24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COMPLETION DEPTH: 40.0 ft
DEPTH TO WATER: 22 ft
BACKFILLED WITH: Cuttings
DRILLING DATE: February 7, 2001

DRILLING METHOD: 8-in. dia, Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: S/O Tools
LOGGED BY: CWelke
CHECKED BY: GSDenlinger

The log main page presented was compiled from data obtained and approved at the time of drilling at the site indicated. Subsequent conditions may differ at other locations and with the passage of time.

LOG OF DRILL HOLE NO. DH-7
Campus Pointe Building No. 4
Santa Barbara, California

PLATE A-7b
**LOG OF TEST PIT NO. TP-1**

<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>DEPTH (ft)</th>
<th>MATERIAL</th>
<th>SYMBOL</th>
<th>SAMPLE NO.</th>
<th>SAMPLE BLOW COUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>47</td>
<td>2</td>
<td>OLDER ALLUVIUM (Oa)</td>
<td></td>
<td>1</td>
<td>X</td>
</tr>
<tr>
<td>40</td>
<td>4</td>
<td>OLDER ALLUVIUM (Oa)</td>
<td></td>
<td>2</td>
<td>X</td>
</tr>
<tr>
<td>30</td>
<td>6</td>
<td>CLAY (CL)</td>
<td></td>
<td>3</td>
<td>X</td>
</tr>
<tr>
<td>35</td>
<td>8</td>
<td>ALLOUS DUST (AD)</td>
<td></td>
<td>4</td>
<td>X</td>
</tr>
</tbody>
</table>

**MATERIAL DESCRIPTION**

- OLDER ALLUVIUM (Oa)
  - Slowly Leach (CLAY - CL): stiff, moderate yellowish brown, damp, slightly porous, cohesive
  - stiff to very stiff, at 2'

**TEST DATA**

- UNIT WET WEIGHT (pcf): 125
- UNIT DRY WEIGHT (pcf): 114
- WET CONTENT (%): 11
- LIQUID LIMIT (%): 11
- PLASTICITY INDEX: 9
- UNDRAINED SHEAR STRENGTH (kPa): 9

**LOGGED BY:** C. Weke

**CHECKED BY:** G. D. Cullen

**EXCAVATION METHOD:** Hollow Stem Auger

**CONTRACTOR:** Mikes Excavating Service

---

**LOG OF TEST PIT NO. TP-2**

<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>DEPTH (ft)</th>
<th>MATERIAL</th>
<th>SYMBOL</th>
<th>SAMPLE NO.</th>
<th>SAMPLE BLOW COUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>2</td>
<td>OLDER ALLUVIUM (Oa)</td>
<td></td>
<td>1</td>
<td>X</td>
</tr>
<tr>
<td>38</td>
<td>4</td>
<td>OLDER ALLUVIUM (Oa)</td>
<td></td>
<td>2</td>
<td>X</td>
</tr>
<tr>
<td>36</td>
<td>6</td>
<td>OLDER ALLUVIUM (Oa)</td>
<td></td>
<td>3</td>
<td>X</td>
</tr>
</tbody>
</table>

**MATERIAL DESCRIPTION**

- OLDER ALLUVIUM (Oa)
  - Clays, silt, and sand, slightly yellowish brown, slightly moist
  - stiff to very stiff, at 2'

**TEST DATA**

- UNIT WET WEIGHT (pcf): 120
- UNIT DRY WEIGHT (pcf): 110
- WATER CONTENT (%): 9
- LIQUID LIMIT (%): 9
- PLASTICITY INDEX: 9
- UNDRAINED SHEAR STRENGTH (kPa): 9

**LOGGED BY:** C. Weke

**CHECKED BY:** G. D. Cullen

**EXCAVATION METHOD:** Hollow Stem Auger

**CONTRACTOR:** Mikes Excavating Service

---

**LOG OF TEST PIT NOS. TP-1 AND TP-2**

**Campus Pointe Building No. 4**

**Santa Barbara, California**

**PLATE A-8**
LOG OF TEST PIT NO. TP-3

LOCATION: Proposed Retaining Wall, see Plate 2

SURFACE EL: 46.3 ft +/- (rel. MSL datum)

ELEVATION, ft 
<table>
<thead>
<tr>
<th>DEPTH, ft</th>
<th>MATERIAL</th>
<th>SAMPLES</th>
<th>BLOW COUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>44</td>
<td>2</td>
<td>OLDER ALLUVIUM (Qoa)</td>
<td>Silty SAND (SM): dense, pale yellowish brown, moist, slightly to moderately porous</td>
</tr>
<tr>
<td>42</td>
<td>4</td>
<td>- trace to some gravel nodules (oxidized), from 3' to 4'</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>6</td>
<td>Steady, Lean CLAY (CL): stiff to very stiff, moderate yellowish brown, moist</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>8</td>
<td>110</td>
<td>105</td>
</tr>
<tr>
<td>36</td>
<td>10</td>
<td>112</td>
<td>106</td>
</tr>
<tr>
<td>34</td>
<td>12</td>
<td>122</td>
<td>105</td>
</tr>
<tr>
<td>32</td>
<td>14</td>
<td>122</td>
<td>105</td>
</tr>
</tbody>
</table>

UNIT VOLUME, cu ft
UNIT WEIGHT, lb/ft³
WATER CONTENT, %
CROSSING % PASSING No. 400 SIEVE
LOSS ON DRYING, %
PLASTICITY INDEX %
UN_DRAINED STRENGTH, ksf

LOGGED BY: C.Wake
CHECKED BY: GSDenlinger
EXCAVATION METHOD: Hollow Stem Auger
CONTRACTOR: Mikis Excavating Service

LOG OF TEST PIT NO. TP-4

LOCATION: Proposed Retaining Wall, see Plate 2

SURFACE EL: 42.0 ft +/- (rel. MSL datum)

ELEVATION, ft
<table>
<thead>
<tr>
<th>DEPTH, ft</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>2</td>
</tr>
<tr>
<td>38</td>
<td>4</td>
</tr>
<tr>
<td>36</td>
<td>6</td>
</tr>
<tr>
<td>34</td>
<td>8</td>
</tr>
<tr>
<td>32</td>
<td>10</td>
</tr>
<tr>
<td>30</td>
<td>12</td>
</tr>
<tr>
<td>28</td>
<td>14</td>
</tr>
</tbody>
</table>

UNIT VOLUME, cu ft
UNIT WEIGHT, lb/ft³
WATER CONTENT, %
CROSSING % PASSING No. 400 SIEVE
LOSS ON DRYING, %
PLASTICITY INDEX %
UN_DRAINED STRENGTH, ksf

LOGGED BY: C.Wake
CHECKED BY: GSDenlinger
EXCAVATION METHOD: Hollow Stem Auger
CONTRACTOR: Mikis Excavating Service

LOG OF TEST PIT NOS. TP-3 AND TP-4
Campus Pointe Building No. 4
Santa Barbara, California

PLATE A-9
LOG OF TEST PIT NO. TP-5

March 2001
Project No. 00-42-3423

LOCATION: Proposed Retaining Wall, see Plate 2

SURFACE EL: 39.0 ft +4' (rel. MSL datum)

<table>
<thead>
<tr>
<th>ELEVATION, ft</th>
<th>DEPTH, ft</th>
<th>MATERIAL SYMBOL</th>
<th>MATERIAL DESCRIPTION</th>
<th>SAMPLED</th>
<th>SAMPLED</th>
<th>SAMPLED</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>2</td>
<td></td>
<td>ARTIFICIAL FILL (af)</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Clayey SAND (SC) with gravel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>loose, moderately brown, damp,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>concrete fragments, at t</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>4</td>
<td></td>
<td>OLDER ALLUVIUM (Oea)</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Silty SAND (SM)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>dense, pale yellowish brown, moist, with gravel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>nodules (replaced)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>5</td>
<td></td>
<td>Sandy Lean CLAY (CL)</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>stiff to very stiff, moderate yellowish</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>brown, moist</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>13</td>
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<td></td>
<td></td>
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<td>24</td>
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<td>22</td>
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<td>20</td>
<td>19</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>18</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COMPLETION DEPTH: 4.0 ft

DEPTH TO WATER: Not encountered

EXCAVATION DATE: February 8, 2003

The log and data presented are a simplification of actual conditions encountered at the time of excavating at the explored location. Subsurface conditions may differ at other locations and with the passage of time. (TP-05)

LOGGED BY: C.Walke
CHECKED BY: G.SDeninger
EXCAVATION METHOD: Hollow Stem Auger
CONTRACTOR: Mike's Excavating Service

LOG OF TEST PIT NO. TP-5
Campus Pointe Building No. 4
Santa Barbara, California

PLATE A-10
### General Notes

**Soil Texture Symbol**

Shaded line in symbol column indicates transitional boundary.

Sampled and sampler dimensions (unless otherwise noted in report text) are as follows:

- **Symbol**: 1 SPT Sampler, driven 1 3/4" ID, 2" OD.
  2 CA Liner Sampler, driven 2 3/4" ID, 3" OD.
  3 CA Liner Sampler, disturbed 2 3/4" ID, 3" OD.
  4 Thin-walled Tube, pushed 2 3/4" ID, 3" OD.
  5 Bulk Bag Sample (from cuttings).
  6 Hand Auger Sample.
  7 CME Core Sample.
  8 Lexan Sample.
  9 Picher Sample.
  10 Vibracore Sample.
  11 No Sample Recovered.

**Sample Driving Resistance**

Number of blows with 140 lb hammer, falling 36" to drive sampler 1" HL after seating sampler 6" in.; for example:

<table>
<thead>
<tr>
<th>Level</th>
<th>Blows</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>85/11</td>
<td>50</td>
</tr>
<tr>
<td>50/6</td>
<td>50</td>
</tr>
</tbody>
</table>

Blow counts for California Liner Sampler shown in ( ).

**Length of sample symbol approximates recovery length.**

**Classification of Soils per ASTM D2487 or D2488**

- **Geologic Formation** noted in bold font at the top of interpreted interval.

**Strength Legend**

- Q: Unconfined Compression
- U: Unconsolidated Undrained Triaxial
- T: Torvane
- P: Pocket Handometer
- m: Miniature Vane

**Water Level Symbols**

- I: Initial or pre-dike water level
- F: Final ground water level
- S: Seepage encountered

**Rock Quality Designation (ROD)** is the sum of recovered core pieces greater than 4 inches divided by the length of the cored interval.

### KEY TO TERMS & SYMBOLS USED ON LOGS

- **Elevation:** The elevation at which the sample was taken.
- **Depth:** The depth below ground surface.
- **Material Symbol:** A code for the type of material.
- **Sampled:** Indicates whether the sample was taken.
- **Samples:** Number of samples taken at each level.
- **Material Description:** Details about the material at each level.
- **Location:** The drill hole location referencing local landmarks or coordinates.
- **Surface EL:** Using local, MSL, MLLW, or other datum.

**PLATE A-11**
<table>
<thead>
<tr>
<th>DRILL HOLE</th>
<th>DEPTH ft</th>
<th>MATERIAL DESCRIPTION</th>
<th>UWY%</th>
<th>UD%</th>
<th>MC%</th>
<th>FINES</th>
<th>ATTERBERG LIMITS</th>
<th>COMPACION LIMITS</th>
<th>DIRECT SHEAR TEST</th>
<th>DENSITY TEST</th>
<th>VELOCITY TEST</th>
<th>CORROSION TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>DH-1</td>
<td>0.0</td>
<td>Sandy Lean CLAY (CL)</td>
<td></td>
<td></td>
<td></td>
<td>52</td>
<td>45</td>
<td>35</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DH-2</td>
<td>0.0</td>
<td>Clayey SAND (SC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DH-2</td>
<td>5.0</td>
<td>Clayey SAND (SG)</td>
<td>141</td>
<td>132</td>
<td>11</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DH-2</td>
<td>16.6</td>
<td>Silty SAND (SM)</td>
<td>115</td>
<td>11</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DH-3</td>
<td>3.0</td>
<td>Sandy Lean CLAY (CL)</td>
<td>84</td>
<td>87</td>
<td>7</td>
<td>55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DH-4</td>
<td>3.0</td>
<td>Sandy Lean CLAY (CL)</td>
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<td>118</td>
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<td>Silty SAND (SM)</td>
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<td>TR-2</td>
<td>6.0</td>
<td>Sandy Lean CLAY (CL)</td>
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<td>108</td>
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**SUMMARY OF LABORATORY TEST RESULTS**

Campus Pointe Building No. 4
Santa Barbara, California
<table>
<thead>
<tr>
<th>DRILL HOLE</th>
<th>DEPTH (ft)</th>
<th>MATERIAL DESCRIPTION</th>
<th>UMW</th>
<th>UDM</th>
<th>MC%</th>
<th>TIN</th>
<th>ALUMEL</th>
<th>LCL</th>
<th>PPL</th>
<th>OMP</th>
<th>OPT MC%</th>
<th>COMPACTION TEST</th>
<th>DIRECT SHEAR</th>
<th>COMPR. STRENGTH TESTS</th>
<th>CORROSIVITY TESTS</th>
<th>EXPANSION INDEX</th>
<th>R-VALUE</th>
<th>TEST LISTING</th>
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<tbody>
<tr>
<td>TP-3</td>
<td>0.0</td>
<td>Silty SAND (SM)</td>
<td>119</td>
<td>106</td>
<td>.4</td>
<td>40</td>
<td>NP</td>
<td>NP</td>
<td>NP</td>
<td>NP</td>
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<td>1.50</td>
<td>33</td>
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<td></td>
<td>A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z</td>
</tr>
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</table>
GRAIN SIZE CURVES
Campus Pointe Building No. 4
Santa Barbara, California

PLATE B-2
PLASTICITY CHART
Campus Pointe Building No. 4
Santa Barbara, California

PLATE B-3
DIRECT SHEAR TEST RESULTS
Campus Pointe Building No. 4
Santa Barbara, California

PLATE 8-4a
March 2001
Project No. C0-42-3423

COHESION, ksf

ANGLE OF INTERNAL FRICTION, deg

LOCATION
DEPTH, ft
MOISTURE CONTENT, %
UNIT DRY WEIGHT, pcf
MATERIAL DESCRIPTION
SAMPLE CONDITION

DIRECT SHEAR TEST RESULTS
Campus Pointe Building No. 4
Santa Barbara, California

PLATE 8-4b
COHESION, ksf
ANGLE OF INTERNAL FRICTION, deg
LOCATION
DEPTH, ft
MOISTURE CONTENT, %
UNIT DRY WEIGHT,pcf
MATERIAL DESCRIPTION
SAMPLE CONDITION

1.5
33.0
TP-3
6
16.0
105.0
Sandy Lean CLAY (CL)

DIRECT SHEAR TEST RESULTS
Campus Pointe Building No. 4
Santa Barbara, California

PLATE B-4c
CONsolidation TEST RESULTS
Campus Pointe Building No. 4
Santa Barbara, California

PLATE B-5
APPENDIX E

EXPLORATION LOGS AND LABORATORY DATA
BY FUGRO WEST, INC. (OCTOBER 2001)
LOG OF DRILL HOLE NO. DH-1
Campus Pointe Residential Development
Santa Barbara, CA

DRILLING METHOD: 8-in. dia. Hollow Stem Auger
HITTER TYPE: Automatic Trip
DRILLED BY: S/I Testing
LOGGED BY: N.J. Delbridge
CHECKED BY: G.S. Ebelinger

LOCATION: See Plate 2
SURFACE EL: 30 ft

OLDER ALLUVIUM (Quel)
Sandy CLAY (CL), stiff to very stiff, reddish and orange brown, dry to 2' then moist, with few roots from 0' to 5', occasional charcoal inclusions

Clayey to Silty SAND (SC-SM), very dense, brown to yellowish brown, moist, below 5'

- light gray poorly graded coarse SAND (SP), at 10'
- grades to fine SAND (SP), very dense, light gray to yellow, moist, with iron oxide stains, below about 10.5'
- seepage noted, at 17'

Hole caved to 17' after augers were removed.
**LOG OF DRILL HOLE NO. DH-2**

**Campus Pointe Residential Development**

**Santa Barbara, CA**

**PLATE A-2**

---

### MATERIAL DESCRIPTION

**OLDER ALLUVIUM (Oa)**
Sandy CLAY (CL): stiff to very stiff, brown to reddish brown, dry to 2' then moist, occasional charcoal inclusions

**Silty SAND (SM) to Clayey SAND (SC):** dense, brown to reddish brown, moist
- with few Lean CLAY (CL) seams at about 5' to 6'
- with gray motles at about 8' to 9'

**Fine SAND (SP):** very dense, light gray to yellowish brown, moist and wet below 17'

---

**COMPLETION DEPTH:** 21.5 ft

**DEPTH TO WATER:** 17 ft (estimated)

**BACKFILLED WITH:** Native Materials

**DRILLING DATE:** August 16, 2001

---

**DRILLING METHOD:** 8-in. dia. Hollow Stem Auger

**HAMMER TYPE:** Automatic Tip

**DRILLED BY:** SG Testing

**LOGGED BY:** NDenbridge

**CHECKED BY:** GSDenlinger
LOCATION: See Plate 2
SURFACE EL: 35 ft +

MATERIAL DESCRIPTION

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<thead>
<tr>
<th>LEVEL</th>
<th>MATERIAL DESCRIPTION</th>
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<tbody>
<tr>
<td>34</td>
<td>ARTIFICIAL FILL (af) Silty SAND to SILT (SM to ML): very dense, light brown, dry</td>
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<tr>
<td>32</td>
<td>OLDER ALLUVIUM (Qa) Silty SAND (SM): very dense, brown to reddish brown, moist, with some charcoal inclusions - interlayered with Lean CLAY (CL), below 5'</td>
</tr>
<tr>
<td>22</td>
<td>SAND (SP): very dense, light gray to moderate yellowish, with iron oxide stains</td>
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</tbody>
</table>

COMPLETION DEPTH: 16.5 ft
DEPTH TO WATER: Not Encountered
BACKFILLED WITH: Native Materials
DRILLING DATE: August 16, 2001

DRILLING METHOD: 8-in. dia Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: S/G Testing
LOGGED BY: N. Debrudge
CHECKED BY: G. Dentinger

LOG OF DRILL HOLE NO. DH-3
Campus Pointe Residential Development
Santa Barbara, CA

PLATE A-3
<table>
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<th>ELEVATION ft</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLE ND</th>
<th>MATERIAL DESCRIPTION</th>
<th>UNIT WET WEIGHT, gcf</th>
<th>UNIT DRY WEIGHT, gcf</th>
<th>% PASSING 4 IN.</th>
<th>LOADING UNIT, lb</th>
<th>PLASTICITY, %</th>
<th>Swell Index %</th>
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<td>24</td>
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<td>21</td>
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<tr>
<td></td>
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<td></td>
<td>Silty to Clayey SAND (SM to SC): loose, light brown, dry</td>
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<tr>
<td>-12</td>
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<td>38</td>
<td>OLDER ALLUVIUM (Qear)</td>
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<td></td>
<td>Clayey SAND (SC) to Sandy CLAY (CL): very stiff to dense, reddish brown and orange brown, moist, with charcoal inclusions, with sand seams</td>
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<td></td>
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<td>- interlayered with Silty to Clayey SAND (SM to SC), at 7&quot;</td>
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<tr>
<td>-20</td>
<td></td>
<td>39</td>
<td>Fine SAND (SP): very dense, light gray to yellowish gray, moist</td>
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<tr>
<td>-28</td>
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<td>39</td>
<td>- medium sand, olive gray, at 20°</td>
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COMPLETION DEPTH: 21.5 ft
DEPT TO WATER: Not Encountered
BACKFILLED WITH: Native Materials
DRILLING DATE: August 16, 2001
DRILLING METHOD: 8-in. dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: NJDeBenedetti
LOGGED BY: NJDeBenedetti
CHECKED BY: GSDeBenedetti

LOG OF DRILL HOLE NO. DH-4
Campus Pointe Residential Development
Santa Barbara, CA
PLATE A-4
<table>
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<th>ELEVATION</th>
<th>MATERIAL DESCRIPTION</th>
<th>UNIT WET WEIGHT (pcf)</th>
<th>UNIT DRY WEIGHT (pcf)</th>
<th>WATER %</th>
<th>COHESION (lbf/ft²)</th>
<th>PENETRATION LIMIT %</th>
<th>UNIAXIAL STRENGTH (psi)</th>
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<td>114</td>
<td>14</td>
<td>73</td>
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<td>37</td>
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<td>OLDER ALLUVIUM (Ochre)</td>
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<td>109</td>
<td>19</td>
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<tr>
<td>-18</td>
<td>- sand layer, from 14.5' to 15'</td>
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<td>103</td>
<td>23</td>
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<tr>
<td>-12</td>
<td>Fine SAND (SP): dense to very dense, light gray to yellow gray to olive, wet</td>
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<td>103</td>
<td>23</td>
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<td>-6</td>
<td>Note: Groundwater measured at 26 ft during drilling, water to augers was added below 20', therefore final water level not measured</td>
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**LOG OF DRILL HOLE NO. DH-5**
Campus Pointe Residential Development
Santa Barbara, CA

**DRILLING METHOD:** 8-in. dia. Hollow Stem Auger
**HAMMER TYPE:** Automatic Trip
**DRILLED BY:** SG Testing
**LOGGED BY:** Norderoque
**CHECKED BY:** GoDenniger

**PLATE A-5**
LOCATION: See Plate 2

SURFACE EL: 31 ft (+) (rel. project datum)

MATERIAL DESCRIPTION

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<th>ELEVATION (ft)</th>
<th>MATERIAL/SYMBOL</th>
<th>SAMPLE NO.</th>
<th>SAMPLER BAY COUNT</th>
<th>UNIT WET WEIGHT, gcf</th>
<th>UNIT DRY WEIGHT, gcf</th>
<th>WATER CONTENT, %</th>
<th>% PASSING 4# 1600</th>
<th>LIQUID LIMIT, %</th>
<th>PLASTICITY INDEX, %</th>
<th>UNBROKEN SHEAR STRENGTH, lb/sq in</th>
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<tr>
<td></td>
<td>Sandy CLAY (CL): loose to medium stiff, brown to moderate reddish brown, moist</td>
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<td></td>
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<tr>
<td>28</td>
<td>YOUNGER ALLUVIUM (Qal)</td>
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<tr>
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<td>Fat CLAY (CH): stiff, dark brown to black, moist, with voids and roots up to about 1/16&quot; to 1/8&quot; diameter</td>
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</tr>
<tr>
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<td>- fewer voids, no roots, below about 7&quot;</td>
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<tr>
<td></td>
<td>- stiff, dark brown to black, moist, with abundant gypsum pockets to approximately 1/8&quot; x 1/2&quot;, at 5'</td>
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<tr>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>- dark brown with gray and dull yellow brown mottles, gypsum absent, at 15'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>grades to Sandy CLAY (CL): stiff, brown with light gray pockets, wet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>OLDER ALLUVIUM (Qool)</td>
<td>(24)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SAND (SP): dense, moderate yellowish and reddish brown, wet, with iron oxide streaks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COMPLETION DEPTH: 31.5 ft

DEPT TO WATER: Not Encountered

BACKFILLED WITH: Native Materials

DRILLING DATE: August 17, 2001

DRILLING METHOD: 8-in. dia. Hollow Stem Auger

HAMMER TYPE: Automatic Trip

DRILLED BY: S/G Testing

LOGGED BY: NJOdebrige

CHECKED BY: GS Dentlinger

LOG OF DRILL HOLE NO. DH-6

Campus Pointe Residential Development
Santa Barbara, CA

PLATE A-6
LOG OF DRILL HOLE NO. DH-7
Campus Pointe Residential Development
Santa Barbara, CA

LOCATION: See Plate 2
SURFACE EL: 23 ft +/- (rel. project datum)

<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>DEPTH</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLER</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>21</td>
<td>CLAY (CL)</td>
<td>(22)</td>
</tr>
<tr>
<td>30</td>
<td>29</td>
<td>LEAN CLAY (CL)</td>
<td>(22)</td>
</tr>
<tr>
<td>15</td>
<td>14</td>
<td>CLAY (CL)</td>
<td>(22)</td>
</tr>
<tr>
<td>10</td>
<td>9</td>
<td>SAND (SP)</td>
<td>(22)</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>SAND (SP)</td>
<td>(22)</td>
</tr>
</tbody>
</table>

MATERIAL DESCRIPTION

OLDER ALLUVIUM (Oa1)
Lean CLAY (CL): stiff, moderate orange brown and brown, dry to 2.5' then moist, minor sand

Clayey to Silty SAND (SC to SM): medium dense, moderate orange brown, moist, with some iron oxide stains

- grades to predominately SILT (ML) to Silty fine SAND (SM): dense, orange brown, with light grey pockets, wet, with iron oxide stains, with few sand layers

SAND (SP): dense, reddish brown and gray, wet, with iron oxide stains
- driller adds drilling mud down augers to establish pressure head and reduce sand from flowing up into augers

SANTA BARBARA FORMATION (Qeb)
Clayey SILT (ML): very stiff to hard, greenish olive, wet

- with sand lenses, at 30'

UNIT WEIGHT, LBF/CT: 127
UNIT DRY WEIGHT, LBF/CT: 107
WATER CONTENT: 17
% PASSING 200-GRADE: 54
LIQUID LIMIT: 15
PLASTIC LIMIT: 15
SHEAR STRENGTH:

COMPLETION DEPTH: 51.5 ft
DEPT TO WATER: 15.5 ft
BACKFILLED WITH: Native Materials
DRILLING DATE: August 17, 2001

DRILLING METHOD: 8-in. dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: S/G Testing
LOGGED BY: NJDeridge
CHECKED BY: GSDeJager

PLATE A-7a
<table>
<thead>
<tr>
<th>ELEVATION, ft</th>
<th>DEPTH, ft</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLE NO</th>
<th>SAMPLE DESCRIPTION</th>
<th>UNIT W/P, %</th>
<th>UNIT DRY W, %</th>
<th>COMPRESS %</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>-18</td>
<td>12</td>
<td></td>
<td></td>
<td>SANTA BARBARA FORMATION (Qsb)</td>
<td>Clayey Silt (ML): slightly to hard, greenish olive, wet</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-22</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>-24</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Completion Depth:** 51.5 ft  
**Depth to Water:** 15.5 ft  
**Backfilled With:** Native Materials  
**Drilling Date:** August 17, 2001  

**Drilling Method:** 8-in. dia Hollow Stem Auger  
**Hammer Type:** Automatic Trip  
**Drilled By:** S/G Testing  
**Logged By:** N.Derfelde  
**Checked By:** GSDeminger

---

**LOG OF DRILL HOLE NO. DH-7**  
Campus Pointe Residential Development  
Santa Barbara, CA  

PLATE A-7b
**LOG OF DRILL HOLE NO. DH-8**

**Campus Pointe Residential Development**

**Santa Barbara, CA**

**PLATE A-8a**

**LOCATION:** See Plate 2

**SURFACE EL.: 22 ft +/-** (rel. project datum)

<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION</th>
<th>UNIT WT. (psf)</th>
<th>UNIT DRY WT. (psf)</th>
<th>WATER %</th>
<th>COHESION (lb/ft)</th>
<th>CUP UNIT</th>
<th>PLASTICITY INDEX</th>
<th>SHAKE DENSITY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ARTIFICIAL FILL (at)</strong>&lt;br&gt;Mixture of Sandy Lean CLAY (CL) and Fat CLAY (CH): medium stiff, moderate reddish brown and black, dry to 2&quot; then moist, with few pea size gravel&lt;br&gt;- piece of asphalt concrete pavement, at about 5'</td>
<td>131</td>
<td>113</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>YOUNGER ALLUVIUM (Qal)</strong>&lt;br&gt;Silty Lean CLAY with sand (CL-ML): medium stiff, moderate reddish brown, moist, with iron oxide stains</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fat CLAY (CH):</strong> stiff, black, with fine roots and voids, transitions to mottled gray and reddish brown below 15'</td>
<td>120</td>
<td>100</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td>0.76</td>
</tr>
<tr>
<td>- no recovery (clay on center bit), at 20'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- no recovery (clay on center bit), at 25'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- grades to grayish brown Sandy CLAY (CL) to Clayey SAND (SC), by 27'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PP 3.3</td>
</tr>
<tr>
<td>- reddish brown with gray mottles, at 35' (possible Older Alluvium (Qoa), below about 35')</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PP 2.5</td>
</tr>
</tbody>
</table>

**COMPLETION DEPTH:** 51.5 ft<br>**DEPTH TO WATER:** 18 ft<br>**BACKFILLED WITH:** Native Materials<br>**DRILLING DATE:** August 17, 2001

**DRILLING METHOD:** 8-in. dia. Hollow Stem Auger<br>**HACKER TYPE:** Automatic Trip<br>**DRILLED BY:** SJG Testing<br>**LOGGED BY:** NJOo-bagné<br>**CHECKED BY:** GGDonlinger

The log and data presented are subject to the limitations of tests conducted at the site of drilling or the drilling location. Subsurface conditions may differ at other locations and with the passage of time.
LOCATION: See Plate 2

SURFACE EL.: 28 ft +/- (rel. project datum)

MATERIAL DESCRIPTION

OLDER ALLUVIUM (QoA)
Fat CLAY (CH): stiff, dark brown to reddish brown, dry to approximately 3' then moist, with some sand lenses

Silty to Clayey fine SAND (SM to SC): medium dense, reddish brown, moist, with some clay seams
- interlayered with fissured clay with white silt infilling at about 6'
- with iron oxide stains, below 9'

- layer of medium SAND (SP) with subrounded to rounded pea sized gravel from 15.5' to at least 16.5'

- wet, below 21'

- with gray layers at about 25'

UNIT WEIGHT, D75:

% CLAY

% SAND

% Silt

LOST SAND:

PLASTICITY INDEX %:

UNCONSOLIDATED SHEAR STRENGTH:

COMPLETION DEPTH: 25.5 ft
DEPTH TO WATER: 17 ft
BACKFILLED WITH: Native Materials
DRILLING DATE: August 20, 2001

DRILLING METHOD: 8-in. dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: SGG Testing
LOGGED BY: N. Derbridge
CHECKED BY: G. Denlinger

LOG OF DRILL HOLE NO. DH-9
Campus Pointe Residential Development
Santa Barbara, CA

PLATE A-9
October 2001
Project No. 01-42-0131

LOCATION: See Plate 2
SURFACE EL: 21 ft +/- (rel. project datum)

MATERIAL DESCRIPTION

OLDER ALLUVIUM (Aq):
Lean to Fat CLAY (CH): stiff, brown, dry to
approximately 2' then moist, with gypsum
pockets, blocky structure

- mottled olive and reddish brown, gypsum absent
below about 3'

grades to Sandy Lean CLAY (CL): stiff, yellow
brown, moist, with light gray motting, few
charcoal pieces

Fine SAND to Silty fine SAND (SP to SM):
medium dense to dense, light brown to gray
brown, moist, wet, below approximately 19'

Silty fine SAND (SM): dense, greenish gray, wet
(possible Santa Barbara Formation (Qsb))

COMPLETION DEPTH: 26.5 ft
DEPTH TO WATER: 19 ft
BACKFILLED WITH: Native Materials
DRILLING DATE: August 20, 2001

LOG OF DRILL HOLE NO. DH-10
Campus Pointe Residential Development
Santa Barbara, CA

PLATE A-10
**LOG OF DRILL HOLE NO. DH-11**

Campus Pointe Residential Development
Santa Barbara, CA

---

**LOCATION:** See Plate 2

**SURFACE EL.:** 25 ft +/- (rel. project datum)

**MATERIAL DESCRIPTION**

<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLE NO.</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td></td>
<td>1</td>
<td>YOUNGER ALLUVIUM (Qa)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Fat CLAY (CH); stiff, dark brown to approximately 2' then black, dry to approximately 1.5' then moist, with fine roots</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>- abundant gypsum pockets below about 7'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>- gypsum absent below about 5'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>Sandy Lean CLAY (CL); stiff, gray brown, wet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>- interlayered with Silty to Clayey SAND (SM to SC) layer below approximately 25'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>8</td>
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<tr>
<td></td>
<td></td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

**DRILLING METHOD:** 8 in. dia. Hollow Stem Auger

**HAMMER TYPE:** Automatic Trip

**DRILLED BY:** NGT Engineering

**LOGGED BY:** NGT Engineering

**CHECKED BY:** GSTD+engineering

---

**COMPLETION DEPTH:** 51.5 ft

**DEPTH TO WATER:** 15 ft

**BACKFILLED WITH:** Native Materials

**DRILLING DATE:** August 20, 2001

*Note: Subsurface conditions may differ at other locations and with the passage of time.*
<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>DEPTH (ft)</th>
<th>MATERIAL SYMBOL</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>-15</td>
<td>10</td>
<td></td>
<td>Sandy Lean CLAY (CL): stiff, gray brown, wet</td>
</tr>
<tr>
<td>-18</td>
<td>11</td>
<td></td>
<td>Fat CLAY (CH): stiff, greenish gray, wet, with sand lenses</td>
</tr>
</tbody>
</table>

**LOCATION:** See Plate 2

**SURFACE EL:** 29 ft +/− (rel. project datum)

**MATERIAL DESCRIPTION**

<table>
<thead>
<tr>
<th>UNIT WEIGHT</th>
<th>MOIST. CONTENT</th>
<th>DENSITY</th>
<th>TAPERED</th>
<th>PLUG</th>
<th>CARRIG.</th>
<th>GAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMPLETION DEPTH:** 51.5 ft

**DEPTH TO WATER:** 15 ft

**BACKFILLED WITH:** Native Materials

**DRILLING DATE:** August 20, 2001

**DRILLING METHOD:** 8 in. dia. Hollow Stem Auger

**HAMMER TYPE:** Automatic Trip

**DRILLED BY:** S.G. Testing

**LOGGED BY:** N. Derbridge

**CHECKED BY:** G.S. Denninger

**LOG OF DRILL HOLE NO. DH-11**
Campus Pointe Residential Development
Santa Barbara, CA

**PLATE A-11b**
### Material Description

**Younger Alluvium (Qal)**
- Fat CLAY (CH): stiff to very stiff, dark brown to black, dry to approximately 2' then moist, with fine roots and voids
- With sand partings, at 4'

**Older Alluvium (Qoal)**
- Grades to Sandy Lean CLAY (CL): stiff to very stiff, dark yellowish brown, moist (possible Older Alluvium (Qoal))

**Older Alluvium (Qoal)**
- Stiff to Clayey fine SAND (SM to SC): dense to very dense, dark yellowish brown to reddish brown, moist

### Completion Depth
- 26.5 ft

### Depth to Water
- Not Encountered

### Backfilled With
- Native Materials

### Drilling Method
- 8-in. dia. Hollow Stem Auger

### Hammer Type
- Automatic Trip

### Drilled By
- S/G Testing

### Logged By
- NJDerdigee

### Checked By
- GSDentinger
LOG OF DRILL HOLE NO. DH-13
Campus Pointe Residential Development
Santa Barbara, CA

DRILLING METHOD: 8-in. dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: Site Testing
LOGGED BY: J. DeLuelle
CHECKED BY: GSDalinger

LOCATION: See Plate 2
SURFACE EL.: 29 ft (rel. project datum)

MATERIAL DESCRIPTION

YOUNGER ALLUVIUM (Qal)
Fat CLAY (CH): stiff to very stiff, dark dusty brown to black, dry to about 2' then moist, with fine (up to approximately 1/16") roots and voids

OLDER ALLUVIUM (Qoal)
Sand clay CLAY (CL) interlayered with Silty to Clayey SAND (SM to SC): stiff to dense, reddish brown, moist, with iron oxide stains

Fine SAND (SP): dense, reddish brown to light gray, moist

with few clay pockets, at 12.5'

COMPLETION DEPTH: 26.5 ft
DEPTH TO WATER: 15 ft
BACKFILLED WITH: Native Materials
DRILLING DATE: August 21, 2001

The log and data presented are a compilation of actual conditions encountered in the cores of drilling at the drilled location. Subsurface conditions may differ from those presented and with the progression thereof.
**LOG OF DRILL HOLE NO. DH-14**

Campus Pointe Residential Development
Santa Barbara, CA

**LOCATION:** See Plate 2

**MATERIAL DESCRIPTION**

<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLE NO</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
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<td>YOUNGER ALLUVIUM (Qa1)</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>(1)</td>
<td>Fat CLAY (CH): medium stiff to stiff, dusky brown to black, dry to approximately 1&quot; then moist, with roots and voids up to approximately 1/16&quot;</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>(21)</td>
<td>- with abundant gypsum pockets at about 7.5'</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>- roots absent below 7.5'</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>- gypsum absent, below about 9.5'</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>(18)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>(35)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>- with sand, at 20'</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>- grades to Sandy Lean CLAY (CL): medium stiff, dark yellowish brown, wet, at 25'</td>
</tr>
</tbody>
</table>

**COMPLETION DEPTH:** 26.5 ft

**DEPT TO WATER:** 10 ft

**BACKFILLED WITH:** Native Materials

**DRILLING DATE:** August 22, 2001

**DRILLING METHOD:** 8-in. dia. Hollow Stem Auger

**HANGER TYPE:** Automatic Trip

**DRILLED BY:** SG Testing

**LOGGED BY:** Niederbide

**CHECKED BY:** J. S. Denlinger

---

**PLATE A-14**
LOG OF DRILL HOLE NO. DH-15  
Campus Pointe Residential Development  
Santa Barbara, CA

**LOCATION:** See Plate 2  
**SURFACE EL.:** 25 ft +/-. (ref. project datum)

<table>
<thead>
<tr>
<th>Elevation, ft</th>
<th>Depth, ft</th>
<th>Material Symbol</th>
<th>Sample No.</th>
<th>Sampler</th>
<th>Biopsy</th>
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<tbody>
<tr>
<td>24</td>
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<td>L</td>
<td>(99)</td>
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</tr>
<tr>
<td>22</td>
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<td>1</td>
<td>39</td>
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<td>(09)</td>
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</tr>
<tr>
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<td>16</td>
<td>6</td>
<td>71</td>
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<td>18</td>
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<td>8</td>
<td>20</td>
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<tr>
<td>6</td>
<td>22</td>
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<td>4</td>
<td>24</td>
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<tr>
<td>-14</td>
<td>42</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MATERIAL DESCRIPTION:**

**YOUNGER ALLUVIUM (Gol)**  
Sandy SILT (ML) to Silty fine SAND (SM): dense to very dense, moderate yellowish brown, dry to about 4", then moist, with sand lenses and pockets, with iron oxide stains, and few fine roots and voids up to approximately 1/32" diameter.

**OLDER ALLUVIUM (Coal)**  
Silty fine SAND (SM) to Fine SAND (SF): dense, moderate yellowish brown, moist.

- Turns to pale yellowish brown, wet, below 15", with iron oxide stains.
- With subrounded to rounded gravel lenses up to approximately 1/2", at 20'

**COMPLETION DEPTH:** 26.5 ft  
**DEPTH TO WATER:** 13 ft  
**BACKFILLED WITH:** Native Materials  
**DRILLING DATE:** August 22, 2001

**DRILLING METHOD:** 8-in. dia. Hollow Stem Auger  
**HAMMER TYPE:** Automatic Trip  
**DRILLED BY:** SJG Testing  
**LOGGED BY:** NJDerbridge  
**CHECKED BY:** GSDentinger

PLATE A-15
**LOG OF DRILL HOLE NO. DH-16**  
Campus Pointe Residential Development  
Santa Barbara, CA

**DRILLING METHOD:** 8-in. dia. Hollow Stem Auger  
**HAMMER TYPE:** Automatic Trip  
**DRILLED BY:** SIG-Testing  
**LOGGED BY:** CM Walker/N. DeForge  
**CHECKED BY:** GS Deninger

**COMPLETION DEPTH:** 51.5 ft  
**DEPTH TO WATER:** 18 ft  
**BACKFILLED WITH:** Native Materials  
**DRILLING DATE:** August 22, 2001

---

### MATERIAL DESCRIPTION

| ELEVATION (ft) | DEPTH (ft) | MATERIAL SYMBOL | SAMPLE NO. | SAND DENSITY | BLOW COUNT | LOCATION: See Plate 2
|----------------|------------|-----------------|------------|--------------|-------------|---------------------------------|
| 26             | 2          | M1 (37)         | 2          |              |             | SURFACE EL: 29 ft +/- (rel. project datum) 
| 26             | 3          | 77              | 3          |              |             | OLDER ALLUVIUM (Qa) Clayey SAND (SC): medium dense, slightly moist to moos, moderate brown  
| 24             | 4          |                | 4          |              |             | - very dense, medium to well sorted, at 4'  
| 22             | 5          | 40              | 5          |              |             | - some caliche, slightly porous, interbedded with thin layers of Silty fine SAND (SM), SILT (ML) and Lean CLAY (CL) 
| 20             | 6          | 6 (6595)        | 6          |              |             | Sandy CLAY (CL): very stiff, moderate brown, slightly moist  
| 18             | 7          | 65              | 7          |              |             | Silty fine SAND (SM): very dense, moderate yellowish brown, slightly moist  
| 16             | 8          | 77              | 8          |              |             | - dusky yellow, lenses of medium grained SAND (SP), zones of oxidation, at 20' 
| 14             | 9          |                | 9          |              |             | SANTA BARBARA FORMATION (Qsb) Lean CLAY with sand (CL): very stiff, olive gray, moist  
| 12             | 10         | (72)            | 10         |              |             | Clayey SILT with sand (ML): very dense, olive gray, wet, with shell up to approximately 3/8" diameter at about 30", with sand lenses

---

**PLATE A-16a**
LOG OF DRILL HOLE NO. DH-16
Campus Pointe Residential Development
Santa Barbara, CA

DRILLING METHOD: 8-in. dia. Hollow Stem Auger

LOCATION: See Plate 2

SURFACE EL: 29 R +/- (rel. project datum)

MATERIAL DESCRIPTION:
- Clayey SILT with sand (ML): very dense, olive gray, wet, with shell up to approximately 3/8" diameter at about 36', with sand lenses
- Fine SAND (SP) layer, dense to very dense, light olive brown, moist, at 45'

COMPLETION DEPTH: 51.5 ft
DEPTH TO WATER: 18 ft
BACKFILLED WITH: Native Materials
DRILLING DATE: August 22, 2001

HAMMER TYPE: Automatic Trio
LOGGED BY: CWAske/NJDebroke
CHECKED BY: GSDelinger
**LOG OF DRILL HOLE NO. DH-17**

Campus Pointe Residential Development  
Santa Barbara, CA

**PLATE A-17**

<table>
<thead>
<tr>
<th>ELEVATION FT</th>
<th>MATERIAL</th>
<th>SAMPLE NO.</th>
<th>SHANK BLOW COUNT</th>
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<tbody>
<tr>
<td>-76</td>
<td>OLDER ALUVIUM (Goal)</td>
<td>M1</td>
<td>26</td>
</tr>
<tr>
<td>-75</td>
<td></td>
<td>2</td>
<td>(74)</td>
</tr>
<tr>
<td>-74</td>
<td>Clayey SAND (SC): medium dense to very dense, dry to 9' than moist, moderate brown to reddish brown</td>
<td>3</td>
<td>88/10'</td>
</tr>
<tr>
<td>-70</td>
<td></td>
<td>4</td>
<td>102.5%</td>
</tr>
<tr>
<td>-50</td>
<td>Fine SAND (SP): very dense, moderate yellowish brown, moist</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>-18</td>
<td></td>
<td>6</td>
<td>80</td>
</tr>
<tr>
<td>-8</td>
<td>dusty yell, medium sand, at 20'</td>
<td></td>
<td></td>
</tr>
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</table>

**LOCATION:** See Plate 2  
**SURFACE EL:** 30 ft +/- (rel project datum)

**MATERIAL DESCRIPTION**

- moist, with few charcoal inclusions, at 9'

**COMPLETION DEPTH:** 21.5 ft  
**DEPTH TO WATER:** 16 ft  
**BACKFILLED WITH:** Native Materials  
**DRILLING DATE:** August 22, 2001  
**DRILLING METHOD:** 30: dia. Hollow Stem Auger  
**HAMMER TYPE:** Automatic Trip  
**DRILLED BY:** S/G Testing  
**LOGGED BY:** NJDeininger  
**CHECKED BY:** GSDeninger

**UNIT Wt. GRADE:**-  
**UNIT Wt. HUMIDITY:**-  
**MOISTURE:**-  
**DENSITY:**-  
**PLASTICITY:**-  
**Sheet Good:**-
**MATERIAL DESCRIPTION**

- **ARTIFICIAL FILL (af)**
  - 5. Asphalt concrete pavement
  - 7. Aggregate base over Clayey SAND (SC)
  - YOUNGER ALLUVIUM (Qal)
    - Clayey SAND (SC): medium dense, dusky brown, moist, with fine roots and common organics, few rounded pea size gravel, (possible fill to a depth of about 10')
    - very loose, interlayered with fine light brown to reddish brown SAND (SP) and Lean CLAY (CL), at 10'

- **Fat CLAY (CH): medium stiff, dusky brown to black, with fine roots and voids**
  - interlayered with Sandy Lean CLAY (CL), medium stiff, brown, moist, with fine sand layers
  - with sand, at 30'
  - grades to Sandy CLAY (CH): stiff, olive gray, with iron oxide stains, at 35'

**LOG OF DRILL HOLE NO. DH-18**

**Campus Pointe Residential Development**

**Santa Barbara, CA**

**PLATE A-18a**

**COMPLETION DEPTH: 31.5 ft**
**DEPTH TO WATER: 24 ft**
**BACKFILLED WITH: Sand/Cement Slurry**
**DRILLING DATE: August 27, 2003**

**DRILLING METHOD: 8-in. dia, Hollow Stem Auger**
**HAMMER TYPE: Automatic Trip**
**DRILLED BY: SIG Testing**
**LOGGED BY: ILDeRidge**
**CHECKED BY: GSDeringer**
<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>MATERIAL SYMBOL</th>
<th>LOCATION: See Plate 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>SURFACE EL: 26 ft +/- (rel project datum)</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>MATERIAL DESCRIPTION</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>- blocky structure, at 40'</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>- with organics and sand layers at about 45'</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>OLDER ALLUVIUM (Coal)</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Fine to medium SAND (SP), dense to very dense, light gray to yellowish gray, wet</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>- greenish gray in shoe, at 65'</td>
</tr>
</tbody>
</table>

**COMPLETION DEPTH:** 31.5 ft  
**DEPTH TO WATER:** 24 ft  
**BACKFILLED WITH:** Sand/Cement Slurry  
**DRILLING DATE:** August 27, 2001  
**DRILLING METHOD:** 8-in. dia. Hollow Stem Auger  
**HUMMER TYPE:** Automatic Trip  
**DRILLED BY:** SIG Testing  
**CHECKED BY:** GSDentlinger

**LOG OF DRILL HOLE NO. DH-18**  
Campus Pointe Residential Development  
Santa Barbara, CA

PLATE A-18b
### General Notes

**Soil Texture Symbol**
- Sloped line in symbol column indicates transitional boundary.
- Samplers and sampler dimensions (unless otherwise noted in report text) are as follows:
  - Symbol for:
    1. SPT Sampler, driven: 1 3/8" ID, 2" OD
    2. CA Liner Sampler, driven: 2 3/8" ID, 3" OD
    3. CA Liner Sampler, disturbed: 2 3/8" ID, 3" OD
    4. Thin-walled Tube, pushed: 2 7/8" ID, 3" OD
    5. Bulk Bag Sample (from cuttings)
    6. Hand Auger Sample
    7. CME Core Sample
    8. Laxon Sample
    9. Pitcher Sample
    10. Vibracore Sample
    11. No Sample Recovered

**Sampler Driving Resistance**
- Number of blows with 140 lb. hammer falling 30 in. to drive sampler: 1 ft. after seating sampler 6 in. for example.
- BlowFill Description
  - 25 blows drove sampler 12" after initial 6" of seating
  - 50/1:1" After driving sampler the initial 6" of seating, 30 blows drove sampler through the second 6" interval, and 50 blows drove the sampler 5" into the third interval
  - 50/6: 50 blows drove sampler 6" after initial 6" of seating
  - 30/3: 50 blows drove sampler 3" during initial 6" seating interval

**Blow Counts for California Liner Sampler**
- Shown in ( )
- Length of sample symbol approximates recovery length
- Classification of Soils per ASTM D2487 or D2488
- Geologic Formation noted in bold font at the top of interpreted interval
- Strength Legend:
  - O = Unconfined Compression
  - U = Unconsolidated Undrained Triaxial
  - T = Tornavane
  - P = Pocket Photometer
  - M = Miniature Vane

**Water Level Symbols**
- G = Initial ground water level
- H = Seepage level

**Rock Quality Designation (RQD)** is the sum of recovered core pieces greater than 4 inches divided by the length of the cored interval.

### Key to Terms & Symbols Used on Logs

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-20</td>
<td>Well graded GRAVEL (GW)</td>
</tr>
<tr>
<td>14-20</td>
<td>Poorly graded GRAVEL (GP)</td>
</tr>
<tr>
<td>16-22</td>
<td>Well graded SAND (SW)</td>
</tr>
<tr>
<td>18-24</td>
<td>Poorly graded SAND (SP)</td>
</tr>
<tr>
<td>20-26</td>
<td>Silty SAND (SM)</td>
</tr>
<tr>
<td>22-28</td>
<td>Clayey SAND (SC)</td>
</tr>
<tr>
<td>24-30</td>
<td>Silty, Clayey SAND (SC-SM)</td>
</tr>
<tr>
<td>26-32</td>
<td>Elasic SILT (MH)</td>
</tr>
<tr>
<td>28-34</td>
<td>SILT (ML)</td>
</tr>
<tr>
<td>30-36</td>
<td>Silty CLAY (CL-ML)</td>
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<tr>
<td>32-38</td>
<td>Fat CLAY (CH)</td>
</tr>
<tr>
<td>34-40</td>
<td>Lean CLAY (CL)</td>
</tr>
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<td>36-42</td>
<td>CONGLOMERATE</td>
</tr>
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<td>38-44</td>
<td>SANDSTONE</td>
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<td>40-46</td>
<td>Siltstone</td>
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<td>42-48</td>
<td>MUDSTONE</td>
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<td>44-50</td>
<td>CLAYSTONE</td>
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<td>46-52</td>
<td>SHALE</td>
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<tr>
<td>50-56</td>
<td>GRANITE</td>
</tr>
<tr>
<td>52-60</td>
<td>Paving and/or Base Materials</td>
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PLATE A-19
## LOG OF TEST PIT NO. TP-1

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<th>MATERIAL SYMBOL</th>
<th>SAMPLE NO.</th>
<th>SAMPLER</th>
<th>MATERIAL DESCRIPTION</th>
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<td>ORGANOCS</td>
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<tr>
<td>32.0</td>
<td></td>
<td></td>
<td>1</td>
<td>OLDER ALLUVIUM (Golu)</td>
</tr>
<tr>
<td>30.0</td>
<td></td>
<td></td>
<td></td>
<td>Sandy Lean CLAY (CL): very stiff, moderate yellowish brown, dry to slightly moist, moderate yellowish brown to light brown, slightly moist, at 1.3 to 3.</td>
</tr>
<tr>
<td>26.0</td>
<td></td>
<td></td>
<td></td>
<td>Lean to Fat CLAY (CLUCh): very stiff, mottled moderate yellowish brown and light brown, moist</td>
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</tbody>
</table>

### LOG OF TEST PIT NO. TP-2

<table>
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<th>ELEV. FT</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLE NO.</th>
<th>SAMPLER</th>
<th>MATERIAL DESCRIPTION</th>
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<tbody>
<tr>
<td>32.0</td>
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<td></td>
<td>ORGANOCS</td>
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<tr>
<td>30.0</td>
<td></td>
<td></td>
<td>1</td>
<td>OLDER ALLUVIUM (Golu)</td>
</tr>
<tr>
<td>26.0</td>
<td></td>
<td></td>
<td></td>
<td>Sandy Lean CLAY (CL): very stiff, moderate yellowish brown, dry to slightly moist, moderate yellowish brown to light brown, slightly moist, at 1.3 to 3.</td>
</tr>
<tr>
<td>24.0</td>
<td></td>
<td></td>
<td></td>
<td>Lean to Fat CLAY (CLUCh): very stiff, mottled moderate yellowish brown and light brown, moist</td>
</tr>
</tbody>
</table>

---

**LOG OF TEST PITS**

Campus Pointe Residential Development
Santa Barbara, CA

PLATE A-20
**LOG OF TEST PIT NO. TP-3**

**LOG OF TEST PIT NO. TP-4**

**LOG OF TEST PITS**
Campus Pointe Residential Development
Santa Barbara, CA

---

**TP-3**

**LOCATION**: See Plate 2

**ELEV. H**: 

<table>
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<th>Depth</th>
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<th>Sample No.</th>
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<tr>
<td>28</td>
<td></td>
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</tr>
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</table>

**Surface EL**: 30.0 ft +/- (rel. project datum)

**MATERIAL DESCRIPTION**

- **TOPSOIL**: Dark brown, dry, with numerous roots
- **OLDER ALLUVIUM (Oa)**
  - Sandy to lean Clay (CaC): moderate yellowish brown, with black inclusions
  - dry to slightly moist, from 1 to 2
  - pin sized pores, from 1 to 5
  - slightly moist, below approximately 2

**Completion Depth**: 3.5 ft

**Excavation Date**: Aug 17, 01

---

**TP-4**

**LOCATION**: See Plate 2

**ELEV. H**: 

<table>
<thead>
<tr>
<th>Depth</th>
<th>Material Symbols</th>
<th>Sample No.</th>
<th>Sample Code</th>
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<tr>
<td>28</td>
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</tr>
</tbody>
</table>

**Surface EL**: 30.0 ft +/- (rel. project datum)

**MATERIAL DESCRIPTION**

- **TOPSOIL**: Dark brown, dry, with numerous roots
- **OLDER ALLUVIUM (Oa)**
  - Sandy to lean Clay (CaC): moderate yellowish brown, with black inclusions
  - dry to slightly moist, from 1 to 2
  - pin sized pores, from 1 to 5
  - slightly moist, below approximately 2

**Completion Depth**: 3.5 ft

**Excavation Date**: Aug 17, 01

---

**LOG OF TEST PITS**
Campus Pointe Residential Development
Santa Barbara, CA

---

**PLATE A-21**
**LOG OF TEST PIT NO. TP-5**

**LOCATION:** See Plate 2

**SURFACE EL:** 20.0 ft +/- (rel. project datum)

**MATERIAL DESCRIPTION**

**ARTIFICIAL FILL (AF):**
- Sandy CLAY (CL), very stiff to hard, dark brown, dry

**YOUNGER ALLUVIUM (Yal):**
- Sandy CLAY (CL), dark gray to black, with rootlets, ps sized voids, minor gravel to 3/8", dry
  - becoming moist, at approximately 5'
  - medium stiff, grayish brown and mottled reddish brown and light gray, moist to very moist, at 9'

**Silty fine SAND (SN):**
- mottled light gray and moderate brown, very moist to wet, with minor clay (possible Older Alluvium (Oal))

**COMPLETION DEPTH:** 12.5 ft

**DEPTCH TO WATER:** Not Encountered

**EXCAVATION DATE:** Aug 17, 01

---

**LOG OF TEST PIT NO. TP-6**

**LOCATION:** See Plate 2

**SURFACE EL:** 26.0 ft +/- (rel. project datum)

**MATERIAL DESCRIPTION**

**ORGANIC, wood chips, twigs:**

**YOUNGER ALLUVIUM (Yal):**
- Sandy Silt with clay (ML): pale yellowish brown, dry, cemented

**Fat CLAY (CH):**
- medium stiff, black to dark gray, moist, porous, roots, topsoil like
  - medium stiff to stiff, moist to very moist, fewer pores, at approximately 4'
  - stiff, moist, numerous gypsum pockets, at about 6'

**Silt, moist, grading to mottled moderate brown and dark gray, below 17', gypsum absent**

**COMPLETION DEPTH:** 12.5 ft

**DEPTCH TO WATER:** Not Encountered

**EXCAVATION DATE:** Aug 17, 01

---

**LOG OF TEST PITS**

Campus Pointe Residential Development
Santa Barbara, CA

PLATE A-22
### LOG OF TEST PIT NO. TP-7

**Location:** See Plate 2  
**Surface EL:** 29.0 ft +/- (alt. project datum)

<table>
<thead>
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<th>Depth ft</th>
<th>Material Symbol</th>
<th>Sample No.</th>
<th>Sampler Blow Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>ARTIFICIAL FILL (a)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Younger ALLUVIUM (Qb)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Older ALLUVIUM (Qa)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Sandy CLAY (CL)</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

**Completion Depth:** 6 ft  
**Depth to Water:** Not Encountered  
**Excavation Date:** Aug 17, 01

---

### LOG OF TEST PIT NO. TP-8

**Location:** See Plate 2  
**Surface EL:** 27.0 ft +/- (alt. project datum)

<table>
<thead>
<tr>
<th>Depth ft</th>
<th>Material Symbol</th>
<th>Sample No.</th>
<th>Sampler Blow Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>ALLUVIUM (Qa)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Fat CLAY (CH)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Fat CLAY (CH)</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
| 6        | - moist to very moist below approximately 4’ 5’
| 8        | - decreasing pores with depth, no visible pores, by about 5’ depth |

**Completion Depth:** 5 ft  
**Depth to Water:** Not Encountered  
**Excavation Date:** Aug 17, 01

---

**LOG OF TEST PITS**

Campus Pointe Residential Development  
Santa Barbara, CA
**LOG OF TEST PIT NO. TP-9**

<table>
<thead>
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<th>ELEV. ft</th>
<th>DEPTH ft</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLE NO</th>
<th>MATERIAL DESCRIPTION</th>
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<td>26</td>
<td></td>
<td></td>
<td>1</td>
<td>OLDER ALLUVIUM (Coal)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>push</td>
<td>Clayey Silt (CL): grayish brown, dry, very porous, pores up to approximately 1/16&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Light gray, dry, porous, at 2</td>
</tr>
<tr>
<td></td>
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<td>2</td>
<td>Fat CLAY (CH): very stiff, moderately yellowish brown, moist, blocky, polished surfaces</td>
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</table>

**LOCATION:** See Plate 2

**SURFACE EL.:** 27.0 ft (+) (rel. project datum)

**COMPLETION DEPTH:** 6 ft

**EXCAVATION DATE:** Aug 17, 01

---

**LOG OF TEST PIT NO. TP-10**

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<th>ELEV. ft</th>
<th>DEPTH ft</th>
<th>MATERIAL SYMBOL</th>
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<td>26</td>
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<td>1</td>
<td>YOUNGER ALLUVIUM (Coal)</td>
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<td>Fat CLAY with sand (CH): stiff, grayish brown, slightly moist, numerous roots, blocky structure, porous</td>
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<td></td>
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<td></td>
<td></td>
<td>- light brown slit laminations, at 3'</td>
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<td></td>
<td>- grading tatter, at 3'</td>
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<td>- few pints by 5'</td>
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<td></td>
<td></td>
<td>- few light gray slit pockets, at 5'</td>
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<td></td>
<td></td>
<td>- moist, numerous gypsum calcite pockets, at 7'</td>
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<td></td>
<td>- very moist, below approximately 9' and 10'</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>- grading to medium stiff, mottled grayish brown and moderate brown, very moist, at approximately 11'</td>
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<tr>
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<td></td>
<td></td>
<td>- no gypsum pockets at 11'</td>
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<td>- water seepage, at 13'</td>
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**LOCATION:** See Plate 2

**SURFACE EL.:** 25.0 ft (+) (rel. project datum)

**COMPLETION DEPTH:** 13 ft

**DEPT TO WATER:** 13 ft

**EXCAVATION DATE:** Aug 17, 01

---

**LOG OF TEST PITS**

Campus Pointe Residential Development
Santa Barbara, CA

PLATE A-24
LOG OF TEST PIT NO. TP-11

LOCATION: See Plate 2

MATERIAL DESCRIPTION

- ARTIFICIAL FILL (a)
  - Sandy CLAY (SC), hard, moderate brown, dry
  - OLDER ALLUVIUM (Quol)
  - Sandy CLAY (CL), very stiff, moderate brown, dry
  - Clayey SILT with sand (ML), grayish brown, dry
  - Very porous, numerous rootlets, to a depth of about 2.5' - dry at 2.5'
  - Light gray to pale yellowish brown, at 3'
  - Fat CLAY (CH), stiff, moderate yellowish brown to moderate brown, moist, polished surfaces

LOGGED BY: GS Dentlinger
CHECKED BY: GS Dentlinger
EXCAVATION METHOD: Backhoe
CONTRACTOR: Carroll Backhoe

COMPLETION DEPTH: 5 ft
DEPTH TO WATER: Not Encountered
EXCAVATION DATE: Aug 17, 01

---

LOG OF TEST PIT NO. TP-12

LOCATION: See Plate 2

MATERIAL DESCRIPTION

- ARTIFICIAL FILL (a)
  - Sandy CLAY (CL), hard, moderate brown, dry
  - OLDER ALLUVIUM (Quol)
  - Sandy CLAY (CL), very stiff, moderate yellowish brown, blocky
  - Fat CLAY (CH), stiff, moderate yellowish brown to light brown, slightly moist
  - Becoming moist, by approximately 4'
  - Clayey SAND (SC) to Sandy CLAY (CL): moderate yellowish brown to light brown, moist

LOGGED BY: GS Dentlinger
CHECKED BY: GS Dentlinger
EXCAVATION METHOD: Backhoe
CONTRACTOR: Carroll Backhoe

COMPLETION DEPTH: 5 ft
DEPTH TO WATER: Not Encountered
EXCAVATION DATE: Aug 17, 01
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<th>ELEV. ft</th>
<th>DEPTH ft</th>
<th>MATERIAL SYMBOL</th>
<th>SAMPLE NO.</th>
<th>MATERIAL DESCRIPTION</th>
<th>UNIT WEIGHT, lb/cu ft</th>
<th>UNIT CEMENT, lb/cu ft</th>
<th>WET, %</th>
<th>DRY, %</th>
<th>CONSERV, %</th>
<th>CONSISTENCE</th>
<th>RISSING</th>
<th>PLASTICITY INDEX</th>
<th>CONSISTENCY LIMIT</th>
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LOGGED BY: GSDenlinger
CHECKED BY: GSDenlinger
EXCAVATION METHOD: Backhoe
CONTRACTOR: Carrol Backhoe

The log and data presented are a simplification of actual conditions encountered at the time of excavation at the plotted location. Subsequent conditions may differ from those shown and with the passage of time. (TP-13)
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<th>MATERIAL DESCRIPTION</th>
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<th>D90</th>
<th>D95</th>
<th>D99</th>
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<td>Clay to clayey SAND (SC)</td>
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<td>Clayey SAND (SM)</td>
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<td>10.0</td>
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<tr>
<td>Fine CLAY (CH)</td>
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<td>Drill HOLE depth</td>
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**SUMMARY OF LABORATORY TEST RESULTS**

- **EITC:** Engineering Index Test
- **T.C.:** Total Consistency
- **M.F.C.:** Maximum Fluidity
- **A.F.C.:** Air Fluidity
- **SO.:** Soils
- **PH.:** pH
- **MC.:** Moisture Content
- **LOM:** Liquid Limit
- **MM:** Plastic Limit
- **MWD:** Moulded Weights

---

**Site Location:** Campus Pointe Residential Development, Santa Barbara, CA

**Date:** October 2001

**Project No.:** 01-42-0131

---

**PLATE B-1a**
### SUMMARY OF LABORATORY TEST RESULTS

Campus Pointe Residential Development, Santa Barbara, CA

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<th>DRILL HOLE</th>
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<th>UDW</th>
<th>MC%</th>
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<th>LL</th>
<th>IL</th>
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<th>DIRECT SHEAR</th>
<th>OPT MC%</th>
<th>OPT WP%</th>
<th>COMPRESSION TEST</th>
<th>DIRECT SHEAR</th>
<th>C</th>
<th>PHI</th>
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<th>R</th>
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<td>Fine to medium SAND (SP)</td>
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<td>112</td>
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**SUMMARY OF LABORATORY TEST RESULTS**
Campus Pointe Residential Development, Santa Barbara, CA
GRAIN SIZE CURVES
Campus Pointe Residential Development
Santa Barbara, CA

LEGEND

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CLASSIFICATION

Cc  Cu

Fat CLAY (CH)  Fat CLAY (CH)

GRAW SIZE CURVES

PLATE B-2
DIRECT SHEAR TEST RESULTS
Campus Pointe Residential Development
Goleta, California

PLATE B-4a

COHESION, ksf
ANGLE OF INTERNAL FRICTION, deg
LOCATION
DEPTH, ft
MOISTURE CONTENT, %
UNIT DRY WEIGHT, pcf
MATERIAL DESCRIPTION
SAMPLE CONDITION

0.2
44
DH-4
5
24
102
Clayey SAND (SC) to Sandy CLAY (CL)
Ring Sample
COHESION, ksf

ANGLE OF INTERNAL FRICTION, deg

LOCATION
DEPTH, ft
MOISTURE CONTENT, %
UNIT DRY WEIGHT, pcf
MATERIAL DESCRIPTION
SAMPLE CONDITION

0.3
31
DH-10
2.5
21
98
Lean to Fat CLAY (CL-CH)
Ring Sample

DIRECT SHEAR TEST RESULTS
Campus Pointe Residential Development
Goleta, California

PLATE B-4b
CONSORTION TEST RESULTS
Campus Pointe Residential Development
Santa Barbara, CA
LOCATION
DEPTH, "H"
INITIAL MOISTURE CONTENT, %
UNIT DRY WEIGHT, "pd"
MATERIAL DESCRIPTION
SAMPLE CONDITION

DH-9
2.5
23
103
Fat CLAY (CH)
Ring Sample

CONSOLIDATION TEST RESULTS
Campus Pointe Residential Development
Santa Barbara, CA

PLATE B-6b
CONSOLIDATION TEST RESULTS
Campus Pointe Residential Development
Santa Barbara, CA

LOCATION
DEPTH, "ft"  
INITIAL MOISTURE CONTENT, %  
UNIT DRY WEIGHT, "pcf"  
MATERIAL DESCRIPTION  
SAMPLE CONDITION  

DH-11
15.0
27
67
Far CLAY (CH)
Ring Sample

PLATE B-6c
CONSOLIDATION TEST RESULTS
Campus Pointe Residential Development
Santa Barbara, CA

LOCATION: DH-14
DEPTH, "ft": 7.5
INITIAL MOISTURE CONTENT, %: 20
UNIT DRY WEIGHT, "pcf": 101
MATERIAL DESCRIPTION: Fat CLAY (CH)
SAMPLE CONDITION: Ring Sample