REPORT OF
GEOTECHNICAL INVESTIGATION
PROPOSED LOT 3 COMMERCIAL BUILDING
SOUTHERN CALIFORNIA LOGISTICS AIRPORT
VICTORVILLE, CALIFORNIA

Prepared for:

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Kleinfelder Project No. 76977

December 11, 2006

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December 11, 2006
Project No. 76977

Mr. Brian Parno
Stirling Capital Investments
27422 Portola Parkway, Suite 300
Foothill Ranch, CA 92610

Subject: **Report of Geotechnical Investigation**
Proposed Lot 3 Commercial Building
Southern California Logistics Airport
Victorville, California

Dear Mr. Parno:

Kleinfelder, Inc., (Kleinfelder) is pleased to present this report summarizing our geotechnical investigation for the subject site. The site is located north of Air Expressway and west of Nevada Avenue within the Southern California Logistics Airport in Victorville, California. The purpose of our investigation was to evaluate the subsurface conditions at the site and develop geotechnical recommendations for project design and construction.

It is our opinion, from a geotechnical engineering perspective, that the site is suitable for the proposed development provided the recommendations presented in this report are incorporated into design and construction of the project.

We appreciate the opportunity to be of service on this project. If you have any questions or require additional information, please do not hesitate to contact the undersigned at your convenience.

Respectfully submitted,

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Geotechnical Engineering Report

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The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

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Appendix A Field Exploration
Appendix B Laboratory Testing

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1.0 INTRODUCTION

1.1 GENERAL

Kleinfelder, Inc., (Kleinfelder) was retained by Stirling Capital Investments (Stirling) to conduct a geotechnical investigation at the site of a proposed new building within the Southern California Logistics Airport (SCLA). The scope of our services was provided in our revised proposal entitled *Revised Proposal to Conduct a Geotechnical Investigation, Proposed Lot 3 – Phase 1 & 2, Southern California Logistics Airport, Victorville, California*, revision dated October 11, 2006.

This report presents our recommendations relative to the geotechnical aspects of design and construction for the proposed project. Conclusions and recommendations presented in this report are based on the subsurface conditions encountered at the locations of our field excavations, and the provisions and requirements outlined in the Additional Services and Limitations sections of this report. Recommendations presented in this report should not be extrapolated to other areas or be used for other projects without our prior review.

Kleinfelder previously performed a geotechnical investigation in 2000 for the parcels that are currently designated Lots 1, 2 and 3 (see References). The investigation included 30 borings and 10 test pits distributed over approximately 180 acres. Of these excavations, two borings and three test pits were located within the footprint of the building currently proposed for Lot 3. Data collected from our previous investigation was evaluated in conjunction with data collected for this investigation during the preparation of this report.

1.2 SITE AND PROPOSED PROJECT DESCRIPTION

The site proposed for development is located north of Air Expressway and west of Nevada Avenue within the SCLA in Victorville, California (see Plate 1, Site Vicinity Map). The site consists of a roughly rectangular-shaped parcel that is primarily undeveloped. The parcel is approximately 68 acres in size. Several dirt roads traverse the property and abandoned single residential structures are located along the eastern

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boundary of the site. In addition, foundation slabs were observed in the southeastern portion of the site where structures had been previously demolished. These slabs and the residential structures appear to be remnants of the former George Air Force Base.

Topographically, the site is generally flat and slopes gradually to the south. The elevation of the site is approximately 2,900 feet above mean sea level (MSL) based on the United States Geological Survey (USGS) Victorville, California quadrangle.

Based on a preliminary site plan provided to us by Stirling and prepared by HPA, revision dated November 10, 2006, the proposed development will consist of constructing a single-story building constructed in two phases. The first phase will consist of a 407,612 square-foot commercial building in the eastern half of the site. The second phase will consist of constructing a 601,120 square-foot building addition to the west. The proposed structures will be built using "tilt-up" type slab-on-grade construction. Paved parking and drive areas will surround the building. We anticipate that appurtenant construction will include underground utilities and concrete flatwork.

Building foundation loads and grading plans were unavailable for our review at the time this report was prepared. We anticipate that cuts and fills required to bring the project site to finished grade will be on the order of 5-feet or less, excluding requirements for remedial grading.

1.3 PURPOSE AND SCOPE

The purpose of this investigation was to evaluate subsurface conditions at the site and provide geotechnical recommendations for design and construction of the proposed development. A description of the scope of services performed is presented below.

Task 1 – Literature Review

We began our services by reviewing soils and geologic data in our files and from select public agencies (see References). We have completed a computerized search of appropriate seismic and faulting information as it relates to the site.

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Task 2 – Field Exploration

Prior to conducting the field exploration, our proposed exploration locations were cleared of known existing utility lines through Underground Service Alert (USA). The subsurface exploration program consisted of excavating and logging 21 exploratory borings and 6 exploratory test pits. The borings were advanced to depths ranging between approximately 11½ and 51½ feet below the existing grade. The test pits were excavated to depths ranging between approximately 6 and 7 feet below the existing grade. Bulk and drive soil samples were obtained from the borings for laboratory testing. A detailed description of the field investigation, and the logs of the borings and test pits excavated for this study are presented in Appendix A.

Task 3 – Laboratory Soil Testing

Laboratory testing was performed on soil samples collected during our field exploration to substantiate field classifications and to assess the physical characteristics of the subsurface soils. Testing consisted of in-situ dry unit weight and moisture content, grain size distribution, laboratory maximum dry unit weight and optimum moisture content, direct shear strength, consolidation/collapse potential, R-value, expansion potential, and corrosion analyses. A summary of the laboratory test program and the test results are presented in Appendix B.

Task 4 – Geotechnical Analyses and Report Preparation

Field and laboratory findings were evaluated in conjunction with the proposed use of the property. This report includes conclusions and recommendations regarding the following:

- Regional geologic setting and geologic hazards including the potential for ground rupture due to surface faulting, liquefaction, and other seismically induced hazards.
- Subsurface materials encountered within the exploratory borings and test pits, anticipated groundwater levels and excavation characteristics of these materials.
- Expansion and corrosion potential of the near surface soils.

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- Site seismic coefficients for use in structural design in accordance with the 2001 California Building Code (CBC).
- Guidelines for earthwork construction including recommendations for site preparation, overexcavations, and fill placement and compaction.
- Foundations and slabs-on-grade, allowable bearing pressure, and anticipated total and differential foundation settlements.
- Lateral earth pressures for design of retaining walls and other below grade structures.
- Pipe bedding and trench backfill.
- Asphalt concrete and Portland cement concrete pavement.

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2.0 REGIONAL GEOLOGY

The project site is located within the western Mojave Desert, which is part of the greater Mojave Desert Geomorphic Province, a broad interior region of isolated mountain ranges separated by desert expanses. The western Mojave is a wedge-shaped area bordered on the southwest by the San Gabriel and San Bernardino Mountains, and on the northwest by the Tehachapi Mountains. These surrounding mountains range up to 10,080 and 7,900 feet in altitude, respectively, while the interior desert has relatively low relief. The only major drainage channel within the desert region is the Mojave River – an intermittent river that flows from the San Bernardino Mountains northward, then eastward to its termination at Soda Lake near Baker, California.

The structural geology and fault patterns within the western Mojave Desert are relatively uniform and internally consistent, comprised of a series of northwest-southeast trending faults, in contrast to the fault patterns north and south of the province. Major faults in the area include the San Andreas and Garlock fault zones to the southwest and northwest, respectively, the northwest-trending Helendale, Lockhart, and Lenwood faults to the northeast, and the North Frontal fault zone to the southeast.

Lithologically, the region is characterized by alluvial-filled basins overlying Paleozoic and Mesozoic igneous and metamorphic basement rocks. The basement rocks are exposed at the surface in isolated mountain ranges throughout the desert.

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3.0 LOCAL GEOLOGIC CONDITIONS

3.1 SUBSURFACE SOIL CONDITIONS

The principal alluvial soil deposits encountered during our investigation consist of silty sand (SM), sand (SW & SP), sand with silt (SW-SM & SP-SM), and clayey sand (SC) with occasional interbedded layers of sandy clay (CL) and sandy silt (ML). Although not encountered during our field investigation, we anticipate that undocumented fill soils may exist within the vicinity of the existing structures at the site. The locations of our exploratory borings are shown on Plate 2, Boring Location Map. Detailed descriptions of the subsurface conditions encountered during our field investigation are presented on the Logs of Borings and Test Pits provided in Appendix A.

The alluvial deposits are generally considered suitable for support of the proposed development provided the overexcavation, moisture conditioning, and compaction of the upper soils as recommended in this report are performed.

3.2 GROUNDWATER

Groundwater was not encountered within the excavations performed for this study. Based on our research, groundwater is present at depths greater than 100 feet below existing grade within this area, and is not anticipated to be encountered during site development.

Fluctuations of the groundwater level, localized zones of perched water, and variations in soil moisture content should be anticipated during and following the rainy season. Irrigation of landscaped areas on and adjacent to the site can also cause a fluctuation of local groundwater levels and perched water conditions can develop.

3.3 COLLAPSE POTENTIAL

A collapsible soil is generally defined as a soil, which will undergo a sudden decrease in volume when its internal structural support is lost. Soils found to be most susceptible to collapse include loess (fine-grained wind-deposited soil) deposits, valley alluvium deposited within a semi-arid to arid climate, and residual soil deposits. The degree of

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collapse for a soil sample can be defined by the collapse potential value, which is expressed as a percent collapse of the total sample. The following Table 1, Collapse Potential Values, as defined in the Naval Facilities Engineering Command Design Manual 7.1 and can be used to relate the collapse potential value to the severity of the collapse problem.

Table 1
Collapse Potential Values
NAVFAC DM 7.1, 1986

Collapse Potential Value	Severity of Problem
0-1%	No problem
1-5%	Moderate trouble
5-10%	Trouble
10-20%	Severe trouble
>20%	Very severe trouble

The project site is located in a geologic environment, which may be prone to a collapsible soil problem. Collapse potential testing performed on samples collected during our field exploration indicated a range in values between zero and about 3 percent, at applied vertical stresses of 2,000 pounds per square foot (psf). Comparing our laboratory test results to those values presented in Table 1, the samples tested indicate a varying range from little to moderate trouble. Based on the results of our field exploration, laboratory testing, and geotechnical analyses performed for this investigation, it is our opinion that the site generally has a low to moderate potential for collapsible soil conditions.

To reduce the collapse potential hazard at this site, we recommend removal and re-compaction of the upper soils, as provided in the conclusions and recommendations section of this report. Compaction efforts should include proof-rolling of the exposed overexcavation bottom subgrade with heavy tamping equipment.

Since the introduction of water into the soils can initiate collapse, proper measures should be taken to reduce the potential for future pipe leakage and/or landscape irrigation infiltration into the soils within the areas of the proposed improvements. It is

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very important that storm water runoff be directed from the roof and other improvements to appropriate storm water collection systems. Diligent efforts should be made to provide an efficient means of transport of runoff water to collection devices, preventing runoff water from infiltrating soils within the vicinity of the structure.

3.4 EXPANSIVE SOILS

One near surface soil sample obtained from our field exploration was tested for expansion potential in accordance with UBC Standard 18-2. The results of this test indicate an Expansion Index (EI) of 21. Soils with an EI between 21 and 50 are considered to have a "low" expansion potential as defined by the 2001 California Building Code.

Testing of the final subgrade soils after completion of grading should be conducted to evaluate the expansion potential and confirm or modify the recommendations presented herein.

3.5 CORROSIVITY

One sample of the near-surface soils was tested for potential corrosion to concrete and reinforcing steel. The sample was tested in general accordance with California Standard Test Methods to evaluate pH, resistivity, and water-soluble sulfates and chlorides content. We have provided the corrosion tests as requested, and these tests should be considered as only an indicator of soil corrosivity for the samples tested. Other soils found on site may be more, less, or of a similar corrosive nature.

Although Kleinfelder does not practice corrosion engineering, the results of the corrosion tests indicate that the soils tested can be considered as "moderately" corrosive to buried metals and as possessing a "negligible" exposure to sulfate attack for concrete. If desired by the client, Kleinfelder can recommend a corrosion engineer to evaluate the corrosion potential of the site soils to concrete and buried metals, to recommend further testing as required, and to provide specific corrosion mitigation methods appropriate for the project.

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4.0 GEOLOGIC HAZARDS

4.1 FAULTING AND SEISMICITY

The project site is located in the highly seismic southern California region within the influence of several fault systems that are considered to be active or potentially active. An active fault is defined by the State of California as "a sufficiently active and well defined fault, which has exhibited surface displacement within the Holocene time (the last 11,000 years)." A potentially active fault is defined by the State as "a fault with a history of movement within Pleistocene time (between 11,000 and 1.6 million years ago)." These active and potentially active faults are capable of producing potentially damaging seismic shaking at the site. It is anticipated that the project site will periodically experience ground acceleration as the result of moderate to large magnitude earthquakes. Other active faults without surface expression (blind faults) that are capable of generating an earthquake, or other potentially active seismic sources may be present that are not currently zoned.

Faults are also type classified as Type A, B, or C for Near-Source Zone ground motion (Ca, Cv, Na and Nv) by the State of California and ICBO (in the CBC, Table 16A-U) according to parameters of known slip rate and maximum earthquake magnitude.

We have performed a computer-aided search of the known active and potentially active faults within a 62-mile (100-kilometer) radius of the site and researched available literature to assess the maximum credible earthquakes expected to be generated on each fault. Table 2 summarizes these parameters for 5 out of the 34 known active and potentially active faults or fault segments within the searched radius of the site that in our opinion will have the greatest impact upon the site. Selection of the faults was based on their proximity to the site and their potential to generate strong ground motion on the site. Table 2 was generated using in part the EQFAULT computer program (version 3.00) developed by Blake (2000) as modified using the fault parameters from CGS Open File Report 96-08 and the 1997 UBC fault maps. This table represents deterministic data only and therefore does not identify the probability of reactivation or the on-site effects from earthquakes occurring on any of the other faults in the region.

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Table 2
Significant Faults

Fault Name – Segment	Approx. Distance from Site mi (km)	Maximum Event* (Moment Mag.)	Fault Seismic Source Type
Helendale – South Lockhardt	12.1 (19.4)	7.1	B
North Frontal Fault Zone	15.2 (24.5)	7.0	B
Cleghorn	19.0 (30.5)	6.5	B
San Andreas - Mojave	20.4 (32.8)	7.1	A
San Andreas - Southern	20.6 (33.2)	7.4	A

* As defined by the ICBO (1998) and CGS (OFR 96-08)

Under the current understanding of regional seismo-tectonics, the largest maximum credible event to impact the site may be generated by the Helendale fault (South Lockhardt segment), which is considered capable of generating a moment magnitude M7.1 earthquake, or by the San Andreas fault (Southern segment), which is considered capable of generating a moment magnitude M7.4 earthquake.

4.2 FAULT RUPTURE

The site is not located within a currently delineated State of California Alquist-Priolo Earthquake Fault Zone (Hart and Bryant, 1997). No known active faults have been identified on the site, thus, the potential for future surface fault rupture at the site is considered to be "low." While fault rupture would most likely occur along previously established fault traces, future fault rupture could occur at other locations.

4.3 SECONDARY SEISMIC HAZARDS

Secondary seismic hazards related to ground shaking include ground deformation, tsunamis, and seiches. Due to the inland location of the site and lack of a nearby large body of open water the hazards from tsunamis and seiches are considered low.

Non-tectonic ground deformation consists of surface cracking of the ground with little to no displacement. This type of deformation is not caused by fault rupture. Rather it is

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generally associated with differential shaking of two or more geologic units with differing physical characteristics. The site possesses relatively consistent geologic materials. The potential for ground deformation is considered "low" under current conditions and proposed grades.

4.4 LIQUEFACTION AND SEISMICALLY INDUCED SETTLEMENT

Liquefaction is the sudden loss of shear strength in a loose, saturated granular soil due to vibratory motions such as those associated with earthquakes. Seismically induced soil liquefaction generally occurs in loose, saturated, cohesionless soil when pore pressures within the soil increase during ground shaking. The increase in pore pressure transforms the soil from a solid to a semi-liquid state. These soils typically lose a portion or all of their shear strength and regain strength sometime after shaking stops.

Groundwater was not encountered in any of the borings excavated for this investigation, to the maximum depth explored of approximately 51½ feet below existing grade. Our research indicates that the groundwater levels in the vicinity of the site are greater than 100 feet below the existing ground surface. Due to the density of the soils encountered and the anticipated depth to groundwater, it is our opinion that under a preliminary, screening level liquefaction analysis, the site has a "low" liquefaction potential. The potential for seismic-induced settlement of the on site soils to impact the proposed development is also considered to be low.

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5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 GENERAL

Based on our field exploration, laboratory testing, and geotechnical analyses, it is our opinion that the site is suitable for development of the proposed project as planned, provided the recommendations presented in this report are incorporated into project design and construction.

Detailed geotechnical engineering recommendations addressing the removal of unsuitable soils, placement of compacted soil, building foundations, slabs-on-grade, and retaining walls are presented in the remaining portions of this report. The following opinions, conclusions, and recommendations are based on the properties of the materials encountered in the exploratory borings and the results of our laboratory test program.

5.2 SEISMIC DESIGN CONSIDERATIONS

5.2.1 General

We consider the most significant geologic hazard to the project to be the potential for moderate to severe seismic shaking that is likely to occur during the design life of the proposed development. The site is located in the seismically active southern California region within the influence of several fault systems that are considered to be active or potentially active. These active and potentially active faults are capable of producing potentially damaging seismic shaking at the site. It is anticipated that the project site will periodically experience strong ground acceleration as the result of moderate to large magnitude earthquakes.

5.2.2 Ground Shaking

We recommend, at a minimum, the proposed development be designed in accordance with the requirements of the 2001 edition of the California Building Code (CBC) for Seismic Zone 4. In developing site-specific seismic design criteria, the characteristics

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of the earth units underlying the site are an important input to evaluate the response at a given site. Based on the results of our field exploration, the proposed project site will be underlain primarily by compacted fill soils overlying alluvial fan deposits. Based on the type of materials encountered during this investigation, we have classified the site soil profile for site response as S_C according to Table 16A-J of the 2001 CBC. Presented in Table 3 is a summary of the estimated seismic parameters for the soil profile for structural design per the 2001 CBC.

Table 3
Summary of Seismic Parameters

Site Soil Profile	S_C
Seismic Zone	4
Design Fault	Helendale – South Lockhardt Segment
Near Source Distance	19.4 km
Seismic Source Type	B
Near Source Factor - N_a	1.0
Near Source Factor - N_v	1.0
Seismic Coefficient - C_a	$0.40N_a = 0.40$
Seismic Coefficient - C_v	$0.56N_v = 0.56$

5.3 EARTHWORK

5.3.1 General

All site preparation and earthwork operations should be performed in accordance with applicable codes, safety regulations, and other local, state, or federal specifications. All references to maximum unit weight should be established in accordance with the current ASTM Standard Test Method D 1557 and may supercede references cited herein.

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5.3.2 Stripping and Grubbing

All debris or structures that may be encountered during the stripping operations, including concrete, asphalt concrete, wood, steel, piping, etc. should be separated and disposed of off-site. Any existing utility pipelines that extend beyond the limits of the proposed development and are to be abandoned in place should be appropriately plugged and capped to prevent migration of soil and/or water. All demolition of underground structures should be accomplished under the observation of our representative in order to identify areas requiring over-excavation and compaction during future grading observation.

Prior to site grading, all existing vegetation, organic matter, and debris should be stripped and disposed outside the construction limits. Concrete, brick, organic matter, and other debris, if encountered, may not be used for fill materials. Deeper stripping or grubbing may be required where concentrations of organics are encountered during site grading.

5.3.3 Remedial Grading

Subsequent to stripping and grubbing operations, areas to receive fill should be stripped of all topsoil, and any loose or soft earth materials until a uniform, firm and unyielding subgrade is exposed, as evaluated by the geotechnical engineer or geologist.

We recommend over-excavation and re-compaction of the existing alluvial soils to reduce the potential for excessive settlement and help mitigate the potential for collapse. Specific over-excavation recommendations are provided in the following paragraphs. However, in all instances the minimum depth of overexcavation within all areas of proposed structures should be at least three feet below existing grade. Overexcavation recommendations are herein provided for the following areas.

Shallow Foundations: Footings for the proposed structure should be placed on a minimum of 3 feet of engineered fill compacted to at least 90 percent relative compaction (ASTM D 1557). For example, if footings are embedded 2 feet below existing grade, overexcavation of 5 five below existing grade is recommended. The engineered fill should extend horizontally beyond the edges of all foundation elements a minimum distance of 5 feet.

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Slab-on-Grade: The slab-on-grade for the proposed structure should be placed on a minimum of 3 feet of engineered fill compacted to at least 90 percent relative compaction (ASTM D 1557).

Pavement Subgrade: New asphalt concrete or Portland cement concrete pavements should be placed over a minimum of 2 feet of engineered fill compacted to at least 90 percent relative compaction (ASTM D 1557). The top 12 inches of engineered fill measured from the finished subgrade elevation should be compacted to at least 95 percent relative compaction. This engineered fill thickness is in addition to the asphalt concrete, Portland cement concrete, and aggregate base layers presented in Section 5.8 of this report.

All over-excavations should extend to a depth where the project geologist or geotechnical engineer has deemed the exposed soils as being suitable for receiving compacted fill. The over-excavation depths may be modified once final grading plans are prepared and reviewed by Kleinfelder.

Prior to the placement of compacted fill, and after site preparation and remedial grading have been performed, processing of the approved excavation bottom should be performed by scarifying to a minimum depth of 6 inches, moisture conditioning as necessary to near optimum moisture content, and compacting to a minimum of 90 percent of the maximum dry unit weight, based on ASTM D 1557. Compaction efforts should also include proof-rolling of the exposed overexcavation bottom with heavy tamping equipment to help mitigate against collapsible soils.

The removal and stripping operations should expose a firm and unyielding subgrade that is free of significant voids. The materials exposed at the bottom of excavations should be observed by a geotechnical engineer or geologist from our office prior to the placement of any compacted fill soils. Additional removals may be required as a result of observation and/or testing of the exposed subgrade subsequent to the required over-excavation. A representative from our firm should be present during all site clearing and grading operations to monitor site conditions; substantiate proper use of materials; evaluate compaction operations; and verify that the recommendations contained herein are met.

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5.3.4 On-site Materials

Borings were advanced with little to moderate effort within the existing on-site soils. Conventional earth moving equipment is expected to be capable of performing the excavations required.

The on-site soils encountered during our investigation, excluding organics, debris, and/or other deleterious materials, are considered suitable for use as engineered fill. When adequately compacted at an appropriate moisture content, these materials can be expected to possess suitable bearing and settlement characteristics for the proposed project.

5.3.5 Import Materials

All import fill soils should be free from deleterious material and debris. Import materials, if required, should have a "very low" to "low" expansion potential, i.e. have an expansion index of less than 50. All imported fill should be compacted to the general recommendations provided for compacted fill.

5.3.6 Compaction Criteria

All fill soils, either native, imported, or blended mixes required to bring the site to final grade should be placed as compacted fill. All soil intended for compacted fill should be uniformly moisture-conditioned to near optimum moisture content, placed in horizontal lifts less than 8 inches in loose thickness, and compacted to at least 90 percent relative compaction based on ASTM D 1557. The upper 12 inches of fill within pavement areas should be compacted to a minimum of 95 percent relative compaction (ASTM D 1557). Additional fill lifts should not be placed if the previous lift did not meet the required dry unit weight or if soil conditions are not stable.

5.4 FOUNDATION RECOMMENDATIONS

5.4.1 General

Based upon the data collected during this study, and from a geotechnical engineering standpoint, it is our opinion that the building foundations may be designed using conventional spread and continuous strip footings with slab-on-grade floors, provided

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the recommendations presented in this report are incorporated into the design and construction of the project. Recommendations for the design of foundations and slabs-on-grade are presented in the following sections.

5.4.2 Conventional Shallow Foundations

The proposed building can be designed with conventional continuous strip footings and isolated spread footings. Footings should have a minimum width of 18 inches and a minimum embedment depth of 24 inches below the lowest adjacent final grade. Foundations constructed in accordance with these recommendations may be designed using an allowable soil bearing pressure of 3,000 pounds per square foot (psf). Footings should be designed by the structural engineer for any specific loading, settlement, or expansive soil conditions. The allowable bearing pressure provided above is a net value; therefore, the weight of the foundation (which extends below grade) may be neglected when computing dead loads. The allowable bearing pressure may be increased by 1/3 for short-term loading due to wind or seismic forces.

Soils removed during any footing or utility trench excavation should not be spread or placed over compacted finished grade soils unless subsequently compacted to at least 90 percent of the maximum dry unit weight, as evaluated by ASTM D 1557, and near optimum moisture content.

Footings may experience an overall loss in bearing capacity or an increased potential to settle where located in close proximity to existing or future utility trenches. Furthermore, stresses imposed by the footings on the utility lines may cause cracking, collapse, and/or a loss of serviceability. To reduce this risk, footings should extend below a 1:1 plane projected upward from the closest bottom corner of the trench.

At the completion of grading, representative samples of the materials at footing grade should be evaluated for expansion potential and corrosivity.

5.4.3 Slabs-On-Grade

Concrete slabs-on-grade may be used for the proposed structure. Slabs-on-grade should be placed on compacted engineered fill that is uniform in composition and at least 3 feet in thickness. We recommend that interior concrete slabs supported-on-

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grade be underlain by a capillary break to reduce the potential for soil moisture migrating upwards toward the slab. Concrete floor slabs should be reinforced as required by the structural engineer. The structural engineer should design all slabs for any specific loading, settlement, or expansive soil conditions. At the completion of grading, representative samples of the materials at pad grade should be evaluated for expansion potential to verify or modify these recommendations.

We anticipate that some of the proposed floor slabs will be covered with moisture-sensitive floor coverings. Within areas where moisture sensitive flooring will be placed, we recommend the placement of an impermeable membrane such as visqueen, or equivalent, to act as a vapor barrier to reduce the potential for upward migration of water vapor through the slab. The vapor barrier should have a thickness of at least ten mils. To promote uniform curing of the slab and provide protection of the membrane during construction, clean, fine-to-medium-grained sand, 2 inches thick, should be placed on top of and below the membrane, for a 4-inch thick sand blanket, prior to the placement of concrete. This sand should be moistened immediately prior to concrete placement.

Clean sand should conform to the specifications for concrete sand in the latest editions of the Standard Specifications for Public Works Construction (Green Book). Generally, the gradation range of clean sand should consist of 100% passing the No. 4 sieve to less than 5% passing the No. 200 sieve. In general, the on-site soils do not appear to meet this requirement. All areas adjacent to the building, including planters, should be designed to drain away from the structure to avoid an accumulation of water beneath the slab.

Concrete should not be placed if sand overlying the vapor barrier has been allowed to become wet (due to precipitation or excessive moistening) or if standing water is present above the membrane. Excessive water beneath interior floor slabs could result in significant vapor transmission through the slab, adversely affecting moisture-sensitive floor coverings.

Although vapor barrier systems are currently the industry standard, this system may not be completely effective in preventing floor slab moisture problems. These systems typically will not necessarily ensure that floor slab moisture transmission rates will meet floor-covering manufacturer standards or that indoor humidity levels will be appropriate

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to inhibit mold growth. In many cases, floor moisture problems are the result of either improper curing of floor slabs or improper application of flooring adhesives.

Our evaluation has not included services to address the influence of moisture vapor transmission through building floor slabs. Slab and flooring system design experts should be retained to provide design recommendations consistent with the maximum allowable moisture transmission rate as it may affect flooring performance and indoor humidity levels.

Special precautions must be taken during the placement and curing of all concrete slabs. Excessive slump (high water-cement ratio) of the concrete and/or improper curing procedures used during either hot or cold weather conditions could lead to excessive shrinkage, cracking, or curling of the slabs. High water-cement ratio and/or improper curing also greatly increase the water vapor permeability of concrete. We recommend that all concrete placement and curing operations be performed in accordance with the American Concrete Institute (ACI) Manual.

5.4.4 Footing and Slab-On-Grade Observation

Prior to placing steel or concrete, footing excavations should be cleaned of all debris, loose or soft soil, and water. All footing excavations should be observed by an engineer from our firm just prior to placing steel or concrete to verify that the recommendations contained herein are implemented during construction. Subgrade soils beneath slabs-on-grade should also be observed during pre-moistening operations to verify that the recommendations contained herein are implemented during construction.

5.4.5 Estimated Settlements

Total settlement of the foundation will vary depending on the plan dimensions of the foundation and the actual load supported. Based on anticipated foundation dimensions and loads, and assuming the site is prepared as recommended under Section 5.3, it is our opinion that the total and differential settlement due to static loading between similarly loaded adjacent footings should be approximately 1-inch and ½-inch over a distance of 40 feet, respectively. In the event that the foundation soils become saturated settlement greater than one inch could occur due to isolated collapsible soils.

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5.4.6 Lateral Earth Pressures

The lateral earth pressure values for level backfill are provided for walls backfilled with drainage materials and existing on-site soils. Retaining walls or structures should be designed for an active soil pressure equivalent to a fluid density of 35 pounds per cubic foot (pcf). The active lateral earth pressures are for horizontal backfills using the on-site native soils on walls that are free to rotate at least 0.1 percent of the wall height. Walls, which are restrained against movement or rotation at the top, should be designed for a soil pressure equivalent to a fluid density of 55 pcf.

The recommended lateral earth pressures assume that drainage is provided behind the walls to prevent the buildup of hydrostatic pressures. Walls should be provided with drains to reduce the potential for the buildup of hydrostatic pressure. Drains may consist of a 2-foot-wide zone of ¾-inch rock wrapped in filter fabric located immediately behind the wall extending to within 1 foot of the ground surface. Perforated Schedule 40 PVC pipe should be installed within the rock at the base of the drain and sloped to discharge to a suitable collection facility. Commercially available drainage panels could be used as an alternative. The product manufacturer's recommendations should be followed in the installation of a drainage panel.

Resistance to lateral loads (including those due to wind or seismic forces) may be provided by frictional resistance between the bottom of concrete foundations and the underlying soil, and by passive soil pressure against the sides of the foundations. A coefficient of friction of 0.35 may be used between cast-in-place concrete foundations and the underlying soil. Passive pressure available in engineered fill may be taken as equivalent to the pressure exerted by a fluid weighing 325 pcf, not to exceed 3,000 psf. The passive resistance may be increased by one-third when considering loads of short duration including wind or seismic loads.

The upper 1-foot of soil should not be considered when calculating passive pressure unless confined by overlying asphalt concrete pavement or Portland cement concrete slab. The passive resistance of the subsurface soils will diminish or be non-existent if trench sidewalls slough, cave, or are overwidened during or following excavations. If this condition is encountered, our firm should be notified to review the condition and provide remedial recommendations, if warranted.

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The above values are applicable if the on-site soils are used for backfill behind the walls. The recommended values do not include compaction or truck-induced wall pressures. Care must be taken during the compaction operation not to overstress the wall. Heavy construction equipment should be maintained a distance of at least 3 feet away from the walls while the backfill soils are being placed. Hand-operated compaction equipment should be used to compact the backfill soils within a 3-foot-wide zone adjacent to the walls.

5.5 TEMPORARY EXCAVATIONS

5.5.1 General

All excavations must comply with applicable local, state, and federal safety regulations including the current OSHA Excavation and Trench Safety Standards. Construction site safety generally is the sole responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. We are providing the information below solely as a service to our client. Under no circumstances should the information provided be interpreted to mean that Kleinfelder is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

5.5.2 Temporary Slopes

Near-surface soils encountered during our field investigation consisted predominantly of silty sand (SM), sand with silt (SP-SM), and clayey sand (SC). In our opinion, these soils would be considered a Type "C" soil with regard to the OSHA regulations. For this soil type, OSHA requires a maximum slope inclination of 1.5:1 (horizontal:vertical) or flatter for excavations 20 feet or less in depth. Steeper cut slopes may be utilized for excavations less than 5 feet deep, depending on the strength, moisture content, and homogeneity of the soils as observed during construction. Loose or running soils may require flatter slope inclinations.

5.5.3 Shoring

Shoring may be required where space or other restrictions do not allow a sloped excavation. Braced excavations should be designed to resist a uniform horizontal soil

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pressure of 25H (in pounds per square foot, psf) where "H" is the excavation depth in feet. The values provided above assume a level ground surface adjacent to the top of the shoring.

Fifty percent of an areal surcharge placed adjacent to the shoring may be assumed to act as a uniform horizontal pressure against the shoring. Special cases such as combinations of slopes and shoring or other surcharge loads (not specified above) may require an increase in the design values recommended above. These conditions should be evaluated by the project geotechnical engineer on a case-by-case basis. The contractor should be responsible for the structural design and safety of all temporary shoring systems.

5.6 TRENCH BACKFILL

5.6.1 Materials

Pipe zone backfill (i.e., material beneath and to 12 inches above the top of the pipe) should consist of sand or similar granular material having a minimum sand equivalent value of 30. Trench zone backfill (i.e., material placed between the pipe zone backfill and finished subgrade) may consist of native or import soil, which meets the requirements for engineered fill provided in Section 5.3.

Recommendations provided above for pipe zone backfill are minimum requirements only. More stringent material specifications may be required to fulfill local building requirements and/or bedding requirements for specific types of pipes. We recommend the project Civil Engineer develop these material specifications based on planned pipe types, bedding conditions, and other factors beyond the scope of this study.

5.6.2 Compaction Criteria

Pipe-zone and above pipe-zone backfill should be moisture conditioned to near optimum moisture content and placed in horizontal lifts less than 8 inches in loose thickness and compacted to at least 90 percent of the maximum dry unit weight based on ASTM Test Method D 1557. Under pavement sections, the upper 12 inches of subgrade soil below the pavement section should be compacted to at least 95 percent relative compaction (ASTM D 1557). Backfill materials should be brought up at

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substantially the same rate on both sides of the pipe. Reduction of the lift thickness may be necessary to achieve the above recommended compaction. Mechanical compaction is recommended; ponding or jetting should be avoided, especially in areas supporting structural loads or beneath concrete slabs supported-on-grade, pavements, or other improvements.

5.7 SURFACE AND SUBGRADE DRAINAGE

Foundation and slab performance depends greatly on how well runoff water drains from the site. Positive drainage should be provided to direct the flow of water away from slopes. Adequate provisions should be made to control and limit moisture changes in the subgrade beneath footings and floor slabs. These may include positive drainage away from building foundations. It is also recommended that all pad drainage and roof runoff be collected and drained away from the building pads to proper drain outlets.

Measures should be taken to reduce the potential for future pipe leakage and/or landscape irrigation infiltration into the soils within the areas of the proposed structures. Surface water should not be allowed to flow against or toward foundation elements. Outlets for gutter systems should discharge water either into storm drains or onto paved surfaces that quickly remove water from the area. Where outlets must discharge into landscape areas, the outlets should have splash blocks or other means of directing the water away from the foundation. Landscape borders should not act as traps for water within landscape areas.

Planters should be built such that water exiting from them will not seep into the foundation areas or beneath slabs and pavement. Maintenance personnel should be instructed to limit irrigation to the minimum actually necessary to properly sustain landscaping plants. Potential sources of water such as water pipes and drains should be frequently examined for signs of leakage or damage. Any such leakage or damage should be promptly repaired.

The drainage pattern should be established at the time of final grading and maintained throughout the life of the project. Structural performance is dependent on many drainage-related factors such as landscaping, irrigation, lateral drainage patterns, and other improvements.

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5.8 PRELIMINARY PAVEMENT DESIGN

The appropriate pavement design section depends primarily on the shear strength of the subgrade soil exposed after grading and anticipated traffic over the useful life of the pavement. Pavement sections provided in the following sections are based on the soil conditions encountered during our field investigation, laboratory testing, and our assumptions regarding final site grades. We recommend representative roadway subgrade samples be obtained during grading and R-Value tests performed. Should the results of these tests indicate a significant difference, the design pavement sections provided above may need to be revised.

To reduce potential settlement, excess soil material, and/or fill material removed during any footing or utility trench excavation, should not be spread or placed over compacted finished grade soils unless subsequently compacted to at least 95 percent of the maximum dry unit weight, as evaluated by ASTM D 1557 test procedure, and at near optimum moisture content, if placed under areas designated for pavement. Pavement sections provided below assume that heavy construction traffic will not be allowed on finished pavement sections.

5.8.1 Asphalt Concrete Pavement

The following asphalt concrete (flexible) pavement sections are based on a minimum R-Value of 36 for soil, R-Value of 78 for base materials, current Caltrans design procedures, and assumed traffic indices. The traffic indices assumed should be reviewed by the project Owner, Architect, and/or Civil Engineer to evaluate their suitability for this project. Changes in the traffic indices will affect the corresponding pavement section.

Table 4
Asphalt Concrete Pavement Sections

Traffic Index	Asphalt Concrete Thickness (in.)	Aggregate Base Thickness (in.)
4.0	3.0	4.0
5.0	3.0	5.0
7.0	4.0	8.0
8.0	5.0	9.0

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- Pavement should be underlain by at least 12 inches of engineered fill compacted to at least 95 percent relative compaction (ASTM D 1557).
- Subgrade soils should be in a stable, non-pumping condition at the time aggregate base materials are placed and compacted.
- Asphalt concrete paving, aggregate base materials, and placement methods should conform to the latest edition of the Standard Specification for Public Works referred to as the Green Book or current Caltrans Specifications.
- Asphalt concrete and aggregate base materials should be compacted to at least 95 percent relative compaction (ASTM D 1557).
- Within the structural pavement section areas, positive drainage (both surface and subsurface) should be provided. In no instance should water be allowed to pond on the pavement. Roadway performance depends greatly on how well runoff water drains from the site. This drainage should be maintained both during construction and over the entire life of the project.

5.8.2 Portland Cement Concrete Pavement

Portland cement concrete (rigid) pavements may be desirable in loading dock, trash collection, and other areas subject to frequent traffic loads. For the recompacted on-site soils and an assumed design modulus of subgrade reaction of 150 pounds per cubic inch, the concrete pavement should have a minimum thickness of 7-inches and a minimum 28-day compressive strength of 3,500 psi. Control joints should be spaced at a maximum of every 15 feet. Rigid pavements should be placed on at least 4 inches of aggregate base compacted to a minimum of 95 percent relative compaction (ASTM D 1557).

A minimum of 12 inches of engineered fill compacted to at least 95 percent relative compaction (ASTM D 1557) should be placed beneath the rigid pavement and aggregate base for purposes of providing additional structural strength and a more uniform bearing surface for the pavement.

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6.0 ADDITIONAL SERVICES

6.1 PLANS AND SPECIFICATIONS REVIEW

We recommend Kleinfelder, Inc., be retained to review preliminary foundation and earthwork plans and specifications. It has been our experience that this service provides an opportunity to review whether or not our recommendations have been properly interpreted and to correct possible misunderstandings of our recommendations prior to the start of construction. In the event Kleinfelder is not retained to perform this recommended review, we will assume no responsibility for misinterpretation of our recommendations. This review may be performed in accordance with our current fee schedule.

6.2 CONSTRUCTION OBSERVATION AND TESTING

We recommend that Kleinfelder, Inc., be retained to provide observation and testing services during site earthwork and construction of foundations. This will allow us the opportunity to compare actual subsurface soil conditions with those encountered during our field exploration and, if necessary, to provide supplemental recommendations, if warranted due to unanticipated subsurface conditions.

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7.0 LIMITATIONS

Recommendations contained in this report are based on our field observations and subsurface explorations, limited laboratory tests, and our present knowledge of the proposed construction. It is possible that soil conditions vary between or beyond the points explored. If soil or groundwater conditions are encountered during construction that differ from those described herein, we should be notified immediately in order that a review may be made and any supplemental recommendations provided. If the scope of the proposed construction, including the proposed loads or structural locations, changes from that described in this report, our recommendations should also be reviewed. We have not reviewed the final grading plans or foundation plans for the project.

Our corrosion recommendations are preliminary. Kleinfelder is not a corrosion engineering consultant. Specific recommendations for corrosion protection should be obtained from a corrosion specialist.

Our evaluation of subsurface conditions at the site has considered subgrade soil and groundwater conditions present at the time of our investigation. The influence(s) of post-construction changes to these conditions such as introduction of water into the subsurface will likely influence future performance of the proposed project. Whereas our scope of services addresses present groundwater conditions; future irrigation, broken water pipelines, etc. may adversely influence the project and should be addressed and mitigated, as needed, by specialized slab and flooring system designers having local knowledge.

Other standards or documents referenced in any given standard cited in this report, or otherwise relied upon by the authors of this report, are only mentioned in the given standard; they are not incorporated into it or "included by reference", as the latter term is used relative to contracts or other matters of law.

We have strived to present the findings, conclusions and recommendations in this report in a manner consistent with the standards of care and skill ordinarily exercised by members of this profession practicing under similar conditions in the area of San Bernardino County, California, and at the time the services were performed. No warranty, express or implied, is made. The recommendations provided in this report are

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based on the assumption that an adequate program of tests and observations will be conducted by Kleinfelder during the construction phase in order to evaluate compliance with our recommendations.

This report may be used only by the client and only for the purposes stated, within a reasonable time from its issuance, but in no event later than one year from the date of the report. Land use, site conditions (both on site and off site) or other factors may change over time, and additional work may be required with the passage of time. Any party other than the client who wishes to use this report shall notify Kleinfelder of such intended use. Based on the intended use of the report, Kleinfelder may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the client or anyone else will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party, and client agrees to defend, indemnify, and hold harmless Kleinfelder from any claim or liability associated with such unauthorized use or non-compliance.

The scope of our geotechnical services did not include any environmental site assessment for the presence or absence of hazardous/toxic materials. Kleinfelder will assume no responsibility or liability whatsoever for any claim, damage, or injury which results from pre-existing hazardous materials being encountered or present on the project site, or from the discovery of such hazardous materials.

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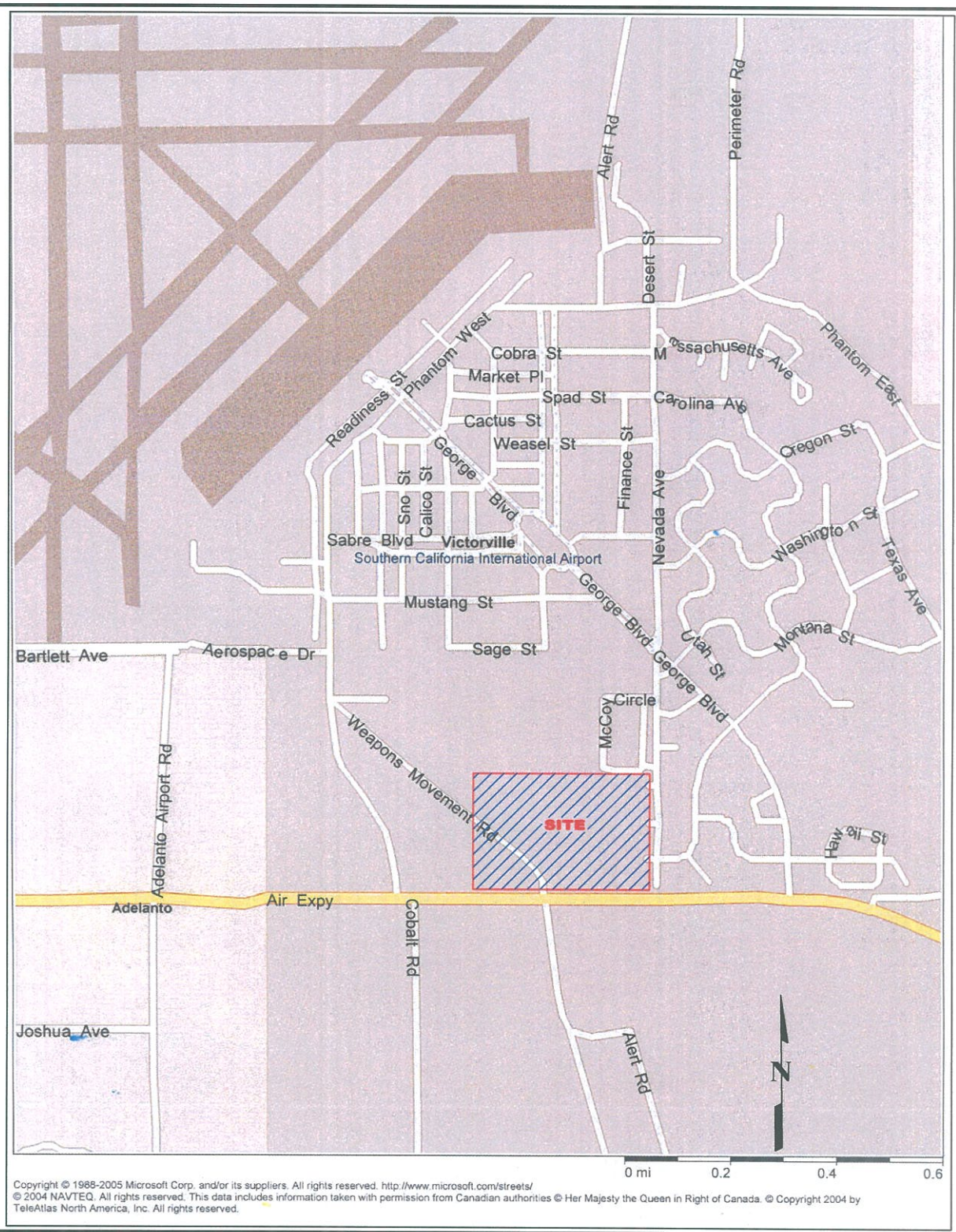
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PLATES



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SITE VICINITY MAP

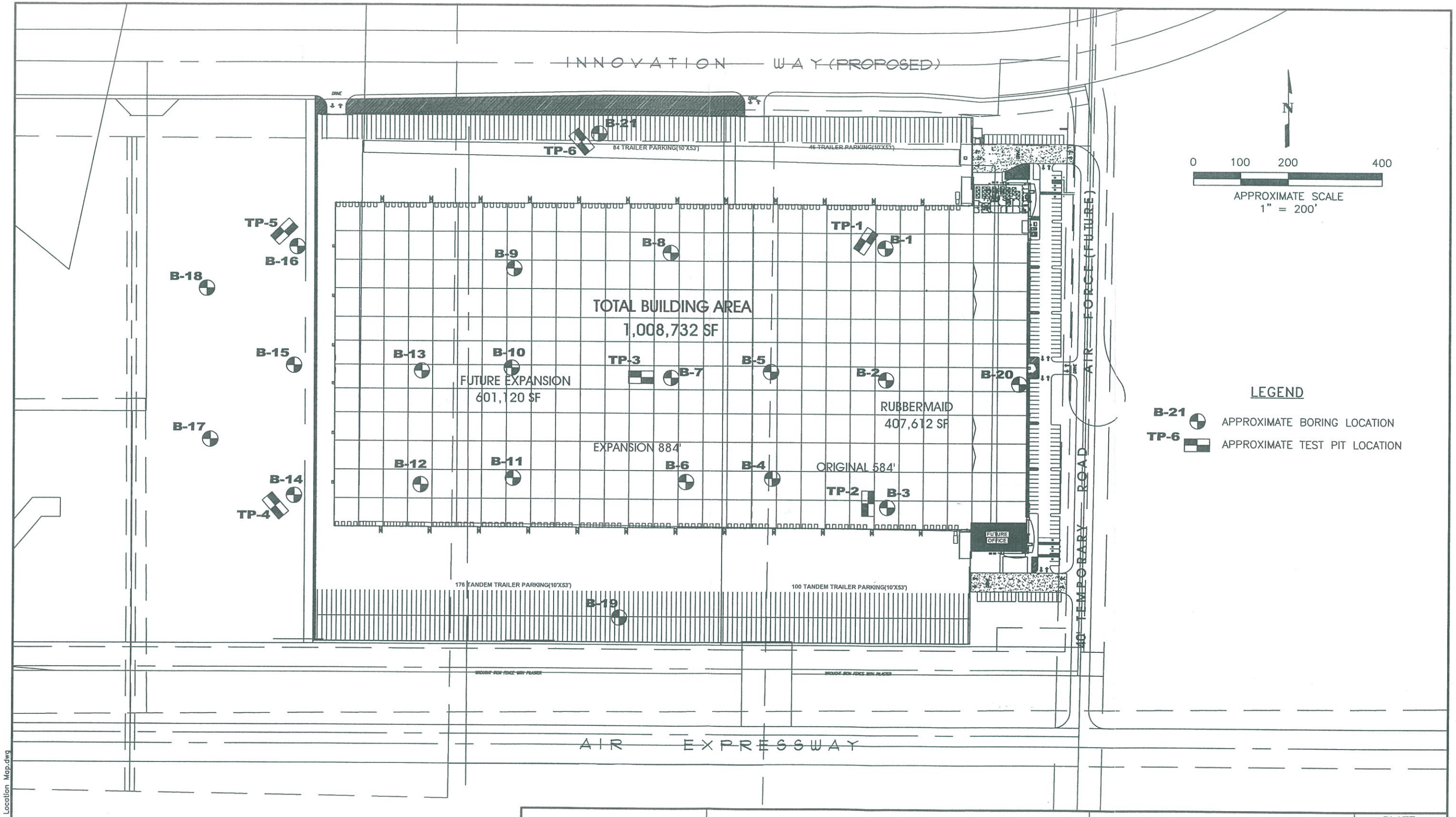
PROPOSED LOT 3
SOUTHERN CALIFORNIA LOGISTICS AIRPORT
VICTORVILLE, CALIFORNIA

DRAWN BY: DRD
REVISED BY:
CHECKED BY: SGL
PLATE 1

DATE: 12-2006 | APPROVED BY: | PROJECT: 76977 | FILE NAME:

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BASE MAP PROVIDED BY: HILL PINCHERT ARCHITECTS, DATED NOVEMBER 10, 2006.

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DRAWN BY: DRD	**BORING LOCATION MAP**	PLATE 2
REVISED BY:		
CHECKED BY: SGL	PROPOSED LOT 3 SOUTHERN CALIFORNIA LOGISTICS AIRPORT VICTORVILLE, CALIFORNIA	
DATE: 12-2006 APPROVED BY:	PROJECT: 76977 FILE NAME:	

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APPENDIX A

FIELD EXPLORATION

APPENDIX A
FIELD EXPLORATION

The subsurface exploration program consisted of excavating and logging 21 hollow-stem auger borings and 6 exploratory test pits. The borings extended to depths ranging from approximately 11½ to 51½ feet below the existing grade. The test pits were excavated to approximately 6 to 7 feet below the existing grade. The exploratory borings were advanced using a Mobile B-53, truck-mounted drill rig equipped with 8-inch diameter hollow-stem augers and an automatic hammer. The exploratory test pits were excavated with a rubber-tire mounted backhoe equipped with a 24-inch wide bucket. Plate 2 shows the approximate locations of the exploratory borings and test pits. The specific boring and test pit locations were established from current landmarks, pacing, and rough measurements. The described locations should be considered accurate only to the degree implied by the method of measurement used.

A legend to the logs is presented as Plate A-1. The logs of borings and test pits are presented as Plates A-2 through A-28. The logs describe the earth materials encountered, indicate the locations of the samples obtained, and show field and laboratory tests performed. The excavations were logged by a staff geologist from this firm using methods outlined in the Unified Soil Classification System (USCS) and general procedures established in ASTM D 2488. The boundaries between soil types shown on the logs are approximate because the transition between different soil layers may be gradual. Bulk and in-place samples of representative earth materials were obtained from the borings.

In-place soil samples were obtained from the borings using either a Standard Penetration (SPT) or California-type Sampler driven a total of 18-inches (or until practical refusal) into the undisturbed soil at the bottom of the boring. The soil sampled by the SPT (2-inch O.D., 1.5 inches I.D.) or California-type sampler (3-inch O.D., 2.4 inches I.D.) was returned to our laboratory for testing. The samplers were driven using a 140 pound hammer falling 30 inches. The total number of hammer blows required to drive the sampler the final 12 inches is termed the blow count and is recorded on the Logs of Borings. Bulk samples of the soils were retrieved directly from the auger blades. In-situ dry unit weight and moisture content tests were performed in the exploratory test pits using a nuclear density gauge in general accordance with ASTM

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Standard Test Methods D 2922 and ASTM D 3017 (Nuclear Method for Determination of Density and Moisture, respectively). All borings and test pits were backfilled using the soil from cuttings.

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UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISION		LTR	ID	DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW		Well-graded gravels, gravel-sand mixtures
		GP		Poorly-graded gravels, gravel-sand mixtures
		GM		Silty gravels, gravel-sand-silt mixtures
		GC		Clayey gravels, gravel-sand-clay mixtures
	SAND AND SANDY SOILS	SW		Well-graded sands, gravelly sands
		SP		Poorly-graded sands and gravelly sands
		SM		Silty sands, sand-silt mixture
		SC		Clayey sands, sand-clay mixture

MAJOR DIVISION		LTR	ID	DESCRIPTION
FINE GRAINED SOILS	SILTS AND CLAYS LL < 50	ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands
		CL		Inorganic clays of low to medium plasticity; gravelly clays silty clays,sandy clays, lean clays
		OL		Organic silts and organic silt-clays of low plasticity
	SILTS AND CLAYS LL > 50	MH		Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
		CH		Inorganic clays of medium to high plasticity
		OH		Organic clays of medium to high plasticity
	HIGHLY ORGANIC SOILS	Pt		Peat, muck and other highly organic soils

▼ Approximate water level observed in boring following drilling

SOIL SAMPLE



Bulk Sample

Drive Sample - California Sample

Shelby Tube Sample

Standard Penetration Test (SPT) Sample

ADDITIONAL TESTS

CN	-	Consolidation
COR	-	Corrosion Potential
CP	-	Collapse Potential
DS	-	Direct Shear
EI	-	Expansion Potential
MAX	-	Maximum Dry Density
SG	-	Specific Gravity
PI	-	Plasticity Index
RV	-	R-Value
SE	-	Sand Equivalent
GS	-	Grain Size Distribution

NOTES:

Blow counts represent the number of blows of a 140-pound hammer falling 30 inches required to drive a sampler through the last 12 inches of an 18-inch penetration, unless otherwise noted.

The lines separating strata on the logs represent approximate boundaries only. The actual transition may be gradual. No warranty is provided as to the continuity of soil strata between borings. Logs represent the soil section observed at the boring location on the date of drilling only.

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LEGEND TO LOGS

PLATE
A-1

Date Drilled	10/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/30/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
					SM	**Silty Sand:** tan, dry, fine to medium grained			
	1	21			SW-SM	**Sand with Silt:** light brown, dry, medium dense, fine to coarse grained	115	1.5	GS
5	2	9				-- loose			
10	3	35				-- medium dense	111	0.7	
15	4	65			CL	**Sandy Clay:** brown, dry, hard, fine grained sand, iron staining			GS
20	5	23, 50/5"			SP	**Sand:** light brown, dry, very dense, fine grained			
25	6	36				-- dense			
						Boring terminated at 26.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B- 1

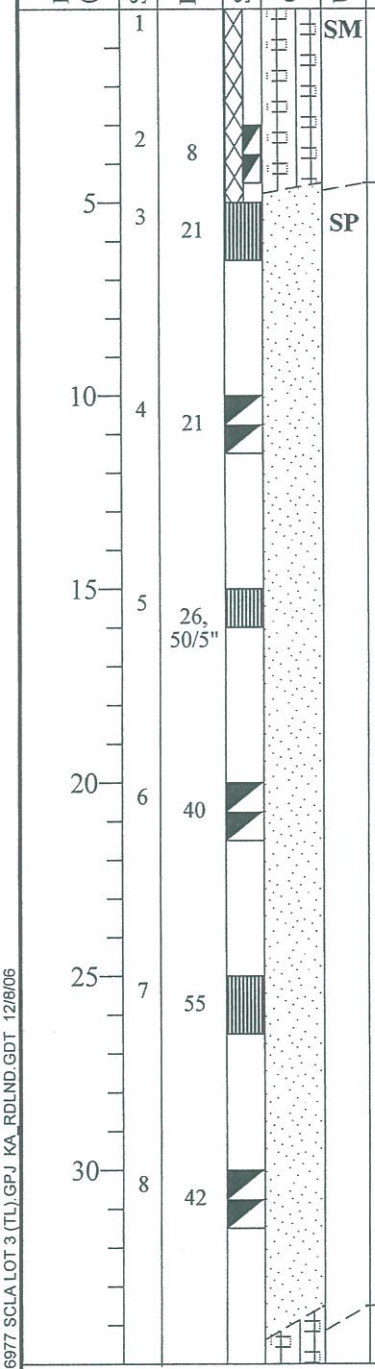
PLATE A-2

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

Date Drilled	10/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/30/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.



Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1				SM	**Silty Sand:** light brown, dry, fine to medium grained			
	2	8				-- loose			MAX
5	3	21			SP	**Sand:** light brown, dry, medium dense, fine to medium grained, trace silt	121	0.6	
10	4	21							
15	5	26, 50/5"				-- red-brown, very dense			
20	6	40				-- dense, trace fine gravel			
25	7	55							
30	8	42				-- brown to red-brown, slightly moist, fine to coarse grained			

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

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LOG OF BORING B- 2

PLATE A-3a

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	9	65			SM	**Silty Sand:** brown, moist, very dense, fine grained, iron staining			
40	10	48			SP	**Sand:** light brown, dry, dense, fine to medium grained			
45	11	27, 50/5"				-- orange-brown, very dense			
50	12	24			SM	**Silty Sand:** brown, slightly moist, medium dense, fine grained, some clay			
						Boring terminated at 51.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B- 2

PLATE

A-3b

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Date Drilled	10/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/30/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
					SM	**Silty Sand:** brown, dry, fine grained			
	1	14			SP	**Sand:** light brown, dry, medium dense, fine to medium grained	116	1.2	
5	2	12							
10	3	42				-- tan, dense			
15	4	24				-- medium dense, 2-inch thick interbedded lense of light brown clayey sand, caliche			
20	5	12, 26, 50/5"			SM	**Silty Sand:** brown, slightly moist, very dense, fine grained, iron staining			
					SC	**Clayey Sand:** brown, moist, medium dense, fine grained, iron staining			
25	6	28							
						Boring terminated at 26.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

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LOG OF BORING B- 3

PLATE A-4

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Date Drilled	10/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/30/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
					SM	**Silty Sand:** light brown, dry, fine to medium grained			
	1	17			SC-SM	**Silty Clayey Sand:** light tan, dry, medium dense, fine to medium grained, cemented with caliche	117	1.2	
5	2	10			SP	**Sand:** light bronw, dry, loose, fine to medium grained			
10	3	40				-- dense	116	0.7	
15	4	28			SM	**Silty Sand:** brown, dry, medium dense, fine grained			
20	5	17, 50/5"				-- very dense, caliche, some clay			
25	6	60				-- lesser percentage of fines			
30	7	14, 50/5"				-- iron staining, trace clay			
						Boring terminated at 31.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B- 4

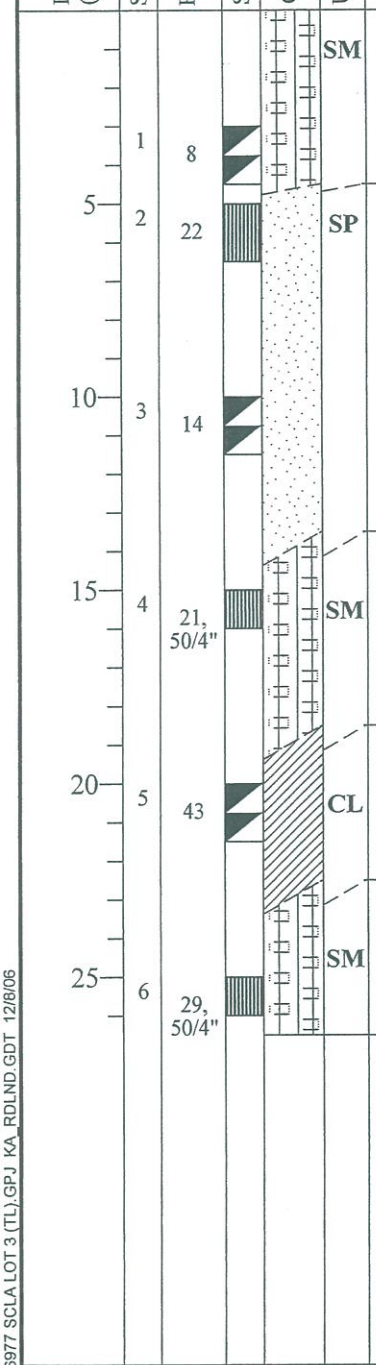
PLATE A-5

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

Date Drilled	10/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/30/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.



Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1	8			SM	**Silty Sand:** brown, dry, fine to medium grained			GS
5	2	22			SP	**Sand:** light brown, dry, medium dense, fine to medium grained			
10	3	14				-- trace gravel			
15	4	21, 50/4"			SM	**Silty Sand:** light brown, dry, very dense, fine grained, trace caliche and iron staining			
20	5	43			CL	**Sandy Clay:** light brown, dry, hard, fine grained sand, caliche			
25	6	29, 50/4"			SM	**Silty Sand:** brown, dry, very dense, fine grained, iron staining, trace clay			
						Boring terminated at 26.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B- 5

PLATE A-6

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

Date Drilled	10/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/30/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
					SM	**Silty Sand:** light brown, dry, fine to medium grained			
5	1	4			SP	**Sand:** brown, dry, loose, fine to medium grained			
	2	25				-- medium dense, trace gravel	115	0.9	
10	3	44			SM	**Silty Sand:** orange-brown, dry, dense, fine grained, trace clay			
					SP	**Sand:** orange rust color, dry, fine grained			
15	4	22, 41, 50/4"				-- gray, very dense, trace silt, iron staining			
20	5	14, 32, 50/5"			CL	**Sandy Clay:** brown, dry, hard, fine grained sand, caliche			
25	6	50/5"			SM	**Silty Sand:** light brown, dry, very dense, fine grained, iron staining			
					SP	**Sand:** light brown, dry, dense, fine to medium grained, iron staining			
30	7	35				Boring terminated at 31.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

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LOG OF BORING B- 6

PLATE A-7

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Date Drilled	10/27/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/27/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1		SM	**Silty Sand:** light brown, dry, fine grained			
	2	23	SP-SM	**Sand with Silt:** light brown, dry, medium dense, fine to medium grained	107	0.9	
5	3	13	SP	**Sand:** light brown, dry, medium dense, fine to medium grained			
10	4	85	SP-SM	**Sand with Silt:** light gray, dry, very dense, fine to medium grained, trace fine gravel	121	0.7	DS
15	5	32		-- dense			No sample recovery
20	6	10, 45, 50/4"	SM	**Silty Sand:** brown, dry, very dense, fine grained			
25	7	71					
				Boring terminated at 26.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B- 7

PLATE A-8

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

Date Drilled	10/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/30/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
					SP-SM	**Sand with Silt:** brown, dry, fine to medium grained			
	1	15			SP	**Sand:** light brown, dry, medium dense, fine to medium grained			
5	2	41				-- dense, interbedded thin lense of clayey sand			
10	3	39				-- red-brown			
15		31							No sample recovery
20	4	64				-- very dense, fine to medium grained			
25	5	67			SM	**Silty Sand:** brown, dry, very dense, fine grained			
30	6	20, 50/5"			CL	**Sandy Clay:** light gray, dry, hard, fine grained sand, trace iron staining			
						Boring terminated at 31.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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Proposed Lot 3
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LOG OF BORING B- 8

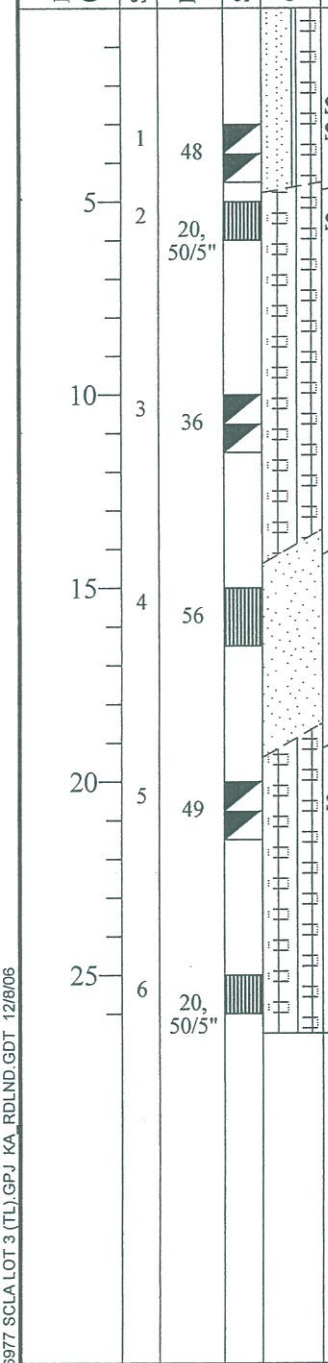
PLATE A-9

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

Date Drilled	10/27/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/27/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.



Depth (feet)	Sample Number	Blows per Foot	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1	48	SP-SM	**Sand with Silt:** brown, dry, dense, fine to medium grained, trace fine gravel			
5	2	20, 50/5"	SM	**Silty Sand:** light brown, slightly moist, very dense, fine grained, caliche, trace clay	115	5.4	CP
10	3	36		-- dense			GS
15	4	56	SP	**Sand:** light brown, dry, dense, medium to coarse grained			
20	5	49	SM	**Silty Sand:** brown, dry, dense, fine grained, trace clay			
25	6	20, 50/5"		-- very dense, trace iron staining			
				Boring terminated at 26.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B- 9

PLATE A-10

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

Date Drilled	10/27/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/27/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
					SM	**Silty Sand:** brown, dry, fine to medium grained			
	1	32				-- medium dense, moist, fine grained, caliche, trace clay	105	9.0	DS
5	2	23			SC	**Clayey Sand:** light brown, dry, medium dense, fine grained, veins of caliche			
10	3	85			SM	**Silty Sand:** mottled orange-brown with pink, slightly moist, very dense, fine grained, iron staining	115	5.9	
15	4	50				-- light brown			
20	5	50/5"			SC	**Clayey Sand:** light brown, dry, very dense, fine grained, some silt, trace iron staining			
25	6	63			SM	**Silty Sand:** red-brown, dry, very dense, fine grained, trace iron staining			
30	7	52				-- light brown, lesser percentage of silt			
						Boring terminated at 31.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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Proposed Lot 3
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LOG OF BORING B-10

PLATE A-11

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

Date Drilled	10/27/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/27/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1				SM	**Silty Sand:** light brown, dry, fine to medium grained			
	2	18			SP	**Sand:** light brown, dry, medium dense, fine to medium grained	103	1.1	MAX
5	3	28			SM	**Silty Sand:** light brown, dry, medium dense, fine grained			
10	4	34, 50/4"			SC-SM	**Silty Clayey Sand:** light brown, slightly moist, very dense, fine grained, caliche, trace iron staining	103	7.2	CN
15	5	55			CL	**Sandy Clay:** light brown, dry, hard, fine grained sand, caliche			
20	6	32, 50/4"			SM	**Silty Sand:** brown, dry, very dense, fine grained			
25	7	37			SP	**Sand:** light brown, dry, dense, fine to coarse grained			
						Boring terminated at 26.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B-11

PLATE A-12

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

Date Drilled	10/27/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/27/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
					SP-SM	**Sand with Silt:** brown, dry, fine to medium grained			
	1	12			SP	**Sand:** red-brown, dry, medium dense, fine to medium grained			
5	2	24				-- light brown, medium dense	113	0.8	
10	3	34				-- dense, trace fine gravel			
15	4	75				-- very dense			
20	5	21			SM	**Silty Sand:** brown, slightly moist, medium dense, fine grained, trace iron staining			
25	6	50			SP	**Sand:** olive-brown, slightly moist, dense, fine grained, trace iron staining and silt			
						Boring terminated at 26.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

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LOG OF BORING B-12

PLATE A-13

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Date Drilled	10/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/30/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1				SM	**Silty Sand:** light brown, dry, fine to medium grained			
	2	28			SP-SM	**Sand with Silt:** light brown, dry, medium dense, fine to medium grained	113	0.8	
5	3	14, 50/5"				-- very dense, interbedded layer of fine grained silty sand	111	0.7	CP
10	4	30				-- medium dense, fine to coarse grained			
15	5	82				-- very dense, fine to medium grained			
20	6	45				-- dense, intebedded lense of silty sand approximately 2-inches thick			
25	7	29, 50/5"			SM	**Silty Sand:** light brown, dry, very dense, fine to medium grained, iron staining, caliche			
30	8	61			SP	**Sand:** light brown, dry, very dense, fine to medium grained, trace silt			
						-- trace gravel			

KLEINFELDER

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Proposed Lot 3
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Victorville, California

LOG OF BORING B-13

PLATE A-14a

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	9	31, 50/5"			SM	**Silty Sand:** light brown, dry, very dense, fine grained, iron staining			
40	10	36				-- dense			
45	11	22, 50/5"			SP	**Sand with Gravel:** light brown, dry, very dense, fine to medium grained sand, fine to coarse gravel			
50	12	20, 50/5"				-- fine grained sand			
						]Boring terminated at 51.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

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LOG OF BORING B-13

PLATE A-14b

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Date Drilled	10/27/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/27/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
					SM	**Silty Sand:** red-brown, dry, fine to medium grained			
	1	16			SW	**Sand:** light brown, dry, medium dense, fine to coarse grained, trace silt		2.2	
5	2	18						0.9	GS
10	3	21, 50/5"			SP	**Sand:** light brown, dry, very dense, cemented lense of soil with caliche			
15	4	45				-- dense, fine to medium grained, some gravel			
20	5	51				-- very dense, trace gravel			
25	6	55			CL	**Sandy Clay:** brown, dry, hard, fine grained sand			
						Boring terminated at 26.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

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Proposed Lot 3
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Victorville, California

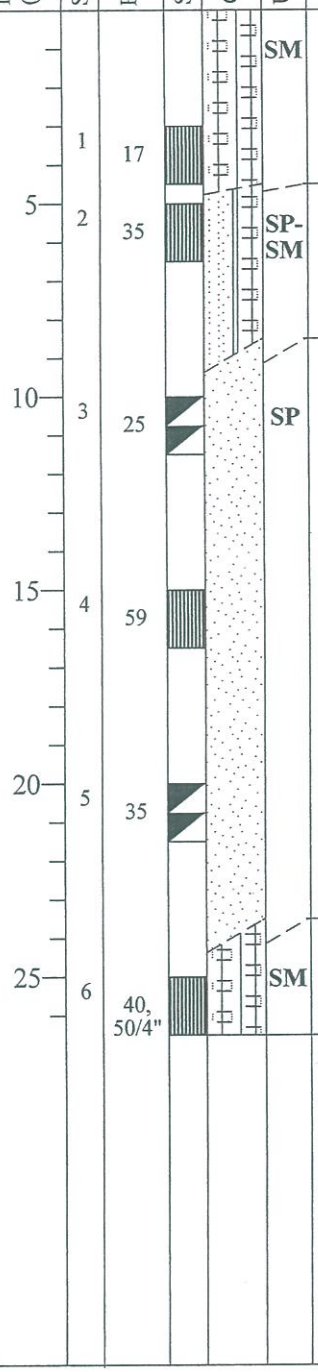
LOG OF BORING B-14

PLATE A-15

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Date Drilled	10/27/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/27/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.



Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
					SM	**Silty Sand:** brown, dry, fine grained			
						-- gray			
	1	17				-- light brown, medium dense, caliche	107	1.9	CP
5	2	35			SP-SM	**Sand with Silt:** light brown, dry, medium dense, fine grained	109	1.4	
10	3	25			SP	**Sand:** light brown, dry, medium dense, fine to medium grained, caliche cemented lense			
						-- trace fine gravel			
15	4	59				-- dense			
20	5	35				-- medium to coarse grained sand, trace gravel			
25	6	40, 50/4"			SM	**Silty Sand:** tan, dry, very dense, fine grained			
						Boring terminated at 26.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B-15

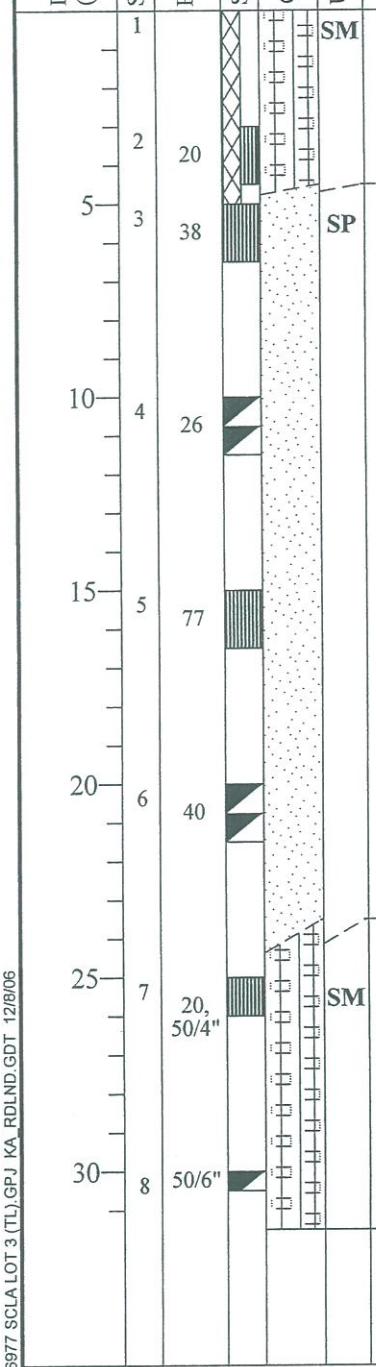
PLATE A-16

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

Date Drilled	10/27/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/27/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.



Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1				SM	**Silty Sand:** light brown, dry, fine to medium grained			
	2	20				-- medium dense	115	2.5	EI, COR, MAX
5	3	38			SP	**Sand:** light brown, dry, dense, fine to medium grained	116	1.7	
10	4	26				-- medium dense			
15	5	77				-- very dense, fine grained			
20	6	40				-- dense, fine to medium grained			
25	7	20, 50/4"			SM	**Silty Sand:** light brown, dry, very dense, fine grained			
30	8	50/6"				-- orange-brown			
						Boring terminated at 31.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

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LOG OF BORING B-16

PLATE A-17

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Date Drilled	10/27/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/27/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1				SM	**Silty Sand:** light brown, dry, fine to medium grained			
	2	13			SW-SM	**Sand with Silt:** light tan, dry, medium dense, fine to medium grained, trace iron staining and caliche	112	1.6	RV
5	3	8				-- loose, fine to coarse grained			GS
10	4	23				-- medium dense, trace gravel			
						Boring terminated at 11.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

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LOG OF BORING B-17

PLATE A-18

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Date Drilled	10/27/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/27/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1				SM	**Silty Sand:** light brown, dry, fine to medium grained			
	2	21			SP-SM	**Sand with Silt:** tan, dry, medium dense, fine to medium grained	111	1.6	
5	3	49				-- dense	115	2.6	
10	4	27				-- medium dense, caliche			
						Boring terminated at 11.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B-18

PLATE

A-19

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

Date Drilled	10/27/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/27/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1				SP-SM	**Sand with Silt:** light brown, dry, fine to medium grained			
	2	35			SP	**Sand:** light brown, dry, dense, fine grained	119	1.1	
5	3	45			SC-SM	**Silty Clayey Sand:** light brown, dry, dense, fine grained			
10	4	16, 44, 50/4"			ML	**Sandy Silt:** brown, slightly moist, hard, fine grained sand, trace clay and caliche veins	114	8.8	CP
						Boring terminated at 11.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B-19

PLATE A-20

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

Date Drilled	10/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/30/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1				SM	**Silty Sand:** light brown, dry, fine to medium grained			
	2	19				-- medium dense, trace caliche	115	3.7	
5	3	10			SP-SM	**Sand with Silt:** light brown, dry, loose, fine grained			
10	4	17, 50/5"				-- very dense, fine to medium grained			
						Boring terminated at 11.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B-20

PLATE A-21

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

Date Drilled	10/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	10/30/06
Drilling Method:	8-inch Hollow-stem auger	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1				SM	**Silty Sand:** light brown, dry, fine to medium grained			RV
	2	13				-- medium dense, caliche	113	3.0	CP
5	3	17			SP-SM	**Sand with Silt:** light brown, dry, medium dense, fine to medium grained	107	1.0	
10	4	21				-- medium dense, trace gravel			
						Boring terminated at 11.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B-21

PLATE A-22

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

Date Excavated	11/1/06	Equipment:	Rubber-tire backhoe
Excavated By:	Wes Bradshaw Backhoe	Orientation:	NE -->
Bucket Size:	24-inch bucket	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
					SM	**Silty Sand:** tan, dry, fine to medium grained			
					SW-SM	**Sand with Silt:** tan to white, slightly moist, fine to medium grained, abundant caliche	106	6.1	
5					SP	**Sand:** light brown, dry, loose, trench sidewall caving			
						Total depth of test pit was 6 feet. Test pit backfilled using excavated soil.			

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Proposed Lot 3
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Victorville, California

LOG OF TEST PIT TP- 1

PLATE

A-23

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

Date Excavated	11/1/06	Equipment:	Rubber-tire backhoe
Excavated By:	Wes Bradshaw Backhoe	Orientation:	N -->
Bucket Size:	24-inch bucket	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
					SM	**Silty Sand:** brown, dry, fine grained			
					SM	**Silty Sand:** light brown with white, fine to medium grained, veins of caliche	104	5.0	
5					SP	**Sand:** light brown, dry, fine to medium grained, trench sidewall caving of loose sand			
						Total depth of test pit was 7 feet. Test pit backfilled using excavated soil.			

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PLATE A-24

PROJECT NO. 76977

LOG OF TEST PIT TP- 2

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

Date Excavated	11/1/06	Equipment:	Rubber-tire backhoe
Excavated By:	Wes Bradshaw Backhoe	Orientation:	W -->
Bucket Size:	24-inch bucket	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
					SM	**Silty Sand:** light brown, dry, fine grained			
					SP-SM	**Sand with Silt:** light brown, dry, medium dense, fine to medium grained, caliche concentrated between 1.5 and 2.5 feet below grade	109	3.9	
5					SP	**Sand:** light brown, dry, fine to medium grained, trench sidewall caving of loose sand			
						Total depth of test pit was 6 feet. Test pit backfilled using excavated soil.			

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LOG OF TEST PIT TP- 3

PLATE

A-25

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Date Excavated	11/1/06	Equipment:	Rubber-tire backhoe
Excavated By:	Wes Bradshaw Backhoe	Orientation:	NE -->
Bucket Size:	24-inch bucket	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
					SM	**Silty Sand:** light brown to brown, dry, fine to medium grained			
					SM	**Silty Sand:** light brown, slightly moist, fine to medium grained, patches of caliche	105	9.0	
5					SP	**Sand:** light brown, dry, fine to medium grained, some caliche, no trench sidewall caving			
						Total depth of test pit was 6 feet. Test pit backfilled using excavated soil.			

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Proposed Lot 3
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LOG OF TEST PIT TP- 5

PLATE

A-26

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

Date Excavated	11/1/06	Equipment:	Rubber-tire backhoe
Excavated By:	Wes Bradshaw Backhoe	Orientation:	NW -->
Bucket Size:	24-inch bucket	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
					SM	**Silty Sand:** red-brown, dry, fine to medium grained, trace roots			
					SP-SM	**Sand with Silt:** light brown, dry, fine to medium grained, patches of caliche	104	3.9	
5					SW	**Sand:** light brown, dry, fine to coarse grained, patches of caliche, trace silt			
						Total depth of test pit was 6 feet. Test pit backfilled using excavated soil.			

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Proposed Lot 3
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Victorville, California

LOG OF TEST PIT TP- 4

PLATE

A-27

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

Date Excavated	11/1/06	Equipment:	Rubber-tire backhoe
Excavated By:	Wes Bradshaw Backhoe	Orientation:	NW -->
Bucket Size:	24-inch bucket	Elevation:	N.A.
Logged By:	J. Perry	Datum:	N.A.

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
					SM	**Silty Sand:** brown, dry, fine to medium grained			
					SM	**Silty Sand:** light brown to white, dry, fine to medium grained, trace clay, abundant caliche	113	4.1	
5					SP-SM	**Sand with Silt:** light brown, dry, fine to medium grained, trench sidewall caving of loose sand			
						Total depth of test pit was 6 feet. Test pit backfilled using excavated soil.			

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Proposed Lot 3
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LOG OF TEST PIT TP- 6

PLATE

A-28

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

APPENDIX B

LABORATORY TESTING

APPENDIX B
LABORATORY TESTING

Laboratory tests were performed on drive and bulk soil samples to estimate engineering characteristics of the various earth materials encountered. Testing was performed in general accordance with procedures outlined by the American Society for Testing and Materials, the California Department of Transportation, or other accepted procedures.

IN-SITU MOISTURE CONTENT AND DRY UNIT WEIGHT

In-situ moisture content and dry unit weight tests were performed on samples that could be recovered in a relatively undisturbed condition. Moisture content was evaluated in general accordance with ASTM Test Method D 2216; dry unit weight was evaluated using procedures similar to ASTM Test Method D 2937. The results are presented on the Logs of Borings.

GRAIN SIZE DISTRIBUTION

Sieve analyses were performed on six soil samples to evaluate the gradation of the material and to aid in soil classification. Tests were performed in general accordance with ASTM Standard Test Method D 422. The results of these tests are presented on Plates B-1 and B-2.

CONSOLIDATION AND COLLAPSE POTENTIAL TESTS

Consolidation and collapse potential tests were performed on representative drive soil samples to evaluate the settlement characteristics of the in-situ soils when subjected to typical foundation loads and wetting. The tests were performed in accordance with ASTM Standard Test Method D 5333. The test results are presented on Plates B-3 through B-8, Consolidation/Collapse Potential Test.

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MAXIMUM DRY UNIT WEIGHT/OPTIMUM MOISTURE CONTENT TESTS

Three maximum dry unit weight/optimum moisture content tests were performed on selected bulk samples of the on-site soils to determine compaction characteristics. The tests were performed in accordance with ASTM Standard Test Method D 1557. The test results are presented in the following table.

Maximum Dry Unit Weight/Optimum Moisture Content Test Results

Location	Depth (ft)	USCS Soil Type	Maximum Dry Unit Weight (ASTM D 1557) (pcf)	Optimum Moisture Content (%)
B-2	0-5	SM	126	11.0
B-11	0-5	SP/SM	134	8.0
B-16	0-5	SM	129	9.5

EXPANSION INDEX

One sample of the near-surface soil was subjected to an evaluation of the expansion index in accordance with UBC Standard 18-2 (1997 edition). The results of this test are presented in the following table.

Expansion Index Test Result

Location	Depth (ft)	USCS Soil Type	Expansion Index
B-16	0-5	SM	21

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DIRECT SHEAR TEST

Two direct shear strength tests were performed on representative drive soil samples to evaluate the drained shear strength of the soils. The samples were tested in a near-saturated condition in general accordance with ASTM Test Method D 3080 (consolidated, drained). The results of these tests are presented in the table below.

Direct Shear Test Results

Location	Depth (ft)	USCS Soil Type	Dry Unit Weight (pcf)	Angle of Internal Friction (degrees)	Cohesion (psf)
B-7	10	SP-SM	121	44	60
B-10	3	SM	105	30	570

CORROSIVITY TESTS

Chemical analyses were performed on a selected sample of the near surface soil to estimate pH, resistivity, soluble sulfate, and chloride contents in general accordance with Caltrans Standard Test Methods 532 (pH), 643 (resistivity), 417 (sulfates), and 422 (chlorides). Results of this test are presented in the table below.

Corrosion Test Results

Location	Depth (ft)	Minimum Resistivity (Ohm-cm)	pH	Sulfate Content (%)	Chloride Content (%)
B-16	0-5	3,000	8.1	0.0003	0.0124

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R-VALUE TEST

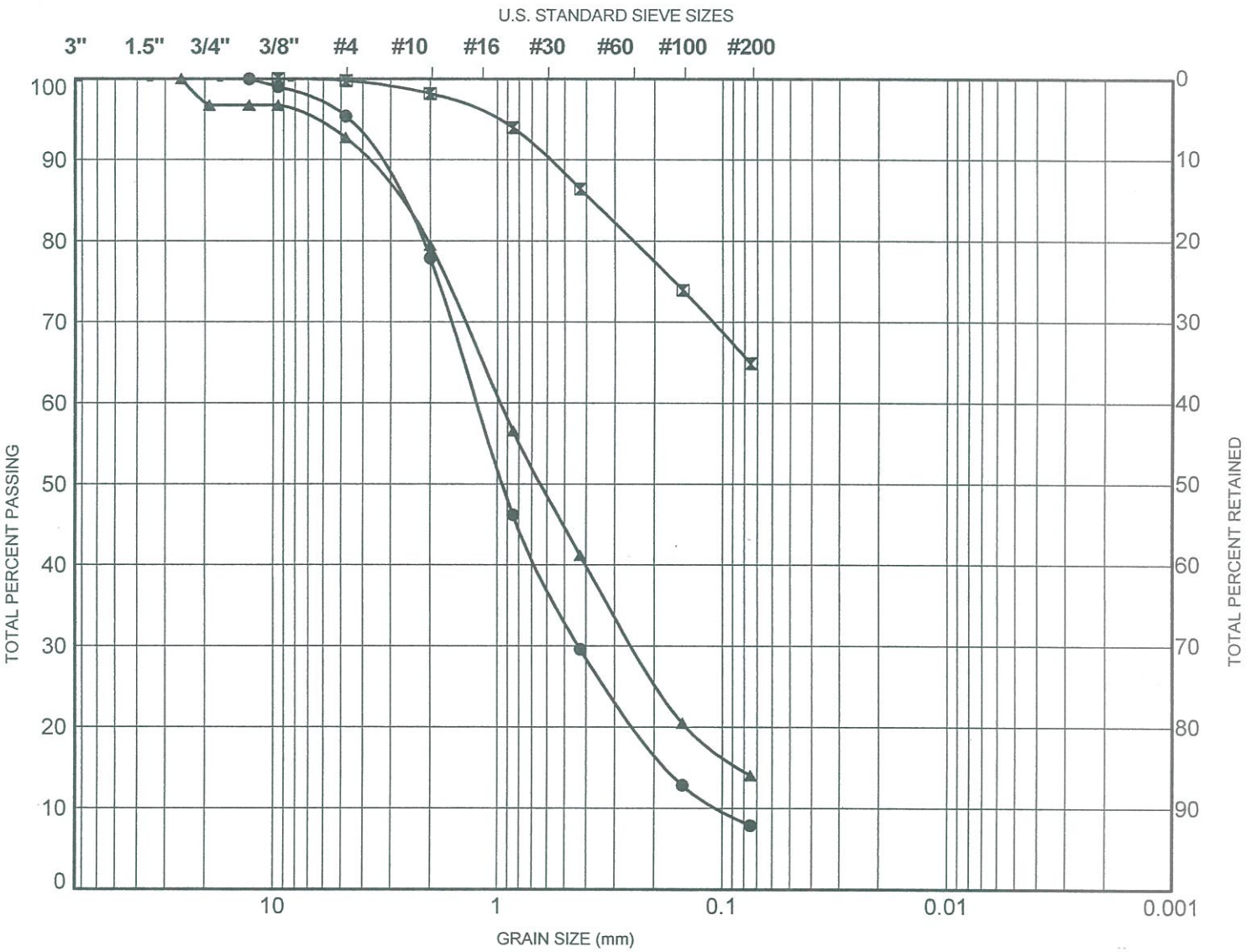
Two resistance value (R-value) tests were performed on bulk soil samples to evaluate pavement support characteristics of the near-surface on-site soils. R-value testing was performed in accordance with Caltrans Standard Test Method 301. The test results are presented in the table below.

R-Value Test Result

Location	Depth (ft)	USCS Soil Type	R-Value
B-17	0-5	SW-SM	60
B-21	0-5	SM	36

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SIEVE ANALYSIS	HYDROMETER



GRAVEL		SAND			SILT	CLAY
coarse	fine	coarse	medium	fine		

Symbol	Sample	Depth (feet)	Description	Classification
●	B- 1	3	Sand with Silt	SW-SM
⊠	B- 1	15	Sandy Clay	CL
▲	B- 5	3	Silty Sand	SM

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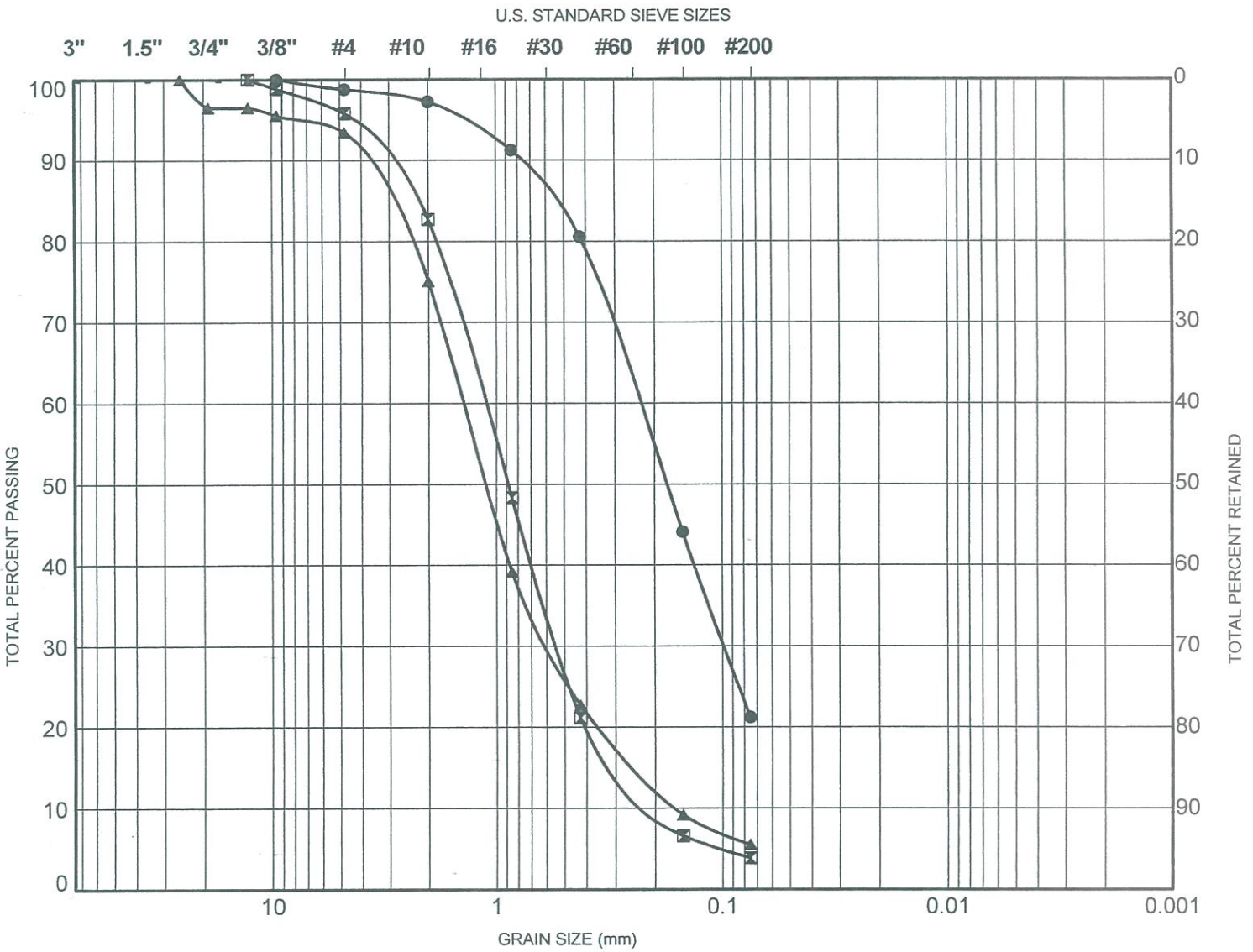
Proposed Lot 3
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GRAIN SIZE DISTRIBUTION

PLATE

B-1

SIEVE ANALYSIS	HYDROMETER



GRAVEL		SAND			SILT	CLAY
coarse	fine	coarse	medium	fine		

Symbol	Sample	Depth (feet)	Description	Classification
●	B- 9	10	Silty Sand	SM
⊠	B-14	5	Sand	SW
▲	B-17	5	Sand with Silt	SW-SM

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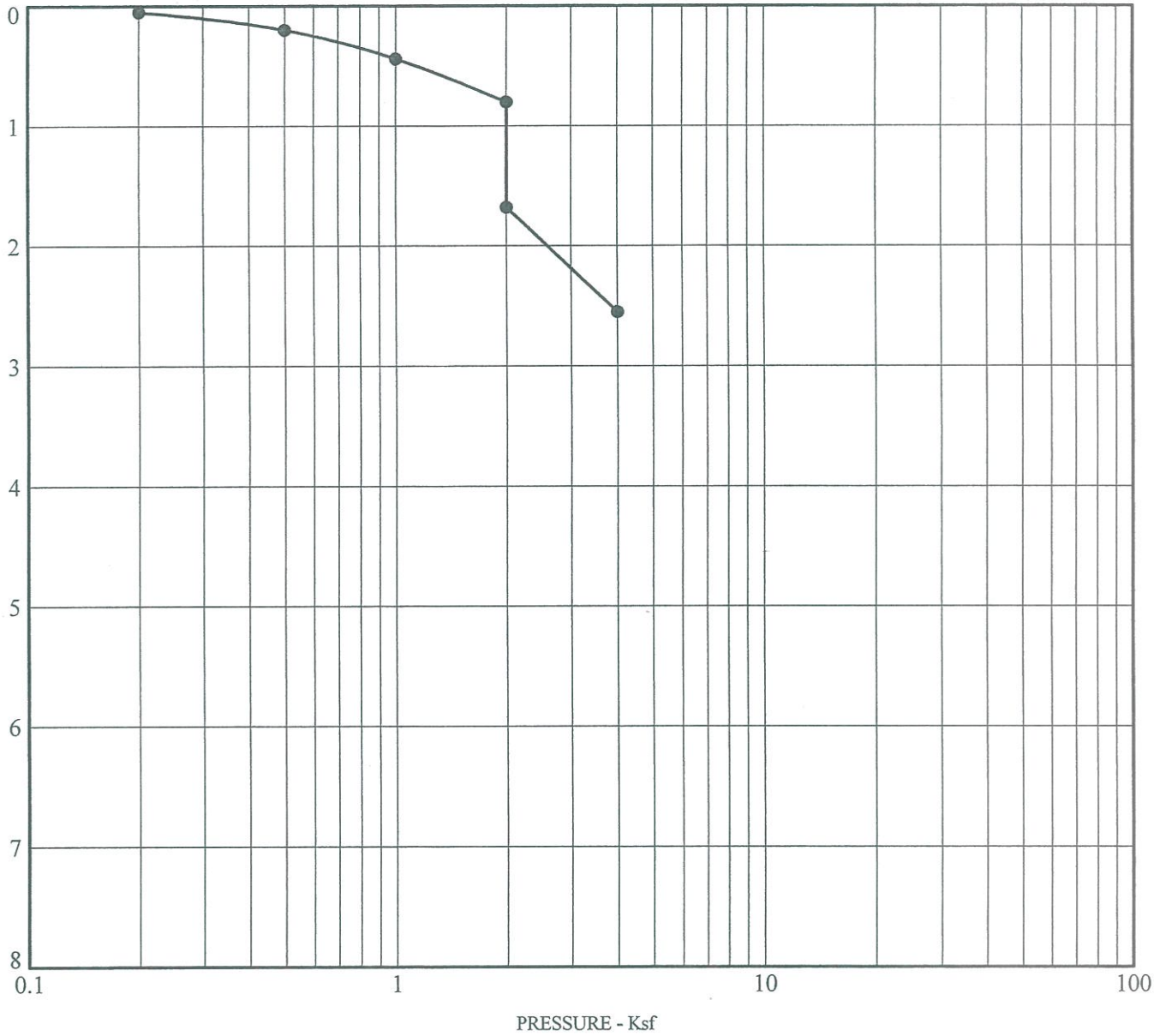
PROJECT NO. 76977

Proposed Lot 3
Southern California Logistics Airport
Victorville, California

GRAIN SIZE DISTRIBUTION

PLATE

B-2



Boring	**B- 9**			
Depth (feet)	**5**			
Moisture Content (%)	**5.4**	**Before**	**17.7**	**After**
Dry Unit Weight (pcf)	**115**			
Description	**Silty Sand**			
Classification	**SM**			

NOTE : SPECIMEN FLOODED AT 2000 psf

CONSOL NO INDICIES 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

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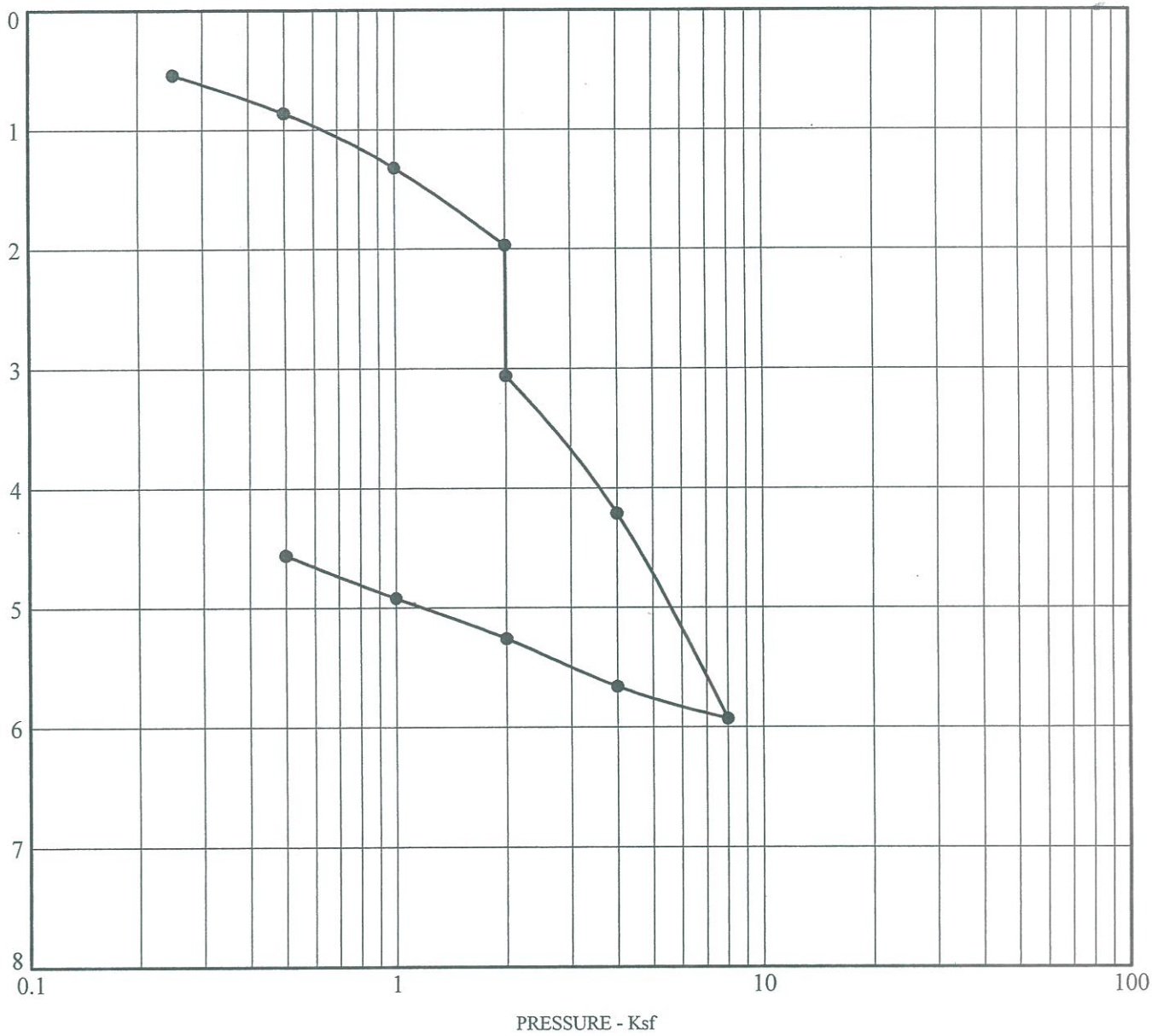
PROJECT NO. 76977

Proposed Lot 3
Southern California Logistics Airport
Victorville, California

CONSOLIDATION/COLLAPSE POTENTIAL TEST

PLATE

B-3



Boring	**B-11**			
Depth (feet)	**10**			
Moisture Content (%)	**7.2**	**Before**	**23.6**	**After**
Dry Unit Weight (pcf)	**103**			
Description	**Silty Clayey Sand**			
Classification	**SC-SM**			

NOTE : SPECIMEN FLOODED AT 2000 psf

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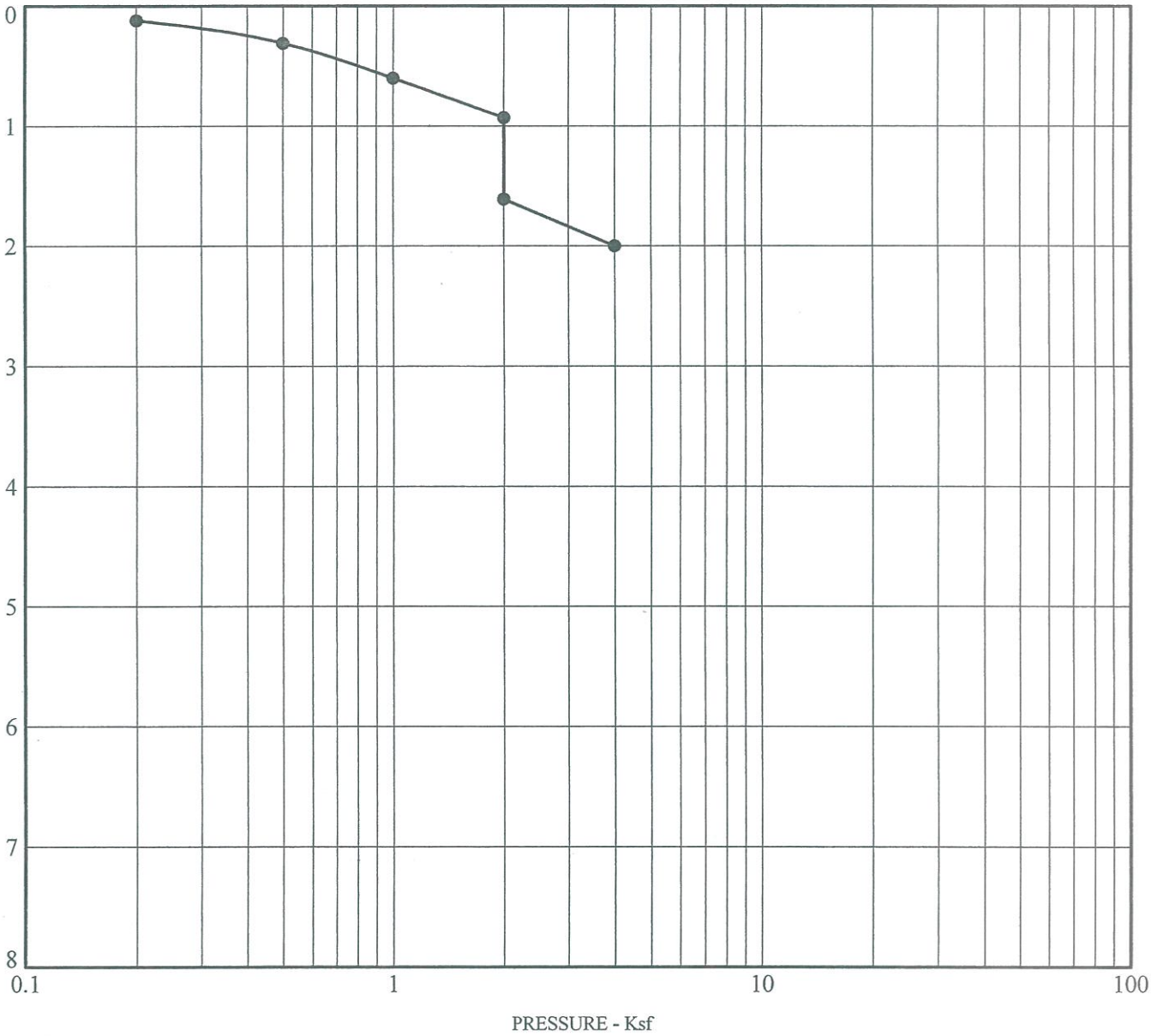
Proposed Lot 3
Southern California Logistics Airport
Victorville, California

CONSOLIDATION/COLLAPSE POTENTIAL TEST

PLATE

B-4

CONSOL NO INDICIES 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06



Boring	**B-13**			
Depth (feet)	**5**			
Moisture Content (%)	**0.7**	**Before**	**18.1**	**After**
Dry Unit Weight (pcf)	**111**			
Description	**Sand with Silt**			
Classification	**SP-SM**			

NOTE : SPECIMEN FLOODED AT 2000 psf

CONSOL NO INDICIES 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

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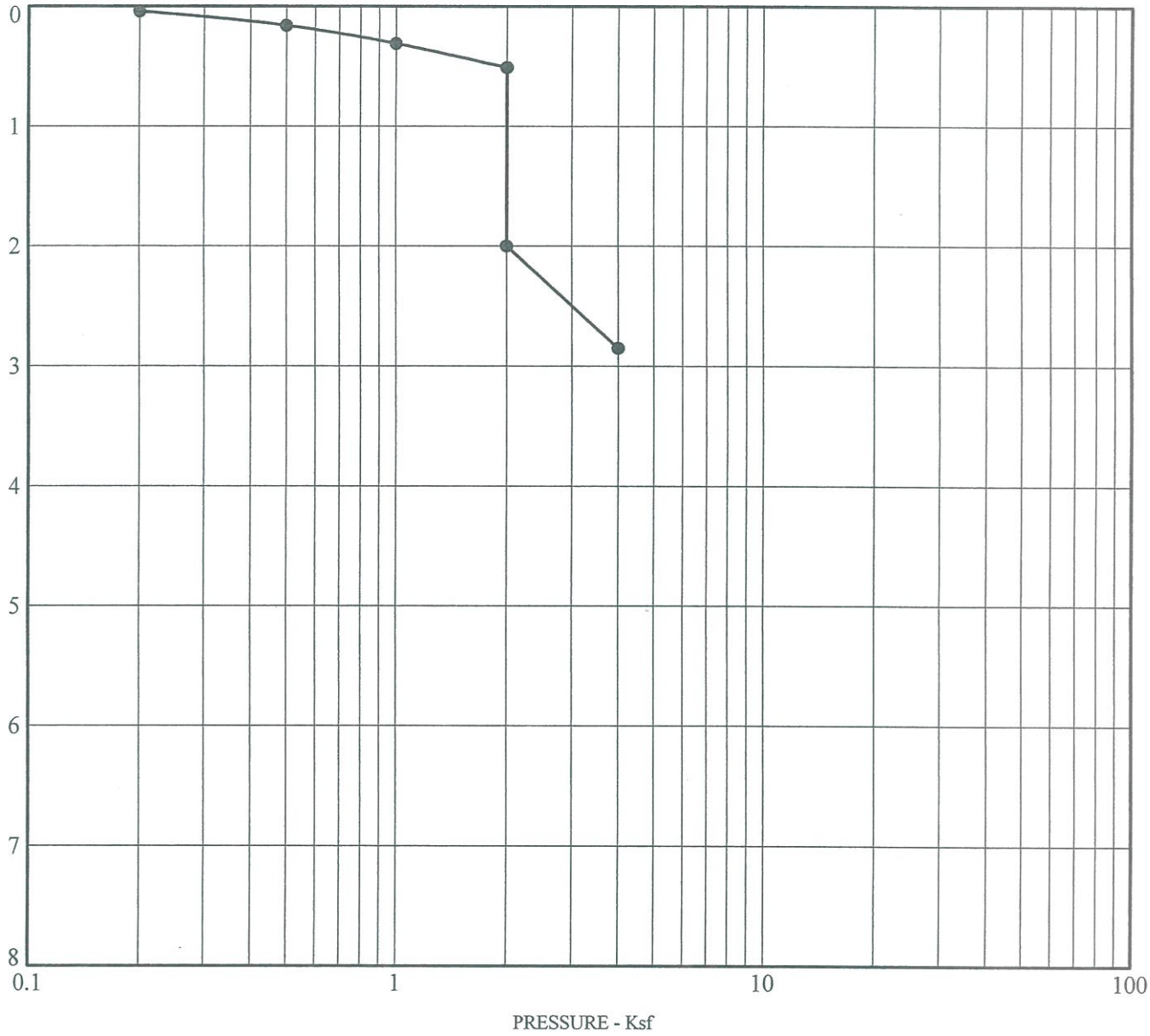
PROJECT NO. 76977

Proposed Lot 3
Southern California Logistics Airport
Victorville, California

CONSOLIDATION/COLLAPSE POTENTIAL TEST

PLATE

B-5



Boring	**B-15**			
Depth (feet)	**3**			
Moisture Content (%)	**1.9**	**Before**	**18.5**	**After**
Dry Unit Weight (pcf)	**107**			
Description	**Silty Sand**			
Classification	**SM**			

NOTE : SPECIMEN FLOODED AT 2000 psf

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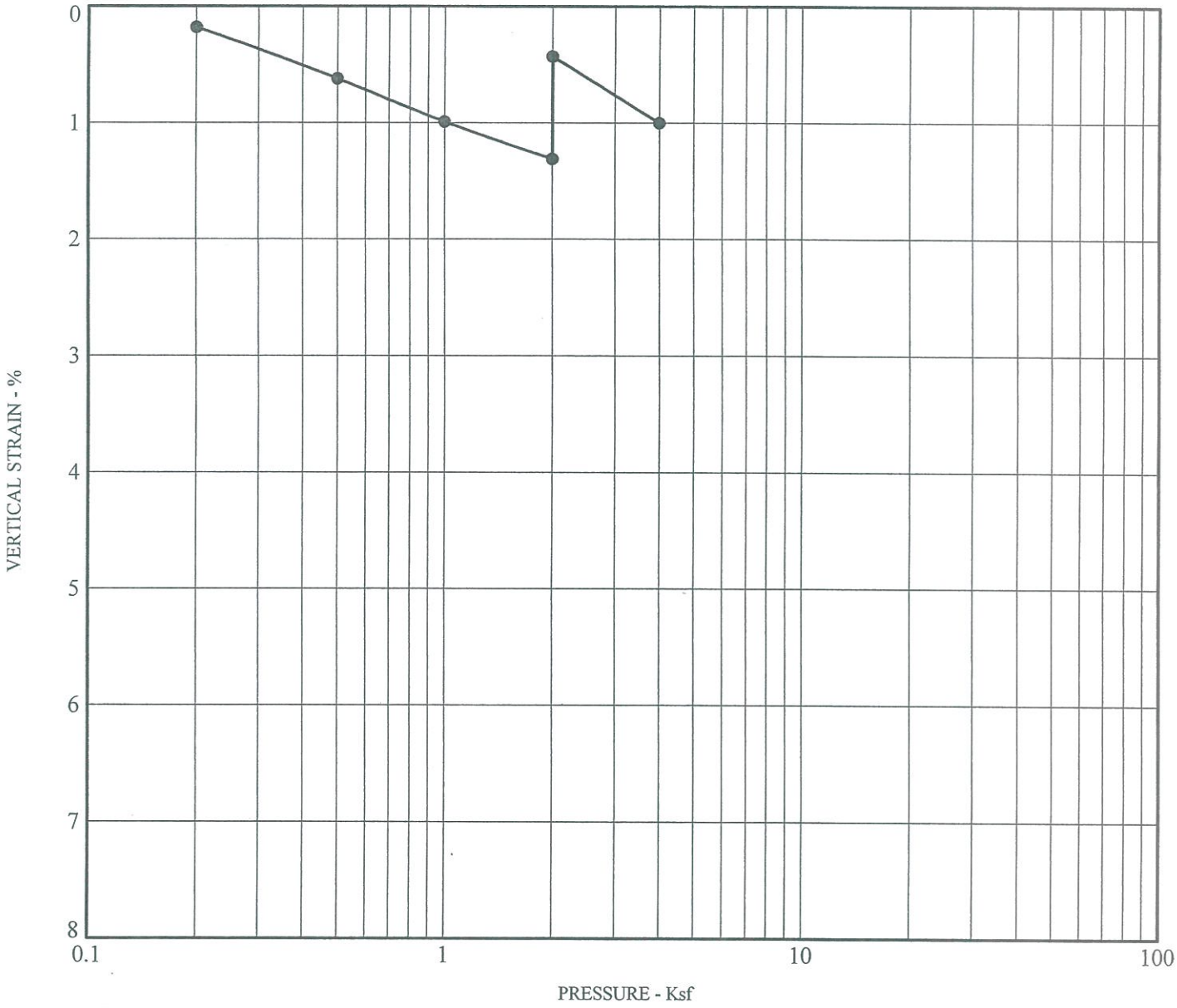
PLATE

B-6

PROJECT NO. 76977

CONSOLIDATION/COLLAPSE POTENTIAL TEST

CONSOL NO INDICIES 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06



Boring	**B-19**			
Depth (feet)	**10**			
Moisture Content (%)	**8.8**	**Before**	**19.7**	**After**
Dry Unit Weight (pcf)	**114**			
Description	**Sandy Silt**			
Classification	**ML**			

NOTE : SPECIMEN FLOODED AT 2000 psf

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Proposed Lot 3
Southern California Logistics Airport
Victorville, California

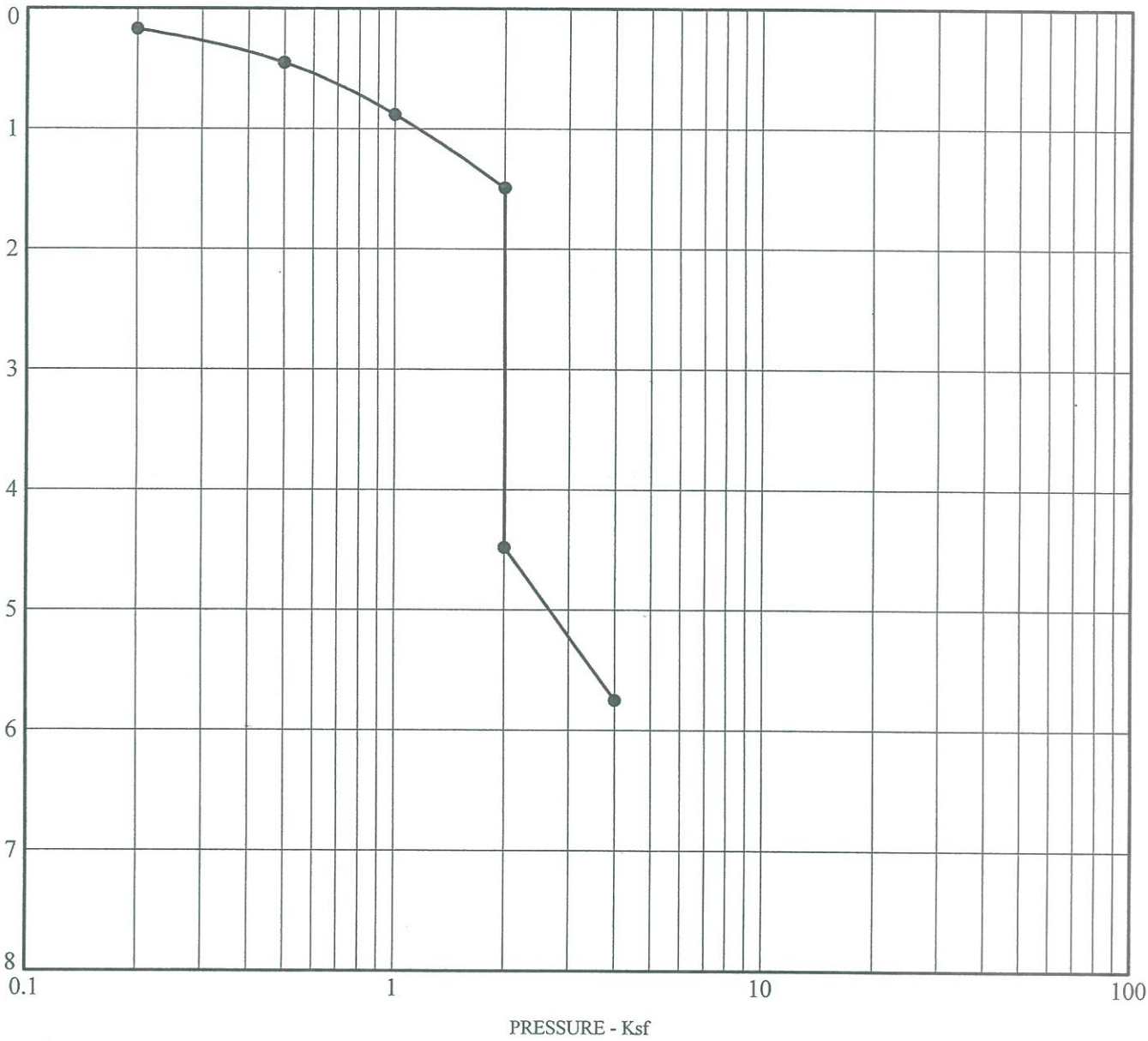
PLATE

B-7

PROJECT NO. 76977

CONSOLIDATION/COLLAPSE POTENTIAL TEST

CONSOL NO INDICIES 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06



Boring	**B-21**			
Depth (feet)	**3**			
Moisture Content (%)	**3.0**	**Before**	**15.8**	**After**
Dry Unit Weight (pcf)	**113**			
Description	**Silty Sand**			
Classification	**SM**			

NOTE : SPECIMEN FLOODED AT 2000 psf

CONSOL NO INDICIES 76977 SCLA LOT 3 (TL).GPJ KA_RDLND.GDT 12/8/06

KLEINFELDER

PROJECT NO. 76977

Proposed Lot 3
Southern California Logistics Airport
Victorville, California

CONSOLIDATION/COLLAPSE POTENTIAL TEST

PLATE

B-8

REPORT OF
GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL BUILDING 13A
SOUTHERN CALIFORNIA LOGISTICS AIRPORT
VICTORVILLE, CALIFORNIA

January 23, 2007

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January 23, 2007
Project No. 77604

Mr. Brian Parno
Stirling Capital Investments
27422 Portola Parkway, Suite 300
Foothill Ranch, CA 92610

Subject: **Report of Geotechnical Investigation**
Proposed Commercial Building 13A
Southern California Logistics Airport
Victorville, California

Dear Mr. Parno:

Kleinfelder, Inc., (Kleinfelder) is pleased to present this report summarizing our geotechnical investigation for the subject site. The site is located between Sabre Boulevard and Mather Street (future Aerospace Road) within the Southern California Logistics Airport in Victorville, California. The purpose of our investigation was to evaluate the subsurface conditions at the site and develop geotechnical recommendations for project design and construction.

It is our opinion, from a geotechnical engineering perspective, that the site is suitable for the proposed development provided the recommendations presented in this report are incorporated into design and construction of the project.

We appreciate the opportunity to be of service on this project. If you have any questions or require additional information, please do not hesitate to contact the undersigned at your convenience.

Respectfully submitted,

KLEINFELDER, INC.

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Project Engineer

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SGL:edg

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Appendix B Laboratory Testing

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Important Information About Your Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you —* should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

1.0 INTRODUCTION

1.1 GENERAL

Kleinfelder, Inc., (Kleinfelder) was retained by Stirling Capital Investments (Stirling) to conduct a geotechnical investigation at the site of the proposed new commercial building 13A within the Southern California Logistics Airport (SCLA). The scope of our services was provided in our proposal entitled *Proposal to Conduct a Geotechnical Investigation, Proposed Building 13A - Lot 13, Southern California Logistics Airport, Victorville, California*, dated October 2, 2006.

This report presents our recommendations relative to the geotechnical aspects of design and construction for the proposed project. Conclusions and recommendations presented in this report are based on the subsurface conditions encountered at the locations of our field excavations, and the provisions and requirements outlined in the Additional Services and Limitations sections of this report. Recommendations presented in this report should not be extrapolated to other areas or be used for other projects without our prior review.

1.2 SITE AND PROPOSED PROJECT DESCRIPTION

The site proposed for development is located between Sabre Boulevard and Mather Street (future Aerospace Road) within the SCLA in Victorville, California (see Plate 1, Site Vicinity Map). The site consists of a rectangular shaped parcel that is primarily occupied by abandoned buildings constructed during the operation of the former George Air Force Base (now SCLA). Demolition operations are currently underway to clear the site of existing structures in anticipation of future development.

The parcel is approximately 18 acres in size. Topographically, the site is generally flat and slopes gradually to the north. The elevation of the site is approximately 2,880 feet above mean sea level (MSL) based on the United States Geological Survey (USGS) Victorville, California Quadrangle.

Based on a preliminary site plan provided to us by Stirling and prepared by HPA dated August 2006, the proposed commercial building 13A was originally proposed as an

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approximately 324,226 square foot rectangular building with the longer dimension of the building oriented east-west parallel with Aerospace Road. During the course of our geotechnical investigation, but after our field exploration was completed, Kleinfelder was informed that the proposed footprint of building 13A was changed. Based on our review of a revised site plan provided to us by Stirling and prepared by RGA Architects, the building footprint has been rotated approximately 90 degrees so the site is now bounded on the north by Sabre Boulevard and on the south by Aerospace Road. Since Kleinfelder was made aware of the revision after the completion of our field exploration, two additional exploratory borings (B-21 and B-22) were subsequently excavated in the northern area of the revised building footprint.

Building 13A will be approximately 296,443 square-feet and will be built using "tilt-up" type slab-on-grade construction. Paved parking and drive areas will surround the building. We anticipate that appurtenant construction will include underground utilities and concrete flatwork. The location of the proposed building 13A is shown on the attached Plate 2, Boring and Test Pit Location Map.

Building foundation loads and grading plans were unavailable for our review at the time this report was prepared. We anticipate that cuts and fills required to bring the project site to finished grade will be on the order of 5-feet or less, excluding requirements for remedial grading.

1.3 PURPOSE AND SCOPE

The purpose of this investigation was to evaluate subsurface conditions at the site and provide geotechnical recommendations for design and construction of the proposed development. A description of the scope of services performed is presented below.

Task 1 – Literature Review

We began our services by reviewing soils and geologic data in our files and from select public agencies (see References). We have completed a computerized search of appropriate seismic and faulting information as it relates to the site.

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Task 2 – Field Exploration

Prior to conducting the field exploration, our proposed exploration locations were cleared of known existing utility lines through Underground Service Alert (USA). The subsurface exploration program consisted of excavating and logging 22 exploratory borings and 6 exploratory test pits. The borings were advanced to depths ranging between approximately 6½ and 51½ feet below the existing grade. The test pits were excavated to depths ranging between approximately 6 and 8 feet below the existing grade. Bulk and drive soil samples were obtained from the borings for laboratory testing. A detailed description of the field investigation, and the logs of the borings and test pits excavated for this study are presented in Appendix A.

Task 3 – Laboratory Soil Testing

Laboratory testing was performed on soil samples collected during our field exploration to substantiate field classifications and to assess the physical characteristics of the subsurface soils. Testing consisted of in-situ dry unit weight and moisture content, grain size distribution, plasticity index, consolidation/collapse potential, laboratory maximum dry unit weight and optimum moisture content, expansion potential, direct shear strength, corrosion analyses, and R-value. A summary of the laboratory test program and the test results are presented in Appendix B.

Task 4 – Geotechnical Analyses and Report Preparation

Field and laboratory findings were evaluated in conjunction with the proposed use of the property. This report includes conclusions and recommendations regarding the following:

- Regional geologic setting and geologic hazards including the potential for ground rupture due to surface faulting, liquefaction, and other seismically induced hazards.
- Subsurface materials encountered within the exploratory borings and test pits, anticipated groundwater levels and excavation characteristics of these materials.
- Expansion and corrosion potential of the near surface soils.

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- Site seismic coefficients for use in structural design in accordance with the 2001 California Building Code (CBC).
- Guidelines for earthwork construction including recommendations for site preparation, overexcavations, and fill placement and compaction.
- Foundations and slabs-on-grade, allowable bearing pressure, and anticipated total and differential foundation settlements.
- Lateral earth pressures for design of retaining walls and other below grade structures.
- Pipe bedding and trench backfill.
- Asphalt concrete and Portland cement concrete pavement.

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2.0 REGIONAL GEOLOGY

The project site is located within the western Mojave Desert, which is part of the greater Mojave Desert Geomorphic Province, a broad interior region of isolated mountain ranges separated by desert expanses. The western Mojave is a wedge-shaped area bordered on the southwest by the San Gabriel and San Bernardino Mountains, and on the northwest by the Tehachapi Mountains. These surrounding mountains range up to 10,080 and 7,900 feet in altitude, respectively, while the interior desert has relatively low relief. The only major drainage channel within the desert region is the Mojave River – an intermittent river that flows from the San Bernardino Mountains northward, then eastward to its termination at Soda Lake near Baker, California.

The structural geology and fault patterns within the western Mojave Desert are relatively uniform and internally consistent, comprised of a series of northwest-southeast trending faults, in contrast to the fault patterns north and south of the province. Major faults in the area include the San Andreas and Garlock fault zones to the southwest and northwest, respectively, the northwest-trending Helendale, Lockhart, and Lenwood faults to the northeast, and the North Frontal fault zone to the southeast.

Lithologically, the region is characterized by alluvial-filled basins overlying Paleozoic and Mesozoic igneous and metamorphic basement rocks. The basement rocks are exposed at the surface in isolated mountain ranges throughout the desert.

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3.0 LOCAL GEOLOGIC CONDITIONS

3.1 SUBSURFACE SOIL CONDITIONS

The principal alluvial soil deposits encountered during our investigation consist of silty sand (SM), sand (SW & SP), sand with silt (SP-SM), and sandy silt (ML) with occasional interbedded layers of clayey sand (SC). Although not encountered during our field investigation, we anticipate that undocumented fill soils may exist within the vicinity of the existing structures at the site. The locations of our exploratory borings are shown on Plate 2, Boring Location Map. Detailed descriptions of the subsurface conditions encountered during our field investigation are presented on the Logs of Borings and Test Pits provided in Appendix A.

The alluvial deposits are generally considered suitable for support of the proposed development provided the overexcavation, moisture conditioning, and compaction of the upper soils as recommended in this report are performed.

3.2 GROUNDWATER

Groundwater was not encountered within the excavations performed for this study. Based on our research, groundwater is present at depths greater than 100 feet below existing grade within this area, and is not anticipated to be encountered during site development.

Fluctuations of the groundwater level, localized zones of perched water, and variations in soil moisture content should be anticipated during and following the rainy season. Irrigation of landscaped areas on and adjacent to the site can also cause a fluctuation of local groundwater levels and perched water conditions can develop.

3.3 COLLAPSE POTENTIAL

A collapsible soil is generally defined as a soil, which will undergo a sudden decrease in volume when its internal structural support is lost. Soils found to be most susceptible to collapse include loess (fine-grained wind-deposited soil) deposits, valley alluvium deposited within a semi-arid to arid climate, and residual soil deposits. The degree of collapse for a soil sample can be defined by the collapse potential value, which is

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expressed as a percent collapse of the total sample. The following Table 1, Collapse Potential Values, provides a range of collapse potential values as defined in the Naval Facilities Engineering Command Design Manual 7.1 and can be used to relate the collapse potential value to the severity of the collapse problem.

Table 1
Collapse Potential Values
NAVFAC DM 7.1, 1986

Collapse Potential Value	Severity of Problem
0-1%	No problem
1-5%	Moderate trouble
5-10%	Trouble
10-20%	Severe trouble
>20%	Very severe trouble

The project site is located in a geologic environment, which may be prone to a collapsible soil problem. Collapse potential testing performed on samples collected during our field exploration indicated a range in values between zero and about 1 percent, at applied vertical stresses of 2,000 pounds per square foot (psf). Comparing our laboratory test results to those values presented in Table 1, the samples tested indicate a varying range from little to moderate trouble. Based on the results of our field exploration, laboratory testing, geotechnical analyses performed for this investigation, and our experience with other projects in the vicinity of the site, it is our opinion that the site generally has a low to moderate potential for collapsible soil conditions.

To reduce the collapse potential hazard at this site, we recommend removal and re-compaction of the upper soils, as provided in the conclusions and recommendations section of this report. Compaction efforts should include proof-rolling of the exposed overexcavation bottom subgrade with heavy tamping equipment prior to fill placement.

Since the introduction of water into the soils can initiate collapse, proper measures should be taken to reduce the potential for future pipe leakage and/or landscape irrigation infiltration into the soils within the areas of the proposed improvements. It is very important that storm water runoff be directed from the roof and other improvements

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to appropriate storm water collection systems. Diligent efforts should be made to provide an efficient means of transport of runoff water to collection devices, preventing runoff water from infiltrating soils within the vicinity of the structure.

3.4 EXPANSIVE SOILS

Two near surface soil samples obtained from our field exploration were tested for expansion potential in accordance with UBC Standard 18-2. The results of these tests indicate Expansion Index (EI) values of 4 and 5, respectively. Soils with an EI between 0 and 20 are considered to have a "very low" expansion potential as defined by the 2001 California Building Code.

Testing of the final subgrade soils after completion of grading should be conducted to evaluate the expansion potential and confirm or modify the recommendations presented herein.

3.5 CORROSIVITY

Two samples of the near-surface soils were tested for potential corrosion to concrete and reinforcing steel. The samples were tested in general accordance with California Standard Test Methods to evaluate pH, resistivity, and water-soluble sulfates and chlorides content. We have provided the corrosion tests as requested, and these tests should be considered as only an indicator of soil corrosivity for the samples tested. Other soils found on site may be more, less, or of a similar corrosive nature.

Although Kleinfelder does not practice corrosion engineering, the results of the corrosion tests indicate that the soils tested can be considered as "moderately" to "severely" corrosive to buried metals and as possessing a "negligible" exposure to sulfate attack for concrete. If desired by the client, Kleinfelder can recommend a corrosion engineer to evaluate the corrosion potential of the site soils to concrete and buried metals, to recommend further testing as required, and to provide specific corrosion mitigation methods appropriate for the project.

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4.0 GEOLOGIC HAZARDS

4.1 FAULTING AND SEISMICITY

The project site is located in the highly seismic southern California region within the influence of several fault systems that are considered to be active or potentially active. An active fault is defined by the State of California as "a sufficiently active and well defined fault, which has exhibited surface displacement within the Holocene time (the last 11,000 years)." A potentially active fault is defined by the State as "a fault with a history of movement within Pleistocene time (between 11,000 and 1.6 million years ago)." These active and potentially active faults are capable of producing potentially damaging seismic shaking at the site. It is anticipated that the project site will periodically experience ground acceleration as the result of moderate to large magnitude earthquakes. Other active faults without surface expression (blind faults) that are capable of generating an earthquake, or other potentially active seismic sources may be present that are not currently zoned.

Faults are also type classified as Type A, B, or C for Near-Source Zone ground motion (Ca, Cv, Na and Nv) by the State of California and ICBO (in the CBC, Table 16A-U) according to parameters of known slip rate and maximum earthquake magnitude.

We have performed a computer-aided search of the known active and potentially active faults within a 62-mile (100-kilometer) radius of the site and researched available literature to assess the maximum credible earthquakes expected to be generated on each fault. Table 2 summarizes these parameters for 5 out of the 34 known active and potentially active faults or fault segments within the searched radius of the site that in our opinion will have the greatest impact upon the site. Selection of the faults was based on their proximity to the site and their potential to generate strong ground motion on the site. Table 2 was generated using in part the EQFAULT computer program (version 3.00) developed by Blake (2000) as modified using the fault parameters from CGS Open File Report 96-08 and the 1997 UBC fault maps. This table represents deterministic data only and therefore does not identify the probability of reactivation or the on-site effects from earthquakes occurring on any of the other faults in the region.

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Table 2
Significant Faults

Fault Name – Segment	Approx. Distance from Site mi (km)	Maximum Event* (Moment Mag.)	Fault Seismic Source Type
Helendale – South Lockhart	11.7 (18.8)	7.1	B
North Frontal Fault Zone	15.9 (25.6)	7.0	B
Cleghorn	19.6 (31.5)	6.5	B
San Andreas - Mojave	20.9 (33.7)	7.1	A
San Andreas - Southern	21.2 (34.1)	7.4	A

* As defined by the ICBO (1998) and CGS (OFR 96-08)

Under the current understanding of regional seismo-tectonics, the largest maximum credible events to impact the site may be generated by the Helendale fault (South Lockhart segment), which is considered capable of generating a moment magnitude M7.1 earthquake, or by the San Andreas fault (Southern segment), which is considered capable of generating a moment magnitude M7.4 earthquake.

4.2 FAULT RUPTURE

The site is not located within a currently delineated State of California Alquist-Priolo Earthquake Fault Zone (Hart and Bryant, 1997). No known active faults have been identified on the site, thus, the potential for future surface fault rupture at the site is considered to be "low." While fault rupture would most likely occur along previously established fault traces, future fault rupture could occur at other locations.

4.3 SECONDARY SEISMIC HAZARDS

Secondary seismic hazards related to ground shaking include ground deformation, tsunamis, and seiches. Due to the inland location of the site and lack of a nearby large body of open water the hazards from tsunamis and seiches are considered low.

Non-tectonic ground deformation consists of surface cracking of the ground with little to no displacement. This type of deformation is not caused by fault rupture. Rather it is

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generally associated with differential shaking of two or more geologic units with differing physical characteristics. The site is underlain by relatively consistent geologic materials. The potential for ground deformation is considered "low" under current conditions and proposed grades.

4.4 LIQUEFACTION AND SEISMICALLY INDUCED SETTLEMENT

Liquefaction is the sudden loss of shear strength in a loose, saturated granular soil due to vibratory motions such as those associated with earthquakes. Seismically induced soil liquefaction generally occurs in loose, saturated, cohesionless soil when pore pressures within the soil increase during ground shaking. The increase in pore pressure transforms the soil from a solid to a semi-liquid state. These soils typically lose a portion or all of their shear strength and regain strength sometime after shaking stops.

Groundwater was not encountered in any of the borings excavated for this investigation, to the maximum depth explored of approximately 51½ feet below existing grade. Our research indicates that the groundwater levels in the vicinity of the site are greater than 100 feet below the existing ground surface. Due to the density of the soils encountered and the anticipated depth to groundwater, it is our opinion that under a preliminary, screening level liquefaction analysis, the site has a "low" liquefaction potential. The potential for seismic-induced settlement of the on site soils to impact the proposed development is also considered to be low.

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5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 GENERAL

Based on our field exploration, laboratory testing, and geotechnical analyses, it is our opinion that the site is suitable for development of the proposed project as planned, provided the recommendations presented in this report are incorporated into project design and construction.

Detailed geotechnical engineering recommendations addressing the removal of unsuitable soils, placement of compacted soil, building foundations, slabs-on-grade, and retaining walls are presented in the remaining portions of this report. The following opinions, conclusions, and recommendations are based on the properties of the materials encountered in the exploratory borings and test pits and the results of our laboratory test program.

5.2 SEISMIC DESIGN CONSIDERATIONS

5.2.1 General

We consider the most significant geologic hazard to the project to be the potential for moderate to severe seismic shaking that is likely to occur during the design life of the proposed development. The site is located in the seismically active southern California region within the influence of several fault systems that are considered to be active or potentially active. These active and potentially active faults are capable of producing potentially damaging seismic shaking at the site. It is anticipated that the project site will periodically experience strong ground acceleration as the result of moderate to large magnitude earthquakes.

5.2.2 Ground Shaking

We recommend, at a minimum, the proposed development be designed in accordance with the requirements of the 2001 edition of the California Building Code (CBC) for Seismic Zone 4. In developing site-specific seismic design criteria, the characteristics of the earth units underlying the site are an important input to evaluate the response at a given site. Based on the results of our field exploration, the proposed project site will be underlain primarily by compacted fill soils overlying alluvial fan deposits. Based on

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the type of materials encountered during this investigation, we have classified the site soil profile for site response as S_C according to Table 16A-J of the 2001 CBC. Presented in Table 3 is a summary of the recommended seismic parameters for the soil profile for structural design per the 2001 CBC.

Table 3
Summary of Seismic Parameters

Site Soil Profile	S_C
Seismic Zone	4
Design Fault	Helendale – South Lockhart Segment
Near Source Distance	18.8 km
Seismic Source Type	B
Near Source Factor - N_a	1.0
Near Source Factor - N_v	1.0
Seismic Coefficient - C_a	$0.40N_a = 0.40$
Seismic Coefficient - C_v	$0.56N_v = 0.56$

5.3 EARTHWORK

5.3.1 General

All site preparation and earthwork operations should be performed in accordance with applicable codes, safety regulations, and other local, state, or federal specifications. All references to maximum unit weight should be established in accordance with the current ASTM Standard Test Method D 1557 and may supercede references cited herein.

5.3.2 Stripping and Grubbing

All debris or structures that may be encountered during the stripping operations, including concrete, asphalt concrete, wood, steel, piping, etc. should be separated and disposed of off-site. Any existing utility pipelines that extend beyond the limits of the proposed development and are to be abandoned in place should be appropriately plugged and capped to prevent migration of soil and/or water. All demolition of

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underground structures should be accomplished under the observation of our representative in order to identify areas requiring over-excavation and compaction during future grading observation.

Prior to site grading, all existing vegetation, organic matter, and debris should be stripped and disposed outside the construction limits. Concrete, brick, organic matter, and other debris, if encountered, may not be used for fill materials. Deeper stripping or grubbing may be required where concentrations of organics are encountered during site grading.

5.3.3 Remedial Grading

Subsequent to stripping and grubbing operations, areas to receive fill should be stripped of all topsoil, and any loose or soft earth materials until a uniform, firm and unyielding subgrade is exposed, as evaluated by the geotechnical engineer or geologist.

We recommend over-excavation and re-compaction of the existing alluvial soils to reduce the potential for excessive settlement and help mitigate the potential for collapse. Specific over-excavation recommendations are provided in the following paragraphs. However, in all instances the minimum depth of overexcavation within all areas of proposed structures should be at least three feet below existing grade. Overexcavation recommendations are herein provided for the following areas.

Shallow Foundations: Footings for the proposed structure should be placed on a minimum of 3 feet of engineered fill compacted to at least 90 percent relative compaction (ASTM D 1557). For example, if footings are embedded 2 feet below existing grade, overexcavation of at least 5 feet below existing grade is recommended. The engineered fill should extend horizontally beyond the edges of all foundation elements a minimum distance of 5 feet.

Slab-on-Grade: The slab-on-grade for the proposed structure should be placed on a minimum of 3 feet of engineered fill compacted to at least 90 percent relative compaction (ASTM D 1557).

Pavement Subgrade: New asphalt concrete or Portland cement concrete pavements should be placed over a minimum of 2 feet of engineered fill compacted to at least 90 percent relative compaction (ASTM D 1557). The top 12 inches of engineered fill

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measured from the finished subgrade elevation should be compacted to at least 95 percent relative compaction. This engineered fill thickness is in addition to the asphalt concrete, Portland cement concrete, and aggregate base layers presented in Section 5.8 of this report.

All over-excavations should extend to a depth where the project geologist or geotechnical engineer has deemed the exposed soils as being suitable for receiving compacted fill. The over-excavation depths may be modified once final grading plans are prepared and reviewed by Kleinfelder.

Prior to the placement of compacted fill, and after site preparation and remedial grading have been performed, processing of the approved excavation bottom should be performed by scarifying to a minimum depth of 6 inches, moisture conditioning as necessary to near optimum moisture content, and compacting to a minimum of 90 percent of the maximum dry unit weight, based on ASTM D 1557. Compaction efforts should also include proof-rolling of the exposed overexcavation bottom with heavy tamping equipment to help mitigate against collapsible soils.

The removal and stripping operations should expose a firm and unyielding subgrade that is free of significant voids. The materials exposed at the bottom of excavations should be observed by a geotechnical engineer or geologist from our office prior to the placement of any compacted fill soils. Additional removals may be required as a result of observation and/or testing of the exposed subgrade subsequent to the required over-excavation. A representative from our firm should be present during all site clearing and grading operations to monitor site conditions; substantiate proper use of materials; evaluate compaction operations; and verify that the recommendations contained herein are met.

5.3.4 On-site Materials

Borings were advanced with little to moderate effort within the existing on-site soils. Conventional earth moving equipment is expected to be capable of performing the excavations required.

The on-site soils encountered during our investigation, excluding organics, debris, and/or other deleterious materials, are considered suitable for use as engineered fill. When adequately compacted at an appropriate moisture content, these materials can

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be expected to possess suitable bearing and settlement characteristics for the proposed project.

5.3.5 Import Materials

All import fill soils should be free from deleterious material and debris. Import materials, if required, should have a "very low" to "low" expansion potential, i.e. have an expansion index of less than 50. All imported fill should be compacted to the general recommendations provided for compacted fill. We recommend that the contractor be responsible to verify that all import soil be documented to be free of environmentally regulated substances including petroleum or petroleum by-products, chemicals, and harmful materials.

5.3.6 Compaction Criteria

All fill soils, either native, imported, or blended mixes required to bring the site to final grade should be placed as compacted fill. All soil intended for compacted fill should be uniformly moisture-conditioned to near optimum moisture content, placed in horizontal lifts less than 8 inches in loose thickness, and compacted to at least 90 percent relative compaction based on ASTM D 1557. The upper 12 inches of fill within pavement areas should be compacted to a minimum of 95 percent relative compaction (ASTM D 1557). Additional fill lifts should not be placed if the previous lift did not meet the required dry unit weight or if soil conditions are not stable.

5.4 FOUNDATION RECOMMENDATIONS

5.4.1 General

Based upon the data collected during this study, and from a geotechnical engineering standpoint, it is our opinion that the building foundations may be designed using conventional spread and continuous strip footings with slab-on-grade floors, provided the recommendations presented in this report are incorporated into the design and construction of the project. Recommendations for the design of foundations and slabs-on-grade are presented in the following sections.

5.4.2 Conventional Shallow Foundations

The proposed building can be designed with conventional continuous strip footings and isolated spread footings. Footings should have a minimum width of 18 inches and a minimum embedment depth of 24 inches below the lowest adjacent final grade.

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Foundations constructed in accordance with these recommendations may be designed using an allowable soil bearing pressure of 3,000 pounds per square foot (psf). Footings should be designed by the structural engineer for any specific loading, settlement, or expansive soil conditions. The allowable bearing pressure provided above is a net value; therefore, the weight of the foundation (which extends below grade) may be neglected when computing dead loads. The allowable bearing pressure may be increased by 1/3 for short-term loading due to wind or seismic forces.

Soils removed during any footing or utility trench excavation should not be spread or placed over compacted finished grade soils unless subsequently compacted to at least 90 percent of the maximum dry unit weight, as evaluated by ASTM D 1557, and near optimum moisture content.

Footings may experience an overall loss in bearing capacity or an increased potential to settle where located in close proximity to existing or future utility trenches. Furthermore, stresses imposed by the footings on the utility lines may cause cracking, collapse, and/or a loss of serviceability. To reduce this risk, footings should extend below a 1:1 plane projected upward from the closest bottom corner of the trench.

At the completion of grading, representative samples of the materials at footing grade should be evaluated for expansion potential and corrosivity.

5.4.3 Slabs-On-Grade

Concrete slabs-on-grade may be used for the proposed structure. Slabs-on-grade should be placed on compacted engineered fill that is uniform in composition and at least 3 feet in thickness. We recommend that interior concrete slabs supported-on-grade be underlain by a capillary break to reduce the potential for soil moisture migrating upwards toward the slab. Concrete floor slabs should be reinforced as required by the structural engineer. The structural engineer should design all slabs for any specific loading, settlement, or expansive soil conditions. At the completion of grading, representative samples of the materials at pad grade should be evaluated for expansion potential to verify or modify these recommendations.

We anticipate that some of the proposed floor slabs will be covered with moisture-sensitive floor coverings. Within areas where moisture sensitive flooring will be placed, we recommend the placement of an impermeable membrane such as visqueen, or

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equivalent, to act as a vapor barrier to reduce the potential for upward migration of water vapor through the slab. The vapor barrier should have a thickness of at least ten mils. To promote uniform curing of the slab and provide protection of the membrane during construction, clean, fine-to-medium-grained sand, 2 inches thick, should be placed on top of and below the membrane, for a 4-inch thick sand blanket, prior to the placement of concrete. This sand should be moistened immediately prior to concrete placement.

Clean sand should conform to the specifications for concrete sand in the latest editions of the Standard Specifications for Public Works Construction (Green Book). Generally, the gradation range of clean sand should consist of 100% passing the No. 4 sieve to less than 5% passing the No. 200 sieve. In general, the on-site soils do not appear to meet this requirement. All areas adjacent to the building, including planters, should be designed to drain away from the structure to avoid an accumulation of water beneath the slab.

Concrete should not be placed if sand overlying the vapor barrier has been allowed to become wet (due to precipitation or excessive moistening) or if standing water is present above the membrane. Excessive water beneath interior floor slabs could result in significant vapor transmission through the slab, adversely affecting moisture-sensitive floor coverings.

Although vapor barrier systems are currently the industry standard, this system may not be completely effective in preventing floor slab moisture problems. These systems typically will not necessarily ensure that floor slab moisture transmission rates will meet floor-covering manufacturer standards or that indoor humidity levels will be appropriate to inhibit mold growth. In many cases, floor moisture problems are the result of either improper curing of floor slabs or improper application of flooring adhesives.

Our evaluation has not included services to address the influence of moisture vapor transmission through building floor slabs. Slab and flooring system design experts should be retained to provide design recommendations consistent with the maximum allowable moisture transmission rate as it may affect flooring performance and indoor humidity levels.

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Special precautions must be taken during the placement and curing of all concrete slabs. Excessive slump (high water-cement ratio) of the concrete and/or improper curing procedures used during either hot or cold weather conditions could lead to excessive shrinkage, cracking, or curling of the slabs. High water-cement ratio and/or improper curing also greatly increase the water vapor permeability of concrete. We recommend that all concrete placement and curing operations be performed in accordance with the American Concrete Institute (ACI) Manual.

5.4.4 Footing and Slab-On-Grade Observation

Prior to placing steel or concrete, footing excavations should be cleaned of all debris, loose or soft soil, and water. All footing excavations should be observed by an engineer from our firm just prior to placing steel or concrete to verify that the recommendations contained herein are implemented during construction. Subgrade soils beneath slabs-on-grade should also be observed during pre-moistening operations to verify that the recommendations contained herein are implemented during construction.

5.4.5 Estimated Settlements

Total settlement of the foundation will vary depending on the plan dimensions of the foundation and the actual load supported. Based on anticipated foundation dimensions and loads, and assuming the site is prepared as recommended under Section 5.3, it is our opinion that the total and differential settlement due to static loading between similarly loaded adjacent footings should be approximately 1-inch and ½-inch over a distance of 40 feet, respectively. In the event that the foundation soils become saturated settlement greater than one inch could occur due to isolated collapsible soils.

5.4.6 Lateral Earth Pressures

The lateral earth pressure values for level backfill are provided for walls backfilled with drainage materials and existing on-site soils. Retaining walls or structures should be designed for an active soil pressure equivalent to a fluid density of 35 pounds per cubic foot (pcf). The active lateral earth pressures are for horizontal backfills using the on-site native soils on walls that are free to rotate at least 0.1 percent of the wall height. Walls, which are restrained against movement or rotation at the top, should be designed for a soil pressure equivalent to a fluid density of 55 pcf.

The recommended lateral earth pressures assume that drainage is provided behind the walls to prevent the buildup of hydrostatic pressures. Walls should be provided with

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drains to reduce the potential for the buildup of hydrostatic pressure. Drains may consist of a 2-foot-wide zone of ¾-inch rock wrapped in filter fabric located immediately behind the wall extending to within 1 foot of the ground surface. Perforated Schedule 40 PVC pipe should be installed within the rock at the base of the drain and sloped to discharge to a suitable collection facility. Commercially available drainage panels could be used as an alternative. The product manufacturer's recommendations should be followed in the installation of a drainage panel.

If sufficient drainage is not provided, walls should be designed to resist equivalent fluid pressures of 80 pcf and 90 pcf for the active and at-rest cases, respectively.

Resistance to lateral loads (including those due to wind or seismic forces) may be provided by frictional resistance between the bottom of concrete foundations and the underlying soil, and by passive soil pressure against the sides of the foundations.

A coefficient of friction of 0.35 may be used between cast-in-place concrete foundations and the underlying soil. Passive pressure available in engineered fill may be taken as equivalent to the pressure exerted by a fluid weighing 325 pcf, not to exceed 3,000 psf. The passive resistance may be increased by one-third when considering loads of short duration including wind or seismic loads.

The upper 1-foot of soil should not be considered when calculating passive pressure unless confined by overlying asphalt concrete pavement or Portland cement concrete slab. The passive resistance of the subsurface soils will diminish or be non-existent if trench sidewalls slough, cave, or are overwidened during or following excavations. If this condition is encountered, our firm should be notified to review the condition and provide remedial recommendations, if warranted.

The above values are applicable if the on-site soils are used for backfill behind the walls. The recommended values do not include compaction or truck-induced wall pressures. Care must be taken during the compaction operation not to overstress the wall. Heavy construction equipment should be maintained a distance of at least 3 feet away from the walls while the backfill soils are being placed. Hand-operated compaction equipment should be used to compact the backfill soils within a 3-foot-wide zone adjacent to the walls.

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5.5 TEMPORARY EXCAVATIONS

5.5.1 General

All excavations must comply with applicable local, state, and federal safety regulations including the current OSHA Excavation and Trench Safety Standards. Construction site safety generally is the sole responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. We are providing the information below solely as a service to our client. Under no circumstances should the information provided be interpreted to mean that Kleinfelder is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

5.5.2 Temporary Slopes

Near-surface soils encountered during our field investigation consisted predominantly of silty sand (SM), sand with silt (SP-SM), sand (SP) and sandy silt (ML). In our opinion, these soils would be considered a Type "C" soil with regard to the OSHA regulations. For this soil type, OSHA requires a maximum slope inclination of 1.5:1 (horizontal:vertical) or flatter for excavations 20 feet or less in depth. Steeper cut slopes may be utilized for excavations less than 5 feet deep, depending on the strength, moisture content, and homogeneity of the soils as observed during construction. Loose or running soils may require flatter slope inclinations.

5.5.3 Shoring

Shoring may be required where space or other restrictions do not allow a sloped excavation. Braced excavations should be designed to resist a uniform horizontal soil pressure of 25H (in pounds per square foot, psf) where "H" is the excavation depth in feet. The values provided above assume a level ground surface adjacent to the top of the shoring.

Fifty percent of an areal surcharge placed adjacent to the shoring may be assumed to act as a uniform horizontal pressure against the shoring. Special cases such as combinations of slopes and shoring or other surcharge loads (not specified above) may require an increase in the design values recommended above. These conditions should be evaluated by the project geotechnical engineer on a case-by-case basis. The contractor should be responsible for the structural design and safety of all temporary shoring systems.

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5.6 TRENCH BACKFILL

5.6.1 Materials

Pipe zone backfill (i.e., material beneath and to 12 inches above the top of the pipe) should consist of sand or similar granular material having a minimum sand equivalent value of 30. Trench zone backfill (i.e., material placed between the pipe zone backfill and finished subgrade) may consist of native or import soil, which meets the requirements for engineered fill provided in Section 5.3.

Recommendations provided above for pipe zone backfill are minimum requirements only. More stringent material specifications may be required to fulfill local building requirements and/or bedding requirements for specific types of pipes. We recommend the project Civil Engineer develop these material specifications based on planned pipe types, bedding conditions, and other factors beyond the scope of this study.

5.6.2 Compaction Criteria

Pipe-zone and above pipe-zone backfill should be moisture conditioned to near optimum moisture content and placed in horizontal lifts less than 8 inches in loose thickness and compacted to at least 90 percent of the maximum dry unit weight based on ASTM Test Method D 1557. Under pavement sections, the upper 12 inches of subgrade soil below the pavement section should be compacted to at least 95 percent relative compaction (ASTM D 1557). Backfill materials should be brought up at substantially the same rate on both sides of the pipe. Reduction of the lift thickness may be necessary to achieve the above recommended compaction. Mechanical compaction is recommended; ponding or jetting should be avoided, especially in areas supporting structural loads or beneath concrete slabs supported-on-grade, pavements, or other improvements.

5.7 SURFACE AND SUBGRADE DRAINAGE

Foundation and slab performance depends greatly on how well runoff water drains from the site. Positive drainage should be provided to direct the flow of water away from slopes. Adequate provisions should be made to control and limit moisture changes in the subgrade beneath footings and floor slabs. These may include positive drainage

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away from building foundations. It is also recommended that all pad drainage and roof runoff be collected and drained away from the building pads to proper drain outlets.

Measures should be taken to reduce the potential for future pipe leakage and/or landscape irrigation infiltration into the soils within the areas of the proposed structures. Surface water should not be allowed to flow against or toward foundation elements. Outlets for gutter systems should discharge water either into storm drains or onto paved surfaces that quickly remove water from the area. Where outlets must discharge into landscape areas, the outlets should have splash blocks or other means of directing the water away from the foundation. Landscape borders should not act as traps for water within landscape areas.

Planters should be built such that water exiting from them will not seep into the foundation areas or beneath slabs and pavement. Maintenance personnel should be instructed to limit irrigation to the minimum actually necessary to properly sustain landscaping plants. Potential sources of water such as water pipes and drains should be frequently examined for signs of leakage or damage. Any such leakage or damage should be promptly repaired.

The drainage pattern should be established at the time of final grading and maintained throughout the life of the project. Structural performance is dependent on many drainage-related factors such as landscaping, irrigation, lateral drainage patterns, and other improvements.

5.8 PRELIMINARY PAVEMENT DESIGN

The appropriate pavement design section depends primarily on the shear strength of the subgrade soil exposed after grading and anticipated traffic over the useful life of the pavement. Pavement sections provided in the following sections are based on the soil conditions encountered during our field investigation, laboratory testing, and our assumptions regarding final site grades. We recommend representative roadway subgrade samples be obtained during grading and R-Value tests performed. Should the results of these tests indicate a significant difference, the design pavement sections provided above may need to be revised.

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To reduce potential settlement, excess soil material, and/or fill material removed during any footing or utility trench excavation, should not be spread or placed over compacted finished grade soils unless subsequently compacted to at least 95 percent of the maximum dry unit weight, as evaluated by ASTM D 1557 test procedure, and at near optimum moisture content, if placed under areas designated for pavement. Pavement sections provided below assume that heavy construction traffic will not be allowed on finished pavement sections.

5.8.1 Asphalt Concrete Pavement

The following asphalt concrete (flexible) pavement sections are based on a minimum R-Value of 29 for soil, R-Value of 78 for base materials, current Caltrans design procedures, and assumed traffic indices. The traffic indices assumed should be reviewed by the project Owner, Architect, and/or Civil Engineer to evaluate their suitability for this project. Changes in the traffic indices will affect the corresponding pavement section.

Table 4
Asphalt Concrete Pavement Sections

Traffic Index	Asphalt Concrete Thickness (in.)	Aggregate Base Thickness (in.)
4.0	3.0	5.0
5.0	3.0	6.0
7.0	4.0	10.0
8.0	5.0	11.0

- Pavement should be underlain by at least 24 inches of engineered fill compacted to at least 90 percent relative compaction (ASTM D 1557). The top 12 inches of engineered fill measured from the finished subgrade elevation should be compacted at least 95% relative compaction.

- Subgrade soils should be in a stable, non-pumping condition at the time aggregate base materials are placed and compacted.

- Asphalt concrete paving, aggregate base materials, and placement methods should conform to the latest edition of the Standard Specification for Public Works referred to as the Green Book or current Caltrans Specifications.

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- Asphalt concrete and aggregate base materials should be compacted to at least 95 percent relative compaction (ASTM D 1557).

- Within the structural pavement section areas, positive drainage (both surface and subsurface) should be provided. In no instance should water be allowed to pond on the pavement. Roadway performance depends greatly on how well runoff water drains from the site. This drainage should be maintained both during construction and over the entire life of the project.

5.8.2 Portland Cement Concrete Pavement

Portland cement concrete (rigid) pavements may be desirable in loading dock, trash collection, and other areas subject to frequent traffic loads. For the recompacted on-site soils and an assumed design modulus of subgrade reaction of 150 pounds per cubic inch, the concrete pavement should have a minimum thickness of 7-inches and a minimum 28-day compressive strength of 3,500 psi. Control joints should be spaced at a maximum of every 15 feet. Rigid pavements should be placed on at least 4 inches of aggregate base compacted to a minimum of 95 percent relative compaction (ASTM D 1557).

A minimum of 12 inches of engineered fill compacted to at least 95 percent relative compaction (ASTM D 1557) should be placed beneath the rigid pavement and aggregate base for purposes of providing additional structural strength and a more uniform bearing surface for the pavement.

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6.0 ADDITIONAL SERVICES

6.1 PLANS AND SPECIFICATIONS REVIEW

We recommend Kleinfelder, Inc., be retained to review preliminary foundation and earthwork plans and specifications. It has been our experience that this service provides an opportunity to review whether or not our recommendations have been properly interpreted and to correct possible misunderstandings of our recommendations prior to the start of construction. In the event Kleinfelder is not retained to perform this recommended review, we will assume no responsibility for misinterpretation of our recommendations. This review may be performed in accordance with our current fee schedule.

6.2 CONSTRUCTION OBSERVATION AND TESTING

We recommend that Kleinfelder, Inc., be retained to provide observation and testing services during site earthwork and construction of foundations. This will allow us the opportunity to compare actual subsurface soil conditions with those encountered during our field exploration and, if necessary, to provide supplemental recommendations, if warranted due to unanticipated subsurface conditions.

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7.0 LIMITATIONS

Recommendations contained in this report are based on our field observations and subsurface explorations, limited laboratory tests, and our present knowledge of the proposed construction. It is possible that soil conditions vary between or beyond the points explored. If soil or groundwater conditions are encountered during construction that differ from those described herein, we should be notified immediately in order that a review may be made and any supplemental recommendations provided. If the scope of the proposed construction, including the proposed loads or structural locations, changes from that described in this report, our recommendations should also be reviewed. We have not reviewed the final grading plans or foundation plans for the project.

Our corrosion recommendations are preliminary. Kleinfelder is not a corrosion engineering consultant. Specific recommendations for corrosion protection should be obtained from a corrosion specialist.

Our evaluation of subsurface conditions at the site has considered subgrade soil and groundwater conditions present at the time of our investigation. The influence(s) of post-construction changes to these conditions such as introduction of water into the subsurface will likely influence future performance of the proposed project. Whereas our scope of services addresses present groundwater conditions; future irrigation, broken water pipelines, etc. may adversely influence the project and should be addressed and mitigated, as needed, by specialized slab and flooring system designers having local knowledge.

Other standards or documents referenced in any given standard cited in this report, or otherwise relied upon by the authors of this report, are only mentioned in the given standard; they are not incorporated into it or "included by reference", as the latter term is used relative to contracts or other matters of law.

We have strived to present the findings, conclusions and recommendations in this report in a manner consistent with the standards of care and skill ordinarily exercised by members of this profession practicing under similar conditions in the area of San Bernardino County, California, and at the time the services were performed. No warranty, express or implied, is made. The recommendations provided in this report are

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based on the assumption that an adequate program of tests and observations will be conducted by Kleinfelder during the construction phase in order to evaluate compliance with our recommendations.

This report may be used only by the client and only for the purposes stated, within a reasonable time from its issuance, but in no event later than one year from the date of the report. Land use, site conditions (both on site and off site) or other factors may change over time, and additional work may be required with the passage of time. Any party other than the client who wishes to use this report shall notify Kleinfelder of such intended use. Based on the intended use of the report, Kleinfelder may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the client or anyone else will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party, and client agrees to defend, indemnify, and hold harmless Kleinfelder from any claim or liability associated with such unauthorized use or non-compliance.

The scope of our geotechnical services did not include any environmental site assessment for the presence or absence of hazardous/toxic materials. Kleinfelder will assume no responsibility or liability whatsoever for any claim, damage, or injury which results from pre-existing hazardous materials being encountered or present on the project site, or from the discovery of such hazardous materials.

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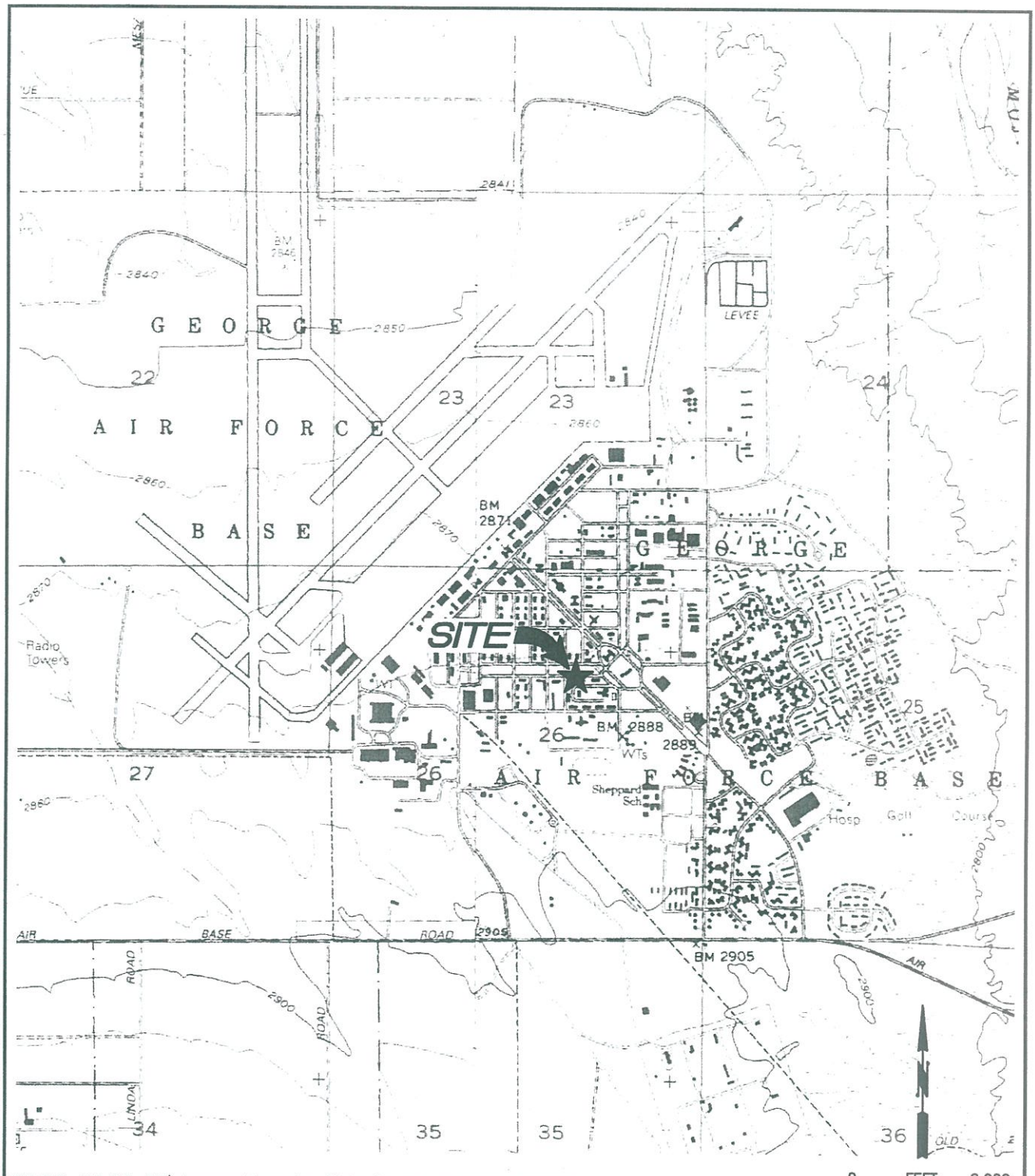
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PLATES



SOURCE: U.S.G.S. 7.5' topographic series, Victorville and Adelanto, California quadrangles dated 1956, photorevised 1993.

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ATTACHED IMAGES: Images: 77607p1.jpg
ATTACHED XREFS:
DB-L:\2007\CADD CAD FILE: U:\CCardiel\77604\ LAYOUT: PLATE 1

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SITE LOCATION MAP

PROPOSED COMMERCIAL BUILDING 13A
SOUTHERN CALIFORNIA LOGISTICS AIRPORT
VICTORVILLE, CALIFORNIA

DRAWN BY:	D. FAHRNEY
REVISED BY:	D. FAHRNEY
CHECKED BY:	S. LAWSON
PLATE	1

DRAWN: 01/19/07	APPROVED BY:_____	PROJECT NO. 77604/1	FILE NAME: 77604p1.dwg

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Sabre Street

Aerospace Street

Gate

Conc. Screenwall

Office

Building 13A 296,433 sf

570 ft

New Land Acquisition: 888,827 sf 20.40 ac

Existing Parcel Area: 817,345 sf 18.76 ac

B-1
B-2
B-3
B-4
B-5
B-6
B-7
B-8
B-9
B-10
B-11
B-12
B-13
B-14
B-15
B-16
B-17
B-18
B-19
B-20
B-21
B-22

TP-1
TP-2
TP-3
TP-4
TP-5
TP-6

P.K

0 FEET 150

EXPLANATION

B-3 APPROXIMATE SOIL BORING LOCATION

TP-4 APPROXIMATE TEST PIT LOCATION

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CAD FILE: U:\CCardiel\77604\ LAYOUT: Layout1

ATTACHED IMAGES:
ATTACHED XREFS:
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PLATE 2

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PLOTTED: 19 Jan 2007, 4:40pm, dfahrney

BORING AND TEST PIT LOCATION MAP

PROPOSED COMMERCIAL BUILDINGS 13 A
SOUTHERN CALIFORNIA LOGISTICS AIRPORT
VICTORVILLE, CALIFORNIA

PROJECT NO. 77604 FILE NAME: 060774-00-A1-1.dwg

DRAWN BY	REVISED BY	CHECKED BY	APPROVED BY:
C. CARDIEL	D. FAHRNEY		
DATE: 1/17/07			

APPENDIX A

FIELD EXPLORATION

APPENDIX A
FIELD EXPLORATION

The subsurface exploration program consisted of excavating and logging 22 hollow-stem auger borings and 6 exploratory test pits. The borings extended to depths ranging from approximately 6½ to 51½ feet below the existing grade. The test pits were excavated approximately 6 to 8 feet below the existing grade. The exploratory borings were advanced using a Mobile B-53, truck-mounted drill rig equipped with 8-inch diameter hollow-stem augers and an automatic hammer. The exploratory test pits were excavated with a rubber-tire mounted backhoe equipped with a 24-inch wide bucket. Plate 2 shows the approximate locations of the exploratory borings and test pits. The specific boring and test pit locations were established from current landmarks, pacing, and rough measurements. The described locations should be considered accurate only to the degree implied by the method of measurement used.

A legend to the logs is presented as Plate A-1. The logs of borings and test pits are presented as Plates A-2 through A-29. The logs describe the earth materials encountered, indicate the locations of the samples obtained, and show field and laboratory tests performed. The excavations were logged by a staff geologist from this firm using methods outlined in the Unified Soil Classification System (USCS) and general procedures established in ASTM D 2488. The boundaries between soil types shown on the logs are approximate because the transition between different soil layers may be gradual. Bulk and in-place samples of representative earth materials were obtained from the borings.

In-place soil samples were obtained from the borings using either a Standard Penetration (SPT) or California-type Sampler driven a total of 18-inches (or until practical refusal) into the undisturbed soil at the bottom of the boring. The soil sampled by the SPT (2-inch O.D., 1.5 inches I.D.) or California-type sampler (3-inch O.D., 2.4 inches I.D.) was returned to our laboratory for testing. The samplers were driven using a 140 pound hammer falling 30 inches. The total number of hammer blows required to drive the sampler the final 12 inches is termed the blow count and is recorded on the Logs of Borings. Bulk samples of the soils were retrieved directly from the auger blades. In-situ dry unit weight and moisture content tests were performed in the exploratory test pits using a nuclear density gauge in general accordance with ASTM

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Standard Test Methods D 2922 and ASTM D 3017 (Nuclear Method for Determination of Density and Moisture, respectively). All borings and test pits were backfilled using the soil from cuttings.

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UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISION		LTR	ID	DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW		Well-graded gravels, gravel-sand mixtures
		GP		Poorly-graded gravels, gravel-sand mixtures
		GM		Silty gravels, gravel-sand-silt mixtures
		GC		Clayey gravels, gravel-sand-clay mixtures
	SAND AND SANDY SOILS	SW		Well-graded sands, gravelly sands
		SP		Poorly-graded sands and gravelly sands
		SM		Silty sands, sand-silt mixture
		SC		Clayey sands, sand-clay mixture

MAJOR DIVISION		LTR	ID	DESCRIPTION
FINE GRAINED SOILS	SILTS AND CLAYS LL < 50	ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands
		CL		Inorganic clays of low to medium plasticity; gravelly clays silty clays,sandy clays, lean clays
		OL		Organic silts and organic silt-clays of low plasticity
	SILTS AND CLAYS LL > 50	MH		Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
		CH		Inorganic clays of medium to high plasticity
		OH		Organic clays of medium to high plasticity
	HIGHLY ORGANIC SOILS	Pt		Peat, muck and other highly organic soils

▼ Approximate water level observed in boring following drilling

SOIL SAMPLE

Bulk Sample

Drive Sample - California Sample

Shelby Tube Sample

Standard Penetration Test (SPT) Sample

ADDITIONAL TESTS

CN	-	Consolidation
COR	-	Corrosion Potential
CP	-	Collapse Potential
DS	-	Direct Shear
EI	-	Expansion Potential
MAX	-	Maximum Dry Density
SG	-	Specific Gravity
PI	-	Plasticity Index
RV	-	R-Value
SE	-	Sand Equivalent
GS	-	Grain Size Distribution

NOTES:

Blow counts represent the number of blows of a 140-pound hammer falling 30 inches required to drive a sampler through the last 12 inches of an 18-inch penetration, unless otherwise noted.

The lines separating strata on the logs represent approximate boundaries only. The actual transition may be gradual. No warranty is provided as to the continuity of soil strata between borings. Logs represent the soil section observed at the boring location on the date of drilling only.

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LEGEND TO LOGS

PLATE
A-1

Date Drilled	11/29/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	11/29/06
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1								
	2	4			ML	**Sandy Silt:** brown, dry, medium stiff, fine grained sand, trace clay			GS COR
5	3	21			SC	**Clayey Sand:** light brown, slightly moist, medium dense, fine grained, trace caliche	105	9.4	CN
10	4	47			SM	**Silty Sand:** brown, dry, dense, fine grained sand, trace clay			
15	5	73			SP	**Sand:** light brown, dry, very dense, fine grained			
20	6	19, 39, 50-5"				-- fine to coarse grained, trace gravel			
25	7	17, 36, 50-5"				-- light tan, fine grained			
30	8	53				-- fine to medium grained			
						Boring terminated at 31.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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Southern California Logistics Airport
Victorville, California

LOG OF BORING B- 1

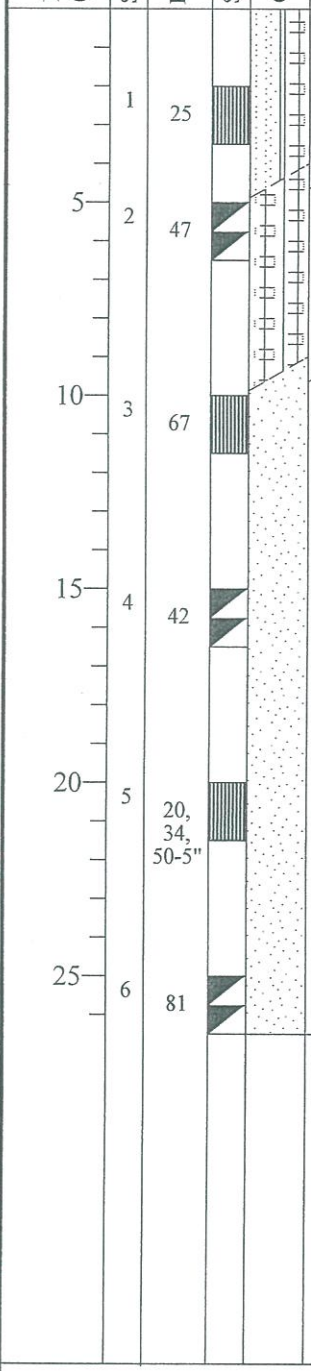
PLATE A-2

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

Date Drilled	11/29/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	11/29/06
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA



Depth (feet)	Sample Number	Blows per Foot	Sample Type	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1	25		SP-SM	**Sand with Silt:** light brown, dry, medium dense, fine to medium grained	122	3.1	
5	2	47		SM	**Silty Sand:** brown, dry, dense, fine grained, some clay, caliche			GS
10	3	67		SP	**Sand:** light brown, dry, very dense, fine grained, trace silt	122	2.7	
15	4	42			-- brown, dense			
20	5	20, 34, 50-5"						
25	6	81						
					Boring terminated at 26.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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Proposed Commercial Building 13A
Southern California Logistics Airport
Victorville, California

LOG OF BORING B- 2

PLATE A-3

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

Date Drilled	11/29/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	11/29/06
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
					SM	**Silty Sand:** light brown, dry, fine grained			
	1	40			SM	**Silty Sand:** tan, dry, dense, fine grained	119	2.3	
5	2	9			SP	**Sand:** light brown, dry, fine to coarse grained, loose			
10	3	58				-- dense, fine to medium grained			
15	4	62				-- very dense			
20	5	36			SM	**Silty Sand:** olive-brown, moist, dense, fine grained			
25	6	23				-- medium dense			
30	7	14, 40, 50-5"				-- very dense			
						Boring terminated at 31.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B- 3

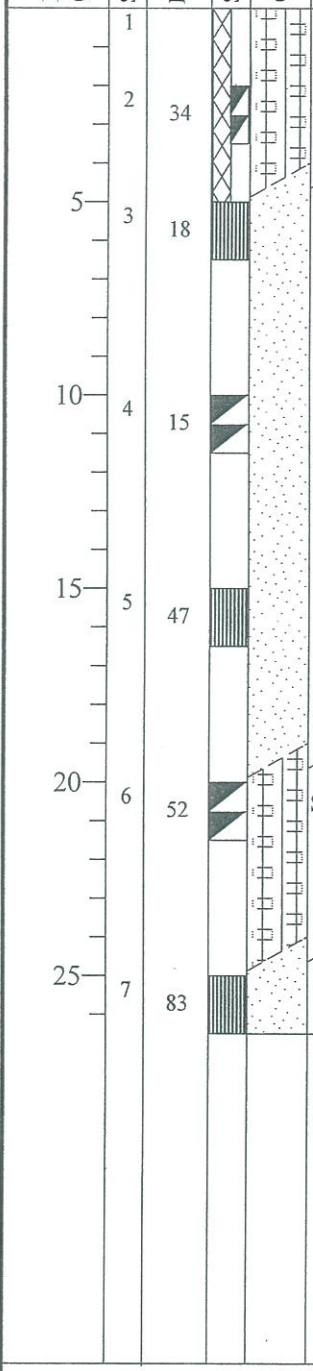
PLATE A-4

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

Date Drilled	11/29/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	11/29/06
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA



Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1								
	2	34			SM	**Silty Sand:** red-brown, dry, dense, fine grained, trace caliche			
5	3	18			SP	**Sand:** light brown, dry, medium dense, fine to medium grained		1.6	
10	4	15							
15	5	47				-- light tan, dense, fine grained			
20	6	52			SM	**Silty Sand:** brown, dry, very dense, fine grained			
25	7	83			SP	**Sand:** brown, dry, very dense, fine grained			
						Boring terminated at 26.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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Proposed Commercial Building 13A
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LOG OF BORING B- 4

PLATE A-5

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/19/07

Date Drilled	11/29/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	11/29/06
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
0	1	50			SM	**Silty Sand:** light brown, slightly moist, dense, fine grained, cemented, caliche	125	6.5	
5	2	8				-- brown, loose, fine to medium grained			
10	3	47			SP	**Sand:** light tan, dry, dense, fine to medium grained			
15	4	65				-- orange-brown, very dense, fine to coarse grained sand, trace fine gravel			
20	5	83				-- slightly moist, very dense, fine to medium sand			
25	6	37				-- dense			
30	7	36							

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Proposed Commercial Building 13A
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Victorville, California

LOG OF BORING B- 5

PLATE A-6a

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	8	68				-- very dense			
40	9	39			SM	**Silty Sand:** brown, moist, dense, fine grained			
45	10	96				-- very dense			
					SP	**Sand:** light brown, dry, very dense, fine grained			
50	11	59				-- fine to medium grained			
						Boring terminated at 51.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

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LOG OF BORING B- 5

PLATE

A-6b

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Date Drilled	11/29/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	11/29/06
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1								
	2	15			SM	**Silty Sand:** light brown to red-brown, dry, medium dense, fine grained, trace caliche			MAX
5	3	15			SP	**Sand:** orange-brown, dry, medium dense, fine to medium grained, trace silt		1.3	
10	4	25				-- fine to coarse grained, thin lense of silty sand			
15	5	21, 50-5"				-- mottled olive/brown/red, very dense, trace silt			
20	6	35				-- dense, fine to medium grained			
25	7	15, 32, 50-5"				-- very dense			
						Boring terminated at 26.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B- 6

PLATE

A-7

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/19/07

Date Drilled	11/29/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	11/29/06
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1	18			SM	**Silty Sand:** tan, dry, medium dense, fine grained	117	2.0	DS
5	2	12			SM	**Silty Sand:** light brown, dry, medium dense, fine to medium grained, trace fine gravel			GS
10	3	46				-- dense	117	1.3	
15	4	87			ML	**Sandy Silt:** olive-brown, moist, hard, fine grained sand, caliche			
						-- auger chatter on gravel			
20	5	70			SP	**Sand:** light brown, slightly moist, very dense, fine grained			
25	6	46				-- dense			
						Boring terminated at 26.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B- 7

PLATE A-8

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

Date Drilled	11/29/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	11/29/06
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1								
	2	12			SM	**Silty Sand:** light brown to tan, dry, medium dense, fine grained, trace clay			
5	3	20				-- fine to medium grained	114	1.2	DS
10	4	39			SP	**Sand:** light brown, dry, dense, fine to coarse grained, trace silt and gravel			
15	5	21, 37, 50-5"				-- very dense	103	0.7	GS
20	6	37							
25	7	50			SM	**Silty Sand:** brown, slightly moist, dense, fine grained, lense of clean sand			
30	8	55			SP	**Sand:** light brown, slightly moist, very dense, fine grained			
						Boring terminated at 31.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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PROJECT NO. 77604

Proposed Commercial Building 13A
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LOG OF BORING B- 8

PLATE A-9

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

Date Drilled	11/29/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	11/29/06
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1								
	2	61			SM	**Silty Sand:** brown, dry, very dense, fine grained, some clay, caliche			EI
5	3	28, 50-5"			SC-SM	**Silty Clayey Sand:** light tan, dry, very dense, fine grained	118	7.5	CN
						Boring terminated at 6.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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Proposed Commercial Building 13A
Southern California Logistics Airport
Victorville, California

LOG OF BORING B- 9

PLATE

A-10

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

Date Drilled	11/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	11/30/06
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1	86			SM	**Silty Sand:** brown, dry, very dense, fine to medium grained, caliche	125	2.7	
5	2	57				-- light tan, some clay			
						Boring terminated at 6.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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Victorville, California

LOG OF BORING B-10

PLATE A-11

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

Date Drilled	11/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	11/30/06
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
0	1	30			SM	**Silty Sand:** light brown, slightly moist, medium dense, fine grained	121	8.1	
5	2	11							
10	3	49			SP	**Sand:** brown, dry, dense, fine to medium, grained			
15	4	62				-- very dense, trace gravel and silt			
20	5	11, 38, 50-5"							
25	6	41				-- dense			
						Boring terminated at 26.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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PROJECT NO. 77604

Proposed Commercial Building 13A
Southern California Logistics Airport
Victorville, California

LOG OF BORING B-11

PLATE

A-12

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

Date Drilled	11/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	11/30/06
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1	21			SM	**Silty Sand:** light brown, dry, medium dense, fine grained, caliche	116	1.6	
5	2	14			SP	**Sand:** light brown, dry, medium dense, fine to medium grained, trace silt			
						Boring terminated at 6.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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PROJECT NO. 77604

Proposed Commercial Building 13A
Southern California Logistics Airport
Victorville, California

LOG OF BORING B-12

PLATE A-13

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

Date Drilled	11/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	11/30/06
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1				SM	**Silty Sand:** light tan, dry, medium dense, fine grained			
	2	15			SP-SM	**Sand with Silt:** light brown, dry, medium dense			
5	3	30					115	1.7	
10	4	24			SP	**Sand:** light brown, slightly moist, medium dense, fine to medium grained			
15	5	79				-- very dense			
20	6	45				-- dense			
25	7	36			SC	**Clayey Sand:** brown, moist, dense fine grained			
30	8	36							
						Boring terminated at 31.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B-13

PLATE
A-14

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/19/07

Date Drilled	11/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	11/30/06
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1				SM	**Silty Sand:** light brown, dry, fine grained			
	2	17				-- red-brown, medium dense			RV
5	3	26				-- caliche	112	2.1	CP
						Boring terminated at 6.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B-14

PLATE A-15

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

Date Drilled	11/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	11/30/06
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1	22			SM	**Silty Sand:** brown, slightly moist, medium dense, fine grained	124	4.0	
5	2	10				-- trace gravel, trace caliche			
						Boring terminated at 6.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B-15

PLATE

A-16

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

Date Drilled	11/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	11/30/06
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1	35			SM	**Silty Sand:** brown to light brown, dry, medium dense, fine grained, caliche	118	3.1	
5	2	13			SW	**Sand:** brown, dry, medium dense, fine to coarse grained			GS
10	3	26, 50-3"			ML	**Sandy Silt:** olive-brown, dry, hard, fine grained sand, caliche	106	15.4	CP
15	4	39			SP	**Sand:** orange-brown, dry, dense, fine to medium grained			
20	5	49				-- light tan			
25	6	30			SM	**Silty Sand:** brown, slightly moist, dense, fine grained, trace clay			
						Boring terminated at 26.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

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LOG OF BORING B-16

PLATE A-17

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Date Drilled	11/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	11/30/06
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1	25			SM	**Silty Sand:** light brown, dry, medium dense, fine grained, veins of caliche	126	3.5	
5	2	14			SP	**Sand:** orange/brown, dry, fine to medium, medium dense			
10	3	19, 50-5"			ML	**Sandy Silt:** brown, slightly moist, hard, fine grained sand, caliche veins	121	13.1	CP
						-- trace gravel in cuttings			
15	4	27			SP	**Sand:** light brown, dry, medium dense, fine to medium grained			
20	5	11, 41, 50-5"			SM	**Silty Sand:** brown, slightly moist, very dense, fine grained			
25	6	13				-- medium dense			
						Boring terminated at 26.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B-17

PLATE

A-18

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

Date Drilled	11/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	11/30/06
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1								
	2	9			SM	**Silty Sand:** light brown, dry, loose, fine grained			
5	3	14				-- medium dense, caliche	115	4.9	CP
						Boring terminated at 6.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B-18

PLATE

A-19

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

Date Drilled	11/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	11/30/06
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1								
	2	18			SM	**Silty Sand:** brown, dry, medium dense, fine to medium grained, caliche			MAX
5	3	10			SW	**Sand:** brown, dry, fine to coarse grained, loose	111	2.1	GS
10	4	75			SM	**Silty Sand:** brown, dry, very dense, caliche			
15	5	17, 33, 50-5"			SP	**Sand:** orange-brown, dry, very dense, fine to coarse grained -- trace cobbles in cuttings from 2" to 4" diameter			
20	6	28			SM	**Silty Sand:** brown, dry, medium dense, fine grained			
25	7	54			CL	**Sandy Clay:** brown, moist, hard, fine grained sand, trace caliche veins	122	12.7	PI
30	8	52			SP-SM	**Sand with Silt:** light brown, slightly moist, very dense, fine grained			
						Boring terminated at 31.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B-19

PLATE A-20

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

Date Drilled	11/30/06	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	11/30/06
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
0	1	9			SM	**Silty Sand:** brown, dry, loose, fine grained			
5	2	16			SP	**Sand:** light brown, dry, medium dense, fine to medium grained	106	1.0	
10	3	10, 21, 50-5"			SM	**Silty Sand:** brown, dry, very dense, fine grained, caliche			GS
15	4	74			SP	**Sand:** orange-brown, slightly moist, very dense, fine to medium grained			
20	5	48				-- dense, fine grained			
25	6	70			SM	**Silty Sand:** brown, moist, very dense, fine grained, iron staining			
30	7	32				-- dense			
						Boring terminated at 31.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B-20

PLATE A-21

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

Date Drilled	1/12/07	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	1/12/07
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1					**Asphalt Concrete:** approximately 2 inches thick **Aggregate Base:** approximately 4 inches thick			
	2	11			SP-SM	**Sand with Silt:** light brown, slightly moist, loose, fine to medium grained			MAX
5	3	21			SP	**Sand:** light brown, dry, medium dense, fine to medium grained	107	2.4	
10	4	51				-- brown, some silt			
15	5	63				-- very dense, fine grained			
20	6	24			SM	**Silty Sand:** brown, slightly moist, medium dense, fine grained, some clay			
25	7	21, 39, 50-5"			SP	**Sand:** light brown, slightly moist, very dense, fine grained			
30	8	58				-- trace silt			
						Boring terminated at 31.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

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LOG OF BORING B-21

PLATE A-22

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Date Drilled	1/12/07	Water Depth:	Not Encountered
Drilled By:	Cal Pac Drilling	Date Measured:	1/12/07
Drilling Method:	8" Hollow-stem auger	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
	1					**Asphalt Concrete:** approximately 4 inches thick			
	2	22			SM	**Silty Sand:** light brown, slightly moist, medium dense, fine to medium grained			COR, EI
5	3	27			SP	**Sand:** orange-brown, slightly moist, medium dense, fine to medium grained, trace silt	108	2.7	
10	4	18, 50-6"			ML	**Sandy Silt:** brown, moist, hard, fine grained sand, trace clay and caliche veins	112	13.6	CP
15	5	29			SP	**Sand:** tan, slightly moist, medium dense, fine to medium grained			
20	6	86				-- brown, very dense, fine grained, some silt			
25	7	25				-- light brown, dry, medium dense, fine to medium grained			
						Boring terminated at 26.5 feet. Groundwater was not encountered. Borehole backfilled using soil from cuttings.			

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LOG OF BORING B-22

PLATE A-23

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

Date Drilled	12/1/06	Water Depth:	Not Encountered
Drilled By:	Wes Bradshaw Backhoe	Date Measured:	12/1/06
Drilling Method:	Rubber-tire backhoe	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
					ML	**Sandy Silt:** light brown, dry, fine grained sand, trace gravel			
					ML	**Sandy Silt:** brown, slightly moist	102	11.0	
5					SC	**Clayey Sand:** light brown to tan, slightly moist, fine grained sand, trace caliche			
						Total depth of test pit was 8 feet. Test pit backfilled using excavated soil.			

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LOG OF TEST PIT TP- 1

PLATE

A-24

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/22/07

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Date Drilled	12/1/06	Water Depth:	Not Encountered
Drilled By:	Wes Bradshaw Backhoe	Date Measured:	12/1/06
Drilling Method:	Rubber-tire backhoe	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
					SM	**Silty Sand:** light brown, dry, fine grained			
					SM	**Silty Sand:** tan to light white, caliche	108	6.1	
5					SP	**Sand:** light brown, dry, loose, fine to coarse grained, trench sidewall caving			
						Total depth of test pit was 6 feet. Test pit backfilled using excavated soil.			

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PLATE A-25

PROJECT NO. 77604

LOG OF TEST PIT TP- 2

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/22/07

Date Drilled	12/1/06	Water Depth:	Not Encountered
Drilled By:	Wes Bradshaw Backhoe	Date Measured:	12/1/06
Drilling Method:	Rubber-tire backhoe	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
						Silty Sand: dark brown, dry, fine grained, some organics			
5					SM	**Silty Sand:** light brown, slightly moist, fine grained, trace caliche	109	10.6	
					SP	**Sand:** light brown, dry, fine to medium grained, trench sidewall caving			
						Total depth of test pit was 8 feet. Test pit backfilled using excavated soil.			

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/22/07

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LOG OF TESP PIT TP- 3

PLATE

A-26

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Date Drilled	12/1/06	Water Depth:	Not Encountered
Drilled By:	Wes Bradshaw Backhoe	Date Measured:	12/1/06
Drilling Method:	Rubber-tire backhoe	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
						Silty Sand: dark brown, dry, fine grained, some organics			
					SM	**Silty Sand:** light tan, dry, fine grained, caliche			
					SP-SM	**Sand with Silt:** light brown, dry, fine to medium grained, trace gravel, trench sidewall caving	100	5.2	
5						Total depth of test pit was 8 feet. Test pit backfilled using excavated soil.			

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LOG OF TEST PIT TP- 4

PLATE

A-27

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/22/07

Date Drilled	12/1/06	Water Depth:	Not Encountered
Drilled By:	Wes Bradshaw Backhoe	Date Measured:	12/1/06
Drilling Method:	Rubber-tire backhoe	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
5					SM	**Silty Sand:** brown, slightly moist, fine grained, interbedded lenses of caliche	108	8.0	
					SP	**Sand:** light brown, dry, fine to medium grained, trench sidewall caving			
						Total depth of test pit was 8 feet. Test pit backfilled using excavated soil.			

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/22/07

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LOG OF TEST PIT TP- 5

PLATE

A-28

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Date Drilled	12/1/06	Water Depth:	Not Encountered
Drilled By:	Wes Bradshaw Backhoe	Date Measured:	12/1/06
Drilling Method:	Rubber-tire backhoe	Elevation:	NA
Logged By:	James Perry	Datum:	NA

Depth (feet)	Sample Number	Blows per Foot	Sample Type	Graphic Log	USCS Description	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests & Remarks
					SM	**Silty Sand:** dark brown, dry, fine grained, some organics -- orange-brown, slightly moist, fine to medium grained, interbedded with roots and silty sand			
					SM	**Silty Sand:** dark brown to brown, moist, fine grained	117	11.8	
5					SW	**Sand:** brown, slightly moist -- approximately 1 foot thick lense of caliche interbedded at 6 feet below grade			
					SW	**Sand:** light brown, dry, fine to medium grained			
						Total depth of test pit was 8 feet. Test pit backfilled using excavated soil.			

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LOG OF TEST PIT TP- 6

PLATE

A-29

Legend to Logs on Plate A-1

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH TEMECULA 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/22/07

APPENDIX B

LABORATORY TESTING

APPENDIX B
LABORATORY TESTING

Laboratory tests were performed on drive and bulk soil samples to estimate engineering characteristics of the various earth materials encountered. Testing was performed in general accordance with procedures outlined by the American Society for Testing and Materials, the California Department of Transportation, or other accepted procedures.

IN-SITU MOISTURE CONTENT AND DRY UNIT WEIGHT

In-situ moisture content and dry unit weight tests were performed on samples that could be recovered in a relatively undisturbed condition. Moisture content was evaluated in general accordance with ASTM Test Method D 2216; dry unit weight was evaluated using procedures similar to ASTM Test Method D 2937. The results are presented on the Logs of Borings.

GRAIN SIZE DISTRIBUTION

Sieve analyses were performed on seven soil samples to evaluate the gradation of the material and to aid in soil classification. Tests were performed in general accordance with ASTM Standard Test Method D 422. The results of these tests are presented on Plates B-1 and B-2.

PLASTICITY INDEX

One soil sample was subjected to an evaluation of the liquid limit and plastic limit in accordance with ASTM Test Method D 4318. The results are presented on Plate B-3.

CONSOLIDATION AND COLLAPSE POTENTIAL TESTS

Consolidation and collapse potential tests were performed on representative drive soil samples to evaluate the settlement characteristics of the in-situ soils when subjected to typical foundation loads and wetting. The tests were performed in accordance with ASTM Standard Test Method D 5333. The test results are presented on Plates B-4 through B-10, Consolidation/Collapse Potential Test.

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MAXIMUM DRY UNIT WEIGHT/OPTIMUM MOISTURE CONTENT TESTS

Three maximum dry unit weight/optimum moisture content tests were performed on selected bulk samples of the on-site soils to determine compaction characteristics. The tests were performed in accordance with ASTM Standard Test Method D 1557. The test results are presented in the following table.

Maximum Dry Unit Weight/Optimum Moisture Content Test Results

Location	Depth (ft)	USCS Soil Type	Maximum Dry Unit Weight (ASTM D 1557) (pcf)	Optimum Moisture Content (%)
B-6	0-5	SM	133	8.5
B-19	0-5	SM	132	7.5
B-21	0-5	SP-SM	135	8.0

EXPANSION INDEX

One sample of the near-surface soil was subjected to an evaluation of the expansion index in accordance with UBC Standard 18-2 (1997 edition). The results of this test are presented in the following table.

Expansion Index Test Result

Location	Depth (ft)	USCS Soil Type	Expansion Index
B-9	0-5	SM	5
B-22	0-5	SM	4

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DIRECT SHEAR TEST

Two direct shear strength tests were performed on representative drive soil samples to evaluate the drained shear strength of the soils. The samples were tested in a near-saturated condition in general accordance with ASTM Test Method D 3080 (consolidated, drained). The results of these tests are presented in the table below.

Direct Shear Test Results

Location	Depth (ft)	USCS Soil Type	Dry Unit Weight (pcf)	Angle of Internal Friction (degrees)	Cohesion (psf)
B-7	2	SM	117	42	0
B-8	5	SM	114	41	20

CORROSIVITY TESTS

Chemical analyses were performed on two selected samples of the near surface soil to estimate pH, resistivity, soluble sulfate, and chloride contents in general accordance with Caltrans Standard Test Methods 532 (pH), 643 (resistivity), 417 (sulfates), and 422 (chlorides). Results of these tests are presented in the table below.

Corrosion Test Results

Location	Depth (ft)	Minimum Resistivity (Ohm-cm)	pH	Sulfate Content (%)	Chloride Content (%)
B-1	0-5	320	8.4	0.0193	0.0614
B-22	0-5	2,000	7.8	0.0034	0.0065

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R-VALUE TEST

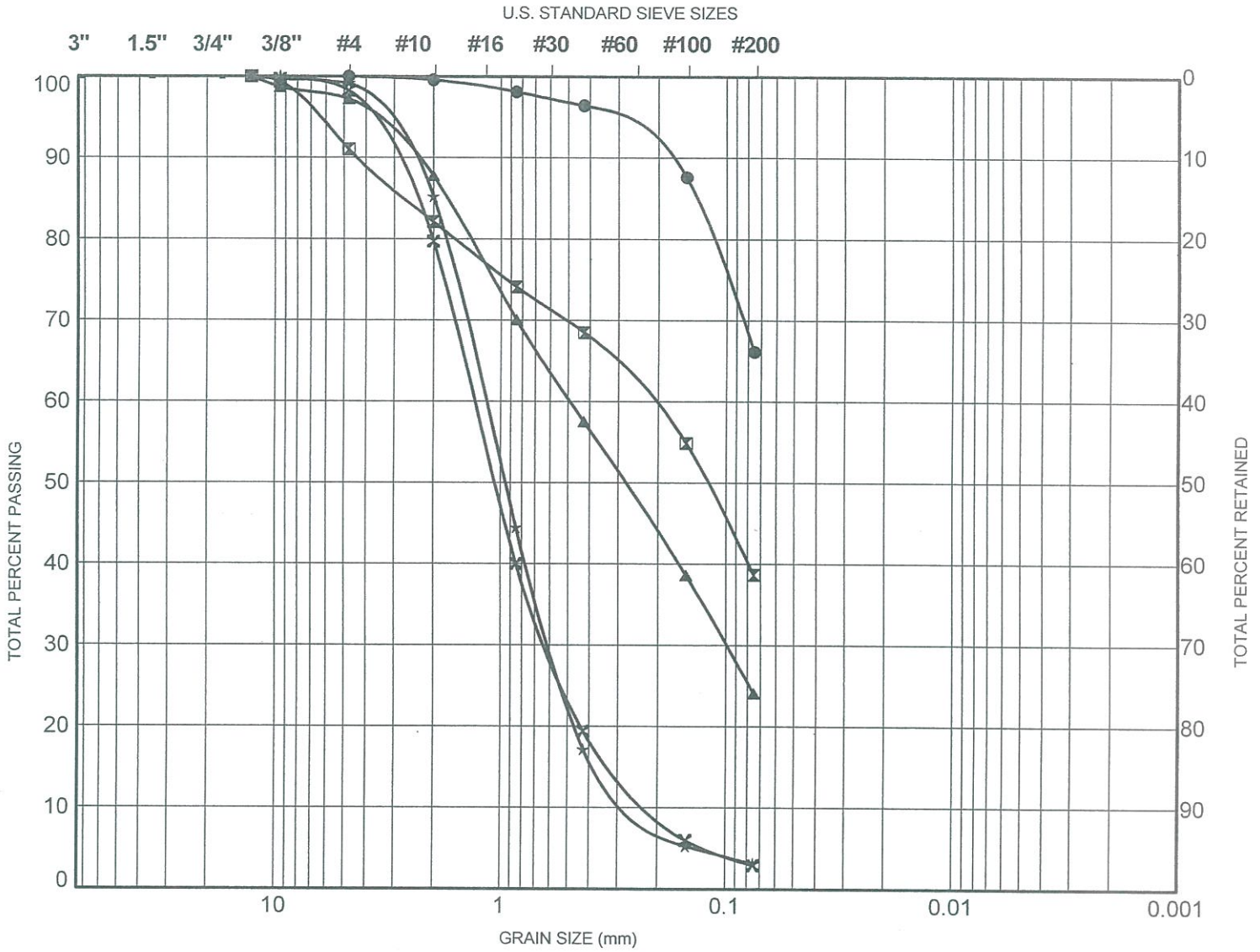
One resistance value (R-value) test was performed on a bulk soil sample to evaluate pavement support characteristics of the near-surface on-site soils. R-value testing was performed in accordance with Caltrans Standard Test Method 301. The test results are presented in the table below.

R-Value Test Result

Location	Depth (ft)	USCS Soil Type	R-Value
B-14	0-5	SM	29

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SIEVE ANALYSIS	HYDROMETER



GRAVEL		SAND			SILT	CLAY
coarse	fine	coarse	medium	fine		

Symbol	Sample	Depth (feet)	Description	Classification
●	B- 1	2	Sandy Silt	ML
⊠	B- 2	5	Silty Sand	SM
▲	B- 7	5	Silty Sand	SM
★	B- 8	15	Sand	SP
✕	B-16	5	Sand	SW

KLEINFELDER

PROJECT NO. 77604

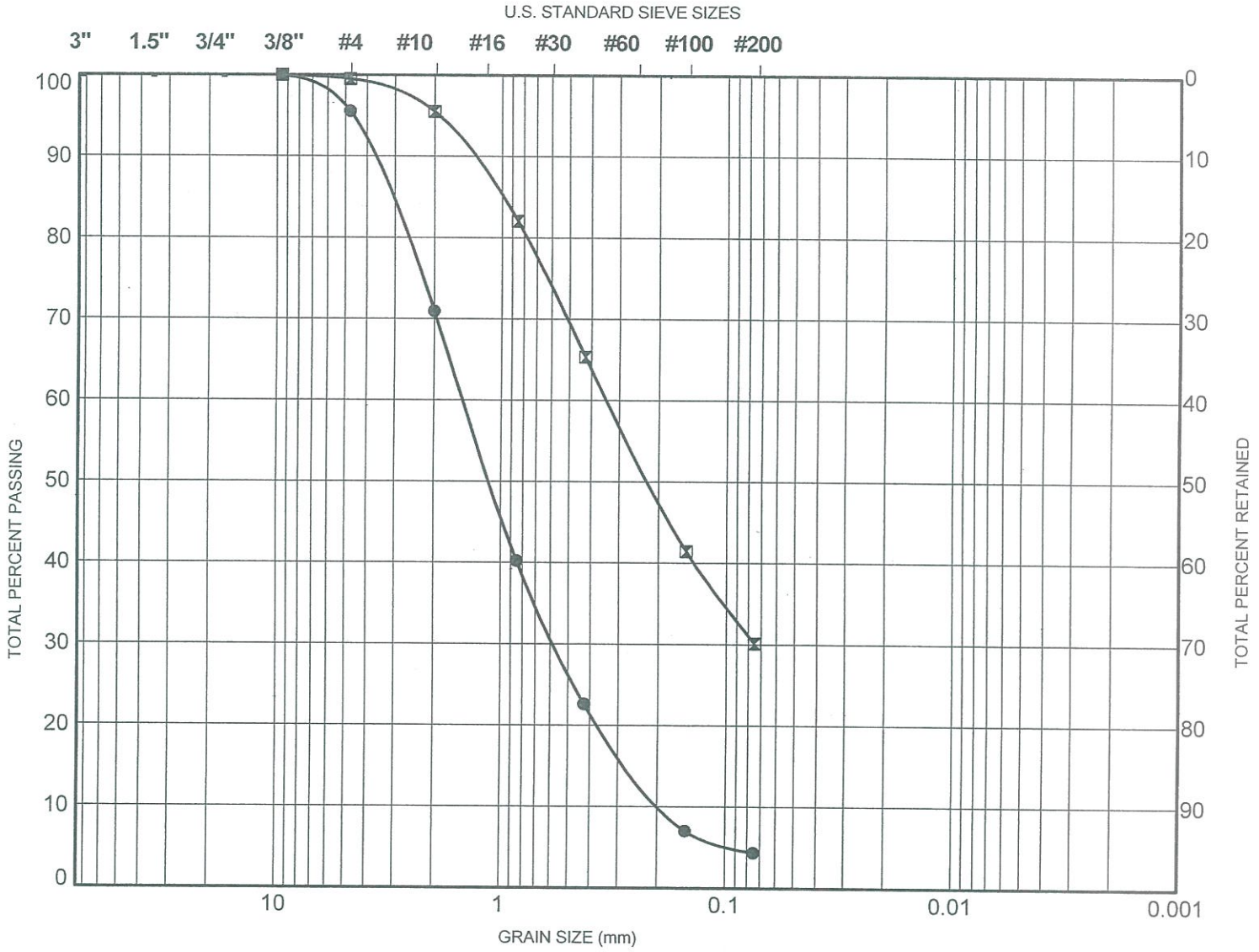
Proposed Commercial Building 13A
Southern California Logistics Airport
Victorville, California

GRAIN SIZE DISTRIBUTION

PLATE

B-1

SIEVE ANALYSIS	HYDROMETER



GRAVEL		SAND			SILT	CLAY
coarse	fine	coarse	medium	fine		

Symbol	Sample	Depth (feet)	Description	Classification
●	B-19	5	Sand	SW
⊠	B-20	10	Silty Sand	SM

KLEINFELDER

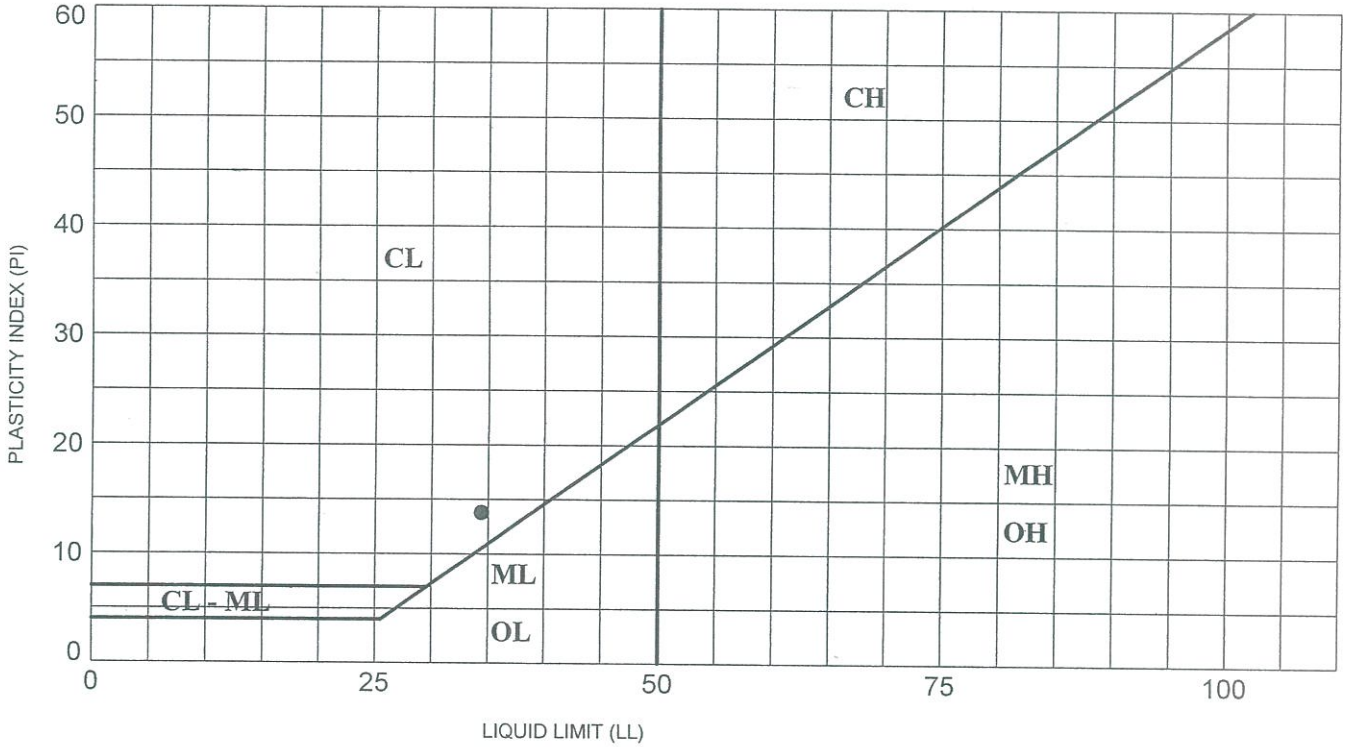
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Proposed Commercial Building 13A
Southern California Logistics Airport
Victorville, California

GRAIN SIZE DISTRIBUTION

PLATE

B-2



	Sample	Depth (ft)	LL (%)	PL (%)	PI (%)	LI (-)	Description
●	B-19	25.0	34	21	14		Sandy Clay

LL - Liquid Limit

PL - Plasticity Limit

PI - Plasticity Index

LI - Liquidity Index

Unified Soil Classification
Fine Grained Soil Groups

	LL < 50
ML	Inorganic clayey silts to very fine sands of slight plasticity
CL	Inorganic clays of low to medium plasticity
OL	Organic silts and organic silty clays of low plasticity

	LL > 50
MH	Inorganic silts and clayey silts of high plasticity
CH	Inorganic clays of high plasticity
OH	Organic clays of medium to high plasticity, organic silts

KLEINFELDER

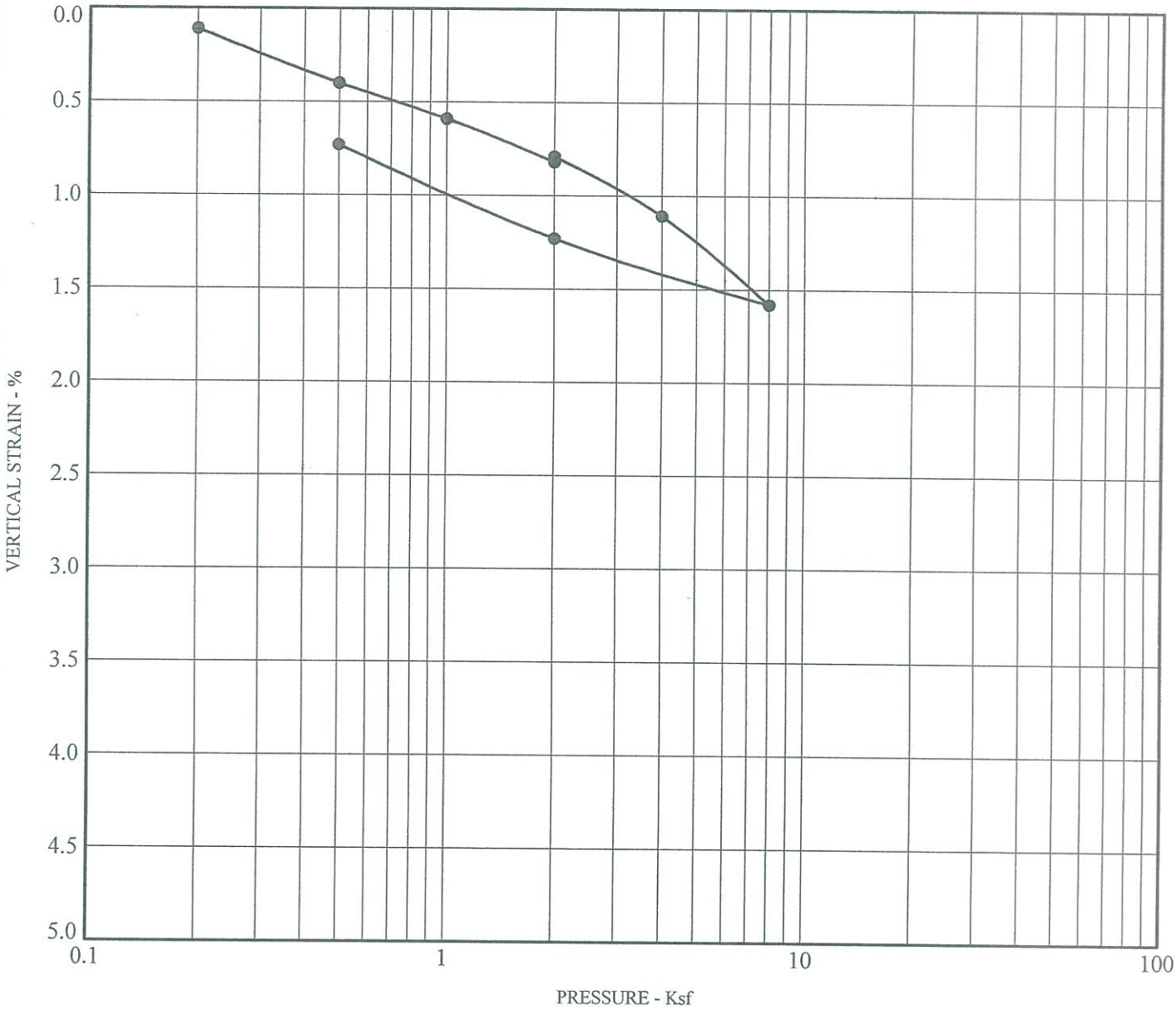
PROJECT NO. 77604

Proposed Commercial Building 13A
Southern California Logistics Airport
Victorville, California

PLASTICITY CHART

PLATE

B-3



Boring	**B- 1**			
Depth (feet)	**5**			
Moisture Content (%)	**9.4**	**Before**	**29.1**	**After**
Dry Unit Weight (pcf)	**105**			
Description	**Clayey Sand**			
Classification	**SC**			

NOTE : SPECIMEN FLOODED AT 2000 psf

KLEINFELDER

PROJECT NO. 77604

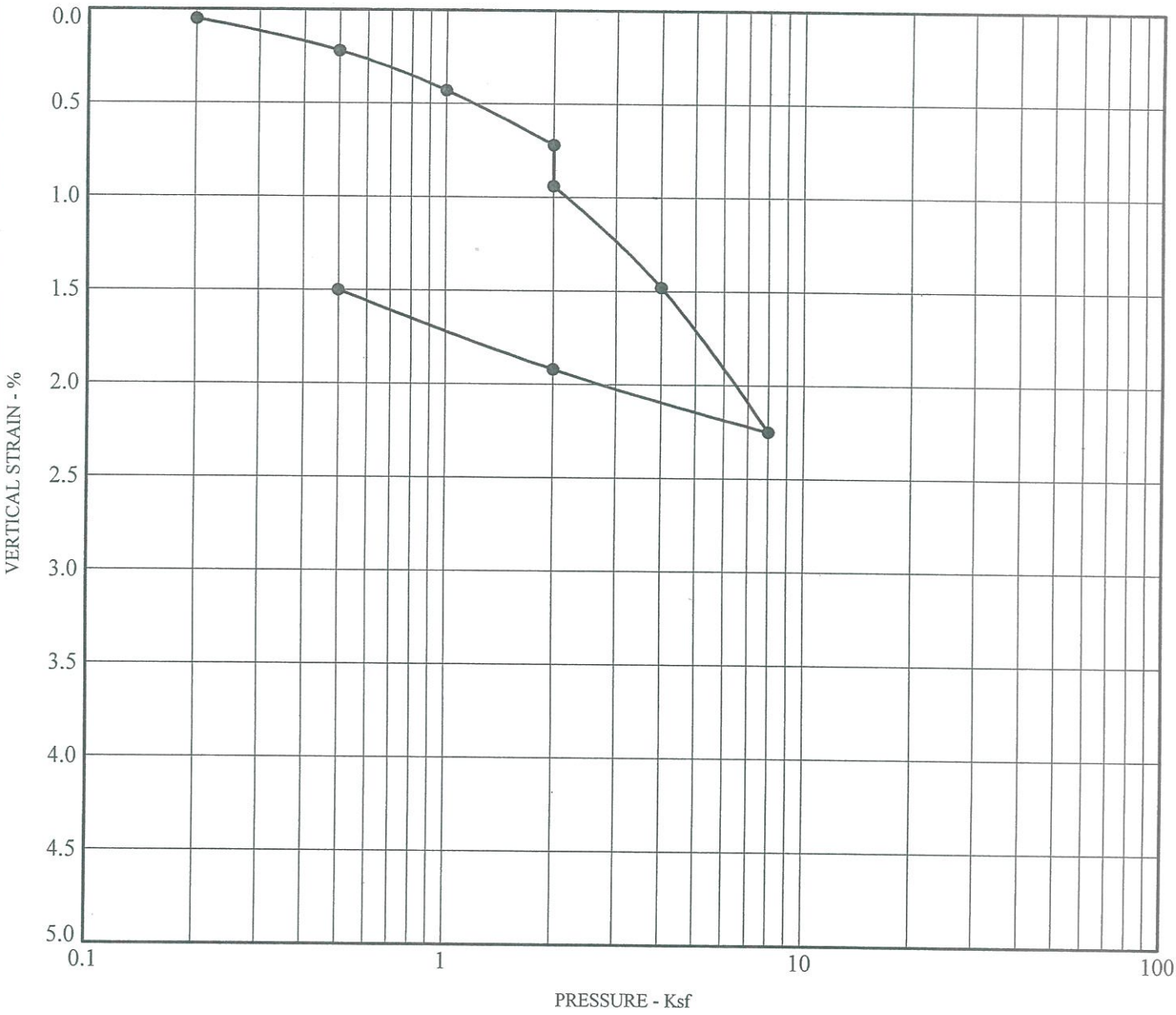
Proposed Commercial Building 13A
Southern California Logistics Airport
Victorville, California

CONSOLIDATION/COLLAPSE POTENTIAL TEST

PLATE

B-4

CONSOL NO INDICIES 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07



Boring	**B- 9**		
Depth (feet)	**5**		
Moisture Content (%)	**7.5 Before**	**14.3 After**	
Dry Unit Weight (pcf)	**118**		
Description	**Silty Clayey Sand**		
Classification	**SC-SM**		

NOTE : SPECIMEN FLOODED AT 2000 psf

CONSOL NO INDICIES 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

KLEINFELDER

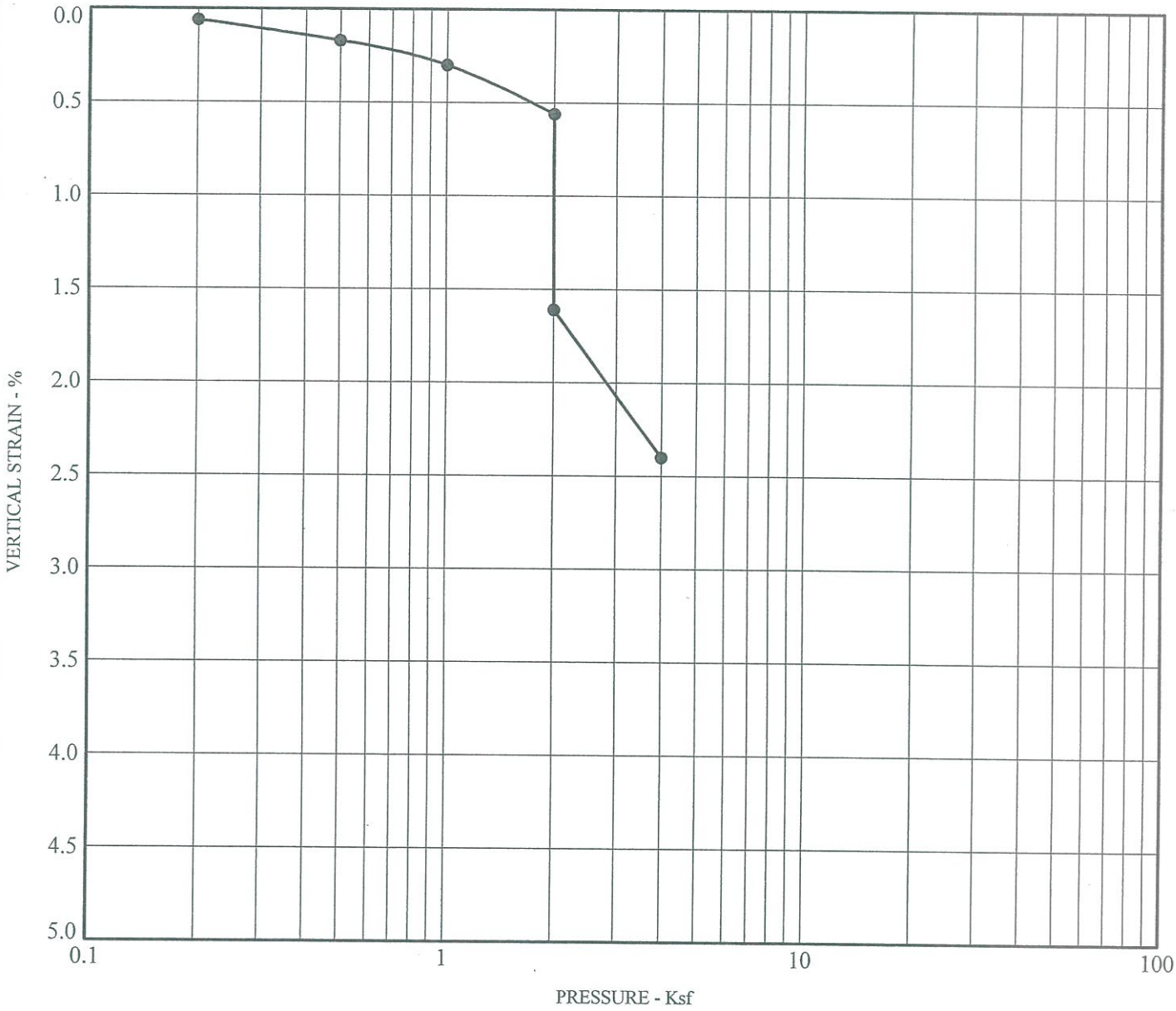
PROJECT NO. 77604

Proposed Commercial Building 13A
Southern California Logistics Airport
Victorville, California

CONSOLIDATION/COLLAPSE POTENTIAL TEST

PLATE

B-5



Boring	**B-14**			
Depth (feet)	**5**			
Moisture Content (%)	**2.1**	**Before**	**16.2**	**After**
Dry Unit Weight (pcf)	**112**			
Description	**Silty Sand**			
Classification	**SM**			

NOTE : SPECIMEN FLOODED AT 2000 psf

CONSOL NO INDICIES 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

KLEINFELDER

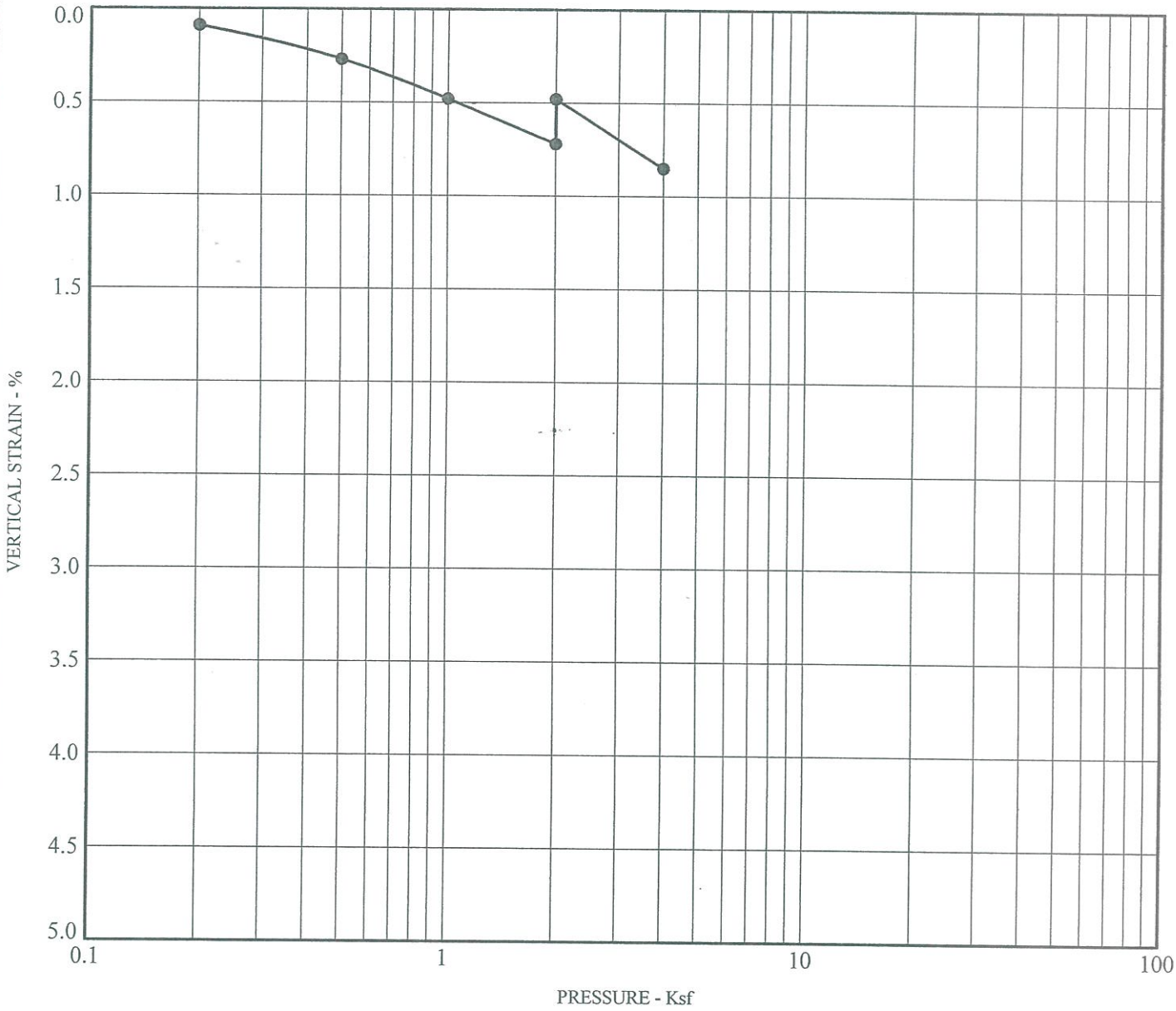
PROJECT NO. 77604

Proposed Commercial Building 13A
Southern California Logistics Airport
Victorville, California

CONSOLIDATION/COLLAPSE POTENTIAL TEST

PLATE

B-6



Boring	**B-16**		
Depth (feet)	**10**		
Moisture Content (%)	**15.4 Before**	**21.7 After**	
Dry Unit Weight (pcf)	**106**		
Description	**Sandy Silt**		
Classification	**ML**		

NOTE : SPECIMEN FLOODED AT 2000 psf

CONSOL NO INDICIES 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

KLEINFELDER

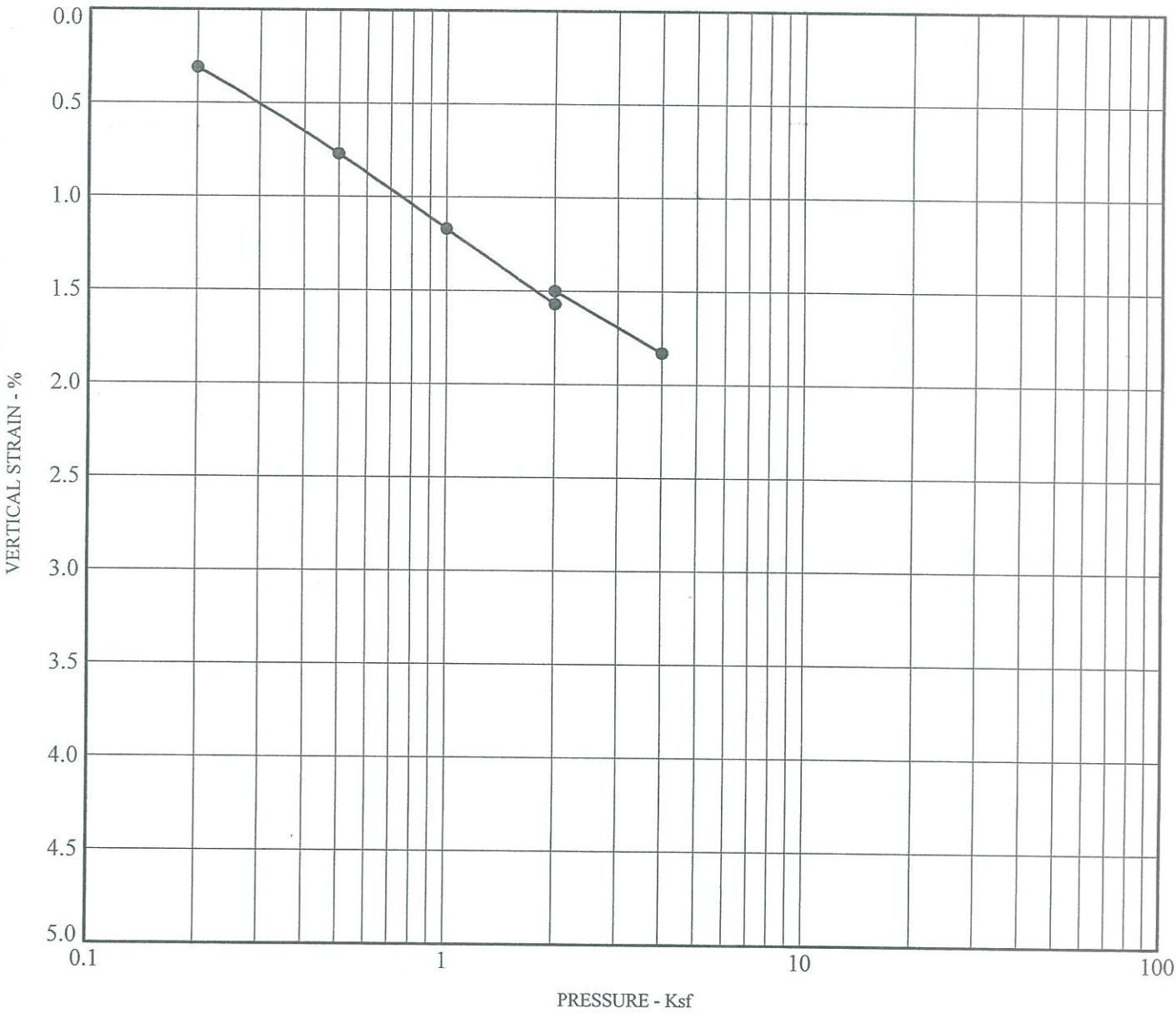
PROJECT NO. 77604

Proposed Commercial Building 13A
Southern California Logistics Airport
Victorville, California

CONSOLIDATION/COLLAPSE POTENTIAL TEST

PLATE

B-7



Boring	**B-17**		
Depth (feet)	**10**		
Moisture Content (%)	**13.1 Before**	**14.2 After**	
Dry Unit Weight (pcf)	**121**		
Description	**Sandy Silt**		
Classification	**ML**		

NOTE : SPECIMEN FLOODED AT 2000 psf

CONSOL NO INDICIES 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07

KLEINFELDER

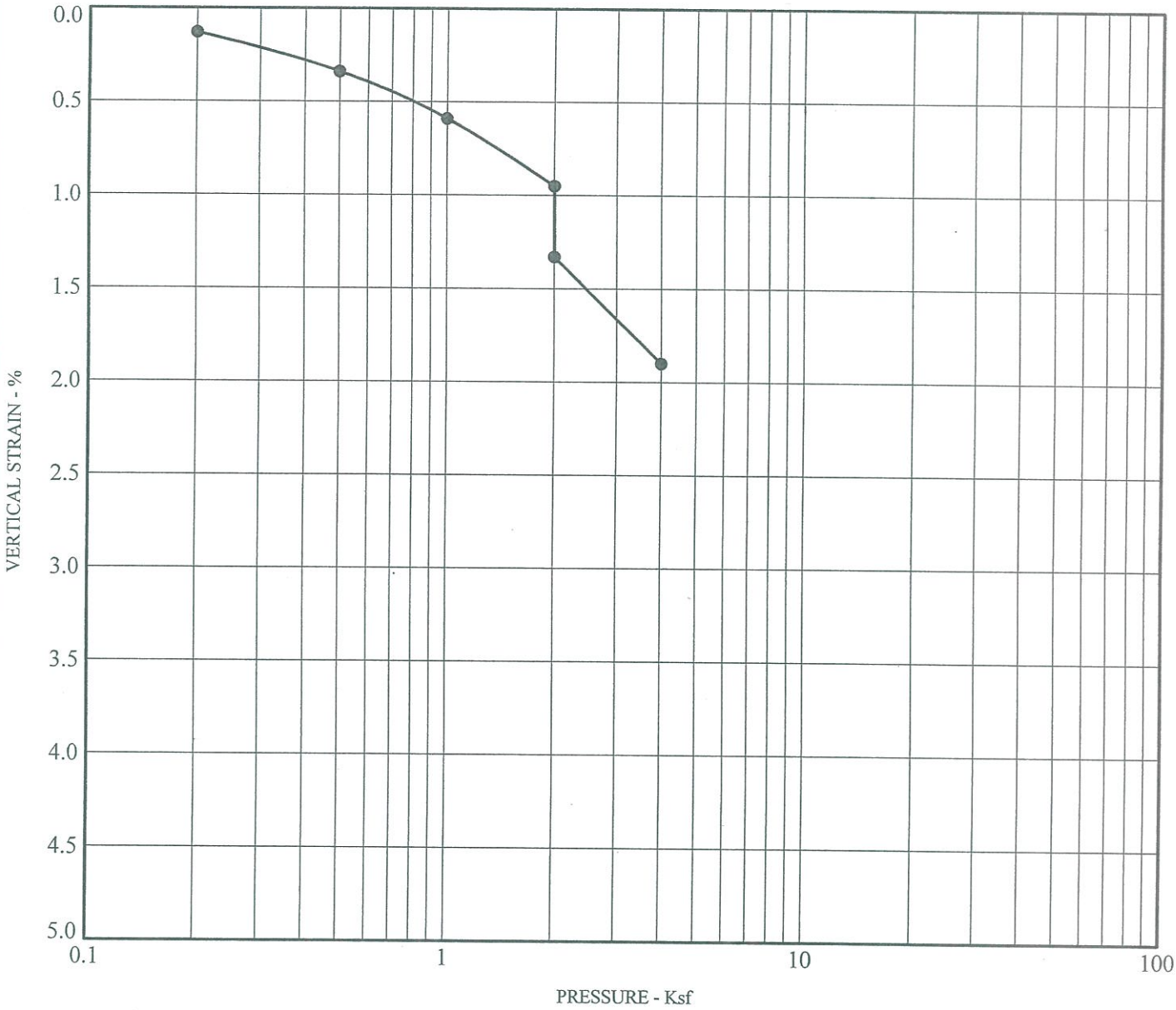
PROJECT NO. 77604

Proposed Commercial Building 13A
Southern California Logistics Airport
Victorville, California

CONSOLIDATION/COLLAPSE POTENTIAL TEST

PLATE

B-8



Boring	**B-18**			
Depth (feet)	**5**			
Moisture Content (%)	**4.9**	**Before**	**15.4**	**After**
Dry Unit Weight (pcf)	**115**			
Description	**Silty Sand**			
Classification	**SM**			

NOTE : SPECIMEN FLOODED AT 2000 psf

KLEINFELDER

Proposed Commercial Building 13A
Southern California Logistics Airport
Victorville, California

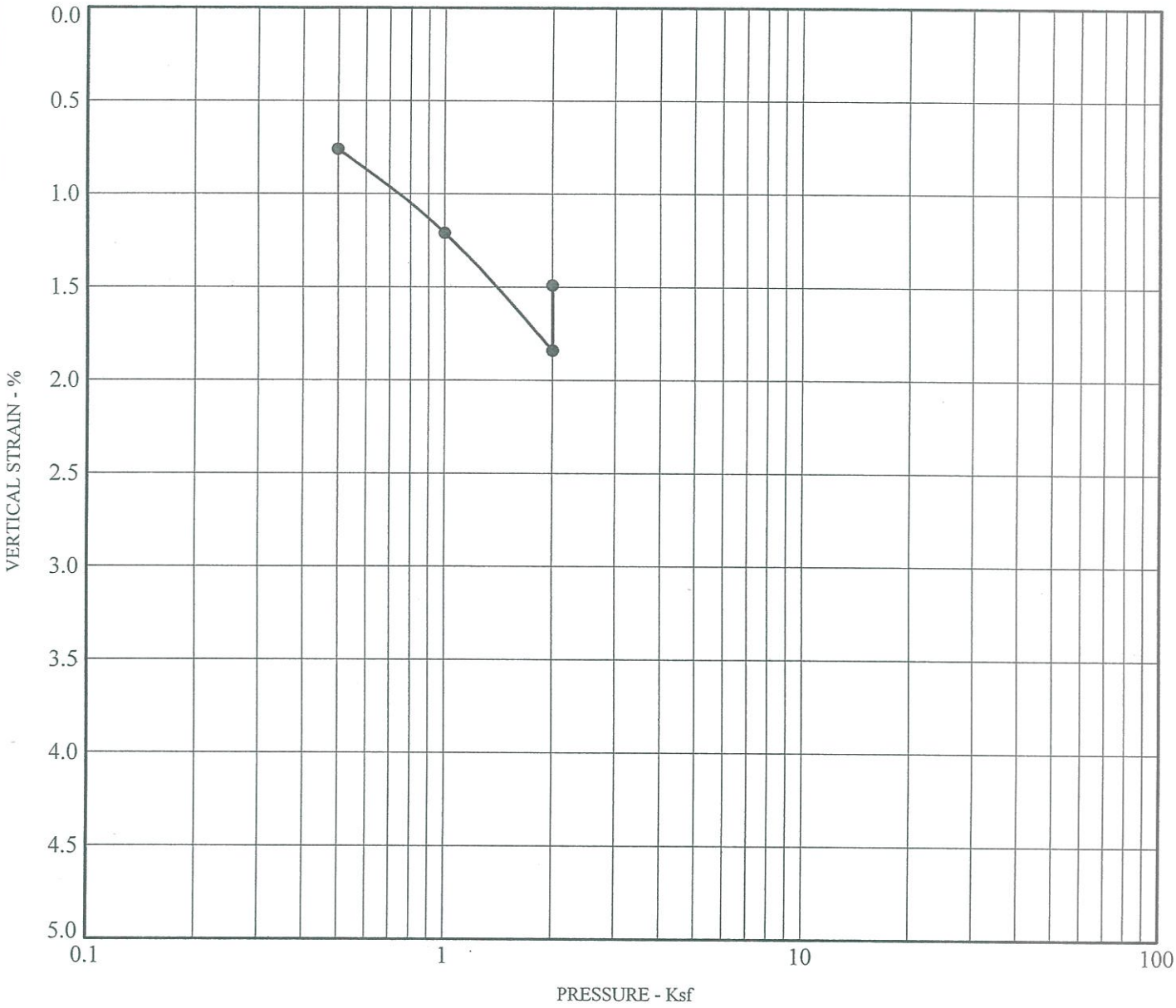
PLATE

B-9

PROJECT NO. 77604

CONSOLIDATION/COLLAPSE POTENTIAL TEST

CONSOL NO INDICIES 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/17/07



Boring	**B-22**			
Depth (feet)	**10**			
Moisture Content (%)	**13.6**	**Before**	**16.8**	**After**
Dry Unit Weight (pcf)	**112**			
Description	**Sandy Silt**			
Classification	**ML**			

NOTE : SPECIMEN FLOODED AT 2000 psf

CONSOL NO INDICIES 77604 SCLA LOT 13 (TL).GPJ KA_RDLND.GDT 1/22/07

KLEINFELDER

PROJECT NO. 77604

Proposed Commercial Building 13A
Southern California Logistics Airport
Victorville, California

CONSOLIDATION/COLLAPSE POTENTIAL TEST

PLATE

B-10

PRELIMINARY GEOTECHNICAL INVESTIGATION, PROPOSED INDUSTRIAL BUILDING 13B, SOUTHERN CALIFORNIA LOGISTICS AIRPORT, VICTORVILLE, CALIFORNIA

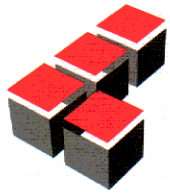
Prepared for:

STIRLING CAPITAL INVESTMENTS

27422 Portola Parkway, Suite 300
Foothill Ranch, California 92610

Project No. 601901-001

September 10, 2007



Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

September 10, 2007

Project No. 601901-001

To: Stirling Capital Investments
27422 Portola Parkway, Suite 300
Foothill Ranch, California 92610

Attention: Mr. Brian Parno

Subject: Preliminary Geotechnical Investigation, Proposed Industrial Building 13B, Southern California Logistics Airport, Victorville, California

In response to your request, Leighton Consulting, Inc. has performed a preliminary geotechnical investigation for the proposed Industrial Building 13B within Southern California Logistics Airport area in Victorville, California.

Based on the information provided by you, we understand that the proposed development will include construction of a industrial tilt-up building structure of approximately 444,633 square-feet footprint area, paved parking and driveway, and other associated facilities.

Based upon the results of this study, the proposed project is considered to be feasible from a geotechnical standpoint. The proposed building may be supported by conventional spread footing foundations with a slab-on-grade. Specific recommendations for the geotechnical aspects of the project are presented in this report.

17781 Cowan ▪ Irvine, CA 92614-6009
949.253.9836 ▪ Fax 949.250.1114 ▪ www.leightonconsulting.com

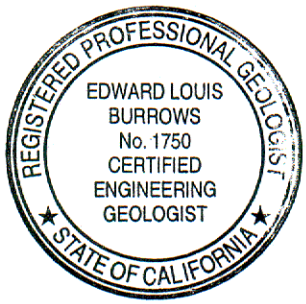
We appreciate the opportunity to work with you on this project. If you have any questions, or if we can be of further service, please call us at your convenience.



Respectfully submitted,

LEIGHTON CONSULTING, INC.

Zafar Ahmed, PE, GE 2720
Senior Project Engineer



Edward L. Burrows, PG, CEG 1750
Director of Geology

ZA/ELB/lr

Distribution: (4) Addressee
(3) RGA Architects, Attention: Chris Savage

Leighton

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Appendix B – Boring Logs
Appendix C – Laboratory Test Procedures and Test Results

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Figure 2 – Boring Location Map — Rear of Text
Figure 3 – Retaining Wall Backfill and Subdrain Detail — Rear of Text

1.0 INTRODUCTION

1.1 Purpose and Scope

The purpose of our geotechnical investigation was to explore the subsurface conditions with respect to the proposed improvements, to evaluate the geologic hazards of the site, and to provide geotechnical recommendations for design and construction of the proposed developments. The scope of work of our current study included the following tasks:

- Perform site reconnaissance to locate and mark the exploratory boring locations.
- Review of available site-specific information, including review of various publications, and documents (see Appendix A, References).
- Perform logging and sampling of seventeen (17) hollow-stem auger borings to depths of approximately 11.5 to 51.5 feet below the existing grade. Collect representative soil samples at selected depth intervals and transport to our laboratory for testing.
- Conduct relevant geotechnical engineering laboratory tests on select representative samples to characterize the engineering properties of the soils.
- Perform geotechnical evaluation of collected data and relevant engineering analyses.
- Prepare this report summarizing our findings, conclusions, and recommendations.

1.2 Site Description

The site is located east of Phantom Street (West) and immediately south of Sabre Street, within the Southern California Logistics Airport area in Victorville, California (see Figure 1, *Site Location Map*). The site encompasses a rectangular-shaped, approximately 21.7 acres of land, currently occupied by multiple building structures and asphalt pavements in the northern portion of the site. The site is relatively flat with the exiting grade elevations varying from approximately 2,888 feet above msl (mean sea level) along the southern perimeter to approximately 2,880 feet above msl along the northern perimeter. Natural drainage is from the south towards the north with average gradient less than 1 percent.

1.3 Proposed Development

Based on the conceptual site plan (RGA, 2007) provided to us, we understand that the proposed developments will include construction of a tilt-up, slab-on-grade building structure of approximately 444,633 square-feet footprint area for industrial use, driveways, parking lots and other associated facilities.

A preliminary precise grading plan was available to us during preparation of this report (Hall & Foreman, 2007). Based on this grading plan, proposed building pad subgrade (at dock high level) will be underlain by approximately 3 to 5 feet of fill with respect to the existing grade.

1.4 Field Investigation

Prior to the field investigation, we performed a site reconnaissance to determine access issues for the drilling rig and to mark the proposed boring locations. Underground Surface Alert (USA) was then notified of the marked locations for utility clearance.

On July 18th and 19th of 2007, the subsurface investigation was performed using hollow-stem auger boring techniques. Seventeen (17) borings (B-1 to B-6, B-8 to B-18; see Figure 2) were advanced to depths ranging from approximately 11.5 to 51.5 feet below the existing grade at an average elevation. Boring B-7, intended to be drilled in the northeastern portion of the site, was not drilled because of its non-accessibility due to an existing building structure. Accordingly, B-7 is not shown in Figure 2 and corresponding boring log is omitted in Appendix B. The drilling rig used for the exploration consisted of a truck-mounted CME-75 hollow-stem auger rig equipped with 8-inch-diameter augers. The approximate boring locations are shown on Figure 2, *Boring Location Map*.

The hollow-stem borings were logged by a staff geologist from our office. Relatively undisturbed soil samples were obtained at selected intervals within the borings using a California Ring sampler. Standard Penetration Tests (SPT) were also conducted at selected intervals within the borings. Bulk samples of representative soil types were also collected. Upon completion of drilling, the borings were backfilled with soil cuttings on the same day of drilling. Collected soil samples were transported to our Irvine laboratory for geotechnical testing.

1.5 Laboratory Testing

Laboratory tests were performed on selected soil samples obtained during our field investigation. The laboratory testing program was designed to evaluate the physical and engineering characteristics of the onsite soil. Tests performed during this investigation include:

- In-situ moisture and density;
- Percent finer than No. 200 Sieve;
- Expansion Index;
- Maximum density and optimum moisture content (Modified Proctor);
- Direct shear;
- Collapse potential;
- One dimensional consolidation;
- R-value; and
- Corrosion suite (pH, resistivity, chloride, and sulfate contents).

All laboratory tests were performed in general conformance with the ASTM or State of California Standard Methods. The results of the in-situ moisture and density tests are presented in Appendix B, *Boring Logs*. The results of other laboratory tests are presented in Appendix C of this report.

2.0 GEOLOGY AND SEISMICITY

2.1 Regional Geology

The proposed development is located in the western Mojave Desert, in San Bernardino County, California. The area is located within what is known as the Mojave Block, which is a tectonic region bounded by the San Andreas fault to the southwest, and the Garlock fault to the northeast (Dibblee, 1967). The mountains that border the Mojave Desert were uplifted along these faults and other secondary faults that generally trend to the northwest across the Mojave Desert. It is theorized that in the geologic past much of this area was intermittently submerged with water, at which time a large amount of sediment was deposited along the valley floor (Dibblee, 1967). The entire region was then intruded by granitic rocks, elevated and subsequently deeply eroded. Finally, during the more recent geologic past, deformation occurred throughout the Mojave Block due to the very active San Andreas, Garlock and associated fault zones (Dibblee, 1967).

On a local scale, the site is underlain by relatively young alluvial fan deposits eroded from the surrounding mountains and deposited in the site vicinity (Morton and Miller, 2003).

2.2 Subsurface Soil and Groundwater Conditions

Subsurface soils at the subject site, as encountered during our investigation, consist of Quaternary alluvium (Qal) up to maximum explored depths of 51.5 feet below the existing ground surface (bgs). Undocumented fill soils underneath the existing asphalt concrete and building structures area were encountered within the northern portion of the site. Approximate thicknesses of asphalt concrete sections and undocumented fill as observed in the drilled holes are presented in Table 1 below. Fill soils are primarily light brown to brown color, damp to moist, medium dense to dense, silty, fine to coarse grained sands.

Alluvial deposits at this site consist of light brown to red-brown color, dry to moist, primarily sandy soils mixed with variable amounts of fines, mostly silts. Occasional silt layers were encountered at depths within 5 to 20 feet bgs. Subsurface soils at the site were found to be medium dense to very dense, gradually denser with depth. However, pockets of loose, collapsible soils were encountered at shallow depths as discussed

below. Detailed descriptions of the encountered subsurface materials are provided in the boring logs included in Appendix B.

Table 1 – Existing Asphalt Pavement Sections and Undocumented Fill

Boring No.	Asphalt Concrete (inches)	Aggregate Base (inches)	Undocumented Fill (feet)
B-1	2.0	-	2.5
B-2	1.5	6.0	2.5
B-5	1.5	6.0	2.5
B-6	NE	NE	5.0
B-8	2.0	6.5	2.5
B-9	3.0	7.0	2.5

NE = Not Encountered.

Collapsible Soil – Localized loose soils were encountered across the site at shallow depths (within upper 10 feet). Based on our laboratory tests on two representative samples, onsite soils at shallow depths demonstrated slight to moderate collapse potential upon saturation (per ASTM D5333) with measured collapse strain at 2 ksf overburden pressure varying from approximately 0.7 to 3.0 percent (see Appendix C). To reduce potential of post-construction settlement due to collapsible soils, we recommend removal and recompaction of the upper soils, as provided in Section 3.2 of this report.

Expansive Soil – Onsite soils at shallow depths (within the upper 5 feet) consist of primarily sandy soils mixed with fines, mostly silts. Laboratory tests of one selective sample indicated very low expansion potential (per CBC, 2001) with tested Expansion Index (EI) value of 1 (see Appendix C). Based on our field observations during exploration and laboratory test results, near surface soils are anticipated to contain very low expansion potential (per CBC, 2001). Upon completion of rough grading, finish pad subgrade soil samples should be tested to determine the actual potential for expansion.

Groundwater Conditions - Groundwater was not encountered in any of the borings up to maximum explored depth of 51.5 feet below the existing ground surface (bgs). Based on the information available from USGS Groundwater Database (http:// http://www.waterdata.usgs.gov/ca/nwis/gw), groundwater is present at depths greater than 120 feet bgs within close vicinity of the subject site. Due to deep groundwater level,

it is not anticipated to be a constraint for design and construction of the proposed developments.

2.3 Faulting

Our review of available in-house literature indicates that no known active faults have been mapped across the site, and the site is not located within an Alquist-Priolo Earthquake Fault Zone (Hart and Bryant, 1999).

The nearest known regional active faults that could produce the most significant ground shaking at the site include the Helendale – South Lockhardt fault, North Frontal Fault Zone and Cleghorn fault which are approximately 19.6, 25.7, and 31 kilometers, respectively, from the site and are classified as seismic source type B (according to UBC/CBC). The nearest Type A seismic source is the San Andreas – Mohave fault which is approximately 33 kilometers away from site and has little effect to this site's seismicity.

2.4 Seismic Hazards Evaluation

Seismic hazards related to ground shaking that could impact the proposed developments may include surface ground rupture, soil liquefaction, seismically-induced settlement, earthquake induced flooding (tsunamis and seiches). Due to the inland location of the site and lack of a nearby large body of water, potential of tsunamis and seiches for this site is considered low. The other potential seismic hazards at the site are discussed below.

2.4.1 Surface Ground Rupture

Surface ground rupture is generally considered most likely to occur along pre-existing active faults. There are no active or potentially active faults mapped or known to traverse the subject site. The subject site does not lie within an earthquake fault zone as created by the Alquist-Priolo Earthquake Zoning Act (Hart and Bryant, 1999). Based on no active or potentially active faults mapped or known to cross the subject site, the potential for surface ground rupture at the subject site is considered low.

2.4.2 Liquefaction

Liquefaction of saturated cohesionless soils can be caused by strong ground motion resulting from an earthquake. Groundwater was not encountered in any of our exploratory borings, drilled to a maximum depth of 51.5 feet. Historic well data within close vicinity of this site indicates that groundwater has been more than 120 feet below the surface. Due to deep historic groundwater level, potential for liquefaction induced settlement for this site is considered low.

2.4.3 Dynamic Densification

Seismically-induced settlement is due to densification of loose granular soil during or shortly after ground shaking. Due to predominately dense nature of the soils encountered at the site, and anticipated moderate level of peak ground acceleration (0.34g for a design earthquake event with 10% probability of exceedance in 50 years as obtained from CGS Probabilistic Seismic Hazards Assessment Model, 2003; http://www.consrv.ca.gov/CGS/rghm/pshamap), seismically-induced settlement at the site is considered low and is not anticipated to cause adverse effects to the proposed developments provided the grading recommendations of this report are adhered to during design and construction.

3.0 RECOMMENDATIONS

The conclusions and recommendations have been developed based on the exhibited engineering properties of the soils and their anticipated behavior both during and after construction. Recommendations are specifically provided for design of foundations and at-grade floor slabs, retaining walls, concrete flatwork, and pavement. The geotechnical engineer should review the final grading plan, foundation plans, and specifications when they are available to verify that the recommendations presented in this report have been properly interpreted and incorporated.

Based upon this study, we conclude that the proposed development is feasible from a geotechnical standpoint, provided that the recommendations presented in this report are properly incorporated in the design and construction of the project.

3.1 Seismic Design Parameters

This site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone. However, strong ground shaking due to seismic activity is anticipated at the site. The following seismic design values in Table 2 are based on the International Building Code (IBC), 2006, guidelines which have recently been adopted in the CBC, 2007. These parameters should be considered as the minimum for the seismic analysis of the subject site. Additional seismic analyses may be necessary based on structural requirements.

Table 2 – Seismic Design Parameters (IBC, 2006 / CBC, 2007)

Categorization/Coefficient	Design Value
Site Class	C
Short Period (0.2 sec) Site Coefficient, F_a	1.0
Long Period (1.0 sec) Site Coefficient, F_v	1.3
Design (5% damped) spectral response acceleration parameter at short period, S_{DS}	0.83
Design (5% damped) spectral response acceleration parameter at a period of 1 sec, S_{D1}	0.485

3.2 Site Grading

The recommendations for earthwork and site preparation are based upon the existing site condition, proposed developments and the preliminary grading plan (Hall & Foreman, 2007). Fill on the order of 3 to 5 feet, with respect to the existing grade, is planned underneath the proposed building pad.

Site Preparation – Prior to construction, the site should be cleared of vegetation, trash, and debris, which should be disposed of offsite. Remnants of the existing development including all foundations, slabs, pavements and other unsuitable materials should be completely removed. Efforts should be made to locate any existing or abandoned utility lines in the area. Existing utility conduits should be removed or rerouted if they interfere with the proposed construction, and the resulting cavities should be properly backfilled and compacted.

Overexcavation and Recompaction – Depending on the encountered subsurface soil conditions and the preliminary grading plan, we recommend remedial overexcavation for the proposed developments as discussed in the following:

- Building Footprint Areas: Within the proposed building footprint areas, remedial overexcavation should extend at least 3 feet below the existing grade. Foundations of the proposed building structure should be bearing on at least 3 feet of properly compacted fill. Interior slab-on-grade should be underlain by a minimum of 3 feet of compacted fill. Due to presence of localized loose, collapsible soils across ths site at shallow depths, deeper overexcavation may be required underneath the footings depending on the exposed removal bottom. In-place testing of removal bottoms should be performed during grading to determine the competency of materials being left in place. A minimum criterion of 110 pounds-per-cubic-foot (pcf) dry density or 85 percent relative compaction (ASTM D1557) should be considered for competent removal bottoms. The lateral limit of overexcavation should be extended a minimum of 5 feet or 1:1 (horizontal:vertical) projection downward and outward from the bottom edges of the footings, whichever is greater.

- Pavement and Concrete Flatwork (outside the building) Areas: In pavement and concrete flatwork areas outside the building pad, a minimum of 24 inches of fill soils should be placed below the proposed finish grade.

Suitability of Site Soils for Fills – The onsite soil, free of organic material, vegetation, oversize particles (cobbles, boulders, rubble, etc.) greater than 6 inches in the largest dimension, is suitable to be used as general fill. These oversize particles should be disposed of offsite. As an alternative, oversized particles can be crushed in place to a size less-than 6-inches in the largest dimension, blended with soil matrix, and then placed as compacted fill in structural fill and pavement areas.

Shrinkage and Bulking – The volume change of excavated onsite soils upon recompaction is expected to vary with materials, density, in-situ moisture content, location and compaction effort. The in-place and compacted densities of soil materials vary and accurate overall determination of shrinkage and bulking cannot be made. Based on our limited geotechnical laboratory testing, we expect a recompaction shrinkage (when recompacted to an average of 92-percent relative compaction per ASTM D1557) of 10- to 20-percent by volume within the upper 10 feet.

Import Soils – Import soils should be evaluated by us prior to import. Import soils should be uncontaminated, granular in nature, free of organic material (loss on ignition less-than 2 percent), have very low expansion potential (with an Expansion Index less than 20) and have a low corrosion impact to the proposed improvements.

Subgrade Preparation – Exposed subgrade soil surfaces, including all excavation or removal bottoms, should be observed by a representative of the geotechnical engineer prior to placement of fill or construction of other improvements to verify that suitable soil is exposed. The exposed subgrade should be scarified to a minimum depth of 8 inches, moisture-conditioned to above the optimum-moisture content and then compacted to a minimum of 90 percent relative compaction (per ASTM D1557).

Fill Placement and Compaction – All fill soils should be placed in thin, loose lifts no more than 8 inches thick, moisture-conditioned to near the optimum moisture content, and compacted using appropriate equipment to a minimum of 90 percent relative compaction (ASTM D1557).

3.3 Foundation Design

The proposed industrial building may be supported on conventional shallow spread footings (continuous wall and/or isolated column) bearing on a zone of newly placed

properly compacted fill (see Section 3.2). Preliminary design parameters for spread footings are described in the following:

Minimum Footing Dimensions and Embedment - Footings should be embedded at least 24-inches below the lowest adjacent grade which is considered as the top of interior slabs-on-grade or the finished exterior grade, excluding landscape topsoil, whichever is lower. Footings located adjacent to utility trenches or vaults should be embedded below an imaginary 1:1 (horizontal:vertical) plane projected upward and outward from the bottom edge of the trench or vault, up towards the footing. Continuous/strip footings should have a minimum width of 18-inches, while column footings for all the structures should have a minimum width of 24-inches. All footing excavations should be observed by geotechnical engineer before reinforcing steel is placed.

Allowable Vertical Bearing - For footings founded on newly placed, properly compacted fill soil, an allowable vertical bearing capacity of 3,000 pounds-per-square-foot (psf) may be used for design for a minimum embedment of 24 inches below the lowest adjacent grade. This allowable bearing pressure may be increased by 500 psf for each additional foot of embedment to a maximum vertical bearing value of 4,000 psf. These bearing values may be increased by one-third when considering short-term seismic or wind loads.

Lateral Loads - Lateral loads may be resisted by friction between the footings and the supporting subgrade. A maximum allowable frictional resistance of 0.35 may be used for design of concrete structures poured on properly compacted fill. In addition, lateral resistance may be provided by passive pressures acting against foundations poured neat against properly compacted granular fill. We recommend that an allowable passive pressure based on an equivalent fluid pressure of 300 pounds-per-cubic-foot (pcf) be used in design. These friction and passive values have already been reduced by a factor-of-safety of 1.5.

Settlement Estimates - For settlement estimates, we assumed maximum anticipated column and wall footing loads 100 kips and 4.5 kips per linear foot of the wall, respectively. If greater column or wall loads are required, we should re-evaluate our foundation recommendation, and re-calculate settlement estimates. Settlement of newly placed properly compacted fill materials is expected to predominantly occur during and within 60 days following fill placement. Buildings founded on compacted fill soils as recommended herein should be designed in anticipation of 1 inch of total settlement and ½ inch of differential settlement within a 40 foot horizontal run.

3.4 Concrete Slab-on-Grade

Slab-on-grade floors utilized with conventional foundations should be designed with a minimum thickness as indicated by the project structural engineer consistent with a modulus of subgrade reaction of 150 pounds-per-cubic-inch (pci) and reinforced in accordance with the structural engineer's recommendations.

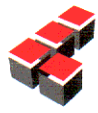
Within areas of interior slab-on-grade floors where moisture sensitive flooring will be placed, we recommend placement of a minimum of 10-mil thick Visqueen (or equivalent) membrane as moisture retarder under the slab. To facilitate uniform curing of concrete and to provide protection of this membrane during construction, clean sand, minimum 2 inches thick, should be placed on top of and below this membrane prior to placement of concrete. Based on our field observation during exploration and limited laboratory test results, onsite soils at shallow depths may not be suitable for use as sands underneath the slab. Clean sands under the slab should consist of 100% passing the No. 4 sieve to 10% or less passing the No. 200 sieve.

Moisture retarders do not completely eliminate moisture vapor movement from the underlying soils up through the slabs or from the unbonded water in the concrete. To reduce moisture vapor emissions that may result in delamination and other tile damage, we suggest the following, only for areas where moisture sensitive floor coverings are anticipated:

- Concrete: A concrete mix design with a low water to cement ratio (less than 0.45) should be used. Water should not be added to this mix during placement. The concrete should be cured in a manner to eliminate slab curling.

- Post Curing: Before floor coverings are placed, any bond breaker coating and all other contaminates should be removed from the slab-on-grade surface. Shot blasting the slab surface may be required. Once the building has been enclosed, and environmental controls (heating and air conditioning) are installed and operational, the slab-on-grade should then be tested for moisture vapor emission, in accordance with ASTM E 1907-97.

- Floor Coverings: A slip-sheet or equivalent should be used if crack-sensitive floor coverings (such as ceramic tiles, etc.) are to be placed directly on the concrete slab-on-grade. Floor coverings and adhesives should be compatible, and the manufacture's requirements should be followed. The tested moisture vapor emission rate (MVER) should be below the specified rate for the floor covering products used (e.g.,



MVER<5), before the product is placed. Expansion gaps hould be provided where floor tiles are placed adjacent to walls under molding, and along appropriate grids for large expanses of tile. Carpet strips or expansion joint flashing plates can be used in open areas at these joints.

Construction Considerations - Cracking of concrete is normal as it cures due to drying and shrinkage, and should be expected. However, cracking is often aggravated by a high water/cement ratio, high concrete temperature at the time of placement, small nominal aggregate size, and rapid moisture loss due to hot, dry, and/or windy weather conditions during placement and curing. Cracking due to temperature and moisture fluctuations can also be expected. The use of low slump concrete can reduce the potential for shrinkage cracking. Concrete placement during hot weather should be minimized due to the potential for slab curling. Slabs should be designed and constructed as promulgated by the Portland Cement Association.

To reduce the potential for excessive cracking, concrete slabs-on-grade should be provided with construction or weakened plane joints at frequent intervals. Joints should be laid out to form approximately square panels.

3.5 Retaining Walls

Any type of retaining walls should be designed for lateral earth pressures. The magnitude of these pressures depends on the amount that the wall can yield horizontally under load. If the wall can yield enough to mobilize full shear strength of backfill soils, then the wall can be designed for "active" pressure. If the wall cannot yield under the applied load, the shear strength of the soil cannot be mobilized and the earth pressure will be higher. Such walls should be designed for "at rest" conditions. If a structure moves toward the soils, the resulting resistance developed by the soil is the "passive" resistance. Retaining walls backfilled with non-expansive soils (EI values less than 21) should be designed using the following equivalent fluid pressures:

Table 3 - Retaining Wall Design Earth Pressures (Static, Drained)

Loading Conditions	Equivalent Fluid Density for Level Backfill (pcf)
Active	35
At-Rest	55
Passive[1]	300

[1] Maximum passive pressure not to exceed 3,000 psf at depth.

Unrestrained (yielding) cantilever walls should be designed for the active equivalent-fluid-weight value provided above for very low expansive soils (EI values less than 21) that are free draining. In the design of walls restrained from movement at the top (non-yielding) such as, utility vaults, dock-high wall that is structurally tied to the floor slab on top, the at-rest equivalent fluid pressure should be used. Total depth of retained earth for design of cantilever walls should be measured as the vertical distance below the ground surface measured at the wall face for stem design, or measured at the heel of the footing for overturning and sliding calculations.

In addition to the above lateral forces due to retained earth, surcharge due to above grade loads on the wall backfill, such as an adjacent structure, should be considered in design of the retaining wall. Vertical surcharge loads behind the retaining wall on or in the backfill within a 1:1 (horizontal:vertical) plane projection up and out from the retaining wall toe, should be considered as lateral and vertical surcharge. Unrestrained (cantilever) retaining walls should be designed to resist one-third of these surcharge loads applied as a uniform horizontal pressure on the wall. Braced walls should also be designed to resist an additional uniform horizontal-pressure equivalent to one-half of uniform vertical surcharge-loads.

Retaining wall foundations should be at least 18 inches wide and embedded a minimum of 24 inches below the lowest adjacent grade. Preliminary design parameters for retaining wall footings shown follow the recommendations in Section 3.3 of this report. Non-standard wall designs should be reviewed by Leighton Consulting. prior to construction to check that the proper soil parameters have been incorporated into the wall design.

All retaining walls should be provided with appropriate drainage. The outlet pipe should be sloped to drain to a suitable outlet. Typical wall drainage design is illustrated in Figure 3, *Retaining Wall Backfill and Subdrain Detail*, for non-expansive backfill. Wall backfill should be compacted by mechanical methods to a minimum of 90 percent

relative compaction (ASTM D1557). Walls should not be backfilled until wall concrete attains the 28-day compressive strength and/or as determined by the Structural Engineer that the wall is structurally capable of supporting backfill. Lightweight compaction equipment should be used, unless other wise approved by the Structural Engineer.

3.6 Temporary Excavations

Based on the materials encountered in the borings, sloped temporary excavations may be constructed according to the slope ratios presented below.

Table 4 - Slope Ratios for Temporary Excavation

Maximum Depth of Cut (feet)	Maximum Slope Ratio* (horizontal:vertical)
0 – 4	Vertical
4 – 10	1:1

*Slope ratio assumed to be uniform from top to toe of slope.

Surfaces exposed in slope excavations should be kept moist but not saturated to retard raveling and sloughing during construction. Adequate provisions should be made to protect the slopes from erosion during periods or rainfall. Surcharge loads should not be permitted within a horizontal distance equal to the depth of the cut from the top of slopes. Workers entering excavations should be protected from possible caving and raveling.

3.7 Utility Trenches

Utility trenches should be backfilled with compacted fill in accordance with Sections 306-1.2 and 306-1.3 of the *Standard Specifications for Public Works Construction*, ("Greenbook"), 2003 Edition or corresponding sections in the later editions. Fill material should be placed in horizontal layers of thickness compatible to the type of equipment being used and should be compacted to at least 90 percent relative compaction (ASTM D 1557) by mechanical means only.

Where granular backfill is used in utility trenches adjacent to moisture sensitive subgrades and foundation soils, we recommend that a cut-off "plug" of impermeable material be placed in these trenches at the perimeter of buildings, and at pavement edges adjacent to irrigated landscaped areas. A "plug" can consist of a 5-foot long section of clayey soils with more than 35-percent passing the No. 200 sieve, or a Controlled Low

Strength Material (CLSM) consisting of one sack of Portland-cement plus one sack of bentonite per cubic-yard of sand. CLSM should generally conform to Section 201-6 of the Standard Specifications for Public Works Construction, ("Greenbook"), 2003 Edition or corresponding sections in the later editions. Then CLSM plug is intended to reduce the likelihood of water migrating from landscaped areas, then seeping along permeable trench backfill into the building and pavement subgrades, resulting in wetting of moisture sensitive subgrade earth materials under buildings and pavements.

Excavation of utility trenches should be performed in accordance with the project plans, specifications and the California Construction Safety Orders (2003 Edition or more current). The contractor must be responsible for providing a "competent person" as defined in Article 6 of the California Construction Safety Orders. All safety precautions should be properly implemented at all times. Spoil piles from the excavation(s) and construction equipment should be kept away from the sides of the trenches. Leighton Consulting does not consult in the area of safety engineering.

3.8 Site Soil Corrosivity

We conducted corrosion suite tests (pH, resistivity, chloride, and sulfate contents) for one representative bulk sample obtained from shallow depth at this site. The test results are included in Appendix C; a summary of the results and corresponding hazard levels are presented in the following Table 5. These limited test results indicate that that the near surface soil is anticipated to be mildly corrosive to buried ferrous metals. Water soluble sulfate and chloride contents of the onsite soils are found to be negligible (per Table 19-A-4 of CBC, 2001) and non-corrosive, respectively, to buried concrete.

Table 5 – Summary of the Corrosivity Test Results

Test Parameter	Test Results	General Classification of Hazard
Water-soluble sulfate content	0.009 percent by weight	Negligible sulfate exposure to buried concrete (per CBC, 2001)
Water-soluble chloride content	31 ppm	Non-corrosive to buried concrete (per Caltrans Specifications)
pH	7.53	Alkaline, relatively passive to buried metals
Minimum resistivity (in saturated condition)	5,880 ohm-cm	Mildly corrosive to buried ferrous pipes (per ASTM[1])

[1] ASTM STP 1013 titled *Effects of Soil Characteristics on Corrosion* (February, 1989).

Ferrous pipe buried in moist to wet site earth materials should be avoided by using high-density polyethylene (HDPE) or other non-ferrous pipe when possible. Ferrous pipe can be protected by polyethylene bags, tap or coatings, di-electric fittings or other means to separate the pipe from on-site soils. If buried ferrous pipes are planned for the project, further testing of soil samples corrosivity should be performed and specific recommendations for corrosion protection will need to be provided by a qualified corrosion engineer.

3.9 Pavement Design

3.9.1 Asphalt Concrete Pavements

Laboratory tests of three selected representative bulk samples of onsite soils within shallow depths (upper 5 feet) indicated R-values of 40, 40, and 61 (see Appendix C). This may be due to variable amounts of fines in subsurface soils that were encountered across the site at shallow depths. For preliminary design purpose, we assume an average R-value of 40. Considering this assumed R-value and following the Highway Design Manual (Caltrans, 2006) guidelines, minimum asphalt pavement sections for different Traffic Indices (TIs) ranging from 4 through 7 are listed in Table 6, below.

Table 6 - Asphalt Pavement Section Thickness

General Traffic Condition	Design Traffic Index (TI)	Asphalt Concrete (inches)	Aggregate Base[1] (inches)	Total Thickness (inches)
Automobile Parking	4.0	3.0	4.0	7.0
	4.5	3.0	4.0	7.0
Automobile Parking Lanes	5.0	3.0	4.0	7.0
	5.5	3.5	5.0	8.5
Truck Access & Parking Areas	6.0	3.5	6.0	9.5
	6.5	4.0	6.0	10.0
	7.0	4.0	7.0	11.0

[1] Minimum design R-value of aggregate base is 78.

Appropriate Traffic Index (TI) data should be selected by the project civil engineer or traffic engineering consultant and appropriate R-value of the subgrade soils will need to be determined after completion of rough grading to finalize the

pavement design. Final pavement sections should be in general accordance with local, county and industry standards. Portland cement concrete may be used, rather than asphalt, in point and impact load areas such as trash truck bin loading areas.

Subgrade soils in the upper 24 inches of the driveways and parking areas should be properly compacted to at least 90 percent relative compaction (ASTM D1557) and should be moisture-conditioned to above optimum moisture contents, and kept in this condition until the pavement section is constructed. Minimum relative compaction requirements for aggregate base should be 95 percent of the maximum laboratory density (ASTM D1557).

Asphalt concrete and aggregate base should conform to Caltrans Standard Specifications (May, 2006 Edition) Sections 39 and 26-1.02A, respectively. As an alternative, asphalt concrete can conform to Section 203-6 of the *Standard Specifications for Public Works Construction* (Green Book), 2003 Edition. Crushed aggregate base or crushed miscellaneous base can conform to Sections 200-2.2 and 200-2.4 of the *Standard Specifications for Public Works Construction* (Green Book), 2003 Edition, respectively.

3.9.2 Portland Cement Concrete Pavements

Proposed pavements for trailer parking and driveway, where high impact loads from truck wheels are anticipated, may be constructed Portland Cement Concrete (PCC). For preliminary planning purposes, we recommend a minimum of 6-inch-thick PCC pavement on soil subgrade for preliminary design purpose provided the following criteria are met during design and construction of the proposed pavements:

- Minimum 28-day modulus of rupture of the PCC should be 650 psi (equivalent minimum 28-day compressive strength of 4,500 psi).
- Upper minimum 12 inches of the finish soil subgrade should have a minimum relative compaction of 95 percent (ASTM D1557) and tested R-value of the subgrade soils should be at least 55.
- Design ADTT (Average Daily Truck Traffic) in both directions for the proposed pavements is 400 or less.

- Driveway and parking lots should have dowel connections at transverse joints and concrete shoulders.

We recommend representative pavement subgrade samples be obtained during grading and R-value tests be performed. Should the tested R-value and the other assumptions deviate from the minimum recommended parameters as in the above, the design PCC pavement sections provided in this report may need to be revised.

3.10 Surface Drainage

Ponding of water adjacent to structures should be avoided. During and after construction, positive drainage should be provided to direct surface water away from structures and towards suitable, nonerosive drainage devices. Locating planters adjacent to buildings or structures should be avoided. Where unavoidable, planters should be properly lined, such as with a membrane, to reduce penetration of irrigation water into the adjacent footing subgrades. Wherever possible, exposed soil areas should be above paved grades. Planters should not be depressed below adjacent paved grades unless drainage, such as catch basins and drains are provided.

3.11 Additional Geotechnical Services

The geotechnical recommendations presented in this report are based on subsurface conditions as interpreted from limited subsurface explorations and laboratory testing. Our conclusions and recommendations presented in this report should be reviewed and verified by Leighton Consulting during site construction and revised accordingly if exposed geotechnical conditions vary from our preliminary findings and interpretations. The recommendations presented in this report are only valid if Leighton Consulting verifies the site conditions during construction. Geotechnical observation and testing should be provided during the following activities:

- Demolition of the existing structures;
- Grading and excavation of the site;
- Overexcavation and compaction of all fill materials;
- Excavation and installation of foundations;

- After excavation of all slabs and footings and prior to placement of steel or concrete to confirm the slabs and footings are founded in firm, compacted fill;
- Utility trench backfilling and compaction;
- Pavement subgrade preparation and base course compaction; and
- When any conditions are encountered that vary significantly form the conditions described in this report.

Leighton Consulting should review the grading and foundation plans and specifications, when available, to comment on the geotechnical aspects. Our recommendations should be revised, as necessary, based on future plans and incorporated into the final design plans and specifications.

4.0 LIMITATIONS

The conclusions and recommendations presented in this report have been based upon the generally accepted principles and practices of geotechnical engineering utilized by other competent engineers at this time and place. No other warranty is either expressed or implied.

The conclusions and recommendations presented in this report have been based upon the subsurface conditions encountered at discrete and widely spaced locations and at specific intervals below the ground surface. Due to the inherent variance in soils conditions, variability may be encountered during construction. Where encountered during construction, such variances should be brought to our attention to determine the impact upon the recommendations presented in this report.

This report has been prepared for the expressed use of our client and the design professionals assigned for this project. The report may not be used by others or for other projects without the expressed written consent of our client and our firm.

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely on Your ASFE-Member Geotechnical Engineer for Additional Assistance

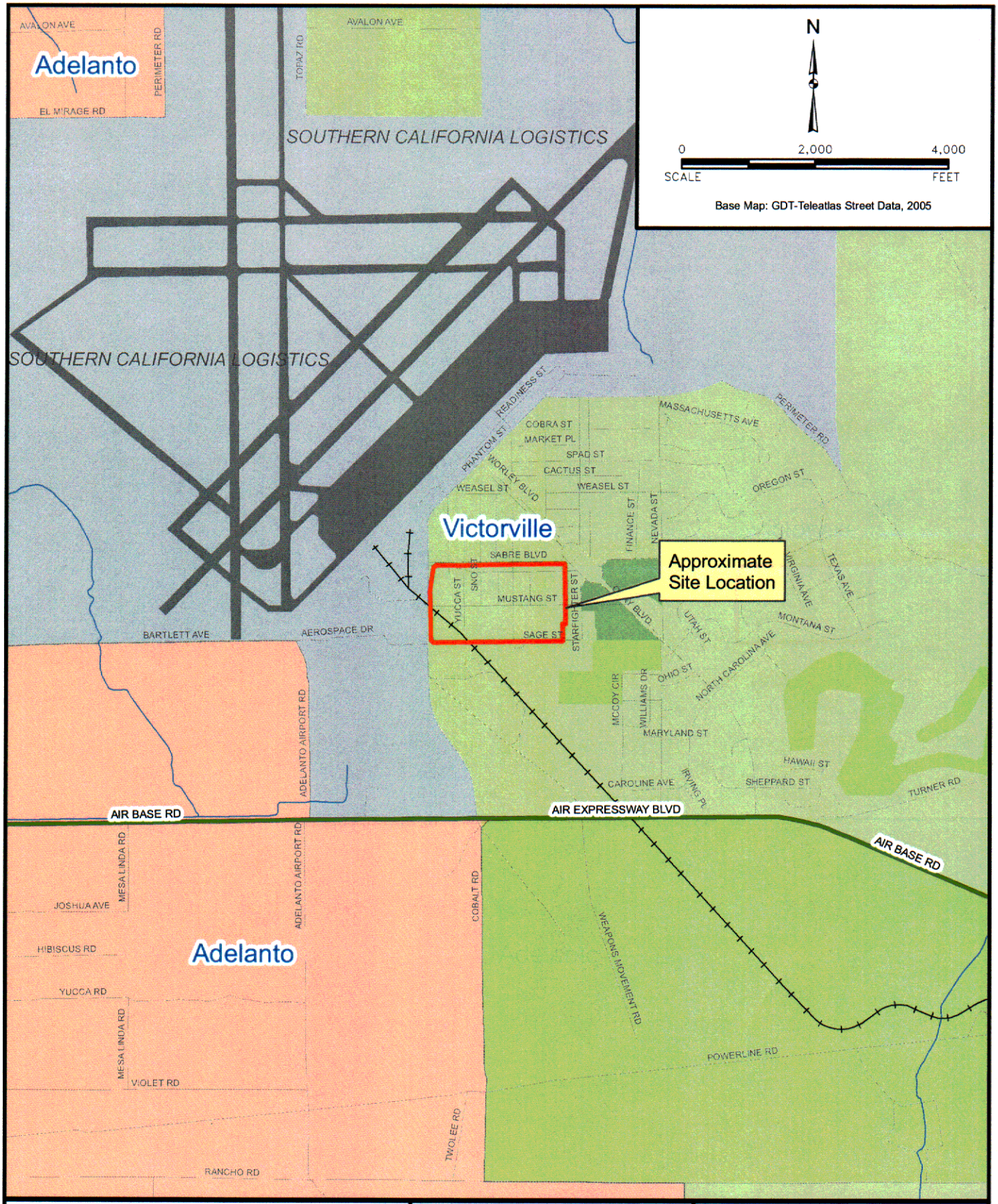
Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

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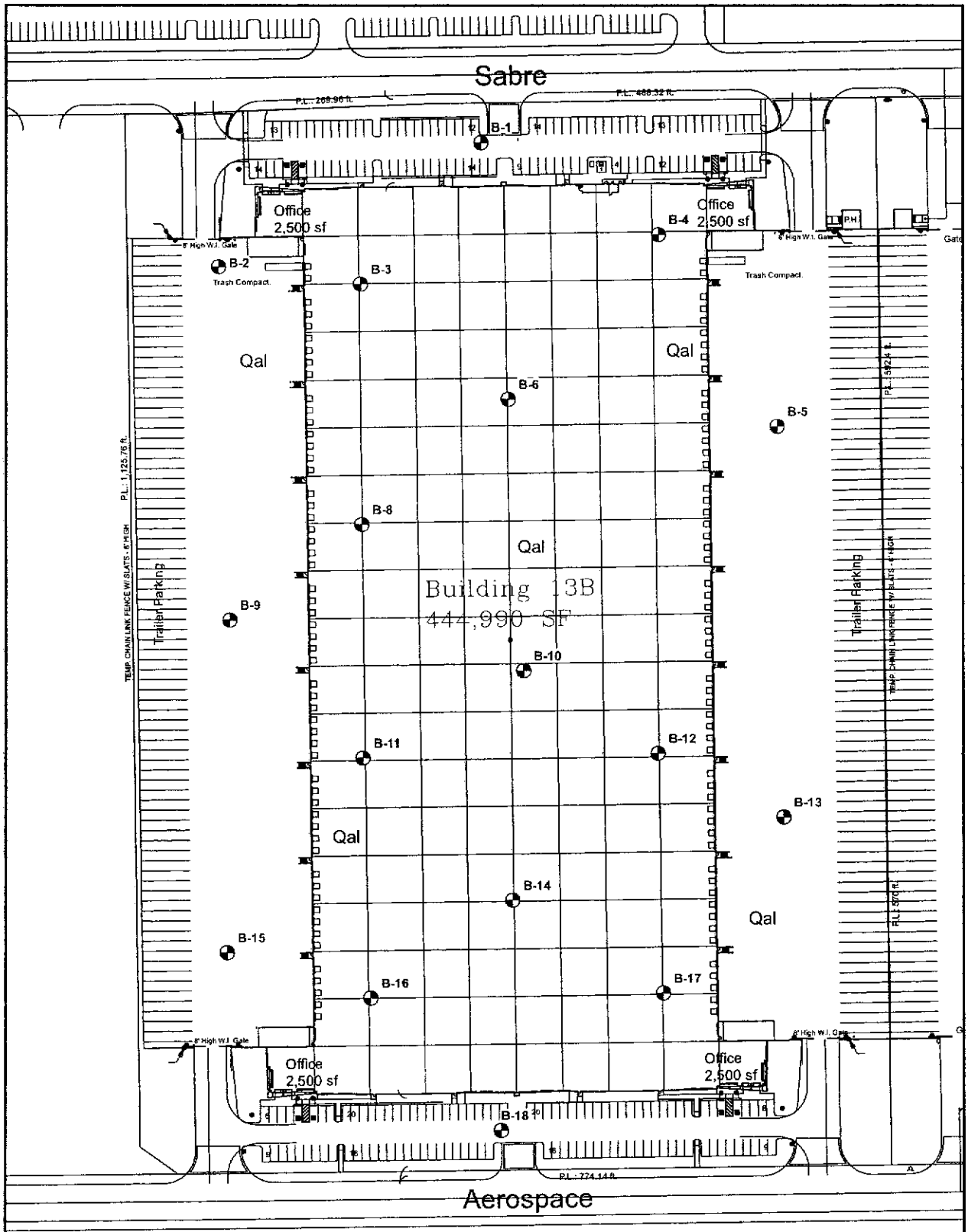
Geotechnical Investigation
Proposed Commercial Building 13B
SCLA, Victorville, CA

SITE LOCATION MAP

Project No.
601901-001

Date
August 2007

Figure 1



LEGEND

B-18	Approximate location of hollowstem boring (B-7 is excluded from this report)
Qal	Quaternary alluvium, circled where buried

BORING LOCATION MAP

Geotechnical Investigation
Proposed Commercial Building 13B
SCLA, Victorville, CA

Project No.	601901-001
Scale	1 inch equals 100 feet
Engr./Geol.	/
Drafted By	PDB
Date	August 2007

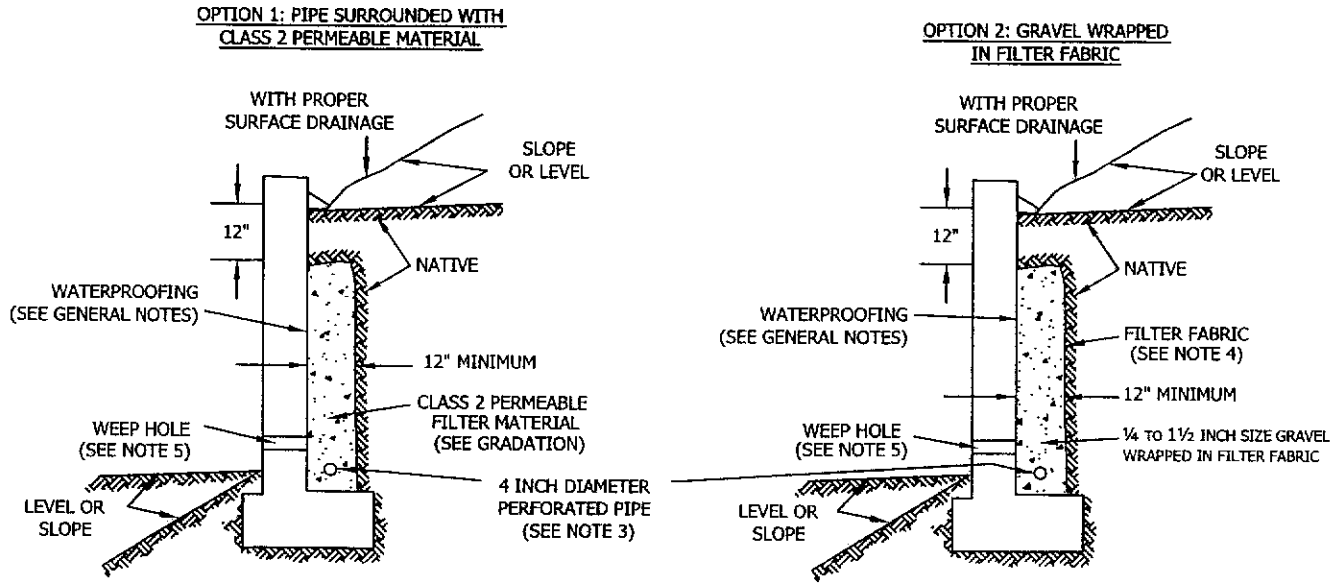
Figure 2

N

0 100 200

SCALE FEET

SUBDRAIN OPTIONS AND BACKFILL WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50



Class 2 Filter Permeable Material Gradation
Per Caltrans Specifications

Sieve Size	Percent Passing
1"	100
3/4"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

GENERAL NOTES:

* Waterproofing should be provided where moisture nuisance problem through the wall is undesirable.
* Water proofing of the walls is not under purview of the geotechnical engineer
* All drains should have a gradient of 1 percent minimum
*Outlet portion of the subdrain should have a 4-inch diameter solid pipe discharged into a suitable disposal area designed by the project engineer. The subdrain pipe should be accessible for maintenance (rodding)
*Other subdrain backfill options are subject to the review by the geotechnical engineer and modification of design parameters.

Notes:
1) Sand should have a sand equivalent of 30 or greater and may be densified by water jetting.
2) 1 Cu. ft. per ft. of 1/4- to 1 1/2-inch size gravel wrapped in filter fabric
3) Pipe type should be ASTM D1527 Acrylonitrile Butadiene Styrene (ABS) SDR35 or ASTM D1785 Polyvinyl Chloride plastic (PVC), Schedule 40, Armco A2000 PVC, or approved equivalent. Pipe should be installed with perforations down. Perforations should be 3/8 inch in diameter placed at the ends of a 120-degree arc in two rows at 3-inch on center (staggered)
4) Filter fabric should be Mirafi 140NC or approved equivalent.
5) Weephole should be 3-inch minimum diameter and provided at 10-foot maximum intervals. If exposure is permitted, weepholes should be located 12 inches above finished grade. If exposure is not permitted such as for a wall adjacent to a sidewalk/curb, a pipe under the sidewalk to be discharged through the curb face or equivalent should be provided. For a basement-type wall, a proper subdrain outlet system should be provided.
6) Retaining wall plans should be reviewed and approved by the geotechnical engineer.
7) Walls over six feet in height are subject to a special review by the geotechnical engineer and modifications to the above requirements.

RETAINING WALL BACKFILL AND SUBDRAIN DETAIL FOR WALLS 6 FEET OR LESS IN HEIGHT

WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50

Leighton

P:\Drafting\templates\details\retain-wall-backfill-and subdrain.dwg (7/00)

Figure 3

APPENDIX A

APPENDIX A

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APPENDIX B

GEOTECHNICAL BORING LOG B-1

Date 7-18-07 **Sheet** 1 **of** 1

Project Building 13B **Project No.** 601901-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lb Auto-hammer **Drop** 30"

Elevation Top of Hole ' **Location** See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0			B1					@ surface: 2-inches of asphalt-concrete over no aggregate base.	
									Quaternary Alluvium (Qal):	
				R-1	6 8 8			SM	@ 2.5': Silty SAND, tan, damp, loose, fine grained sand, trace coarse grained sand.	
	5			R-2	5 7 13			SP	@ 5': SAND, light tan, dry, medium dense, fine to coarse grained sand, trace well rounded gravel.	
	10			R-3	9 17 34			SP-SM	@ 10': SAND with silt, light tan, dry, dense, fine to coarse grained sand.	
	15								Total depth of boring: 11.5 feet No groundwater was encountered The boring was backfilled with soil cuttings and patched with cold asphalt mix.	
	20									
	25									
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-2

Date 7-18-07 **Sheet** 1 **of** 1

Project Building 13B **Project No.** 601901-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lb Auto-hammer **Drop** 30"

Elevation Top of Hole ' **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
		N S							**Logged By** CDL **Sampled By** CDL	
	0			B1					@ surface: 1.5-inches of asphalt-concrete over 6-inches of aggregate base.	
									Quaternary Alluvium (Qal):	
				R-1	12 12 14			SM	@ 2.5': Silty SAND, brown, moist, medium dense, fine to medium grained sand.	
	5			R-2	4 5 7			SM	@ 5': Silty SAND, brown, damp, loose, fine grained sand, trace coarse grained sand.	
	10			R-3	4 8 11			SP-SM	@ 10': Silty SAND/SAND with silt, red-brown, damp to moist, medium dense, fine to coarse grained sand.	
	15								Total depth of boring: 11.5 feet No groundwater was encountered The boring was backfilled with soil cuttings and patched with cold asphalt mix.	
	20									
	25									
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE



GEOTECHNICAL BORING LOG B-3

Date 7-18-07 **Sheet** 1 **of** 1

Project Building 13B **Project No.** 601901-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lb Auto-hammer **Drop** 30"

Elevation Top of Hole ' **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
		N S							**Logged By** CDL **Sampled By** CDL	
	0								**Quaternary Alluvium (Qal):**	
				R-1	7 12 13			SM	@ 2.5': Silty SAND, light red-brown, damp, medium dense, fine grained sand, some calcium carbonate stringers, poorly cemented with calcium carbonate, trace roots and pin-hole porosity.	
	5			R-2	4 5 7			SP	@ 5': SAND, brown, damp, loose, fine to coarse grained sand.	
	10			R-3	11 15 24			SP	@ 10': SAND, light tan-grey, dry, medium dense, fine grained sand.	
	15			R-4	12 23 33			SP	@ 15': SAND, light grey, dry, dense, fine to medium grained sand.	
	20			R-5	13 21 34			SP	@ 20': SAND, light grey, brown, dry, fine to coarse grained sand.	
	25			S-1	18 13 13			SP	@ 25': SAND, light brown, dry, medium dense, fine to coarse grained sand interbedded with silty SAND, brown, damp, fine grained sand.	
	30								Total depth of boring: 26.5 feet No groundwater was encountered The boring was backfilled with soil cuttings	

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-4

Date 7-18-07 **Sheet** 1 **of** 1

Project Building 13B **Project No.** 601901-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lb Auto-hammer **Drop** 30"

Elevation Top of Hole ' **Location** See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0			B1					**Quaternary Alluvium (Qal):**	
				R-1	28 50/6"			SM	@ 2.5': Silty SAND, brown, damp to moist, fine to medium grained sand, trace coarse grained sand.	
	5			R-2	19 20 22			SM	@ 5': Silty SAND, brown, damp, medium dense, fine to medium grained sand, mottled along with SAND, light white grey, dry, medium dense, fine to coarse grained sand.	
	10			R-3	10 25 28			SP	@ 10': gravelly SAND, light orange-brown, dry, dense, fine to coarse grained sand, fine sub-angular gravel.	
	15			R-4	20 50/6"			SM	@ 15': Silty SAND, brown, moist, very dense, fine to medium grained sand.	
	20			R-5	12 25 37			SP	@ 20': SAND, orange-brown, dry to damp, dense, fine to coarse grained sand, noncohesive.	
	25			S-1	6 7 11			SM	@ 25': Silty SAND, brown, damp, dense, fine grained sand.	
	30								Total depth of boring: 26.5 feet No groundwater was encountered The boring was backfilled with soil cuttings	

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-5

Date 7-18-07 **Sheet** 1 **of** 1

Project Building 13B **Project No.** 601901-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lb Auto-hammer **Drop** 30"

Elevation Top of Hole ' **Location** See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0			B1					@ surface: 1.5-inches of asphalt-concrete over 6-inches of aggregate base	
									Quaternary Alluvium (Qal):	
				R-1	8 8 10			SM	@ 2.5': Silty SAND, brown, damp to moist, medium dense, fine to medium grained sand, trace coarse grained sand.	
	5			R-2	7 13 18			SP	@ 5': SAND, light brown, damp, medium dense, fine to coarse grained sand.	
	10			R-3	18 21 45			SP-SM	@ 10': SAND with silt, tan-grey, damp, dense, fine grained sand.	
									Total depth of boring: 11.5 feet No groundwater was encountered The boring was backfilled with soil cuttings and patched with cold asphalt mix.	
	15									
	20									
	25									
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-6

Date 7-18-07 **Sheet** 1 **of** 1

Project Building 13B **Project No.** 601901-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lb Auto-hammer **Drop** 30"

Elevation Top of Hole ' **Location** See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0			B1					**Artificial fill (Afu):**	
				R-1	22 28 41			SM	@ 2.5': Silty SAND, light brown, damp, fine grained sand, some medium grained sand.	
	5			R-2	18 22 28			SM	**Quaternary alluvium (Qal):** @ 5': Silty SAND, light brown, damp, fine to medium grained sand, poorly cemented with calcium carbonate.	
	10			R-3	11 14 20			SP	@ 10': SAND, brown, dry, medium dense, fine to coarse grained sand grades with depth to fine to medium grained sand.	
	15			R-4	18 29 31			SP	@ 15': SAND, light tan white, dry, dense, fine to coarse grained sand.	
	20			R-5	27 37 50			SP	@ 20': SAND, light tan white, dry, very dense, fine to coarse grained sand, non-cohesive.	
	25			S-1	11 20 22			SP	@ 25': SAND, light tan white, dry, dense, fine to coarse grained sand.	
	30								Total depth of boring: 26.5 feet No groundwater was encountered The boring was backfilled with soil cuttings	

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-8

Date 7-18-07 **Sheet** 1 **of** 1

Project Building 13B **Project No.** 601901-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lb Auto-hammer **Drop** 30"

Elevation Top of Hole ' **Location** See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								@ surface: 2-inches asphalt-concrete over 6.5-inches aggregate base.	
									Artificial fill (Afu):	
				R-1	4 4 5			SM	@ 2.5': Silty SAND, brown, moist, loose, fine grained sand, trace calcium carbonate stringers	
	5			R-2	7 9 9			SM	@ 5': Silty SAND, red-brown, moist, medium dense, fine grained sand, calcium carbonate stringers.	
	10			R-3	9 10 15			SP	@ 10': SAND, tan white grey, dry, medium dense, fine to coarse grained sand, non-cohesive, sample disturbed upon acquisition.	
	15			R-4	50/6"			SM	@ 15': Silty SAND/sandy SILT, brown, moist, very dense/hard, fine grained sand, mottled with calcium carbonate.	
	20			R-5	20 30 40			SP	@ 20': SAND, tan, dry, dense, fine to medium grained sand, trace coarse grained sand.	
	25								Total depth of boring: 21.5 feet No groundwater was encountered The boring was backfilled with soil cuttings and patched with cold asphalt mix.	
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-9

Date 7-18-07 **Sheet** 1 **of** 1

Project Building 13B **Project No.** 601901-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lb Auto-hammer **Drop** 30"

Elevation Top of Hole ' **Location** See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0			B1					@ surface: 3-inches asphalt-concrete over 7-inches aggregate base.	
									Quaternary alluvium (Qal):	
				R-1	6 9 12			SM	@ 2.5': Silty SAND, brown, moist, medium dense, fine grained sand, moderately well cemented with calcium carbonate.	
	5			R-2	5 6 10			SP-SM	@ 5': SAND with silt, light brown, damp, medium dense, fine and coarse grained sand.	
	10			R-3	10 12 18			SP	@ 10': SAND, tan-brown, damp, medium dense, fine to medium grained sand grades with depth to fine to coarse grained sand.	
	15								Total depth of boring: 11.5 feet No groundwater was encountered The boring was backfilled with soil cuttings and patched with cold asphalt mix.	
	20									
	25									
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-10

Date 7-19-07 **Sheet** 1 **of** 2

Project Building 13B **Project No.** 601901-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lb Auto-hammer **Drop** 30"

Elevation Top of Hole ' **Location** See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0	N S								
				R-1	9 20 27			SM	**Quaternary alluvium (Qal):** @ 2.5': Silty/clayey SAND, red-brown, moist, medium dense, fine to medium grained sand, calcium carbonate stringers, well cemented with calcium carbonate.	
	5			R-2	18 24 25			SC	@ 5': Clayey SAND, brown, moist, medium dense, fine grained sand, well cemented with calcium carbonate.	
	10			R-3	13 25 36			SP	@ 10': Gravelly SAND, light brown, damp, dense, fine to medium grained sand, fine to medium well rounded gravel, trace silt and coarse grained sand.	
	15			R-4	16 50/6"			SM	@ 15': Silty SAND, olive grey-brown, damp, very dense, fine grained sand.	
	20			R-5	14 28 50			SP	@ 20': SAND, light brown, dry, very dense, fine to coarse grained sand.	
	25			S-1	10 19 23			SP	@ 25': SAND, light brown, dry, very dense, fine to coarse grained sand.	
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-10

Date 7-19-07 **Sheet** 2 **of** 2

Project Building 13B **Project No.** 601901-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lb Auto-hammer **Drop** 30"

Elevation Top of Hole ' **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	30			R-6	15 26 40			SP-SM	@ 30': SAND with silt, light brown, damp, dense, fine to coarse grained sand, grades with depth to SAND, light brown-white, dry, dense, fine to medium grained sand.	
	35			S-2	13 22 24			SP-SM	@ 35': SAND with silt, light brown, damp, dense, fine to coarse grained sand.	
	40			R-7	11 33 50/3.5"			SP	@ 40': SAND, light brown, dry, dry, very dense, fine to coarse grained sand, interbedded with silty sand, fine to coarse grained.	
	45			S-3	37 50/4.5"			SM	@ 45': Silty SAND, brown, damp, dry, very dense, fine grained sand, grades to SAND, light brown, dry, very dense, fine to coarse grained sand, non-cohesive.	
	50			R-8	50/6"				@ 50': No recovery.	
	55								Total depth of boring: 51.5 feet No groundwater was encountered The boring was backfilled with soil cuttings	
	60									

Logged By CDL

Sampled By CDL

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-11

Date 7-19-07 **Sheet** 1 **of** 1

Project Building 13B **Project No.** 601901-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lb Auto-hammer **Drop** 30"

Elevation Top of Hole ' **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
		N S							**Logged By** CDL **Sampled By** CDL	
	0								**Quaternary alluvium (Qal):**	
				R-1	4 10 21			SM	@ 2.5': Silty SAND, brown, moist, medium dense, fine grained sand, tip of sample is moderately well cemented with calcium carbonate.	
	5			R-2	19 19 21			SM	@ 5': Clayey/silty SAND, red-brown, moist, medium dense, fine to medium grained sand.	
	10			R-3	11 13 17			SP-SM SM	@ 10': SAND with silt, red-brown, damp, medium dense, fine to coarse grained sand grades with depth to silty SAND, brown, damp, fine grained sand.	
	15			R-4	27 50/6"			SM	@ 15': Silty SAND, brown, moist, very dense, fine grained sand.	
	20			R-5	26 36 50			SP SM	@ 20': SAND, brown, damp, very dense, fine to coarse grained sand, grades with depth to silty SAND, brown, moist, very dense, fine grained sand.	
	25								Total depth of boring: 21.5 feet No groundwater was encountered The boring was backfilled with soil cuttings	
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-12

Date 7-18-07 **Sheet** 1 **of** 1

Project Building 13B **Project No.** 601901-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lb Auto-hammer **Drop** 30"

Elevation Top of Hole ' **Location** See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0									
				R-1	9 16 16			SM	**Quaternary alluvium (Qal):** @ 2.5': Silty SAND, red-brown, damp, medium dense, calcium carbonate stringers, moderately well cemented.	
	5			R-2	7 8 9			SM/ML	@ 5': SAND with silt/silty SAND, brown, damp, medium dense, fine to coarse grained sand grades with depth to fine grained sand.	
	10			R-3	7 12 15			SP	@ 10': SAND, brown, damp, medium dense, fine to coarse grained sand, non-cohesive, trace fine well rounded gravel.	
	15			R-4	18 50/5"			SM	@ 15': Silty SAND, brown, moist, very dense, fine grained sand.	
	20			R-5	13 31 39			SP	@ 20': SAND, light grey-brown, dry, dense, fine to medium grained sand with coarse grained sand.	
	25								Total depth of boring: 21.5 feet No groundwater was encountered The boring was backfilled with soil cuttings	
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-13

Date 7-19-07 **Sheet** 1 **of** 1

Project Building 13B **Project No.** 601901-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lb Auto-hammer **Drop** 30"

Elevation Top of Hole ' **Location** See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0			B1						
				R-1	12 19 25			SM	**Quaternary alluvium (Qal):** @ 2.5': Silty SAND, tan to red-brown with depth, damp to moist with depth, medium dense, fine to medium grained sand, poorly cemented with calcium carbonate.	
	5			R-2	9 14 14			SP	@ 5': SAND, tan-brown, damp, medium dense, fine and coarse grained sand, non-cohesive.	
	10			R-3	10 18 16			SP SM	@ 10': SAND, light brown, dry, medium dense, coarse grained sand, grades with depth to silty SAND, brown, moist, medium dense, fine grained sand.	
	15								Total depth of boring: 11.5 feet No groundwater was encountered The boring was backfilled with soil cuttings	
	20									
	25									
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-14

Date 7-19-07 **Sheet** 1 **of** 1

Project Building 13B **Project No.** 601901-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lb Auto-hammer **Drop** 30"

Elevation Top of Hole ' **Location** See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0	N S								
				R-1	3 8 14			SM	**Quaternary alluvium (Qal):** @ 2.5': Silty SAND, brown, damp, medium dense, fine to medium grained sand, trace coarse grained sand.	
	5			R-2	7 14 14			SP-SM	@ 5': SAND with silt, light tan, damp, medium dense, fine to medium grained sand, trace coarse and fine well rounded gravel, very poorly cemented with calcium carbonate.	
	10			R-3	9 17 33			SP	@ 10': SAND, light tan, dry, medium dense, medium grained sand, non-cohesive.	
	15			R-4	17 31 50			SP	@ 15': SAND, light tan, dry, very dense, medium grained sand, trace fine and coarse grained sand.	
	20			R-5	8 10 26			ML/SM	@ 20': Sandy SILT, brown, moist, very stiff, fine grained sand.	
	25			S-1	12 13 12			SM	@ 25': Silty SAND, brown, moist, medium dense, fine to medium grained sand.	
	30								Total depth of boring: 26.5 feet No groundwater was encountered The boring was backfilled with soil cuttings	

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-15

Date 7-19-07 **Sheet** 1 **of** 1

Project Building 13B **Project No.** 601901-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lb Auto-hammer **Drop** 30"

Elevation Top of Hole ' **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0			B1					**Logged By** CDL **Sampled By** CDL	
				R-1	7 8 18			SM	**Quaternary alluvium (Qal):** @ 2.5': Silty SAND, brown, damp to moist, medium dense, fine grained sand, tip of sample is well cemented with calcium carbonate.	
	5			R-2	9 20 50/5"			ML	@ 5': SILT, tan-grey, damp, hard, well cemented with calcium carbonate.	
	10			R-3	10 14 20			SM	@ 10': Silty SAND, light brown, damp, medium dense, fine to medium grained sand.	
	15								Total depth of boring: 11.5 feet No groundwater was encountered The boring was backfilled with soil cuttings	
	20									
	25									
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-16

Date 7-19-07 **Sheet** 1 **of** 1

Project Building 13B **Project No.** 601901-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lb Auto-hammer **Drop** 30"

Elevation Top of Hole ' **Location** See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0									
				R-1	2 7 19			SM	**Quaternary alluvium (Qal):** **@ 2.5': Silty SAND, brown, damp, medium dense, fine grained sand, some mottled calcium carbonate.**	
	5			R-2	10 13 23			ML/SM	@ 5': Silty SAND/sandy SILT, light brown-grey, damp, medium dense, fine grained sand, moderately well cemented with calcium carbonate.	
	10			R-3	21 29 50/4"			SM	@ 10': Silty SAND, brown, damp, very dense, fine grained sand.	
	15			R-4	20 50/6"			SP	@ 15': SAND, red-brown, damp, very dense, fine to medium grained sand, trace coarse grained sand, some fine sub-rounded gravel.	
	20			R-5	15 50/6"			SM	@ 20': Silty SAND, light brown, damp, very dense, fine grained sand.	
	25			S-1	8 23 23			SM	@ 25': Silty SAND, light brown, damp, very dense, fine grained sand.	
	30								Total depth of boring: 26.5 feet No groundwater was encountered The boring was backfilled with soil cuttings	

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-17

Date 7-19-07 **Sheet** 1 **of** 1

Project Building 13B **Project No.** 601901-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lb Auto-hammer **Drop** 30"

Elevation Top of Hole ' **Location** See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0									
				R-1	10 10 12			SM	@ 2.5': Silty SAND, brown, moist, medium dense, fine to medium grained sand, pinhole porosity.	
	5			R-2	6 6 7			SM	@ 5': Silty SAND, light red-brown, damp, loose, fine to medium grained sand, rootlets.	
	10			R-3	31 50/6"				@ 10': No sample recovery.	
	15			R-4	32 50/6"			SM/ML	@ 15': Silty SAND/sandy SILT, grey-brown, moist, very dense, fine grained sand, well cemented with calcium carbonate.	
	20			R-5	32 50/6"			SP	@ 20': Gravelly SAND, light red-tan, dry, very dense, fine to coarse grained sand, fine sub-rounded gravel.	
	25			S-1	23 16 16			SP-SM	@ 25': SAND with silt, tan, damp, dense, fine to medium grained sand.	
	30								Total depth of boring: 26.5 feet No groundwater was encountered The boring was backfilled with soil cuttings	

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-18

Date 7-19-07 **Sheet** 1 of 1

Project Building 13B **Project No.** 601901-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lb Auto-hammer **Drop** 30"

Elevation Top of Hole ' **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0			B1					**Logged By** CDL **Sampled By** CDL	
				R-1	13 11 12			SM	**Quaternary alluvium (Qal):** @ 2.5': Silty SAND, brown, damp, medium dense, fine t medium grained sand, trace hair rootlets and pinhole porosity.	
	5			R-2	3 5 5				@ 5': No sample recovery.	
	10			R-3	14 40 50/3"			SM	@ 10': Silty SAND, light white-tan, cry, very dense, fine to medium grained sand, very poorly cemented with calcium carbonate.	
	15								Total depth of boring: 11.5 feet No groundwater was encountered The boring was backfilled with soil cuttings	
	20									
	25									
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

APPENDIX C

APPENDIX C

Laboratory Test Procedures and Test Results

Moisture and Density Determination Tests: Moisture content and dry density determinations were performed, in general accordance with ASTM test method D2937, on relatively undisturbed samples obtained from the test borings and/or trenches. The results of these tests are presented in the boring logs (see Appendix A).

Percent Passing No. 200 Sieve: Selected samples were tested in accordance with the ASTM Standard D1140 to determine the amounts of materials finer than the U.S. Standard Sieve No. 200. Test results are presented in this appendix.

Expansion Index Tests: Expansion Index (EI) tests were performed on representative bulk samples of the onsite soil, in general accordance with the ASTM D 4829 Standard Test Method. Test results are presented in this appendix.

Maximum Density Tests: The maximum dry density and optimum moisture content of representative bulk soil samples were determined in accordance with ASTM Test Method D1557. Test results are presented on the *Modified Proctor Compaction Test* figures in this appendix.

Direct Shear Tests: Direct shear tests were performed on selected relatively undisturbed ring samples, which were soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. Samples and specimens were then transferred to the shear box, reloaded, and pore pressures set up in the sample (due to transfer) were allowed to dissipate for a period of approximately one-hour. Following pore pressure dissipation, samples were subjected to shearing forces. The samples were tested under various normal loads by a motor-driven, strain-controlled, direct-shear testing apparatus at a strain rate of 0.05 inches per minute. Test results data and graphical plots are presented in this appendix.

Collapse Tests: Collapse tests were performed on selected, relatively undisturbed ring samples. Samples were placed in a consolidometer, loaded up to 2 ksf, allowed to stabilize under this load, and then submerged. The test results are presented on the *One-Dimensional Swell or Settlement* figures in this appendix.

Consolidation Tests: Consolidation tests were performed on selected, relatively undisturbed ring samples. These samples were placed in a consolidometer and loads were applied in geometric progression. The percent consolidation for each load cycle was recorded as the ratio of the amount of vertical compression to the original 1-inch height. Consolidation results (curves) are presented on the One-Dimensional Consolidation figure in this appendix.

APPENDIX C (Continued)

Laboratory Test Procedures and Test Results

"R"-Value: The resistance "R"-value was determined by the California Standard Test Method No. 301 for representative pavement subgrade soils. Three specimens were prepared from one bulk sample and exudation pressure and "R"-value determined on each one. The graphically determined "R"-value at exudation pressure of 300 psi is reported in this appendix.

Chloride Content, Sulfate Content, Minimum Resistivity and pH Tests: Chloride content, sulfate content, minimum resistivity and pH tests were performed in general accordance with California Test Methods 422, 417, and 532. These results are presented in this appendix.

Boring No.	B-10	B-10	B-10	B-10	B-10	B-10	B-15	B-15
Sample No.	R-1	R-2	R-3	R-4	R-5	S-2	R-1	R-2
Depth (ft.)	2.5	5	10	15	20	35	2.5	5
Sample Type	Drive	Drive	Drive	Drive	Drive	SPT	Drive	Drive
Soil Identification	Olive brown silty sand (SM)	Light olive brown poorly graded sand with silt (SP-SM)	Light olive brown poorly graded sand with silt (SP-SM)g	Light olive brown silty sand (SM)	Light olive brown poorly graded sand with silt (SP-SM)	Olive yellow poorly graded sand with silt (SP-SM)	Yellowish brown silty sand (SM)	Olive sandy silt s(ML)
Moisture Correction								
Wet Weight of Soil + Container (g)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dry Weight of Soil + Container (g)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Weight of Container (g)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Moisture Content (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sample Dry Weight Determination								
Weight of Sample + Container (g)	394.80	389.60	433.30	374.70	444.50	386.70	364.40	328.10
Weight of Container (g)	78.10	77.30	75.00	82.80	77.60	78.10	72.90	82.90
Weight of Dry Sample (g)	316.70	312.30	358.30	291.90	366.90	308.60	291.50	245.20
Container No.:								
After Wash								
Method (A or B)	B	B	B	B	B	B	B	B
Dry Weight of Sample + Cont. (g)	299.60	352.70	400.10	256.50	422.70	369.70	319.60	206.50
Weight of Container (g)	78.10	77.30	75.00	82.80	77.60	78.10	72.90	82.90
Dry Weight of Sample (g)	221.50	275.40	325.10	173.70	345.10	291.60	246.70	123.60
% Passing No. 200 Sieve	**30.1**	**11.8**	**9.3**	**40.5**	**5.9**	**5.5**	**15.4**	**49.6**
% Retained No. 200 Sieve	69.9	88.2	90.7	59.5	94.1	94.5	84.6	50.4

Leighton

PERCENT PASSING
No. 200 SIEVE
ASTM D 1140

Project Name: SCLA, Bldg. 13B
Project No.: 601901-001
Client Name: LCI / Irvine
Tested By: G. Berdy Date: 07/30/07

Leighton

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	SCLA, Bldg. 13B	Tested By:	G. Berdy	Date:	07/27/07
Project No. :	601901-001	Checked By:	J. Ward	Date:	07/31/07
Boring No.:	B-6	Depth (ft.)	0-5		
Sample No. :	B-1				
Soil Identification:	Light olive brown silty sand (SM)				

Dry Wt. of Soil + Cont.	(g)	1000.00
Wt. of Container No.	(g)	0.00
Dry Wt. of Soil	(g)	1000.00
Weight Soil Retained on #4 Sieve		0.00
Percent Passing # 4		100.00

MOLDED SPECIMEN		Before Test	After Test
Specimen Diameter	(in.)	4.01	4.01
Specimen Height	(in.)	1.0000	1.0010
Wt. Comp. Soil + Mold	(g)	631.40	447.50
Wt. of Mold	(g)	204.80	0.00
Specific Gravity (Assumed)		2.70	2.70
Container No.		O	O
Wet Wt. of Soil + Cont.	(g)	854.10	652.30
Dry Wt. of Soil + Cont.	(g)	794.50	601.60
Wt. of Container	(g)	0.00	204.80
Moisture Content	(%)	7.50	12.78
Wet Density	(pcf)	128.7	134.9
Dry Density	(pcf)	119.7	119.6
Void Ratio		0.408	0.410
Total Porosity		0.290	0.291
Pore Volume	(cc)	60.0	60.2
Degree of Saturation (%) [S_{meas}]		**49.6**	84.2

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
07/27/07	10:07	1.0	0	0.1565
07/27/07	10:17	1.0	10	0.1560
Add Distilled Water to the Specimen				
07/27/07	11:30	1.0	73	0.1565
07/28/07	7:38	1.0	1281	0.1575
07/28/07	8:40	1.0	1343	0.1575

Expansion Index (EI_{meas}) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	1.5
Expansion Index (EI)$_{50}$ = EI_{meas} - (50 -S_{meas})x((65+EI_{meas}) / (220-S_{meas}))	**1**

Leighton

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	SCLA, Bldg. 13B	Tested By :	R. Santos	Date:	07/27/07
Project No.:	601901-001	Input By :	J. Ward	Date:	07/31/07
Boring No.:	B-4	Depth (ft.)	0-5		
Sample No. :	B-1				
Soil Identification:	Yellowish brown silty sand (SM)				

Preparation Method: [X] Moist [ ] Dry

[X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft^3) 0.03321

Ram Weight = 10 lb.; Drop = 18 in.

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3726.0	3854.0	3909.0	3838.0		
Weight of Mold (g)	1786.0	1786.0	1786.0	1786.0		
Net Weight of Soil (g)	1940.0	2068.0	2123.0	2052.0		
Wet Weight of Soil + Cont. (g)	560.60	482.30	440.50	501.20		
Dry Weight of Soil + Cont. (g)	541.80	457.10	409.10	456.80		
Weight of Container (g)	53.60	51.50	53.90	54.00		
Moisture Content (%)	3.85	6.21	8.84	11.02		
Wet Density (pcf)	128.8	137.3	140.9	136.2		
Dry Density (pcf)	124.0	129.3	129.5	122.7		

Maximum Dry Density (pcf) **130.5** **Optimum Moisture Content (%)** **7.5**

PROCEDURE USED

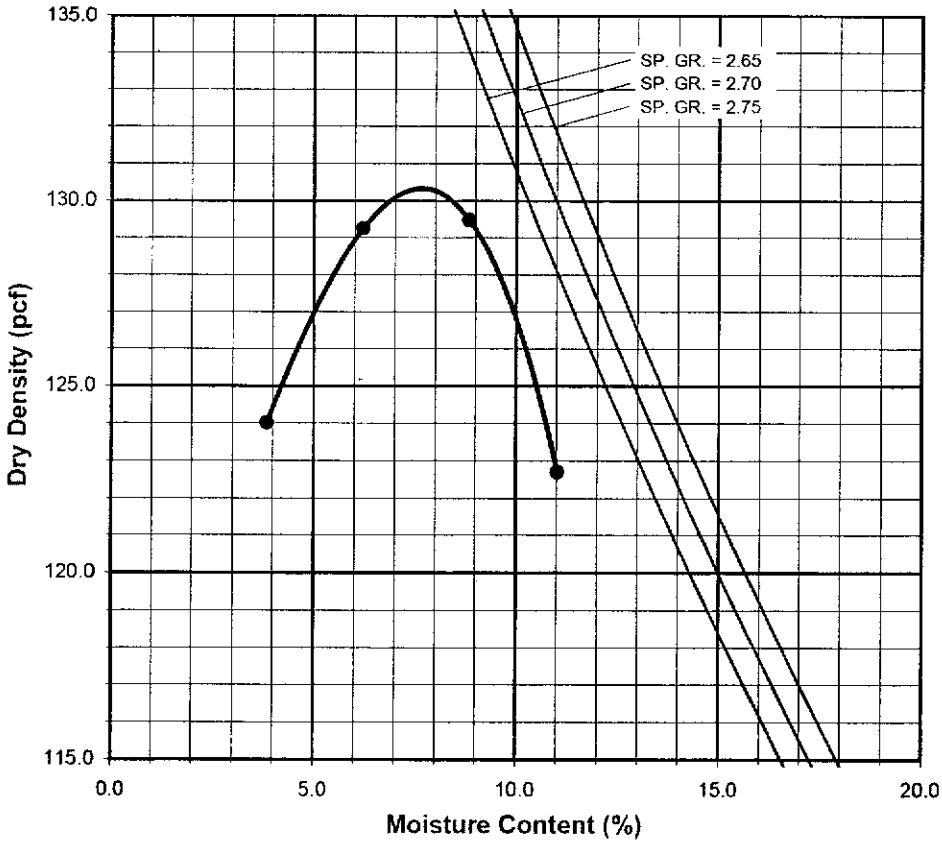
[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:
[ ]
GR:SA:FI

Atterberg Limits:
[ ]
LL,PL,PI



Leighton

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	SCLA, Bldg. 13B	Tested By :	R. Santos	Date:	08/03/07
Project No.:	601901-001	Input By :	J. Ward	Date:	08/06/07
Boring No.:	B-15	Depth (ft.)	0-5		
Sample No. :	B-1				
Soil Identification:	Dark brown silty sand (SM)				

Preparation Method:	X	Moist	
		Dry	
Compaction Method	X	Mechanical Ram	
		Manual Ram	

Scalp Fraction (%)	
#3/4	
#3/8	
#4	6.0

Rammer Weight (lb.) = 10.0

Height of Drop (in.) = 18.0

Mold Volume (ft^3) 0.03321

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3718.0	3852.0	3932.0	3838.0		
Weight of Mold (g)	1786.0	1786.0	1786.0	1786.0		
Net Weight of Soil (g)	1932.0	2066.0	2146.0	2052.0		
Wet Weight of Soil + Cont. (g)	536.60	483.50	448.40	438.70		
Dry Weight of Soil + Cont. (g)	517.90	458.10	415.90	398.90		
Weight of Container (g)	53.90	54.10	53.80	53.70		
Moisture Content (%)	4.03	6.29	8.98	11.53		
Wet Density (pcf)	128.3	137.1	142.5	136.2		
Dry Density (pcf)	123.3	129.0	130.7	122.1		

Maximum Dry Density (pcf) 131.0

Corrected Dry Density (pcf) 133.0

Optimum Moisture Content (%) 8.0

Corrected Moisture Content (%) 7.5

[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

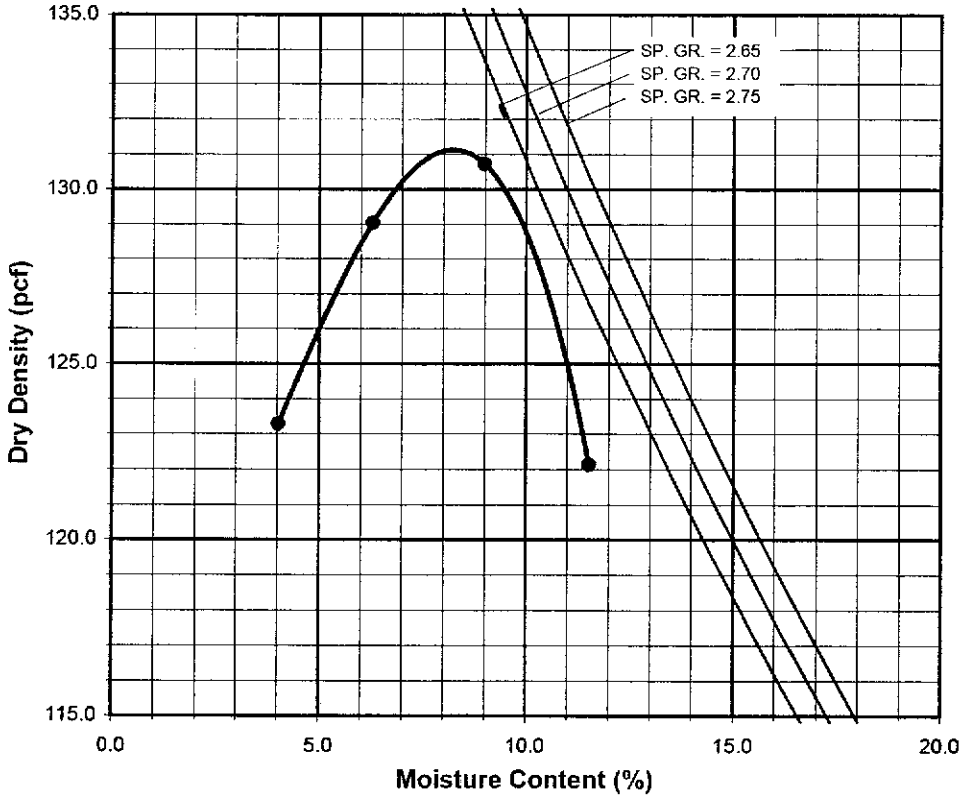
[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

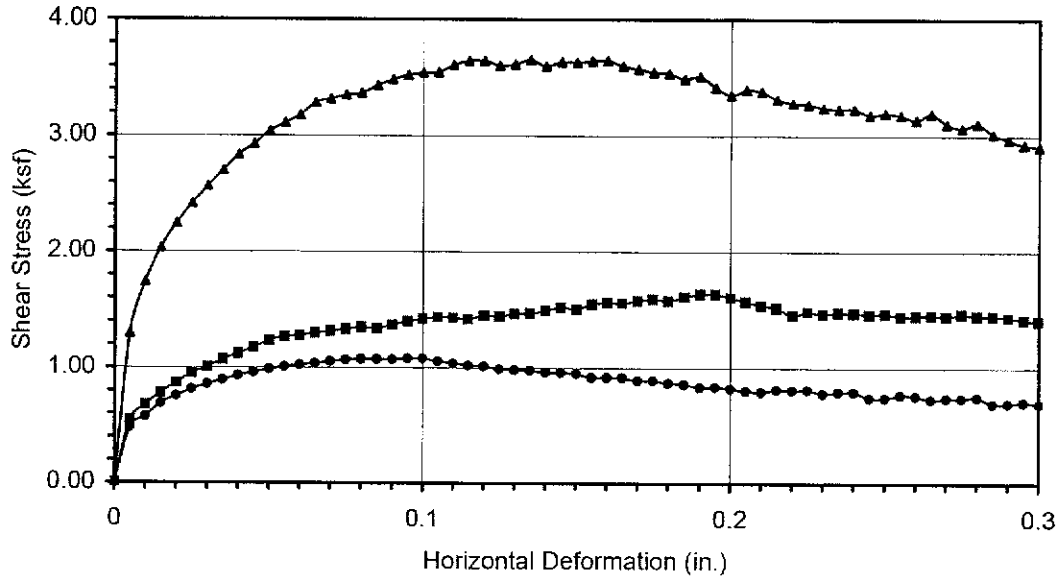
Particle-Size Distribution:

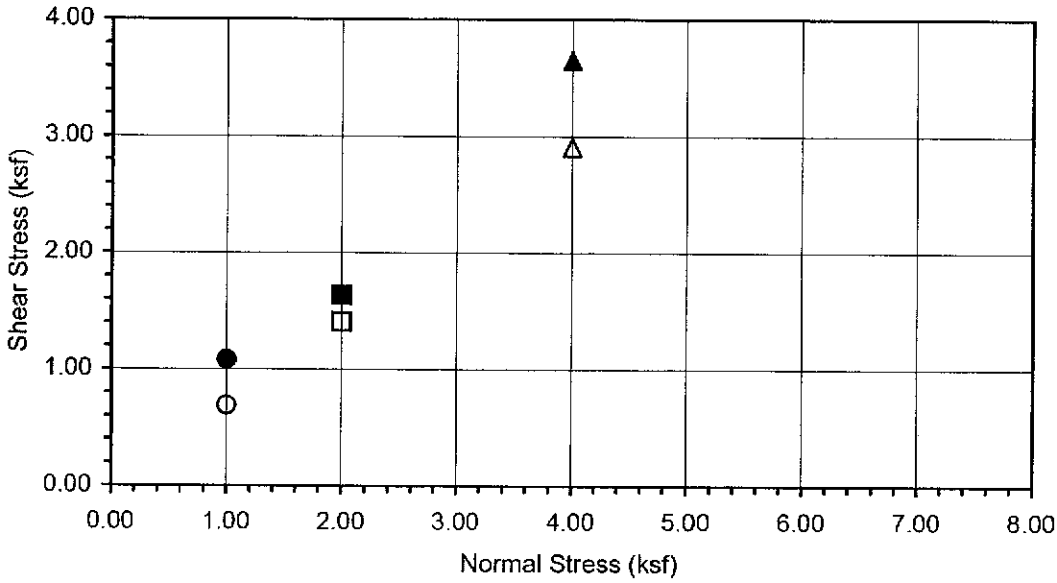
GR:SA:FI

Atterberg Limits:

LL,PL,PI







Boring No.	**B-3**
Sample No.	**R-2**
Depth (ft)	**5**
Sample Type: Drive	
Soil Identification: Yellowish brown poorly-graded sand (SP)	

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 1.081	■ 1.635	▲ 3.653
Shear Stress @ End of Test (ksf)	○ 0.688	□ 1.402	△ 2.908
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	0.81	0.81	0.81
Dry Density (pcf)	111.2	111.4	115.5
Saturation (%)	4.3	4.3	4.8
Soil Height Before Shearing (in.)	0.9986	0.9806	0.9756
Final Moisture Content (%)	15.5	13.5	15.2

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DIRECT SHEAR TEST RESULTS

Consolidated Undrained

Project No.: 601901-001

SCLA, Bldg. 13B

07-07

Leighton

One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546)

Project Name:	SCLA, Bldg. 13B	Tested By:	F. Tabibkhoei	Date:	07/26/07
Project No.:	601901-001	Checked By:	J. Ward	Date:	09/10/07
Boring No.:	B-2	Sample Type:	Drive		
Sample No.:	R-3	Depth (ft.)	10.0		
Sample Description:	Yellowish brown silty sand (SM)				

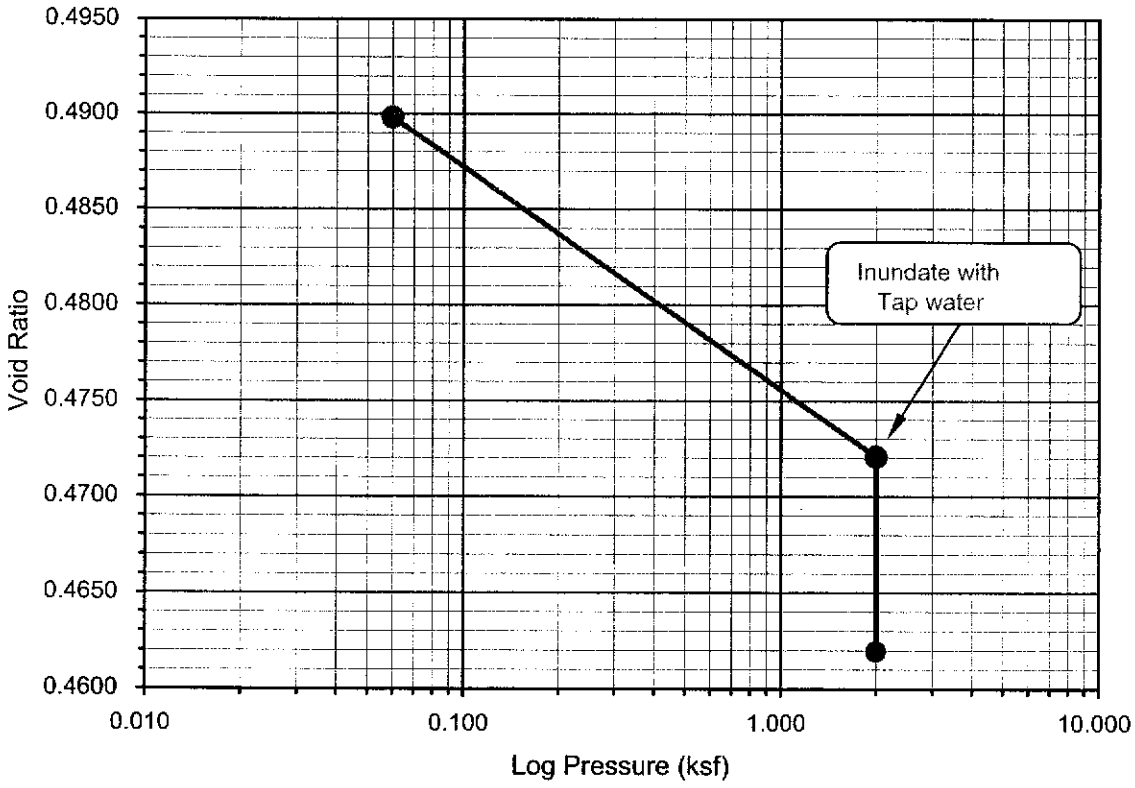
Initial Dry Density (pcf):	113.1
Initial Moisture (%):	2.29
Initial Length (in.):	1.0000
Initial Dial Reading:	0.1196
Diameter(in):	2.416

Final Dry Density (pcf):	113.7
Final Moisture (%) :	15.1
Initial Void ratio:	0.4904
Specific Gravity(assumed):	2.70
Initial Saturation (%)	12.6

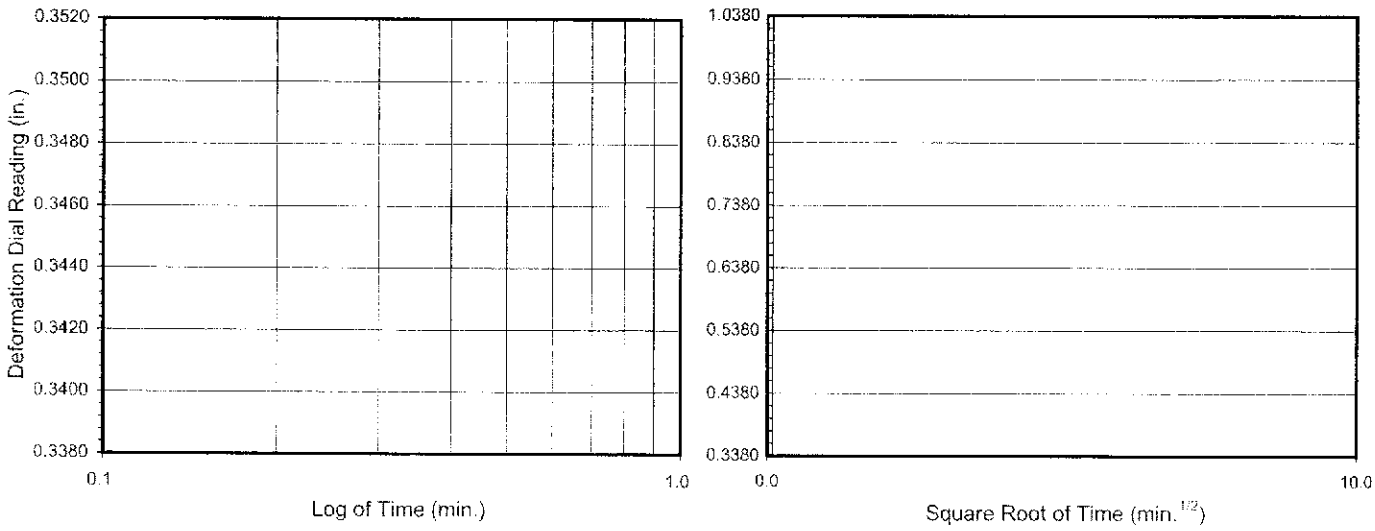
Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.060	0.1200	0.9996	0.00	-0.04	0.4898	-0.04
2.000	0.1319	0.9877	0.00	-1.23	0.4721	-1.23
H2O	0.1387	0.9809	0.00	-1.91	0.4619	-1.91

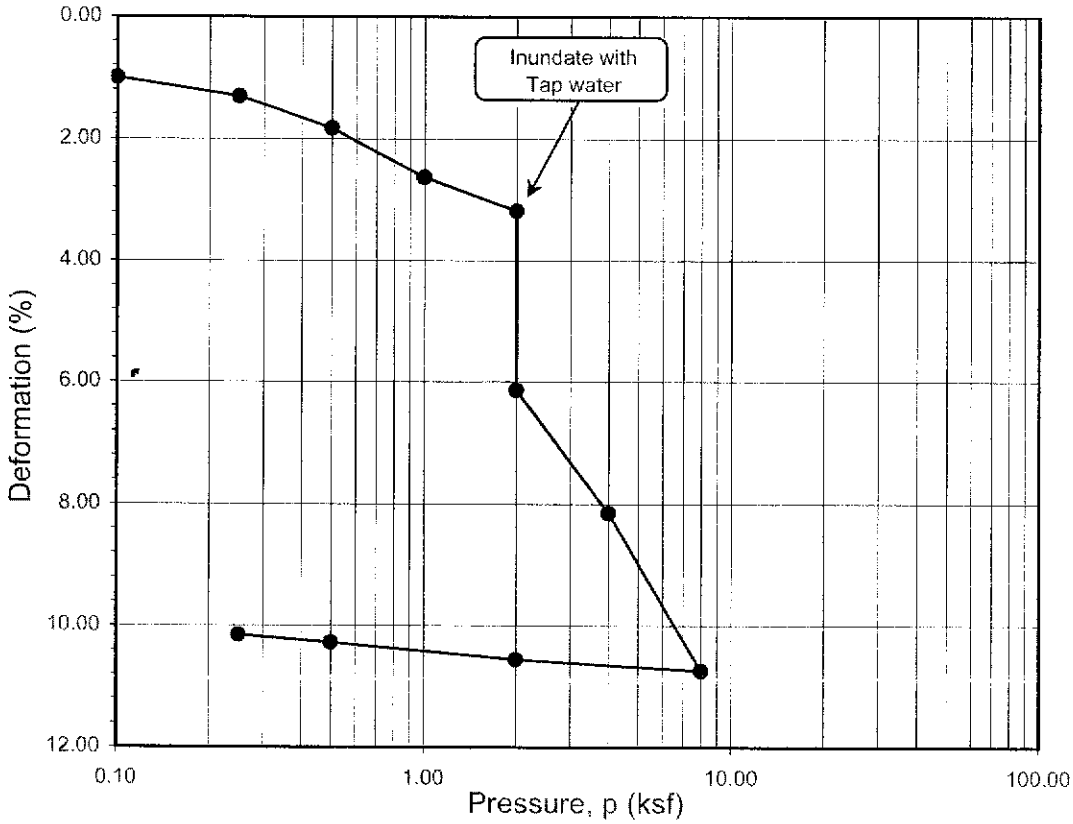
Percent Swell (+) / Settlement (-) After Inundation = -0.69

Void Ratio - Log Pressure Curve



No Time Readings





Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-8	**R-2**	**5**	**7.1**	**14.2**	**112.4**	**124.9**	**0.499**	**0.347**	**39**	**100**

Soil Identification: Brown silty sand (SM)

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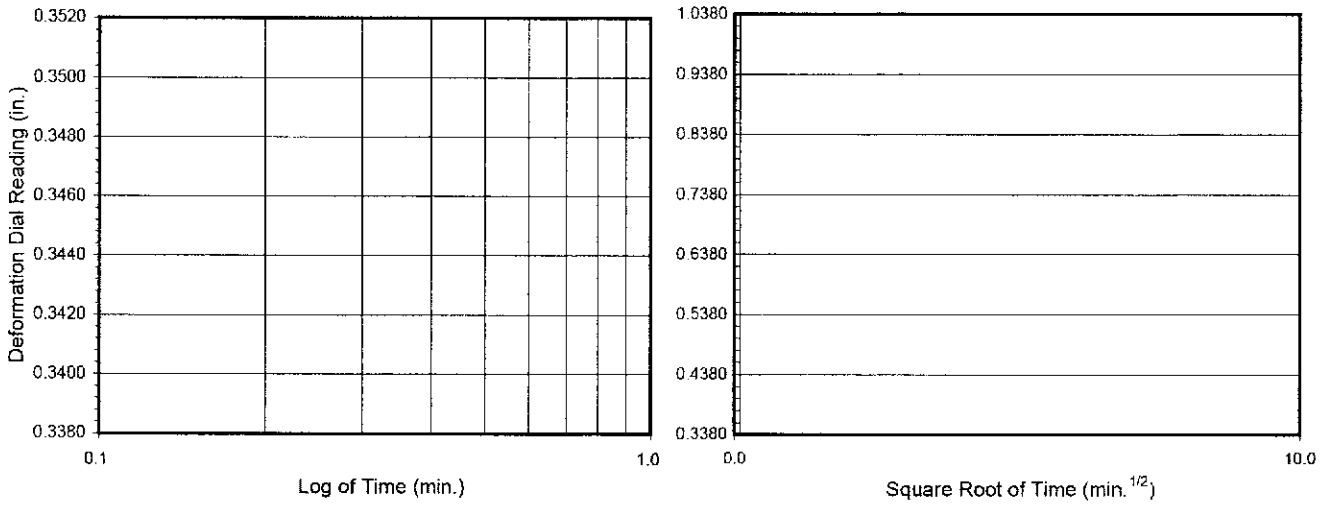
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
(ASTM D 2435)

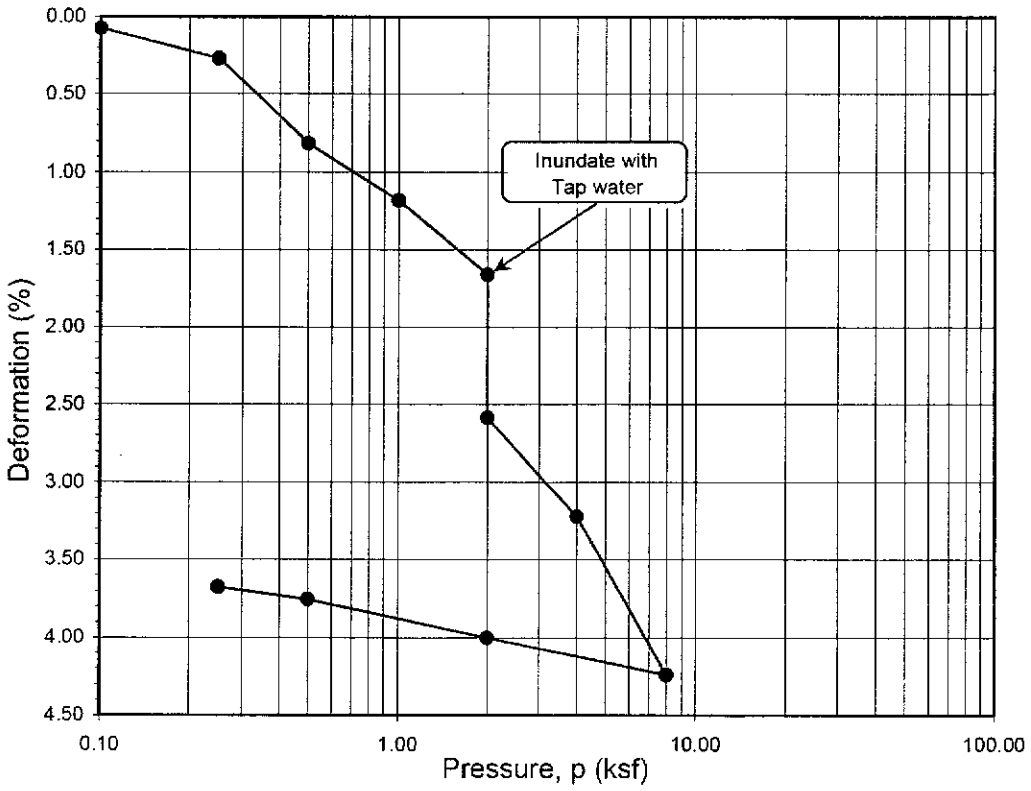
Project No.: 601901-001

SCLA, Bldg. 13B

08-07

No Time Readings





Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-17	**R-2**	**5**	**2.5**	**13.7**	**114.0**	**116.3**	**0.479**	**0.424**	**14**	**83**

Soil Identification: Brown poorly graded sand (SP)

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ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
(ASTM D 2435)

Project No.: 601901-001

SCLA, Bldg. 13B

08-07

Leighton

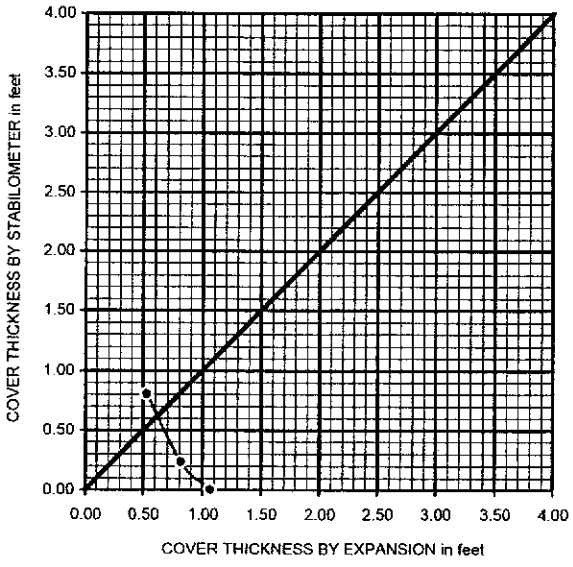
R-VALUE TEST RESULTS

PROJECT NAME:	SCLA,Bldg.13B	PROJECT NUMBER:	601901-001
SAMPLE NUMBER:	B1	SAMPLE LOCATION:	B-1,0-5'
SAMPLE DESCRIPTION:	SM	TECHNICIAN:	SCF
		DATE COMPLETED	8/5/2007

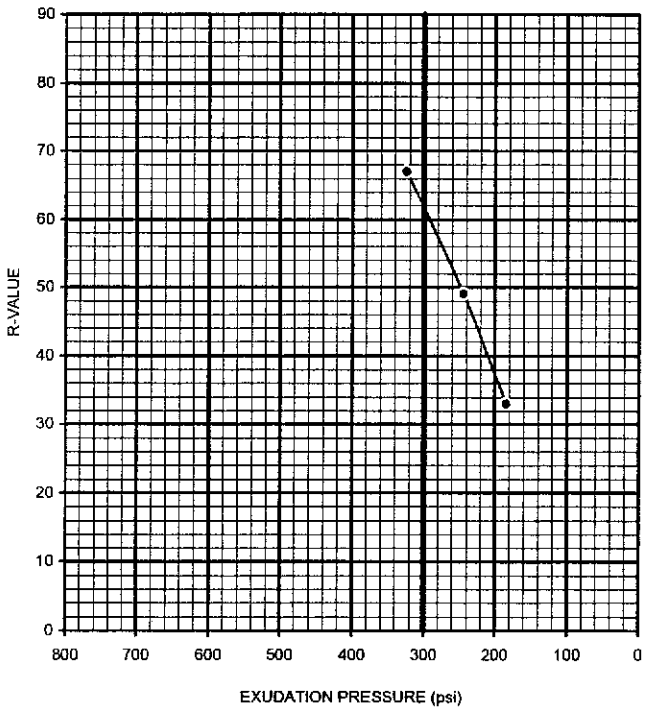
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	9.8	10.2	10.7
HEIGHT OF SAMPLE, Inches	2.47	2.50	2.56
DRY DENSITY, pcf	125.0	125.3	124.0
COMPACTOR PRESSURE, psi	250	175	50
EXUDATION PRESSURE, psi	324	244	184
EXPANSION, Inches x 10exp-4	24	7	0
STABILITY Ph 2,000 lbs (160 psi)	38	61	86
TURNS DISPLACEMENT	4.03	4.21	4.38
R-VALUE UNCORRECTED	67	49	33
R-VALUE CORRECTED	67	49	33

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.53	0.82	1.07
EXPANSION PRESSURE THICKNESS, ft.	0.80	0.23	0.00

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	61
R-VALUE BY EXUDATION:	62
EQUILIBRIUM R-VALUE:	61

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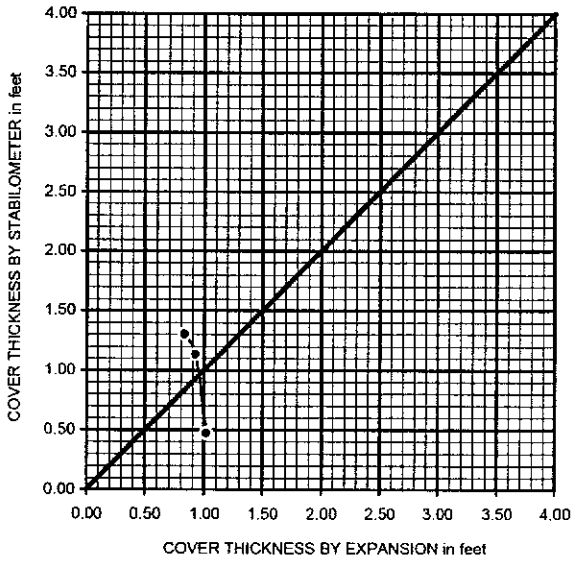
R-VALUE TEST RESULTS

PROJECT NAME:	SCLA,Bldg.13B	PROJECT NUMBER:	601901-001
SAMPLE NUMBER:	B1	SAMPLE LOCATION:	B-9,0-5'
SAMPLE DESCRIPTION:	SM	TECHNICIAN:	SCF
		DATE COMPLETED	8/5/2007

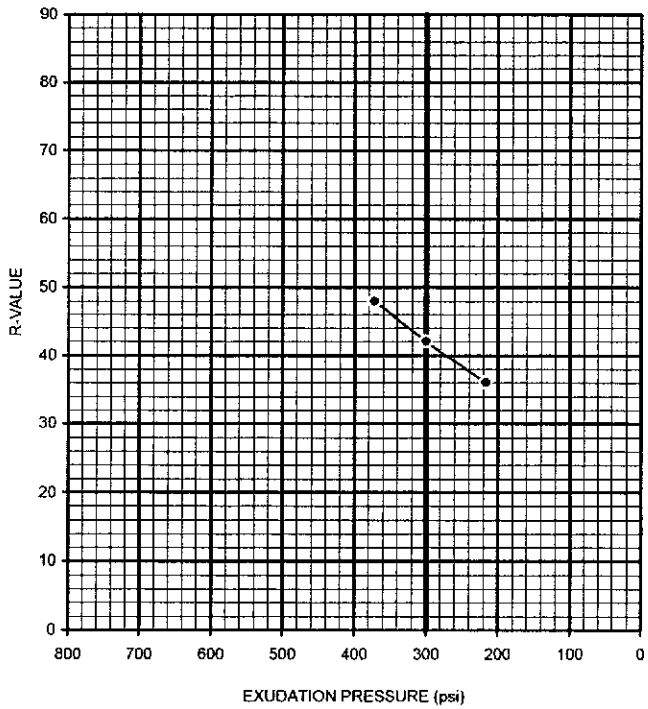
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	10.6	11.0	11.5
HEIGHT OF SAMPLE, Inches	2.47	2.48	2.45
DRY DENSITY, pcf	124.3	123.2	124.4
COMPACTOR PRESSURE, psi	175	125	50
EXUDATION PRESSURE, psi	372	300	216
EXPANSION, Inches x 10exp-4	39	34	14
STABILITY Ph 2,000 lbs (160 psi)	60	69	76
TURNS DISPLACEMENT	4.51	4.54	4.89
R-VALUE UNCORRECTED	48	42	36
R-VALUE CORRECTED	48	42	36

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.83	0.93	1.02
EXPANSION PRESSURE THICKNESS, ft.	1.30	1.13	0.47

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	40
R-VALUE BY EXUDATION:	42
EQUILIBRIUM R-VALUE:	40

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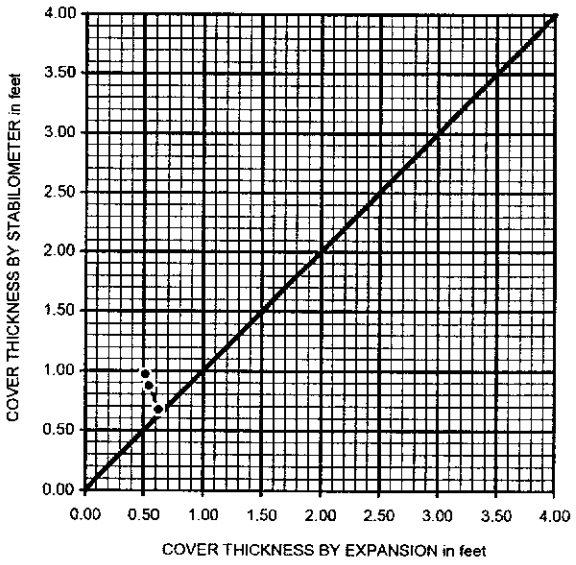
R-VALUE TEST RESULTS

PROJECT NAME:	SCLA,Bldg.13B	PROJECT NUMBER:	601901-001
SAMPLE NUMBER:	B-1	SAMPLE LOCATION:	B-18,0-5'
SAMPLE DESCRIPTION:	SM	TECHNICIAN:	SCF
		DATE COMPLETED	8/5/2007

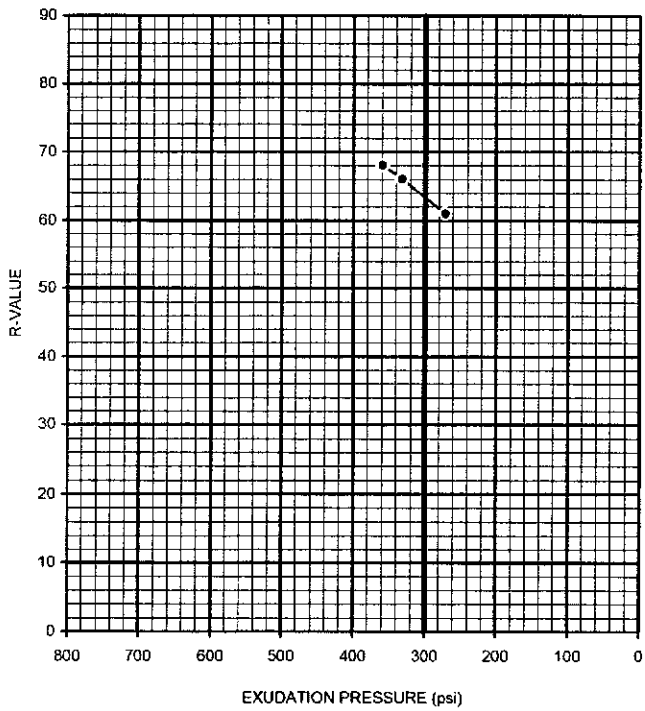
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	9.2	9.3	9.6
HEIGHT OF SAMPLE, Inches	2.60	2.60	2.54
DRY DENSITY, pcf	125.5	124.7	126.0
COMPACTOR PRESSURE, psi	250	200	150
EXUDATION PRESSURE, psi	360	332	270
EXPANSION, Inches x 10exp-4	29	26	20
STABILITY Ph 2,000 lbs (160 psi)	35	37	40
TURNS DISPLACEMENT	4.55	4.69	4.81
R-VALUE UNCORRECTED	66	64	61
R-VALUE CORRECTED	68	66	61

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.51	0.54	0.62
EXPANSION PRESSURE THICKNESS, ft.	0.97	0.87	0.67

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	40
R-VALUE BY EXUDATION:	63
EQUILIBRIUM R-VALUE:	40

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TESTS for SULFATE CONTENT
CHLORIDE CONTENT and pH of SOILS

Project Name: SCLA Bldg. 13B Tested By : VJ Date: 07/27/07

Project No. : 601901-001 Data Input By: LF Date: 07/31/07

Boring No.	B-4			
Sample No.	B1			
Sample Depth (ft)	0-5			
Soil Identification:	SM			
Wet Weight of Soil + Container (g)	282.14			
Dry Weight of Soil + Container (g)	274.01			
Weight of Container (g)	70.36			
Moisture Content (%)	3.99			
Weight of Soaked Soil (g)	100.39			

SULFATE CONTENT, DOT California Test 417, Part II

Beaker No.	4			
Crucible No.	28			
Furnace Temperature (°C)	840			
Time In / Time Out	7:30 / 8:15			
Duration of Combustion (min)	45			
Wt. of Crucible + Residue (g)	18.9708			
Wt. of Crucible (g)	18.9688			
Wt. of Residue (g) (A)	0.0020			
PPM of Sulfate (A) x 41150	82.30			
PPM of Sulfate, Dry Weight Basis	**86**			

CHLORIDE CONTENT, DOT California Test 422

ml of Chloride Soln. For Titration (B)	30			
ml of AgNO3 Soln. Used in Titration (C)	0.5			
PPM of Chloride (C -0.2) * 100 * 30 / B	30			
PPM of Chloride, Dry Wt. Basis	**31**			

pH TEST, DOT California Test 532/643

pH Value	**7.53**			
Temperature °C	22.5			

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SOIL RESISTIVITY TEST

DOT CA TEST 532 / 643

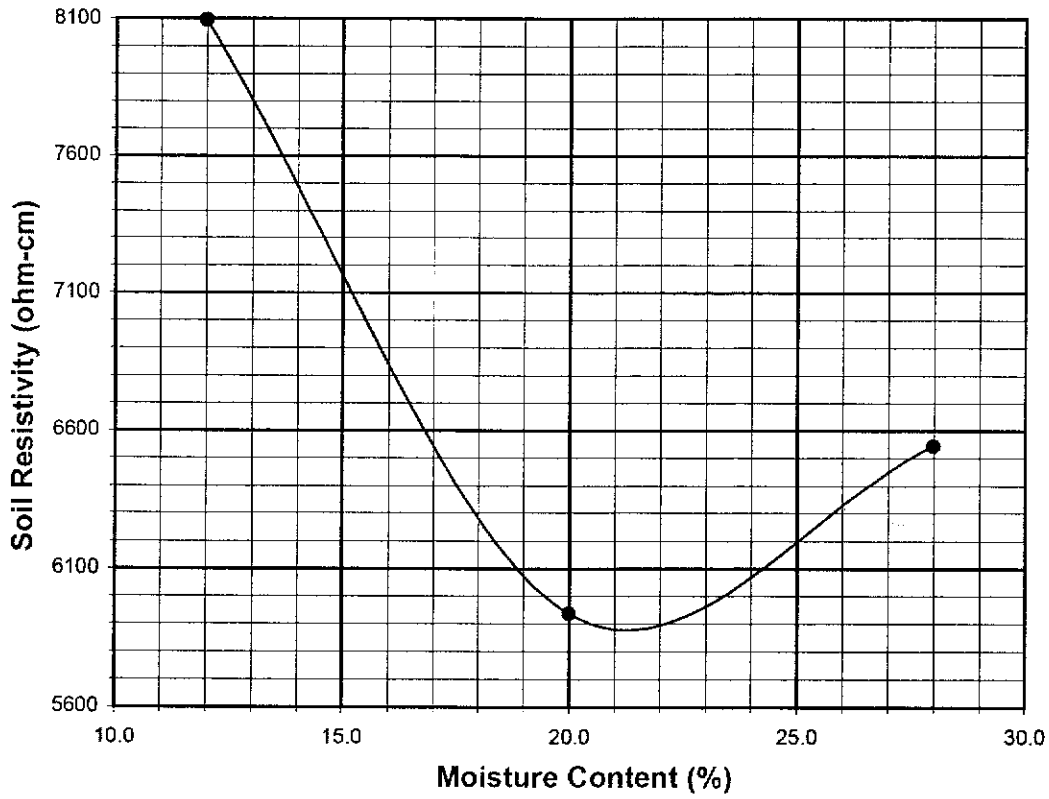
Project Name: SCLA Bldg. 13B
Project No. : 601901-001
Boring No.: B-4
Sample No. : B1
Soil Identification: SM

Tested By : VJ Date: 07/27/07
Data Input By: LF Date: 07/31/07
Depth (ft.) : 0-5

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	100	11.99	1200	8095
2	200	19.99	880	5936
3	300	27.99	970	6544
4				
5				

Moisture Content (%) (MCi)	3.99
Wet Wt. of Soil + Cont. (g)	282.14
Dry Wt. of Soil + Cont. (g)	274.01
Wt. of Container (g)	70.36
Container No.	
Initial Soil Wt. (g) (Wt)	1300.00
Box Constant	6.746
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532 / 643	
5880	**21.2**	**86**	**31**	**7.53**	**22.5**



PRELIMINARY GEOTECHNICAL INVESTIGATION, PROPOSED INDUSTRIAL BUILDING 1, SOUTHERN CALIFORNIA LOGISTICS AIRPORT, VICTORVILLE, CALIFORNIA

Prepared for:

STIRLING CAPITAL INVESTMENTS

27422 Portola Parkway, Suite 300
Foothill Ranch, California 92610

Project No. 601904-001

September 11, 2007

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

September 11, 2007

Project No. 601904-001

To: Stirling Capital Investments
27422 Portola Parkway, Suite 300
Foothill Ranch, California 92610

Attention: Mr. Brian Parno

Subject: Preliminary Geotechnical Investigation, Proposed Industrial Building 1, Southern California Logistics Airport, Victorville, California

In response to your request, Leighton Consulting, Inc. has performed a preliminary geotechnical investigation for the proposed Industrial Building 1 within Southern California Logistics Airport area in Victorville, California.

Based on the information provided by you, we understand that the proposed development will include construction of a industrial tilt-up building structure of approximately 1,002,060 square-feet footprint area, paved parking and driveway, and other associated facilities.

Based upon the results of this study, the proposed project is considered to be feasible from a geotechnical standpoint. The proposed building may be supported by conventional spread footing foundations with a slab-on-grade. Specific recommendations for the geotechnical aspects of the project are presented in this report.

17781 Cowan ■ Irvine, CA 92614-6009
949.253.9836 ■ Fax 949.250.1114 ■ www.leightonconsulting.com

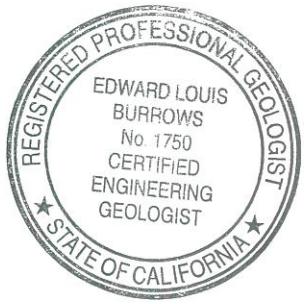
We appreciate the opportunity to work with you on this project. If you have any questions, or if we can be of further service, please call us at your convenience.



Respectfully submitted,

LEIGHTON CONSULTING, INC.

Zafar Ahmed, GE 2720
Senior Project Engineer



Edward L. Burrows, CEG 1750
Principal Geologist

ZA/ELB/lr

Distribution: (4) Addressee
(3) HPA, Attention: Mr. Yong Nam

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Figure 2 – Boring Location Map — Rear of Text
Figure 3 – Retaining Wall Backfill and Subdrain Detail — Rear of Text

1.0 INTRODUCTION

1.1 Purpose and Scope

The purpose of our geotechnical investigation was to explore the subsurface conditions with respect to the proposed improvements, to evaluate the geologic hazards of the site, and to provide geotechnical recommendations for design and construction of the proposed developments. The scope of work of our current study included the following tasks:

- Perform site reconnaissance to locate and mark the exploratory boring locations.
- Review of available site-specific information, including review of various publications, and documents (see Appendix A, References).
- Perform logging and sampling of twenty-five (25) hollow-stem auger borings to depths of approximately 10.9 to 51.3 feet below the existing grade. Collect representative soil samples at selected depth intervals and transport to our laboratory for testing.
- Conduct relevant geotechnical engineering laboratory tests on select representative samples to characterize the engineering properties of the soils.
- Perform geotechnical evaluation of collected data and relevant engineering analyses.
- Prepare this report summarizing our findings, conclusions, and recommendations.

1.2 Site Description

The site is located at the southwest corner of Innovation Way and Phantom West, within the Southern California Logistics Airport area in the Victorville, California (see Figure 1, *Site Location Map*). The site encompasses an irregular-shaped, approximately 46 acres of land, currently vacant of any structures. Broken clay pigeons, left from previous usage in a shooting range that pre-existed at this site, were found thinly scattered over a broad area in the central portion of the site. Remnants of a previous dirt road leading to the above shooting range are also visible, which ran south to north in the western portion of this site. The site is relatively flat with the exiting grade elevations varying from approximately 2,891 feet above msl (mean sea level) at the northeast corner to

approximately 2,900 feet above msl at the southwest corner. Natural drainage is towards the northeast direction in the western portion of the site, while in the eastern portion of the site it is towards the northwest direction. Gradients of these drainage paths are less than 2 percent.

1.3 Proposed Development

Based on the conceptual site plan (HPA, 2007) provided to us, we understand that the proposed developments will include construction of a tilt-up, slab-on-grade building structure of approximately 1,002,060 square-feet footprint area, driveways, parking lots and other associated facilities.

A preliminary grading plan was available to us during preparation of this report (Hall & Foreman, 2007). Based on this grading plan, there will be cut/fill transition underneath the proposed building pad. Maximum anticipated cut and fill under the interior slab-on-grade (at dock-high level) are 3 feet and 9 feet, respectively, with respect to the existing grade.

1.4 Field Investigation

Prior to the field investigation, we performed a site reconnaissance to determine access issues for the drilling rig and to mark the proposed boring locations. Underground Service Alert (USA) was then notified of the marked locations for utility clearance.

On July 16th and 17th of 2007, the subsurface investigation was performed using hollow-stem auger boring techniques. Twenty-five (25) borings were advanced to depths ranging from approximately 10.9 to 51.3 feet below the existing grade. The drilling rig used for the exploration consisted of a truck-mounted CME-75 hollow-stem auger rig equipped with 8-inch-diameter augers. The approximate boring locations are shown on Figure 2, *Boring Location Map*.

The hollow-stem borings were logged by a staff geologist from our office. Relatively undisturbed soil samples were obtained at selected intervals within the borings using a California Ring sampler. Standard Penetration Tests (SPT) were also conducted at selected intervals within the borings. Bulk samples of representative soil types were also collected. Upon completion of drilling, the borings were backfilled with soil cuttings on

the same day of drilling. Collected soil samples were transported to our Irvine laboratory for geotechnical testing.

1.5 Laboratory Testing

Laboratory tests were performed on selected soil samples obtained during our field investigation. The laboratory testing program was designed to evaluate the physical and engineering characteristics of the onsite soil. Tests performed during this investigation include:

- In-situ moisture and density;
- Particle Size Gradation;
- Percent finer than No. 200 Sieve;
- Expansion Index;
- Maximum density and optimum moisture content (Modified Proctor);
- Direct shear;
- One dimensional consolidation;
- R-value; and
- Corrosion suite (pH, resistivity, chloride, and sulfate contents).

All laboratory tests were performed in general conformance with the ASTM or State of California Standard Methods. The results of the in-situ moisture and density tests are presented in Appendix B, *Boring Logs*. The results of other laboratory tests are presented in Appendix C of this report.

2.0 GEOLOGY AND SEISMICITY

2.1 Regional Geology

The project site is located within the western Mojave Desert, which is part of the greater Mohave Desert Geomorphic Province, a broad interior region of isolated mountain ranges separated by desert expanses. The western Mojave is a wedge-shaped area bordered on the southwest by the San Gabriel and San Bernardino Mountains, and on the northwest by the Tehachapi Mountains. These surrounding mountains range up to 10,080 and 7,900 fee in altitude, respectively, while the interior desert has relatively low relief. The only major drainage channel within the desert region is the Mojave River – an intermittent river that flows from the San Bernardino Mountains northward, then eastward to its termination at Soda Lake near Baker, California.

The structural geology and fault patters within the western Mojave Desert are relatively uniform and internally consistent, comprised of a series of northwest-southeast trending faults, in contrast to the fault patters north and south of the province. Major faults in the area include the San Andreas and Garlock fault zones to the southwest and northwest, respectively, the northwest-trending Helendale, Lockhart, and Lenwood fault to the northeast, and the North Frontal fault zone to the southeast.

Lithologically, the region is characterized by alluvial-filled basins overlying Paleozoic and Mesozoic igneous and metamorphic basement rocks. The basement rocks are exposed at the surface in isolated mountain ranges throughout the desert.

2.2 Subsurface Soil and Groundwater Conditions

Subsurface soils at the subject site, as encountered during our investigation, consist of Quaternary alluvium (Qal) up to maximum explored depths of 51.3 feet below the existing ground surface (bgs). A stockpile of undocumented fill soils was encountered up to a depth of 6 feet at the northeastern corner of the site (see Figure 2). These fill soils are primarily grayish brown color, damp, medium dense to dense, silty sand matrix mixed with asphalt-concrete, concrete chunks, and oversize debris.

Alluvial deposits at this site consist of light grey to red-brown color, damp to moist, primarily sandy soils mixed with variable amounts of fines. Few fine gravel, mostly sub-angular shaped, were encountered at different depths up to approximately 20 feet bgs.

Subsurface soils at the site were found to be medium dense to very dense, gradually denser with depth. However, pockets of loose, collapsible soils were encountered at shallow depths as discussed below. Detailed descriptions of the encountered subsurface materials are provided in the boring logs included in Appendix B.

Collapsible Soil – Localized loose soils were encountered across the site at shallow depths (within upper 5 feet). Based on our laboratory tests on two representative samples, onsite soils at shallow depths demonstrated slight to moderate collapse potential upon saturation (per ASTM D5333) with measured collapse strain at 2 ksf overburden pressure varying from 0.6 to 3.4 percent (see Appendix C). To reduce potential of post-construction settlement due to collapsible soils, we recommend removal and recompaction of the upper soils, as provided in Section 3.2 of this report.

Expansive Soil – Onsite soils at shallow depths (within upper 5 feet) consist of primarily sandy soils mixed with fines, mostly silts. Laboratory tests of one selective sample indicated very low expansion potential (per CBC, 2001) with tested Expansion Index (EI) value of 6 (see Appendix C). Based on our field observations during exploration and laboratory test results, near surface soils are anticipated to contain very low expansion potential (per CBC, 2001). Upon completion of rough grading, finish pad subgrade soil samples should be tested to determine actual potential for expansion.

Groundwater Conditions - Groundwater was not encountered in any of the borings up to maximum explored depth of 51.3 feet below the existing ground surface (bgs). Based on the information available from USGS Groundwater Database (http:// http://www.waterdata.usgs.gov/ca/nwis/gw), groundwater is present at depths greater than 120 feet bgs within close vicinity of the subject site. Due to deep groundwater level, it is not anticipated to be a constraint for design and construction of the proposed developments.

2.3 Faulting

Our review of available in-house literature indicates that no known active faults have been mapped across the site, and the site is not located within an Alquist-Priolo Earthquake Fault Zone (Hart and Bryant, 1999).

The nearest known regional active faults that could produce the most significant ground shaking at the site include the Helendale – South Lockhardt fault, North Frontal Fault

Zone and Cleghorn fault which are approximately 20.1, 25.2, and 30.2 kilometers, respectively, from the site and are classified as seismic source type B (according to UBC/CBC). The nearest Type A seismic source is the San Andreas – Mohave fault which is approximately 32.3 kilometers away from site and has little effect to this site's seismicity.

2.4 Seismic Hazards Evaluation

Seismic hazards related to ground shaking that could impact the proposed developments may include surface ground rupture, soil liquefaction, seismically-induced settlement, earthquake induced flooding (tsunamis and seiches). Due to the inland location of the site and lack of a nearby large body of water, potential of tsunamis and seiches for this site is considered low. The other potential seismic hazards at the site are discussed below.

2.4.1 Surface Ground Rupture

Surface ground rupture is generally considered most likely to occur along pre-existing active faults. There are no active or potentially active faults mapped or known to traverse the subject site. The subject site does not lie within an earthquake fault zone as created by the Alquist-Priolo Earthquake Zoning Act (Hart and Bryant, 1999). Based on no active or potentially active faults mapped or known to cross the subject site, the potential for surface ground rupture at the subject site is considered low.

2.4.2 Liquefaction

Liquefaction of saturated cohesionless soils can be caused by strong ground motion resulting from an earthquake. Groundwater was not encountered in any of our exploratory borings, drilled to a maximum depth of 51.3 feet. Historic well data within close vicinity of this site indicates that groundwater has been more than 120 feet below the surface. Due to deep historic groundwater level, potential for liquefaction at the site is considered low.

2.4.3 Dynamic Densification

Seismically-induced settlement is due to densification of loose granular soil during or shortly after ground shaking. Due to predominately dense nature of the soils encountered at the site, and anticipated moderate level of peak ground

acceleration (see Section 3.1), seismically-induced settlement at the site is considered low and is not anticipated to cause adverse effects to the proposed developments provided the grading recommendations of this report are adhered to during design and construction.

3.0 RECOMMENDATIONS

The conclusions and recommendations have been developed based on the exhibited engineering properties of the soils and their anticipated behavior both during and after construction. Recommendations are specifically provided for design of foundations and at-grade floor slabs, retaining walls, concrete flatwork, and pavement. The geotechnical engineer should review the final grading plan, foundation plans, and specifications when they are available to verify that the recommendations presented in this report have been properly interpreted and incorporated.

Based upon this study, we conclude that the proposed development is feasible from a geotechnical standpoint, provided that the recommendations presented in this report are properly incorporated in the design and construction of the project.

3.1 Seismic Design Parameters

This site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone. However, strong ground shaking due to seismic activity is anticipated at the site. The following seismic design values in Table 1 are based on the International Building Code (IBC), 2006, guidelines which have recently been adopted in the CBC, 2007. These parameters should be considered as the minimum for the seismic analysis of the subject site. Additional seismic analyses may be necessary based on structural requirements.

Table 1 – Seismic Design Parameters (IBC, 2006 / CBC, 2007)

Categorization/Coefficient	Design Value
Site Class	C
Short Period (0.2 sec) Site Coefficient, F_a	1.0
Long Period (1.0 sec) Site Coefficient, F_v	1.3
Design (5% damped) spectral response accl. parameter at short period, S_{DS}	0.836
Design (5% damped) spectral response accl. parameter at a period of 1 sec, S_{D1}	0.49

3.2 Site Grading

The recommendations for earthwork and site preparation are based upon the anticipated cut and fill transition across the building pad according to the preliminary grading plan (Hall & Foreman, 2007). Maximum cut on the order of 3 feet is anticipated in the southeastern portion of the pad, while maximum fill on the order of 6 to 9 feet is planned in the western portion of the pad.

Site Preparation – Prior to construction, the site should be cleared of all undocumented fill, vegetation, trash, broken clay pigeons (see Section 1.2) and debris, which should be disposed of offsite. Existing utility conduits, if encountered during remedial grading, should be removed or rerouted, and the resulting cavities should be properly backfilled and compacted.

Overexcavation and Recompaction – Depending on the encountered subsurface soil conditions and the preliminary grading plan, we recommend remedial overexcavation for the proposed developments as discussed in the following:

- Building Footprints: In building footprint areas the minimum depth of overexcavation should extend at least 2 feet below the existing grade. Foundations of the proposed commercial building structure should be bearing on at least 3-feet of properly compacted fill. Due to presence of localized loose, collapsible soils across ths site at shallow depths, deep overexcavation may be required depending on the exposed removal bottom. In-place testing of removal bottoms should be performed during grading to determine the competency of materials being left in place. A minimum criterion of 110 pounds-per-cubic-foot (pcf) dry density or 85 percent relative compaction (ASTM D1557) should be considered for competent removal bottoms. The lateral limit of overexcavation should be extended a minimum of 5 feet or 1:1 (horizontal:vertical) projection downward and outward from the bottom edges of the footings, whichever is greater.

- Slab-on-Grade (inside the buiding) Areas: In order to mitigate the impact of underlying cut/fill transition conditions, we recommend compacted fill underneath the interior slab-on-grade should extend to a minimum depth of 3 feet.

- Pavement and Concrete Flatwork (outside the building) Areas: In pavement and concrete flatwork areas outside the building pad, a minimum of 18 inches of fill soils should be placed below the proposed finish grade.

Suitability of Site Soils for Fills – The onsite soil, free of organic material, oversize particles (cobbles, boulders, rubble, etc.) greater than 6 inches in largest dimension, is suitable to be used as general fill. These oversize particles should be disposed of in non-structural and non-pavement areas. As an alternative, oversized particles can be crushed in place to a size less-than 6-inches, blended with soil matrix, and then placed as compacted fill in structural fill and pavement areas.

Shrinkage and Bulking – The volume change of excavated onsite soils upon recompaction is expected to vary with materials, density, in-situ moisture content, location and compaction effort. The in-place and compacted densities of soil materials vary and accurate overall determination of shrinkage and bulking cannot be made. Based on our limited geotechnical laboratory testing, we expect a recompaction shrinkage (when recompacted to an average of 92-percent relative compaction per ASTM D1557) of 5- to 15-percent by volume within the upper 10 feet.

Import Soils – Import soils should be evaluated by us prior to import. Import soils should be uncontaminated, granular in nature, free of organic material (loss on ignition less-than 2 percent), have very low expansion potential (with an Expansion Index less than 20) and have a low corrosion impact to the proposed improvements.

Subgrade Preparation – Exposed subgrade soil surfaces, including all excavation or removal bottoms, should be observed by a representative of the geotechnical engineer prior to placement of fill or construction of other improvements to verify that suitable soil is exposed. The exposed subgrade should be scarified to a minimum depth of 8 inches, moisture-conditioned to above the optimum-moisture content and then compacted to a minimum of 90 percent relative compaction (per ASTM D1557).

Fill Placement and Compaction – All fill soils should be placed in thin, loose lifts no more than 8 inches thick, moisture-conditioned to near the optimum moisture content, and compacted using appropriate equipment to a minimum of 90 percent relative compaction (ASTM D1557).

3.3 Foundation Design

The proposed building may be supported on conventional shallow spread footings (continuous wall and/or isolated column) bearing on a zone of newly placed properly

compacted fill (see Section 3.2). Preliminary design parameters for spread footings are described in the following:

Minimum Footing Dimensions and Embedment - Footings should be embedded at least 24-inches below the lowest adjacent grade which is considered as the top of interior slabs-on-grade or the finished exterior grade, excluding landscape topsoil, whichever is lower. Footings located adjacent to utility trenches or vaults should be embedded below an imaginary 1:1 (horizontal:vertical) plane projected upward and outward from the bottom edge of the trench or vault, up towards the footing. Continuous/strip footings should have a minimum width of 18-inches, while column footings for all the structures should have a minimum width of 24-inches. All footing excavations should be observed by geotechnical engineer before reinforcing steel is placed.

Allowable Vertical Bearing - For footings founded on newly placed, properly compacted fill soil, an allowable vertical bearing capacity of 3,000 pounds-per-square-foot (psf) may be used for design for a minimum embedment of 24 inches below the lowest adjacent grade. This allowable bearing pressure may be increased by 500 psf for each additional foot of embedment to a maximum vertical bearing value of 4,000 psf. These bearing values may be increased by one-third when considering short-term seismic or wind loads.

Lateral Loads - Lateral loads may be resisted by friction between the footings and the supporting subgrade. A maximum allowable frictional resistance of 0.35 may be used for design of concrete structures poured on properly compacted fill. In addition, lateral resistance may be provided by passive pressures acting against foundations poured neat against properly compacted granular fill. We recommend that an allowable passive pressure based on an equivalent fluid pressure of 300 pounds-per-cubic-foot (pcf) be used in design. These friction and passive values have already been reduced by a factor-of-safety of 1.5.

Settlement Estimates - For settlement estimates, we assumed maximum anticipated column and wall footing loads 100 kips and 4.5 kips per linear foot of the wall, respectively. If greater column or wall loads are required, we should re-evaluate our foundation recommendation, and re-calculate settlement estimates. Settlement of newly placed properly compacted fill materials is expected to predominantly occur during and within 60 days following fill placement. Buildings founded on compacted fill soils as recommended herein should be designed in anticipation of 1 inch of total settlement and ½ inch of differential settlement within a 40 foot horizontal run.

3.4 Concrete Slab-on-Grade

Slab-on-grade floors utilized with conventional foundations should be designed with a minimum thickness as indicated by the project structural engineer consistent with a modulus of subgrade reaction of 150 pounds-per-cubic-inch (pci) and reinforced in accordance with the structural engineer's recommendations.

Within areas of interior slab-on-grade floors where moisture sensitive flooring will be placed, we recommend placement of a minimum of 10-mil thick Visqueen (or equivalent) membrane as moisture retarder under the slab. To facilitate uniform curing of concrete and to provide protection of this membrane during construction, clean sand, minimum 2 inches thick, should be placed on top of and below this membrane prior to placement of concrete. Based on our field observations and limited laboratory test results, onsite sandy soils at shallow depths may be used selectively underneath the slab after they are screened of fine gravel. Clean sands under the slab should consist of 100% passing the No. 4 sieve to 10% or less passing the No. 200 sieve.

Moisture retarders do not completely eliminate moisture vapor movement from the underlying soils up through the slabs or from the unbonded water in the concrete. To reduce moisture vapor emissions that may result in delamination and other tile damage, we suggest the following, only for areas where moisture sensitive floor coverings are anticipated:

- Concrete: A concrete mix design with a low water to cement ratio (less than 0.45) should be used. Water should not be added to this mix during placement. The concrete should be cured in a manner to eliminate slab curling.

- Post Curing: Before floor coverings are placed, any bond breaker coating and all other contaminates should be removed from the slab-on-grade surface. Shot blasting the slab surface may be required. Once the building has been enclosed, and environmental controls (heating and air conditioning) are installed and operational, the slab-on-grade should then be tested for moisture vapor emission, in accordance with ASTM E 1907-97.

- Floor Coverings: A slip-sheet or equivalent should be used if crack-sensitive floor coverings (such as ceramic tiles, etc.) are to be placed directly on the concrete slab-on-grade. Floor coverings and adhesives should be compatible, and the manufacture's requirements should be followed. The tested moisture vapor emission rate (MVER) should be below the specified rate for the floor covering products used (e.g.,



MVER<5), before the product is placed. Expansion gaps hould be provided where floor tiles are placed adjacent to walls under molding, and along appropriate grids for large expanses of tile. Carpet strips or expansion joint flashing plates can be used in open areas at these joints.

Construction Considerations - Cracking of concrete is normal as it cures due to drying and shrinkage, and should be expected. However, cracking is often aggravated by a high water/cement ratio, high concrete temperature at the time of placement, small nominal aggregate size, and rapid moisture loss due to hot, dry, and/or windy weather conditions during placement and curing. Cracking due to temperature and moisture fluctuations can also be expected. The use of low slump concrete can reduce the potential for shrinkage cracking. Concrete placement during hot weather should be minimized due to the potential for slab curling. Slabs should be designed and constructed as promulgated by the Portland Cement Association.

To reduce the potential for excessive cracking, concrete slabs-on-grade should be provided with construction or weakened plane joints at frequent intervals. Joints should be laid out to form approximately square panels.

3.5 Retaining Walls

Any type of retaining walls should be designed for lateral earth pressures. The magnitude of these pressures depends on the amount that the wall can yield horizontally under load. If the wall can yield enough to mobilize full shear strength of backfill soils, then the wall can be designed for "active" pressure. If the wall cannot yield under the applied load, the shear strength of the soil cannot be mobilized and the earth pressure will be higher. Such walls should be designed for "at rest" conditions. If a structure moves toward the soils, the resulting resistance developed by the soil is the "passive" resistance. Retaining walls backfilled with non-expansive soils (EI values less than 21) should be designed using the following equivalent fluid pressures:

Table 2 - Retaining Wall Design Earth Pressures (Static, Drained)

Loading Conditions	Equivalent Fluid Density for Level Backfill (pcf)
Active	35
At-Rest	55
Passive[1]	300

[1] Maximum passive pressure not to exceed 3,000 psf at depth.

Unrestrained (yielding) cantilever walls should be designed for the active equivalent-fluid-weight value provided above for very low expansive soils (EI values less than 21) that are free draining. In the design of walls restrained from movement at the top (non-yielding) such as, utility vaults, dock-high wall that is structurally tied to the floor slab on top, the at-rest equivalent fluid pressure should be used. Total depth of retained earth for design of cantilever walls should be measured as the vertical distance below the ground surface measured at the wall face for stem design, or measured at the heel of the footing for overturning and sliding calculations. Should a sloping backfill other than a 2:1 (horizontal:vertical) be constructed above the wall (or a backfill is loaded by an adjacent surcharge load), the equivalent fluid weight values provided above should be re-evaluated on an individual case basis by Leighton Consulting.

In addition to the above lateral forces due to retained earth, surcharge due to above grade loads on the wall backfill, such as an adjacent structure, should be considered in design of the retaining wall. Vertical surcharge loads behind the retaining wall on or in the backfill within a 1:1 (horizontal:vertical) plane projection up and out from the retaining wall toe, should be considered as lateral and vertical surcharge. Unrestrained (cantilever) retaining walls should be designed to resist one-third of these surcharge loads applied as a uniform horizontal pressure on the wall. Braced walls should also be designed to resist an additional uniform horizontal-pressure equivalent to one-half of uniform vertical surcharge-loads.

Retaining wall foundations should be at least 18 inches wide and embedded a minimum of 24 inches below the lowest adjacent grade. Preliminary design parameters for retaining wall footings shown follow the recommendations in Section 3.3 of this report. Non-standard wall designs should be reviewed by Leighton Consulting. prior to construction to check that the proper soil parameters have been incorporated into the wall design.

All retaining walls should be provided with appropriate drainage. The outlet pipe should be sloped to drain to a suitable outlet. Typical wall drainage design is illustrated in Figure 3, *Retaining Wall Backfill and Subdrain Detail*, for non-expansive backfill. Wall backfill should be compacted by mechanical methods to a minimum of 90 percent relative compaction (ASTM D1557). Walls should not be backfilled until wall concrete attains the 28-day compressive strength and/or as determined by the Structural Engineer that the wall is structurally capable of supporting backfill. Lightweight compaction equipment should be used, unless other wise approved by the Structural Engineer.

3.6 Temporary Excavations

Based on the materials encountered in the borings, sloped temporary excavations may be constructed according to the slope ratios presented below.

Table 3 - Slope Ratios for Temporary Excavation

Maximum Depth of Cut (feet)	Maximum Slope Ratio* (horizontal:vertical)
0 – 4	Vertical
4 – 10	1:1

*Slope ratio assumed to be uniform from top to toe of slope.

Surfaces exposed in slope excavations should be kept moist but not saturated to retard raveling and sloughing during construction. Adequate provisions should be made to protect the slopes from erosion during periods or rainfall. Surcharge loads should not be permitted within a horizontal distance equal to the depth of the cut from the top of slopes. Workers entering excavations should be protected from possible caving and raveling.

3.7 Utility Trenches

Utility trenches should be backfilled with compacted fill in accordance with Sections 306-1.2 and 306-1.3 of the *Standard Specifications for Public Works Construction*, ("Greenbook"), 2003 Edition or corresponding sections in the later editions. Fill material should be placed in horizontal layers of thickness compatible to the type of equipment being used and should be compacted to at least 90 percent relative compaction (ASTM D 1557) by mechanical means only.

Where granular backfill is used in utility trenches adjacent to moisture sensitive subgrades and foundation soils, we recommend that a cut-off "plug" of impermeable material be placed in these trenches at the perimeter of buildings, and at pavement edges adjacent to irrigated landscaped areas. A "plug" can consist of a 5-foot long section of clayey soils with more than 35-percent passing the No. 200 sieve, or a Controlled Low Strength Material (CLSM) consisting of one sack of Portland-cement plus one sack of bentonite per cubic-yard of sand. CLSM should generally conform to Section 201-6 of the Standard Specifications for Public Works Construction, ("Greenbook"), 2003 Edition or corresponding sections in the later editions. Then CLSM plug is intended to reduce the likelihood of water migrating from landscaped areas, then seeping along permeable trench backfill into the building and pavement subgrades, resulting in wetting of moisture sensitive subgrade earth materials under buildings and pavements.

Excavation of utility trenches should be performed in accordance with the project plans, specifications and the California Construction Safety Orders (2003 Edition or more current). The contractor must be responsible for providing a "competent person" as defined in Article 6 of the California Construction Safety Orders. All safety precautions should be properly implemented at all times. Spoil piles from the excavation(s) and construction equipment should be kept away from the sides of the trenches. Leighton Consulting does not consult in the area of safety engineering.

3.8 Site Soil Corrosivity

We conducted corrosion suite tests (pH, resistivity, chloride, and sulfate contents) for one representative bulk sample obtained from shallow depth at this site. The test results are included in Appendix C; a summary of the results and corresponding hazard levels are presented in the following Table 4. These limited test results indicate that that the near surface soil is anticipated to be moderately corrosive to buried ferrous metals. Water soluble sulfate and chloride contents of the onsite soils are found to be negligible (per Table 19-A-4 of CBC, 2001) and non-corrosive, respectively, to buried concrete.

Table 4 – Summary of the Corrosivity Test Results

Test Parameter	Test Results	General Classification of Hazard
Water-soluble sulfate content	0.01 percent by weight	Negligible sulfate exposure to buried concrete (per CBC, 2001)
Water-soluble chloride content	71 ppm	Non-corrosive to buried concrete (per Caltrans Specifications)
pH	7.68	Alkaline, relatively passive to buried metals
Minimum resistivity (in saturated condition)	4,130 ohm-cm	Moderately corrosive to buried ferrous pipes (per ASTM[1])

[1] ASTM STP 1013 titled *Effects of Soil Characteristics on Corrosion* (February, 1989).

Ferrous pipe buried in moist to wet site earth materials should be avoided by using high-density polyethylene (HDPE) or other non-ferrous pipe when possible. Ferrous pipe can be protected by polyethylene bags, tap or coatings, di-electric fittings or other means to separate the pipe from on-site soils. If buried ferrous pipes are planned for the project, further testing of soil samples corrosivity should be performed and specific recommendations for corrosion protection will need to be provided by a qualified corrosion engineer.

3.9 Pavement Design

3.9.1 Asphalt Concrete Pavements

Laboratory tests of four selected representative bulk samples of onsite soils within shallow depths (upper 5 feet) indicated R-values varying over a wide range from 38 to 64. This is due to variable amounts of sand and fine gravel encountered across the site at shallow depths. For preliminary design purpose, we assume an average R-value of 50. Considering this assumed R-value and following the Highway Design Manual (Caltrans, 2006) guidelines, minimum asphalt pavement sections for different Traffic Indices (TIs) ranging from 4 through 6.5 are listed in Table 5, below.

Table 5 - Asphalt Pavement Section Thickness

General Traffic Condition	Design Traffic Index (TI)	Asphalt Concrete (inches)	Aggregate Base[1] (inches)	Total Thickness (inches)
Automobile Parking	4.0	3.0	4.0	7.0
	4.5	3.0	4.0	7.0
Automobile Parking Lanes	5.0	3.0	4.0	7.0
	5.5	3.5	4.0	7.5
Truck Access & Parking Areas	6.0	3.5	4.0	7.5
	6.5	4.0	4.0	8.0
	7.0	4.0	5.0	9.0

[1] Minimum design R-value of aggregate base is 78.

Appropriate Traffic Index (TI) data should be selected by the project civil engineer or traffic engineering consultant and appropriate R-value of the subgrade soils will need to be determined after completion of rough grading to finalize the pavement design. Final pavement sections should be in general accordance with local, county and industry standards. Portland cement concrete may be used, rather than asphalt, in point and impact load areas such as trash truck bin loading areas.

Subgrade soils in the upper 18 inches of the driveways and parking areas should be properly compacted to at least 90 percent relative compaction (ASTM D1557) and should be moisture-conditioned to above optimum moisture contents, and kept in this condition until the pavement section is constructed. Minimum relative compaction requirements for aggregate base should be 95 percent of the maximum laboratory density (ASTM D1557).

Asphalt concrete and aggregate base should conform to Caltrans Standard Specifications (May, 2006 Edition) Sections 39 and 26-1.02A, respectively. As an alternative, asphalt concrete can conform to Section 203-6 of the *Standard Specifications for Public Works Construction* (Green Book), 2003 Edition. Crushed aggregate base or crushed miscellaneous base can conform to Sections 200-2.2 and 200-2.4 of the *Standard Specifications for Public Works Construction* (Green Book), 2003 Edition, respectively.

3.9.2 Portland Cement Concrete Pavements

For preliminary planning purposes, we recommend a minimum of 6-inch-thick PCC pavement on soil subgrade for preliminary design purpose provided the following criteria are met during design and construction of the proposed pavements:

- Minimum 28-day modulus of rupture of the PCC should be 650 psi (equivalent minimum 28-day compressive strength of 4,500 psi).
- Upper minimum 12 inches of the finish soil subgrade should have a minimum relative compaction of 95 percent (ASTM D1557) and tested R-value of the subgrade soils should be at least 55.
- Design ADTT (Average Daily Truck Traffic) in both directions for the proposed pavements is 400 or less.
- Driveway and parking lots should have dowel connections at transverse joints and concrete shoulders.

We recommend representative pavement subgrade samples be obtained during grading and R-value tests be performed. Should the tested R-value and the other assumptions deviate from the minimum recommended parameters as in the above, the design PCC pavement sections provided in this report may need to be revised.

3.10 Surface Drainage

Ponding of water adjacent to structures should be avoided. During and after construction, positive drainage should be provided to direct surface water away from structures and towards suitable, nonerosive drainage devices. Locating planters adjacent to buildings or structures should be avoided. Where unavoidable, planters should be properly lined, such as with a membrane, to reduce penetration of irrigation water into the adjacent footing subgrades. Wherever possible, exposed soil areas should be above paved grades. Planters should not be depressed below adjacent paved grades unless drainage, such as catch basins and drains are provided.

3.11 Additional Geotechnical Services

The geotechnical recommendations presented in this report are based on subsurface conditions as interpreted from limited subsurface explorations and laboratory testing. Our conclusions and recommendations presented in this report should be reviewed and verified by Leighton Consulting during site construction and revised accordingly if exposed geotechnical conditions vary from our preliminary findings and interpretations. The recommendations presented in this report are only valid if Leighton Consulting verifies the site conditions during construction. Geotechnical observation and testing should be provided during the following activities:

- Grading and excavation of the site;
- Overexcavation and compaction of all fill materials;
- Excavation and installation of foundations;
- After excavation of all slabs and footings and prior to placement of steel or concrete to confirm the slabs and footings are founded in firm, compacted fill;
- Utility trench backfilling and compaction;
- Pavement subgrade preparation and base course compaction; and
- When any conditions are encountered that vary significantly form the conditions described in this report.

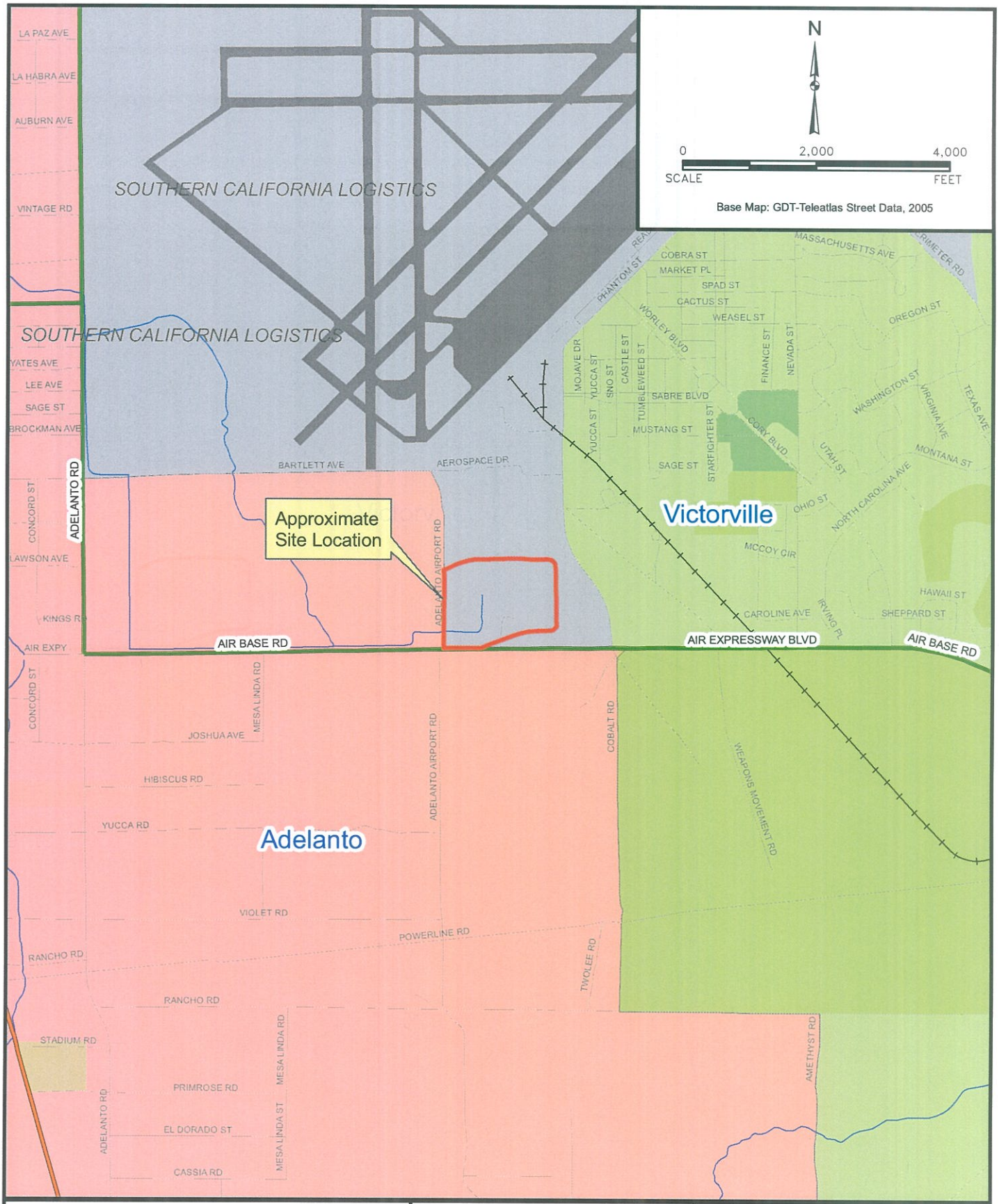
Leighton Consulting should review the grading and foundation plans and specifications, when available, to comment on the geotechnical aspects. Our recommendations should be revised, as necessary, based on future plans and incorporated into the final design plans and specifications.

4.0 LIMITATIONS

The conclusions and recommendations presented in this report have been based upon the generally accepted principles and practices of geotechnical engineering utilized by other competent engineers at this time and place. No other warranty is either expressed or implied.

The conclusions and recommendations presented in this report have been based upon the subsurface conditions encountered at discrete and widely spaced locations and at specific intervals below the ground surface. Due to the inherent variance in soils conditions, variability may be encountered during construction. Where encountered during construction, such variances should be brought to our attention to determine the impact upon the recommendations presented in this report.

This report has been prepared for the expressed use of our client and the design professionals assigned for this project. The report may not be used by others or for other projects without the expressed written consent of our client and our firm.



Geotechnical Investigation
Proposed Industrial Building 1
SCLA, Victorville, CA

SITE LOCATION MAP

Project No.
601904-001

Date
September 2007

Figure 1



BORING LOCATION MAP

Geotechnical Investigation
Proposed Industrial Building 1
SCLA, Victorville, CA

Project No.	601904-001
Scale	1 inch equals 200 feet
Engr./Geol.	ZA/ELB
Drafted By	PDB
Date	September 2007

Figure No. 2

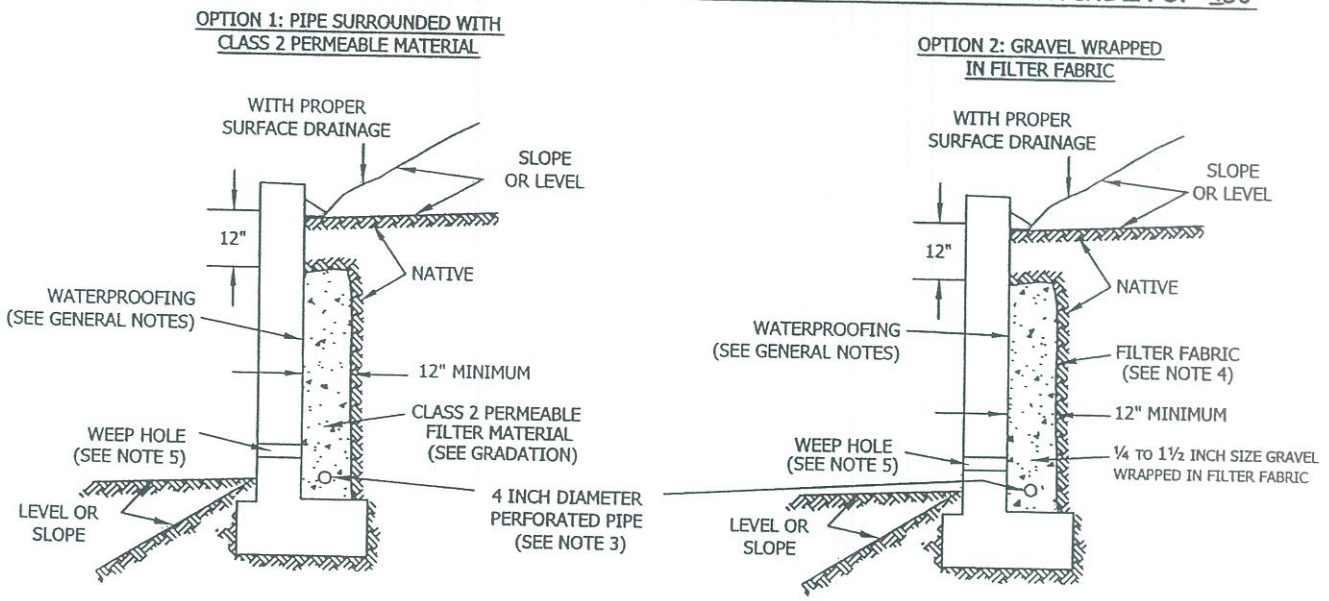
LEGEND

B-25	Approximate location of hollowstem boring (B-7 is excluded from this report)
	Approximate lateral limits of stockpile
Qal	Quaternury alluvium, circled where burried
Afu	Artificial Fill, uncertified

N

0 200 400
SCALE FEET

SUBDRAIN OPTIONS AND BACKFILL WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50



Class 2 Filter Permeable Material Gradation
Per Caltrans Specifications

Sieve Size	Percent Passing
1"	100
3/4"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

GENERAL NOTES:

* Waterproofing should be provided where moisture nuisance problem through the wall is undesirable.
* Water proofing of the walls is not under purview of the geotechnical engineer
* All drains should have a gradient of 1 percent minimum
*Outlet portion of the subdrain should have a 4-inch diameter solid pipe discharged into a suitable disposal area designed by the project engineer. The subdrain pipe should be accessible for maintenance (rodding)
*Other subdrain backfill options are subject to the review by the geotechnical engineer and modification of design parameters.

Notes:

1) Sand should have a sand equivalent of 30 or greater and may be densified by water jetting.
2) 1 Cu. ft. per ft. of 1/4- to 1 1/2-inch size gravel wrapped in filter fabric
3) Pipe type should be ASTM D1527 Acrylonitrile Butadiene Styrene (ABS) SDR35 or ASTM D1785 Polyvinyl Chloride plastic (PVC), Schedule 40, Armco A2000 PVC, or approved equivalent. Pipe should be installed with perforations down. Perforations should be 3/8 inch in diameter placed at the ends of a 120-degree arc in two rows at 3-inch on center (staggered)
4) Filter fabric should be Mirafi 140NC or approved equivalent.
5) Weephole should be 3-inch minimum diameter and provided at 10-foot maximum intervals. If exposure is permitted, weepholes should be located 12 inches above finished grade. If exposure is not permitted such as for a wall adjacent to a sidewalk/curb, a pipe under the sidewalk to be discharged through the curb face or equivalent should be provided. For a basement-type wall, a proper subdrain outlet system should be provided.
6) Retaining wall plans should be reviewed and approved by the geotechnical engineer.
7) Walls over six feet in height are subject to a special review by the geotechnical engineer and modifications to the above requirements.

RETAINING WALL BACKFILL AND SUBDRAIN DETAIL FOR WALLS 6 FEET OR LESS IN HEIGHT

WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50

Leighton

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Figure 3

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you —* should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

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APPENDIX A

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APPENDIX B

GEOTECHNICAL BORING LOG B-1

Date 7-16-07 **Sheet** 1 **of** 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2889± **Location** See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0			B1 @0-5'					**Quarternary alluvium (Qal):**	
				R-1	10 10 12	119.4	3.1	SM	@ 2.5': Silty SAND, red-brown, damp, medium dense, coarse grained sand, abundant calcium carbonate stringers.	
	5			R-2	5 6 11	141.2	0.9	SM	@ 5': Silty SAND, tan-brown, dry, medium dense, fine to coarse grained sand, fine sub-angular gravel, non-cohesive.	
	10			R-3	10 29 39			SM	@ 10': Silty SAND, tan-brown, dry, dense, fine to coarse grained sand, fine sub-angular gravel, non-cohesive.	
	15								Total depth of boring 11.5 feet No groundwater encountered The boring was backfilled with soil cuttings	
	20									
	25									
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- EI EXPANSION INDEX
- RV R VALUE

GEOTECHNICAL BORING LOG B-2

Date 7-16-07 **Sheet** 1 **of** 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2888±' **Location** See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0	N S							**Quarternary alluvium (Qal):**	
				R-1	40 50/3"	128.9	4.9	SM	@ 2.5': Silty SAND, dark red-brown, moist, very dense, fine to medium grained sand, some well rounded to sub-rounded gravel.	
	5			R-2	38 50/5"	115.6	3.5	SP	@ 5': SAND with silt, light red-brown, damp to moist, very medium dense, fine to medium grained sand, fine well rounded gravel.	
	10			R-3	32 50/5.5"			SP	@ 10': SAND, dark red-brown, moist, very dense, medium to coarse grained sand.	
	15								Total depth of boring 11.5 feet No groundwater encountered The boring was backfilled with soil cuttings	
	20									
	25									
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- EI EXPANSION INDEX
- RV R VALUE

GEOTECHNICAL BORING LOG B-3

Date 7-16-07 **Sheet** 1 **of** 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2892±' **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
									Logged By CDL **Sampled By** CDL	
	0								**Quarternary alluvium (Qal):**	
				R-1	8 25 29	119.0	4.9	SM	@ 2.5': Silty SAND, light brown, moist, dense, fine grained sand grades with depth to fine grained sand with coarse grained sand, some calcium carbonate. @ 4': Encounter thick zone of calcium carbonate.	
	5			R-2	9 12 15	95.0	2.5	SP	@ 5': SAND, brown, dry, medium dense, fine to coarse grained sand, fine sub-angular gravel.	
				B1 5-10'						
	10			R-3	21 28 50/5"			SP	@ 10': SAND, brown, dry, dense, fine to coarse grained sand, abundance of coarse grained sand increases from sample R-2, fine sub-angular gravel.	
									Total depth of boring 11.5 feet No groundwater encountered The boring was backfilled with soil cuttings	
	15									
	20									
	25									
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- EI EXPANSION INDEX
- RV R VALUE

GEOTECHNICAL BORING LOG B-4

Date 7-16-07 **Sheet** 1 **of** 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2899± **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
									Logged By CDL **Sampled By** CDL	
	0								**Quarternary alluvium (Qal):**	
				R-1	13 16 16	119.6	7.7	SM	@ 2.5': Silty SAND, brown, moist, medium dense, medium to coarse grained sand.	
	5			R-2	12 13 20	121.4	12.0		@ 5': Clayey SAND, brown, wet, medium dense, medium to coarse grained sand.	
								SC	**Quaternary alluvium (Qal):** @ 6': Clayey SAND, dark brown, moist, medium dense, fine to medium grained sand.	
	10			R-3	14 17 28			ML/SM	@ 10': Sandy SILT, tan, damp, very stiff, fine grained sand.	
									Total depth of boring 11.5 feet No groundwater encountered The boring was backfilled with soil cuttings	
	15									
	20									
	25									
	30									

SAMPLE TYPES:

S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
C CORE SAMPLE

TYPE OF TESTS:

DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
SA SIEVE ANALYSIS
SE SAND EQUIVALENT
EI EXPANSION INDEX
RV R VALUE

GEOTECHNICAL BORING LOG B-5

Date 7-16-07 **Sheet** 1 **of** 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2899±' **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By CDL; Sampled By CDL)	Type of Tests
	0			B1 @0-5'					**Quarternary alluvium (Qal):**	
				R-1	12 23 44	127.3	7.1	SM	@ 2.5': Silty SAND, grey-brown, moist, medium dense, fine to medium grained sand.	
	5			R-2	11 18 17	118.0	9.6	SC SM SC	**Quarternary alluvium (Qal):** @ 4': Clayey SAND, dark red-brown, damp, dense, fine to medium grained sand. @ 5': Silty SAND, brown, moist, medium dense, fine grained sand, grades with depth to sandy CLAY, dark brown-red, moist, hard, fine to medium grained sand,	
	10			R-3	13 41 50/3"	123.5	2.2	SP	@ 10': Silty SAND with gravel, brown, damp, very dense, fine to coarse grained sand, sub-rounded gravel.	
	15			R-4	50/6"	103.2	8.5	SP	@ 15': SAND, brown, moist, very dense, fine to medium grained sand, some coarse grained sand.	
				B2 17-19'				ML	@ 17': Silt, white-grey, dry.	
	20			R-5	15 23 41			SP	@ 20': SAND, white-grey, dry, dense, fine to coarse grained sand, non-cohesive.	
	25			S-1	20 50/6"			SM	@ 25': Silty SAND, light grey-brown, damp, very dense, fine to medium grained sand.	
	30								Total depth of boring 26 feet No groundwater encountered The boring was backfilled with soil cuttings	

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- EI EXPANSION INDEX
- RV R VALUE



GEOTECHNICAL BORING LOG B-6

Date 7-16-07 **Sheet** 1 **of** 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2894±' **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By CDL; Sampled By CDL)	Type of Tests
	0								**Quarternary alluvium (Qal):**	
				R-1	20 50/6"	105.8	5.9	SM	@ 2.5': Silty SAND, light tan, damp to moist, very dense, fine grained sand, well cemented with calcium carbonate.	
	5			R-2	29 50/4"	116.8	2.4	SP-SM	@ 5': SAND with silt, brown, damp, very dense, fine to coarse grained sand.	
	10			R-3	50/6"	104.1	8.0	SP-SM	@ 10': SAND with silt, brown, moist, very dense, fine to medium grained sand, some coarse grained sand.	
	15			R-4	25 50/6"	111.2	2.8	SM	@ 15': Silty SAND, light grey, damp, very dense, fine grained sand.	
	20			R-5	20 50/6"			SM/ML	@ 20': Sandy SILT, light grey, dry, hard, fine grained sand.	
	25								Total depth of boring 21 feet No groundwater encountered The boring was backfilled with soil cuttings	
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- EI EXPANSION INDEX
- RV R VALUE



GEOTECHNICAL BORING LOG B-7

Date 7-16-07 **Sheet** 1 **of** 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2892± **Location** See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0			B1 @0-5'					**Quarternary alluvium (Qal):**	
				R-1	6 10 23	118.7	3.9	SM	@ 2.5': Silty SAND, light brown, damp to moist, medium dense, fine grained sand, with medium and coarse grained sand, trace zones of calcium carbonate cemented beds.	
	5			R-2	18 37 50/6"	114.3	3.0	SP	@ 5': SAND, tan-brown, dry to damp, very dense, fine to coarse grained sand, weakly cementation by calcium carbonate.	
								GP	@ 7': Encounter large cobble/boulder to 9 feet.	
	10			R-3	29 50/5"	119.8	2.9	SP	@ 10': SAND, red-brown, damp, very dense, medium to coarse grained sand, non-cohesive.	
	15			R-4	26 50/6"	101.5	9.7	SM ML/SM	@ 15': Silty SAND, light grey, moist, very dense, fine grained sand, grades with depth to sandy SILT, light grey, dry, hard, fine grained sand.	
	20			R-5	23 39 50/5"			SP	@ 20': SAND, light grey, dry, very dense, fine to coarse grained sand.	
	25								Total depth of boring 21.4 feet No groundwater encountered The boring was backfilled with soil cuttings	
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- EI EXPANSION INDEX
- RV R VALUE

GEOTECHNICAL BORING LOG B-8

Date 7-16-07 **Sheet** 1 **of** 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2893± **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By CDL; Sampled By CDL)	Type of Tests
	0								**Quarternary alluvium (Qal):**	
				R-1	11 13 11	115.5	4.2	SM	@ 2.5': Silty SAND, brown, damp to moist, medium dense, fine grained sand, trace fine well rounded gravel.	
	5			R-2	5 5 12	108.1	4.6	SM	@ 5': Silty SAND, brown, damp to moist, medium dense, fine to medium grained sand, trace coarse grained sand and clay.	
	10			R-3	25 50/6"	116.5	2.6	SP	@ 10': SAND with gravel, orange-brown, damp, very dense, medium to coarse grained sand, fine sub-angular gravel.	
	15			R-4	18 36 42	119.4	2.7	SP	@ 15': SAND with gravel, orange-brown, damp, dense, medium to coarse grained sand, fine sub-angular gravel.	
	20			R-5	20 37 50/5"			SP	@ 20': SAND, red-brown, moist, very dense, fine to coarse grained sand, trace fine sub-angular gravel.	
	25								Total depth of boring 21.4 feet No groundwater encountered The boring was backfilled with soil cuttings	
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- EI EXPANSION INDEX
- RV R VALUE

GEOTECHNICAL BORING LOG B-9

Date 7-16-07 **Sheet** 1 **of** 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2895± **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By CDL; Sampled By CDL)	Type of Tests
	0								**Quarternary alluvium (Qal):**	
				R-1	10 8 8	108.3	4.0	SM	@ 2.5': Silty SAND with gravel, light tan, damp, loose, fine grained sand, poorly cemented with calcium carbomate.	
	5			R-2	5 12 22	114.8	2.4	SP	@ 5': Silty SAND with gravel, light red-tan, damp, medium dense, fine to coarse grained sand, some fine sub-angular gravel.	
	10			R-3	10 16 29			SP	@ 10': SAND, light grey-tan, dry, medium dense, fine to medium grained sand grades with depth to a medium to coarse grained sand, non-cohesive.	
	15			R-4	17 50/6"	111.6	1.4	SP	@ 15': Silty SAND with gravel, orange-brown, dry, very dense, fine to coarse grained sand, fine sub-rounded gravel.	
	20			R-5	22 33 50			SP	@ 20': SAND, light tan, dry, very dense, medium to coarse grained sand, fine sub-rounded gravel in tip of sampler.	
	25			S-1	10 19 28				@ 25': No sample recovery.	
	30								Total depth of boring 26.5 feet No groundwater encountered The boring was backfilled with soil cuttings	

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- EI EXPANSION INDEX
- RV R VALUE

GEOTECHNICAL BORING LOG B-10

Date 7-16-07 **Sheet** 1 **of** 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2896± **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By CDL; Sampled By CDL)	Type of Tests
	0			B1 @0-5'					**Quarternary alluvium (Qal):**	
				R-1	13 21 30	121.2	6.1	SM	@ 2.5': Silty SAND, brown, moist, dense, fine to medium grained sand, some calcium carbonate stringers.	
	5			R-2	31 50/6"	117.1	4.8	SM	@ 5': Silty SAND, brown, damp to moist, very dense, fine to medium grained sand.	
	10			R-3	15 18 28			SP	@ 10': SAND, orange-brown, damp, medium dense, medium to coarse grained sand, some fine angular gravel.	
									Total depth of boring 11.5 feet No groundwater encountered The boring was backfilled with soil cuttings	
	15									
	20									
	25									
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- EI EXPANSION INDEX
- RV R VALUE

GEOTECHNICAL BORING LOG B-11

Date 7-16-07 **Sheet** 1 **of** 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2889± **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								**Logged By** CDL **Sampled By** CDL	
									Quarternary alluvium (Qal):	
				R-1	12 20 19	130.1	4.6	SM	@ 2.5': Clayey SAND, red-brown, moist, medium dense, fine grained sand, some medium grained sand, hair rootlets, some calcium carbonate stringers.	
	5			R-2	7 7 10	110.5	1.4	SP	@ 5': Silty SAND with gravel, orange-brown, dry, medium dense, fine to caorse grained sand.	
	10			R-3	26 28 35	111.4	2.3	SP	@ 10': Silty SAND with gravel, light brown, damp, dense, fine to caorse grained sand.	
	15			R-4	29 50/6"	111.4	1.5	SP	@ 15': Silty SAND with gravel, light brown, very dense, dry, fine to coarse grained sand, fine sub-rounded gravel in tip of sampler.	
	20			R-5	23 36 50			SP	@ 20': Gravelly SAND, light brown, damp, very dense, fine to coarse grained sand, fine sub-angular gravel.	
	25								Total depth of boring 21.5 feet No groundwater encountered The boring was backfilled with soil cuttings	
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- EI EXPANSION INDEX
- RV R VALUE

GEOTECHNICAL BORING LOG B-12

Date 7-16-07 **Sheet** 1 **of** 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2889± **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By CDL; Sampled By CDL)	Type of Tests
	0								**Quarternary alluvium (Qal):**	
				R-1	10 17 30	117.9	3.5	SM	@ 2.5': Silty SAND, damp to moist, brown, medium dense, fine grained sand, grades in tip of sampler to red-brown, cemented by calcium carbonate.	
	5			R-2	13 15 15	113.9	3.9	SM	@ 5': Silty SAND, red-brown, damp to moist, medium dense, fine to coarse grained sand, poorly stratified coarse grained thick beds, calcium carbonate stringers.	
	10			R-3	12 16 17	115.6	3.5	SP/SM	@ 10': Silty SAND/SAND with silt, brown, damp to moist, medium dense, fine to medium grained sand, some fine sub-rounded gravel.	
	15			R-4	21 39 50/5"	120.6	2.0	SP	@ 15': Silty SAND, brown, damp, very dense, fine to coarse grained sand, fine sub-angular gravel to sub-rounded gravel.	
	20			R-5	23 34 50/5"			SP	@ 20': SAND, light grey-tan, damp, very dense, fine and coarse grained sand, fine sub-angular to sub-rounded gravel in tip of sampler.	
	25			S-1	10 16 30				@ 25': No sample recovery, dense.	
	30								Total depth of boring 26.5 feet No groundwater encountered The boring was backfilled with soil cuttings	

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- EI EXPANSION INDEX
- RV R VALUE

GEOTECHNICAL BORING LOG B-13

Date 7-17-07 **Sheet** 1 of 2

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2889± **Location** See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								**Quarternary alluvium (Qal):**	
				B1 @0-5'						
				R-1	8 12 15	115.0	2.8	SP-SM	@ 2.5': SAND with silt, brown, damp, medium dense, fine and coarse grained sand, trace fine sub-angular gravel.	
	5			R-2	8 12 19	110.3	5.4	SP-SM	@ 5': SAND with silt, brown, damp to moist, medium dense, fine to coarse grained sand, trace medium sub-angular gravel.	
	10			R-3	9 15 27	113.0	2.5	SP	@ 10': SAND, light tan, damp, medium dense, fine to coarse grained sand, fine angular gravel.	
	15			R-4	19 27 50	100.8	1.5	SP	@ 15': SAND, light tan, dry, dense, medium to coarse grained sand, trace fine angular to sub-angular gravel.	
	20			R-5	50/5"	110.5	2.6	SP	@ 20': SAND, light tan-white, damp, very dense, fine to medium grained sand, grades with depth to gravelly silty SAND, brown, moist, fine grained sand, fine angular gravel.	
	25			S-1	12 20 28			SP	@ 25': SAND, light tan-grey, dry, dense, fine to medium grained sand, trace fine well rounded gravel.	
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
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GEOTECHNICAL BORING LOG B-13

Date 7-17-07 **Sheet** 2 **of** 2

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2889± **Location** See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	30			R-6	12 50/6"	112.5	1.1	SP	@ 30': SAND, tan, dry, very dense, fine to medium grained sand, grades in sampler tip to silty SAND, brown, damp to moist, very dense, fine grained sand, cemented with calcium carbonate.	
	35			S-2	45 38 42			ML-CL	@ 35': Clayey SILT, brown, damp, hard, grades with depth to silty SAND, brown, damp, very dense, fine grained sand.	
	40			R-7	23 50/5"	113.2	6.6	SM	@ 40': Silty SAND, tan, moist, very dense, fine grained sand.	
	45			S-3	38 50/6"			SP	@ 45': SAND, light tan-white, dry, very dense, fine grained sand.	
	50			R-8	18 30 50/4"	125.4	2.5	ML/SM	@ 50': Sandy SILT, tan, damp, hard, fine grained sand.	
	55								Total depth of boring 51.3 feet No groundwater encountered The boring was backfilled with soil cuttings	
	60									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
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GEOTECHNICAL BORING LOG B-14

Date 7-17-07 **Sheet** 1 **of** 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2890± **Location** See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								**Quarternary alluvium (Qal):**	
				R-1	11 16 25	125.4	2.5	SM	@ 2.5': Silty SAND, brown to red-brown with depth, dry to damp with depth, medium dense, fine grained sand grades with depth to fine to coarse grained sand, trace clay, roots.	
	5			R-2	17 25 35	116.6	3.4	SM	@ 5': Silty SAND, dark red-brown, damp to moist, dense, fine and coarse grained sand.	
	10			R-3	32 50/6"	110.4	6.3	ML/SM	@ 10': Sandy SILT, light tan-grey, moist, hard, fine grained sand, cemented with calcium carbonate.	
				B1 10-15'						
	15			R-4	19 33 50/3"	110.6	6.7	ML/SM	@ 15': Sandy SILT, light tan-grey, moist, hard, fine grained sand, cemented with calcium carbonate.	
	20			R-5	18 31 50			SP	@ 20': SAND, light tan-white, dry, very dense, fine grained sand grades with depth to medium to coarse graineds and, non-cohesive.	
	25			S-1	7 20 28			SP	@ 25': SAND, light tan-white, dry, dense, fine to coarse grained sand.	
	30								Total depth of boring 26.5 feet No groundwater encountered The boring was backfilled with soil cuttings	

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
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- RV R VALUE



GEOTECHNICAL BORING LOG B-15

Date 7-17-07 **Sheet** 1 of 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2896± **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
									Logged By CDL **Sampled By** CDL	
	0								**Quarternary alluvium (Qal):**	
				R-1	4 5 7	108.7	2.7	SP-SM	@ 2.5': SAND with silt, brown, damp, loose, fine to coarse grained sand, trace fine sub-angular gravel.	
	5			R-2	4 7 8	111.2	1.2	SP	@ 5': SAND with gravel, brown, dry, loose, fine to coarse grained sand, fine angular gravel.	
	10			R-3	23 34 50	121.8	3.3	SP	@ 10': SAND, brown, damp to moist, very dense, fine to medium grained sand, some coarse grained sand, grades with depth to sandy SILT, tan, damp, hard, fine grained sand.	
	15			R-4	29 37 50	118.6	5.9	SM/ML	@ 15': Silty SAND/sandy SILT, tan, moist, very dense, fine grained sand.	
	20			R-5	18 50/6"			SM ML/SM	@ 20': Silty SAND, tan-grey, damp, very dense, fine to medium grained sand, grades with depth to sandy SILT, tan-grey, damp, hard, fine grained sand.	
	25								Total depth of boring 21 feet No groundwater encountered The boring was backfilled with soil cuttings	
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
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GEOTECHNICAL BORING LOG B-16

Date 7-17-07 **Sheet** 1 **of** 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2897±' **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
		N S							Logged By CDL Sampled By CDL	
	0			B1 @0-5'					**Quarternary alluvium (Qal):**	
				R-1	11 13 12	103.7	7.4	SM	**Quarternary alluvium (Qal):**@ 2.5': Silty SAND, red-brown, moist, medium dense, fine to medium grained sand, cemented with calcium carbonate, pin-hole porousity.	
	5			R-2	5 8 10	111.2	1.8	SP	@ 5': SAND, light brown, dry, medium dense, fine to coarse grained sand.	
	10			R-3	50/6"			SP ML	@ 10': SAND, light brown, dry, very dense, fine to coarse grained sand, grades with depth to SILT, light white grey, dry, hard.	
	15								Total depth of boring 10.5 feet No groundwater encountered The boring was backfilled with soil cuttings	
	20									
	25									
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- EI EXPANSION INDEX
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GEOTECHNICAL BORING LOG B-17

Date 7-17-07 **Sheet** 1 of 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2890± **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By CDL; Sampled By CDL)	Type of Tests
	0								**Quarternary alluvium (Qal):**	
				R-1	21 50/6"	123.7	3.8	SM	@ 2.5': Silty SAND, red-brown, damp to moist, very dense, fine and coarse grained sand, trace fine well rounded gravel.	
	5			R-2	10 27 50	101.1	9.4	ML/SM	@ 5': Sandy SILT, tan-white, moist, hard, fine grained sand, cemented with calcium carbonate.	
	10			R-3	9 40 50/4"	110.7	4.1	SM	@ 15': Silty SAND, brown, damp to moist, very dense, fine to medium grained sand.	
	15			R-4	33 50/6"	111.9	2.9	SM	@ 20': Silty SAND, tan-grey, tan-grey, damp, very dense, fine grained sand, trace medium grained sand.	
	20			R-5	50/6"			SM	@ 20': Silty SAND, tan-grey, damp, very dense, fine grained sand, trace medium grained sand.	
	25			S-1	12 23 20			SM	@ 25': Silty SAND, tan-brown, dry, dense, fine grained sand.	
	30								Total depth of boring 26.5 feet No groundwater encountered The boring was backfilled with soil cuttings	

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- EI EXPANSION INDEX
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GEOTECHNICAL BORING LOG B-18

Date 7-17-07 **Sheet** 1 of 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2892±' **Location** See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								**Quarternary alluvium (Qal):**	
				R-1	3 6 10			SM	@ 2.5': Silty SAND, brown, damp, loose, fine grained sand, some hair rootlets.	
	5			R-2	20 39 50/5"			SC	@ 5': Silty SAND grades to clayey SAND, red-brown, moist, very dense, medium to coarse grained sand.	
	10			R-3	11 13 18			SM	@ 10': Silty SAND, orange/red-brown, moist, medium dense, fine to medium grained sand, trace coarse grained sand and clay.	
	15			R-4	29 35 45			SP	@ 15': SAND, tan, dry, very dense, fine to coarse grained snd, non-cohesive.	
	20			R-5	21 50/5"			CL SM	@ 20': CLAY, brown, moist, hard, calcium carbonate stringers, trace coarse grained sand, grades with depth to silty SAND, brown, moist, very dense, fine grained sand, grades with depth to SAND with silt, red-brown, moist, very dense, fine to coarse grained sand, trace clay.	
	25								Total depth of boring 21.4 feet No groundwater encountered The boring was backfilled with soil cuttings	
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
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GEOTECHNICAL BORING LOG B-19

Date 7-17-07 | Sheet 1 of 1

Project Building 1 | Project No. 601904-001

Drilling Co. Martini Drilling Corp. | Type of Rig CME 75

Hole Diameter 8" | Drive Weight 140 lb autohammer | Drop 30"

Elevation Top of Hole 2895±' | Location See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								**Quarternary alluvium (Qal):**	
				R-1	9 14 20	113.4	3.2	SW-SM	@ 2.5': SAND with silt, red-brown, damp, medium dense, fine to coarse grained sand, well graded.	
	5			R-2	18 27 26	110.8	3.6	SM	@ 5': Silty SAND, tan-white, damp, dense, fine grained sand, fine sub-angular gravel, poorly cemented with calcium carbonate.	
	10			R-3	18 50/6"	113.6	2.3	SP	@ 10': SAND, tan-brown, damp, very dense, fine to coarse grained sand.	
	15			R-4	26 35 50	117.1	1.7	SP	@ 15': SAND, tan-brown, damp, very dense, fine to coarse grained sand.	
	20			R-5	16 33 38			SP	@ 20': SAND, tan-brown, damp, dense, fine to coarse grained sand.	
	25								Total depth of boring 21.5 feet No groundwater encountered The boring was backfilled with soil cuttings	
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- EI EXPANSION INDEX
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GEOTECHNICAL BORING LOG B-20

Date 7-17-07 **Sheet** 1 of 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2898± **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								**Logged By** CDL **Sampled By** CDL	
									Quarternary alluvium (Qal):	
				R-1	16 19 20	114.7	5.7	SM	@ 2.5': Silty SAND, light brown, moist, medium dense, fine to medium grained sand, poorly developed calcium carbonate stringers, poorly to moderately cemented with calcium carbonate, pin-hole porousity.	
	5			R-2	10 12 14	114.5	2.7	SM	@ 5': Silty SAND, light brown, damp, medium dense, fine to coarse grained sand, poorly developed calcium carbonate stringers, poorly to moderately cemented with calcium carbonate, trace fine sub-angular gravel.	
	10			R-3	22 50/6"	121.3	1.9	SP	@ 10': SAND, light tan, damp, very dense, fine to coarse grained sand, non-cohesive.	
				B1 10-15'						
	15			R-4	30 42 46	113.6	1.6	SP	@ 15': SAND, light brown, dry, very dense, fine to medium grained sand.	
	20			R-5	15 37 50/3"			SP	@ 20': SAND with gravel, tan-white, dry, very dense, fine to coarse grained sand, fine angular gravel.	
	25								Total depth of boring 21.3 feet No groundwater encountered The boring was backfilled with soil cuttings	
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- EI EXPANSION INDEX
- RV R VALUE



GEOTECHNICAL BORING LOG B-21

Date 7-17-07 **Sheet** 1 of 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2893±' **Location** See boring location map

Logged By CDL

Sampled By CDL

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								**Quarternary alluvium (Qal):**	
				R-1	5 6 10	117.6	3.2	SM	@ 2.5': Silty SAND, light brown, damp, loose, fine and coarse grained sand.	
	5			R-2	8 12 16	121.9	1.5	SW	@ 5': SAND with gravel, light brown, damp, medium dense, fine to coarse grained sand, well graded, fine angular to sub-rounded gravel.	
	10			R-3	10 26 45	129.7	1.4	SP	@ 10': SAND with gravel, light brown, damp, dense, fine to coarse grained sand, fine angular to sub-rounded gravel.	
	15			R-4	21 30 37		1.7	SP	@ 15': SAND, brown, damp, dense, fine to coarse grained sand, trace medium well rounded gravel.	
	20			R-5	27 50/5"			SP	@ 20': SAND, orange-brown, damp, very dense, fine to coarse grained sand.	
	25			S-1	13 27 31			SP	@ 25': SAND, light brown, dry, very dense, fine to coarse grained sand, 6-inch thick interbed of fine well rounded gravel.	
	30								Total depth of boring 26.5 feet No groundwater encountered The boring was backfilled with soil cuttings	

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- EI EXPANSION INDEX
- RV R VALUE

GEOTECHNICAL BORING LOG B-22

Date 7-17-07 **Sheet** 1 **of** 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2891±' **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0			B1 @0-5'					**Logged By** CDL **Sampled By** CDL **Quarternary alluvium (Qal):**	
				R-1	7 7 12	109.2	2.6	SM	@ 2.5': Silty SAND, red-brown, damp, medium dense, fine to medium grained sand with coarse grained sand, poorly cemented with calcium carbonate.	
	5			R-2	8 13 31	110.7	3.1	SM	@ 5': Silty SAND, red-brown, damp, medium dense, fine to medium grained sand with coarse grained sand.	
	10			R-3	23 34 43			SP	@ 10': Silty gravelly SAND, orange-brown, moist, dense, fine to coarse grained sand, fine sub-rounded gravel.	
									Total depth of boring 11.5 feet No groundwater encountered The boring was backfilled with soil cuttings	
	15									
	20									
	25									
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- EI EXPANSION INDEX
- RV R VALUE

GEOTECHNICAL BORING LOG B-23

Date 7-17-07 **Sheet** 1 **of** 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2897±' **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								**Logged By** CDL **Sampled By** CDL	
									Quarternary alluvium (Qal):	
				R-1	4 6 6	108.2	3.6	SM	@ 2.5': Silty SAND, brown, damp, loose, fine to medium grained sand.	
	5			R-2	6 6 7	108.7	3.2	SM	@ 5': Silty SAND, white-grey, damp, loose, fine to medium grained sand, trace angular gravel, abundant calcium carbonate, poorly cemented.	
	10			R-3	12 24 37			SM	@ 10': Silty SAND, light tan-white, dry to damp, dense, fine to medium grained sand, some fine angular gravel, poorly cemented with calcium carbonate.	
	15									
	20									
	25									
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- EI EXPANSION INDEX
- RV R VALUE

GEOTECHNICAL BORING LOG B-24

Date 7-17-07 **Sheet** 1 **of** 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2899±' **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By CDL; Sampled By CDL)	Type of Tests
	0			B1 @0-5'					**Quarternary alluvium (Qal):**	
				R-1	12 17 20	122.2	3.8	SM	@ 2.5': Silty SAND, red-brown, damp to moist, medium dense, fine to medium grained sand, some coarse grained sand, trace clay.	
	5			R-2	16 24 30	122.9	3.2	SM	@ 5': Silty SAND, brown, damp to moist, dense, 1/8-inch thick root, grades in sampler tip to gravelly SAND, light brown, dry, dense, fine to coarse grained sand, fine sub-rounded gravel.	
	10			R-3	18 18 27			SP	@ 10': SAND, light orange-brown, damp, medium dense, fine to medium grained sand, trace coarse grained sand.	
	15								Total depth of boring 11.5 feet No groundwater encountered The boring was backfilled with soil cuttings	
	20									
	25									
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- EI EXPANSION INDEX
- RV R VALUE

GEOTECHNICAL BORING LOG B-25

Date 7-17-07 **Sheet** 1 **of** 1

Project Building 1 **Project No.** 601904-001

Drilling Co. Martini Drilling Corp. **Type of Rig** CME 75

Hole Diameter 8" **Drive Weight** 140 lb autohammer **Drop** 30"

Elevation Top of Hole 2900± **Location** See boring location map

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								**Logged By** CDL **Sampled By** CDL	
				B1 @0-5'					**Quarternary alluvium (Qal):**	
				R-1	16 14 11	110.3	4.4	SM	@ 2.5': Silty SAND, red-brown, damp to moist, medium dense, fine to medium grained sand, trace clay.	
	5			R-2	9 13 14	113.8	3.2	SM SP	@ 5': Silty SAND, tan-white, damp, medium dense, fine to medium grained sand, trace well rounded gravel, moderately cemented with calcium carbonate, grades with depth to SAND, fine to coarse grained sand, dry, medium dense, non-cohesive.	
	10			R-3	10 22 40			SP	@ 10': SAND, light red-brown, damp, dense, fine to coarse grained sand, non-cohesive.	
	15								Total depth of boring 11.5 feet No groundwater encountered The boring was backfilled with soil cuttings	
	20									
	25									
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- EI EXPANSION INDEX
- RV R VALUE

APPENDIX C

Laboratory Test Procedures and Test Results

Moisture and Density Determination Tests: Moisture content and dry density determinations were performed, in general accordance with ASTM test method D2937, on relatively undisturbed samples obtained from the test borings and/or trenches. The results of these tests are presented in the boring logs (see Appendix A).

Percent Passing No. 200 Sieve: Selected samples were tested in accordance with the ASTM Standard D1140 to determine the amounts of materials finer than the U.S. Standard Sieve No. 200. Test results are presented in this appendix.

Particle Size Gradation Tests: Selected samples were subjected to mechanical grain-size analysis by sieving from U.S. Standard brass screens (ASTM Test Method D422). Particle Size Distribution curves are presented in this appendix.

Expansion Index Tests: Expansion Index (EI) tests were performed on representative bulk samples of the onsite soil, in general accordance with the ASTM D 4829 Standard Test Method. Test results are presented in this appendix.

Maximum Density Tests: The maximum dry density and optimum moisture content of representative bulk soil samples were determined in accordance with ASTM Test Method D1557. Test results are presented on the *Modified Proctor Compaction Test* figures in this appendix.

Direct Shear Tests: Direct shear tests were performed on selected relatively undisturbed ring samples, which were soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. Samples and specimens were then transferred to the shear box, reloaded, and pore pressures set up in the sample (due to transfer) were allowed to dissipate for a period of approximately one-hour. Following pore pressure dissipation, samples were subjected to shearing forces. The samples were tested under various normal loads by a motor-driven, strain-controlled, direct-shear testing apparatus at a strain rate of 0.05 inches per minute. Test results data and graphical plots are presented in this appendix.

Consolidation Tests: Consolidation tests were performed on selected, relatively undisturbed ring samples. These samples were placed in a consolidometer and loads were applied in geometric progression. The percent consolidation for each load cycle was recorded as the ratio of the amount of vertical compression to the original 1-inch height. Consolidation results (curves) are presented on the One-Dimensional Consolidation figure in this appendix.

APPENDIX C (Continued)

Laboratory Test Procedures and Test Results

"R"-Value: The resistance "R"-value was determined by the California Standard Test Method No. 301 for representative pavement subgrade soils. Three specimens were prepared from one bulk sample and exudation pressure and "R"-value determined on each one. The graphically determined "R"-value at exudation pressure of 300 psi is reported in this appendix.

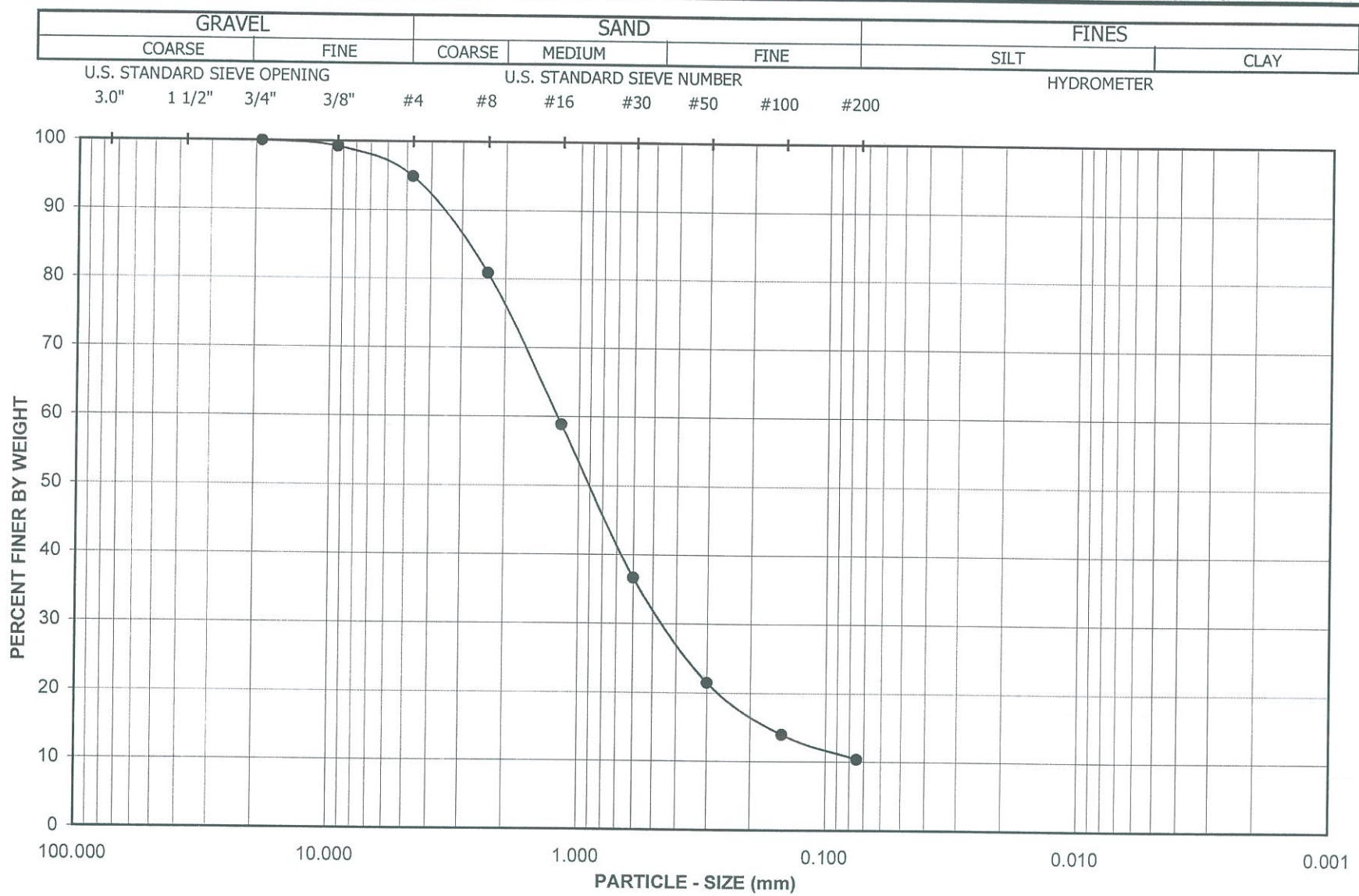
Chloride Content, Sulfate Content, Minimum Resistivity and pH Tests: Chloride content, sulfate content, minimum resistivity and pH tests were performed in general accordance with California Test Methods 422, 417, and 532. These results are presented in this appendix.

Boring No.	B-13	B-13	B-13	B-13	B-13	B-13		
Sample No.	R-1	R-2	R-3	S-1	S-2	S-3		
Depth (ft.)	2.5	5	10	25	35	45		
Sample Type	Drive	Drive	Drive	SPT	SPT	SPT		
Soil Identification	Brown poorly graded sand with silt and gravel (SP-SM)g	Brown poorly graded sand with silt and gravel (SP-SM)g	Brown poorly graded sand with gravel (SP)g	V light brown poorly graded sand with silt and gravel (SP-SM)g	Brown sandy lean clay s(CL)	V light brown silty sand (SM)		
Moisture Correction								
Wet Weight of Soil + Container (g)	0.00	0.00	0.00	0.00	0.00	0.00		
Dry Weight of Soil + Container (g)	0.00	0.00	0.00	0.00	0.00	0.00		
Weight of Container (g)	1.00	1.00	1.00	1.00	1.00	1.00		
Moisture Content (%)	0.00	0.00	0.00	0.00	0.00	0.00		
Sample Dry Weight Determination								
Weight of Sample + Container (g)	576.50	615.20	671.50	614.60	651.60	609.20		
Weight of Container (g)	108.40	110.90	107.40	107.40	108.00	107.70		
Weight of Dry Sample (g)	468.10	504.30	564.10	507.20	543.60	501.50		
Container No.:								
After Wash								
Method (A or B)	B	B	B	B	B	B		
Dry Weight of Sample + Cont. (g)	527.60	562.60	649.50	581.10	360.00	539.50		
Weight of Container (g)	108.40	110.90	107.40	107.40	108.00	107.70		
Dry Weight of Sample (g)	419.20	451.70	542.10	473.70	252.00	431.80		
% Passing No. 200 Sieve	**10.4**	**10.4**	**3.9**	**6.6**	**53.6**	**13.9**		
% Retained No. 200 Sieve	89.6	89.6	96.1	93.4	46.4	86.1		

Leighton

PERCENT PASSING
No. 200 SIEVE
ASTM D 1140

Project Name: Bldg. 1
Project No.: 601904-001
Client Name: LCI / Irvine
Tested By: R. Lee Date: 07/26/07



Project Name: Bldg 1

Project No.: 601904-001

Exploration No.: B-19 Sample No.: R-1

Depth (feet): 2.5 Soil Type : SW-SM

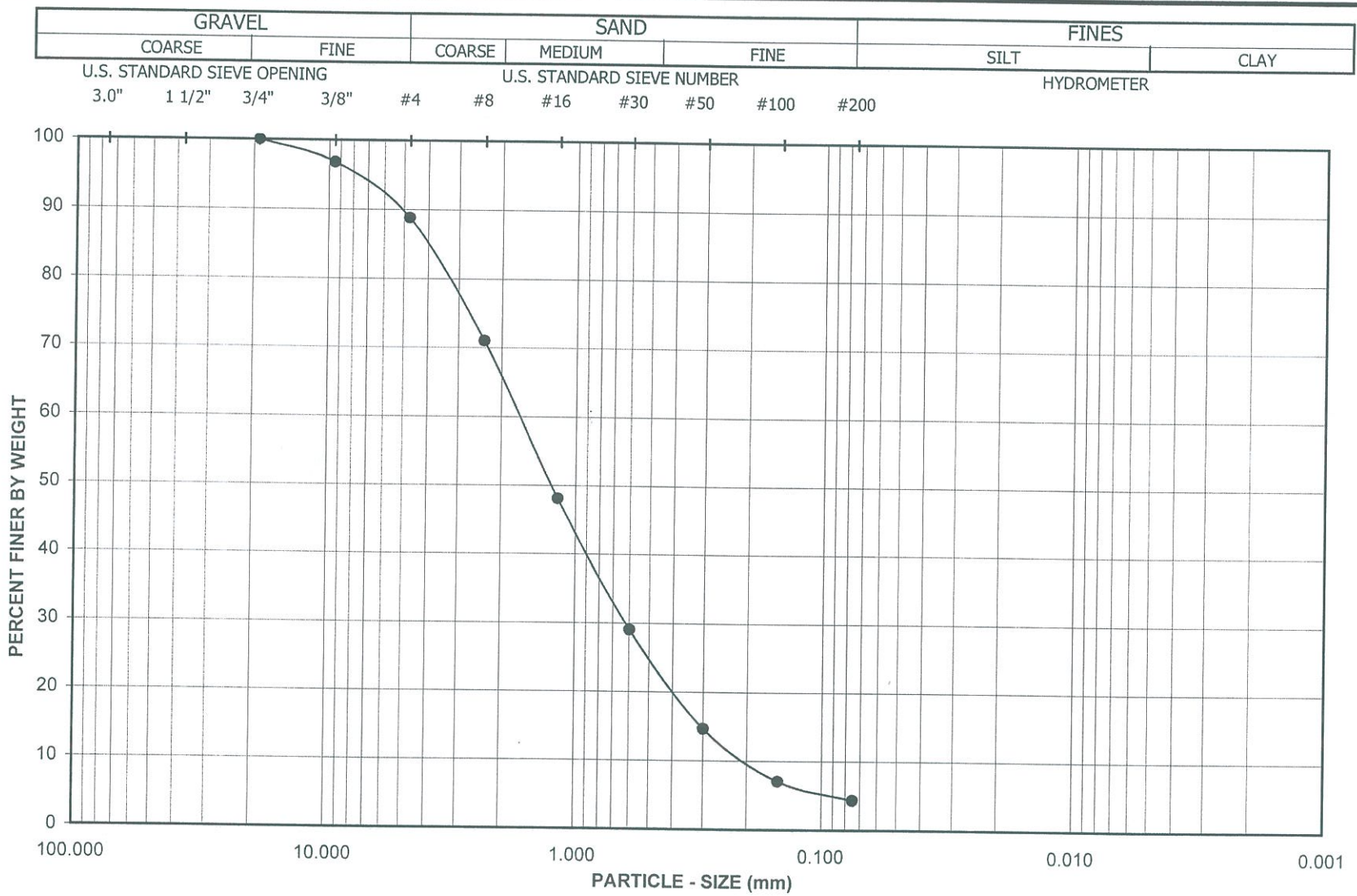
Soil Identification: Yellowish red well-graded sand with silt (SW-SM)

GR:SA:FI : (%) 5 : 85 : 10

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422

Sep-07



Project Name: Bldg 1

Project No.: 601904-001

Exploration No.: B-21 Sample No.: R-2

Depth (feet): 5.0 Soil Type : SW

Soil Identification: Light brown well-graded sand (SW)

GR:SA:FI : (%) 11 : 85 : 4

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PARTICLE - SIZE DISTRIBUTION ASTM D 422

Aug-07

Leighton

PARTICLE-SIZE ANALYSIS of SOILS
ASTM D 422

Project Name: Bldg 1
Project No.: 601904-001
Exploration No.: B-19
Sample No.: R-1
Soil Identification: Yellowish red well-graded sand with silt (SW-SM)

Tested By: R. Lee Date: 07/30/07
Checked By: LF Date: 09/11/07
Depth (feet): 2.5

		Moisture Content of Total Air - Dry Soil	
Container No.:	957	Wt. of Air-Dry Soil + Cont. (g)	0.00
Wt. of Air-Dried Soil + Cont.(g)	664.30	Wt. of Dry Soil + Cont. (g)	0.00
Wt. of Container (g)	108.30	Wt. of Container No._____ (g)	1.00
Dry Wt. of Soil (g)	556.00	Moisture Content (%)	0.00

After Wet Sieve	Container No.	957
	Wt. of Dry Soil + Container (g)	606.80
	Wt. of Container (g)	108.30
	Dry Wt. of Soil Retained on # 200 Sieve (g)	498.50

U. S. Sieve Size (in.)	U. S. Sieve Size (mm.)	Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
6"	152.400		
3"	75.000		
1 1/2	37.500		
3/4"	19.000	0.00	100.0
3/8"	9.500	4.30	99.2
#4	4.750	28.40	94.9
#8	2.360	106.40	80.9
#16	1.180	228.70	58.9
#30	0.600	352.00	36.7
#50	0.300	436.20	21.5
#100	0.150	478.10	14.0
#200	0.075	498.00	10.4
PAN			

GRAVEL: **5 %**
SAND: **85 %**
FINES: **10 %**
GROUP SYMBOL: **SW-SM**

Cu = D60/D10 = 18.46
Cc = $(D30)^2/(D60*D10)$ = 2.65

Remarks:

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MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name: Bldg 1 | Tested By : R. Santos | Date: 07/26/07

Project No.: 601904-001 | Input By : J. Ward | Date: 07/30/07

Boring No.: B-7 | Depth (ft.) 0-5

Sample No. : B-1

Soil Identification: Reddish yellow silty sand (SM)

Preparation Method: [X] Moist [ ] Dry

[X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft^3) 0.03321 *Ram Weight = 10 lb.; Drop = 18 in.*

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3799.0	3930.0	3909.0	3830.0		
Weight of Mold (g)	1786.0	1786.0	1786.0	1786.0		
Net Weight of Soil (g)	2013.0	2144.0	2123.0	2044.0		
Wet Weight of Soil + Cont. (g)	537.40	496.30	435.00	509.10		
Dry Weight of Soil + Cont. (g)	517.60	468.40	402.70	461.00		
Weight of Container (g)	54.00	54.20	51.40	53.90		
Moisture Content (%)	4.27	6.74	9.19	11.82		
Wet Density (pcf)	133.6	142.3	140.9	135.7		
Dry Density (pcf)	128.2	133.3	129.1	121.3		

Maximum Dry Density (pcf) **133.5** **Optimum Moisture Content (%)** **6.5**

PROCEDURE USED

[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

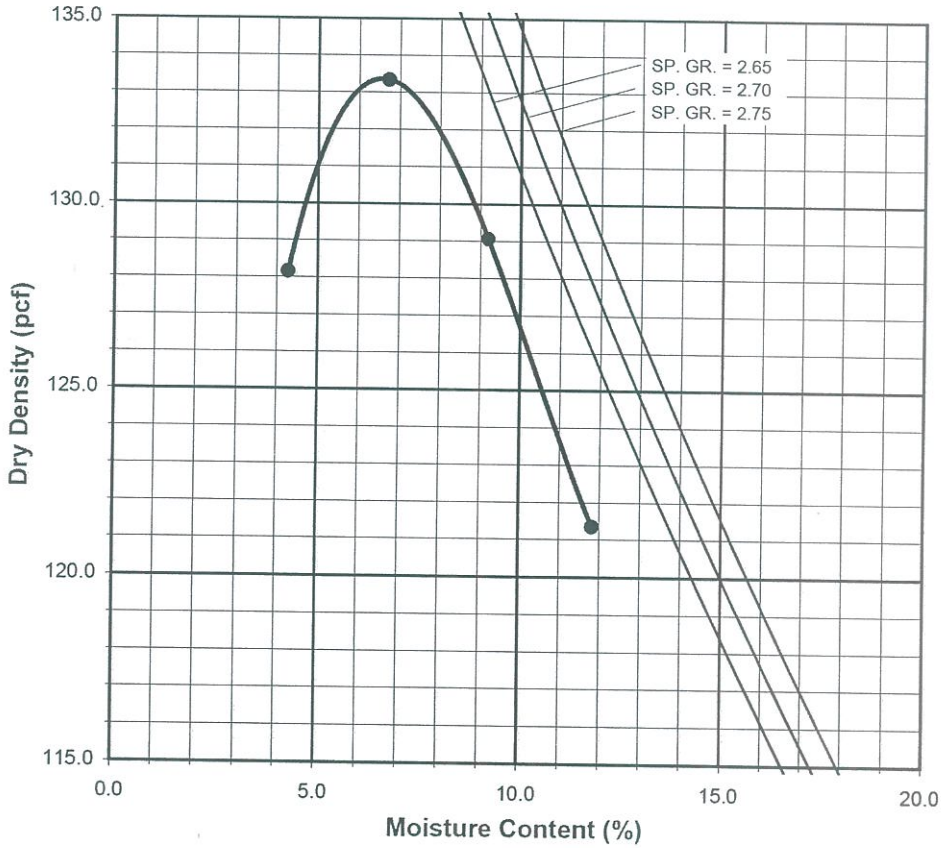
[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:

GR:SA:FI

Atterberg Limits:

LL,PL,PI



Leighton

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name: Bldg 1
Project No. : 601904-001
Boring No.: B-13
Sample No. : B-1
Soil Identification: Dark yellowish brown silty sand (SM) with capping compound pieces

Tested By: G. Berdy Date: 07/26/07
Checked By: J. Ward Date: 07/30/07
Depth (ft.) 0-5

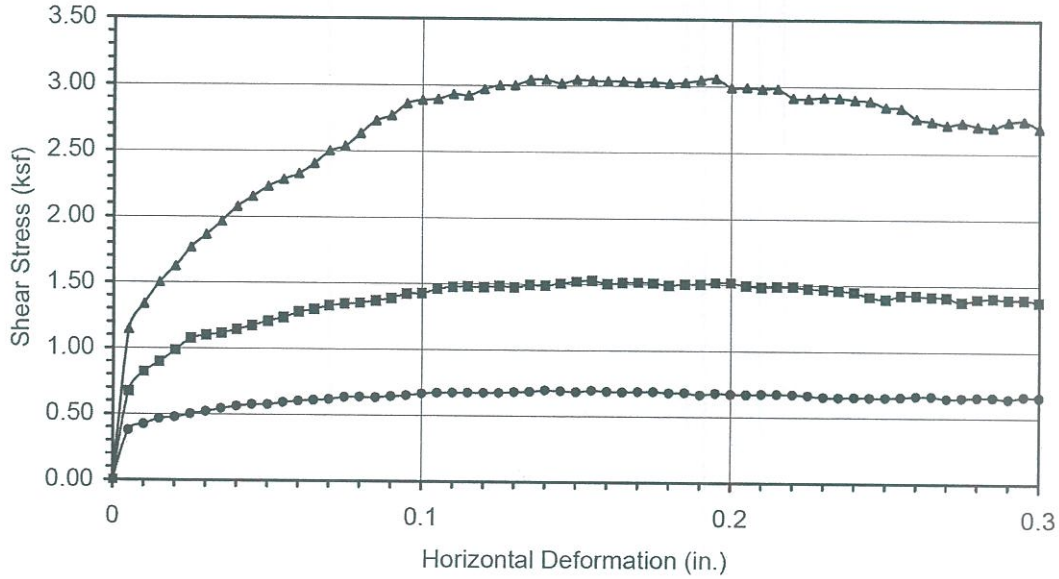
Dry Wt. of Soil + Cont.	(g)	1000.00
Wt. of Container No.	(g)	0.00
Dry Wt. of Soil	(g)	1000.00
Weight Soil Retained on #4 Sieve		0.00
Percent Passing # 4		100.00

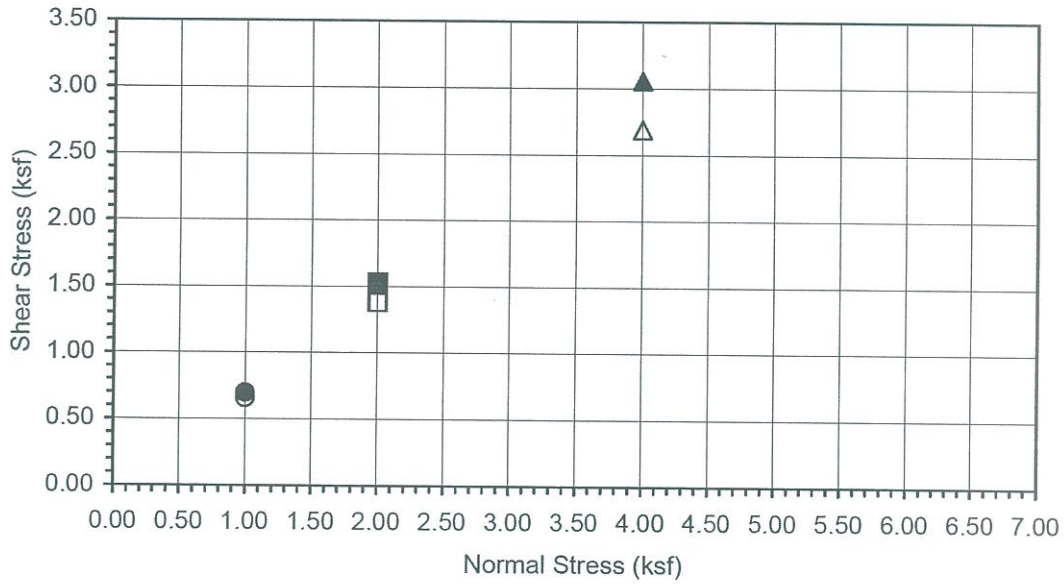
MOLDED SPECIMEN		Before Test	After Test
Specimen Diameter	(in.)	4.01	4.01
Specimen Height	(in.)	1.0000	1.0055
Wt. Comp. Soil + Mold	(g)	637.20	454.80
Wt. of Mold	(g)	204.80	0.00
Specific Gravity (Assumed)		2.70	2.70
Container No.		O	O
Wet Wt. of Soil + Cont.	(g)	867.90	659.60
Dry Wt. of Soil + Cont.	(g)	811.10	608.90
Wt. of Container	(g)	0.00	204.80
Moisture Content	(%)	7.00	12.55
Wet Density	(pcf)	130.4	136.4
Dry Density	(pcf)	121.9	121.2
Void Ratio		0.383	0.391
Total Porosity		0.277	0.281
Pore Volume	(cc)	57.3	58.5
Degree of Saturation (%) [S_{meas}]		**49.4**	86.7

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
07/26/07	8:34	1.0	0	0.1755
07/26/07	8:44	1.0	10	0.1750
Add Distilled Water to the Specimen				
07/26/07	9:00	1.0	16	0.1795
07/27/07	7:30	1.0	1366	0.1810
07/27/07	8:47	1.0	1443	0.1810

Expansion Index (EI_{meas}) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	6.0
Expansion Index (EI)$_{50}$ = EI_{meas} - (50 -S_{meas})x((65+EI_{meas}) / (220-S_{meas}))	**6**





Boring No.	**B-16**
Sample No.	**R-2**
Depth (ft)	**5**
Sample Type: Drive	
Soil Identification: Yellowish brown poorly-graded sand (SP)	

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.695	■ 1.531	▲ 3.059
Shear Stress @ End of Test (ksf)	○ 0.657	□ 1.380	△ 2.691
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	1.78	1.78	1.78
Dry Density (pcf)	108.6	110.9	114.2
Saturation (%)	8.7	9.2	10.1
Soil Height Before Shearing (in.)	0.9887	0.9871	0.9710
Final Moisture Content (%)	14.4	13.6	14.0

Leighton

DIRECT SHEAR TEST RESULTS

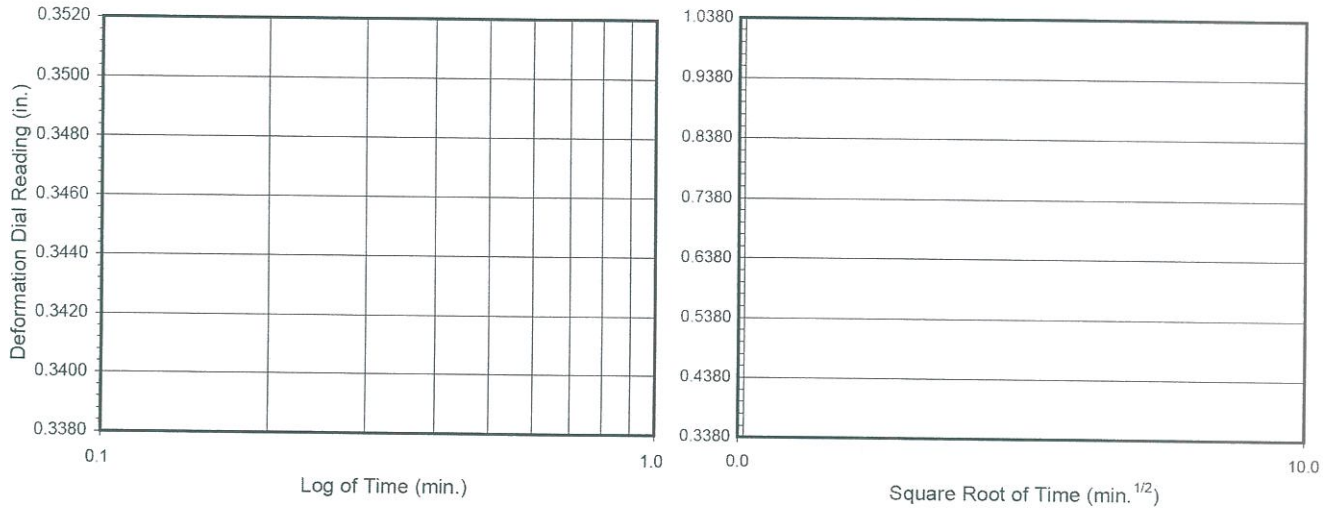
Consolidated Undrained

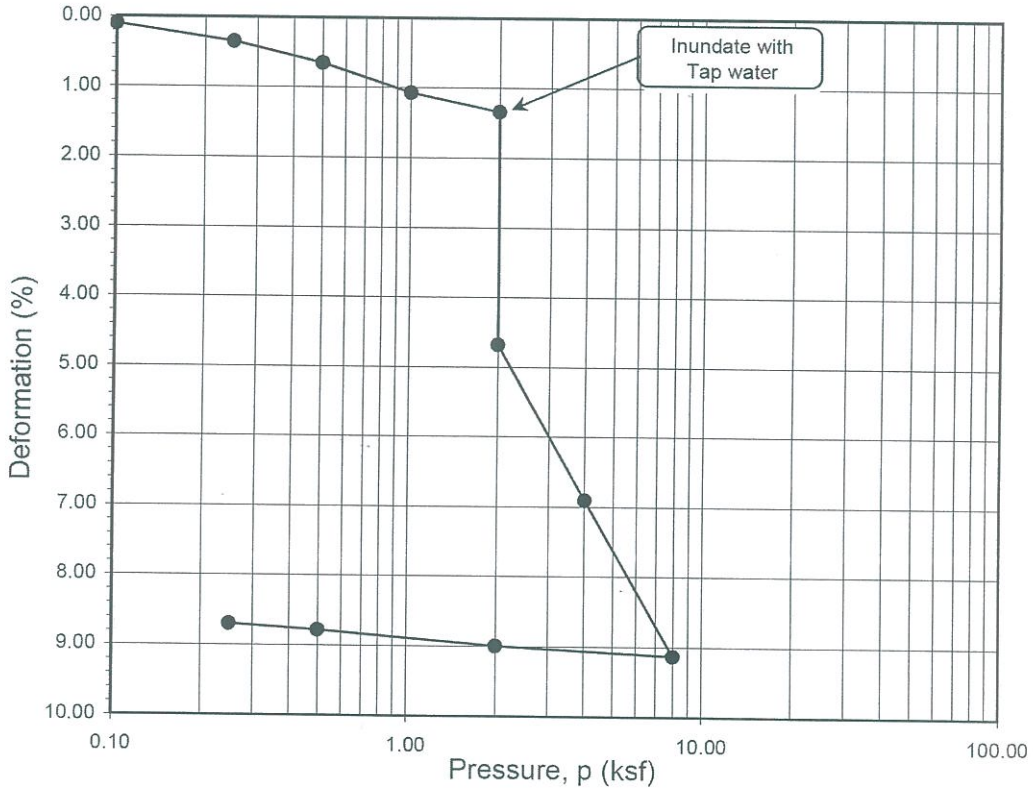
Project No.: 601904-001

Bldg 1

07-07

No Time Readings





Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-8	**R-2**	**5**	**4.6**	**14.0**	**108.1**	**117.8**	**0.560**	**0.424**	**22**	**88**

Soil Identification: Brown silty sand / poorly graded sand (SM/SP)

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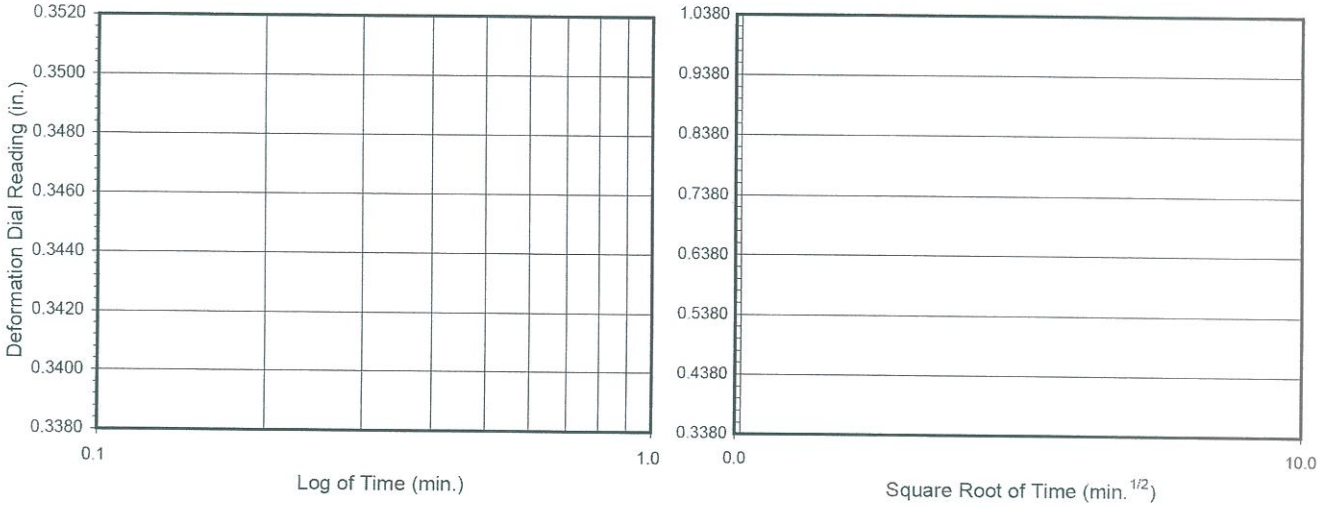
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
(ASTM D 2435)

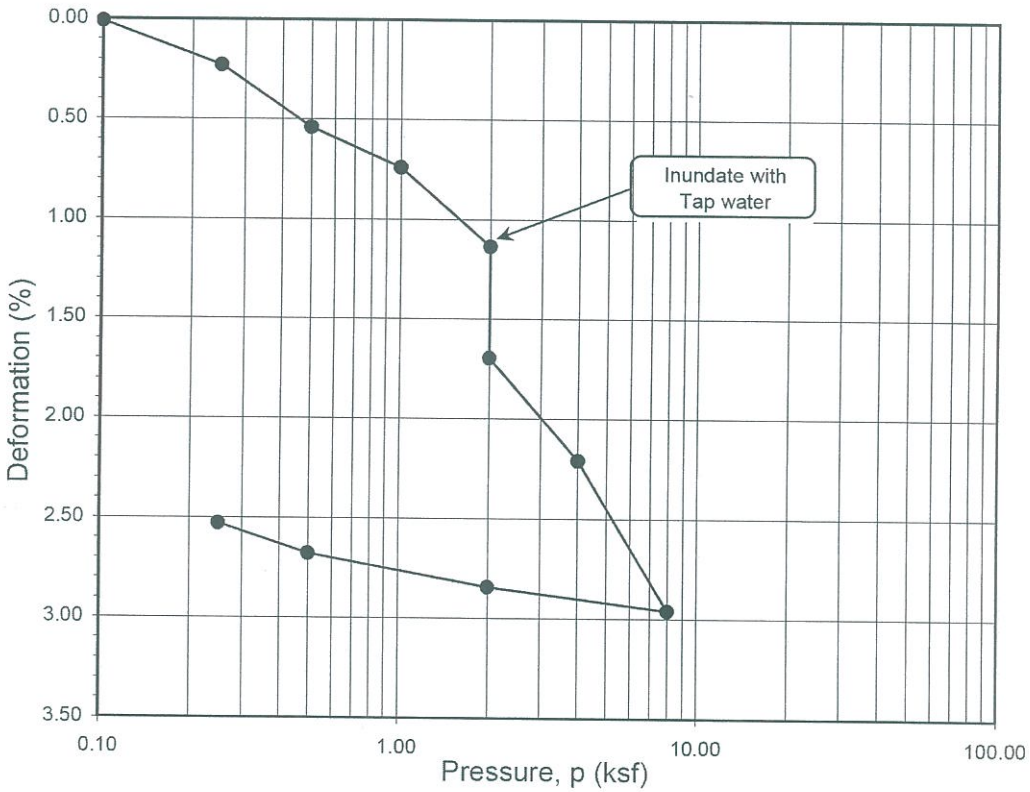
Project No.: 601904-001

Bldg. 1

07-07

No Time Readings





Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-15	**R-2**	**5**	**1.2**	**15.2**	**111.2**	**110.2**	**0.516**	**0.477**	**6**	**77**

Soil Identification: Yellowish brown poorly graded sand with gravel (SP)g

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ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
(ASTM D 2435)

Project No.: 601904-001

Bldg. 1

07-07

Leighton

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	Bldg 1	Tested By :	R. Santos	Date:	07/26/07
Project No.:	601904-001	Input By :	J. Ward	Date:	07/30/07
Boring No.:	B-13	Depth (ft.)	0-5		
Sample No. :	B-1				
Soil Identification:	Dark yellowish brown silty sand (SM) with capping compound pieces				

Preparation Method:	X	Moist
		Dry
Compaction Method	X	Mechanical Ram
		Manual Ram

Scalp Fraction (%)	
#3/4	
#3/8	
#4	5.1

Rammer Weight (lb.) = 10.0

Height of Drop (in.) = 18.0

Mold Volume (ft^3) 0.03321

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3690.0	3823.0	3952.0	3904.0		
Weight of Mold (g)	1786.0	1786.0	1786.0	1786.0		
Net Weight of Soil (g)	1904.0	2037.0	2166.0	2118.0		
Wet Weight of Soil + Cont. (g)	570.50	554.50	482.90	422.10		
Dry Weight of Soil + Cont. (g)	559.40	533.40	454.70	390.40		
Weight of Container (g)	51.20	53.70	54.20	53.60		
Moisture Content (%)	2.18	4.40	7.04	9.41		
Wet Density (pcf)	126.4	135.2	143.8	140.6		
Dry Density (pcf)	123.7	129.5	134.3	128.5		

Maximum Dry Density (pcf) 134.5

Corrected Dry Density (pcf) 136.0

Optimum Moisture Content (%) 7.0

Corrected Moisture Content (%) 6.5

[X] Procedure A
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] Procedure B
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

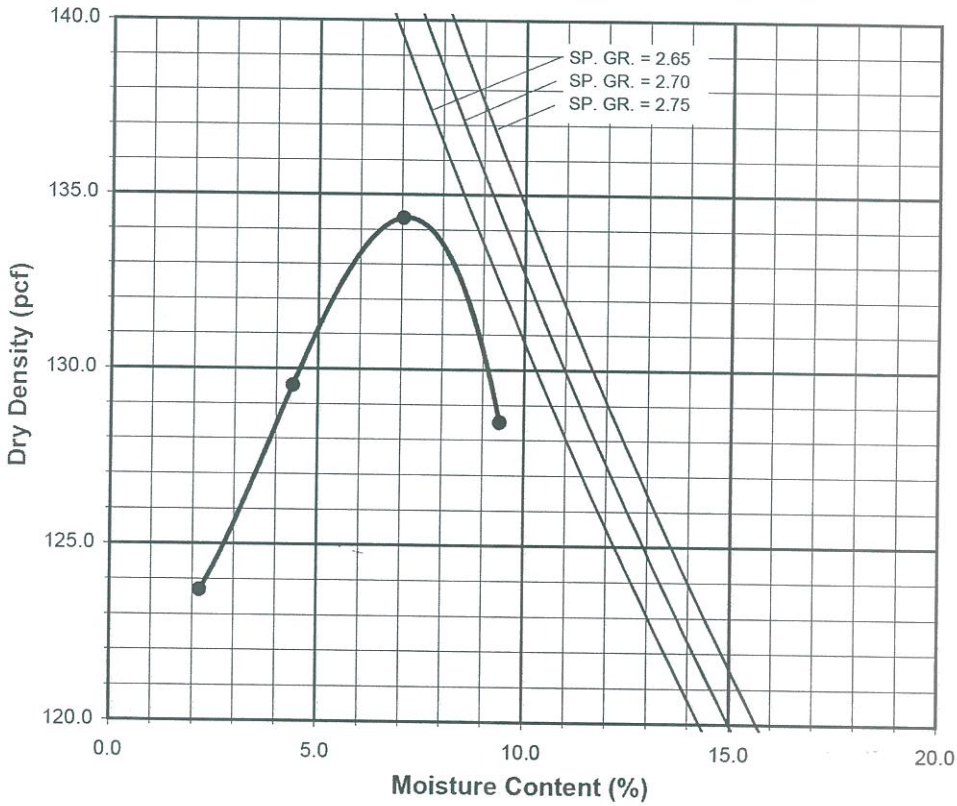
[ ] Procedure C
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:

GR:SA:FI

Atterberg Limits:

LL,PL,PI



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R-VALUE TEST RESULTS

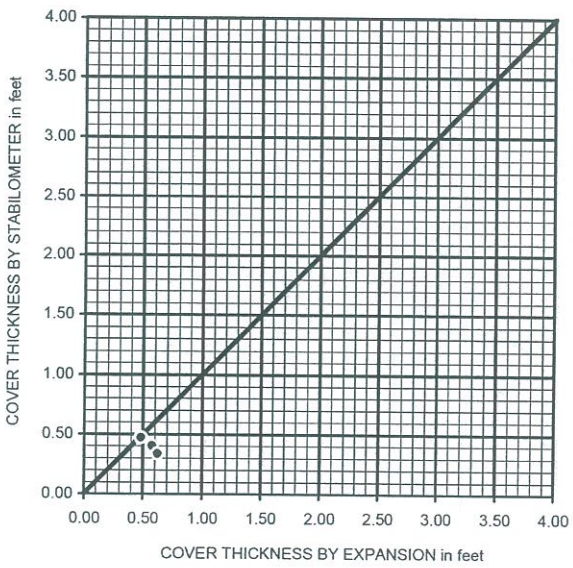
PROJECT NAME: BLDG 1
SAMPLE NUMBER: B1
SAMPLE DESCRIPTION: SM

PROJECT NUMBER: 601904-001
SAMPLE LOCATION: B-1 @ 0-5'
TECHNICIAN: SCF
DATE COMPLETED 7/31/2007

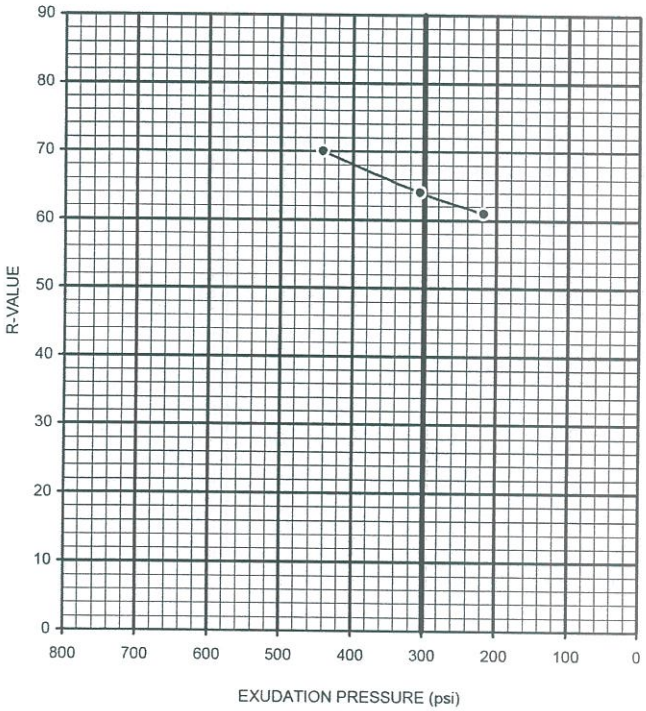
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	8.9	9.1	9.3
HEIGHT OF SAMPLE, Inches	2.52	2.57	2.61
DRY DENSITY, pcf	129.8	128.5	127.9
COMPACTOR PRESSURE, psi	125	100	75
EXUDATION PRESSURE, psi	442	306	217
EXPANSION, Inches x 10exp-4	14	12	10
STABILITY Ph 2,000 lbs (160 psi)	32	37	40
TURNS DISPLACEMENT	4.24	4.72	5.00
R-VALUE UNCORRECTED	70	64	60
R-VALUE CORRECTED	70	64	61

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.48	0.58	0.62
EXPANSION PRESSURE THICKNESS, ft.	0.47	0.40	0.33

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION: 70
R-VALUE BY EXUDATION: 64
EQUILIBRIUM R-VALUE: 64

Leighton

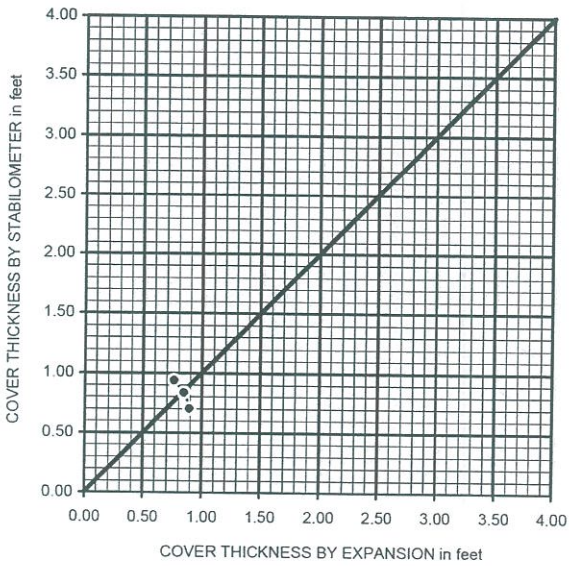
R-VALUE TEST RESULTS

PROJECT NAME:	BLDG 1	PROJECT NUMBER:	601904-001
SAMPLE NUMBER:	B1	SAMPLE LOCATION:	B-10 @ 0-5'
SAMPLE DESCRIPTION:	SM	TECHNICIAN:	SCF
		DATE COMPLETED	7/31/2007

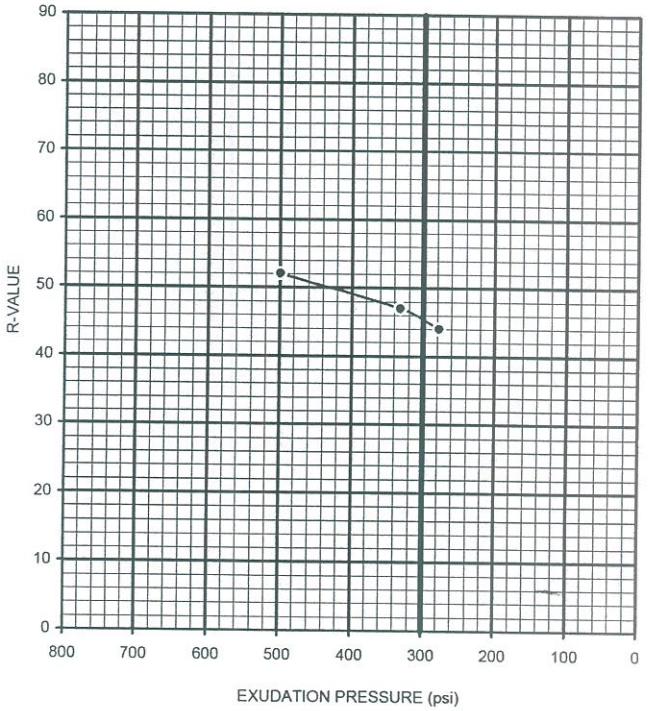
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	10.1	10.6	10.8
HEIGHT OF SAMPLE, Inches	2.46	2.52	2.55
DRY DENSITY, pcf	127.3	124.9	124.2
COMPACTOR PRESSURE, psi	125	75	50
EXUDATION PRESSURE, psi	500	332	278
EXPANSION, Inches x 10exp-4	28	25	21
STABILITY Ph 2,000 lbs (160 psi)	55	61	64
TURNS DISPLACEMENT	4.46	4.60	4.86
R-VALUE UNCORRECTED	52	47	44
R-VALUE CORRECTED	52	47	44

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.77	0.85	0.90
EXPANSION PRESSURE THICKNESS, ft.	0.93	0.83	0.70

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	48
R-VALUE BY EXUDATION:	46
EQUILIBRIUM R-VALUE:	46

Leighton

R-VALUE TEST RESULTS

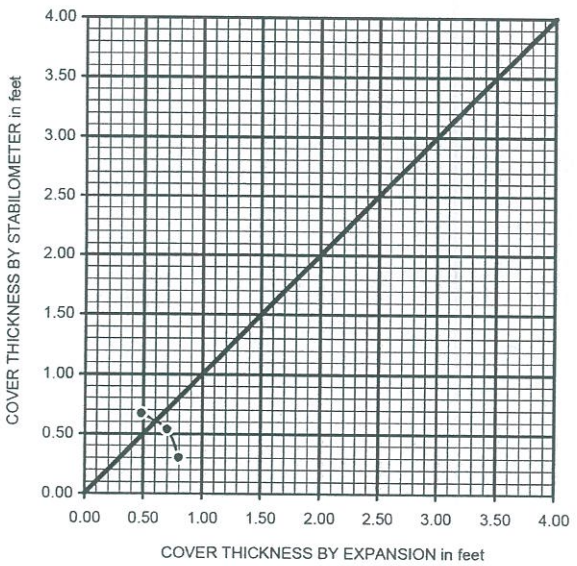
PROJECT NAME: BLDG 1
SAMPLE NUMBER: B1
SAMPLE DESCRIPTION: SM

PROJECT NUMBER: 601904-001
SAMPLE LOCATION: B-16 @ 0-5'
TECHNICIAN: SCF
DATE COMPLETED 7/31/2007

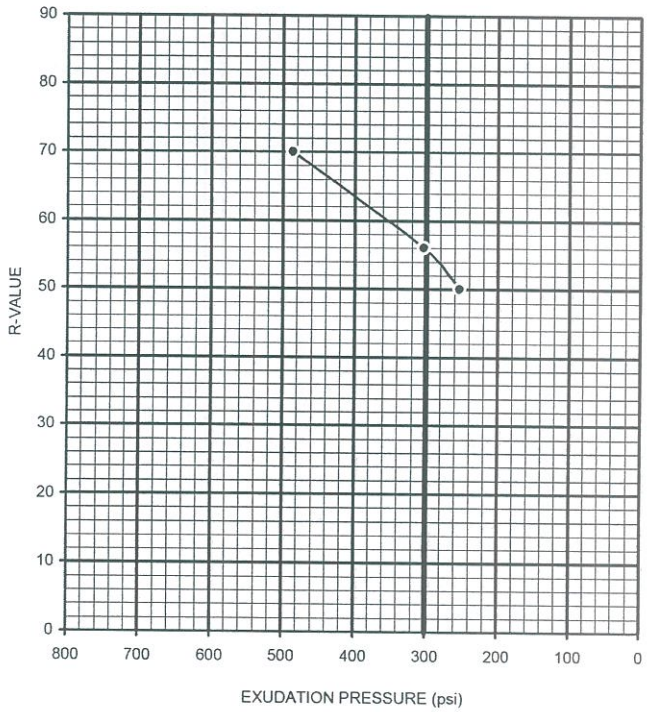
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	9.4	9.8	10.0
HEIGHT OF SAMPLE, Inches	2.51	2.55	2.54
DRY DENSITY, pcf	127.4	126.9	126.0
COMPACTOR PRESSURE, psi	150	100	80
EXUDATION PRESSURE, psi	486	303	254
EXPANSION, Inches x 10exp-4	20	16	9
STABILITY Ph 2,000 lbs (160 psi)	31	48	54
TURNS DISPLACEMENT	4.36	4.63	4.87
R-VALUE UNCORRECTED	70	56	50
R-VALUE CORRECTED	70	56	50

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.48	0.70	0.80
EXPANSION PRESSURE THICKNESS, ft.	0.67	0.53	0.30

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION: 61
R-VALUE BY EXUDATION: 56
EQUILIBRIUM R-VALUE: 56

Leighton

R-VALUE TEST RESULTS

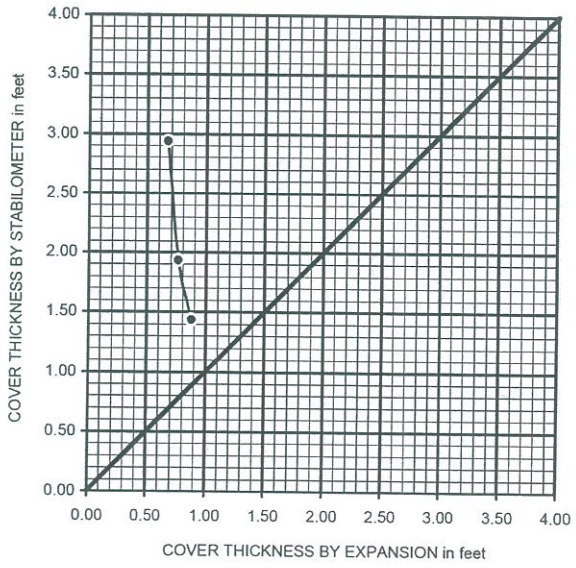
PROJECT NAME: BLDG 1
SAMPLE NUMBER: B1
SAMPLE DESCRIPTION: SM

PROJECT NUMBER: 601904-001
SAMPLE LOCATION: B-25 @ 0-5'
TECHNICIAN: SCF
DATE COMPLETED 7/31/2007

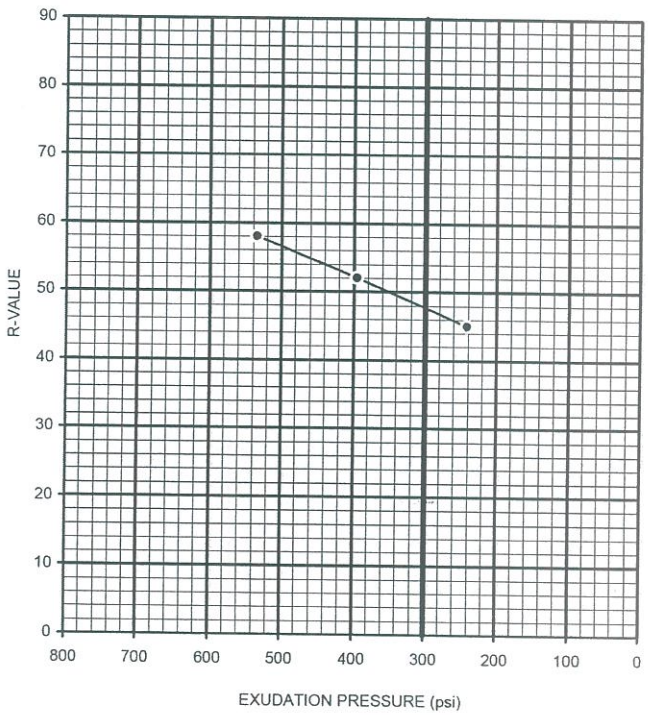
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	10.6	11.0	11.4
HEIGHT OF SAMPLE, Inches	2.49	2.55	2.52
DRY DENSITY, pcf	125.1	124.5	123.4
COMPACTOR PRESSURE, psi	150	100	50
EXUDATION PRESSURE, psi	535	395	242
EXPANSION, Inches x 10exp-4	88	58	43
STABILITY Ph 2,000 lbs (160 psi)	50	57	65
TURNS DISPLACEMENT	4.00	4.17	4.39
R-VALUE UNCORRECTED	58	52	45
R-VALUE CORRECTED	58	52	45

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.67	0.77	0.88
EXPANSION PRESSURE THICKNESS, ft.	2.93	1.93	1.43

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION: 38
R-VALUE BY EXUDATION: 48
EQUILIBRIUM R-VALUE: 38

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TESTS for SULFATE CONTENT
CHLORIDE CONTENT and pH of SOILS

Project Name: Bldg. 1 Tested By : VJ Date: 07/26/07

Project No. : 601904-001 Data Input By: LF Date: 07/31/07

Boring No.	B-7			
Sample No.	B1			
Sample Depth (ft)	0-5			
Soil Identification:	SM			
Wet Weight of Soil + Container (g)	199.89			
Dry Weight of Soil + Container (g)	196.73			
Weight of Container (g)	36.82			
Moisture Content (%)	1.98			
Weight of Soaked Soil (g)	100.22			

SULFATE CONTENT, DOT California Test 417, Part II

Beaker No.	3			
Crucible No.	27			
Furnace Temperature (°C)	840			
Time In / Time Out	7:30 / 8:15			
Duration of Combustion (min)	45			
Wt. of Crucible + Residue (g)	17.6367			
Wt. of Crucible (g)	17.6344			
Wt. of Residue (g) (A)	0.0023			
PPM of Sulfate (A) x 41150	94.65			
PPM of Sulfate, Dry Weight Basis	**97**			

CHLORIDE CONTENT, DOT California Test 422

ml of Chloride Soln. For Titration (B)	30			
ml of $AgNO_3$ Soln. Used in Titration (C)	0.9			
PPM of Chloride (C -0.2) * 100 * 30 / B	70			
PPM of Chloride, Dry Wt. Basis	**71**			

pH TEST, DOT California Test 532/643

pH Value	**7.68**			
Temperature °C	22.5			

Leighton

SOIL RESISTIVITY TEST

DOT CA TEST 532 / 643

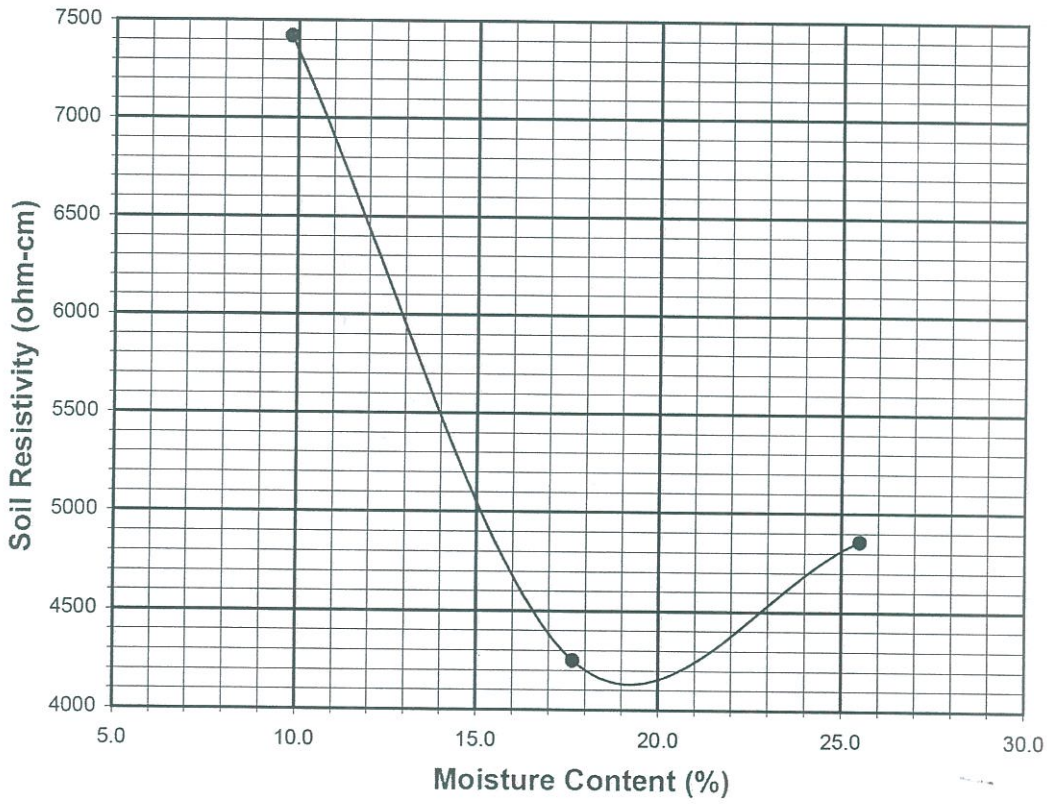
Project Name: Bldg. 1
Project No. : 601904-001
Boring No.: B-7
Sample No. : B1
Soil Identification: SM

Tested By : VJ Date: 07/26/07
Data Input By: LF Date: 07/31/07
Depth (ft.) : 0-5

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	100	9.82	1100	7421
2	200	17.66	630	4250
3	300	25.51	720	4857
4				
5				

Moisture Content (%) (MCi)	1.98
Wet Wt. of Soil + Cont. (g)	199.89
Dry Wt. of Soil + Cont. (g)	196.73
Wt. of Container (g)	36.82
Container No.	
Initial Soil Wt. (g) (Wt)	1300.00
Box Constant	6.746
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532 / 643	
4130	**19.3**	**97**	**71**	**7.68**	**22.5**



Geotechnical
Environmental
Hydrogeology
Material Testing
Construction Inspection

July 25, 2016 Project No. 16-5878

Stirling Development
27422 Portola Parkway, Suite 300
Foothill Ranch, CA 92610

Attention: Mr. Jason Huber, PE – Project Manager

Subject: Limited Geotechnical Investigation, Lot 18, Southern California Logistics Airport, Victorville, California

Jason,

In accordance with your request and authorization, TGR Geotechnical, Inc. (TGR) has performed a preliminary geotechnical investigation for the proposed development at the subject site in the City of Victorville, California. This report presents the findings of our geotechnical investigation, including site seismicity and provides geotechnical design recommendations for the proposed improvements. The work was performed in general accordance with our proposal dated April 4, 2016.

Based on our investigation the proposed development is feasible from a geotechnical viewpoint provided the recommendations presented in this report are implemented during design and construction.

If you have any questions regarding this report, please do not hesitate to contact this office. We appreciate this opportunity to be of service.

Respectfully submitted,

TGR GEOTECHNICAL, INC.





Sanjay Govil, PhD, PE, GE 2382
Principal Geotechnical Engineer

Edward L. Burrows, MS, PG, CEG 1750
Principal Engineering Geologist

TGR GEOTECHNICAL
DBE & 8(a) firm
3037 S. HARBOR BLVD
SANTA ANA, CA 92704
P 714.641.7189 F 714.641.7190
www.tgrgeotech.com

Attachments:

Figure 1 - Site Location Map
Figure 2 - Regional Geology Map
Figure 3 - Regional Fault Map
Plate 1 - Boring Location Map

Appendix A – References
Appendix B – Log of Borings
Appendix C – Laboratory Testing Procedures and Results
Appendix D – EQFAULT

Distribution: (4) Addressee

TGR GEOTECHNICAL
DBE & 8(a) firm
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INTRODUCTION

Site Descriptions and Proposed Project Development

The subject site is located on the southeast corner of Phantom West and George Blvd.at the Southern California Logistics Airport in the City of Victorville, California. The 16.34-acre site is relatively flat and is currently vacant and was the former administration/base support area for the former air force base. A monitoring well (MW-57) was noted in the northern portion of the site. The approximate location of the well is shown on Plate 1. It is our understanding that the proposed development will consist of a 370,040-square foot building with associated truck dock, parking, drive aisles and an infiltration/detention basin.

Scope of Work

The scope of work for this geotechnical investigation included the following:

- Site reconnaissance.
- Excavation of six (6) hollow stem auger borings to depths ranging from approximately 16.5 to 26.5 feet below the existing grade to evaluate soil conditions at the subject site
- Excavation of three (3) exploratory borings with a truck mounted hollow stem auger rig to an approximate depth of 5 feet below existing grade to evaluate the infiltration rate at the location of the proposed water basin area.
- Laboratory testing of selected samples for in-situ moisture density, maximum dry density and optimum moisture content, shear, consolidation, expansion potential, R-value, and corrosion potential.
- Analyses of data, including percolation rates, site seismicity, seismic settlement, and foundation design for proposed improvements, and soils engineering/earthwork with respect to the suitability of the proposed development.
- Preparing this report summarizing current subsurface soil conditions, findings, and presenting our recommendations for the proposed development.

Field Investigation

Field exploration was performed on June 13, 2016 by members from our firm who logged the borings and obtained representative samples, which were subsequently transported to the laboratory for further review and testing. The approximate locations of the borings are indicated on the enclosed Boring Location Map (Plate 1).

The subsurface conditions were explored by drilling, sampling, and logging five borings with a truck mounted hollow stem drill rig to approximate depths ranging from sixteen and a half (16.5) to twenty-six and a half (26.5) feet below existing grade. Subsequent to drilling, all borings were backfilled with cuttings. The logs of borings presenting soil conditions and descriptions are given in Appendix B.

The drill rig was equipped with a sampling apparatus to allow for recovery of driven modified California Ring Sampler (CRS), 3-inch outside diameter, and 2.42-inch inside diameter and SPT

samples. Driven samples and bulk samples of the earth materials encountered at selected intervals were recovered from the borings.

The samples were driven using an automatic 140-pound hammer falling freely from a height of 30-inches. The blow counts for CRS were converted to equivalent SPT blow counts. Soil descriptions were entered on the logs in general accordance with the Unified Soil Classification System (USCS). The locations and depths of the soil samples recovered are indicated on the logs in Appendix B.

Three (3) percolation test borings P-1 through P-3 were advanced to depths of approximately five feet below existing ground surface in the area of the proposed water basin. Subsequent to infiltration testing the borings were backfilled with excavated soils.

Infiltration Testing

The infiltration testing was performed in general accordance with the County of San Bernardino Technical Guidance Document (2011).

The results of our testing are as follows:

P-1 6.4 inches per hour infiltration rate
P-2 6.6 inches per hour infiltration rate
P-3 11.5 inches per hour infiltration rate

The infiltration test rates were determined utilizing the Riverside County Department of Environmental Health Technical Guidance Document (2011).

These results do not include an applied factor of safety.

Laboratory Testing

Laboratory tests were performed on representative samples to verify the field classification of the recovered samples and to evaluate the geotechnical properties of the subsurface soils. The following tests were performed:

- In-situ moisture content (ASTM D2216) and dry density;
- Maximum Dry Density and Optimum Moisture Content (ASTM D1557);
- Corrosion series:
    1. Soluble Sulfate (CAL.417A);
    2. Soluble Chlorides (CAL.422);
    3. Minimum Resistivity (CAL.643); and
    4. pH.
- Consolidation (ASTM D2435);
- Direct Shear Strength (ASTM D3080);
- Expansion Index (ASTM D4829); and
- R-value (CA 301).

Laboratory tests for geotechnical characteristics were performed in general accordance with the ASTM procedures. The results of the in-situ moisture content and density tests are shown on the borings logs (Appendix B). The results of the laboratory tests are presented in Appendix C.

GEOTECHNICAL FINDINGS

Geology

Regional Geologic Setting

The proposed development is located in the western Mojave Desert, in San Bernardino County, California. The area is located within what is known as the Mojave Block, which is a tectonic region bounded by the San Andreas fault to the southwest, and the Garlock fault to the northeast (Dibblee, 1967). The mountains that boarder the Mojave Desert were uplifted along these faults and other secondary faults that generally trend to the northwest across the Mojave Desert. It is theorized that in the geologic past much of this area was intermittently submerged with water, at which time a large amount of sediment was deposited along the valley floor (Dibblee, 1967). The entire region was then intruded by granitic rocks, elevated and subsequently deeply eroded. Finally, during the more recent geologic past, deformation occurred throughout the Mojave Block due to the very active San Andreas, Garlock and associated fault zones (Dibblee, 1967).

On a local scale, the site is underlain by relatively young alluvial fan deposits eroded from the surrounding mountains and deposited in the site vicinity (Morton and Miller, 2003).

Groundwater

Subsurface water was not encountered during the exploration to a maximum depth of 26.5 feet below existing ground surface. Based on site specific monitoring well (MW-57) data provided to us by Mr. Calvin Cox the depth to groundwater is 135 feet.

Seasonal and long-term fluctuations in the groundwater may occur as a result of variations in subsurface conditions, rainfall, run-off conditions and other factors. Therefore, variations from our observations may occur. Static groundwater is not anticipated to impact the proposed development.

Earth Units

Based on our subsurface investigation, the subject area is underlain by Quaternary age alluvial deposits to the maximum depth explored of 26.5 feet below the existing grade. Alluvial deposits at the site consist of light brown to red-brown, dry to moist sandy soils mixed with variable amounts of fines, mostly silts. Occasional silt layers were encountered at depths within 10 to 20 feet below ground surface. Subsurface soils at the site were found to be medium dense to very dense, gradually denser with depth. However, pockets of loose, collapsible soils were encountered at shallow depths (within the upper 5 feet). To reduce potential of post-construction settlement due to collapsible soils, we recommend removal and recompaction of the upper soils. A soil stockpile was located in the northwest portion of the site. The stockpile was approximately 3’ in height. The location of the stockpile is shown on Plate 1. Detailed descriptions of the earth units encountered in our borings are presented in the log of the borings.

Seismic Review

Faulting and Seismicity

The subject site, like the rest of Southern California, is located within a seismically active region as a result of being located near the active margin between the North American and Pacific tectonic plates. The principal source of seismic activity is movement along the northwest-trending regional faults such as the San Andreas, San Jacinto and Elsinore fault zones. These fault systems produce approximately 5 to 35 millimeters per year of slip between the plates.

By definition of the State Mining and Geology Board, an active fault is one which has had surface displacement within the Holocene Epoch (roughly the last 11,000 years). The State Mining and Geology Board has defined a potentially active fault as any fault which has been active during the Quaternary Period (approximately the last 1,600,000 years). These definitions are used in delineating Earthquake Fault Zones as mandated by the Alquist-Priolo Geologic Hazard Zones Act of 1972 and as subsequently revised in 1994 (Hart, 1997) as the Alquist-Priolo Geologic Hazard Zoning Act and Earthquake Fault Zones.

The intent of the act is to require fault investigations on sites located within Special Studies Zones to preclude new construction of certain inhabited structures across the trace of active faults.

The subject site is not included within any Earthquake Fault Zones as created by the Alquist-Priolo Earthquake Fault Zoning Act (Hart, 1997). Our review of geologic literature pertaining to the site area indicates that there are no known active or potentially active faults located within or immediately adjacent to the subject property. The nearest known active fault is the Helendale – South Lockhardt Fault, located approximately 11.6 miles from the subject site.

Other faults close to the site are the North Frontal Fault Zone (16.3 miles away), and the Cleghorn Fault (19.7 miles away). A summary list of faults within a 100-mile radius of the site, obtained from the EQFAULT computer program, is presented in Appendix D. The results include the approximate distance of each fault from the site, the maximum earthquake magnitude and peak site acceleration associated with fault.

Secondary Seismic Hazards

Surface Fault Rupture and Ground Shaking

Since no known faults are located within the site, surface fault rupture is not anticipated. However, due to the close proximity of known active and potentially active faults, severe ground shaking should be expected during the life of the proposed structures.

Liquefaction

Liquefaction is a seismic phenomenon in which loose, saturated, fine-grained granular soils behave similarly to a fluid when subjected to high-intensity ground shaking. Liquefaction occurs when these ground conditions exist: 1) Shallow groundwater; 2) Low density, fine, clean sandy soils; and 3) High-intensity ground motion. Effects of liquefaction can include sand boils, settlement, and bearing capacity failures below foundations.

Groundwater was not encountered in any of our exploratory borings, drilled to a maximum depth of 26.5 feet. Onsite monitoring well data indicates that groundwater has been 135 feet below the surface. Due to the deep historic groundwater level, the potential for liquefaction at the subject site is considered low.

Seismically Induced Settlement

Ground accelerations generated from a seismic event can produce settlements in sands or in granular earth materials both above and below the groundwater table. This phenomenon is often referred to as seismic settlement and is most common in relatively clean sands, although it can also occur in other soil materials. The total seismic settlement for the above subject site is anticipated to be negligible.

Lateral Spreading

Seismically induced lateral spreading involves primarily movement of earth materials due to earth shaking. Lateral spreading is demonstrated by near-vertical cracks with predominantly horizontal movement of the soil mass involved. The topography in the vicinity of the subject site is relatively flat. Therefore, the potential for lateral spreading at the subject site is considered very low.

DISCUSSIONS AND CONCLUSIONS

General

Based on our field exploration, laboratory testing, and geotechnical engineering analysis, the proposed development is considered suitable from a geotechnical viewpoint, provided that the recommendations contained in this report are incorporated into the design and construction phases of the project.

Conclusions

Based on our findings and analyses, the subject site is likely to be subjected to moderate to severe ground shaking due to the proximity of known active and potentially active faults. This may reasonably be expected during the life of the structure and should be designed accordingly.

The engineering evaluation performed concerning site preparation and the recommendations presented are based on information provided to us and obtained by us during our office and fieldwork. This report is prepared for the development of a 339,738 square foot building, with associated parking, drive aisles, and truck docks. In the event that any significant changes are made to the proposed development, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the recommendations of this report are verified or modified in writing by TGR.

RECOMMENDATIONS

Seismic Design Parameters

When reviewing the 2013 California Building Code, the following data should be incorporated into the design.

Latitude (degree)	34.5865
Longitude (degree)	-117.3722
Site Class	D
Site Coefficient, F_a	1.0
Site Coefficient, F_v	1.5
Mapped Spectral Acceleration at 0.2-sec Period, S_s	1.331 g
Mapped Spectral Acceleration at 1.0-sec Period, S_1	0.532 g
Spectral Acceleration at 0.2-sec Period Adjusted for Site Class, S_{MS}	1.331 g
Spectral Acceleration at 1.0-sec Period Adjusted for Site Class, S_{M1}	0.799 g
Design Spectral Acceleration at 0.2-sec Period, S_{DS}	0.887 g
Design Spectral Acceleration at 1.0-sec Period, S_{D1}	0.532 g

The structural consultant should review the above parameters and the 2013 California Building Code to evaluate the seismic design.

Conformance to the criteria presented in the above table for seismic design does not constitute any type of guarantee or assurance that significant structural damage or ground failure will not occur during a large earthquake event. The intent of the code is “life safety” and not to completely prevent damage of the structure, since such design may be economically prohibitive.

Foundation Design Recommendations

The proposed buildings may be supported on continuous and/or spread footings. Bearing capacity recommendations for shallow foundations are presented below. These recommendations assume that the footings will be supported on a minimum of three (3) feet of engineered fill.

For foundations supported on three (3) feet of engineered fill with minimum ninety (90) percent relative compaction an allowable bearing pressure of 2200 pounds per square foot may be used in design.

All shallow foundations should extend a minimum of twenty-four (24) inches below the lowest adjacent grade. The minimum recommended footing width is fifteen (15) inches for continuous footing and twenty-four (24) inches for pad footing. A minimum reinforcement of two (2) No. 4 steel bar top and bottom is required for continuous footings from a geotechnical viewpoint.
A one-third (1/3) increase on the aforementioned bearing pressure may be used in design for short-term wind or seismic loads.

The total static settlement and total differential settlements between adjacent footings supported on compacted fill are not anticipated to exceed 0.75 inches and 0.4 inches over 30 feet, respectively.

Lateral Earth Pressures

The following soil parameters may be used for the design of retaining walls up to 6 feet high with level backfill:

Conditions	Equivalent Fluid Pressure (psf/ft) On-Site Materials
Active (Level)	35
At Rest	55
Passive	300 (maximum 3000 psf)

- Unrestrained retaining wall, such as a cantilever wall, the active earth pressure shall be used.
- Any import backfill shall be granular non-expansive select fill with a minimum sand equivalent of 30 The import fill should be tested and approved by TGR prior to backfill.
- An allowable coefficient of friction between properly compacted on-site fill soil and concrete of 0.40 may be used with the dead-load forces.
- Passive pressure and frictional resistance could be combined in determining the total lateral resistance. However, one of them shall be reduced by 50 percent.
- The passive pressure in the upper 6 inches of soil not confined by slabs or pavement should be neglected.

Retaining structures should be provided with a drainage system to prevent buildup of hydrostatic pressure behind the walls. Provisions should be made to collect and dispose of excess water away from the wall. Wall drainage may be provided by a perforated pipe encased in gravel or crushed rock and enclosed by geo-synthetic filter fabric. We do not recommend omitting the drains behind walls.

In addition to the above lateral forces due to retained earth, surcharge due to improvements, such as an adjacent structure, should be considered in the design of the retaining wall. A minimum vertical surcharge load of 300 psf should be used in design of walls due to adjacent traffic unless the traffic is kept at least 6 feet from the walls. Loads applied within a 1:1 projection from any surcharging structure on the stem of the wall shall be considered as lateral surcharge. For uniform lateral surcharge conditions applied to free-to-deflect walls and restrained walls, we recommend utilizing a minimum horizontal load equal to 33 percent and 50 percent of the vertical load, respectively, and should be applied uniformly over the entire height of the wall. This horizontal load should be applied below the 1:1 projection plane. To minimize the surcharge load from an adjacent footing, deepened footings may be considered.

Retaining wall footings should have a minimum embedment of 24 inches below the lowest adjacent grade unless deeper footings are needed for other reasons. The retaining walls

footings shall be supported on a minimum 2 feet of compacted engineered-fill compacted to a minimum 90 percent relative compaction as per ASTM D1557.

Cement Type and Corrosion

Concrete used should be designed in accordance with the provisions of ACI 318-11, Chapter 4 for Exposure Class S0.

Corrosion tests indicate mild corrosion potential for ferrous metals exposed to site soils.

TGR does not practice corrosion engineering. If needed, a qualified specialist should review the site conditions and evaluate the corrosion potential of the site soil to the proposed improvements and to provide the appropriate corrosion mitigations for the project.

Expansion Potential

The site subsurface soils consist of sandy soils having a very low expansion potential. Any import soils should have a very low expansion potential (EI<20). Prior to importing soils for backfill operations, the expansion potential shall be evaluated per ASTM D4829 to confirm conformance of the material to the recommendations of this report.

Slab-On-Grade

Slab-on-grade should be a minimum of 5-inches thick supported on a minimum of 3 feet of properly compacted fill. Prior to placement of concrete, the subgrade soils should be well moistened to near optimum moisture content and verified by our field representative. The actual thickness and reinforcement of the slab shall be designed by the structural engineer and should include the anticipated loading condition (fork lift etc.), the anticipated use of the building, and should incorporate mitigation measures for shrinkage, expansion and thermal cracking. Slab-on-grade shall have a vapor retarder and capillary break where moisture sensitive flooring is proposed. The floor slab should be underlain by an impermeable polyethylene membrane (Stego Wrap, Moistop Plus, or any equivalent meeting the requirements of ASTM D1745) as a capillary break. The membrane shall be a minimum 10-mil thick and be provided with a 2-inch thick layer of moistened (not saturated) sand top and bottom to both protect the membrane and provide proper concrete curing. The polyethylene membrane joints should be lapped not less than 6 inches.

Flatwork

Flatwork should be a minimum of 4-inches thick. The subgrade material should be compacted to a minimum of 90 percent of the maximum laboratory dry density (ASTM 1557) to a minimum depth of two (2) feet. Prior to placement of concrete, the subgrade soils should be well moistened to at least optimum moisture content and verified by our field representative. The actual thickness and reinforcement of the flatwork shall be designed by the structural engineer and should include the anticipated loading condition, the anticipated use of the flatwork, and should incorporate mitigation measures for shrinkage, expansion and thermal cracking.

Site Development Recommendations

General

During earthwork construction, all site preparation and the general procedures of the contractor should be observed, and the fill selectively tested by a representative of TGR. If unusual or unexpected conditions are exposed in the field, they should be reviewed by this office and if warranted, modified and/or additional recommendations will be offered.

Grading

All grading should conform to the guidelines presented in the California Building Code (2013 edition), except where specifically superseded in the text of this report. Prior to grading, TGR's representative should be present at the pre-construction meeting to provide grading guidelines, if needed, and review any earthwork.

Within the proposed building footprint areas, remedial overexcavation should extend at least three feet below the existing grade. To support the foundation a minimum three (3) feet of approved engineered fill should be placed under the footings. A minimum of three (3) feet of engineered fill is recommended under slab-on-grade, and a minimum of two (2) feet of engineered fill is recommended under flatwork, and pavement. Due to the presence of localized loose, collapsible soils across the site at shallow depths, deeper overexcavation may be required underneath the footings depending on the exposed removal bottom. Site soils could be reused as engineered fill provided the recommendations presented in this report are implemented. Exposed bottoms should be scarified a minimum of 6-inches, moisture conditioned and compacted to a minimum 90 percent relative compaction. Subsequently, site fill soils should be re-compacted to a minimum of ninety (90) percent relative compaction at a minimum of optimum moisture content. The lateral extent of removals beyond the building/structure/footing limits should be equal to at least the depth of fill or 5 feet, whichever is greater.

The depth of over-excavation should be reviewed by the Geotechnical Consultant during the actual construction. Any subsurface obstruction buried structural elements, and unsuitable material encountered during grading, should be immediately brought to the attention of the Geotechnical Consultant for proper exposure, removal and processing, as recommended.

Fill Placement

Prior to any fill placement TGR should observe the exposed surface soils. The site soils may be re-used as engineered fill provided they are free of organic content and particle size greater than 4-inches. Fill shall be moisture-conditioned to a minimum of optimum and compacted to a minimum relative compaction of 90 percent in accordance with ASTM D1557. Any import soils shall be non expansive and approved by TGR Geotechnical Inc.

Compaction

Prior to fill placement, the exposed surface should be scarified to a minimum depth of six (6) inches, fill placed in six (6) inches loose lifts if cohesionless and eight (8) inches loose lifts if cohesive fill, moisture conditioned to near optimum for cohesionless soils or a minimum of two (2) percent over optimum moisture for cohesive soils, and compacted to a minimum relative compaction of ninety (90) percent in accordance with ASTM D 1557.

Shrinkage and Subsidence

The volume changes of excavated onsite soils upon recompaction is expected to vary with materials, density, in-situ moisture content, location and compaction effort. The in-place and compacted densities of soil materials vary and an accurate overall determination of shrinkage and bulking cannot be made. Based on our limited geotechnical laboratory testing, we expect a recompaction shrinkage (when recompacted to an average of 92-percent relative compaction per ASTM D1557)) of 10- to 20-percent by volume within the upper 10 feet.

Trenching

All excavations should conform to CAL-OSHA and local safety codes.

Drainage

Positive site drainage should be maintained at all times. Water should be directed away from foundations and not allowed to pond and/or seep into the ground. Pad drainage should be directed towards street/parking or other approved area.

Utility Trench Backfill

All utility trench backfill in structural areas and beneath hardscape features should be brought to near-optimum moisture content and compacted to a minimum relative compaction of 90 percent of the laboratory standard.

Sand backfill, (unless trench excavation material), should not be allowed in parallel exterior trenches adjacent to and within an area extending below a 1:1 plane projected from the outside bottom edge of the footing. All trench excavations should minimally conform to CAL-OSHA and local safety codes. Soils generated from utility trench excavations may be used provided it is moisture conditioned and compacted to 90 percent minimum relative compaction.

Preliminary Pavement Design

The Caltrans method of design was utilized to develop the following asphalt pavement section. The section was developed based on the tested “R-Value” of 76 on site near surface subgrade soils.

A traffic index of 4.5, 5, 6, and 7 were assumed for use in the evaluation of automobile parking stalls and driveways, medium and heavy truck driveways, respectively. The traffic indices are subject to approval by controlling authorities and shall be approved by the project civil engineer.

ASPHALT PAVEMENT SECTION					PCC PAVEMENT SECTION		
Pavement Utilization	Traffic Index	Asphalt (Inch)	Aggregate Base (Inch)	Total (Inch)	PCC	Aggregate Base (Inch)	Total (Inch)
Auto Parking	4.5	4.0	4.0	8.0	*4.5	--	4.5
Auto Driveways	5.0	4.0	4.0	8.0	*5.0	--	5.0
Truck Aisles/ Driveways	6.0	4.0	4.0	8.0	*6	0	6
	7.0	4.0	5.0	9.0	*6	0	6

*Minimum concrete compressive strength of 4,500 psi.

Aggregate base material should consist of CAB/CMB complying with the specifications in Section 200.2.2 of the current "Standard Specifications for Public Works Construction" and should be compacted to at least ninety-five (95) percent of the maximum dry density (ASTM D1557). The surface of the aggregate base should exhibit a firm and unyielding condition just prior to the placement of asphalt concrete paving. Asphalt concrete shall comply with Greenbook requirements.

The pavement subgrade should be constructed in accordance with the recommendations presented in the grading section of this report. However, asphalt or concrete pavement supported on subgrade without base material should be underlain by minimum 2 feet of 95 percent compacted material per ASTM D1557 at near optimum moisture content.

The design ADTT (Average Daily Truck Traffic) in both directions for the proposed pavements is 400 or less.

The PCC pavement should be minimally reinforced with #4 bars at 24-inches on center in two perpendicular directions. The maximum joint spacing shall be 10 feet on center.

PCC driveway and parking lots should have dowel connections at transverse joints and concrete shoulders.

The R-value and the associated pavement section should be conformed at the completion of site grading.

Geotechnical Review of Plans

All grading and foundation plans should be reviewed and accepted by the geotechnical consultant prior to construction. If significant time elapses since preparation of this report, the geotechnical consultant should verify the current site conditions, and provide any additional recommendations (if necessary) prior to construction.

Geotechnical Observation/Testing During Construction

The geotechnical consultant should perform observation and/or testing at the following stages:

- During any grading and fill placement;
- After foundation excavation and prior to placing concrete;
- During placement of aggregate base and asphalt concrete;
- When any unusual soil conditions are encountered during any construction operation subsequent to issuance of this report.

Limitations

This report was prepared for a specific client and a specific project, based on the client's needs, directions and requirements at the time.

This report was necessarily based upon data obtained from a limited number of observances, site visits, soil and/or other samples, tests, analyses, histories of occurrences, spaced subsurface exploration and limited information on historical events and observations. Such information is necessarily incomplete. Variations can be experienced within small distances and under various climatic conditions. Changes in subsurface conditions can and do occur over time.

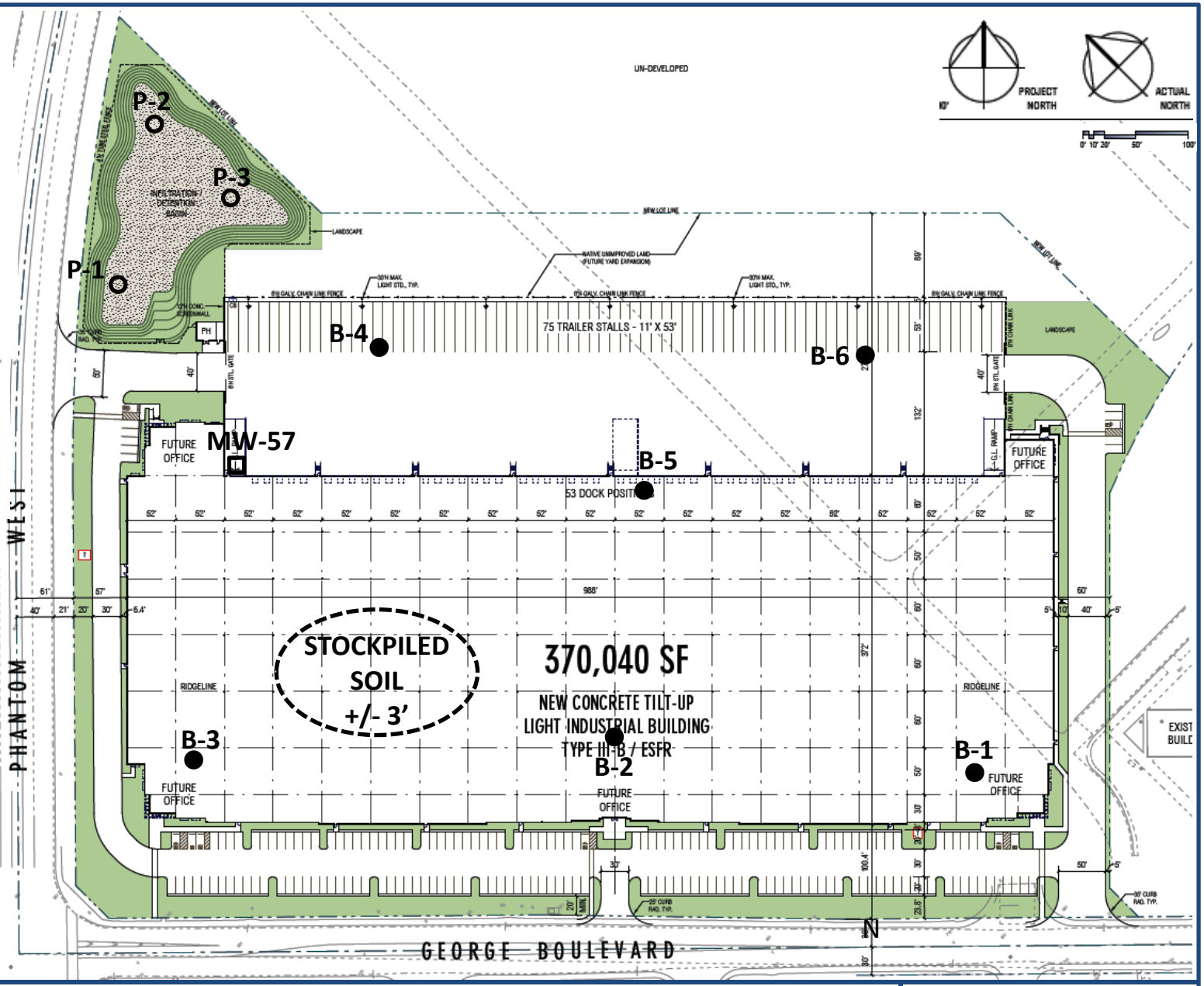
This report is not authorized for use by, and is not to be relied upon by any party except the client with whom TGR contracted for the work. Use or reliance on this report by any other party is that party's sole risk. Unauthorized use of or reliance on this report constitutes an agreement to defend and indemnify TGR from and against any liability which may arise as a result of such use or reliance, regardless of any fault, negligence, or strict liability of TGR.

MW-57 APPROXIMATE LOCATION OF MONITORING WELL MW-57

APPROXIMATE LOCATION OF STOCKPILED SOILS (~3' HIGH)

P-3 APPROXIMATE LOCATION OF PERCOLATION TEST

B-6 APPROXIMATE LOCATION OF EXPLORATORY BORING

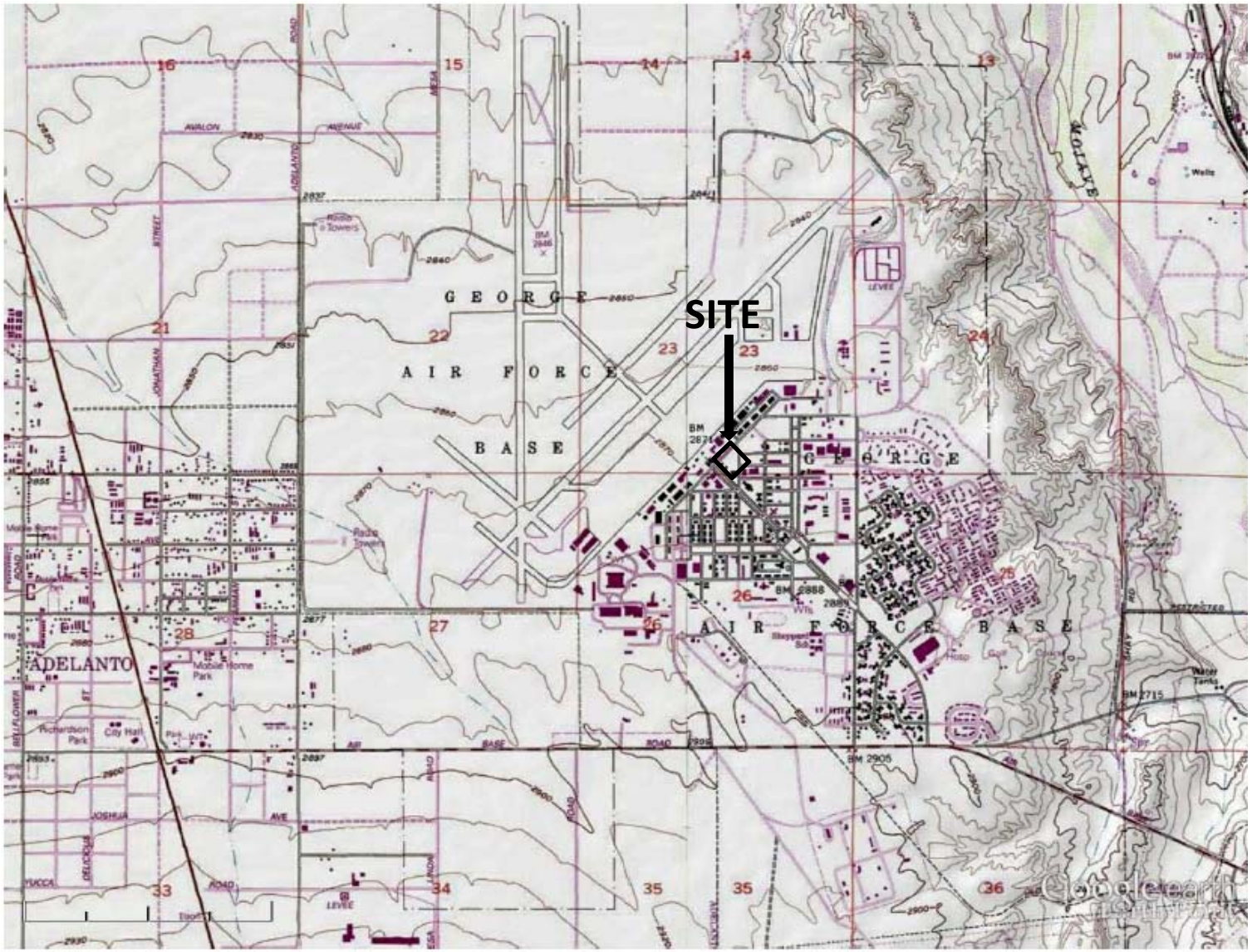


TGR Geotechnical Environmental Hydrogeology Material Testing Construction Inspection

BORING LOCATION MAP
SOUTHERN CALIFORNIA LOGISTICS AIRPORT, LOT 18
VICTORVILLE, CALIFORNIA

PROJECT NO. 16-5878

PLATE 1

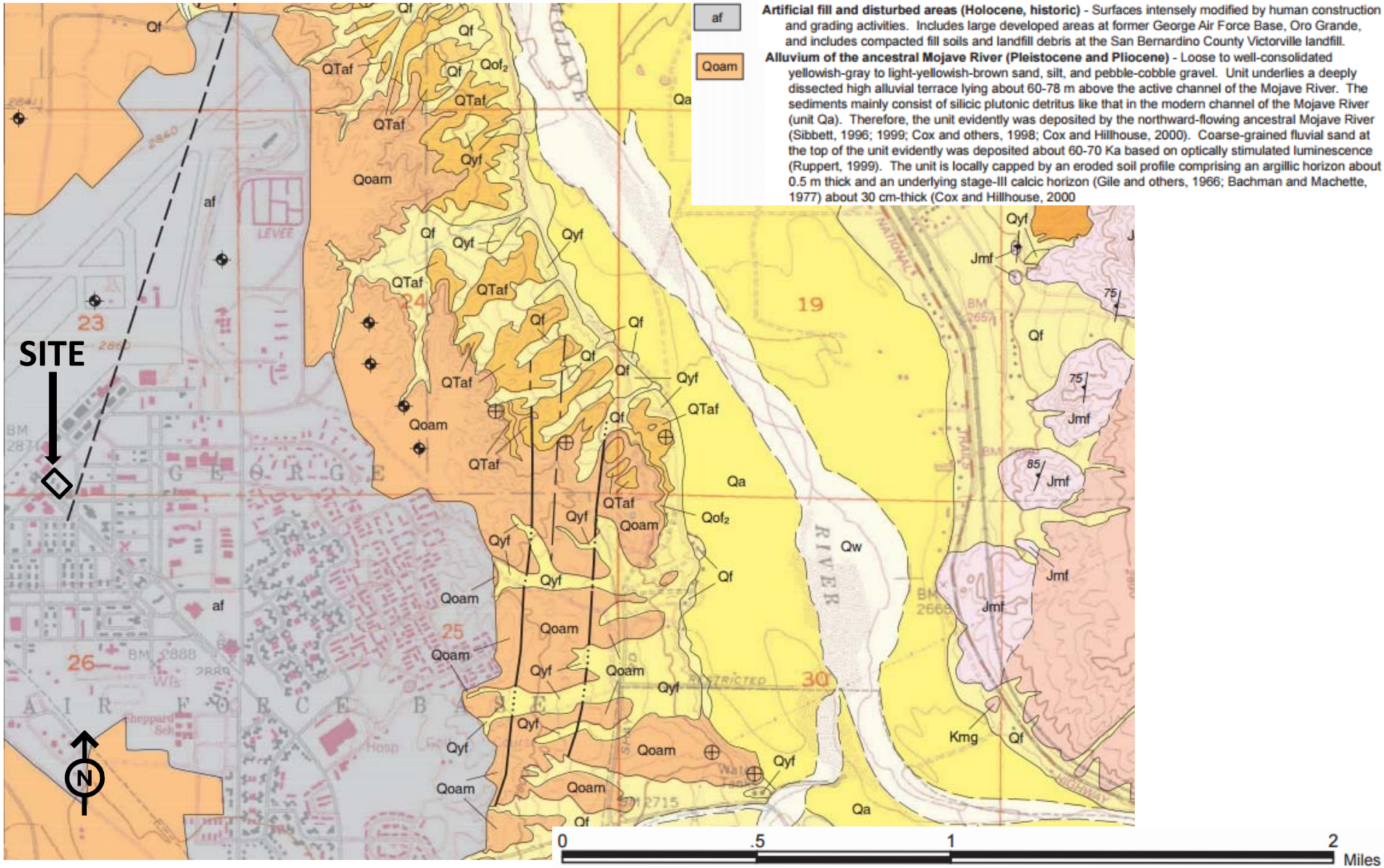


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Material Testing
Construction Inspection

SITE LOCATION MAP
SOUTHERN CALIFORNIA LOGISTICS AIRPORT, LOT 18
VICTORVILLE, CALIFORNIA

PROJECT NO. 16-5878

FIGURE 1



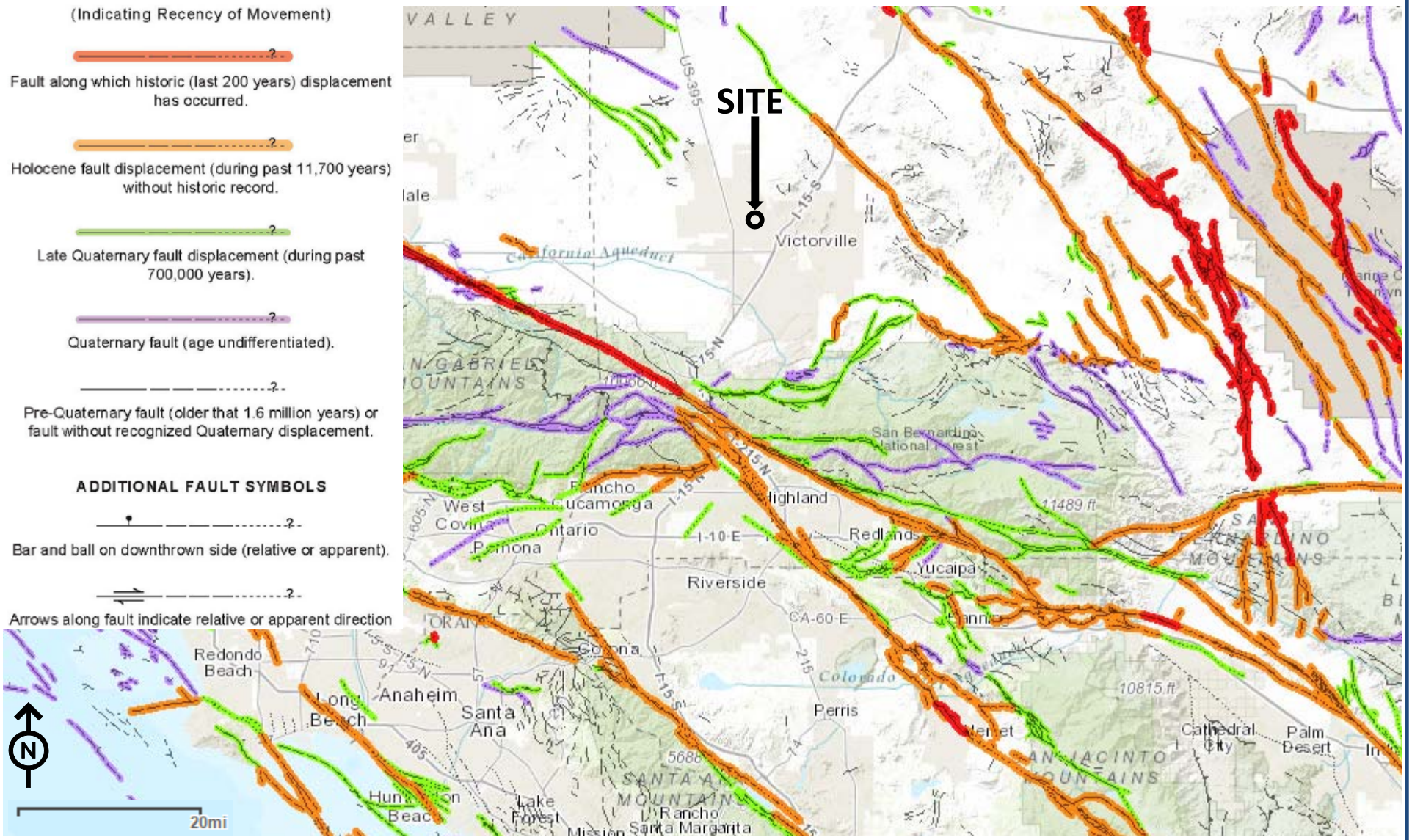
Modified From: Hernandez, J.L., Brown, H.J., and Cox, B.F., 2008, Geologic Map of the Victorville 7.5' Quadrangle, San Bernardino County, California: A Digital Database, Version 1.0, California Department of Conservation, Division of Mines and Geology and California Geological Survey, scale 1:24,000.

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REGIONAL GEOLOGY MAP
SOUTHERN CALIFORNIA LOGISTICS AIRPORT, LOT 18
VICTORVILLE, CALIFORNIA

PROJECT NO. 16-5878

FIGURE 2



Modified From: Jennings, C. W., 2010, Fault Activity Map of California and Adjacent Areas, California Division of Mines and Geology, Geologic Data Map Series, No. 6, Scale 1:750,000.

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REGIONAL FAULT MAP
SOUTHERN CALIFORNIA LOGISTICS AIRPORT, LOT 18
VICTORVILLE, CALIFORNIA

PROJECT NO. 16-5878

FIGURE 3

APPENDIX A
REFERENCES

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APPENDIX A

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USGS, Earthquakes Hazard Program Website http://earthquake.usgs.gov/eqcenter/ for historic earthquakes.

APPENDIX B
LOG OF BORINGS

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THE FOLLOWING DESCRIBES THE TERMS AND SYMBOLS USED ON THE LOG OF BORINGS TO SUMMARIZE THE RESULTS OBTAINED IN THE FIELD INVESTIGATION AND SUBSEQUENT LABORATORY TESTING.

DENSITY AND CONSISTENCY

The consistency of fine grained soils and the density of coarse grained soils are described on the basis of the Standard Penetration Test as follows:

COARSE GRAINED SOILS		Estimated Unconfined Compressive Strength (Tsf)	FINE GRAINED SOILS	
Very Loose	< 4	< 0.25	Very soft	< 2
Loose	4 – 10	0.35 – 0.50	Soft	2 – 4
Medium	10 – 30	0.50 – 1.0	Firm (medium)	4 – 8
Dense	30 – 50	1.0 – 2.0	Stiff	8 – 15
Very dense	> 50	2.0 – 4.0	Very stiff	15 – 30
		> 4.0	Hard	> 30

PARTICULE SIZE DEFINITION (As per ASTM D2487 And D422)

Boulder	⇒ Larger than 12 inches	Coarse Sands	⇒ No. 10 to No. 4 sieve
Cobbles	⇒ 3 to 12 inches	Medium Sands	⇒ No. 40 to No. 10 sieve
Coarse Gravel	⇒ 3/4 to 3 inches	Fine Sands	⇒ No. 200 to 40 sieve
Fine Gravel	⇒ No. 4 to 3/4 inches	Silt	⇒ 5μm to No. 200 sieve
		Clay	⇒ Smaller than 5μm

SOIL CLASSIFICATION

Soils and bedrock are classified and described based on their engineering properties and characteristics and using ASTM D2487 and D2488.

Percentage description of minor components

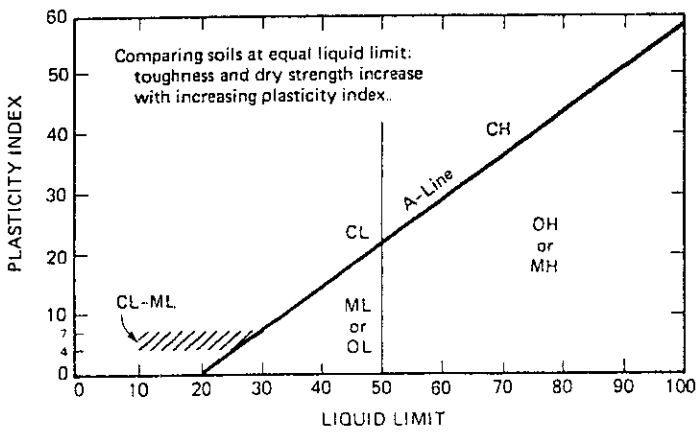
Trace	1-10 %	Some	20-35 %
Little	10-20 %	And or y	35-50 %

Stratified soils description

Parting	0 to 1/16 inch thick	Layer	½ to 12 inches thick
Seam	1/16 to ½ inch thick	Stratum	> 12 inches thick

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS	CLASSIFICATION CRITERIA
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 4$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1$ to 3
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES	Not meeting all above requirements
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES	Atterberg limits below "A" line or $I_p < 4$
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES	Atterberg limits above "A" line or $I_p > 7$
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 6$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1$ to 3
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES	Not meeting all above requirements
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES	Atterberg limits below "A" line or $I_p < 4$
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES	Atterberg limits above "A" line or $I_p > 7$
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	$W_L < 50$
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	$W_L < 30$
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	$W_L < 50$
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS	$W_L > 50$
				CH	INORGANIC CLAYS OF HIGH PLASTICITY	$W_L > 50$
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	$W_L > 50$
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	Strong color or odor and often fibrous texture



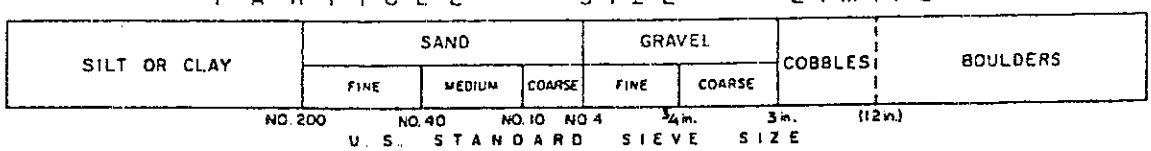
LABORATORY TEST DESIGNATIONS

BR	Bearing Ration	PP	Pocket Penetrometer
C	Consolidation	R	R-Value
COR	Corrosion Test	S	Direct Shear
Chl	Water Soluble Chlorides	SA	Sieve Analysis
EI	Expansive Index	SE	Sand Equivalent
ER	Electrical Resistivity	Sg	Specific Gravity
K	Permeability	SO_4	Water Soluble Sulfates
MC	Moisture Content	SV	Shear Vane
OC	Organic Content	TC	Triaxial Compression
PH	PH Test	UC	Unconfined Compression

ADDITIONAL SOIL CLASSIFICATION

Fill	Ss Sandstone	Ms Siltstone	Bdr Bedrock

PARTICLE SIZE LIMITS



TGR GEOTECHNICAL, INC.

LOG OF BORING EXPLANATION

PLATE 1

LOG OF EXPLORATORY BORING B-1

Project Number: **16-5878**
Project Name: **Stirling SCLA Lot 18**
Date Drilled: **6/13/16 - 6/13/16**
Ground Elev:

Logged By: **ELB**
Project Engineer: **SG**
Drill Type: **Hollow Stem**
Drive Wt & Drop: **140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							Sand- light brown, dry to slightly moist, firm, medium to coarse grained.			
			■	11		SP		2	110	Corr., Shear
5			■	16		SP	...contains scattered gravels.	2	115	
10			■	27		SP		1	119	
15			■	34		SP		1	114	
20			⊠	42		SP	...fine to medium grained sand.	2		
25			⊠	32		SM	Silty Sand- brown, slightly moist, firm, fine sand.	13		
							Total Depth: 26.5 feet below existing grade. No groundwater encountered during drilling. No caving observed. Boring backfilled with soil cuttings upon completion.			

LOG OF BORING 16-5878 STIRLING SCLA LOT 18 VICTORVILLE.GPJ TGR GEOTECH.GDT 6/28/16

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 2

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-2

Project Number: **16-5878**
Project Name: **Stirling SCLA Lot 18**
Date Drilled: **6/13/16 - 6/13/16**
Ground Elev:

Logged By: **ELB**
Project Engineer: **SG**
Drill Type: **Hollow Stem**
Drive Wt & Drop: **140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							Sand- light brown, dry to slightly moist, firm, slightly cemented, medium to coarse grained.			
			■	18		SP		1	118	
5			■	12		SP	...medium grained.	2	112	
10			■	22		SP	...medium to coarse grained with scattered gravels.	1	118	
15			■	30		SP		11	117	
20			⊠	30		SP	...no visible gravel.	2		
25			⊠	38		SP		5		
							Total Depth: 26.5 feet below existing grade. No groundwater encountered during drilling. No caving observed. Boring backfilled with soil cuttings upon completion.			

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 3

TGR GEOTECHNICAL, INC.

LOG OF BORING 16-5878 STIRLING SCLA LOT 18 VICTORVILLE.GPJ TGR GEOTECH.GDT 6/28/16

LOG OF EXPLORATORY BORING B-3

Project Number: **16-5878**
Project Name: **Stirling SCLA Lot 18**
Date Drilled: **6/13/16 - 6/13/16**
Ground Elev:

Logged By: **ELB**
Project Engineer: **SG**
Drill Type: **Hollow Stem**
Drive Wt & Drop: **140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							Sand- light brown, dry, firm, medium to coarse grained.			
			■	8		SP		1	117	
5			■	10		SP	...contains scattered gravels.	2	112	
10			■	24		SP		1	119	
							Silty Sand- brown, slightly moist, firm, slight cementation.			
15			■	>50		SM		11	127	
							Sand- light brown, slightly moist, firm, medium to coarse sand.			
20			⊠	32		SP		1		
25			⊠	35		SP		2		
							Total Depth: 26.5 feet below existing grade. No groundwater encountered during drilling. No caving observed. Boring backfilled with soil cuttings upon completion.			

LOG OF BORING 16-5878 STIRLING SCLA LOT 18 VICTORVILLE.GPJ TGR GEOTECH.GDT 6/28/16

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 4

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-4

Project Number: **16-5878**
Project Name: **Stirling SCLA Lot 18**
Date Drilled: **6/13/16 - 6/13/16**
Ground Elev:

Logged By: **ELB**
Project Engineer: **SG**
Drill Type: **Hollow Stem**
Drive Wt & Drop: **140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
			■	6		SP	Sand- light brown, dry, loose, fine grained, scattered gravels.	1	99	EI, R-value
5			■	13		SP	...medium to coarse grained, scattered gravels.	1	116	
10			■	43		SM	Silty Sand- light brown, slightly moist, firm.	12	137	
15			■	47		SP	Sand- light brown to tan, slightly moist, firm, medium to coarse grained.	1	120	
							Total Depth: 16.5 feet below existing grade. No groundwater encountered during drilling. No caving observed. Boring backfilled with soil cuttings upon completion.			
20										

LOG OF BORING 16-5878 STIRLING SCLA LOT 18 VICTORVILLE.GPJ TGR GEOTECH.GDT 6/28/16

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 5

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-5

Project Number: **16-5878**
Project Name: **Stirling SCLA Lot 18**
Date Drilled: **6/13/16 - 6/13/16**
Ground Elev:

Logged By: **ELB**
Project Engineer: **SG**
Drill Type: **Hollow Stem**
Drive Wt & Drop: **140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							Sand- light brown, dry, medium dense, fine to medium grained.			
			■	12		SP		1	106	
5			■	19		SP	...with scattered gravels.	1	117	
10			■	>50		SP	...becomes brown, fine grained sand, slightly moist.	9	113	
15			■	40		SP	...becomes light brown, medium to coarse sand with scattered gravels.	1	119	
20			⊠	48		SP	...becomes medium grained.	2		
25			⊠	26		SP	...becomes brown, fine grained sand.	10		
							Total Depth: 26.5 feet below existing grade. No groundwater encountered during drilling. No caving observed. Boring backfilled with soil cuttings upon completion.			

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 6

TGR GEOTECHNICAL, INC.

LOG OF BORING 16-5878 STIRLING SCLA LOT 18 VICTORVILLE.GPJ TGR GEOTECH.GDT 6/28/16

LOG OF EXPLORATORY BORING B-6

Project Number: **16-5878**
Project Name: **Stirling SCLA Lot 18**
Date Drilled: **6/13/16 - 6/13/16**
Ground Elev:

Logged By: **ELB**
Project Engineer: **SG**
Drill Type: **Hollow Stem**
Drive Wt & Drop: **140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							Sand- light brown, dry, firm, medium to coarse grained with scattered gravels.			
			■	10		SP		2	113	Max
5							...becomes brown fine grained sand, slightly moist.			
			■	33		SP		8	116	Consol
10							...becomes reddish brown.			
			■	44		SP		6	116	
15							...becomes light reddish brown to tan, medium to coarse sand.			
			■	33		SP		2	117	
							Total Depth: 16.5 feet below existing grade. No groundwater encountered during drilling. No caving observed. Boring backfilled with soil cuttings upon completion.			
20										
25										

LOG OF BORING 16-5878 STIRLING SCLA LOT 18 VICTORVILLE.GPJ TGR GEOTECH.GDT 6/28/16

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 7

TGR GEOTECHNICAL, INC.

APPENDIX C
LABORATORY TEST RESULTS

TGR GEOTECHNICAL
DBE & 8(a) firm
3037 S. HARBOR BLVD
SANTA ANA, CA 92704
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APPENDIX C

Laboratory Testing Procedures and Results

Direct Shear Tests: Direct shear test was performed on a selected remolded sample, which was soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. After transfer of the sample to the shear box, and reloading the sample, pore pressures set up in the sample due to the transfer were allowed to dissipate for a period of approximately 1-hour prior to application of shearing force. The sample was tested under various normal loads, a motor-driven, strain-controlled, direct-shear testing apparatus at a strain rate of less than 0.001 to 0.5 inches per minute (depending upon the soil type). The test result is presented in the test data.

Sample Location	Sample Description	Friction Angle (degrees)	Apparent Cohesion (psf)
B-1 @ 0-5 feet	Sand (Remolded)	32	325

Soluble Sulfates: The soluble sulfate content of selected sample was determined by standard geochemical methods. The test result is presented in the table below:

Sample Location	Sample Description	Water Soluble Sulfate in Soil, (% by Weight)	Sulfate Content (ppm)	Exposure Class*
B-1 @ 0-5 feet	Sand	0.0115	115	S0

* Based on the current version of ACI 318-11 Building Code, Table No. 4.2.1; Exposure Categories and Classes.

Corrosivity Test: Electrical conductivity, pH, and soluble chloride tests were conducted on representative samples and the results are provided below and attached:

Sample Location	Sample Description	Soluble Chloride (CAL.422) ppm	Electrical Resistivity (CAL.643) (ohm-cm)	PH (CAL.747)	Potential Degree of Attack on Steel
B-1 @ 0-5 feet	Sand	32	4,300	7.8	Mild

Moisture and Density Determination Tests: Moisture content and dry density determinations were performed on relatively undisturbed samples obtained from the test borings. The results of these tests are presented in the boring logs. Where applicable, only moisture content was determined from "undisturbed" or disturbed samples.

Maximum Density Tests: The maximum dry density and optimum moisture content of typical materials were determined in accordance with ASTM Test Method D1557. The results of these tests are presented in the test data and in the table below:

Sample Location	Sample Description	Maximum Dry Density (Pcf)	Optimum Moisture Content (%)
B-6 @ 0-5 feet	Sand	130.0	7.5

Consolidation Tests (ASTM D2435): Consolidation test were performed on selected, relatively undisturbed ring samples. Samples were placed in a consolidometer and loads were applied in geometric progression. The percent consolidation for each load cycle was recorded as the ratio of the amount of vertical compression to the original 1-inch height. The consolidation pressure curves are presented in Appendix C.

Expansion Index Tests: The expansion potential of selected materials was evaluated by the Expansion Index Test, ASTM D4829. Specimens are molded under a given compactive energy to approximately the optimum moisture content and approximately 50 percent saturation or approximately 90 percent relative compaction. The prepared 1-inch thick by 4-inch diameter specimens are loaded to an equivalent 144 psf surcharge and are inundated with tap water until volumetric equilibrium is reached. The results of these tests are presented in the table below:

Sample Location	Sample Description	Expansion Index	Expansion Potential
B-4 @ 0-5 feet	Sand	0	Very Low

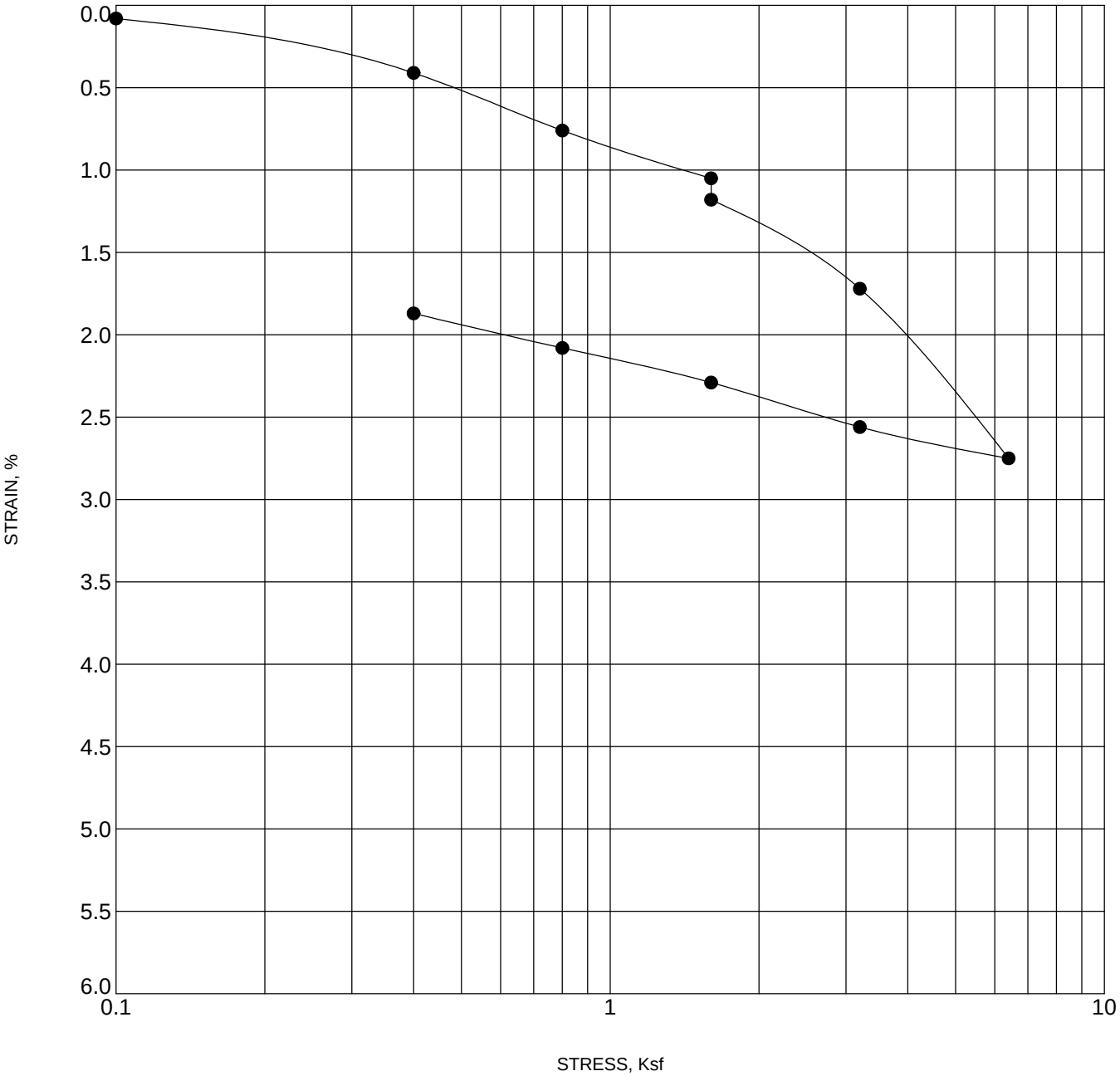
R-Value: The resistance “R”-Value was determined by the California Materials Method No. 301 for subgrade soils. One sample was prepared and exudation pressure and “R”-Value determined. The graphically determined “R”-Value at exudation pressure of 300 psi is summarized in the table below:

Sample Location	Sample Description	R-Value
B-4 @ 0-5 feet	Sand	76

Wash Sieve Test: Typical materials were washed over No. 200 sieve (ASTM Test Method D1140). The test results are presented below:

Sample Location	% Passing No. 200 Sieve
P-2 @ 0-5 feet	13.4%
P-3 @ 0-5 feet	9.9%

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www.tgrgeotech.com



Specimen Identification		Classification	γ_d	MC%
● **B-6** **5.0**		**Sand**	**116**	**8**

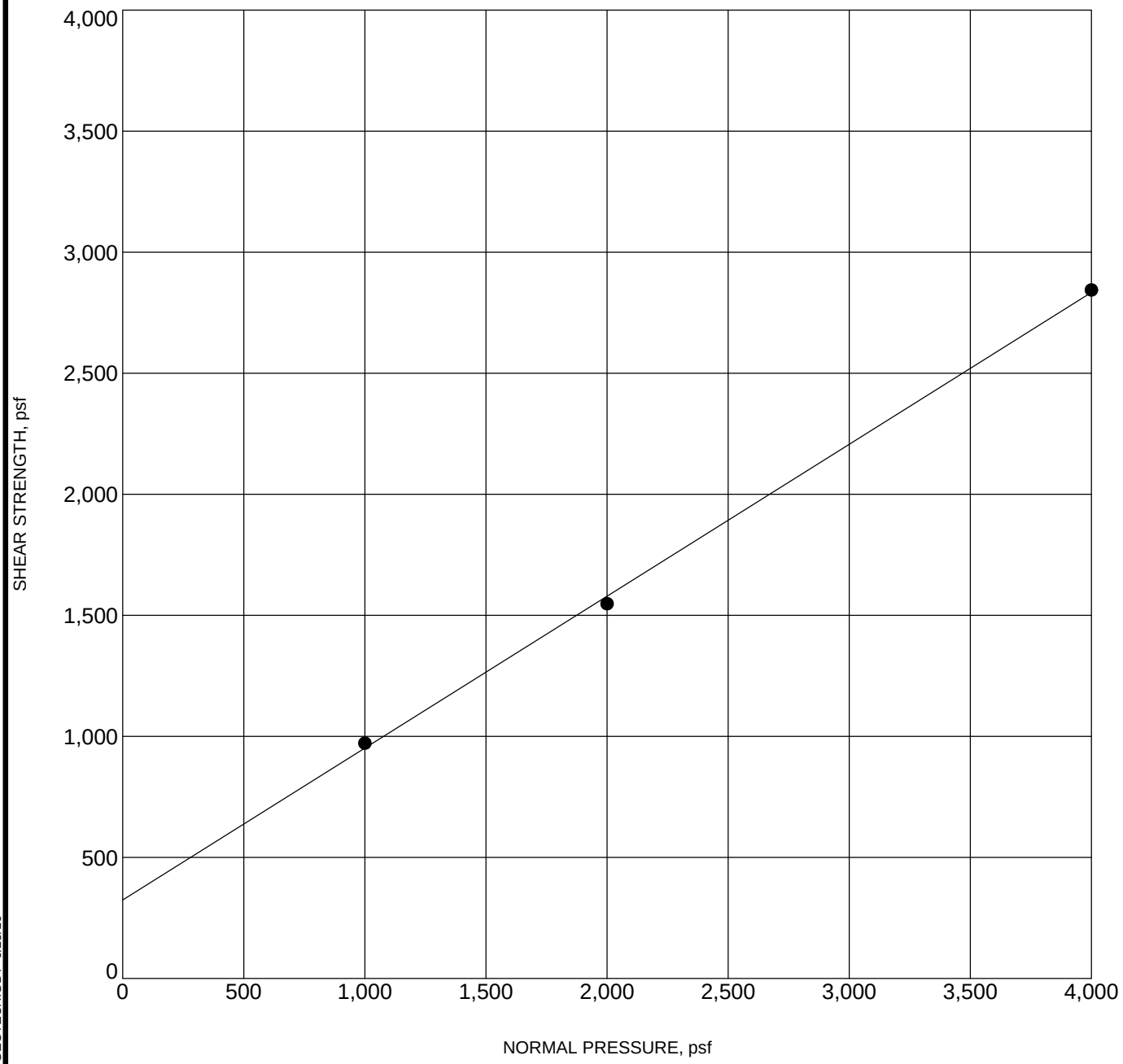
TGR GEOTECHNICAL, INC.
3037 S. Harbor Blvd.
Santa Ana, CA
Telephone:
Fax:

CONSOLIDATION TEST

Project Number: 16-5878

Project Name: Stirling SCLA Lot 18

US CONSOL STRAIN 16-5878 STIRLING SCLA LOT 18 VICTORVILLE.GPJ TGR GEOTECH.GDT 6/28/16



Specimen Identification		Classification	γ_d	MC%	c	ϕ
● **B-1**	**0-5 feet**	**Sand, Remolded**	**117**	**8**	**325**	**32**

TGR GEOTECHNICAL, INC.
3037 S. Harbor Blvd.
Santa Ana, CA
Telephone:
Fax:

DIRECT SHEAR TEST

Project Number: 16-5878

Project Name: Stirling SCLA Lot 18

US DIRECT SHEAR 16-5878 STIRLING SCLA LOT 18 VICTORVILLE.GPJ TGR GEOTECH.GDT 6/23/16

ANAHEIM TEST LAB, INC

3008 ORANGE AVENUE
SANTA ANA, CALIFORNIA 92707
PHONE (714) 549-7267

TO:

TGR GEOTECHNICAL
3037 S. HARBOR BLVD.
SANTA ANA, CA 92704

DATE: 06/16/16

P.O. NO: VERBAL

LAB NO: B-9475-1

SPECIFICATION: CA-417/422/643

MATERIAL: Sand

PROJECT NO: 16-5878

Sterling Bldg. 18, SCLA

ANALYTICAL REPORT

CORROSION SERIES
SUMMARY OF DATA

	PH	SOLUBLE SULFATES per CA. 417 ppm	SOLUBLE CHLORIDES per CA. 422 ppm	MIN. RESISTIVITY per CA. 643 ohm-cm
B-1(Bulk)@ 0-5’	7.8	115	32	4,300

RESPECTFULLY SUBMITTED

WES BRIDGER CHEMIST

ANAHEIM TEST LAB, INC

3008 ORANGE AVENUE
SANTA ANA, CALIFORNIA 92707
PHONE (714) 549-7267

TO:

TGR GEOTECHNICAL
3037 S. HARBOR BLVD.
SANTA ANA, CA. 92704

DATE: 06/20/16

P.O. NO.: VERBAL

LAB NO.: B-9475-2

SPECIFICATION: CA 301

MATERIAL: L. Brown, F.C. Silty Sand w. Gravel

PROJECT#: 16-5878
Sterling Bldg. 18, SCLA

ANALYTICAL REPORT

"R" VALUE

	BY EXUDATION	BY EXPANSION
B-4, Bulk @ 0-5'	80	76

RESPECTFULLY SUBMITTED

WES BRIDGER CHEMIST

APPENDIX D
EQFAULT

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*   *
* E Q F A U L T *
*   *
* Version 3.00 *
*   *
****

DETERMINISTIC ESTIMATION OF
PEAK ACCELERATION FROM DIGITIZED FAULTS

JOB NUMBER: 16-5878

DATE: 06-23-2016

JOB NAME: Southern California Logistics Airport

CALCULATION NAME: Phantom Way, Victorville

FAULT-DATA-FILE NAME: CGSFLTE.DAT

SITE COORDINATES:
SITE LATITUDE: 34.5865
SITE LONGITUDE: 117.3722

SEARCH RADIUS: 100 mi

ATTENUATION RELATION: 3) Boore et al. (1997) Horiz. - NEHRP D (250)
UNCERTAINTY (M=Median, S=Sigma): M Number of Sigmas: 0.0
DISTANCE MEASURE: cd_2drp
SCOND: 0
Basement Depth: 5.00 km Campbell SSR: Campbell SHR:
COMPUTE PEAK HORIZONTAL ACCELERATION

FAULT-DATA FILE USED: CGSFLTE.DAT

MINIMUM DEPTH VALUE (km): 0.0

EQFAULT SUMMARY

DETERMINISTIC SITE PARAMETERS

ABBREVIATED FAULT NAME	APPROXIMATE DISTANCE mi (km)	ESTIMATED MAX. EARTHQUAKE EVENT MAXIMUM EARTHQUAKE MAG.(Mw)	PEAK SITE ACCEL. g	EST. SITE INTENSITY MOD.MERC.
HELENDALE - S. LOCKHARDT	11.6(18.6)	7.3	0.273	IX
NORTH FRONTAL FAULT ZONE (West)	16.3(26.2)	7.2	0.245	IX
CLEGHORN	19.7(31.7)	6.5	0.121	VII
SAN ANDREAS - Cho-Moj M-1b-1	21.4(34.5)	7.8	0.225	IX
SAN ANDREAS - Whole M-1a	21.4(34.5)	8.0	0.250	IX
SAN ANDREAS - 1857 Rupture M-2a	21.4(34.5)	7.8	0.225	IX
SAN ANDREAS - Mojave M-1c-3	21.4(34.5)	7.4	0.182	VIII
SAN ANDREAS - SB-Coach. M-2b	21.7(35.0)	7.7	0.211	VIII
SAN ANDREAS - San Bernardino M-1	21.7(35.0)	7.5	0.190	VIII
SAN ANDREAS - SB-Coach. M-1b-2	21.7(35.0)	7.7	0.211	VIII
CUCAMONGA	21.9(35.3)	6.9	0.167	VIII
SAN JACINTO-SAN BERNARDINO	24.9(40.0)	6.7	0.113	VII
LENWOOD-LOCKHART-OLD WOMAN SPRGS	25.8(41.5)	7.5	0.167	VIII
SIERRA MADRE	30.4(49.0)	7.2	0.153	VIII
GRAVEL HILLS - HARPER LAKE	31.4(50.5)	7.1	0.116	VII
LANDERS	32.7(52.6)	7.3	0.125	VII
CLAMSHELL-SAWPIT	35.3(56.8)	6.5	0.094	VII
BLACKWATER	36.4(58.5)	7.1	0.104	VII
SAN JOSE	36.7(59.0)	6.4	0.087	VII
NORTH FRONTAL FAULT ZONE (East)	36.8(59.3)	6.7	0.101	VII
CALICO - HIDALGO	38.1(61.3)	7.3	0.111	VII
JOHNSON VALLEY (Northern)	38.4(61.8)	6.7	0.081	VII
SAN JACINTO-SAN JACINTO VALLEY	40.1(64.6)	6.9	0.087	VII
CHINO-CENTRAL AVE. (Elsinore)	43.7(70.4)	6.7	0.089	VII
PUENTE HILLS BLIND THRUST	44.7(71.9)	7.1	0.108	VII
RAYMOND	44.7(72.0)	6.5	0.078	VII
VERDUGO	47.0(75.6)	6.9	0.093	VII
EMERSON So. - COPPER MTN.	47.5(76.5)	7.0	0.080	VII
WHITTIER	50.0(80.5)	6.8	0.069	VI
PINTO MOUNTAIN	52.2(84.0)	7.2	0.083	VII
UPPER ELYSIAN PARK BLIND THRUST	52.8(84.9)	6.4	0.066	VI
ELSINORE (GLEN IVY)	52.8(85.0)	6.8	0.066	VI
PISGAH-BULLION MTN.-MESQUITE LK	52.9(85.2)	7.3	0.086	VII
SIERRA MADRE (San Fernando)	54.0(86.9)	6.7	0.075	VII
SAN GABRIEL	54.9(88.3)	7.2	0.080	VII
HOLLYWOOD	57.3(92.2)	6.4	0.061	VI
GARLOCK (West)	58.9(94.8)	7.3	0.079	VII
GARLOCK (East)	60.5(97.3)	7.5	0.087	VII
NORTHRIDGE (E. Oak Ridge)	62.6(100.8)	7.0	0.079	VII
BURNT MTN.	63.3(101.9)	6.5	0.049	VI

DETERMINISTIC SITE PARAMETERS

ABBREVIATED FAULT NAME	APPROXIMATE DISTANCE mi (km)	ESTIMATED MAX. EARTHQUAKE EVENT: MAXIMUM EARTHQUAKE MAG.(Mw)	ESTIMATED MAX. EARTHQUAKE EVENT: PEAK SITE ACCEL. g	ESTIMATED MAX. EARTHQUAKE EVENT: EST. SITE INTENSITY MOD.MERC.
SAN JACINTO-ANZA	63.9(102.9)	7.2	0.071	VI
EUREKA PEAK	64.2(103.3)	6.4	0.046	VI
SANTA SUSANA	64.4(103.7)	6.7	0.066	VI
SAN ANDREAS - Carrizo M-1c-2	65.1(104.8)	7.4	0.077	VII
ELSINORE (TEMECULA)	65.2(104.9)	6.8	0.056	VI
SAN JOAQUIN HILLS	67.2(108.1)	6.6	0.060	VI
HOLSER	67.9(109.3)	6.5	0.057	VI
SAN ANDREAS - Coachella M-1c-5	68.8(110.8)	7.2	0.067	VI
NEWPORT-INGLEWOOD (L.A.Basin)	69.0(111.0)	7.1	0.063	VI
SANTA MONICA	69.3(111.6)	6.6	0.059	VI
So. SIERRA NEVADA	71.8(115.6)	7.3	0.083	VII
LITTLE LAKE	72.6(116.8)	6.9	0.055	VI
TANK CANYON	73.2(117.8)	6.4	0.051	VI
MALIBU COAST	75.1(120.9)	6.7	0.058	VI
NEWPORT-INGLEWOOD (Offshore)	75.4(121.3)	7.1	0.059	VI
PANAMINT VALLEY	75.7(121.8)	7.4	0.069	VI
OWL LAKE	75.9(122.1)	6.5	0.043	VI
SIMI-SANTA ROSA	76.9(123.7)	7.0	0.067	VI
PALOS VERDES	77.0(124.0)	7.3	0.065	VI
WHITE WOLF	77.5(124.7)	7.3	0.078	VII
OAK RIDGE (Onshore)	77.9(125.4)	7.0	0.066	VI
SAN CAYETANO	79.7(128.3)	7.0	0.065	VI
ANACAPA-DUME	85.3(137.2)	7.5	0.081	VII
ELSINORE (JULIAN)	86.1(138.5)	7.1	0.053	VI
SANTA YNEZ (East)	86.8(139.7)	7.1	0.053	VI
PLEITO THRUST	87.0(140.0)	7.0	0.061	VI
DEATH VALLEY (South)	89.5(144.0)	7.1	0.052	VI
SAN JACINTO-COYOTE CREEK	92.2(148.4)	6.6	0.039	V
BIG PINE	94.4(151.9)	6.9	0.045	VI
CORONADO BANK	96.4(155.1)	7.6	0.064	VI

-END OF SEARCH- 70 FAULTS FOUND WITHIN THE SPECIFIED SEARCH RADIUS.

THE HELENDALE - S. LOCKHARDT FAULT IS CLOSEST TO THE SITE.
IT IS ABOUT 11.6 MILES (18.6 km) AWAY.

LARGEST MAXIMUM-EARTHQUAKE SITE ACCELERATION: 0.2732 g