Appendix B Geotechnical Study

GEOTECHNICAL ENGINEERING FEASIBIITY STUDY
PROPOSED MIXED-USE DEVELOPMENT
7441 EDINGER AVENUE
HUNTINGTON BEACH, CALIFORNIA

Prepared for:

SARES-REGIS GROUP
18825 Bardeen Avenue
Irvine, California 92612

Project No. 012428-001

October 30, 2009

Leighton and Associates, Inc.
A LEIGHTON GROUP COMPANY

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To: Sares-Regis Group
18825 Bardeen Avenue
Irvine, California 92612

Attention: Mr. Nate Carlson

Subject: Geotechnical Engineering Feasibility Study for the Proposed Mixed-Use Development, 7441 Edinger Avenue, Huntington Beach, California

In accordance with your request and authorization, Leighton and Associates, Inc. (Leighton) has competed a geotechnical engineering feasibility study for the proposed mixed-use development located at 7441 Edinger Avenue in Huntington Beach, California. The purpose of the study was to evaluate the geotechnical engineering aspects of the site; provide considerations for design and development in the intended manner; and preliminary design parameters for use in evaluating the feasibility of the proposed development.

Two development concepts are understood to be contemplated for the proposed site. In one alternative, numerous low-rise multi-tenant apartment buildings will be located throughout the site with at-grade parking areas and "tuck-under" parking in regions of the first floor of the buildings. In the other concept, the apartment buildings will surround a central multi-story parking structure in which a potion of the first level of parking will be subterranean.

Based upon the findings of our field exploration and visual review of the recovered soil samples, the primary geotechnical considerations for development of the site are the potential for liquefaction to occur within the non-cohesive soils; the relatively low strength and compressible nature of the interbedded sediments; and the likelihood of shallow groundwater that will affect below-grade construction.

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Of the significant geotechnical aspects identified for this site, the primary develop/design consideration may prove to be the compressibility of the soils and the effect on the selection of suitable foundation systems. At a minimum, special preparation of the foundation areas, e.g., overexcavation and placement of a structural compacted fill, is expected to be necessary to develop suitable bearing conditions for foundation support. As an alternate to overexcavation and fill compaction, the Geo-Pier proprietary foundation improvement system may be used. Walls and columns that support heavy structural loads may require the use of a structural mat foundation, possibly in conjunction with the GeoPier (or similar) ground improvement technique, or a deep foundation system if shallow ground improvement will not be sufficient.

Below-grade construction and permanent subterranean structures may be affected by the relatively shallow groundwater that exists at the site. Temporary dewatering operations may require special permits to discharge groundwater.

The recommendations presented in this report are considered preliminary and not intended for final design. Additional field exploration and engineering analyses are recommended to be performed once the site layout and building details have been established.

We appreciate this opportunity to be of service. If you have any questions regarding this report, please do not hesitate to contact this office.

Respectfully submitted,

LEIGHTON AND ASSOCIATES, INC.

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1.0 INTRODUCTION

1.1 Purpose and Scope

This report presents the results of our geotechnical feasibility study for the proposed residential and commercial development located at 7441 Edinger Avenue, Huntington Beach, California. The purpose of this study was to evaluate the subsurface conditions and to evaluate the geotechnical aspects of the site that could affect design and development. In addition, preliminary recommendations are presented to assist in the economic evaluation of the site. The scope of our work included the following tasks:

- Site reconnaissance of the proposed site and marking of the locations for subsurface exploration.
- Notification of Underground Service Alert (USA) of marked locations prior to the commencement of our field exploration and coordination with contractors to conduct the soil borings and Cone Penetrometer Test (CPT) soundings.
- Subsurface exploration consisting of excavation, logging, and sampling of two (2) exploratory borings and four (4) Cone Penetrometer Test (CPT) soundings.
- Collection of representative and relatively undisturbed soil samples by conducting the Standard Penetration Test (SPT) and composite bulk soil samples at selected depth intervals and transporting of the samples to our laboratory for testing.
- Laboratory testing of selected samples to evaluate the geotechnical engineering properties of the onsite soils within the exploration depths.
- Geotechnical evaluation of collected data and relevant engineering analyses.
- Preparation of this report summarizing our findings, conclusions, and recommendations.

1.2 Site Location and Proposed Development

Site Description

The subject site is located at 7441 Edinger Avenue at the northeast corner with Gothard Street in Huntington Beach, California. The location of the site is shown in Figure 1

included at the end of the report text. At the time of our field exploration the site was developed with a vacant large warehouse-type structure that was most recently used as a Levitz furniture store. The existing building occupied approximately the northern two-thirds of the site with the southern region used for customer parking. Asphalt pavement also existed along the west and north sides of the building. A railroad spur was located along the east side of the building.

Proposed Development

Two preliminary development concepts are understood to be under consideration at his time. In each concept, the apartment building(s) will be four stores in height. In one concept, a number of individual buildings will be located throughout the site with vehicle parking at-grade and within portions of the first floors of the buildings ("tuck-under" parking). In the other concept, the apartment buildings will surround a central multi-story structure for all vehicle parking. On a preliminary basis, this parking structure may be six or seven stories in height and a portion of the first level will be subterranean. A portion of the proposed development may also include a commercial component such as the at-grade level of the building(s) along Edinger Avenue.

Specific structural plans are not yet available, but we understand that the proposed buildings are anticipated to be of Type V construction. The parking structure is anticipated to consist of either masonry or poured-in-place walls and concrete decks.

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 Field Exploration

The field exploration initially consisted of a site reconnaissance to mark the proposed boring locations and to evaluate the proposed boring locations with respect to access for drilling equipment and subsurface structures. Underground Service Alert (USA) was then notified of the marked locations.

The subsurface exploration was performed on October 12, 2009. The subsurface exploration consisted of two (2) hollow-stem test borings advanced by conventional rotary drilling techniques and four (4) Cone Penetrometer Test (CPT) soundings. Each of the test borings was advanced to a depth of approximately 50 feet below the current grade. The CPT soundings were each advanced to a depth of approximately 60 feet below grade. The approximate locations of the test borings and CPT soundings are shown on Figure 2, Boring and CPT Location Map.

The test borings were logged by a member of our technical staff during the field exploration. Soil samples were collected at regular intervals by conducting the Standard Penetration Test (SPT) in general accordance with the American Society for Testing and Materials (ASTM) Standard Test Methods D1586 and D3550. The ASTM D3550 test method pertains to the modified California sampler which is used to collect relatively undisturbed samples. Bulk samples were also obtained from the borings. The number of blows required to drive the sampler using a 140-pound weight falling 30 inches for an 18-inch drive length is shown on the boring logs in the “Blows per Foot” column. The boring logs are included in Appendix B. The combined number of blows to drive the sampler the final 12 inches is referred to as the SPT N-value, or “Blow Count.”

The CPT soundings were performed in accordance with ASTM D5778 and D3441 specifications. The logs of the CPT soundings are included in Appendix B.

Each soil sample collected was reviewed and described in general conformance with the Unified Soil Classification System (USCS) pursuant to ASTM D2488. The soil descriptions were entered on the boring logs. All samples were sealed and packaged for transportation to our laboratory. After completion of drilling, borings were backfilled with grout and the excess soil cuttings collected in 55-gallon drums for off-site disposal. Asphalt cold patch was used to patch the existing pavement at the boring locations.

2.2 Laboratory Testing

Laboratory tests were performed on representative samples to verify the field classification of the recovered samples and to determine the geotechnical properties of the subsurface materials. The following tests were performed:

- In-situ moisture content and density (ASTM D2216 and D2987);
- Atterberg Limits (ASTM D4318);
- Sieve Analysis (ASTM D422);
- Direct shear (ASTM D3080);
- Triaxial Compression (Unconsolidated Undrained – ASTM D2850)
- Consolidation (ASTM D2435); and
- Corrosivity (DOT test 417, 422 and 532/643).

All laboratory tests were performed in general conformance with ASTM or State of California Standard Methods. The results of the in-situ moisture and density tests are presented on our geotechnical boring logs (Appendix B). The results of other laboratory tests are presented in Appendix C of this report.

3.0 SUBSURFACE CONDITIONS AND SEISMIC HAZARDS

3.1 Regional Geology

The proposed site is located within the southern portion of the Los Angeles Basin (LA Basin), a structural depression located within the northern margin of the Peninsular Ranges geomorphic province of California. The site is underlain by up to 15,000 feet of Cenozoic-age sediments overlying older Triassic to Late Jurassic metasedimentary rocks (Yerkes et al., 1965). The soils beneath the site are comprised of varying proportions of silts, sands, and gravels largely of the San Pedro Formation (Poland and Piper, 1956) with lesser proportions of younger alluvial deposits. In general, both sites are essentially flat.

The site lies within the Newport-Inglewood Structural Zone, a northwest-trending, belt of anticlinal folds and right-lateral faults disrupting Late Pleistocene and older deposits (Barrows, 1974). Tilted and structurally deformed Holocene sediments have also been observed within the Newport-Inglewood Structural Zone, but evidence of surface rupture within the Site has not been documented.

3.2 Subsurface Conditions

The following description of the subsurface conditions encountered during field exploration has been summarized for clarity. Detailed descriptions of the actual conditions and stratigraphy are presented in the logs of the test borings and graphically in the logs of the CPT soundings in Appendix B.

The results of our field exploration indicate the approximate thickness of the asphalt pavement was 2½ inches at Test Boring No. B-1 and 5 inches at Test Boring No. B-2. The approximate thickness of the underlying base course was 6½ and 3½ inches, respectively.

3.2.1 Stratigraphy

Soils classified as fill were encountered to depths of approximately 3 to 5 feet below the current grade at the two test boring locations. The fill soils consisted of stiff consistency clayey silts. The native soil conditions that underlie the pavement and fill consist of interbedded layers of silts, fine sands and clays to depths of 43 to 60 feet below current grade where firm to dense sands and gravels

were encountered and extended to at least the maximum depths explored of 60 feet. The sands and silts generally exhibited loose to medium dense relative density while the clays typically exhibited medium stiff comparative consistency although zones of softer consistency material were encountered. At the location of Test Boring No. B-1 (near the entrance to the former store), thin seams of peat were encountered at depths of 11 and 20 feet. The thickness of the peat deposits appeared to be on the order of inches.

3.2.2 Expansion Potential

The near surface soils that were encountered above the groundwater table did not exhibit clay content that would suggest a high expansion potential. Soils of high plasticity were encountered at depths below the groundwater, but their location and natural saturation results in no significant expansion potential.

3.2.2 Consolidation and Compressibility

Specialized consolidation testing was performed on select samples of the clays that exhibited medium stiff to soft consistency to evaluate their compressibility and rate of consolidation when subjected to stress increase as may occur due to foundations. The results of the consolidation testing indicated the soils are slightly overconsolidated (OCR of 2 to 2.9). As such, these soils may be susceptible to a significant degree of compression depending upon the magnitude of stress increase. Further discussion of the consolidation and settlement potential is discussed in Section 5.3.

3.2.3 Soil Corrosivity Potential

The National Association of Corrosion Engineers (NACE) defines corrosion as “a deterioration of a substance or its properties because of a reaction with its environment.” For inland construction the “environment” is the surrounding soil and the “substances” are reinforced concrete foundations or various types of steel substructures such as piles, pipes, etc., that are in contact with the soil.

In general, soil environments that are detrimental to concrete have high concentrations of soluble sulfates and/or pH values of less than 5.5. Based upon recommendations promulgated by the Portland Cement Association and as adopted by the California Building Code, specific guidelines have been established for concrete mix-design when the soluble sulfate content of the soil exceeds 0.1 percent

by weight or 1,000 parts per million (ppm). The minimum concentration of chloride ions in the soil environment that are corrosive to steel, either in the form of reinforcement protected by concrete cover or plain steel substructures such as steel pipes or piles, is 500 ppm as determined by California Test 532. Concentrations of chloride ions above the stated concentration or other characteristics such as soil resistivity or redox potential may warrant special corrosion protection measures.

For screening purposes, two composite samples of the soil to a depth of approximately 5 feet were tested for soluble sulfate, chloride, pH and resistivity. Test results are included in Appendix C and indicate the tested soils do not pose a significant potential for sulfate attack on structural concrete. The test results indicate low concentrations of chloride, but the measured resistivities are anticipated to present a significant potential for corrosion to buried ferrous metal. Additional testing and evaluation by a Corrosion Engineer may be warranted to provide specific recommendations for the proposed development where metallic structures will be contact with the on-site soils.

3.3 Groundwater Conditions

Groundwater was encountered at a depth of approximately 15 feet during the drilling operations. However, based upon the relative moisture and measured moisture contents of the material recovered from the test borings, the groundwater table is considered to have existed at depths on the range of 7 to 8 feet below grade. Perched water conditions may develop depending seasonal precipitation where porous granular soils are underlain by less permeable fine-grained soils as indicated by the continuous stratigraphy profiles of the CPT soundings.

The historical high groundwater in the area is reported to be approximately 5 to 10 feet below the existing ground based upon data presented by the California Geologic Survey (CGS, 1997).

3.4 Principal Seismic Hazard

The principal seismic hazard to the site is ground shaking resulting from an earthquake occurring along any of several major active and potentially active faults in Southern California. Known regional active faults that could produce significant ground shaking at the site include the Newport-Inglewood and San Joaquin Blind Thrust among others.

The intensity of ground shaking at a given location depends primarily upon the earthquake magnitude, the distance from the source, and the site response characteristics. Peak Horizontal Ground Accelerations (PHGA) is generally used to evaluate the intensity of ground motion.

A Probabilistic Seismic Hazard Analysis (PSHA) was performed using the computer program FRISKSP (Blake, 2000) to estimate the PHGA. The analysis considers both active and potentially active faults within a 60-mile radius of the site. Various probabilistic functions were applied to the analysis to assess the uncertainty inherent in the calculation with respect to magnitudes, recurrence intervals, fault geometry, and attenuation relationships.

The probabilistic hazard evaluation was performed using three attenuation relationships: Abrahamson and Silva 1997; Campbell, 1997; and Sadigh et al., 1997. The attenuation relationships were used for a "soil" site to estimate ground motions at the site. The results of the probabilistic seismic hazard analysis are summarized in the table below for two specific risk exposures. The results of the probabilistic seismic hazard analysis are provided in Appendix D.

Table 1 - Peak Ground Acceleration (PGA)

Probability of Exceedance (%)	Exposure Period (years)	Average Return Period (years)	Peak Ground Acceleration (g)
10	50	475	0.33
2	50	2,475	0.57

Notes:

- The 475-year Average Return Period is the ground motion basis for the 2001 California Building Code.
- The 2,475-year Average Return Period is termed the Maximum Considered Earthquake (MCE) in accordance with the methodology of the 2007 California Building Code.
- The Peak Ground Accelerations pertain to horizontal motion.

3.5 Secondary Seismic Hazards

Secondary seismic hazards affecting the site may include fault rupture, soil liquefaction, dynamic settlements, earthquake-induced lateral displacement, landslide, earthquake-induced flooding, seiches, and tsunamis. An evaluation of these effects on the subject site is discussed in the following sections.

3.5.1 Fault Rupture

The site is not located within a currently designated Alquist-Priolo Earthquake Zone (Hart and Bryant, 1999). No known active faults are mapped on the site. Based on this consideration, the potential for surface fault rupture is considered to be low at the site.

3.5.2 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 three general conditions exist: 1) shallow groundwater; 2) low density, fine, clean sandy soils; and 3) high-intensity ground motion. Studies indicate that saturated, loose and medium dense, near-surface cohesionless soils exhibit the highest liquefaction potential, while dry, dense, cohesionless soils and cohesive soils exhibit low to negligible liquefaction potential.

The subject site is located within an area that has been identified by the State of California as being potentially susceptible to liquefaction. The potential for liquefaction to occur has been evaluated in accordance with the requirements of the State of California. The liquefaction analysis was conducted on the CPT data and has been performed using the commercially available software package *LiquefyPro* (v5; CivilTech, 2007). The liquefaction analysis performed by the software complies with the procedures outlined in the NCEER Workshop Proceedings Summary Report (Youd et al., 2001). The analysis was conducted using an earthquake magnitude (M_w) of 7.0 and PGA of 0.41g.

The results of the liquefaction analysis indicate the potential for liquefaction to occur within the strata of non-cohesive soils that exist below the ground water table (7) feet. The primary effect of liquefaction is expected to be ground surface settlement due to the consolidation of the liquefied material. The volumetric strain and corresponding settlement based upon the methodology of Tokimatsu and Seed (1987) was performed for the individual strata. The total settlement was then summed and the estimated settlement of the ground surface is reported in the output. The results of the analysis indicated the estimated settlement ranged from approximately 2½ to 3½ inches with a maximum of 4½ inches at CPT-3. The graphical output of the program is presented in Appendix D.

3.5.3 Earthquake-Induced Lateral Spreading

Lateral spreading is the result of liquefaction within sloping terrain where the non-liquefied overlying material displaces down gradient. For lateral spreading to occur, the liquefiable zone must be continuous, unconstrained laterally, and free to move along gently sloping ground toward an unconfined area. However, if lateral containment is present for those zones, then no significant risk of lateral spreading will exist (CDMG, 1998). Since the site is located in an area of little topographic relief, the potential for significant lateral spread is considered to be low.

3.5.4 Landslides

No significant ground slopes exist in the vicinity of the site. Therefore, the potential for seismically-induced landslides are not considered to be a potential seismic hazard for the site.

3.5.5 Earthquake-Induced Flooding

This is flooding caused by failure of dams or other water-retaining structures as a result of earthquakes. Since no major dams or water-retaining structures are located near the site, the potential of earthquake-induced flooding is considered to be very low.

3.5.6 Seiches

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Due to the lack of the presence of enclosed bodies of water in the vicinity of the subject site, seiches are not considered to be a seismic hazard to the site.

3.5.7 Tsunamis

Tsunamis are waves generated in large bodies of water by fault displacement or major ground movement. Based on the location of the site relative to the coast and the elevation above sea level, tsunamis are not anticipated to be a hazard to the project site.

4.0 GEOTECHNICAL DESIGN AND DEVELOPMENT CONSIDERATIONS

Based upon the findings of our field exploration and visual review of the recovered soil samples, the primary geotechnical considerations for development of the site are the potential for liquefaction to occur within the non-cohesive soils; the relatively low strength and compressible nature of the interbedded sediments; and the likelihood of shallow groundwater that will affect below-grade construction. Other aspects that may also be of significance pending further field exploration are the presence of existing fill and the highly moisture sensitive nature of the near surface soils. The following is a discussion of these aspects of the site and considerations for development.

4.1 Liquefaction

The relative density characteristics exhibited by the sands indicate the potential for liquefaction to occur under strong ground-shaking such as the magnitude associated with the seismic design requirements of the current California Building Code (CBC). The effect of liquefaction is expected to be limited to ground surface subsidence due to the relatively thin nature of the susceptible layers with the magnitude of settlement preliminarily estimated to be on the order of 2½ to 3½ inches with a maximum of 4½ inches in the vicinity of the southwestern corner of the existing building. The greater settlement at one location is due to the presence of two relatively thick layers, the first extending from 20 to 30 feet below grade and the next from 36 to 46 feet. The liquefaction characteristics exhibited by exploration at this location may be indicative of a localized condition, but could equally be representative of conditions in unexplored areas of the site due to the widely spaced locations of field exploration.

The estimated magnitude of settlement related to liquefaction is greater than typically considered tolerable for structures. The actual effect on the structures will, however, be related to the differential settlement that occurs. The variance in the calculated settlement magnitudes (2 inches) is relatively low when considered over large spans as may be expected to occur.

Recommendations subsequently presented in this report relative to settlement include the recommendation that the structural engineer review the estimated differential settlement attributed to liquefaction. The magnitude of settlement and the resulting angular distortion may require special connection details to reduce the effects of these settlements and maintain structural integrity. Although structural damage may be avoided, the estimated settlements attributed to liquefaction may result in architectural damage which must be acknowledged and acceptable to the owner. If unacceptable, or if determined by

the structural engineer to threaten the structural integrity of the buildings, mitigation measures will be required. Typical methods of mitigation include in-situ ground improvement or the use of a deep foundation system.

4.2 Compressible Soils

The soils encountered from depths of approximately 5 to 12 feet consisted of clays that exhibited medium stiff and locally soft consistency. Soils of similar consistency were also encountered to a lesser vertical extent at depths of 20 and 30 to 35 feet below grade. In addition to these clays, thin zones of fibrous organic peat deposits were also encountered. The peat deposits appeared to be very thin at the locations explored by the test borings and are not anticipated to be of significance. However, organic soils are typically highly compressible and, if present in thicker zones elsewhere on the site, could present significant considerations for development and may affect the selection of the foundation system.

The primary issue regarding soil compressibility pertains to the medium stiff to soft consistency clays. Soils of this nature are susceptible to long-term gradual compression which will result in settlement of foundations/structures supported by these soils and ground surface subsidence if significant quantities of fill are placed on the site to raise grade. Due to the developed nature of the property, significant quantities of fill are not expected to be necessary to achieve grades appropriate for construction. The results of laboratory testing indicated these clays are potentially compressible; typical spread footing foundations could experience significant settlement that may exceed structural tolerances depending upon the magnitude of the structural loads and the resulting sizes of the foundations.

The size of the footing is of significance since the depth of influence (i.e., stress increase) extends to greater depths as the size of the footing grows larger in plan dimension. The magnitude of soil strain, and therefore foundation settlement, increases as the depth of footing influence increases. The use of spread footing foundations is expected to require special preparation of the foundation bearing soils, i.e., a portion of the soils within the foundation influence zone will need to be overexcavated and replaced with either suitable on-site soils or a select structural compacted fill such as a crushed aggregate base course material. The reuse of the on-site soils as the structural fill reinforcing layer below footings is anticipated to be feasible for continuous strip and isolated square pad footings that do not exceed 2 feet and 4 feet, respectively. The use a select crushed aggregate material will facilitate compaction and also provide a greater reinforcing effect so that the

stresses transmitted to the underlying compressible soils will be reduced and thereby control settlement. In the anticipation that the subgrade for the placement of this fill material will be soft and unstable in its natural condition, a coarse crushed aggregate will be required as the initial layer of fill to stabilize the subgrade and serve as a working mat.

In areas where a spread footing foundation system may not be feasible due to settlement, a suitable foundation system may consist of a structural mat. A mat foundation may be practical for the parking structure(s) due to the heavy structural loads typically associated with these types of multi-story structures.

The settlements associated with liquefaction combined with long-term settlements due to static loading and the compression of soils may be excessive for some types of structures with either a spread footing foundation or structural mat foundation system. In this event, either a deep foundation system or specialized ground improvement techniques may be used. Based upon discussions with the client, we understand that a deep foundation and extensive ground improvement techniques are not expected to be economically viable for this site and these options are not desired for consideration. The use of the Geo-Pier construction technique may, however, be a feasible alternative for the site depending upon the structural loads and the resulting footing sizes.

Geo-Piers is a proprietary ground improvement technique which generally consists of drilling large diameter boreholes (1- to 2-foot), typically to depths of 10 to 15 feet below grade at regular intervals either throughout a proposed building area or the areas of spread footing foundations. The boreholes are backfilled in lifts by the placement of select coarsely graded crushed aggregate. Each lift of aggregate is dynamically compacted using a proprietary, specially designed tamper. The resulting column of aggregate essentially reinforces the soils within the upper region of the zone of foundation influence, thereby increasing their bearing capacity and reducing settlement potential.

4.3 Shallow Groundwater

The field exploration encountered groundwater at depths estimated to be on the order of 7 to 8 feet below grade. Seasonal fluctuation may occur, thereby resulting in periods in which groundwater exists at shallower depths and water may be locally perched in porous granular soils where underlain by less permeable material.

The depth at which groundwater will likely exist at the site presents considerations for below-grade construction and the design of subterranean structures. Utility trenches and other excavations that extend below the water table will likely require temporary dewatering depending upon the rate of water infiltration and the duration in which these excavations remain open. Off-site disposal of groundwater may include considerations with regard to hazardous substances due to the previous environmental assessments conducted at the site that included groundwater monitoring wells. The design of subterranean structures such as below-grade walls and floor slabs may require provisions to resist hydrostatic pressures and be water-tight.

4.4 Moisture Sensitive Soils

The near surface soils that will be exposed during general site preparation and excavating are expected to consist of fine sandy silt and clayey silt which are extremely sensitive to moisture. Soils of this type require careful control of their moisture content to allow proper recompaction and maintain stable subgrades. Grading during the wet winter season may, therefore, result in significant grading difficulties which could require significant processing/aeration of the soils to facilitate recompaction or off-site disposal and import of suitable material for fill. Subgrades that are exposed to water infiltration and become unstable may require similar processing or alteration of the subgrade by chemical or mechanical means to develop a stable subgrade for construction. Modification may include the addition of lime or Portland cement, or the placement of a coarse crushed aggregate, possibly including an underlying geogrid, to develop stability.

4.5 Existing Fill

Fill soils that exist in unexplored areas of the site may require overexcavation and recompaction to ensure adequate support for new improvements. In consideration of the current development of the site and the developmental history described in the Phase I Environmental Site Assessment, areas of existing fill requiring overexcavation to extensive depth or lateral extent are generally not anticipated to be encountered. Existing fill is, however, anticipated to underlie the vacant building, but these fill soils are also anticipated to have been placed under engineering controlled conditions and should be suitable for support although preparation of foundation areas for the proposed structures may require the removal of this existing fill.

5.0 PRELIMINARY RECOMMENDATIONS

The recommendations presented below are intended to be used for comparative cost estimation purposes to evaluate the feasibility of the site for the proposed type of development. Due to the limited exploration and laboratory testing program implemented thus far, combined with the general description of the proposed development, further geotechnical analysis is expected to be necessary to provide specific recommendations for design. Furthermore, the complexity of the subsurface conditions and the importance of adequate delineation of the stratigraphy indicate additional field exploration will be necessary.

5.1 Earthwork

Earthwork that may be required for development of the site in the proposed manner is expected to primarily consist of minor cuts and fills to establish finished grades. Depending upon the nature of the automobile parking facilities, earthwork may also include excavation for subterranean construction. General subgrade preparation is expected to consist of overexcavation to depths of 1 to 2 feet below grade to prepare soils disturbed by site clearing.

5.1.1 Footing Preparation

The majority of the earthwork is anticipated to be associated with the preparation of foundation areas if a spread footing foundation system is used for support of the buildings. The excavation may be limited to a specific depth and plan extent surrounding each footing location as compared to a uniform overexcavation of the entire building pad. The dimensions of the excavations to prepare footing areas will be a function of the foundation size which is related to the allowable bearing capacity and tolerable settlement On a preliminary basis, overexcavation is estimated to be required to a minimum depth below the bottom of footings (bearing grade) that is equal to the 1 to 1.5 times the width (B) of square column footings or 1 to 2 times the width of continuous strip footings. The lateral extent of this overexcavation beyond the edges of the footings should be equal to the depth below the bearing grade.

5.1.2 Foundation Area Backfill Material

The use of the onsite soils as the structural compacted backfill within the overexcavated footing trenches may be adequate in some instances, but will be a function of the structural loads to be supported. Wall and column footings that do

not exceed widths of 2 and 4 feet, respectively, may be supported by suitable, low expansive potential on-site soils. Based on the results of limited laboratory testing, the backfill material for preparation of larger footing areas is expected to consist of soils that provide some increased reinforcing effect to reduce the stresses transmitted to the compressible soils to reduce settlement potential. Backfill material that will provide this reinforcing effect typically consists of well-graded granular soils or, for greater effect, crushed aggregate. The actual type of material recommended for backfill will be determined once structural load data is provided for our use and detailed settlement analyses can performed.

5.2 Seismic Design Parameters

Seismic design parameters are provided based upon the 2007 California Building Code (CBC). The following design parameters may be considered for the seismic analysis of the structures proposed within the site:

Table 2 – Seismic Design Parameters

2007 California Building Code		
Site Class	Table 1613.5.2	E
Mapped Spectral Response Accelerations		
0.2-second S_s	Figure 1613.5(3)	1.588
1.0-second S_1	Figure 1613.5(4)	0.555
Site Coefficient (F_a)	Table 1613.5.3(1)	0.9
Site Coefficient (F_v)	Table 1613.5.3(2)	2.4
Design Spectral Response Acceleration		
0.2-second SD_s		0.953
1.0-second SD_1		0.888

5.3 Foundation Design

The conditions encountered at the test boring locations generally consist of interbedded layers of medium stiff but occasionally soft consistency, compressible clays, loose sands and medium stiff clayey silts. The encountered soil conditions are generally considered suitable for support of a spread footing or structural mat foundation system, but specific preparation of footing areas will be necessary as described in Section 5.1. The following recommendations are provided on a preliminary basis for both types of foundation systems. The primary benefit of a mat foundation is that the mat foundation will provide a higher level of consistency in foundation performance and thereby reduce the potential for differential settlement as may occur with the use of a spread footing foundation that supports a wide variance in foundation loads and/or where greater settlements are anticipated.

In consideration that specific structural load data were not yet available and the design concept has not yet been determined, the recommendations for foundation design are considered to be preliminary. We recommend that the recommendations presented in this report be reviewed once the structural loads and framing system have been determined and the planned finished grades have been established to provide parameters for design.

5.3.1 Spread Footing Foundation

The use of a spread footing foundation system may be feasible for the proposed apartment building structures after proper preparation of the foundation areas as previously described. The foundations may consist of isolated square pad footings for column support and continuous strip footings for wall support. For preliminary design purposes, footings supported on a structural fill layer comprised of the on-site soils may be designed for a maximum net allowable soil bearing pressure of 2,500 and 2,000 pounds per square foot (psf), for square and continuous footings, respectively. The allowable bearing pressure values may be increased to 4,000 and 3,200 psf for square pad and continuous strip footings, respectively, if supported in a structural fill layer comprised of select granular material as described in Section 5.1.2. The footings should extend at least 1 foot into the newly placed structural compacted fill. The footings may be supported at nominal depth below the finished surface of the below-grade floor. The minimum footing widths are recommended to be at least 24 inches and 18 inches for isolated square pad footings and continuous strip footings, respectively. The recommended bearing pressures may be increased by one-third for short term loading conditions.

The resistance to lateral loads will be derived by the passive pressure acting against the sides of foundations and the sliding resistance developed at the base of the footings. Lateral load resistance may be calculated based upon an allowable equivalent passive fluid pressure of 240 psf per foot of footing thickness and a coefficient of sliding friction of 0.30 for footings supported by structural fill comprised of on-site soils. These values may be increased to 360 pcf and 0.40 for footings supported by the select granular fill. The use of passive pressure and lateral load resistance requires continuous contact between the sides of footings and the adjacent soils. The passive pressure may be increased by one third for short term loading conditions.

5.3.2 Structural Mat Foundation

The parking structure in its preliminary design concept as a 6- to 7-story structure is not expected to be supported by a spread footing foundation system. An alternate foundation system that may be feasible consists of a structural mat foundation supported on competent native soil or engineered fill. The use of a mat foundation may, however, require ground improvement depending upon the size of the structure in plan dimension and the actual magnitude of structural load.

On a preliminary basis, a structural mat foundation may be designed using a Modulus of Subgrade Reaction (k_{v1}) of 50 pounds per cubic inch (pci). The maximum bearing pressure below areas of concentrated load under conventional dead plus live load should not exceed 2,000 pounds per square foot (psf). The allowable bearing pressure may be increased by one third for short duration dynamic loads including wind or seismic forces.

Resistance to lateral load for the mat foundation will be derived from a combination of passive pressure and frictional resistance. We recommend that an equivalent fluid pressure of 220 pounds per cubic foot (pcf) be used in calculating the passive resistance provided that the vertical face of the foundation is in full contact with competent native soil or properly compacted engineered fill. A coefficient of 0.25 may be used in calculating the frictional resistance along the interface between concrete and soil. No reduction is required when combining the passive pressure and frictional resistance.

5.3.3 Foundation Settlements

Estimation of the total and differential settlements of a spread footing foundation or a structural mat will require specific structural load data for the proposed structures and can be better evaluated with further exploration of the subsurface conditions. On a preliminary basis, the total and differential settlements of a spread footing foundation supported by a structural compacted fill layer of specific minimum thickness and material type below bearing grade are anticipated to be 1½ and ¾ inches, respectively. The settlement of a mat foundation will be dependent upon the actual dimensions of the slab and the structural loading.

The settlements discussed above pertain to static conditions that are the result of compression/consolidation of the soils. Due to the liquefaction potential, additional settlement should be considered. The majority of the seismically-induced/liquefaction settlement is on the order of 2½ to 4½ inches. Although this magnitude is greater than typically acceptable for static conditions, the effect of liquefaction settlement is recommended to be evaluated by assuming a differential settlement of approximately 2 inches over a clear span of 50 feet. The structural engineer should evaluate the estimated differential settlement to determine if any special design or detailing will be required to reduce the effects and maintain structural integrity.

5.4 Slabs-on-Grade

The first floors of the buildings may be designed and constructed a slab-on-grade. The thicknesses of the floor slabs are generally anticipated to be 4 inches, but 5- or 6-inch thick slabs may be required where special loading conditions exist. The structural engineer should design the actual slab thickness and reinforcement based on structural load requirements.

5.5 Cement Type and Corrosion Measures

Based on the results of soluble sulfate content testing, we recommend that foundation concrete for the proposed structures at the subject site be designed in accordance with the “negligible” category of the concrete mix design guidelines contained within the California Building Code.

The resistivity test result of the site soil indicates that these soils are corrosive to metals. Significant precautions are, therefore, anticipated to be necessary relative to corrosion. However, consideration should be given to retaining a corrosion engineer to obtain recommendations for the protection of metal components embedded in the site soils.

5.6 Additional Services

The findings of this limited exploration and analysis indicate significant considerations exist for design and development. In view of the complexity of the subsurface profile combined with the lack of exploration within the area of the existing building, additional exploration, laboratory testing and appropriate engineering analyses are recommended to be performed once the development concept has been selected and structural details can be provided for our use in analysis.

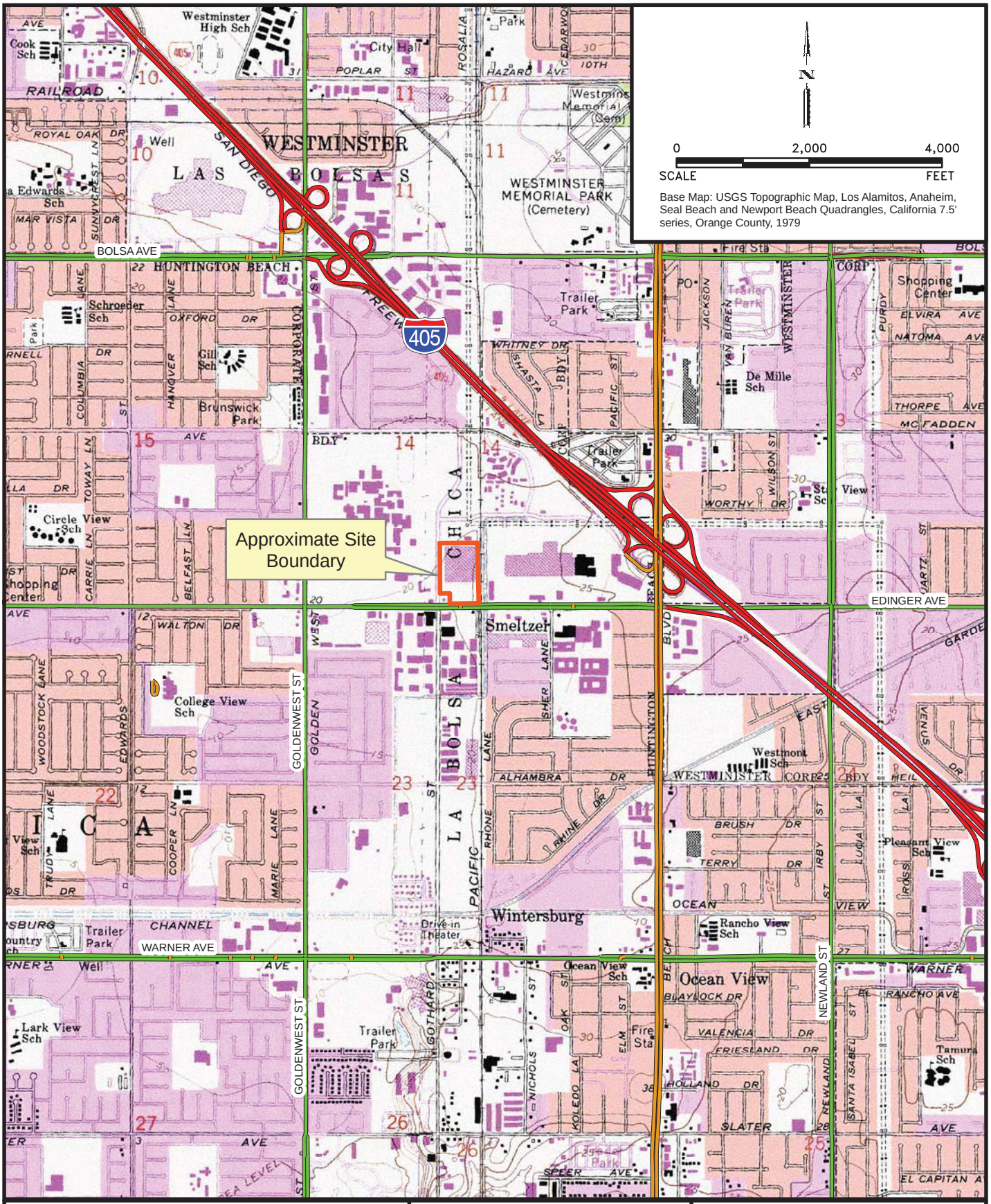
The preliminary recommendations presented herein have indicated some type of ground improvement may be necessary. A feasible technique presented in this report is the GeoPier proprietary method of ground improvement. Consultation with the local representative is recommended to better evaluate the feasibility and associated costs if implemented at the site.

6.0 LIMITATIONS

The conclusions and recommendations in this report are based in part upon data that were obtained from a limited number of observations, site visits, excavations, samples, and tests. Such information is by necessity incomplete. The nature of many sites is such that differing geotechnical or geological conditions can occur within small distances and under varying climatic conditions. Changes in subsurface conditions can and do occur over time. Therefore, the findings, conclusions, and recommendations presented in this report can be relied upon only if Leighton has the opportunity to observe the subsurface conditions during grading and construction of the project, in order to confirm that our findings are representative for the site.

Our conclusions and recommendations were derived based on engineering analysis, combined with interpolation and extrapolation of subsurface conditions encountered during previous and/or current field explorations. Changes in subsurface conditions over an area are not uncommon and will occur over time. If change in subsurface conditions is encountered during construction, this office will evaluate the conditions and make modifications to the conclusions and recommendations accordingly.

Our professional services were performed in accordance with the prevailing standard of professional care practiced by other geotechnical engineers in this area at this time. We make no other warranty, either expressed or implied.



Proposed Mixed-Use Development
7441 Edinger Avenue
Huntington Beach, California

SITE LOCATION MAP

Project No.
012428-001

Date
October 2009

Figure 1

\\GIS\Drafting\012428\001\GIS\of_09-10-13\Figure1-SiteLocationMap.mxd

LEGEND:

B-2
T.D.50'
GW=15'
APPROXIMATE BORING LOCATION WITH TOTAL DEPTH OF BORING AND GROUNDWATER

CPT-4
T.D.60'
APPROXIMATE CPT LOCATION AND TOTAL DEPTH

NOTE:
Figure 2 adapted from A.L.T.A/A.C.S.M. Land Title Survey, prepared by AllWest, Project 29T37.90, dated October 6, 2009.

N

0 80 160
SCALE FEET

TEST BORING AND CPT LOCATION PLAN
PROPOSED MIXED-USE DEVELOPMENT
7441 EDINGER AVENUE
HUNTINGTON BEACH, CALIFORNIA

FIGURE 2

Proj: 012428-001	Eng/Geol: JH
Scale: 1"=80'	Date: 10/09

Drafted By: MAM | Checked By:

Leighton

APPENDIX A

APPENDIX A

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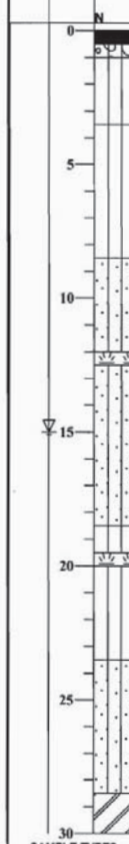
APPENDIX B

GEOTECHNICAL BORING LOG B-1

Date 10-12-09 **Sheet** 1 **of** 2
Project 012428-001 Proposed Mixed-Use Development, Huntington Beach **Logged / Sampled By** MAW
Drilling Co. Martini Drilling Corporation **Type of Rig** CME-75
Hole Diameter 6 **Drive Weight** 140 **Drop** 30"
Elevation Top of Hole ' **Location** See Boring Location Map, Figure 2



Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
									The Soil Description applies only to a location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	
	0								@ Surface - 5 inches of aspalt concrete over 6.5 inches of aggregate base	
				R-1	5 10 12	98	23	ML	@ 1': **Artificial Fill (Af)** SILT, stiff, dark gray, slightly moist, some fine grained sand, micaceous, trace clay	
				B-1				ML		CR
									@ 3.5': **QUATERNARY ALLUVIUM (Qal)**	DS
	5			R-2	7 9 12	101	21	ML	SILT with thin interbedded Clay and Sandy Silt, stiff, dark gray, moist	
				R-3	4 6 8	67	52	ML	@ 6': increase Clayey SILT; grades to Silty CLAY at 7', very moist to wet	
	10			R-4	3 5 5	81	39	SM-ML	@ 8.5': Silty SAND to Sandy SILT, stiff, dark gray, moist, trace thin decomposed organic layers, thin interbeds of clay	
				R-5	2 2 3	34 50	135 63	PT CL	@ 11': Silty CLAY, soft, dark gray, wet, abundant organics, decomposed and fresh roots, strong decomposed organic odor; fibrous peat at 11.5'	
	15			R-6	3 11 8	97	25	SM	@ 13.5': Silty SAND, medium dense, medium gray, wet, fine grained, decomposed organic odor, micaceous	
	20			R-7	3 3 4	69	45	ML	@ 18.5': Sandy SILT, firm, dark gay, micaceous, fine grained sand, thin fibrous peat seam	SA
	25			R-8	6 8 9	93	29	SM	@ 23.5': Silty SAND, loose, medium gray, wet, fine grained, micaceous	
	30			S-1	1 1 1		57	CH	@ 28.5': Silty CLAY, soft, dark gray, wet	AL

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
UC UNCONFINED COMPRESSIVE STRENGTH
SA SIEVE ANALYSIS
SE SAND EQUIVALENT
EI EXPANSION INDEX
RV R VALUE
-200 % FINES PASSING
AL ATTERBERG LIMITS
CO COLLAPSE
PP POCKET PENETROMETER
Tx TRIAXIAL COMPRESSION

* * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * *

GEOTECHNICAL BORING LOG B-1

Date 10-12-09 | Sheet 2 of 2
Project 012428-001 Proposed Mixed-Use Development, Huntington Beach | Logged / Sampled By MAW
Drilling Co. Martini Drilling Corporation | Type of Rig CME-75
Hole Diameter 6 | Drive Weight 140 | Drop 30"
Elevation Top of Hole ' | Location See Boring Location Map, Figure 2

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION The Soil Description applies only to a location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	Type of Tests
	30	N S							Quaternary Alluvium (Qal) continued	
	35			S-2	1 1 2		73	CH	@ 33.5': Silty CLAY, soft, gray, wet, decomposed organic layers, decomposed organic odor	AL,SA
	40			S-3	1 2 2			CH	@ 38.5': Silty CLAY, soft, gray, wet; fine grained sand at tip of sampler	
	45			S-4	3 5 6			SP	@ 43.5': SAND, loose, gray, wet, fine to coarse grained, some fine to coarse grained gravel Sample lost due to heaving sands, bag sample taken of sand stuck in augers (S4 @ 43.5).	
	50							SP		
	55								Total depth of Boring 50 ft Sample at 48.5 ft was not attempted due to heaving sand conditions. Groundwater encountered while drilling @ 15 ft bgs Boring was backfilled with cement bentonite grout and patch with cold patch.	
	60									

SAMPLE TYPES:
S SPLIT SPOON | G GRAB SAMPLE
R RING SAMPLE | C CORE SAMPLE
B BULK SAMPLE
T TUBE SAMPLE

TYPE OF TESTS:
DS DIRECT SHEAR | SA SIEVE ANALYSIS | -200 % FINES PASSING
MD MAXIMUM DENSITY | SE SAND EQUIVALENT | AL ATTERBERG LIMITS
CN CONSOLIDATION | EI EXPANSION INDEX | CO COLLAPSE
CR CORROSION | RV R VALUE | PP POCKET PENETROMETER
UC UNCONFINED COMPRESSIVE STRENGTH | Tx TRIAXIAL COMPRESSION

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GEOTECHNICAL BORING LOG B-2

Date 10-12-09 | Sheet 1 of 2
Project 012428-001 Proposed Mixed-Use Development, Huntington Beach | Logged / Sampled By MAW
Drilling Co. Martini Drilling Corporation | Type of Rig CME-75
Hole Diameter 8 | Drive Weight 140 | Drop 30"
Elevation Top of Hole ' | Location See Boring Location Map, Figure 2

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION The Soil Description applies only to a location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	Type of Tests
	0	N S							@ Surface - 2.5 inches of asphalt concrete over 3.5 inches of aggregate base	
				B-1				ML	@ 0.5': **Artificial Fill (Af)** Clayey SILT to SILT, dark brown, moist	CR
	5			R-1	6 7 12	94	29	CL	@ 5': **QUATERNARY ALLUVIUM (Qal)** Silty CLAY, stiff, medium gray, moist, some mica	
	10			R-2	4 3 4	63	59	MH	@ 8.5': Silty CLAY, firm, medium gray, wet, some fine grained sand, plastic, micaceous, moderately decomposed roots, oxidized around roots	AL,CN
				R-3	2 2 4	75	46	MH	@ 11': oxidized around organic fibers	Tx
	15			R-4	3 7 12			SM	@ 13.5': Silty SAND, medium dense, wet, fine grained sand, micaceous, trace roots	
	20			R-5	2 2 3	75	46	CH	@ 18.5': CLAY, soft, medium gray, wet, fine grained sand, plastic, micaceous	AL,CN
	25			R-6	1 3 4	77	45	ML	@ 23.5': SAND in upper 6" of sampler SILT, firm, olive gray, wet, some clay, trace fine grained sand	Tx
	30			S-1	3 3 3		29	ML	@ 28.5': SILT, firm, medium gray, wet, some clay, some fine grained sand layers	AL

SAMPLE TYPES:
S SPLIT SPOON | G GRAB SAMPLE
R RING SAMPLE | C CORE SAMPLE
B BULK SAMPLE
T TUBE SAMPLE

TYPE OF TESTS:
DS DIRECT SHEAR | SA SIEVE ANALYSIS | -200 % FINES PASSING
MD MAXIMUM DENSITY | SE SAND EQUIVALENT | AL ATTERBERG LIMITS
CN CONSOLIDATION | EI EXPANSION INDEX | CO COLLAPSE
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GEOTECHNICAL BORING LOG B-2

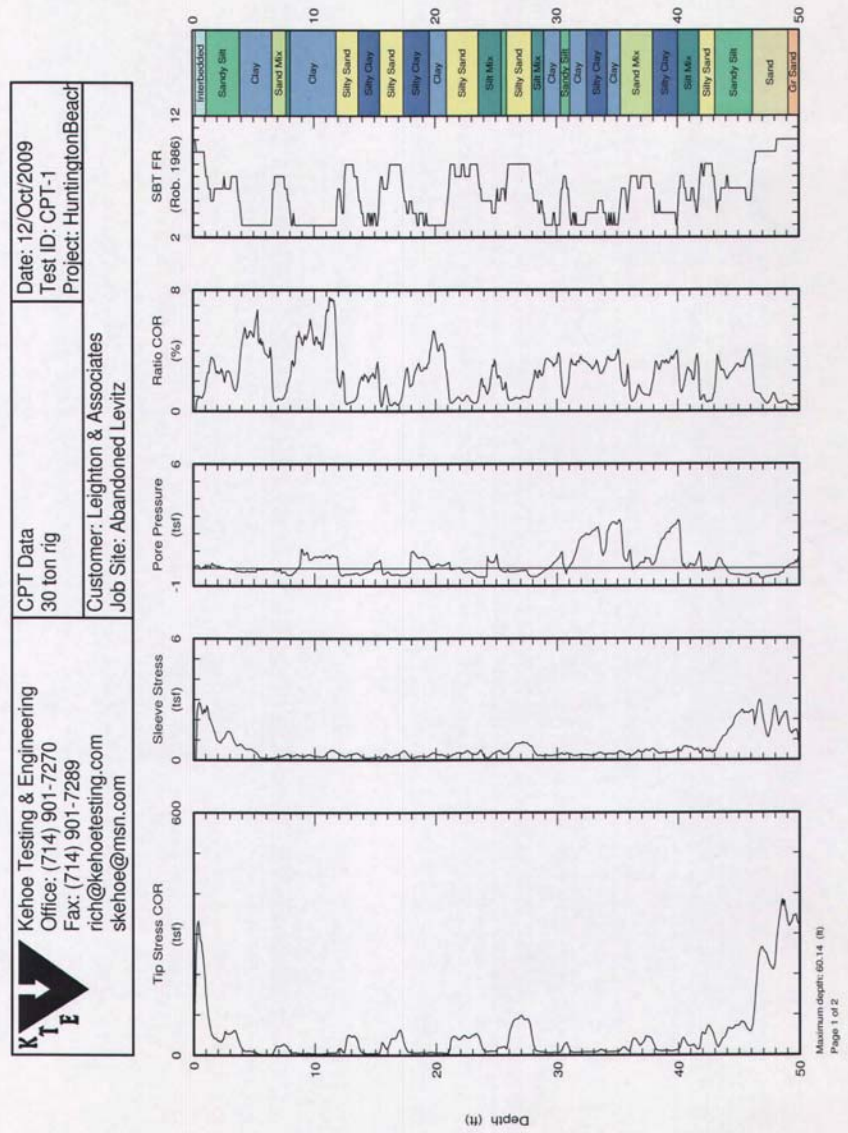
Date 10-12-09 **Sheet** 2 of 2
Project 012428-001 Proposed Mixed-Use Development, Huntington Beach **Logged / Sampled By** MAW
Drilling Co. Martini Drilling Corporation **Type of Rig** CME-75
Hole Diameter 8 **Drive Weight** 140 **Drop** 30"
Elevation Top of Hole ' **Location** See Boring Location Map, Figure 2

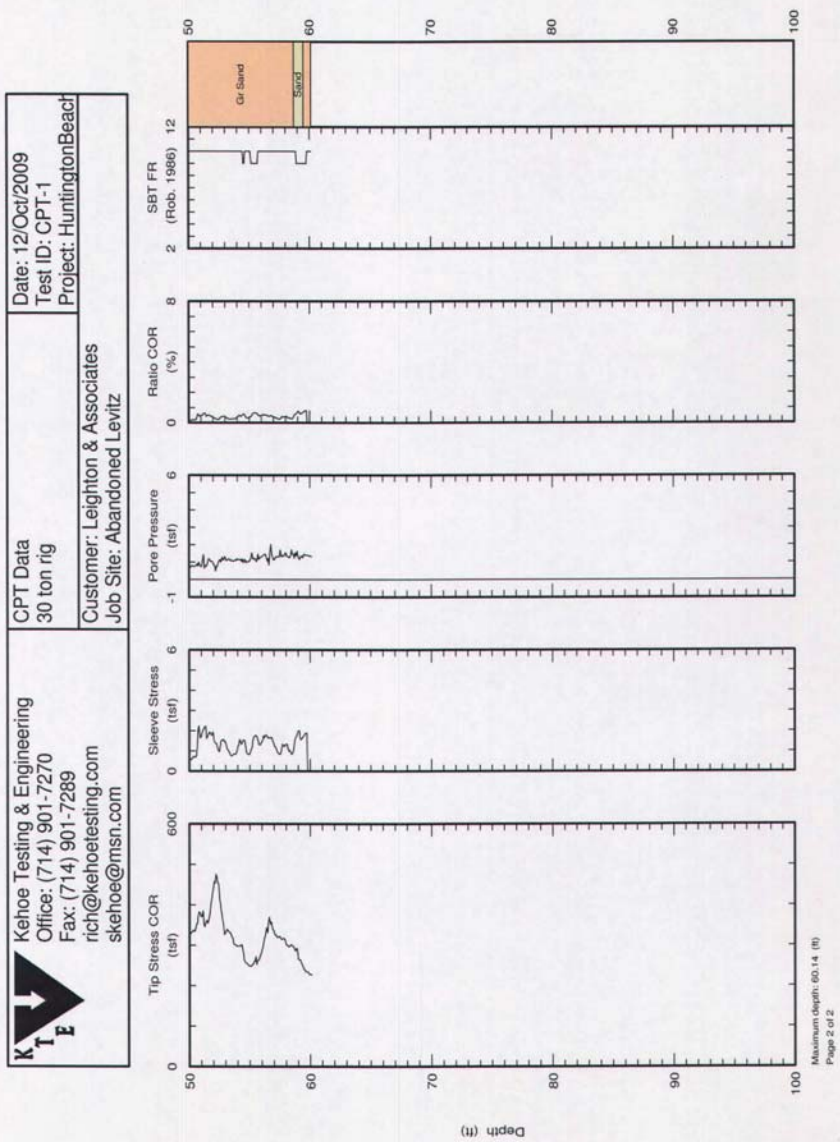
Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION The Soil Description applies only to a location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	Type of Tests
	30								Quaternary Alluvium (Qal) continued	
	35			S-2	push 1 2		50	CL	@ 33.5': Silty CLAY, soft, medium gray, wet, roots, trace fine grained sand washed in sample during drilling	
	40			S-3	3 7 10		28	SM	@ 38.5': Silty SAND, loose, medium gray, fine grained sand, trace roots	
	45			S-4	3 5 5			ML	@ 43.5': Clayey SILT with Sand, dark gray, wet, fine grained sand, micaceous	SA
	50			S-5	3 5 7			ML	@ 48.5': poor sample recovery, Sandy SILT, firm to loose, medium gray, wet, fine grained sand	
	55								Total depth of boring 50 ft Groundwater encountered @ 15 ft bgs during drilling Boring was backfilled with cement bentonite grout and patched with cold patch	
	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
UC UNCONFINED COMPRESSIVE STRENGTH
SA SIEVE ANALYSIS
SE SAND EQUIVALENT
EI EXPANSION INDEX
RV R VALUE
-200 % FINES PASSING
AL ATTERBERG LIMITS
CO COLLAPSE
PP POCKET PENETROMETER
Tx TRIAXIAL COMPRESSION

* * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * *






```
"
"Output file from CPTINT - Version 5.2
"=====================================
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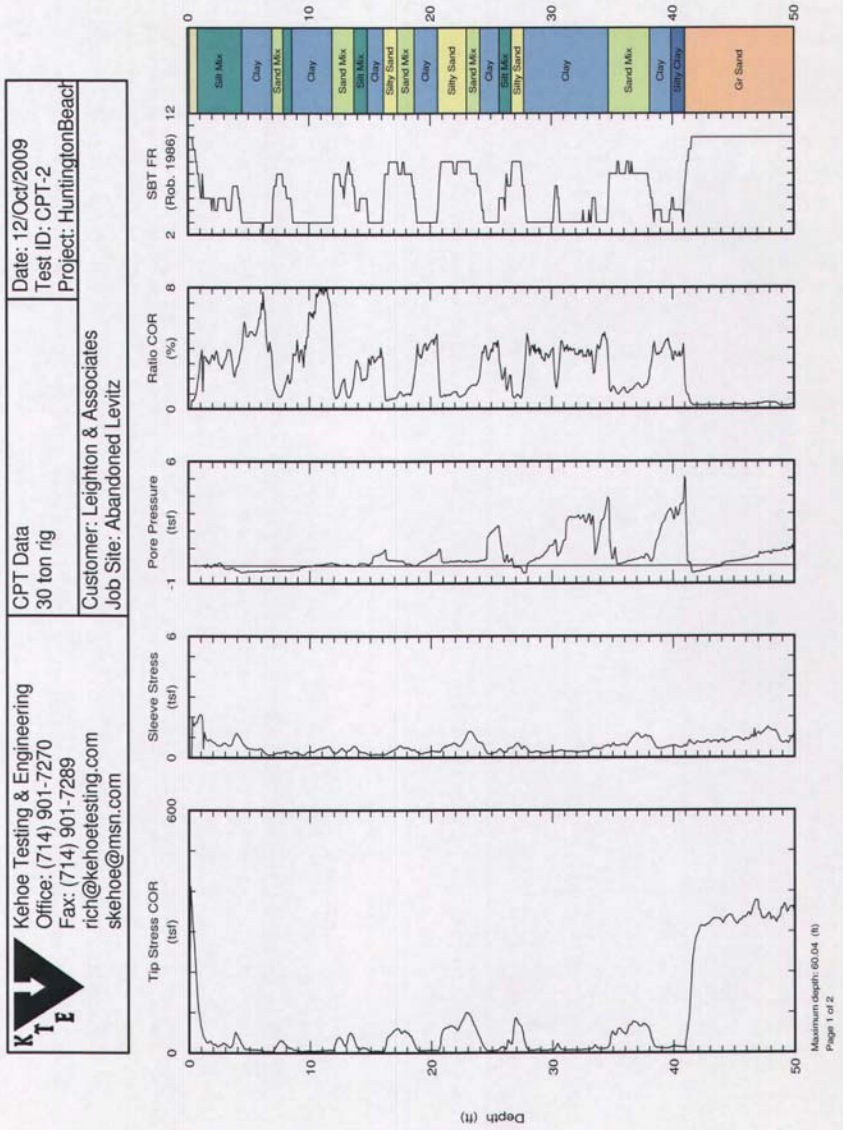
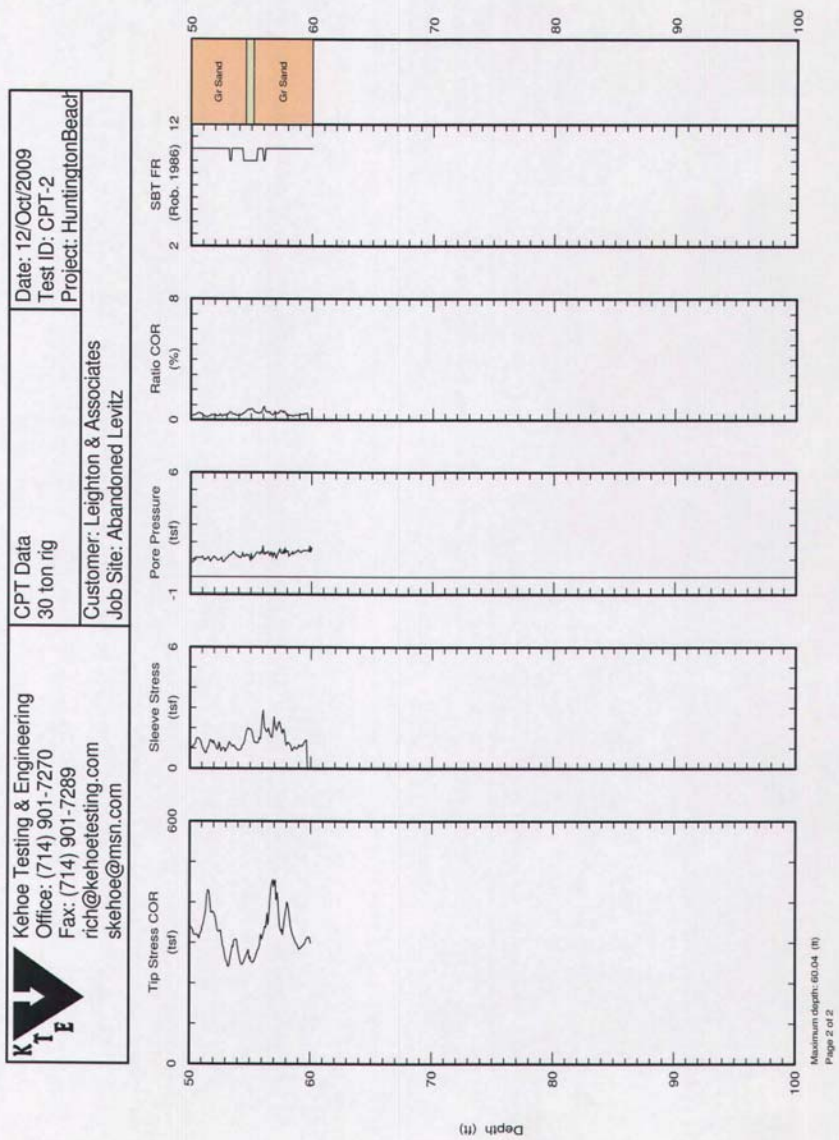
"-----------------------------
"
"Developed by: UBC In-Situ Testing FREEWARE
"     Program: Piezocone Interpretation
"    Web Site: www.civil.ubc.ca/home/in-situ
"
"Interpreter Name:
"
"
"SUMMARY SHEET
"-------------
"'a' for calculating Qt:                  0.830
"Value for Water Table (in m):            25.000
"Valid Zone Classification based on:      Rf
"Missing unit weight to start depth:      18.860
"Method for calculating Su:               Nkt
"Value of the constant Nkt:               15.000
"Define Zone 6 for Sand Parameters?       NO
"Vertical Flow Gradient, i (- up):        +0.000
"CPT to SPT N60 Conversion:               Robertson & Campanella
"
"Soil Behavior Type Zone Numbers
"For Rf Zone & Bq Zone Classification
"-----------------------------------
"Zone #1=Sensitive fine grained      Zone #7 =Silty sand
"Zone #2=Organic material            Zone #8 =Fine sand
"Zone #3=Clay                        Zone #9 =Sand
"Zone #4=Silty clay                  Zone #10=Gravelly sand
"Zone #5=Clayey silt                 Zone #11=Very stiff fine grained *
"Zone #6=Sandy silt                  Zone #12=Sand to clayey sand *
"   * Overconsolidated and/or cemented
"
"NOTE:
"-----
"For soil classification, Rf values > 8 are assumed to be 8.
"
"( Note: 9E9 means Out Of Range )
"
INPUT FILE: C:\temp\CPT-1.CSV  |-------------------------------------------------
" Depth      Qc(avg)   Fs(avg)   Rf        Rf Zone   Spt N     Spt N1    Su
" (feet)     (TSF)     (TSF)     (%)       (zone #)  (blow/ft) (blow/ft) (TSF)
"-------------------------------------------------------------------------------
    0.500   243.573     1.875     0.770     9         47        71          9E9
    1.500    67.820     1.828     2.694     6         26        39        4.517
    2.500    44.927     1.122     2.498     6         17        26        2.984
    3.500    48.220     0.954     1.980     6         18        27        3.197
    4.500    11.456     0.573     5.025     3         11        17        0.742
    5.500     3.953     0.209     5.287     3          4         6        0.240
    6.500     9.540     0.119     1.254     5          5         8        0.607
    7.500    22.700     0.243     1.071     6          9        14        1.479
    8.500     6.337     0.234     3.698     3          6         9        0.387
    9.500     4.633     0.237     4.951     3          5         8        0.280
   10.500     4.227     0.200     4.594     3          4         6        0.247
   11.500     7.647     0.446     5.738     3          7         9        0.471
   12.500    28.931     0.267     0.924     7          9        11          9E9
   13.500    31.740     0.301     0.949     7         10        12          9E9
   14.500     5.487     0.123     2.256     4          3         3        0.305
   15.500    17.040     0.197     1.157     6          7         7        1.074
   16.500    42.606     0.241     0.566     7         14        14          9E9
   17.500    28.047     0.348     1.242     6         11        10        1.796
   18.500     7.233     0.190     2.572     4          5         5        0.417
   19.500     7.620     0.281     3.661     3          7         6        0.432
   20.500     6.800     0.261     3.808     3          7         6        0.373
   21.500    39.427     0.306     0.776     7         13        11          9E9
   22.500    46.767     0.399     0.853     7         15        12          9E9
   23.500    40.380     0.363     0.900     7         13        10          9E9
   24.500    11.000     0.243     2.203     5          5         4        0.637
```

INPUT FILE: C:\temp\CPT-1.CSV

" Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
25.500	22.193	0.393	1.772	6	9	6	1.377
26.500	83.900	0.705	0.841	8	20	14	9E9
27.500	83.160	0.825	0.992	8	20	13	9E9
28.500	13.447	0.305	2.277	5	6	4	0.776
29.500	7.862	0.252	3.193	3	8	5	0.406
30.500	19.700	0.319	1.616	6	8	5	1.194
31.500	8.693	0.267	3.015	4	6	4	0.463
32.500	8.300	0.271	3.126	4	6	4	0.447
33.500	11.362	0.324	2.769	4	7	4	0.645
34.500	9.107	0.319	3.338	3	9	5	0.498
35.500	14.987	0.369	2.416	5	7	4	0.874
36.500	32.153	0.356	1.105	7	10	5	9E9
37.500	39.412	0.496	1.256	7	13	7	9E9
38.500	13.180	0.397	2.957	4	9	5	0.739
39.500	11.700	0.420	3.456	4	8	4	0.651
40.500	30.233	0.600	1.974	6	12	6	1.863
41.499	26.131	0.517	1.972	6	10	5	1.580
42.499	60.440	0.472	0.781	8	14	7	9E9
43.499	35.060	0.913	2.601	6	13	7	2.165
44.499	68.840	1.803	2.620	6	26	13	4.406
45.499	72.856	2.389	3.284	6	28	14	4.666
46.499	188.287	2.482	1.319	8	45	23	9E9
47.499	234.420	1.741	0.743	9	45	23	9E9
48.499	341.927	2.185	0.639	10	55	28	9E9
49.499	334.181	1.446	0.433	10	53	27	9E9
50.499	351.720	1.128	0.321	10	56	28	9E9
51.499	378.640	1.939	0.512	10	60	30	9E9
52.499	416.053	1.399	0.336	10	66	33	9E9
53.499	322.680	0.981	0.304	10	52	26	9E9
54.499	278.381	1.264	0.454	10	44	22	9E9
55.499	262.913	1.467	0.558	9	50	25	9E9
56.499	336.760	1.683	0.499	10	54	27	9E9
57.499	322.220	1.138	0.353	10	51	26	9E9
58.499	297.050	1.299	0.437	10	47	24	9E9
59.499	246.720	1.449	0.586	9	47	24	9E9
60.499	229.900	0.000	0.000	10	9E9	9E9	9E9






```
"
"Output file from CPTINT - Version 5.2
"=====================================
"INPUT FILE: C:\temp\CPT-2.CSV
"-----------------------------
"
"Developed by: UBC In-Situ Testing FREEWARE
"     Program: Piezocone Interpretation
"    Web Site: www.civil.ubc.ca/home/in-situ
"
"Interpreter Name:
"
"
"SUMMARY SHEET
"-------------
"'a' for calculating Qt:                  0.830
"Value for Water Table (in m):            25.000
"Valid Zone Classification based on:      Rf
"Missing unit weight to start depth:      18.860
"Method for calculating Su:               Nkt
"Value of the constant Nkt:               15.000
"Define Zone 6 for Sand Parameters?       NO
"Vertical Flow Gradient, i (- up):        +0.000
"CPT to SPT N60 Conversion:               Robertson & Campanella
"
"Soil Behavior Type Zone Numbers
"For Rf Zone & Bq Zone Classification
"-----------------------------------
"Zone #1=Sensitive fine grained     Zone #7 =Silty sand
"Zone #2=Organic material           Zone #8 =Fine sand
"Zone #3=Clay                       Zone #9 =Sand
"Zone #4=Silty clay                 Zone #10=Gravelly sand
"Zone #5=Clayey silt                Zone #11=Very stiff fine grained *
"Zone #6=Sandy silt                 Zone #12=Sand to clayey sand *
"   * Overconsolidated and/or cemented
"
"NOTE:
"-----
"For soil classification, Rf values > 8 are assumed to be 8.
"
"( Note: 9E9 means Out Of Range )
"
INPUT FILE: C:\temp\CPT-2.CSV  |-----------------------------------------------
" Depth     Qc(avg)   Fs(avg)   Rf        Rf Zone   Spt N     Spt N1    Su
" (feet)    (TSF)     (TSF)     (%)       (zone #)  (blow/ft) (blow/ft) (TSF)
"-----------------------------------------------------------------------------
    0.500   218.440    1.347    0.617     9         42        63          9E9
    1.500    33.793    1.074    3.179     5         16        24        2.246
    2.500    20.867    0.666    3.190     5         10        15        1.382
    3.500    26.480    0.771    2.917     5         13        20        1.748
    4.500    20.425    0.752    3.697     4         13        20        1.339
    5.500     8.033    0.419    5.264     3          8        12        0.509
    6.500     4.033    0.213    5.342     3          4         6        0.240
    7.500    23.113    0.248    1.076     6          9        14        1.505
    8.500    11.600    0.271    2.346     5          6         9        0.736
    9.500     5.033    0.199    3.963     3          5         8        0.296
   10.500     5.047    0.361    7.147     3          5         7        0.294
   11.500     6.740    0.478    7.043     3          7         9        0.406
   12.500    28.481    0.333    1.169     7          9        11          9E9
   13.500    34.653    0.451    1.302     7         11        13          9E9
   14.500    10.573    0.243    2.298     5          5         6        0.647
   15.500     4.713    0.162    3.361     3          5         5        0.259
   16.500    35.331    0.259    0.730     7         11        11          9E9
   17.500    55.293    0.509    0.919     7         18        17          9E9
   18.500    29.693    0.389    1.311     7          9         8          9E9
   19.500     6.453    0.253    3.878     3          6         5        0.357
   20.500    18.506    0.332    1.786     6          7         6        1.159
   21.500    64.100    0.621    0.968     8         15        12          9E9
   22.500    77.560    0.734    0.946     8         19        15          9E9
   23.500    72.753    1.090    1.497     7         23        18          9E9
   24.500    13.706    0.424    3.055     4          9         7        0.826
```

INPUT FILE: C:\temp\CPT-2.CSV

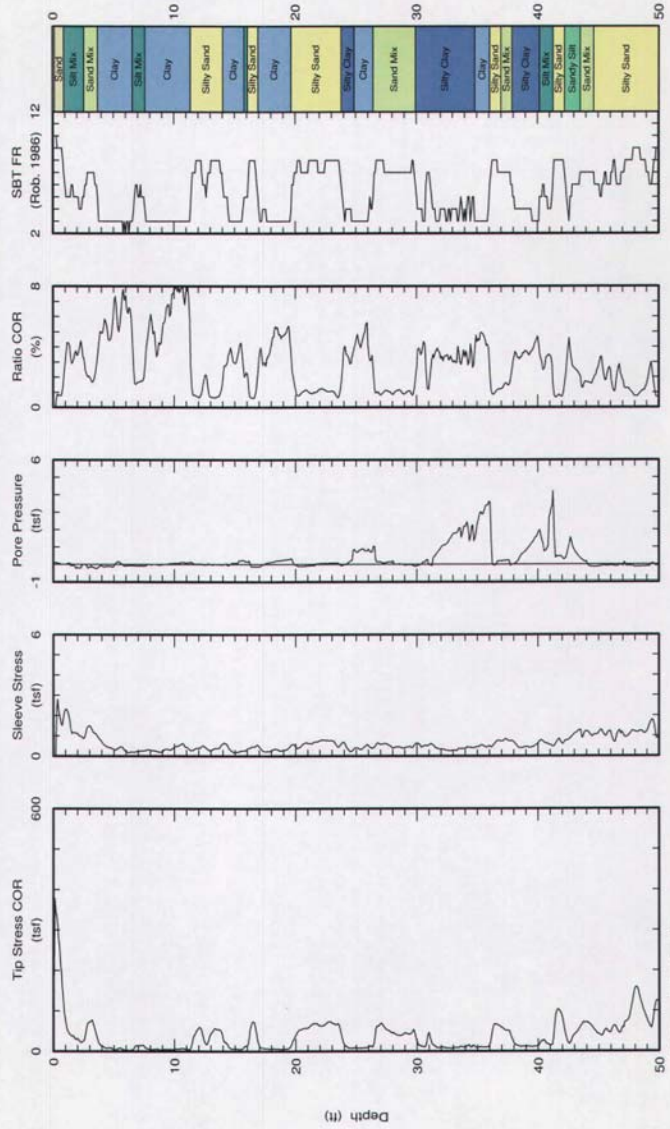
Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
25.500	9.413	0.318	3.256	4	6	4	0.548
26.500	35.573	0.444	1.246	7	11	8	9E9
27.500	50.627	0.560	1.108	7	16	11	9E9
28.500	7.227	0.294	4.042	3	7	5	0.370
29.500	7.138	0.258	3.536	3	7	4	0.368
30.500	12.293	0.330	2.641	5	6	4	0.710
31.500	7.200	0.301	3.920	3	7	4	0.385
32.500	7.460	0.291	3.639	3	8	5	0.401
33.500	12.112	0.422	3.370	4	8	5	0.700
34.500	20.427	0.557	2.662	5	10	6	1.255
35.500	52.373	0.630	1.202	7	17	9	9E9
36.500	66.440	0.842	1.266	7	21	11	9E9
37.500	68.050	1.061	1.558	7	22	12	9E9
38.500	21.507	0.673	3.104	5	10	5	1.291
39.500	11.887	0.514	4.134	3	12	6	0.669
40.500	14.533	0.546	3.603	4	10	5	0.847
41.499	172.494	0.699	0.405	9	33	17	9E9
42.499	313.887	0.763	0.243	10	50	25	9E9
43.499	330.107	0.788	0.239	10	53	27	9E9
44.499	333.853	0.824	0.247	10	53	27	9E9
45.499	328.544	0.923	0.281	10	52	26	9E9
46.499	358.600	1.049	0.292	10	57	29	9E9
47.499	340.407	1.299	0.382	10	54	27	9E9
48.499	335.007	1.153	0.344	10	54	27	9E9
49.499	358.525	0.841	0.235	10	57	29	9E9
50.499	325.813	1.276	0.391	10	52	26	9E9
51.499	384.320	1.105	0.287	10	61	31	9E9
52.499	328.527	1.064	0.324	10	52	26	9E9
53.499	275.513	1.111	0.403	10	44	22	9E9
54.499	265.200	1.402	0.528	9	51	26	9E9
55.499	274.267	1.563	0.569	9	53	27	9E9
56.499	374.760	1.984	0.529	10	60	30	9E9
57.499	377.040	1.979	0.525	10	60	30	9E9
58.499	337.256	1.090	0.323	10	54	27	9E9
59.499	299.613	0.831	0.277	10	48	24	9E9

Kehoe Testing & Engineering
Office: (714) 901-7270
Fax: (714) 901-7289
rich@kehoetesting.com
skehoe@msn.com

CPT Data
30 ton rig

Date: 12/Oct/2009
Test ID: CPT-3
Project: HuntingtonBeach

Customer: Leighton & Associates
Job Site: Abandoned Levitz



Maximum depth: 60.07 (ft)
Page 1 of 2

Kehoe Testing & Engineering
Office: (714) 901-7270
Fax: (714) 901-7289
rich@kehoetesting.com
skehoe@msn.com

CPT Data
30 ton rig

Date: 12/Oct/2009
Test ID: CPT-3
Project: HuntingtonBeach

Customer: Leighton & Associates
Job Site: Abandoned Levitz

012428-001

```
"
"Output file from CPTINT - Version 5.2
"=====================================
"INPUT FILE: C:\temp\CPT-3.CSV
"-----------------------------
"
"Developed by: UBC In-Situ Testing FREEWARE
"     Program: Piezocone Interpretation
"    Web Site: www.civil.ubc.ca/home/in-situ
"
"Interpreter Name:
"
"
"SUMMARY SHEET
"-------------
"'a' for calculating Qt:                    0.830
"Value for Water Table (in m):              25.000
"Valid Zone Classification based on:        Rf
"Missing unit weight to start depth:        18.860
"Method for calculating Su:                 Nkt
"Value of the constant Nkt:                 15.000
"Define Zone 6 for Sand Parameters?         NO
"Vertical Flow Gradient, i (- up):          +0.000
"CPT to SPT N60 Conversion:                 Robertson & Campanella
"
"Soil Behavior Type Zone Numbers
"For Rf Zone & Bq Zone Classification
"-----------------------------------
"Zone #1=Sensitive fine grained      Zone #7 =Silty sand
"Zone #2=Organic material            Zone #8 =Fine sand
"Zone #3=Clay                        Zone #9 =Sand
"Zone #4=Silty clay                  Zone #10=Gravelly sand
"Zone #5=Clayey silt                 Zone #11=Very stiff fine grained *
"Zone #6=Sandy silt                  Zone #12=Sand to clayey sand *
"  * Overconsolidated and/or cemented
"
"NOTE:
"-----
"For soil classification, Rf values > 8 are assumed to be 8.
"
"( Note: 9E9 means Out Of Range )
"
INPUT FILE: C:\temp\CPT-3.CSV |-----------------------------------------
" Depth      Qc(avg)   Fs(avg)   Rf        Rf Zone   Spt N    Spt N1    Su
" (feet)     (TSF)     (TSF)     (%)       (zone #)  (blow/ft) (blow/ft) (TSF)
"-----------------------------------------------------------------------
    0.500    228.060   1.512     0.663     9         44        66        9E9
    1.500     43.067   1.562     3.627     5         21        32        2.864
    2.500     39.027   1.111     2.850     6         15        23        2.590
    3.500     49.287   1.119     2.272     6         19        29        3.269
    4.500      9.700   0.493     5.097     3         9         14        0.625
    5.500      5.893   0.377     6.388     3         6         9         0.371
    6.500      6.907   0.209     3.054     3         7         11        0.430
    7.500     11.760   0.282     2.403     5         6         9         0.752
    8.500      5.556   0.252     4.543     3         5         8         0.335
    9.500      5.353   0.339     6.339     3         5         8         0.318
   10.500      7.033   0.535     7.604     3         7         10        0.427
   11.500     25.480   0.356     1.396     6         10        13        1.653
   12.500     38.000   0.413     1.087     7         12        15        9E9
   13.500     51.927   0.416     0.801     7         17        20        9E9
   14.500     15.087   0.427     2.831     5         7         8         0.947
   15.500      8.107   0.242     2.968     4         5         5         0.481
   16.500     45.869   0.454     0.991     7         15        15        9E9
   17.500      8.273   0.277     3.347     3         8         8         0.480
   18.500      6.440   0.312     4.825     3         6         5         0.356
   19.500     14.340   0.443     3.081     4         9         8         0.879
   20.500     53.288   0.534     1.003     7         17        14        9E9
   21.500     66.007   0.678     1.027     8         16        13        9E9
   22.500     68.460   0.787     1.149     8         16        13        9E9
   23.500     57.527   0.613     1.066     7         18        14        9E9
   24.500     10.619   0.382     3.581     3         10        7         0.612
```

INPUT FILE: C:\temp\CPT-3.CSV

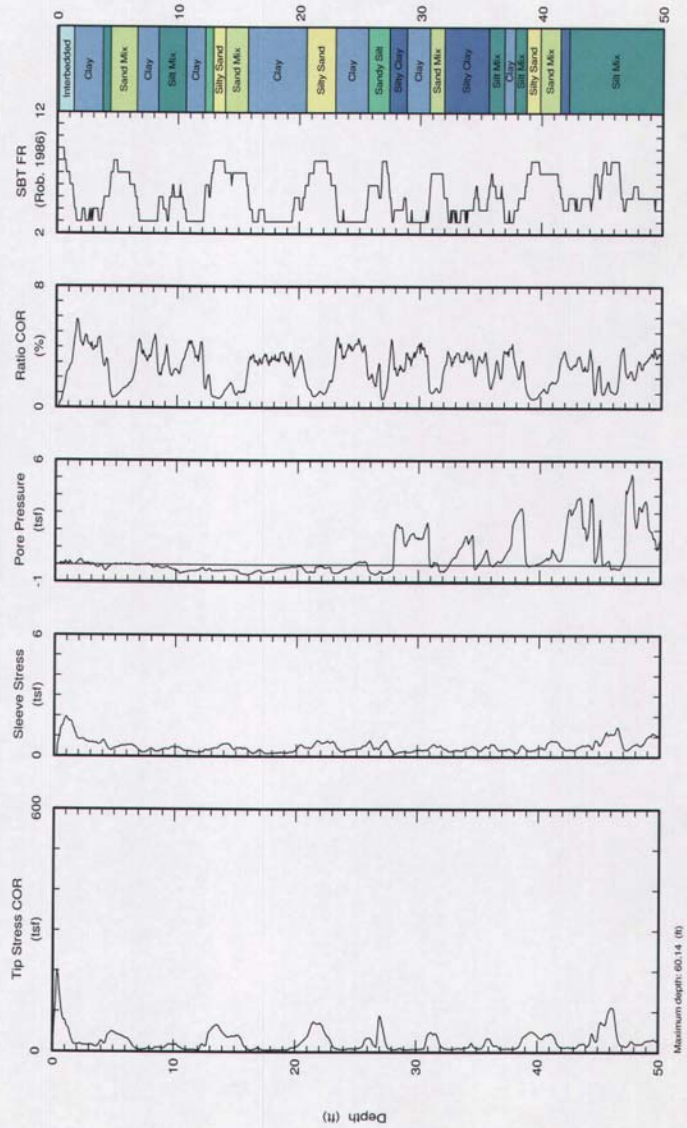
Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
25.500	9.053	0.433	4.699	3	9	6	0.510
26.500	36.360	0.509	1.396	7	12	8	9E9
27.500	56.840	0.569	1.000	7	18	12	9E9
28.500	42.140	0.435	1.031	7	13	9	9E9
29.500	44.388	0.487	1.097	7	14	9	9E9
30.500	19.100	0.537	2.810	5	9	6	1.151
31.500	17.933	0.479	2.660	5	9	5	1.074
32.500	8.880	0.299	3.273	3	9	5	0.478
33.500	10.069	0.342	3.279	4	7	4	0.560
34.500	12.653	0.437	3.361	4	8	5	0.728
35.500	10.420	0.493	4.476	3	11	6	0.590
36.500	54.920	0.637	1.156	7	18	10	9E9
37.500	47.631	0.777	1.631	7	15	8	9E9
38.500	14.033	0.489	3.467	4	9	5	0.785
39.500	12.180	0.479	3.856	3	12	6	0.668
40.500	21.313	0.689	3.194	5	10	5	1.274
41.499	67.275	0.647	0.958	8	16	8	9E9
42.499	37.880	0.844	2.218	6	15	8	2.365
43.499	59.780	1.163	1.944	7	19	10	9E9
44.499	59.647	1.093	1.834	7	19	10	9E9
45.499	46.437	1.165	2.510	6	18	9	2.910
46.499	55.427	1.019	1.838	7	18	9	9E9
47.499	94.873	1.089	1.148	8	23	12	9E9
48.499	126.113	1.194	0.947	8	30	15	9E9
49.499	90.856	1.373	1.511	7	29	15	9E9
50.499	116.967	1.283	1.097	8	28	14	9E9
51.499	114.640	1.538	1.342	8	27	14	9E9
52.499	108.147	1.632	1.509	8	26	13	9E9
53.499	83.347	1.119	1.342	8	20	10	9E9
54.499	43.394	0.801	1.844	7	14	7	9E9
55.499	56.113	0.949	1.688	7	18	9	9E9
56.499	157.700	1.960	1.242	8	38	19	9E9
57.499	284.380	2.971	1.044	9	54	27	9E9
58.499	330.487	2.110	0.638	10	53	27	9E9
59.499	441.580	1.067	0.241	10	71	36	9E9
60.499	458.800	0.000	0.000	10	9E9	9E9	9E9

Kehoe Testing & Engineering
Office: (714) 901-7270
Fax: (714) 901-7289
rich@kehoetesting.com
skehoe@msn.com

CPT Data
30 ton rig

Customer: Leighton & Associates
Job Site: Abandoned Levitz

Date: 12/Oct/2009
Test ID: CPT-4
Project: HuntingtonBeach



Maximum depth: 60.14 (ft)
Page 1 of 2

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 rich@kehoetesting.com skehoe@msn.com	CPT Data 30 ton rig	Date: 12/Oct/2009 Test ID: CPT-4 Project: HuntingtonBeach
	Customer: Leighton & Associates Job Site: Abandoned Levitz	

012428-001

```
"
"Output file from CPTINT - Version 5.2
"=====================================
"INPUT FILE: C:\temp\CPT-4.CSV
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"
"Developed by: UBC In-Situ Testing FREEWARE
"     Program: Piezocone Interpretation
"     Web Site: www.civil.ubc.ca/home/in-situ
"
"Interpreter Name:
"
"
"SUMMARY SHEET
"-------------
"'a' for calculating Qt:                    0.830
"Value for Water Table (in m):              25.000
"Valid Zone Classification based on:        Rf
"Missing unit weight to start depth:        18.860
"Method for calculating Su:                 Nkt
"Value of the constant Nkt:                 15.000
"Define Zone 6 for Sand Parameters?         NO
"Vertical Flow Gradient, i (- up):          +0.000
"CPT to SPT N60 Conversion:                 Robertson & Campanella
"
"Soil Behavior Type Zone Numbers
"For Rf Zone & Bq Zone Classification
"-----------------------------------
"Zone #1=Sensitive fine grained      Zone #7 =Silty sand
"Zone #2=Organic material            Zone #8 =Fine sand
"Zone #3=Clay                        Zone #9 =Sand
"Zone #4=Silty clay                  Zone #10=Gravelly sand
"Zone #5=Clayey silt                 Zone #11=Very stiff fine grained *
"Zone #6=Sandy silt                  Zone #12=Sand to clayey sand *
"  * Overconsolidated and/or cemented
"
"NOTE:
"-----
"For soil classification, Rf values > 8 are assumed to be 8.
"
"( Note: 9E9 means Out Of Range )
"
INPUT FILE: C:\temp\CPT-4.CSV |-----------------------------------------
" Depth      Qc(avg)   Fs(avg)   Rf        Rf Zone   Spt N    Spt N1    Su
" (feet)     (TSF)     (TSF)     (%)       (zone #)  (blow/ft) (blow/ft) (TSF)
"-----------------------------------------------------------------------
     0.500   117.873    1.033    0.876     8         28        42        9E9
     1.500    41.207    1.493    3.623     5         20        30        2.741
     2.500    18.453    0.804    4.354     3         18        27        1.221
     3.500    17.000    0.661    3.889     4         11        17        1.118
     4.500    36.212    0.504    1.394     7         12        18        9E9
     5.500    42.833    0.498    1.162     7         14        21        9E9
     6.500    22.687    0.522    2.301     6         9         14        1.486
     7.500     7.160    0.256    3.575     3         7         11        0.447
     8.500     9.794    0.308    3.150     4         6         9         0.617
     9.500    15.597    0.415    2.666     5         7         11        0.998
    10.500    13.447    0.389    2.908     5         6         8         0.850
    11.500     6.407    0.241    3.815     3         6         8         0.375
    12.500    21.837    0.301    1.380     6         8         10        1.402
    13.500    61.440    0.480    0.782     8         15        17        9E9
    14.500    41.107    0.534    1.301     7         13        14        9E9
    15.500    32.473    0.425    1.312     7         10        10        9E9
    16.500     8.200    0.256    3.146     3         8         8         0.475
    17.500     6.500    0.211    3.285     3         6         6         0.358
    18.500     6.020    0.201    3.352     3         6         5         0.324
    19.500     8.433    0.234    2.784     4         5         4         0.481
    20.500    23.600    0.496    2.107     6         9         8         1.487
    21.500    65.040    0.619    0.952     8         16        13        9E9
    22.500    51.207    0.713    1.395     7         16        13        9E9
    23.500    11.493    0.438    3.838     3         11        8         0.665
    24.500     8.413    0.352    4.189     3         8         6         0.460
```

INPUT FILE: C:\temp\CPT-4.CSV

" Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
25.500	18.060	0.517	2.860	5	9	6	1.101
26.500	33.313	0.515	1.549	6	13	9	2.107
27.500	40.007	0.599	1.501	7	13	9	9E9
28.500	7.920	0.219	2.643	4	5	3	0.436
29.500	7.387	0.275	3.574	3	7	4	0.393
30.500	14.213	0.346	2.380	5	7	4	0.846
31.500	43.600	0.545	1.251	7	14	8	9E9
32.500	11.400	0.353	3.103	4	7	4	0.627
33.500	9.825	0.343	3.414	3	10	6	0.533
34.500	15.273	0.455	2.950	5	7	4	0.889
35.500	17.880	0.422	2.351	5	9	5	1.053
36.500	20.960	0.487	2.324	5	10	5	1.250
37.500	9.363	0.353	3.679	3	9	5	0.487
38.500	20.473	0.393	1.876	6	8	4	1.240
39.500	47.960	0.346	0.721	7	15	8	9E9
40.500	39.407	0.515	1.306	7	13	7	9E9
41.499	31.619	0.702	2.215	6	12	6	1.946
42.499	11.973	0.365	2.914	4	8	4	0.662
43.499	17.480	0.507	2.811	5	9	5	1.026
44.499	28.813	0.621	2.128	6	11	6	1.765
45.499	74.981	0.944	1.259	8	18	9	9E9
46.499	66.580	1.135	1.705	7	21	11	9E9
47.499	20.033	0.457	2.202	6	8	4	1.192
48.499	21.547	0.662	2.987	5	11	6	1.281
49.499	29.987	1.076	3.551	5	15	8	1.819
50.499	36.487	0.911	2.485	6	14	7	2.239
51.499	51.900	0.757	1.455	7	17	9	9E9
52.499	77.853	0.901	1.157	8	19	10	9E9
53.499	56.153	0.869	1.548	7	18	9	9E9
54.499	34.594	0.719	2.068	6	13	7	2.095
55.499	69.767	1.207	1.724	7	22	11	9E9
56.499	178.787	1.635	0.914	9	34	17	9E9
57.499	117.620	1.790	1.521	8	28	14	9E9
58.499	228.469	1.729	0.756	9	44	22	9E9
59.499	266.140	2.087	0.784	9	51	26	9E9
60.499	270.300	0.000	0.000	10	9E9	9E9	9E9

APPENDIX C

APPENDIX C

Laboratory Test Results

Laboratory tests were conducted in our geotechnical laboratory on representative soil samples for the purpose of evaluating the physical properties and engineering characteristics of the sampled materials. A summary of the various laboratory tests conducted is presented below.

In-situ Moisture Content and Dry Density

Data obtained from these tests performed on relatively undisturbed ring samples obtained from the field, were used to aid in the classification and correlation of the earth materials and to provide qualitative information regarding soil strength and compressibility. The percent of moisture as a function of dry weight, and the measured dry density in units of pounds per cubic foot (pcf) are presented on the exploration logs.

Percent Passing No. 200 Sieve

Percent passing the No. 200 sieve was determined for the selected sample. The sieve analysis was performed in general accordance with the ASTM Test Method D1140-97.

Grain-Size Distribution

Sieve analyses were performed on the selected samples to assist in soil classification and to determine the distribution of soil particle sizes. The sieve analyses were performed in general accordance with the ASTM D422-98 Standard Test Method. Results are plotted and shown in Appendix C, *Grain-Size Distribution*.

Atterberg Limits

Atterberg Limits testing was performed on one soil sample. The liquid limit (LL), plastic limit (PL), and plasticity index (PI) of the sample were determined in accordance with ASTM Test Method D4318-98. Test results are shown graphically on in Appendix C, *Atterberg Limits.*

Direct Shear Test

Direct shear tests were performed on the relatively undisturbed ring samples in accordance with ASTM Test Method D3080-98. Specimens were soaked prior to shearing. Results of the tests are presented in Appendix C, *Direct Shear Test Results.*

APPENDIX C (Cont'd)

Laboratory Test Results

Consolidation Tests

Consolidation tests were performed on the relatively undisturbed ring samples in accordance with ASTM D2435-96. These tests were performed to evaluate the compressibility and moisture sensitivity of site soils under load. This test involved loading specimens into a consolidometer, which contained porous stones top and bottom to accommodate vertical drainage during testing. Normal vertical axial loads were applied through the porous stones, and the resulting deflections were recorded at various time periods. Normal loads were applied at a constant load-increment ratio, successive loads being generally twice the preceding load. Samples were tested at field and submerged moisture contents. Test results are presented in Appendix C, *Consolidation Curve.*

Leighton

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Proposed Mixed-Use Development, HB	Tested By:	G. Bathala	Date:	10/20/09
Project No. :	012428-001	Input By:	J. Ward	Date:	10/22/09
Boring No.:	B-1	Checked By:	J. Ward		
Sample No.:	S-1	Depth (ft.)	28.5-30		
Soil Identification:	Olive gray fat clay with sand (CH)s				

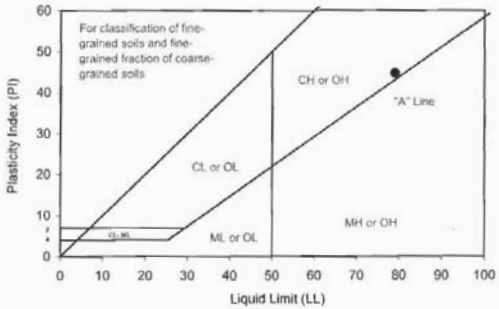
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			32	23	17	
Wet Wt. of Soil + Cont. (g)	10.14	11.59	11.73	11.98	13.61	
Dry Wt. of Soil + Cont. (g)	7.82	8.89	7.09	7.15	7.92	
Wt. of Container (g)	1.04	1.04	1.08	1.05	1.06	
Moisture Content (%) [Wn]	34.22	34.39	77.20	79.18	82.94	

Liquid Limit	**79**
Plastic Limit	**34**
Plasticity Index	**45**
Classification	**CH**

PI at "A" - Line = 0.73(LL-20) 43.07

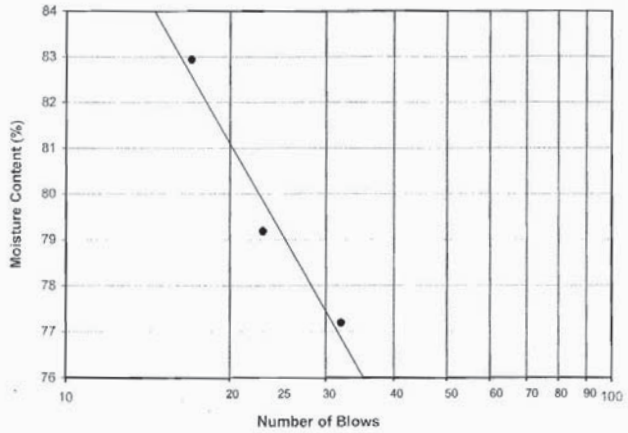
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.12}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [x] Dry Preparation
  Multipoint - Dry
- [x] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



Leighton

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Proposed Mixed-Use Development, HB	Tested By:	A. Santos	Date:	10/21/09
Project No. :	012428-001	Input By:	J. Ward	Date:	10/22/09
Boring No.:	B-1	Checked By:	J. Ward		
Sample No.:	S-2	Depth (ft.)	33.5-35		
Soil Identification:	Dark olive elastic silt with sand (MH)s				

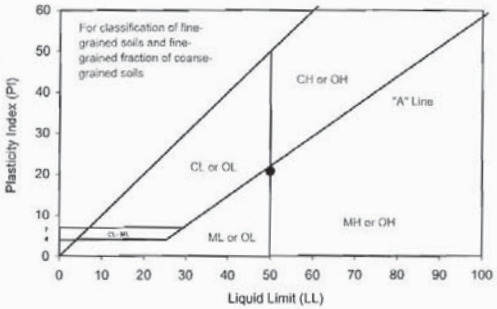
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			35	25	18	
Wet Wt. of Soil + Cont. (g)	9.32	9.40	19.62	19.33	20.49	
Dry Wt. of Soil + Cont. (g)	7.46	7.49	13.60	13.27	13.93	
Wt. of Container (g)	1.05	1.04	1.08	1.02	1.10	
Moisture Content (%) [Wn]	29.02	29.61	48.08	49.47	51.13	

Liquid Limit	**50**
Plastic Limit	**29**
Plasticity Index	**21**
Classification	**MH**

PI at "A" - Line = 0.73(LL-20) 21.9

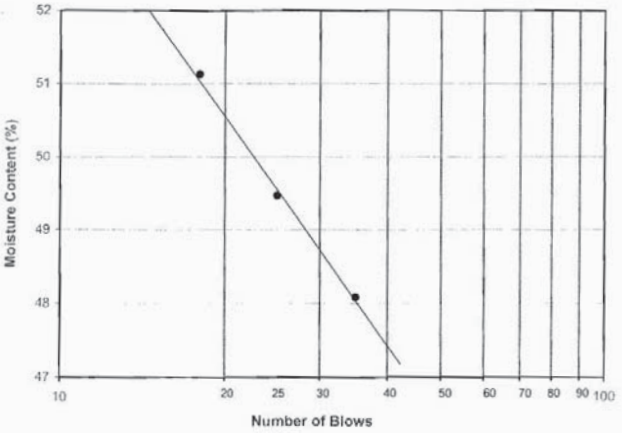
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.12}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [x] Dry Preparation
  Multipoint - Dry
- [x] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



Leighton

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Proposed Mixed-Use Development, HB	Tested By:	A. Santos	Date:	10/16/09
Project No. :	012428-001	Input By:	J. Ward	Date:	10/22/09
Boring No.:	B-2	Checked By:	J. Ward		
Sample No.:	R-2	Depth (ft.)	8.5-10		
Soil Identification:	Dark gray elastic silt (MH)				

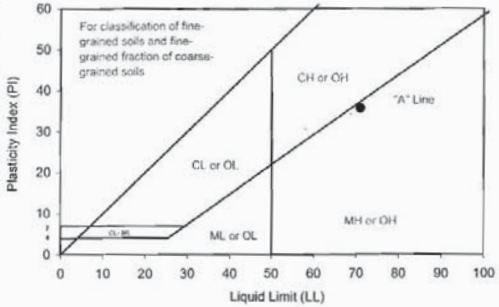
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			28	21	15	
Wet Wt. of Soil + Cont. (g)	10.11	9.86	19.06	19.55	20.95	
Dry Wt. of Soil + Cont. (g)	7.72	7.56	11.62	11.76	12.42	
Wt. of Container (g)	1.01	1.00	1.05	1.05	1.08	
Moisture Content (%) [Wn]	35.62	35.06	70.39	72.74	75.22	

Liquid Limit	**71**
Plastic Limit	**35**
Plasticity Index	**36**
Classification	**MH**

PI at "A" - Line = 0.73(LL-20) 37.23

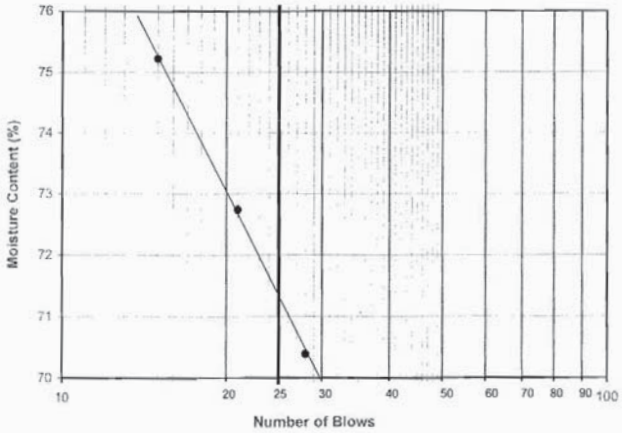
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.12}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [x] Dry Preparation
  Multipoint - Dry
- [x] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



Leighton

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Proposed Mixed-Use Development, HB	Tested By:	A. Santos	Date:	10/16/09
Project No. :	012428-001	Input By:	J. Ward	Date:	10/22/09
Boring No.:	B-2	Checked By:	J. Ward		
Sample No.:	R-5	Depth (ft.)	18.5-20		
Soil Identification:	Dark gray fat clay (CH)				

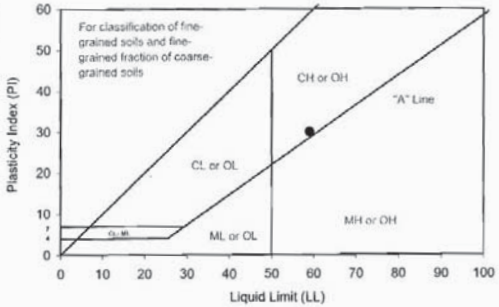
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			30	22	19	
Wet Wt. of Soil + Cont. (g)	9.55	9.51	18.36	19.21	18.57	
Dry Wt. of Soil + Cont. (g)	7.64	7.62	12.06	12.42	11.95	
Wt. of Container (g)	1.07	1.09	1.05	1.01	1.04	
Moisture Content (%) [Wn]	29.07	28.94	57.22	59.51	60.68	

Liquid Limit	**59**
Plastic Limit	**29**
Plasticity Index	**30**
Classification	**CH**

PI at "A" - Line = 0.73(LL-20) 28.47

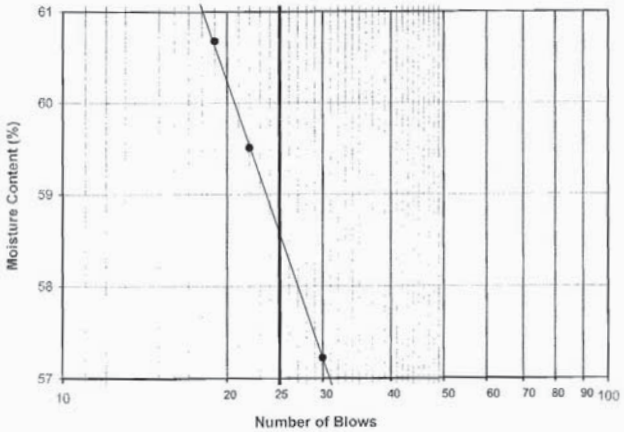
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.12}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [x] Dry Preparation
  Multipoint - Dry
- [x] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



Leighton

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Proposed Mixed-Use Development, HB	Tested By:	A. Santos	Date:	10/20/09
Project No. :	012428-001	Input By:	J. Ward	Date:	10/22/09
Boring No.:	B-2	Checked By:	J. Ward		
Sample No.:	S-1	Depth (ft.)	28.5-30		
Soil Identification:	Gray silty clay with sand (CL-ML)s				

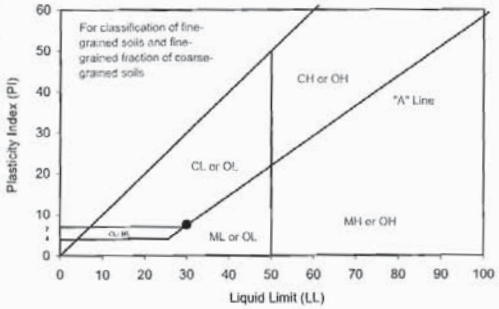
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			32	26	21	
Wet Wt. of Soil + Cont. (g)	10.29	9.93	18.52	21.71	22.02	
Dry Wt. of Soil + Cont. (g)	8.59	8.29	14.62	16.99	17.10	
Wt. of Container (g)	1.04	1.01	1.06	1.06	1.03	
Moisture Content (%) [Wn]	22.52	22.53	28.76	29.63	30.62	

Liquid Limit	**30**
Plastic Limit	**23**
Plasticity Index	**7**
Classification	**CL-ML**

PI at "A" - Line = 0.73(LL-20) 7.3

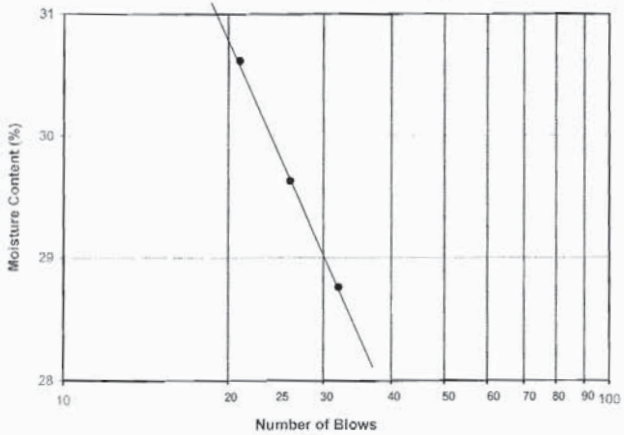
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.12}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [x] Dry Preparation
  Multipoint - Dry
- [x] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



Leighton

PARTICLE-SIZE ANALYSIS OF SOILS

ASTM D 422

Project Name:	Proposed Mixed-Use Development, HB	Tested By :	G. Berdy	Date:	10/15/09
Project No. :	012428-001	Data Input By:	J. Ward	Date:	10/20/09
Exploration No.:	B-1				
Sample No.:	R-7	Depth (feet) :	18.5-20		
Soil Identification:	Dark olive silt (ML)				

% Gravel	0	Soil Type	ML
% Sand	11		
% Fines	89		

			Moisture Content of Total Air-Dry Soil	Moisture Content of Air-Dry Soil Passing #10	After Hydrometer & Wet Sieve ret. in #200 Sieve
Specific Gravity (Assumed)	2.70	Wt.of Air-Dry Soil + Cont.(g)	0.00	0.00	
Correction for Specific Gravity	0.99	Dry Wt. of Soil + Cont. (g)	0.00	0.00	87.66
Wt.of Air-Dry Soil + Cont. (g)	248.45	Wt. of Container No.___ (g)	1.00	1.00	77.45
Wt. of Container	53.01	Moisture Content (%)	0.00	0.00	
Dry Wt. of Soil (g)	195.44	Wt. of Dry Soil (g)			10.21

Coarse Sieve

U.S. Sieve	Cumulative Wt. Of Dry Soil Retained (g)	% Passing
3"	0.00	100.0
1½"	0.00	100.0
3/4"	0.00	100.0
3/8"	0.00	100.0
No. 4	0.00	100.0
No. 10	0.00	100.0
Pan		

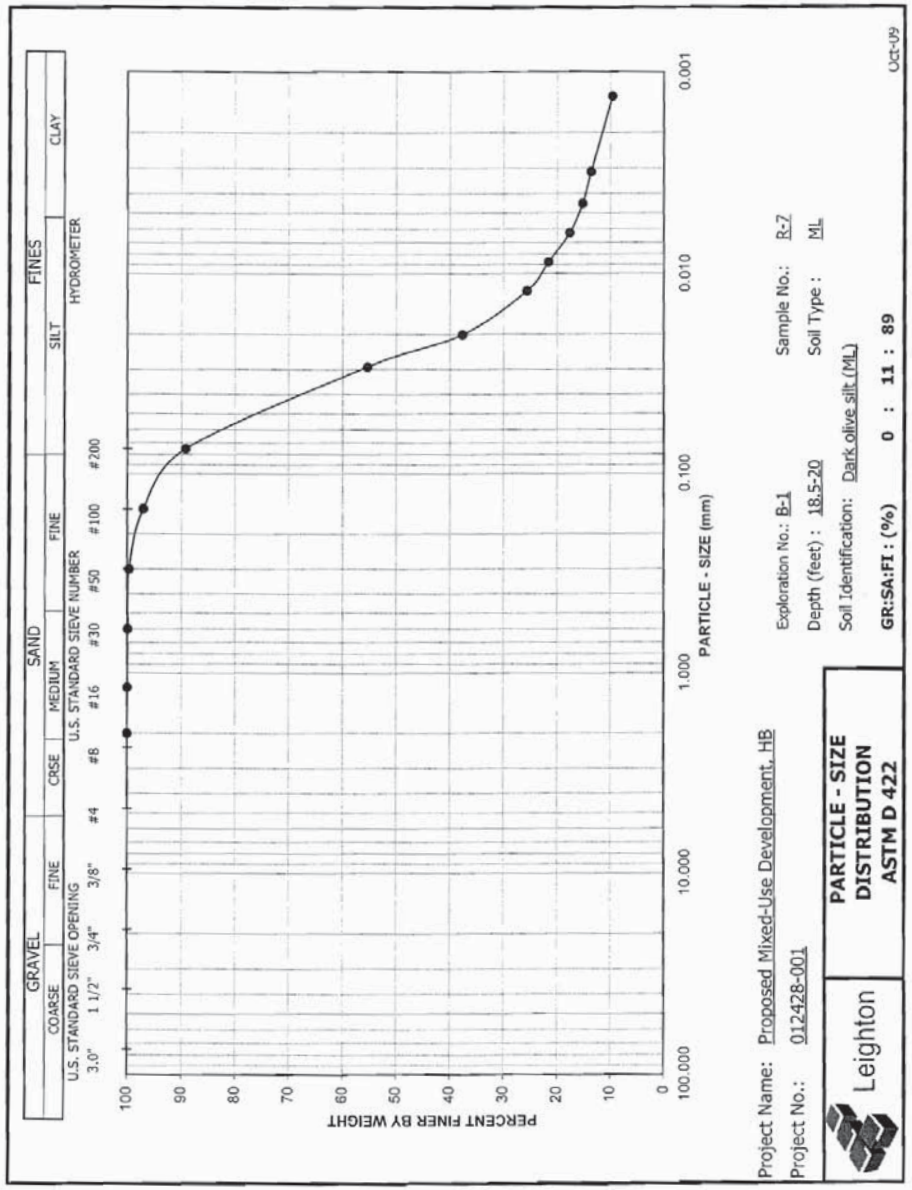
Sieve after Hydrometer & Wet Sieve

U.S. Sieve Size	Cumulative Wt. Of Dry Soil Retained (g)	% Passing	% Total Sample
No. 10	0.00	100.0	100.0
No. 16	0.02	100.0	100.0
No. 30	0.06	99.9	99.9
No. 50	0.20	99.7	99.7
No. 100	1.84	97.0	97.0
No. 200	6.68	89.2	89.2
Pan			

Hydrometer Wt. of Air-Dry Soil (g) 61.90 Wt. of Dry Soil (g) 61.90

Deflocculant 125 cc of 4% Solution

Date	Time	Elapsed Time (min)	Water Temperature (°C)	Composite Correction 152H	Actual Hydrometer Readings	% Total Sample (%)	Soil Particle Diameter (mm)
15-Oct-09	9:30	0		6.5			
	9:32	2	21.5	6.5	41.0	55.3	0.0291
	9:35	5	21.5	6.5	30.0	37.7	0.0201
	9:45	15	21.4	6.5	22.5	25.6	0.0122
	10:00	30	21.6	6.5	20.0	21.6	0.0087
	10:30	60	21.5	6.5	17.5	17.6	0.0063
	11:30	120	21.5	6.5	16.0	15.2	0.0045
	13:40	250	21.9	6.5	15.0	13.6	0.0031
16-Oct-09	9:30	1440	21.3	6.5	12.5	9.6	0.0013



Project Name: Proposed Mixed-Use Development, HB
Project No.: 012428-001

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422

Exploration No.: B-1
Depth (feet) : 18.5-20
Soil Identification: Dark olive silt (ML)

Sample No.: R-7
Soil Type : ML

GR:SA:FI : (%) 0 : 11 : 89

Oct-09

Leighton

PARTICLE-SIZE ANALYSIS OF SOILS

ASTM D 422

Project Name: Proposed Mixed-Use Development, HB — Tested By : G. Berdy — Date: 10/15/09
Project No. : 012428-001 — Data Input By: J. Ward — Date: 10/22/09
Exploration No.: B-1
Sample No.: S-2 — Depth (feet) : 33.5-35
Soil Identification: Dark olive elastic silt with sand (MH)s

% Gravel	0	Soil Type	
% Sand	15	(MH)s	
% Fines	85		

			Moisture Content of Total Air-Dry Soil	Moisture Content of Air-Dry Soil Passing #10	After Hydrometer & Wet Sieve ret. in #200 Sieve
Specific Gravity (Assumed)	2.70	Wt.of Air-Dry Soil + Cont.(g)	0.00	0.00	
Correction for Specific Gravity	0.99	Dry Wt. of Soil + Cont. (g)	0.00	0.00	85.33
Wt.of Air-Dry Soil + Cont. (g)	278.23	Wt. of Container No.___ (g)	1.00	1.00	76.90
Wt. of Container	76.90	Moisture Content (%)	0.00	0.00	
Dry Wt. of Soil (g)	201.33	Wt. of Dry Soil (g)			8.43

Coarse Sieve

U.S. Sieve	Cumulative Wt. Of Dry Soil Retained (g)	% Passing
3"	0.00	100.0
1½"	0.00	100.0
3/4"	0.00	100.0
3/8"	0.00	100.0
No. 4	0.00	100.0
No. 10	0.00	100.0
Pan		

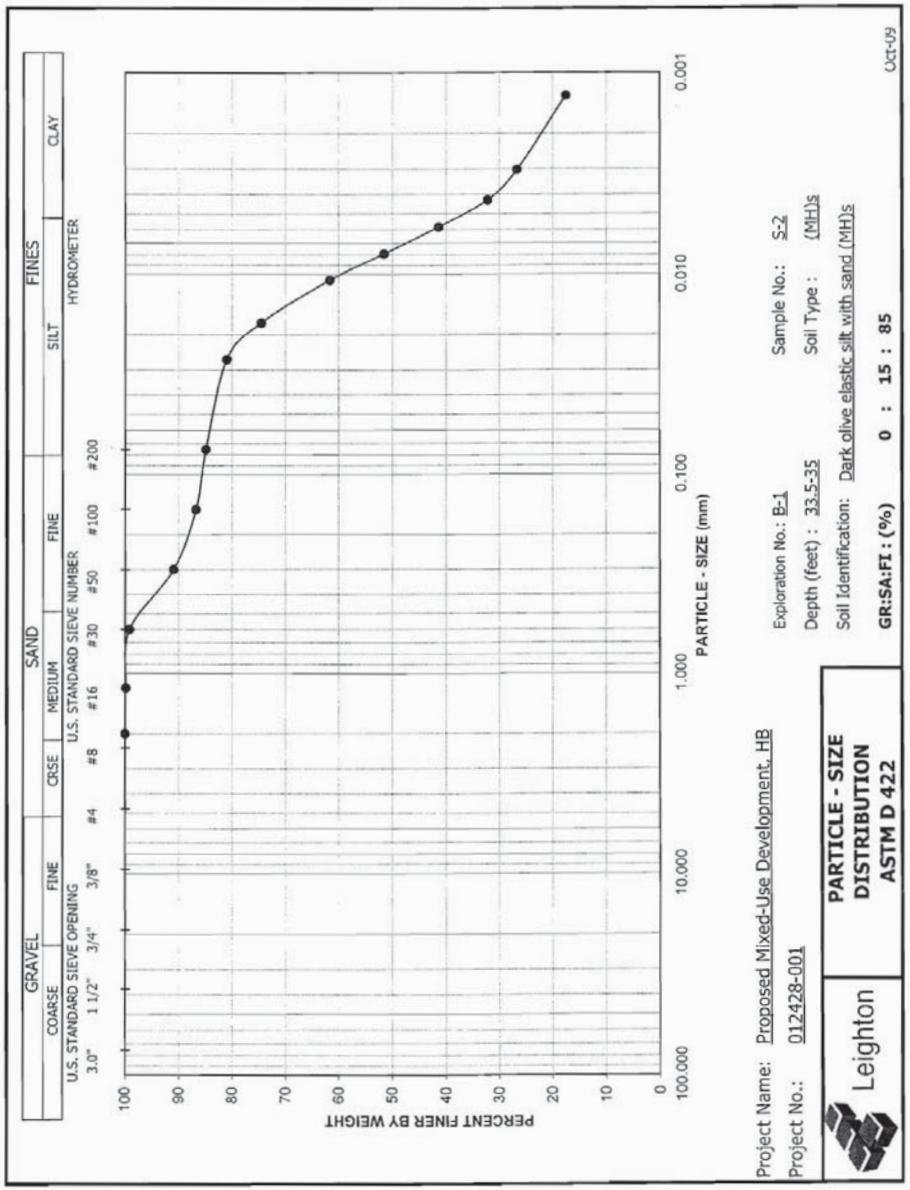
Sieve after Hydrometer & Wet Sieve

U.S. Sieve Size	Cumulative Wt. Of Dry Soil Retained (g)	% Passing	% Total Sample
No. 10	0.00	100.0	100.0
No. 16	0.09	99.8	99.8
No. 30	0.45	99.2	99.2
No. 50	4.89	90.9	90.9
No. 100	7.14	86.8	86.8
No. 200	8.15	84.9	84.9
Pan			

Hydrometer — Wt. of Air-Dry Soil (g): 53.91 — Wt. of Dry Soil (g): 53.91

Deflocculant 125 cc of 4% Solution

Date	Time	Elapsed Time (min)	Water Temperature (°C)	Composite Correction 152H	Actual Hydrometer Readings	% Total Sample (%)	Soil Particle Diameter (mm)
15-Oct-09	9:26	0		6.5			
	9:28	2	21.4	6.5	50.5	81.0	0.0266
	9:31	5	21.5	6.5	47.0	74.5	0.0174
	9:41	15	21.5	6.5	40.0	61.6	0.0107
	9:56	30	21.5	6.5	34.5	51.5	0.0079
	10:26	60	21.4	6.5	29.0	41.4	0.0058
	11:26	120	21.5	6.5	24.0	32.2	0.0043
	13:36	250	21.9	6.5	21.0	26.7	0.0030
16-Oct-09	9:26	1440	21.3	6.5	16.0	17.5	0.0013



Project Name: Proposed Mixed-Use Development, HB
Project No.: 012428-001

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422

Exploration No.: B-1 Sample No.: S-2
Depth (feet) : 33.5-35 Soil Type : (MH)s
Soil Identification: Dark olive elastic silt with sand (MH)s
GR:SA:FI : (%) 0 : 15 : 85

Oct-09

Leighton

PARTICLE-SIZE ANALYSIS OF SOILS

ASTM D 422

Project Name: Proposed Mixed-Use Development, HB — Tested By : G. Berdy — Date: 10/15/09
Project No. : 012428-001 — Data Input By: J. Ward — Date: 10/21/09
Exploration No.: B-2
Sample No.: S-4 — Depth (feet) : 43.5-45
Soil Identification: Dark olive silt with sand (ML)s

		Soil Type
% Gravel	0	(ML)s
% Sand	18	
% Fines	82	

			Moisture Content of Total Air-Dry Soil	Moisture Content of Air-Dry Soil Passing #10	After Hydrometer & Wet Sieve ret. in #200 Sieve
Specific Gravity (Assumed)	2.70	Wt.of Air-Dry Soil + Cont.(g)	0.00	0.00	
Correction for Specific Gravity	0.99	Dry Wt. of Soil + Cont. (g)	0.00	0.00	91.40
Wt.of Air-Dry Soil + Cont. (g)	405.64	Wt. of Container No.___ (g)	1.00	1.00	75.78
Wt. of Container	77.71	Moisture Content (%)	0.00	0.00	
Dry Wt. of Soil (g)	327.93	Wt. of Dry Soil (g)			15.62

Coarse Sieve

U.S. Sieve	Cumulative Wt. Of Dry Soil Retained (g)	% Passing
3"	0.00	100.0
1½"	0.00	100.0
3/4"	0.00	100.0
3/8"	0.00	100.0
No. 4	0.00	100.0
No. 10	0.00	100.0
Pan		

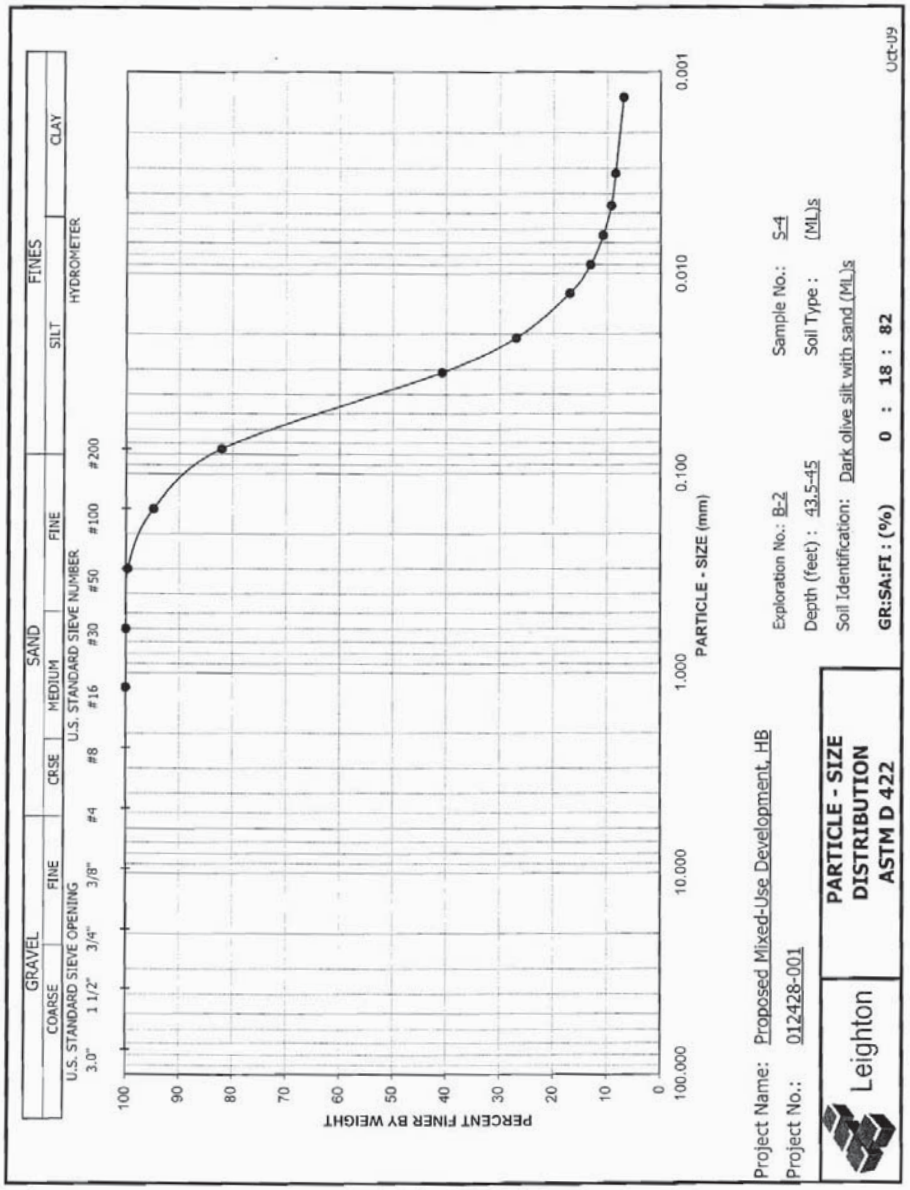
Sieve after Hydrometer & Wet Sieve

U.S. Sieve Size	Cumulative Wt. Of Dry Soil Retained (g)	% Passing	% Total Sample
No. 10	0.00	100.0	100.0
No. 16	0.00	100.0	100.0
No. 30	0.03	100.0	100.0
No. 50	0.21	99.7	99.7
No. 100	3.34	94.8	94.8
No. 200	11.62	82.0	82.0
Pan			

Hydrometer Wt. of Air-Dry Soil (g) 64.48 Wt. of Dry Soil (g) 64.48

Deflocculant 125 cc of 4% Solution

Date	Time	Elapsed Time (min)	Water Temperature (°C)	Composite Correction 152H	Actual Hydrometer Readings	% Total Sample (%)	Soil Particle Diameter (mm)
15-Oct-09	9:34	0		6.5			
	9:36	2	21.5	6.5	33.0	40.8	0.0310
	9:39	5	21.5	6.5	24.0	26.9	0.0209
	9:49	15	21.4	6.5	17.5	16.9	0.0126
	10:04	30	21.6	6.5	15.0	13.1	0.0090
	10:34	60	21.6	6.5	13.5	10.8	0.0064
	11:34	120	21.5	6.5	12.5	9.2	0.0046
	13:44	250	21.9	6.5	12.0	8.5	0.0032
16-Oct-09	9:34	1440	21.3	6.5	11.0	6.9	0.0013



Project Name: Proposed Mixed-Use Development, HB
Project No.: 012428-001

Exploration No.: B-2
Depth (feet) : 43.5-45
Soil Identification: Dark olive silt with sand (ML)s

Sample No.: S-4
Soil Type : (ML)s

GR:SA:FI : (%) 0 : 18 : 82

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422

Oct-09

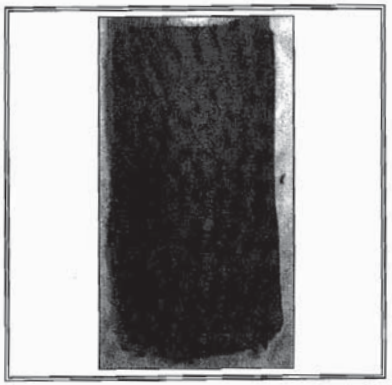
Leighton

Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

ASTM D 2850

Project Name:	Proposed Mixed-Use Development, HB	Tested by:	A. Santos	Date:	10/13/09
Project No:	012428-001	Checked by:	J. Ward	Date:	10/22/09
Boring No.:	B-2	Sample Type:	Drive		
Sample No.:	R-3	Depth(ft):	11-12.5		
Sample Description:	Gray lean clay (CL)				

Diameter (in)	1	2.425
	2	2.423
	3	2.416
	Average	2.421
Height (in)	1	5.547
	2	5.548
	3	5.547
	Average	5.547
Weight of Sample + Tube / Rings (g)		734.30
Weight of Tube / Rings (g)		0.00
Weight of Wet Sample + Container (g)		843.60
Weight of Dry Sample + Container (g)		614.40
Weight of Container (g)		110.98
Specific Gravity (assumed)		2.70
Confining Pressure (psi)		4.8
Rate of Deformation (in/min)		0.045

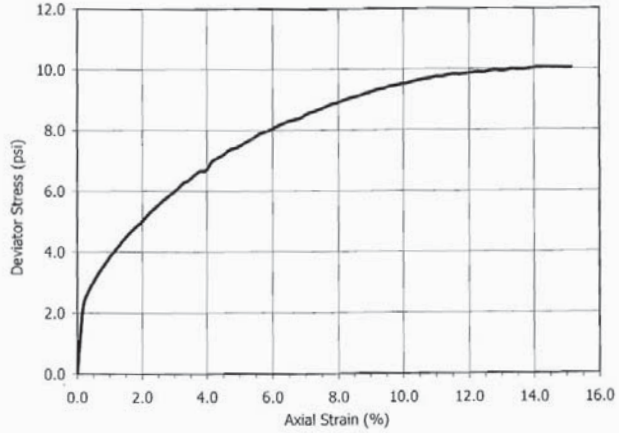


Sample Properties	
Moisture Content (%)	45.53
Dry Density (pcf)	75.3
Void Ratio	1.239
% Saturation	99.2

At Failure*	
Deviator stress (psi)	**10.05**
Minor principal total stress (psi)	**4.80**
Major principal total stress (psi)	**14.85**
Axial strain (%)	**14.42**

* Stress values have been corrected for membrane effects

Stress - Strain Curve



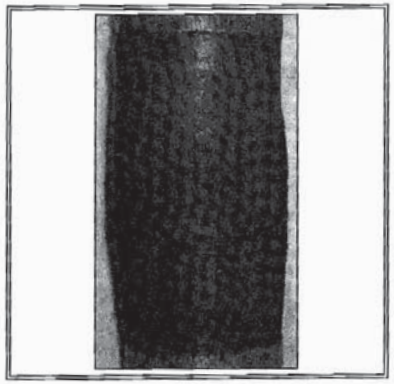
Leighton

Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

ASTM D 2850

Project Name:	Proposed Mixed-Use Development, HB	Tested by:	A. Santos	Date:	10/14/09
Project No:	012428-001	Checked by:	J. Ward	Date:	10/22/09
Boring No.:	B-2	Sample Type:	Drive		
Sample No.:	R-6	Depth(ft):	23.5-25		
Sample Description:	Gray silt (ML)				

Diameter (in)	1	2.417
	2	2.418
	3	2.420
	Average	2.418
Height (in)	1	5.464
	2	5.465
	3	5.467
	Average	5.465
Weight of Sample + Tube / Rings (g)		732.40
Weight of Tube / Rings (g)		0.00
Weight of Wet Sample + Container (g)		837.60
Weight of Dry Sample + Container (g)		612.00
Weight of Container (g)		108.20
Specific Gravity (assumed)		2.70
Confining Pressure (psi)		7.6
Rate of Deformation (in/min)		0.045

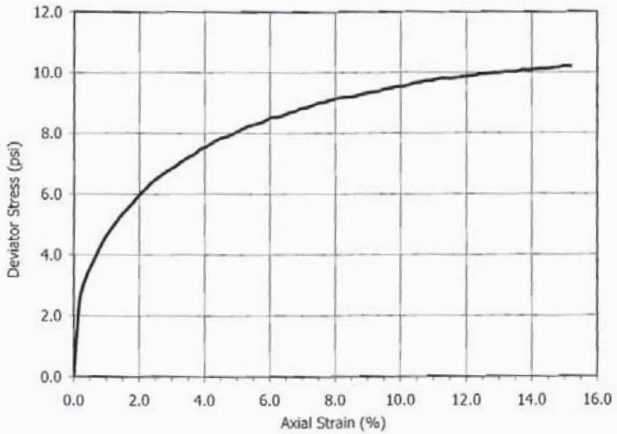


Sample Properties	
Moisture Content (%)	44.78
Dry Density (pcf)	76.8
Void Ratio	1.195
% Saturation	101.2

At Failure*	
Deviator stress (psi)	**10.21**
Minor principal total stress (psi)	**7.60**
Major principal total stress (psi)	**17.81**
Axial strain (%)	**15.00**

* Stress values have been corrected for membrane effects

Stress - Strain Curve



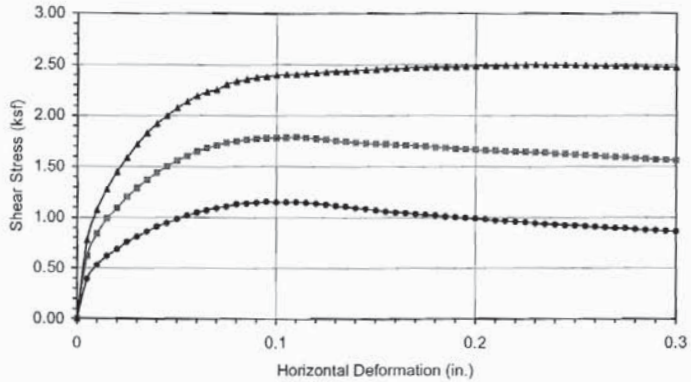
Leighton

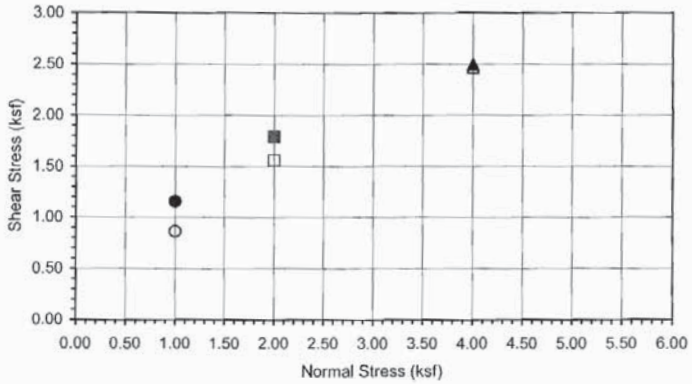
DIRECT SHEAR TEST

Consolidated Undrained

Project Name:	Proposed Mixed-Use Development, HB	Tested By:	A. Santos	Date:	10/13/09
Project No.:	012428-001	Checked By:	J. Ward	Date:	10/21/09
Boring No.:	B-1	Sample Type:	Drive		
Sample No.:	R-2	Depth (ft.):	3.5-5		
Soil Identification:	Dark olive gray silty sand / sandy silt (SM)/s(ML)				

Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	187.91	190.87	192.11
Weight of Ring(gm):	42.32	43.12	43.26
Before Shearing			
Weight of Wet Sample+Cont.(gm):	252.97	252.97	252.97
Weight of Dry Sample+Cont.(gm):	222.50	222.50	222.50
Weight of Container(gm):	74.79	74.79	74.79
Vertical Rdg.(in): Initial	0.0000	0.2604	0.3584
Vertical Rdg.(in): Final	-0.0079	0.2795	0.3900
After Shearing			
Weight of Wet Sample+Cont.(gm):	208.05	207.15	206.59
Weight of Dry Sample+Cont.(gm):	174.80	173.80	176.70
Weight of Container(gm):	61.05	59.21	59.23
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43





Boring No.	**B-1**
Sample No.	**R-2**
Depth (ft)	**3.5-5**
Sample Type:	
Drive	
Soil Identification:	
Dark olive gray silty sand / sandy silt (SM)/s(ML)	

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 1.154	■ 1.789	▲ 2.499
Shear Stress @ End of Test (ksf)	○ 0.861	□ 1.559	△ 2.471
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 (%)	20.63	20.63	20.63
Dry Density (pcf)	100.4	101.9	102.6
Saturation (%)	82.0	85.1	86.7
Soil Height Before Shearing (in.)	0.9921	0.9809	0.9684
Final Moisture Content (%)	29.2	29.1	25.4

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DIRECT SHEAR TEST RESULTS
Consolidated Undrained

Project No.: 012428-001
Proposed Mixed-Use Development, HB
10-09

Leighton

TESTS for SULFATE CONTENT CHLORIDE CONTENT and pH of SOILS

Project Name: Proposed Mixed-Use Development, HB — Tested By: V. Juliano — Date: 10/13/09
Project No.: 012428-001 — Data Input By: J. Ward — Date: 10/22/09

Boring No.	B-1	B-2		
Sample No.	B-1	B-1		
Sample Depth (ft)	1-5	1-5		
Soil Identification:	Very dark olive (CL)	Very dark olive (CL)		
Wet Weight of Soil + Container (g)	185.10	224.60		
Dry Weight of Soil + Container (g)	172.60	207.40		
Weight of Container (g)	60.70	77.70		
Moisture Content (%)	11.17	13.26		
Weight of Soaked Soil (g)	100.20	100.40		

SULFATE CONTENT, DOT California Test 417, Part II

Beaker No.	6	8		
Crucible No.	31	32		
Furnace Temperature (°C)	830	830		
Time In / Time Out	7:25 / 8:10	7:25 / 8:10		
Duration of Combustion (min)	45	45		
Wt. of Crucible + Residue (g)	18.9893	19.1726		
Wt. of Crucible (g)	18.9792	19.1664		
Wt. of Residue (g) (A)	0.0101	0.0062		
PPM of Sulfate (A) x 41150	415.62	255.13		
PPM of Sulfate, Dry Weight Basis	**468**	**294**		

CHLORIDE CONTENT, DOT California Test 422

ml of Chloride Soln. For Titration (B)	30	30		
ml of AgNO3 Soln. Used in Titration (C)	0.9	0.8		
PPM of Chloride (C -0.2) * 100 * 30 / B	70	60		
PPM of Chloride, Dry Wt. Basis	**79**	**69**		

pH TEST, DOT California Test 532/643

pH Value	**7.49**	**7.48**		
Temperature °C	20.4	20.3		

Leighton

SOIL RESISTIVITY TEST

DOT CA TEST 532 / 643

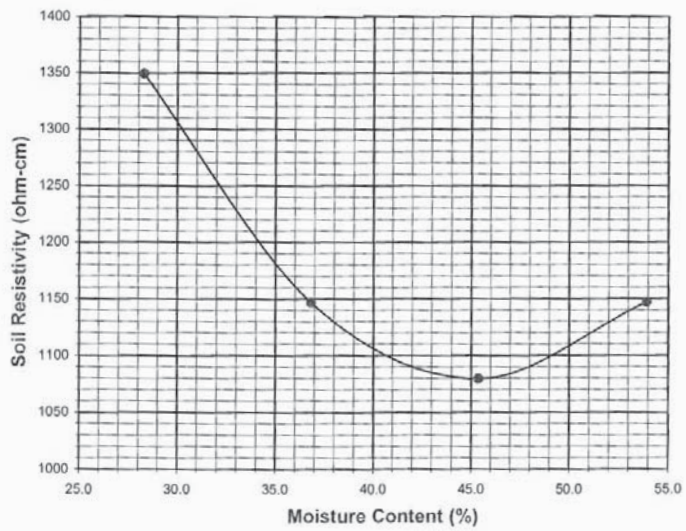
Project Name: Proposed Mixed-Use Development, HB
Project No. : 012428-001
Boring No.: B-1
Sample No. : B-1
Soil Identification: Very dark olive (CL)

Tested By : V. Juliano Date: 10/14/09
Data Input By: J. Ward Date: 10/22/09
Depth (ft.) : 1-5

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	200	28.27	200	1349
2	300	36.83	170	1147
3	400	45.38	160	1079
4	500	53.93	170	1147
5				

Moisture Content (%) (MCi)	11.17
Wet Wt. of Soil + Cont. (g)	185.10
Dry Wt. of Soil + Cont. (g)	172.60
Wt. of Container (g)	60.70
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	
1079	**45.2**	**468**	**79**	**7.49**	**20.4**



Leighton

SOIL RESISTIVITY TEST

DOT CA TEST 532 / 643

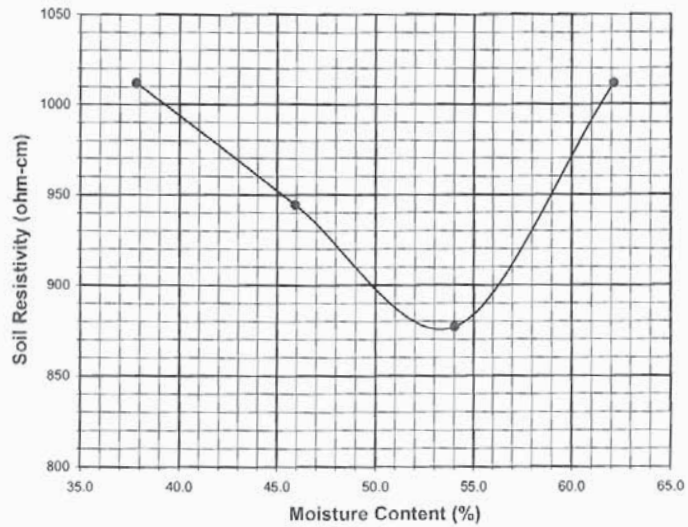
Project Name: Proposed Mixed-Use Development, HB
Project No. : 012428-001
Boring No.: B-2
Sample No. : B-1
Soil Identification: Very dark olive (CL)

Tested By : V. Juliano Date: 10/14/09
Data Input By: J. Ward Date: 10/22/09
Depth (ft.) : 1-5

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	400	37.82	150	1012
2	500	45.93	140	944
3	600	54.03	130	877
4	700	62.14	150	1012
5				

Moisture Content (%) (MCi)	5.39
Wet Wt. of Soil + Cont. (g)	172.10
Dry Wt. of Soil + Cont. (g)	166.80
Wt. of Container (g)	68.50
Container No.	
Initial Soil Wt. (g) (Wt)	1300.00
Box Constant	6.746
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

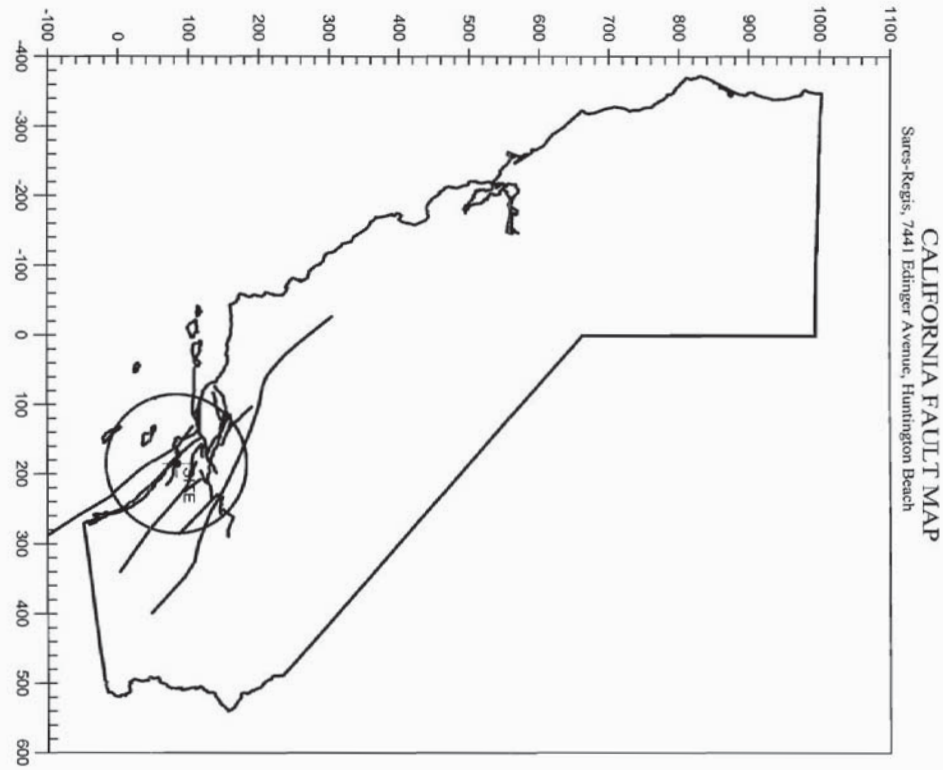
Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532 / 643	
875	**53.4**	**294**	**69**	**7.48**	**20.3**



APPENDIX D

APPENDIX D

PROBABILISTIC SEISMIC HAZARD ANALYSIS



PN 012428-001

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*****************************************
*                                       *
*        FRISKSP - IBM-PC VERSION       *
*                                       *
*  Modified from *FRISK* (McGuire 1978) *
*   To Perform Probabilistic Earthquake *
*  Hazard Analyses Using Multiple Forms *
* of Ground-Motion-Attenuation Relations *
*                                       *
*   Modifications by:  Thomas F. Blake  *
*             - 1988-2000 -             *
*                                       *
*              VERSION 4.00             *
*            (Visual Fortran)           *
*****************************************
```

TITLE: Sares-Regis, 7441 Edinger Avenue, Huntington Beach

IPR_FILE
0

IPLOT
0

SITE CONDITION
0.00

BASEMENT DEPTH (km)
5.00

RHGA FACTOR RHGA DIST (km)
1.000 0.000

NFLT	NSITE	NPROB	NATT	LCD
41	1	4	12	1

ATT	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
1	-0.3130	0.5270	0.0000	-0.7780	-0.3710	1396.0000	5.5700	150.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ATT	C15	C16	C17	C18	C19	C20	C21	C22	C23	PER	DSMIN	SIGA	IRELAF	ICHK
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5200	35	0

ATT	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
2	-0.1170	0.5270	0.0000	-0.7780	-0.3710	1396.0000	5.5700	150.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ATT	C15	C16	C17	C18	C19	C20	C21	C22	C23	PER	DSMIN	SIGA	IRELAF	ICHK
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5200	35	0
ATT	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
3	-0.1170	0.5270	0.0000	-0.7780	-0.3710	1396.0000	5.5700	150.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ATT	C15	C16	C17	C18	C19	C20	C21	C22	C23	PER	DSMIN	SIGA	IRELAF	ICHK
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5200	35	0
ATT	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
4	-3.5120	0.9040	-1.3280	0.1490	0.6470	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ATT	C15	C16	C17	C18	C19	C20	C21	C22	C23	PER	DSMIN	SIGA	IRELAF	ICHK
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	1.0000	37	0
ATT	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
5	-3.5120	0.9040	-1.3280	0.1490	0.6470	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ATT	C15	C16	C17	C18	C19	C20	C21	C22	C23	PER	DSMIN	SIGA	IRELAF	ICHK
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	1.0000	37	0
ATT	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
6	-3.5120	0.9040	-1.3280	0.1490	0.6470	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ATT	C15	C16	C17	C18	C19	C20	C21	C22	C23	PER	DSMIN	SIGA	IRELAF	ICHK
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	1.0000	37	0
ATT	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
7	-2.1700	1.0000	1.7000	0.0000	0.0000	0.0000	0.0000	1.5200	0.1600	0.0000	0.0000	0.0000	0.0000	0.0000
ATT	C15	C16	C17	C18	C19	C20	C21	C22	C23	PER	DSMIN	SIGA	IRELAF	ICHK
7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	25	0
ATT	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
8	-1.9200	1.0000	1.7000	0.0000	0.0000	0.0000	0.0000	1.5200	0.1600	0.0000	0.0000	0.0000	0.0000	0.0000
ATT	C15	C16	C17	C18	C19	C20	C21	C22	C23	PER	DSMIN	SIGA	IRELAF	ICHK
8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	25	0
ATT	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
9	-1.9200	1.0000	1.7000	0.0000	0.0000	0.0000	0.0000	1.5200	0.1600	0.0000	0.0000	0.0000	0.0000	0.0000
ATT	C15	C16	C17	C18	C19	C20	C21	C22	C23	PER	DSMIN	SIGA	IRELAF	ICHK
9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	25	0
ATT	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
10	5.6000	1.6400	0.5120	-1.1450	-0.1440	0.6100	0.2600	0.3700	-0.4170	-0.2300	0.0000	0.1700	6.4000	0.0300
ATT	C15	C16	C17	C18	C19	C20	C21	C22	C23	PER	DSMIN	SIGA	IRELAF	ICHK
10	2.0000	0.7000	0.1350	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	23	0
ATT	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
11	5.6000	1.6400	0.5120	-1.1450	-0.1440	0.6100	0.2600	0.3700	-0.4170	-0.2300	0.0000	0.1700	6.4000	0.0300
ATT	C15	C16	C17	C18	C19	C20	C21	C22	C23	PER	DSMIN	SIGA	IRELAF	ICHK
11	2.0000	0.7000	0.1350	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	1.0000	23	0
ATT	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
12	5.6000	1.6400	0.5120	-1.1450	-0.1440	0.6100	0.2600	0.3700	-0.4170	-0.2300	0.0000	0.1700	6.4000	0.0300
ATT	C15	C16	C17	C18	C19	C20	C21	C22	C23	PER	DSMIN	SIGA	IRELAF	ICHK
12	2.0000	0.7000	0.1350	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	1.0000	23	0

PROBLEM DATA:

```
BOORE ET AL. (1997) SOIL (150)   AMPLITUDES:
    15          0.100    0.200    0.300    0.400    0.500    0.600    0.700    0.800    0.900    1.000
                1.100    1.200    1.300    1.400    1.500

     MAGNITUDE WEIGHTING FACTORS:     MWF:   0    MWF MAGNITUDE:     0.00

CAMPBELL (1997 Rev.) AL          AMPLITUDES:
    15          0.100    0.200    0.300    0.400    0.500    0.600    0.700    0.800    0.900    1.000
                1.100    1.200    1.300    1.400    1.500

     MAGNITUDE WEIGHTING FACTORS:     MWF:   0    MWF MAGNITUDE:     0.00

SADIGH ET AL. (1997) DEEP SOIL   AMPLITUDES:
    15          0.100    0.200    0.300    0.400    0.500    0.600    0.700    0.800    0.900    1.000
                1.100    1.200    1.300    1.400    1.500

     MAGNITUDE WEIGHTING FACTORS:     MWF:   0    MWF MAGNITUDE:     0.00

ABRAHAMSON & SILVA (1997) SOIL   AMPLITUDES:
    15          0.100    0.200    0.300    0.400    0.500    0.600    0.700    0.800    0.900    1.000
                1.100    1.200    1.300    1.400    1.500

     MAGNITUDE WEIGHTING FACTORS:     MWF:   0    MWF MAGNITUDE:     0.00

RISKS SPECIFIED:
  5     0.013900  0.010000  0.005000  0.002105  0.000400

SITE COORDINATES:
 1    -117.9992   33.7312


FAULT INFORMATION:

-----------------------------------------------------------------------------

FAULT  1

FAULT NAME:  NEWPORT-INGLEWOOD (L.A.Basin)


NFP    NRL   ATTENUATION CODES:
10     10      1  4  7 10

AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
5.000   0.1000      1  1.0000  1.842  3.300  2.000  1.000

NMAX AMMAX  PMAX
 1    7.10  1.00


  dmchar ampchar dmpchar
    0.50    6.60    1.00

Slip Rate (  1.0000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
```

```
0.330E+12
 Input Fault Area    - cm**2
0.85E+13
 LOG10[Mo(m)]        = (1.50)m + (16.05)
   IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
      1  7.1000  1.0000   0.00454   0.00343   0.00111


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240

 FAULT SEGMENT COORDINATES
  1    -117.9247   33.6060
  2    -117.9949   33.6780
  3    -118.0326   33.6954
  4    -118.0927   33.7512
  5    -118.1951   33.8204
  6    -118.2157   33.8503
  7    -118.2479   33.8715
  8    -118.2811   33.9132
  9    -118.3315   33.9566
 10    -118.3896   34.0433

 NDP
   2
 ORIGINAL FAULT CROSS SECTION
  1       0.0000    0.0000
  2       0.0000   13.0000

 Computed Total Fault Area = 0.85E+03

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 FAULT  2

 FAULT NAME:  SAN JOAQUIN HILLS


 NFP    NRL   ATTENUATION CODES:
  4     10      3  6  9 12

 AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
 5.000   0.1000      1  0.5000  1.842  1.400  2.000  0.500

 NMAX AMMAX  PMAX
  1    6.60  1.00


   dmchar ampchar dmpchar
     0.50    6.10    1.00

 Slip Rate (  0.5000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.360E+12
 Input Fault Area    - cm**2
```



```
0.430E+13
 LOG10[Mo(m)]        = (1.50)m + (16.05)
   IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
      1  6.6000  1.0000   0.00363   0.00193   0.00170


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240

 FAULT SEGMENT COORDINATES
  1    -117.6740   33.5970
  2    -117.7360   33.6470
  3    -117.8230   33.6880
  4    -117.9330   33.6950

 NDP
   3
 ORIGINAL FAULT CROSS SECTION
  1       0.0000    1.9900
  2       0.0000    2.0000
  3     -14.1400    8.0000

 Computed Total Fault Area = 0.35E+03

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 FAULT  3

 FAULT NAME:  NEWPORT-INGLEWOOD (Offshore)


 NFP    NRL   ATTENUATION CODES:
  6     10      1  4  7 10

 AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
 5.000   0.1000      1  1.5000  1.842  3.300  2.000  1.000

 NMAX AMMAX  PMAX
  1    7.10  1.00


   dmchar ampchar dmpchar
     0.50    6.60    1.00

 Slip Rate (  1.5000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.330E+12
 Input Fault Area    - cm**2
0.858E+13
 LOG10[Mo(m)]        = (1.50)m + (16.05)
   IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
      1  7.1000  1.0000   0.00681   0.00515   0.00166


 IND_RL
```

```
     2

RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240

FAULT SEGMENT COORDINATES
 1    -117.9146   33.5910
 2    -117.7989   33.5080
 3    -117.6882   33.4024
 4    -117.5473   33.2515
 5    -117.4870   33.2163
 6    -117.4291   33.1559

NDP
  2
ORIGINAL FAULT CROSS SECTION
 1       0.0000    0.0000
 2       0.0000   13.0000

Computed Total Fault Area = 0.86E+03

-----------------------------------------------------------------------------

FAULT  4

FAULT NAME:  PALOS VERDES


NFP    NRL   ATTENUATION CODES:
 6     10      1  4  7 10

AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
5.000   0.1000      1  3.0000  2.030  4.800  2.000  1.000

NMAX AMMAX  PMAX
 1    7.30  1.00


  dmchar ampchar dmpchar
    0.50    6.80    1.00

Slip Rate (  3.0000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
0.330E+12
Input Fault Area    - cm**2
0.125E+14
LOG10(Mo(m))        = (1.50)m + (16.05)
  IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
     1  7.3000  1.0000   0.01427   0.01184   0.00243


IND_RL
     2

RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240

FAULT SEGMENT COORDINATES
 1    -117.9397   33.2830
```



```
 2    -118.0372   33.4072
 3    -118.0663   33.4661
 4    -118.1980   33.6571
 5    -118.2777   33.7568
 6    -118.5773   33.9476

NDP
  2
ORIGINAL FAULT CROSS SECTION
 1       0.0000    0.0000
 2       0.0000   13.0000

Computed Total Fault Area = 0.13E+04

-----------------------------------------------------------------------------

FAULT  5

FAULT NAME:  PUENTE HILLS BLIND THRUST


NFP    NRL   ATTENUATION CODES:
 4     10      3  6  9 12

AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
5.000   0.1000      1  0.4000  1.842  2.200  2.000  0.500

NMAX AMMAX  PMAX
 1    7.10  1.00


  dmchar ampchar dmpchar  '
    0.50    6.60    1.00

Slip Rate (  0.4000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
0.360E+12
Input Fault Area    - cm**2
0.833E+13
LOG10(Mo(m))        = (1.50)m + (16.05)
  IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
     1  7.1000  1.0000   0.00192   0.00145   0.00047


IND_RL
     2

RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240

FAULT SEGMENT COORDINATES
 1    -117.8673   33.9269
 2    -118.0432   33.9315
 3    -118.1435   33.9541
 4    -118.2976   34.0586

NDP
  3
```

```
ORIGINAL FAULT CROSS SECTION
 1       0.0000    4.9900
 2       0.0000    5.0000
 3      17.1600   13.0000

Computed Total Fault Area = 0.73E+03

-----------------------------------------------------------------------------

FAULT  6

FAULT NAME:  WHITTIER


NFP    NRL   ATTENUATION CODES:
 2     10      1  4  7 10

AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
5.000   0.1000      1  2.5000  1.842  1.900  2.000  1.000

NMAX AMMAX  PMAX
 1    6.80  1.00


  dmchar ampchar dmpchar
    0.50    6.30    1.00

Slip Rate (  2.5000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
0.330E+12
Input Fault Area     - cm**2
0.590E+13
LOG10[Mo(m)]         = (1.50)m + (16.05)
  IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
     1  6.8000  1.0000   0.01454   0.00918   0.00536


IND_RL
    2

RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240

FAULT SEGMENT COORDINATES
 1    -117.6370   33.8540
 2    -118.0180   33.9860

NDP
  2
ORIGINAL FAULT CROSS SECTION
 1       0.0000    0.0000
 2       4.0200   15.0000

Computed Total Fault Area = 0.59E+03

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FAULT  7
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```
5.000   0.1000      1  5.0000  1.842  3.800  2.000  1.000

NMAX AMMAX  PMAX
 1    7.10  1.00


  dmchar ampchar dmpchar
    0.50    6.60    1.00

Slip Rate (  5.0000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
0.330E+12
Input Fault Area     - cm**2
0.114E+14
LOG10[Mo(m)]         = (1.50)m + (16.05)
  IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
     1  7.1000  1.0000   0.03016   0.02282   0.00734


IND_RL
    2

RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240

FAULT SEGMENT COORDINATES
 1    -117.0130   33.3770
 2    -116.3620   32.9650

NDP
  2
ORIGINAL FAULT CROSS SECTION
 1       0.0000    0.0000
 2       0.0000   15.0000

Computed Total Fault Area = 0.11E+04

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SITE 1 COORDINATES: -117.9992  33.7312

BOORE ET AL. (1997) SOIL (150)
     AMPLITUDES (g):      0.1000E+000.2000E+000.3000E+000.4000E+000.5000E+000.6000E+000.7000E+000.8000E+000.9000E+000.1000E+01
     LN (AMPLITUDE):        -2.30     -1.61     -1.20     -0.92     -0.69     -0.51     -0.36     -0.22     -0.11      0.00
   FAULT   1 E(NO/YR)      0.3367E-020.2138E-020.1421E-020.9707E-030.6726E-030.4696E-030.3298E-030.2329E-030.1655E-030.1183E-03
   FAULT   2 E(NO/YR)      0.1563E-020.9941E-030.5992E-030.3587E-030.2159E-030.1315E-030.8127E-040.5101E-040.3251E-040.2104E-04
   FAULT   3 E(NO/YR)      0.2785E-020.1015E-020.4203E-030.1858E-030.8652E-040.4215E-040.2138E-040.1125E-040.6108E-050.3415E-05
   FAULT   4 E(NO/YR)      0.7202E-020.2831E-020.1319E-020.6499E-030.3302E-030.1724E-030.9250E-040.5094E-040.2876E-040.1662E-04
   FAULT   5 E(NO/YR)      0.6080E-030.2682E-030.1291E-030.6449E-040.3304E-040.1737E-040.9369E-050.5185E-050.2941E-050.1707E-05
   FAULT   6 E(NO/YR)      0.8450E-020.2831E-020.9594E-030.3453E-030.1328E-030.5439E-040.2357E-040.1074E-040.5113E-050.2533E-05
   FAULT   7 E(NO/YR)      0.1762E-020.4311E-030.1075E-030.2996E-040.9316E-050.3185E-050.1181E-050.4689E-060.1976E-060.8767E-07
   FAULT   8 E(NO/YR)      0.9950E-020.2181E-020.5326E-030.1478E-030.4600E-040.1576E-040.5861E-050.2335E-050.9871E-060.4393E-06
   FAULT   9 E(NO/YR)      0.2364E-020.5603E-030.1363E-030.3721E-040.1137E-040.3829E-050.1400E-050.5496E-060.2291E-060.1006E-06
   FAULT  10 E(NO/YR)      0.3510E-020.1195E-020.4003E-030.1421E-030.5397E-040.2186E-040.9379E-050.4236E-050.2001E-050.9843E-06
   FAULT  11 E(NO/YR)      0.4226E-020.9143E-030.2097E-030.5484E-040.1619E-040.5299E-050.1891E-050.7263E-060.2970E-060.1282E-06
   FAULT  12 E(NO/YR)      0.7979E-030.1900E-030.5013E-040.1478E-040.4826E-050.1721E-050.6618E-060.2714E-060.1177E-060.5360E-07
   FAULT  13 E(NO/YR)      0.3405E-020.9279E-030.2920E-030.1003E-030.3722E-040.1479E-040.6247E-050.2782E-050.1298E-050.6311E-06
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FAULT  14 E(NO/YR)     0.2362E-020.4210E-030.8350E-040.1952E-040.5263E-050.1597E-050.5341E-060.1938E-060.7537E-070.3110E-07
FAULT  15 E(NO/YR)     0.1085E-020.1944E-030.3919E-040.9298E-050.2540E-050.7794E-060.2633E-060.9637E-070.3777E-070.1570E-07
FAULT  16 E(NO/YR)     0.7721E-020.1677E-020.4116E-030.1147E-030.3577E-040.1228E-040.4569E-050.1821E-050.7700E-060.3426E-06
FAULT  17 E(NO/YR)     0.1461E-020.2997E-030.7817E-040.2340E-040.7810E-050.2853E-050.1124E-050.4717E-060.2092E-060.9727E-07
FAULT  18 E(NO/YR)     0.2209E-020.3863E-030.7738E-040.1831E-040.4997E-050.1532E-050.5174E-060.1894E-060.7421E-070.3084E-07
FAULT  19 E(NO/YR)     0.4957E-030.7550E-040.1395E-040.3118E-050.8143E-060.2410E-060.7903E-070.2821E-070.1081E-070.4407E-08
FAULT  20 E(NO/YR)     0.5365E-020.6043E-030.9123E-040.1754E-040.4061E-050.1088E-050.3277E-060.1086E-060.3897E-070.1497E-07
FAULT  21 E(NO/YR)     0.2119E-020.3047E-030.5359E-040.1149E-040.2896E-050.8312E-060.2651E-060.9231E-070.3460E-070.1381E-07
FAULT  22 E(NO/YR)     0.4968E-030.6523E-040.1124E-040.2390E-050.6005E-060.1721E-060.5490E-070.1913E-070.7179E-080.2870E-08
FAULT  23 E(NO/YR)     0.2372E-020.4645E-030.1154E-030.3288E-040.1049E-040.3679E-050.1396E-050.5668E-060.2437E-060.1102E-06
FAULT  24 E(NO/YR)     0.1809E-020.3156E-030.6617E-040.1632E-040.4610E-050.1456E-050.5044E-060.1888E-060.7551E-070.3195E-07
FAULT  25 E(NO/YR)     0.1268E-010.1172E-020.1520E-030.2593E-040.5447E-050.1344E-050.3766E-060.1171E-060.3969E-070.1447E-07
FAULT  26 E(NO/YR)     0.2920E-020.6726E-030.1871E-030.5746E-040.1935E-040.7068E-050.2773E-050.1157E-050.5090E-060.2347E-06
FAULT  27 E(NO/YR)     0.6290E-020.1138E-020.2638E-030.7100E-040.2159E-040.7262E-050.2658E-050.1044E-050.4362E-060.1920E-06
FAULT  28 E(NO/YR)     0.6365E-030.9274E-040.1759E-040.4026E-050.1070E-050.3213E-060.1065E-060.3835E-070.1481E-070.6075E-08
FAULT  29 E(NO/YR)     0.9432E-030.1705E-030.3952E-040.1064E-040.3234E-050.1088E-050.3983E-060.1565E-060.6537E-070.2877E-07
FAULT  30 E(NO/YR)     0.2202E-020.3759E-030.8158E-040.2077E-040.6029E-050.1950E-050.6895E-060.2629E-060.1069E-060.4591E-07
FAULT  31 E(NO/YR)     0.3915E-020.6683E-030.1450E-030.3692E-040.1072E-040.3466E-050.1226E-050.4674E-060.1900E-060.8161E-07
FAULT  32 E(NO/YR)     0.6190E-030.9252E-040.1804E-040.4222E-050.1144E-050.3492E-060.1175E-060.4285E-070.1675E-070.6942E-08
FAULT  33 E(NO/YR)     0.9516E-020.8977E-030.1197E-030.2092E-040.4482E-050.1124E-050.3198E-060.1007E-060.3455E-070.1273E-07
FAULT  34 E(NO/YR)     0.5089E-020.5702E-030.8433E-040.1588E-040.3608E-050.9501E-060.2816E-060.9194E-070.3255E-070.1235E-07
FAULT  35 E(NO/YR)     0.2038E-020.1276E-030.1270E-040.1779E-050.3197E-060.6930E-070.1739E-070.4912E-080.1529E-080.5161E-09
FAULT  36 E(NO/YR)     0.5083E-030.5138E-040.7311E-050.1345E-050.3008E-060.7828E-070.2299E-070.7451E-080.2622E-080.9894E-09
FAULT  37 E(NO/YR)     0.6103E-030.7336E-040.1165E-040.2320E-050.5517E-060.1509E-060.4619E-070.1551E-070.5633E-080.2185E-08
FAULT  38 E(NO/YR)     0.3429E-030.2780E-040.3270E-050.5183E-060.1027E-060.2412E-070.6484E-080.1944E-080.6382E-090.2261E-09
FAULT  39 E(NO/YR)     0.5721E-030.7443E-040.1276E-040.2701E-050.6746E-060.1923E-060.6101E-070.2115E-070.7895E-080.3141E-08
FAULT  40 E(NO/YR)     0.2498E-020.2716E-030.4024E-040.7611E-050.1737E-050.4592E-060.1366E-060.4474E-070.1589E-070.6042E-08
FAULT  41 E(NO/YR)     0.1839E-020.1344E-030.1531E-040.2389E-050.4693E-060.1097E-060.2941E-070.8804E-080.2888E-080.1023E-08
TOTAL     E(NO/YR)     0.1307E+000.2790E-010.8830E-020.3657E-020.1811E-020.1006E-020.6034E-030.3808E-030.2491E-030.1674E-03
TOTAL RISK             0.1225E+000.2751E-010.8791E-020.3651E-020.1809E-020.1006E-020.6033E-030.3807E-030.2491E-030.1674E-03

   AMPLITUDES (g):     0.1100E+010.1200E+010.1300E+010.1400E+010.1500E+01
     LN (AMPLITUDE):     0.10      0.18      0.26      0.34      0.41
FAULT   1 E(NO/YR)     0.8512E-040.6166E-040.4497E-040.3302E-040.2440E-04
FAULT   2 E(NO/YR)     0.1381E-040.9190E-050.6196E-050.4228E-050.2918E-05
FAULT   3 E(NO/YR)     0.1960E-050.1152E-050.6917E-060.4236E-060.2641E-06
FAULT   4 E(NO/YR)     0.9813E-050.5913E-050.3630E-050.2267E-050.1439E-05
FAULT   5 E(NO/YR)     0.1012E-050.6120E-060.3770E-060.2363E-060.1504E-06
FAULT   6 E(NO/YR)     0.1299E-050.6877E-060.3744E-060.2092E-060.1196E-06
FAULT   7 E(NO/YR)     0.4068E-070.1964E-070.9827E-080.5074E-080.2696E-08
FAULT   8 E(NO/YR)     0.2045E-060.9901E-070.4966E-070.2571E-070.1369E-07
FAULT   9 E(NO/YR)     0.4627E-070.2215E-070.1099E-070.5635E-080.2973E-08
FAULT  10 E(NO/YR)     0.5017E-060.2640E-060.1430E-060.7946E-070.4522E-07
FAULT  11 E(NO/YR)     0.5804E-070.2739E-070.1341E-070.6787E-080.3539E-08
FAULT  12 E(NO/YR)     0.2547E-070.1257E-070.6413E-080.3373E-080.1824E-08
FAULT  13 E(NO/YR)     0.3183E-060.1659E-060.8906E-070.4909E-070.2772E-07
FAULT  14 E(NO/YR)     0.1351E-070.6139E-080.2903E-080.1423E-080.7196E-09
FAULT  15 E(NO/YR)     0.6863E-080.3138E-080.1492E-080.7350E-090.3737E-09
FAULT  16 E(NO/YR)     0.1595E-060.7720E-070.3871E-070.2003E-070.1067E-07
FAULT  17 E(NO/YR)     0.4715E-070.2372E-070.1232E-070.6596E-080.3625E-08
FAULT  18 E(NO/YR)     0.1348E-070.6164E-080.2931E-080.1444E-080.7343E-09
FAULT  19 E(NO/YR)     0.1893E-080.8520E-090.3994E-090.1941E-090.9750E-10
FAULT  20 E(NO/YR)     0.6093E-080.2610E-080.1169E-080.5443E-090.2623E-09
FAULT  21 E(NO/YR)     0.5822E-080.2574E-080.1187E-080.5679E-090.2810E-09
FAULT  22 E(NO/YR)     0.1212E-080.5367E-090.2479E-090.1189E-090.5892E-10
FAULT  23 E(NO/YR)     0.5203E-070.2554E-070.1297E-070.6795E-080.3660E-08
FAULT  24 E(NO/YR)     0.1420E-070.6594E-080.3181E-080.1588E-080.8173E-09
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FAULT  25 E(NO/YR)     0.5618E-080.2302E-080.9892E-090.4425E-090.2056E-09
FAULT  26 E(NO/YR)     0.1128E-060.5624E-070.2897E-070.1537E-070.8373E-08
FAULT  27 E(NO/YR)     0.8846E-070.4244E-070.2111E-070.1084E-070.5731E-08
FAULT  28 E(NO/YR)     0.2624E-080.1186E-080.5584E-090.2724E-090.1373E-09
FAULT  29 E(NO/YR)     0.1326E-070.6362E-080.3164E-080.1625E-080.8591E-09
FAULT  30 E(NO/YR)     0.2069E-070.9727E-080.4748E-080.2396E-080.1246E-08
FAULT  31 E(NO/YR)     0.3678E-070.1729E-070.8440E-080.4260E-080.2215E-08
FAULT  32 E(NO/YR)     0.3029E-080.1382E-080.6562E-090.3227E-090.1639E-09
FAULT  33 E(NO/YR)     0.4993E-080.2065E-080.8950E-090.4041E-090.1883E-09
FAULT  34 E(NO/YR)     0.4967E-080.2104E-080.9324E-090.4300E-090.2054E-09
FAULT  35 E(NO/YR)     0.1866E-090.7124E-100.2736E-100.9867E-110.2538E-11
FAULT  36 E(NO/YR)     0.3964E-090.1673E-090.7388E-100.3394E-100.1611E-10
FAULT  37 E(NO/YR)     0.8976E-090.3875E-090.1748E-090.8193E-100.3976E-10
FAULT  38 E(NO/YR)     0.8547E-100.3418E-100.1435E-100.6211E-110.2650E-11
FAULT  39 E(NO/YR)     0.1320E-080.5821E-090.2677E-090.1278E-090.6313E-10
FAULT  40 E(NO/YR)     0.2437E-080.1035E-080.4596E-090.2124E-090.1017E-09
FAULT  41 E(NO/YR)     0.3868E-090.1545E-090.6443E-100.2760E-100.1164E-10
TOTAL     E(NO/YR)     0.1148E-030.8012E-040.5671E-040.4063E-040.2943E-04
TOTAL RISK             0.1148E-030.8012E-040.5671E-040.4063E-040.2943E-04

  SPECIFIED RISKS:       0.013900  0.010000  0.005000  0.002105  0.000400
  ESTIMATED LN AMP. :     -1.367    -1.250    -1.019    -0.741    -0.237
   ESTIMATED AMP. (g):   0.25492   0.28657   0.36086   0.47649   0.78861

CAMPBELL (1997 Rev.) AL
   AMPLITUDES (g):     0.1000E-000.2000E-000.3000E-000.4000E-000.5000E-000.6000E-000.7000E-000.8000E-000.9000E-000.1000E+01
     LN (AMPLITUDE):    -2.30     -1.61     -1.20     -0.92     -0.69     -0.51     -0.36     -0.22     -0.11      0.00
FAULT   1 E(NO/YR)     0.2762E-020.1839E-020.1188E-020.7210E-030.4116E-030.2250E-030.1200E-030.6323E-040.3325E-040.1754E-04
FAULT   2 E(NO/YR)     0.1346E-020.8345E-030.4663E-030.2389E-030.1166E-030.5564E-040.2642E-040.1261E-040.6086E-050.2979E-05
FAULT   3 E(NO/YR)     0.1596E-020.5858E-030.1890E-030.5718E-040.1732E-040.5412E-050.1762E-050.6000E-060.2135E-060.7922E-07
FAULT   4 E(NO/YR)     0.4102E-020.1933E-020.7754E-030.2698E-030.8982E-040.3001E-040.1028E-040.3640E-050.1337E-050.5089E-06
FAULT   5 E(NO/YR)     0.3503E-030.1481E-030.4936E-040.1456E-040.4216E-050.1250E-050.3856E-060.1246E-060.4212E-070.1489E-07
FAULT   6 E(NO/YR)     0.4738E-020.1041E-020.2059E-030.4353E-040.1018E-040.2635E-050.7465E-060.2293E-060.7564E-070.2657E-07
FAULT   7 E(NO/YR)     0.4632E-030.4381E-040.5889E-050.1046E-050.2288E-060.5871E-070.1709E-070.5510E-080.1934E-080.7293E-09
FAULT   8 E(NO/YR)     0.3557E-020.4367E-030.6581E-040.1231E-040.2750E-050.7089E-060.2053E-060.6546E-070.2264E-070.8396E-08
FAULT   9 E(NO/YR)     0.5975E-030.5447E-040.7192E-050.1266E-050.2756E-060.7056E-070.2052E-070.6620E-080.2326E-080.8784E-09
FAULT  10 E(NO/YR)     0.1351E-020.1930E-030.3096E-040.5940E-050.1337E-050.3438E-060.9880E-070.3116E-070.1063E-070.3885E-08
FAULT  11 E(NO/YR)     0.8241E-030.6281E-040.7551E-050.1255E-050.2630E-060.6558E-070.1872E-070.5954E-080.2070E-080.7758E-09
FAULT  12 E(NO/YR)     0.1657E-030.1571E-040.2119E-050.3772E-060.8260E-070.2121E-070.6178E-080.1993E-080.6998E-090.2640E-09
FAULT  13 E(NO/YR)     0.8604E-030.1077E-030.1637E-040.3073E-050.6876E-060.1773E-060.5136E-070.1638E-070.5661E-080.2098E-08
FAULT  14 E(NO/YR)     0.2975E-030.1537E-040.1446E-050.2011E-060.3665E-070.8143E-080.2107E-080.6155E-090.1984E-090.6939E-10
FAULT  15 E(NO/YR)     0.1280E-030.6595E-050.6201E-060.8625E-070.1572E-070.3493E-080.9040E-090.2641E-090.8517E-100.2977E-10
FAULT  16 E(NO/YR)     0.1334E-020.1098E-030.1382E-040.2367E-050.5064E-060.1282E-060.3699E-070.1186E-070.4152E-080.1564E-08
FAULT  17 E(NO/YR)     0.4837E-030.7061E-040.1168E-040.2277E-050.5157E-060.1326E-060.3797E-070.1190E-070.4033E-080.1462E-08
FAULT  18 E(NO/YR)     0.2528E-030.1314E-040.1247E-050.1750E-060.3212E-070.7185E-080.1870E-080.5493E-090.1780E-090.6245E-10
FAULT  19 E(NO/YR)     0.3921E-040.1669E-050.1416E-060.1839E-070.3185E-080.6799E-090.1703E-090.4834E-100.1516E-100.5120E-11
FAULT  20 E(NO/YR)     0.6334E-030.2863E-040.2525E-050.3375E-060.5981E-070.1301E-070.3312E-080.9539E-090.3033E-090.1042E-09
FAULT  21 E(NO/YR)     0.1250E-030.4105E-050.2913E-060.3302E-070.5122E-080.9966E-090.2303E-090.6080E-100.1757E-100.5202E-11
FAULT  22 E(NO/YR)     0.8226E-040.5214E-050.5682E-060.8856E-070.1771E-070.4257E-080.1179E-080.3659E-090.1245E-090.4575E-10
FAULT  23 E(NO/YR)     0.2924E-030.2307E-040.2866E-050.4877E-060.1040E-060.2625E-070.7561E-080.2422E-080.8464E-090.3183E-09
FAULT  24 E(NO/YR)     0.1638E-030.8269E-050.7719E-060.1070E-060.1947E-070.4326E-080.1120E-080.3273E-090.1056E-090.3688E-10
FAULT  25 E(NO/YR)     0.9401E-030.2740E-040.1808E-050.1945E-060.2896E-070.5447E-080.1223E-080.3118E-090.8713E-100.2448E-10
FAULT  26 E(NO/YR)     0.1148E-020.1771E-030.2918E-040.5662E-050.1280E-050.3293E-060.9446E-070.2970E-070.1010E-070.3675E-08
FAULT  27 E(NO/YR)     0.1794E-020.2068E-030.3040E-040.5627E-050.1252E-050.3227E-060.9362E-070.2995E-070.1040E-070.3871E-08
FAULT  28 E(NO/YR)     0.1303E-030.1032E-040.1271E-050.2146E-060.4551E-070.1145E-070.3291E-080.1053E-080.3678E-090.1384E-09
FAULT  29 E(NO/YR)     0.2686E-030.3097E-040.4555E-050.8432E-060.1877E-060.4836E-070.1403E-070.4488E-080.1558E-080.5803E-09
FAULT  30 E(NO/YR)     0.5775E-030.5894E-040.8222E-050.1487E-050.3281E-060.8444E-070.2458E-070.7911E-080.2768E-080.1040E-08
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FAULT  31 E(NO/YR)      0.1027E-020.1048E-030.1462E-040.2644E-050.5832E-060.1501E-060.4370E-070.1406E-070.4921E-080.1848E-08
FAULT  32 E(NO/YR)      0.1325E-030.1115E-040.1420E-050.2451E-060.5274E-070.1340E-070.3879E-080.1247E-080.4375E-090.1650E-09
FAULT  33 E(NO/YR)      0.7629E-030.2440E-040.1714E-050.1933E-060.2989E-070.5806E-080.1340E-080.3524E-090.1011E-090.2978E-10
FAULT  34 E(NO/YR)      0.1400E-030.2840E-050.1502E-060.1378E-070.1811E-080.3071E-090.6174E-100.1265E-100.2206E-110.0000E+00
FAULT  35 E(NO/YR)      0.5434E-040.7868E-060.3395E-070.2689E-080.3149E-090.4711E-100.7675E-110.0000E+000.0000E+000.0000E+00
FAULT  36 E(NO/YR)      0.4916E-040.1915E-050.1537E-060.1917E-070.3216E-080.6688E-090.1637E-090.4554E-100.1399E-100.4593E-11
FAULT  37 E(NO/YR)      0.1933E-040.4557E-060.2646E-070.2596E-080.3598E-090.6381E-100.1355E-100.3182E-110.7402E-120.9810E-13
FAULT  38 E(NO/YR)      0.3545E-050.3993E-070.1478E-080.1048E-090.1112E-100.1391E-110.6471E-130.0000E+000.0000E+000.0000E+00
FAULT  39 E(NO/YR)      0.2313E-040.6728E-060.4460E-070.4822E-080.7219E-090.1365E-090.3077E-100.7896E-110.2182E-110.5662E-12
FAULT  40 E(NO/YR)      0.5654E-040.1099E-050.5686E-070.5135E-080.6673E-090.1119E-090.2219E-100.4448E-110.6160E-120.0000E+00
FAULT  41 E(NO/YR)      0.8217E-040.1836E-050.1050E-060.1024E-070.1418E-080.2512E-090.5297E-100.1235E-100.2861E-110.4101E-12
TOTAL     E(NO/YR)      0.3375E-010.8244E-020.3139E-020.1394E-020.6605E-030.3227E-030.1604E-030.8069E-040.4109E-040.2118E-04
TOTAL RISK              0.3319E-010.8210E-020.3134E-020.1393E-020.6603E-030.3227E-030.1603E-030.8069E-040.4109E-040.2118E-04

   AMPLITUDES (g):      0.1100E+010.1200E+010.1300E+010.1400E+010.1500E+01
   LN (AMPLITUDE):         0.10      0.18      0.26      0.34      0.41
FAULT   1 E(NO/YR)      0.9326E-050.5005E-050.2716E-050.1491E-050.8285E-06
FAULT   2 E(NO/YR)      0.1481E-050.7888E-060.3850E-060.2012E-060.1069E-06
FAULT   3 E(NO/YR)      0.3058E-070.1225E-070.5074E-080.2170E-080.9558E-09
FAULT   4 E(NO/YR)      0.2006E-060.8179E-070.3441E-070.1491E-070.6640E-08
FAULT   5 E(NO/YR)      0.5486E-080.2102E-080.8354E-090.3433E-090.1456E-09
FAULT   6 E(NO/YR)      0.9869E-080.3853E-080.1573E-080.6686E-090.2947E-09
FAULT   7 E(NO/YR)      0.2924E-090.1236E-090.5474E-100.2519E-100.1193E-10
FAULT   8 E(NO/YR)      0.3306E-080.1372E-080.5959E-090.2696E-090.1264E-09
FAULT   9 E(NO/YR)      0.3528E-090.1494E-090.6629E-100.3056E-100.1445E-10
FAULT  10 E(NO/YR)      0.1506E-080.6145E-090.2625E-090.1168E-090.5390E-10
FAULT  11 E(NO/YR)      0.3098E-090.1307E-090.5774E-100.2619E-100.1204E-10
FAULT  12 E(NO/YR)      0.1059E-090.4477E-100.1982E-100.9128E-110.4331E-11
FAULT  13 E(NO/YR)      0.8251E-090.3419E-090.1484E-090.6705E-100.3140E-10
FAULT  14 E(NO/YR)      0.2565E-100.9769E-110.3671E-110.1146E-110.1141E-12
FAULT  15 E(NO/YR)      0.1099E-100.4201E-110.1581E-110.4927E-120.7453E-13
FAULT  16 E(NO/YR)      0.6268E-090.2650E-090.1172E-090.5367E-100.2497E-10
FAULT  17 E(NO/YR)      0.5619E-090.2275E-090.9641E-100.4256E-100.1947E-10
FAULT  18 E(NO/YR)      0.2329E-100.8980E-110.3480E-110.1232E-110.3503E-12
FAULT  19 E(NO/YR)      0.1813E-110.6422E-120.2042E-120.4390E-130.0000E+00
FAULT  20 E(NO/YR)      0.3764E-100.1396E-100.4887E-110.1451E-110.0000E+00
FAULT  21 E(NO/YR)      0.1228E-110.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  22 E(NO/YR)      0.1791E-100.7372E-110.3150E-110.1376E-110.5740E-12
FAULT  23 E(NO/YR)      0.1274E-090.5374E-100.2371E-100.1084E-100.5062E-11
FAULT  24 E(NO/YR)      0.1363E-100.5207E-110.1965E-110.6436E-120.1568E-12
FAULT  25 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  26 E(NO/YR)      0.1418E-080.5763E-090.2452E-090.1086E-090.4992E-10
FAULT  27 E(NO/YR)      0.1531E-080.6379E-090.2783E-090.1264E-090.5948E-10
FAULT  28 E(NO/YR)      0.5544E-100.2344E-100.1037E-100.4725E-110.2188E-11
FAULT  29 E(NO/YR)      0.2295E-090.9562E-100.4172E-100.1895E-100.8915E-11
FAULT  30 E(NO/YR)      0.4149E-090.1746E-090.7688E-100.3525E-100.1672E-10
FAULT  31 E(NO/YR)      0.7377E-090.3104E-090.1367E-090.6267E-100.2972E-10
FAULT  32 E(NO/YR)      0.6623E-100.2804E-100.1243E-100.5703E-110.2681E-11
FAULT  33 E(NO/YR)      0.7117E-110.9455E-120.0000E+000.0000E+000.0000E+00
FAULT  34 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  35 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  36 E(NO/YR)      0.1555E-110.4812E-120.1461E-120.0000E+000.0000E+00
FAULT  37 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  38 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  39 E(NO/YR)      0.1211E-120.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  40 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  41 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
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TOTAL     E(NO/YR)      0.1107E-040.5859E-050.3145E-050.1711E-050.9439E-06
TOTAL RISK              0.1107E-040.5859E-050.3145E-050.1711E-050.9439E-06

  SPECIFIED RISKS:        0.013900  0.010000  0.005000  0.002105  0.000400
  ESTIMATED LN AMP.  :     -1.871    -1.707    -1.401    -1.063    -0.566
   ESTIMATED AMP. (g):    0.15401   0.18135   0.24644   0.34549   0.56806

SADIGH ET AL. (1997) DEEP SOIL
   AMPLITUDES (g):      0.1000E+000.2000E+000.3000E+000.4000E+000.5000E+000.6000E+000.7000E+000.8000E+000.9000E+000.1000E+01
   LN (AMPLITUDE):        -2.30     -1.61     -1.20     -0.92     -0.69     -0.51     -0.36     -0.22     -0.11      0.00
FAULT   1 E(NO/YR)      0.2574E-020.1621E-020.1040E-020.6325E-030.3664E-030.2065E-030.1151E-030.6432E-040.3627E-040.2073E-04
FAULT   2 E(NO/YR)      0.1274E-020.7635E-030.4325E-030.2384E-030.1309E-030.7257E-040.4085E-040.2341E-040.1367E-040.8132E-05
FAULT   3 E(NO/YR)      0.1595E-020.4822E-030.1347E-030.3771E-040.1108E-040.3476E-050.1170E-050.4220E-060.1629E-060.6700E-07
FAULT   4 E(NO/YR)      0.4302E-020.1661E-020.5322E-030.1562E-030.4602E-040.1412E-040.4584E-050.1582E-050.5815E-060.2276E-06
FAULT   5 E(NO/YR)      0.3847E-030.1656E-030.6013E-040.2000E-040.6608E-050.2247E-050.7979E-060.2973E-060.1163E-060.4773E-07
FAULT   6 E(NO/YR)      0.5039E-020.1108E-020.2262E-030.5030E-040.1253E-040.3488E-050.1073E-050.3609E-060.1314E-060.5142E-07
FAULT   7 E(NO/YR)      0.7016E-030.8439E-040.1283E-040.2467E-050.5722E-060.1541E-060.4686E-070.1575E-070.5759E-080.2264E-08
FAULT   8 E(NO/YR)      0.3627E-020.3087E-030.3217E-040.4362E-050.7426E-060.1529E-060.3695E-070.1025E-070.3203E-080.1111E-08
FAULT   9 E(NO/YR)      0.8916E-030.9911E-040.1422E-040.2612E-050.5838E-060.1524E-060.4510E-070.1480E-070.5302E-080.2045E-08
FAULT  10 E(NO/YR)      0.1804E-020.3241E-030.5876E-040.1220E-040.2916E-050.7915E-060.2399E-060.8004E-070.2905E-070.1136E-07
FAULT  11 E(NO/YR)      0.1390E-020.1219E-030.1444E-040.2271E-050.4468E-060.1049E-060.2840E-070.8658E-080.2917E-080.1071E-08
FAULT  12 E(NO/YR)      0.2819E-030.2360E-040.2265E-050.2787E-060.4298E-070.8031E-080.1768E-080.4486E-090.1290E-090.4134E-10
FAULT  13 E(NO/YR)      0.1453E-020.1779E-030.1950E-040.2449E-050.3654E-060.6444E-070.1328E-070.3162E-080.8632E-090.2676E-09
FAULT  14 E(NO/YR)      0.5617E-030.3618E-040.3647E-050.5194E-060.9545E-070.2132E-070.5555E-080.1641E-080.5385E-090.1931E-09
FAULT  15 E(NO/YR)      0.2495E-030.1473E-040.1352E-050.1764E-060.2993E-070.6220E-080.1519E-080.4233E-090.1318E-090.4513E-10
FAULT  16 E(NO/YR)      0.2288E-020.1467E-030.1181E-040.1283E-050.1804E-060.3147E-070.6587E-080.1615E-080.4541E-090.1419E-09
FAULT  17 E(NO/YR)      0.3494E-030.2162E-040.1558E-050.1447E-060.1693E-070.2415E-080.4089E-090.8048E-100.1802E-100.4481E-11
FAULT  18 E(NO/YR)      0.4648E-030.2348E-040.1877E-050.2181E-060.3359E-070.6445E-080.1475E-080.3909E-090.1172E-090.3866E-10
FAULT  19 E(NO/YR)      0.6968E-040.2297E-050.1362E-060.1260E-070.1626E-080.2717E-090.5587E-100.1350E-100.3611E-110.9334E-12
FAULT  20 E(NO/YR)      0.3979E-030.6192E-050.2239E-060.1475E-070.1517E-080.2181E-090.3819E-100.5319E-110.0000E+000.0000E+00
FAULT  21 E(NO/YR)      0.2497E-030.6468E-050.3238E-060.2646E-070.3105E-080.4820E-090.9373E-100.2097E-100.3151E-110.5883E-14
FAULT  22 E(NO/YR)      0.3442E-040.3335E-060.7145E-080.3000E-090.2227E-100.2420E-110.1519E-120.0000E+000.0000E+000.0000E+00
FAULT  23 E(NO/YR)      0.4446E-030.1784E-040.9293E-060.6724E-070.6425E-080.7711E-090.1114E-090.1819E-100.3049E-110.4685E-12
FAULT  24 E(NO/YR)      0.2438E-030.5598E-050.2212E-060.1449E-070.1436E-080.2012E-090.3677E-100.7413E-110.9448E-120.0000E+00
FAULT  25 E(NO/YR)      0.5736E-030.6328E-050.1995E-060.1266E-070.1326E-080.2022E-090.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  26 E(NO/YR)      0.7867E-030.4073E-040.2339E-050.1776E-060.1737E-070.2098E-080.3011E-090.5005E-100.9090E-110.1729E-11
FAULT  27 E(NO/YR)      0.1016E-020.2991E-040.1221E-050.7278E-070.5914E-080.6136E-090.7536E-100.1067E-100.1170E-110.0000E+00
FAULT  28 E(NO/YR)      0.5938E-040.7024E-060.1611E-070.6654E-090.4487E-100.4037E-110.1403E-120.0000E+000.0000E+000.0000E+00
FAULT  29 E(NO/YR)      0.1523E-030.4487E-050.1833E-060.1092E-070.8880E-090.9219E-100.1131E-100.1596E-110.1805E-120.0000E+00
FAULT  30 E(NO/YR)      0.2971E-030.6406E-050.2137E-060.1101E-070.8012E-090.7524E-100.8266E-110.8986E-120.0000E+000.0000E+00
FAULT  31 E(NO/YR)      0.5282E-030.1139E-040.3799E-060.1958E-070.1424E-080.1338E-090.1470E-100.1597E-110.0000E+000.0000E+00
FAULT  32 E(NO/YR)      0.5994E-040.8086E-060.2009E-070.8512E-090.5499E-100.4355E-110.2878E-120.0000E+000.0000E+000.0000E+00
FAULT  33 E(NO/YR)      0.2964E-030.1938E-050.4132E-070.2040E-080.1760E-090.5942E-110.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  34 E(NO/YR)      0.2665E-030.3588E-050.1222E-060.7761E-080.7716E-090.1055E-090.1248E-100.0000E+000.0000E+000.0000E+00
FAULT  35 E(NO/YR)      0.3421E-040.2587E-060.7139E-080.4232E-090.4058E-100.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  36 E(NO/YR)      0.1103E-040.4158E-070.5262E-090.1692E-100.6630E-120.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  37 E(NO/YR)      0.2425E-040.1738E-060.3502E-080.1554E-090.1230E-100.4240E-120.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  38 E(NO/YR)      0.7542E-050.7381E-070.2322E-080.1471E-090.1501E-100.1353E-110.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  39 E(NO/YR)      0.2436E-040.1586E-060.2671E-080.9899E-100.6173E-110.1514E-120.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  40 E(NO/YR)      0.5815E-040.2909E-060.4943E-080.2085E-090.1318E-100.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  41 E(NO/YR)      0.9310E-050.1589E-070.1640E-090.3680E-110.0000E+000.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
TOTAL     E(NO/YR)      0.3488E-010.7329E-020.2607E-020.1165E-020.5796E-030.3039E-030.1640E-030.9054E-040.5098E-040.2928E-04
TOTAL RISK              0.3428E-010.7303E-020.2603E-020.1164E-020.5795E-030.3038E-030.1640E-030.9054E-040.5098E-040.2928E-04

   AMPLITUDES (g):      0.1100E+010.1200E+010.1300E+010.1400E+010.1500E+01
   LN (AMPLITUDE):         0.10      0.18      0.26      0.34      0.41
FAULT   1 E(NO/YR)      0.1205E-040.7131E-050.4300E-050.2643E-050.1656E-05
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FAULT   2 E(NO/YR)      0.4925E-050.3035E-050.1901E-050.1209E-050.7804E-06
FAULT   3 E(NO/YR)      0.2930E-070.1357E-070.6628E-080.3402E-080.1827E-08
FAULT   4 E(NO/YR)      0.9478E-070.4191E-070.1964E-070.9718E-080.5059E-08
FAULT   5 E(NO/YR)      0.2052E-070.9217E-080.4320E-080.2108E-080.1069E-08
FAULT   6 E(NO/YR)      0.2146E-070.9490E-080.4426E-080.2166E-080.1108E-08
FAULT   7 E(NO/YR)      0.9477E-090.4192E-090.1947E-090.9448E-100.4768E-10
FAULT   8 E(NO/YR)      0.4211E-090.1716E-090.7348E-100.3206E-100.1292E-10
FAULT   9 E(NO/YR)      0.8415E-090.3664E-090.1678E-090.8033E-100.4003E-10
FAULT  10 E(NO/YR)      0.4749E-080.2106E-080.9858E-090.4842E-090.2484E-09
FAULT  11 E(NO/YR)      0.4238E-090.1790E-090.8017E-100.3780E-100.1861E-10
FAULT  12 E(NO/YR)      0.1446E-100.5364E-110.1942E-110.5436E-120.1082E-12
FAULT  13 E(NO/YR)      0.9291E-100.3510E-100.1351E-100.4457E-110.1137E-11
FAULT  14 E(NO/YR)      0.7477E-100.3095E-100.1329E-100.4335E-110.3325E-12
FAULT  15 E(NO/YR)      0.1668E-100.6287E-110.1970E-110.2071E-120.8148E-14
FAULT  16 E(NO/YR)      0.4655E-100.1423E-100.3211E-110.4488E-120.0000E+00
FAULT  17 E(NO/YR)      0.9522E-120.1218E-120.0000E+000.0000E+000.0000E+00
FAULT  18 E(NO/YR)      0.1315E-100.4084E-110.3850E-120.0000E+000.0000E+00
FAULT  19 E(NO/YR)      0.1168E-120.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  20 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  21 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  22 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  23 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  24 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  25 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  26 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  27 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  28 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  29 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  30 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  31 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  32 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  33 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  34 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  35 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  36 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  37 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  38 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  39 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  40 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  41 E(NO/YR)      0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
TOTAL     E(NO/YR)      0.1715E-040.1024E-040.6238E-050.3871E-050.2446E-05
TOTAL RISK              0.1715E-040.1024E-040.6238E-050.3871E-050.2446E-05

  SPECIFIED RISKS:        0.013900  0.010000  0.005000  0.002105  0.000400
  ESTIMATED LN AMP.  :     -1.898    -1.750    -1.461    -1.128    -0.588
   ESTIMATED AMP. (g):    0.14987   0.17371   0.23211   0.32366   0.55516

ABRAHAMSON & SILVA (1997) SOIL
   AMPLITUDES (g):      0.1000E+000.2000E+000.3000E+000.4000E+000.5000E+000.6000E+000.7000E+000.8000E+000.9000E+000.1000E+01
   LN (AMPLITUDE):        -2.30     -1.61     -1.20     -0.92     -0.69     -0.51     -0.36     -0.22     -0.11      0.00
FAULT   1 E(NO/YR)      0.2548E-020.1594E-020.1030E-020.6429E-030.3879E-030.2295E-030.1349E-030.7946E-040.4716E-040.2829E-04
FAULT   2 E(NO/YR)      0.1381E-020.8438E-030.4823E-030.2698E-030.1514E-030.8609E-040.4988E-040.2947E-040.1776E-040.1092E-04
FAULT   3 E(NO/YR)      0.1591E-020.4370E-030.1171E-030.3297E-040.9996E-050.3274E-050.1154E-050.4354E-060.1746E-060.7406E-07
FAULT   4 E(NO/YR)      0.4152E-020.1404E-020.4134E-030.1189E-030.3561E-040.1134E-040.3856E-050.1398E-050.5386E-060.2196E-06
FAULT   5 E(NO/YR)      0.4465E-030.1644E-030.5379E-040.1737E-040.5851E-050.2092E-050.7977E-060.3238E-060.1394E-060.6339E-07
FAULT   6 E(NO/YR)      0.5007E-020.1167E-020.2607E-030.6378E-040.1741E-040.5259E-050.1738E-050.6210E-060.2375E-060.9645E-07
FAULT   7 E(NO/YR)      0.1077E-020.1868E-030.3717E-040.8844E-050.2450E-050.7680E-060.2665E-060.1006E-060.4082E-070.1760E-07
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FAULT   8 E(NO/YR)      0.4442E-020.5011E-030.6641E-040.1100E-040.2207E-050.5179E-060.1383E-060.4109E-070.1337E-070.4703E-08
FAULT   9 E(NO/YR)      0.1409E-020.2319E-030.4437E-040.1024E-040.2767E-050.8494E-060.2894E-060.1075E-060.4297E-070.1828E-07
FAULT  10 E(NO/YR)      0.2237E-020.4731E-030.1020E-030.2504E-040.7009E-050.2203E-050.7652E-060.2894E-060.1178E-060.5113E-07
FAULT  11 E(NO/YR)      0.2319E-020.3160E-030.5208E-040.1066E-040.2610E-050.7374E-060.2341E-060.8185E-070.3104E-070.1262E-07
FAULT  12 E(NO/YR)      0.4070E-030.4683E-040.6194E-050.1024E-050.2066E-060.4929E-070.1354E-070.4185E-080.1432E-080.5342E-09
FAULT  13 E(NO/YR)      0.1845E-020.2467E-030.3384E-040.5541E-050.1095E-050.2564E-060.6977E-070.2161E-070.7479E-080.2845E-08
FAULT  14 E(NO/YR)      0.1168E-020.1316E-030.1956E-040.3749E-050.8754E-060.2385E-060.7349E-070.2505E-070.9283E-080.3694E-08
FAULT  15 E(NO/YR)      0.5119E-030.5280E-040.7225E-050.1287E-050.2819E-060.7258E-070.2127E-070.6928E-080.2466E-080.9462E-09
FAULT  16 E(NO/YR)      0.3632E-020.3533E-030.4174E-040.6364E-050.1209E-050.2751E-060.7279E-070.2184E-070.7291E-080.2666E-08
FAULT  17 E(NO/YR)      0.4459E-030.2953E-040.2489E-050.2758E-060.3846E-070.6477E-080.1275E-080.2860E-090.7159E-100.1952E-10
FAULT  18 E(NO/YR)      0.9761E-030.8850E-040.1087E-040.1772E-050.3603E-060.8718E-070.2424E-070.7558E-080.2592E-080.9644E-09
FAULT  19 E(NO/YR)      0.1801E-030.1186E-040.1160E-050.1589E-060.2813E-070.6077E-080.1539E-080.4441E-090.1428E-090.5025E-10
FAULT  20 E(NO/YR)      0.1211E-020.4297E-040.2684E-050.2571E-060.3363E-070.5563E-080.1104E-080.2517E-090.6258E-100.1508E-10
FAULT  21 E(NO/YR)      0.7291E-030.4290E-040.3859E-050.4951E-060.8311E-070.1717E-070.4181E-080.1165E-080.3627E-090.1240E-09
FAULT  22 E(NO/YR)      0.9796E-040.2425E-050.1035E-060.7019E-080.6770E-090.8578E-100.1327E-100.2239E-110.2280E-120.7290E-14
FAULT  23 E(NO/YR)      0.7903E-030.4592E-040.3506E-050.3640E-060.4900E-070.8192E-080.1645E-080.3864E-090.1034E-090.3043E-10
FAULT  24 E(NO/YR)      0.5895E-030.3080E-040.2345E-050.2598E-060.3895E-070.7439E-080.1727E-080.4704E-090.1457E-090.4980E-10
FAULT  25 E(NO/YR)      0.2404E-020.7067E-040.4011E-050.3622E-060.4549E-070.7301E-080.1404E-080.3090E-090.7513E-100.0000E+00
FAULT  26 E(NO/YR)      0.9628E-030.6386E-040.4997E-050.5098E-060.6558E-070.1020E-070.1855E-080.3836E-090.8816E-100.2220E-10
FAULT  27 E(NO/YR)      0.1617E-020.7202E-040.4438E-050.3832E-060.4339E-070.6093E-080.1015E-080.1936E-090.4064E-100.8732E-11
FAULT  28 E(NO/YR)      0.1369E-030.3845E-050.1717E-060.1178E-070.1129E-080.1404E-090.2114E-100.3493E-110.3594E-120.0000E+00
FAULT  29 E(NO/YR)      0.2423E-030.1080E-040.6656E-060.5748E-070.6511E-080.9143E-090.1523E-090.2904E-100.6106E-110.1305E-11
FAULT  30 E(NO/YR)      0.5323E-030.1997E-040.1090E-050.8604E-070.9084E-080.1204E-080.1909E-090.3459E-100.6676E-110.1142E-11
FAULT  31 E(NO/YR)      0.9463E-030.3549E-040.1938E-050.1530E-060.1615E-070.2141E-080.3394E-090.6149E-100.1187E-100.2031E-11
FAULT  32 E(NO/YR)      0.1325E-030.3870E-050.1783E-060.1246E-070.1203E-080.1489E-090.2223E-100.3673E-110.5052E-120.0000E+00
FAULT  33 E(NO/YR)      0.1540E-020.3290E-040.1429E-050.1037E-060.1087E-070.1489E-080.2474E-090.4197E-100.1584E-110.0000E+00
FAULT  34 E(NO/YR)      0.1314E-020.5170E-040.3614E-050.3874E-060.5670E-070.1050E-070.2339E-080.6042E-090.1746E-090.5302E-10
FAULT  35 E(NO/YR)      0.2479E-030.5252E-050.2588E-060.2159E-070.2576E-080.3961E-090.7340E-100.1361E-100.0000E+000.0000E+00
FAULT  36 E(NO/YR)      0.6564E-040.9341E-060.2816E-070.1486E-080.1178E-090.1237E-100.1316E-110.2373E-130.0000E+000.0000E+00
FAULT  37 E(NO/YR)      0.1330E-030.3637E-050.1837E-060.1527E-070.1851E-080.3002E-090.6102E-100.1448E-100.3193E-110.5105E-12
FAULT  38 E(NO/YR)      0.6996E-040.2253E-050.1479E-060.1552E-070.2256E-080.4167E-090.9253E-100.2368E-100.6610E-110.1644E-11
FAULT  39 E(NO/YR)      0.1215E-030.3029E-050.1358E-060.1014E-070.1134E-080.1748E-090.3435E-100.7628E-110.1323E-110.1890E-12
FAULT  40 E(NO/YR)      0.4514E-030.9982E-050.4449E-060.3406E-070.3902E-080.6082E-090.1187E-090.2481E-100.3697E-110.2522E-12
FAULT  41 E(NO/YR)      0.1453E-030.1276E-050.2984E-070.1351E-080.9516E-100.7587E-110.7204E-130.0000E+000.0000E+000.0000E+00
TOTAL     E(NO/YR)      0.5026E-010.8836E-020.2818E-020.1235E-020.6297E-030.3437E-030.1943E-030.1124E-030.6629E-040.3978E-04
TOTAL RISK              0.4901E-010.8797E-020.2814E-020.1234E-020.6295E-030.3437E-030.1943E-030.1124E-030.6629E-040.3978E-04

   AMPLITUDES (g):      0.1100E+010.1200E+010.1300E+010.1400E+010.1500E+01
   LN (AMPLITUDE):        0.10      0.18      0.26      0.34      0.41
FAULT   1 E(NO/YR)      0.1719E-040.1058E-040.6607E-050.4184E-050.2686E-05
FAULT   2 E(NO/YR)      0.6832E-050.4351E-050.2816E-050.1851E-050.1234E-05
FAULT   3 E(NO/YR)      0.3305E-070.1544E-070.7530E-080.3816E-080.2004E-08
FAULT   4 E(NO/YR)      0.9442E-070.4262E-070.2013E-070.9917E-080.5079E-08
FAULT   5 E(NO/YR)      0.3031E-070.1518E-070.7927E-080.4300E-080.2414E-08
FAULT   6 E(NO/YR)      0.4128E-070.1852E-070.8662E-080.4208E-080.2115E-08
FAULT   7 E(NO/YR)      0.8000E-080.3809E-080.1889E-080.9721E-090.5168E-09
FAULT   8 E(NO/YR)      0.1769E-080.7047E-090.2948E-090.1279E-090.5628E-10
FAULT   9 E(NO/YR)      0.8209E-080.3865E-080.1897E-080.9662E-090.5089E-09
FAULT  10 E(NO/YR)      0.2347E-070.1132E-070.5699E-080.2985E-080.1619E-08
FAULT  11 E(NO/YR)      0.5444E-080.2475E-080.1179E-080.5847E-090.3009E-09
FAULT  12 E(NO/YR)      0.2149E-090.9230E-100.4192E-100.1993E-100.9772E-11
FAULT  13 E(NO/YR)      0.1173E-080.5175E-090.2420E-090.1187E-090.6039E-10
FAULT  14 E(NO/YR)      0.1563E-080.6971E-090.3259E-090.1588E-090.8025E-10
FAULT  15 E(NO/YR)      0.3874E-090.1678E-090.7633E-100.3625E-100.1780E-10
FAULT  16 E(NO/YR)      0.1054E-080.4459E-090.1990E-090.9160E-100.4162E-10
FAULT  17 E(NO/YR)      0.5600E-110.1543E-110.3679E-120.5875E-130.0000E+00
FAULT  18 E(NO/YR)      0.3847E-090.1630E-090.7271E-100.3373E-100.1584E-10
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FAULT  19 E(NO/YR)     0.1905E-100.7579E-110.3036E-110.1128E-110.3440E-12
FAULT  20 E(NO/YR)     0.2303E-110.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  21 E(NO/YR)     0.4540E-100.1704E-100.5242E-110.1026E-110.1040E-12
FAULT  22 E(NO/YR)     0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  23 E(NO/YR)     0.9221E-110.2597E-110.5117E-120.5426E-130.0000E+00
FAULT  24 E(NO/YR)     0.1767E-100.5904E-110.1787E-110.4431E-120.3450E-13
FAULT  25 E(NO/YR)     0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  26 E(NO/YR)     0.5601E-110.1421E-110.0000E+000.0000E+000.0000E+00
FAULT  27 E(NO/YR)     0.1264E-110.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  28 E(NO/YR)     0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  29 E(NO/YR)     0.1807E-120.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  30 E(NO/YR)     0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  31 E(NO/YR)     0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  32 E(NO/YR)     0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  33 E(NO/YR)     0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  34 E(NO/YR)     0.1239E-100.1221E-110.0000E+000.0000E+000.0000E+00
FAULT  35 E(NO/YR)     0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  36 E(NO/YR)     0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  37 E(NO/YR)     0.1679E-130.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  38 E(NO/YR)     0.4246E-130.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  39 E(NO/YR)     0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  40 E(NO/YR)     0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
FAULT  41 E(NO/YR)     0.0000E+000.0000E+000.0000E+000.0000E+000.0000E+00
TOTAL     E(NO/YR)     0.2427E-040.1505E-040.9480E-050.6063E-050.3935E-05
TOTAL RISK             0.2427E-040.1505E-040.9480E-050.6063E-050.3935E-05

  SPECIFIED RISKS:        0.013900  0.010000  0.005000  0.002105  0.000400
  ESTIMATED LN AMP.  :     -1.794    -1.661    -1.408    -1.103    -0.557
   ESTIMATED AMP. (g):    0.16629   0.18992   0.24453   0.33201   0.57318
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CLOSEST DISTANCES BETWEEN SITE AND FAULT RUPTURES

NO.	FAULT NAME	CD_1DRP	CD_2DRP	CDIST	CLODIS	CD_EPI	CD_HYPO
1	NEWPORT-INGLEWOOD (L.A.Basin)	5.0	5.0	5.0	5.0	5.0	5.1 km
2	SAN JOAQUIN HILLS	7.3	7.3	7.6	7.6	8.8	9.1 km
3	NEWPORT-INGLEWOOD (Offshore)	17.4	17.4	17.4	17.4	18.4	18.5 km
4	PALOS VERDES	20.0	20.0	20.0	20.0	20.0	20.2 km
5	PUENTE HILLS BLIND THRUST	22.1	22.1	22.7	22.7	23.1	23.7 km
6	WHITTIER	25.5	25.5	25.5	25.5	25.8	25.8 km
7	SAN JOSE	36.0	36.0	36.0	36.0	37.0	37.0 km
8	ELSINORE (GLEN IVY)	36.2	36.2	36.2	36.2	36.7	36.7 km
9	UPPER ELYSIAN PARK BLIND THRUST	38.6	38.6	38.7	38.7	39.3	39.5 km
10	CHINO-CENTRAL AVE. (Elsinore)	38.6	31.6	35.0	35.0	32.1	35.0 km
11	RAYMOND	44.7	44.7	44.7	44.7	45.1	45.1 km
12	VERDUGO	46.7	46.7	46.7	46.7	48.1	48.1 km
13	SIERRA MADRE	46.9	46.9	46.9	46.9	48.1	48.1 km
14	HOLLYWOOD	48.1	48.1	48.1	48.1	48.9	48.9 km
15	CLAMSHELL-SAWPIT	49.6	49.6	49.6	49.6	50.9	50.9 km
16	CUCAMONGA	50.5	50.5	50.5	50.5	51.8	51.8 km
17	CORONADO BANK	51.9	51.9	51.9	51.9	52.8	52.8 km
18	SANTA MONICA	53.4	53.4	53.4	53.4	53.7	53.7 km
19	MALIBU COAST	59.5	59.5	59.5	59.5	60.6	60.6 km
20	ELSINORE (TEMECULA)	61.0	61.0	61.0	61.0	61.9	61.9 km
21	SIERRA MADRE (San Fernando)	66.7	66.7	66.7	66.7	67.6	67.6 km
22	SAN GABRIEL	70.2	70.2	70.2	70.2	71.2	71.2 km
23	ANACAPA-DUME	70.2	70.2	70.2	70.2	71.5	71.5 km
24	NORTHRIDGE (E. Oak Ridge)	71.6	64.7	67.7	67.7	66.0	68.7 km
25	SAN JACINTO-SAN BERNARDINO	72.5	72.5	72.5	72.5	72.5	72.5 km
26	SAN ANDREAS - Whole M-1a	76.7	76.7	76.7	76.7	76.7	76.8 km
27	SAN ANDREAS - 1857 Rupture M-2a	76.7	76.7	76.7	76.7	76.7	76.8 km
28	SAN ANDREAS - Mojave M-1c-3	76.7	76.7	76.7	76.7	76.7	76.7 km
29	SAN ANDREAS - Cho-Moj M-1b-1	76.7	76.7	76.7	76.7	76.7	76.9 km
30	SAN ANDREAS - SB-Coach. M-1b-2	77.5	77.5	77.5	77.5	77.6	77.6 km
31	SAN ANDREAS - SB-Coach. M-2b	77.5	77.5	77.5	77.5	77.6	77.6 km
32	SAN ANDREAS - San Bernardino M-1	77.5	77.5	77.5	77.5	77.6	77.6 km
33	SAN JACINTO-SAN JACINTO VALLEY	77.6	77.6	77.6	77.6	78.0	78.0 km
34	SANTA SUSANA	80.3	80.3	80.3	80.3	81.0	81.0 km
35	CLEGHORN	81.3	81.3	81.3	81.3	81.6	81.6 km
36	ROSE CANYON	86.1	86.1	86.1	86.1	87.2	87.2 km
37	SIMI-SANTA ROSA	90.2	90.2	90.2	90.2	91.1	91.1 km
38	HOLSER	91.6	88.3	89.3	89.3	89.5	90.3 km
39	NORTH FRONTAL FAULT ZONE (West)	93.8	93.4	93.6	93.6	94.5	94.7 km
40	OAK RIDGE (Onshore)	99.9	95.8	96.8	96.8	96.9	97.8 km
41	ELSINORE (JULIAN)	99.3	99.3	99.3	99.3	100.4	100.4 km

EXPLANATION

CD_1DRP = Closest distance to projection of rupture area along fault trace.
CD_2DRP = Closest distance to surface projection of the rupture area.
CDIST = Closest distance to seismogenic rupture.
CLODIS = Closest distance to subsurface rupture.
CD_EPI = Closest epicentral distance.
CD_HYPO = Closest hypocentral distance.

APPENDIX D

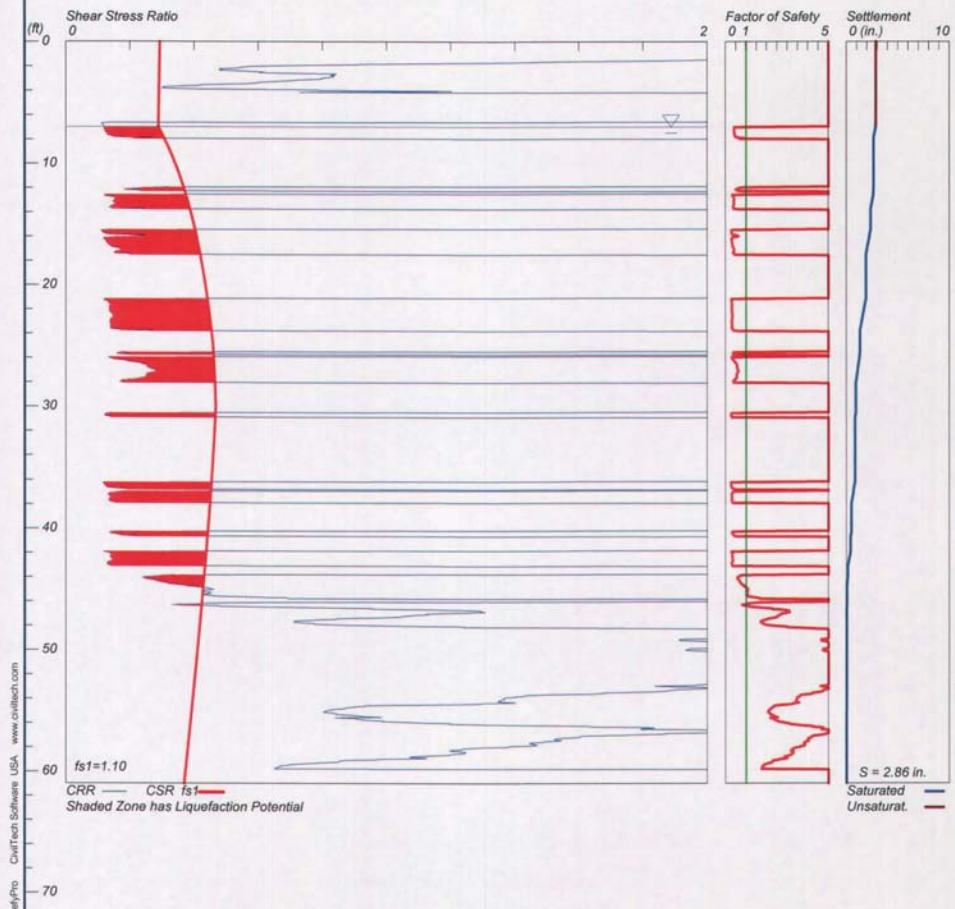
LIQUEFACTION AND SEISMIC SETTLEMENT ANALYSIS

SEISMIC SETTLEMENT ANALYSIS

Proposed Mixed-Use Development

Hole No.=CPT-1 Water Depth=7 ft

Magnitude=7.0
Acceleration=0.41g



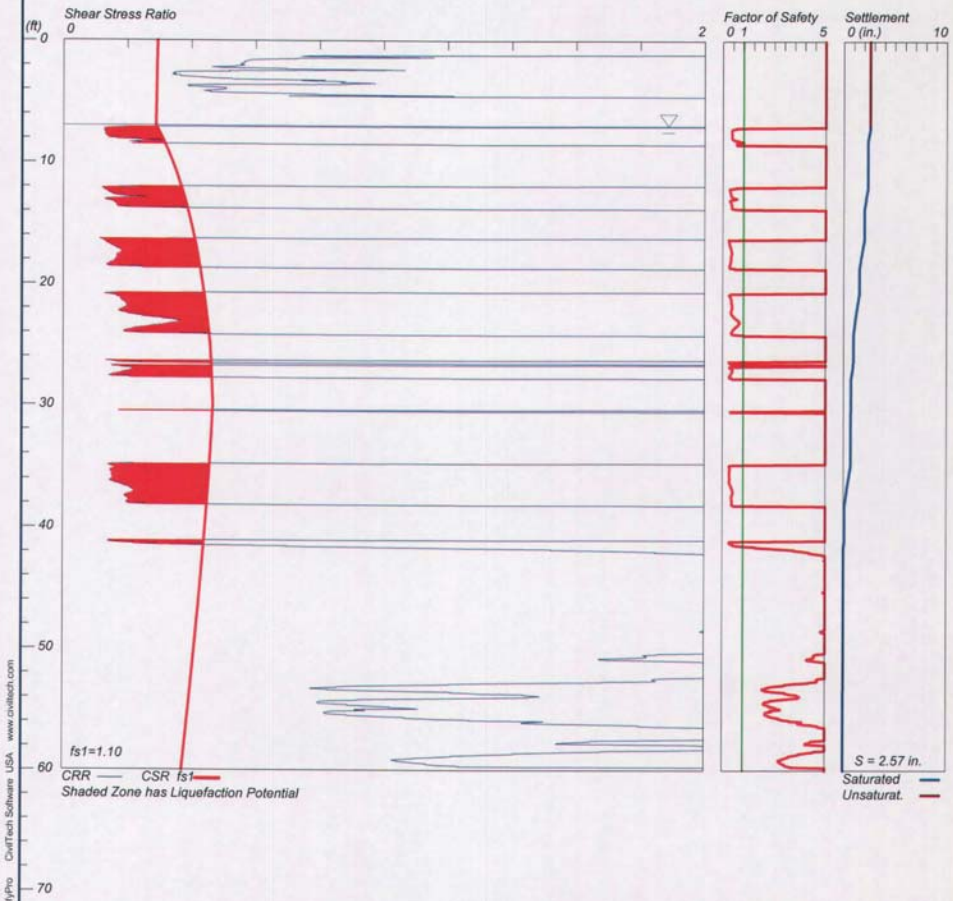
Leighton and Associates, Inc. 012428-001 Figure D-1

SEISMIC SETTLEMENT ANALYSIS

Proposed Mixed-Use Development

Hole No.=CPT-2 Water Depth=7 ft

Magnitude=7.0
Acceleration=0.41g



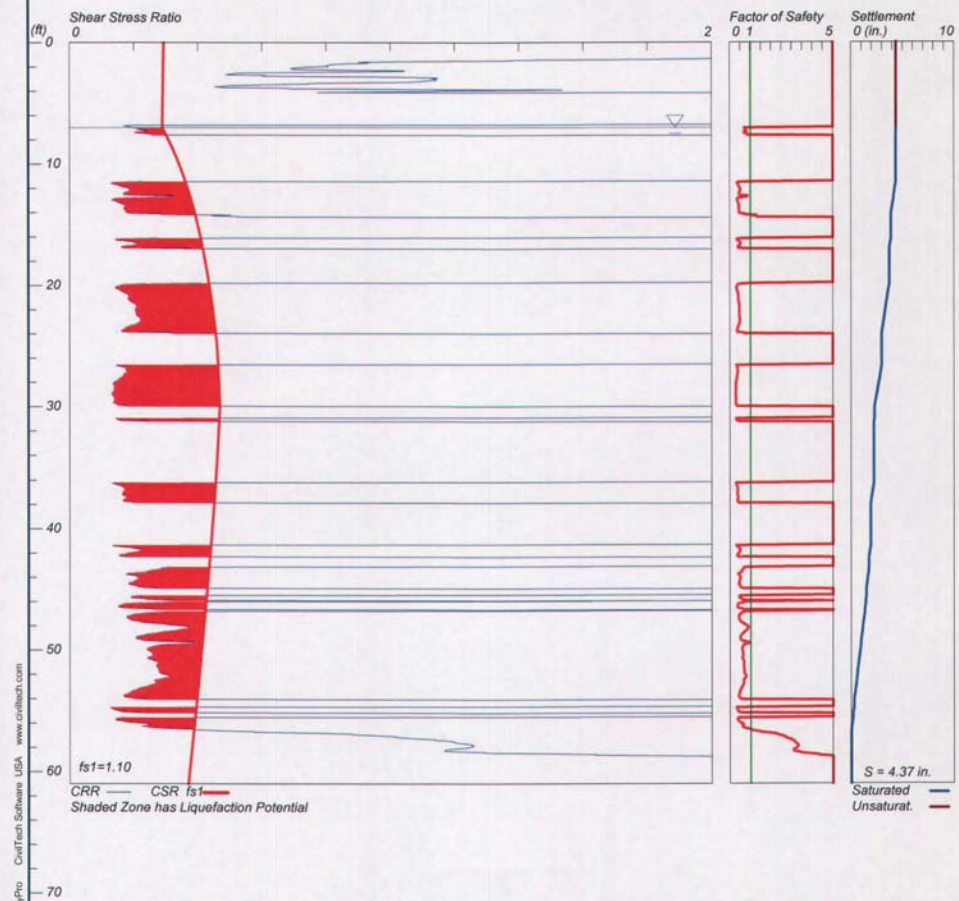
Leighton and Associates, Inc. 012428-001 Figure D-2

SEISMIC SETTLEMENT ANALYSIS

Proposed Mixed-Use Development

Hole No.=CPT-3 Water Depth=7 ft

Magnitude=7.0
Acceleration=0.41g



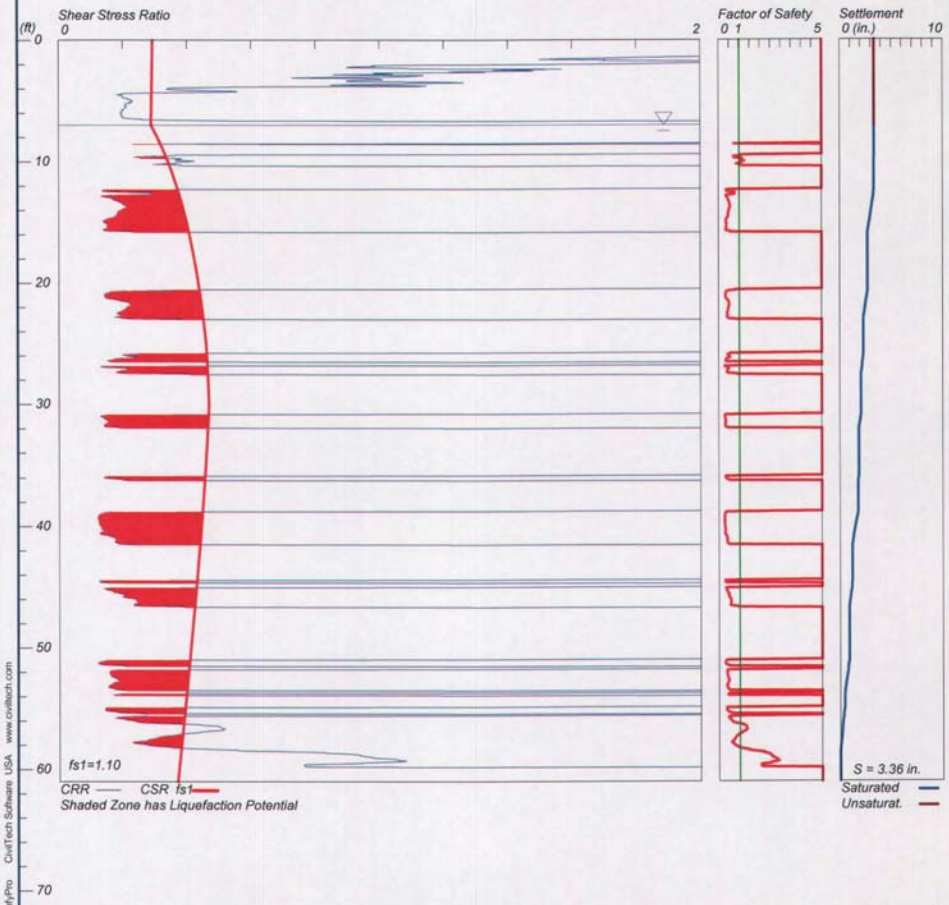
Leighton and Associates, Inc. 012428-001 Figure D-3

SEISMIC SETTLEMENT ANALYSIS

Proposed Mixed-Use Development

Hole No.=CPT-4 Water Depth=7 ft

Magnitude=7.0
Acceleration=0.41g



Leighton and Associates, Inc. 012428-001 Figure D-4