Appendix E

Preliminary Geotechnical Evaluation

PRELIMINARY GEOTECHNICAL ENGINEERING EVALUATION FOR THE PROPOSED BACK BAY LANDING – MIXED-USE WATERFRONT DEVELOPMENT LEGISLATIVE APPROVALS (GPA, CLUPA, ETC.), BAYSIDE DRIVE AND PACIFIC COAST HIGHWAY, NEWPORT BEACH, CALIFORNIA

Prepared for:

BAYSIDE VILLAGE MARINA, LLC

c/o Mr. Gordon Craig
39 Agia
Laguna Niguel, California 92677

Project No. 602668-002

March 2, 2012

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

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Date: Project No. 602668-002

To: Bayside Village Marina, LLC
c/o Mr. Gordon Craig
39 Agia
Laguna Niguel, California 92677

Attention: Mr. Gordon Craig

Subject: Preliminary Geotechnical Engineering Evaluation for the proposed Back Bay Landing – Mixed-Use Waterfront Development Legislative Approvals (GPA, CLUPA, etc.), Bayside Drive and Pacific Coast Highway, Newport Beach, California

In accordance with your request and authorization, Leighton Consulting, Inc. has conducted a preliminary geotechnical engineering exploration and analysis for the proposed Back Bay Landing mixed-use development in Newport Beach, California. The purpose of this geotechnical study was to evaluate the subsurface soil and groundwater conditions at the Back Bay site (Parcel 3, Parcel Map 93 111) and present preliminary design parameters and considerations for use in the evaluation of the proposed development.

The proposed General Plan and Coastal Land Use Plan Amendments and Zone Change (PC Development Plan) would allow for a mixed use waterfront development that may consist of several single-story commercial structures, multi-level residential development over ground-level commercial space and stacked flats, a boat house facility for dry boat storage, and central parking structure with one level subterranean. A new bulkhead is planned along the currently unprotected northern and western Parcel 3 Back Bay shorelines.

The proposed project is anticipated to be feasible based on geotechnical aspects of the site, but the potential for liquefaction and construction below grade in proximity to the water table will present construction challenges that will need to be addressed in design and construction. The recommendations presented in this report are intended to be used for preliminary future evaluation of the proposed GPA, CLUPA and ZC and assist in identifying aspects of the development that require further geotechnical engineering evaluation that will allow final design to be completed.

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

Respectfully submitted,

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1.0 INTRODUCTION

1.1 Purpose and Scope

This report presents the results of a preliminary geotechnical study prepared for land use amendment applications (legislative approvals) for the proposed Back Bay Landing mixed-use development planned in the city of Newport Beach, California. The purpose of this geotechnical study was to evaluate the geotechnical characteristics of the subsurface soil and groundwater conditions at the site and present preliminary design parameters and considerations for use in the evaluation of the proposed development.

The recommendations presented in this report are preliminary and should be reviewed and evaluated considering the potential for changes in the scope and nature of the proposed development as may occur during the agency review and approval process.

The scope of our work included the following tasks:

- Review of available geologic reports, aerial photographs and maps included in Appendix A.
- Notify Underground Service Alert (USA) of California to locate and mark underground utilities prior to commencement of field exploration.
- Subsurface exploration consisting of excavation, logging, and sampling of three (3) hollow-stem auger borings, LBH-1 through LBH-3 and nine (9) Cone Penetrometer Test (CPT) soundings, LCPT-1 through LCPT-9 at pre-selected locations. The CPT exploration was performed in two phases: The initial phase in 2009 and the latter phase in November 2011; the test borings were drilled in 2009.
- Collection of relatively undisturbed ring samples and bulk samples at selected depth intervals from the soil borings and transportation of the samples to our laboratory for testing.
- Laboratory testing of selected samples to evaluate engineering characteristics of the onsite earth materials within the exploration depths.
- Geotechnical evaluation of collected test boring and CPT data and relevant engineering analyses.

- Preparation of this report summarizing our findings, conclusions, and preliminary recommendations.

1.2 Site Location and Description

The project site is located at the northwestern corner of the intersection of Bayside Drive and Pacific Coast Highway (PCH) adjacent to Upper Newport Bay in Newport Beach, California. At the time of our explorations, the site consisted of a vacant paved parking lot with several runs of chain link fence that subdivided the area. An office trailer was present on site. An OCSD pump station was located in the central region of the southern boundary of the site. The pump station is not part of the existing or future commercial development. The site was used for RV and trailered boat storage as well as kayak and other personal watercraft rentals. Parking and gangway access to a floating fish market was located near the Newport Channel on the west end of the site. The location of the proposed Back Bay Landing development is shown in Figure 1 included at the end of the text.

1.3 Description of Proposed Project

A General Plan and Coastal Land Use Plan Amendment, Planned Community Development Plan ("PCDP") Amendment and potential Development Agreement is being processed to provide for the inclusion of integrated residential uses in a mixed use waterfront setting. The future mixed-use, marine oriented project would include recreational marine commercial, (dry boat storage, restaurant, marine and visitor serving retail), and integrated residential development). Vehicle parking would be primarily in a central parking structure along with some at-grade parking and/or storage in the southwestern region of the site below the East Coast Highway overpass. The parking structure would be built in the eastern half of the property above ground and include one subterranean level and be wrapped by 3-story structures with the ground floors of such structures used for commercial/retail establishments and the upper two levels attached residential units. Additional free-standing residential buildings would be included but limited per the PCDP.

Based on the proposed draft PCDP, a dry stack boat storage building is envisioned to be located west of the parking structure site next to a similar retail/residential building surrounding or "wrapping" the parking structure. The boat storage structure would conceptually be bordered to the west by three-story residential buildings that would overlook the bay.

The development would include three single-story retail/restaurant buildings in the eastern portion of the site. A publicly accessible 60-foot tall lighthouse structure is envisioned for the development to be located in the center of a circular, park-like round-about/plaza adjacent to the north bayfront portion of the site. The iconic lighthouse would provide for bay and coastal viewing opportunities.

The finished first floor elevations of the structures are generally planned to be close to existing grade to reduce grading requirements. As discussed above, the parking structure includes one level subterranean. The following table presents the assumed finished floor elevations of the various structures.

Table 1 - Maximum Finished Floor Elevations (El.)

Building Identification	Assumed Finished First Floor (MSL[1])
Residential - West	12.0
Dry Stack Boat Storage	11.0
Retail	11.0
Parking Structure – Subterranean	5.0
– 1st Level	15.0
Other Retail (e.g., along Parking Structure)	15.0
Restaurant/Bayside (East) Retail	15.0

The proposed residential buildings, the single-story commercial (restaurant/retail) buildings and the residential over retail buildings are anticipated to consist of wood frame construction. The dry stack storage facility anticipated to be included in the mixed-use project would be a steel frame structure. The parking structure is anticipated to consist of concrete block masonry walls and concrete slab decks supported by interior columns and the perimeter walls.

Structural load information was not available at the time of geotechnical analysis. Based upon the nature of the development and our experience with similar types of structures, we have assumed the structural loads of the 3-story retail/residential buildings and the boat house to be a maximum of 3 kips per lineal foot (klf) for load bearing walls and 40 kips for columns; and for the parking

[1] MSL: Mean Sea Level; Datum assumed for Elevations indicated on Plate 1

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structure, a maximum of 8 klf for bearing walls and 400 kips for columns. We should be notified if the actual loads vary from these estimates.

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 Field Exploration

Prior to the field exploration, an engineer from our firm performed a site reconnaissance to identify and evaluate the proposed boring locations with respect to access for heavy equipment and subsurface structures. Underground Service Alert was then notified of the boring locations for utility clearance.

Subsurface exploration consisted of three (3) test borings advanced by a conventional truck-mounted drilling rig using 3¼-inch diameter (I.D.) hollow stem augers. The borings were extended to depths of either 30 or 51½ feet below current grade. The approximate locations of the borings are shown on Plate 1, Boring and CPT Location Map.

Soil sampling was performed by the Standard Penetration Test (SPT) in accordance with ASTM D1586 procedures. Relatively undisturbed samples were collected by ASTM D3550 procedures. Samples were collected at either 2½- or 5-foot intervals throughout the depth of exploration. In both test methods, the sampler is driven below the bottom of the borehole by a 140-pound weight (hammer) free-falling 30 inches. The drilling rig was equipped with an automatic hammer to provide greater consistency in the drop height and striking frequency. The number of blows to drive the sampler the final 12 inches of the 18-inch drive interval is termed the “blowcount” or SPT N-value. The N-values provide a measure of relative density in granular (non-cohesive) soils and comparative consistency in cohesive soils. Bulk samples were also obtained from the borings for laboratory analysis.

Each soil sample collected was examined in the field and its description was entered in the boring logs in general conformance with the Unified Soil Classification System (USCS) pursuant to ASTM D2488. All samples were sealed and packaged for transport to our laboratory. After completion of drilling, the borings were backfilled with soil cuttings. The logs of the test borings are included in Appendix B. In addition, the logs of the boring from our prior subsurface explorations are also included in Appendix B.

In addition to the soil borings, nine (9) CPT soundings were performed as part of the exploration. Several of the CPT soundings were situated in close proximity to the boring locations so that samples collected from the test boring locations could be correlated to the CPT data and the profile penetrated by the CPT probe. The CPT soundings were advanced to 40 to 60 feet below grade. The CPT soundings were performed in accordance with ASTM D5778 and D3441 specifications.

Upon completion of the drilling, the boreholes were backfilled with soil cuttings and the boreholes patched with dyed concrete. The locations of the soil borings and CPT soundings are shown on Plate 1, Boring and CPT Location Map. The test boring logs and the logs of the CPT soundings are included in Appendix B.

Exploration of the site was previously performed by Mactec Engineering and Consulting, (Mactec, 2004). The subsurface conditions encountered at their test borings and CPT soundings have been reviewed and considered in the evaluation of the site. The locations of their exploration are also shown on Plate 1 and copies of the boring and CPT logs are included in Appendix B.

2.2 Laboratory Testing

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

- Determination of the in-situ moisture content and density;
- Particle size distribution by mechanical sieve analysis and hydrometer sedimentation;
- Determination of fines content by Percent Passing No. 200 Sieve;
- Shear strength by Direct Shear and Triaxial Compression (Unconsolidated Undrained) testing;
- Soil plasticity by determination of Atterberg Limits; and
- Soil corrosivity by testing to determine pH, chloride and sulfate content and minimum resistivity.

All laboratory tests were performed in general conformance with ASTM Standard Test Methods and Caltrans Test Methods as appropriate. The results of the in-situ moisture content and density are included on the logs of the test borings while the results other tests are presented in Appendix C of this report.

3.0 SUBSURFACE CONDITIONS AND SEISMICITY

3.1 Regional Geology

The project site is located on the landward side of a natural coastal barrier island formed by a transgressive sea and littoral ocean currents at the seaward edge of San Diego Creek drainage within Upper Newport Bay coastal estuary near the San Joaquin Hills. The Newport Bay estuary was originally formed as the lower reach of the Santa Ana River. However, due to extensive widespread flooding in 1915-1916, the Santa Ana River realigned its course to the west. The bay is currently fed only by San Diego Creek and its tributaries.

The San Joaquin Hills lie within the northern part of the Peninsular Ranges geomorphic province which extends 900 miles southward from the Santa Monica Mountains to the tip of Baja California (Yerkes, et al., 1965). Regional tectonic activity has uplifted the San Joaquin Hills into an elongated arched fold (anticlinorium) trending to the northwest from San Juan Capistrano and Huntington Mesa. This anticlinal folding has occurred as this entire section of the southern California coast was uplifted by the San Joaquin Hills blind thrust fault (Grant et at., 1997, 1999, and 2002; Mueller et al., 1998). The geology in the vicinity of the project site is shown in Figure 3.

3.2 Subsurface Soil Conditions

The results of the field exploration indicate the presence of fill to depths that varied from approximately 6 to 8 feet below the existing grade at the test borings and potentially to a depth of 10 feet at in the eastern region of the site in area of CPT Nos. L-CPT-4 and L-CPT-5. The fill encountered at the boring locations consisted predominately of fine grained sands that exhibited loose to medium dense relative density on the basis of field testing (N-values).

The fill was underlain by native soils comprised of Quaternary estuarine deposits consisting of loose to medium dense relative density sands and silty sands to a depth of 20 to 25 feet which were underlain by medium dense to dense sands extending to at least the depths explored.

The native soil profile included a relatively thin (1- to 3-foot thick) layer of soft consistency clay at depths ranging from 8 to 10 feet below grade at the majority of the test borings and CPT locations. The depths at which this material was encountered corresponded to approximately El. 3 to El. 6 feet above MSL.

3.2.1 Soil Expansion Potential

The near-surface soil encountered in our borings consisted of mainly sandy materials. Due to the granular nature of the soils, the expansion potential of the soils is expected to be very low.

3.2.2 Soil Corrosivity

In general, soil environments that are detrimental to concrete have high concentrations of soluble sulfates and/or pH values of less than 5.5. Section 4.3 of ACI 318 (ACI, 2005), as referred in the 2010 CBC, provides specific guidelines for the 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 amount 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, is 500 ppm per 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, composite bulk samples of the onsite soils to a depth of 5 feet below current grade were tested to provide a preliminary evaluation of corrosivity. The test results are included in Appendix C and are further discussed in Section 5.10. Based upon the results of the screening tests, the near surface soils have “negligible” soluble sulfate contents and low chloride contents. The soils are considered to have a moderate corrosion potential to buried ferrous metal. Additional testing should be performed during construction to verify the corrosion potential of subsurface soils.

3.3 Groundwater Conditions

Groundwater was typically encountered at depths of approximately 6 to 8 feet below grade at the test boring locations during field exploration in 2009. These depths correspond to El. 3.5 to El. 8 feet above MSL. Due to the coastal location of the project site, groundwater levels will vary in response to tidal fluctuations. Groundwater highs will likely approach tidal highs in the bay, and groundwater lows can be expected to drop below mean sea level. In consideration of the subterranean construction planned for the parking structure, further evaluation of the groundwater table and its fluctuations is recommended through the installation of shallow observation wells.

3.4 Faulting and Seismicity

3.4.1 Faulting

Review of available in-house literature indicates no known active or potentially active faults traverse the site, and the site is not located within an Alquist-Priolo Earthquake Fault Zone (Bryant and Hart, 2007).

Two major faults are located in close proximity to the site, the Newport Inglewood (L.A. Basin and Offshore segments) located 2.5 and 2.8 miles from the site respectively, and the San Joaquin Hills Blind Thrust, located approximately 6.4 miles from the project site (Grant, Ballenger and Runnerstrom, 2002). A description of these faults is presented below:

Newport-Inglewood Fault Zone: The Newport-Inglewood Fault Zone is a broad zone of left-stepping en echelon faults and folds striking southeastward from near Santa Monica across the Los Angeles basin to Newport Beach. Altogether these various faults constitute a system more than 150 miles long that extends into Baja California, Mexico. Faults having similar trends and projections occur offshore from San Clemente and San Diego (the Rose Canyon and La Nacion Faults). A near-shore portion of the Newport-Inglewood Fault Zone was the source of the destructive 1933 Long Beach earthquake (ML 6.3) (Hauksson and Gross, 1991). The reported recurrence interval for a large event along this fault zone is 1,200 to 1,300 years with an expected slip of 1 meter (Forest et al., 1997).

San Joaquin Hills Blind Thrust Fault: The seismic hazards in Southern California have been further complicated with the recent realization that major earthquakes can occur on large thrust faults that are concealed at depths between 5 to 20 km, referred to as “blind thrusts.” The uplift of the San Joaquin Hills is produced by a southwest dipping blind thrust fault that extends at least 14 km from northwestern Huntington Mesa to Dana Point and comes to within 2 km of the ground surface (Grant et al., 1997;

Mueller et al., 1998). Work by Grant et al. (1997 and 1999) suggest that uplift of the hills began in the Late Quaternary and continues during the Holocene. Uplift rates have been estimated between 0.25 and 0.5 mm/yr. If the entire length of the fault ruptured, the earthquake has been estimated to generate an Mw 6.8 event (Grant et al., 1999).

3.4.2 Ground Motion

The intensity of ground shaking at a given location depends primarily upon the earthquake magnitude, the distance from the earthquake source, and the site response characteristics which are dependent upon the subsurface stratigraphy. The location of the site relative to active faults indicates the subject site and the structures that will comprise the proposed development are likely to experience strong ground shaking during the life of the development. Peak horizontal ground acceleration (PGA) is generally used to characterize the amplitude of ground motion.

Evaluation of the seismic hazard relative to strong ground shaking was performed on the basis of probabilistic and deterministic methodologies. The probabilistic hazard evaluation was performed using three attenuation relationships to estimate ground motions at the site: Boore-Atkinson 2008, Campbell-Bozorgnia 2008, and Chiou-Young 2008. The results of the analyses indicate the design PGA is 0.495g while the PGA associated with the Maximum Considered Earthquake (MCE) is 0.743g for the site. The details of the analyses are presented in Appendix D.

3.5 Seismic Hazards

The potential hazards to be evaluated with regard to seismic conditions include fault rupture, soil liquefaction, earthquake-induced vertical and lateral displacements, landslides triggered by ground shaking, earthquake-induced flooding due to the failure of water containment structures, seiches, and tsunamis.

3.5.1 Fault Rupture

The project is not located within a currently designated Alquist-Priolo Earthquake Zone (Bryant and Hart, 2007). No known active faults are mapped on the site. Based on this consideration, the potential for surface fault rupture at the site is considered to be low.

3.5.2 Liquefaction

Liquefaction is a seismic phenomenon in which loose, saturated, non-cohesive granular soils exhibit severe reduction in strength and stability when subjected to high-intensity ground shaking. The mechanism by which liquefaction occurs is the progressive increase in excess pore pressure generated by the shaking associated with the seismic event and the tendency for loose non-cohesive soils to consolidate. As the excess pore fluid pressure approaches the in-situ overburden pressure, the soils exhibit behavior similar to a dense fluid with a corresponding significant decrease in shear strength and increase in compressibility. Liquefaction occurs when three general conditions exist: 1) shallow groundwater; 2) low density, non-cohesive sandy soils; and 3) high-intensity ground motion.

The subject site is located in an area that has been identified by the State of California as being potentially susceptible to liquefaction (CDMG, 1997). As a result, a site-specific evaluation of the potential for liquefaction to occur is required for new development and appropriate remedial measures commensurate with the proposed structure if the potential exists for liquefaction to occur.

The potential for liquefaction to occur has been evaluated based upon the subsurface data collected by the CPT sounding exploration and the software package CLiq (GeoLogismiki, v1.5.1.16). The procedure used in the software to determine the potential for triggering of liquefaction was the empirical procedure described by Robertson and Wride as adapted by the NCEER (1998; Youd 2001) and the calibrated procedures for post-earthquake displacement by Zhang et. al. (2002, 2004). The liquefaction analysis was conducted on the basis of a seismic event (Mw) of 7.0 and peak horizontal ground acceleration (PGA) of 0.49g. The groundwater table used in the analysis was approximately El. 3.5 feet. The analysis was based upon a minimum Factor of Safety of 1.0 for liquefaction triggering.

The results of the liquefaction analysis are included in Appendix D which are presented as the graphical output of the computer program. The analysis focused on the CPT soundings rather than the test borings due to the refinement offered by the continuous record of the subsurface profile provided by the data collected during the penetration of the CPT probe.

The interpreted profile of the CPT soundings was compared to the samples collected from test borings where located in close proximity to a CPT sounding.

The liquefaction analysis indicated the potential for liquefaction in relatively thin strata typically no greater than 3 to 4 feet in thickness based upon the analysis of CPT data. However, several strata occurred at shallow depth below the water table particularly at the CPT locations near the shores that border the property. At these locations, the zones of liquefiable soils generally existed from several feet below the groundwater table to depths of 13 to 16 feet below grade. Other strata of potentially liquefiable soils existed at greater depth exhibiting thicknesses of 1 to 2 feet and were typically widely spaced within the respective profiles. Based upon the encountered conditions, generalized profiles were developed that suggest continuity in the potentially liquefiable soil layers and the likelihood that they extend to the submarine slopes.

The primary effects of liquefaction on structures supported at shallow depth below ground surface are loss of bearing capacity if liquefaction occurs within the zone of foundation influence below footings or settlement due to the consolidation of liquefied sediments if bearing capacity is not compromised. Based upon the depths at which liquefaction is anticipated to occur and the probability that all structures (except the subterranean level of the parking structure) will be supported at shallow depth below existing grade, bearing capacity failures are not anticipated to occur. However, ground surface settlement (as discussed in Section 3.5.4 below) and ground oscillation are anticipated and should be considered in design.

Ground oscillation is a phenomenon in which the surficial crust of non-liquefied soils becomes fissured as the mass responds to the oscillations induced by the shear waves propagating to the surface. As the ground shaking progresses, the non-liquefied mass may begin to break into large blocks bounded by fissures and these blocks may undergo horizontal displacements in different directions. Fissures that occur within the footprint of structures may result in large horizontal forces on foundation elements such as column pad footings that are located on opposite sides of a fissure which, in turn, could tend to pull apart the structure.

The lower level of the parking structure will be approximately 10 feet below the first level which is approximately level with current grade. Soils susceptible to liquefaction exist are expected to exist at or slightly below this elevation and will, therefore, present a serious risk of loss of bearing capacity and foundation support. Preparation of the parking structure area will require either improvement/densification of the soils to mitigate liquefaction potential or the use of a deep foundation system to transfer the structural loads to stable, non-liquefiable soils. Recommendations presented in this report focus on either overexcavation of existing soils and recompaction to develop a structural fill layer below the foundation system to improve bearing capacity for static conditions and also provide some improvement and reduction in the potential for liquefaction to occur, or the use of a proprietary ground improvement technique to improve bearing capacity and reduce the potential effects of liquefaction.

3.5.3 Lateral Spreading

The occurrence of liquefaction may also cause lateral spreading. Lateral spreading is a phenomenon in which large lateral displacement can occur on the ground surface due to movement of non-liquefied soils along zones of liquefied soils. 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. The strength reduction that occurs at the onset of liquefaction and the general continuity of the liquefiable layers interpreted from the field explorations provide planes of weakness for the overlying non-liquefied deposits to slide along toward the free faces of the submarine slopes The potential for lateral spreading is, therefore, very high due to the topographic aspects of the site and the unprotected/unrestrained shoreline along the northern and western boundaries of the site.

The occurrence of liquefaction will result in the potential for lateral spreading and load demand on the bulkhead system proposed for the development. The load demand induced by lateral spreading is expected to greatly exceed the load demands under static and pseudostatic conditions and is, therefore, expected to control the design of the bulkhead retention system. Analysis of the proposed bulkhead stability and recommendations for preliminary design are presented in Section 5.6 of this report.

3.5.4 Earthquake-Induced Settlements

Earthquake-induced settlements result from densification of non-cohesive granular soils which occur as a result of reduction in volume during or after an earthquake event. The magnitude of settlement that results from the occurrence of liquefaction is typically greater than the settlement that results solely from densification during strong ground shaking in the absence of liquefaction. Based upon the empirical procedure described by Yoshimine and Ishihara as adapted in Zhang et. al. (2004), the post-liquefaction seismically-induced settlements ranged from less than 1 inch to a maximum of approximately 2 inches, excluding vertical distortion attributed to lateral displacement and ground oscillation.

3.5.5 Earthquake-Induced Flooding

The failure of dams or other water-retaining structures as a result of earthquakes and strong ground shaking could result in the inundation of adjacent areas. Due to the lack of a major dam or water-retaining structure located near the site, the potential of earthquake-induced flooding affecting the site is considered to be low.

3.5.6 Seiches

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Because of the partially enclosed configuration of the Upper Newport Bay, the possibility of seiche phenomena occurring onsite could be of concern. Further study of wave runup during a major seismic event should be performed during the design phase.

3.5.7 Tsunamis

Tsunamis are waves generated in large bodies of water as a result of change of seafloor topography caused by tectonic displacement. As a result of the proximity of the site to the ocean, its near-sea level elevation, tsunami inundation (CGS, 2009) should be considered during design. Historically, southern California has experienced several tsunamis with the most recent being reported in August of 1934 in Newport Beach with a reported wave height of 9.8 feet. Further study on tsunamis inundation and its potential impact on the bulkhead should be performed during the future project design phase by a qualified engineer experienced in coastal engineering.

4.0 SUMMARY OF GEOTECHNICAL FINDINGS AND CONCLUSIONS

Presented below is a summary of findings based upon the results of our evaluation of the site:

- Subsurface soils at the project site encountered during our field exploration consisted of undocumented fill to depths of 6 to 8½ feet at several borings comprised of loose to medium dense sands and silty sands, and may extend to a depth of 10 feet in the eastern region of the site.

- Based on our observations and testing, the onsite near surface soils are expected to have a low expansion potential.

- Groundwater was encountered in the borings at depths of 6 to 8 feet below grade. Groundwater levels could be sensitive tidal fluctuations; further evaluation of groundwater levels via observation wells is recommended considering the proposed construction of a subterranean level in the parking structure.

- The potential exists for liquefaction to occur which will affect the recommendations for foundation selection and design.

- Preparation of building areas will require some overexcavation and recompaction to develop increased and more uninform support conditions.

- Due to the proximity of groundwater and potentially liquefiable soils to the subterranean level of the parking structure, overexcavation and recompaction of the soils to develop a suitable structural fill layer and reduce liquefaction effects is anticipated to require dewatering.

- Liquefaction is expected to result in lateral spreading and increase in the load demand upon the seawall bulkhead proposed for the development.

- Excavation stability problems should be expected where steep, unbraced excavations are attempted in the non-cohesive granular soils and where unsupported excavations are attempted below the water table.

Based upon the results of our geotechnical evaluation of the site, the proposed project is anticipated to be feasible based on geotechnical aspects of the site, but the potential for liquefaction and construction below grade in proximity to the water table will present challenges to be addressed in design and construction. The recommendations presented in Section 5.0 of this report are intended to be used for preliminary evaluation of the proposed development and assist in identifying aspects of the development that require further geotechnical engineering evaluation to allow final design to be completed.

5.0 PRELIMINARY RECOMMENDATIONS

Presented below are preliminary recommendations that are anticipated to be appropriate for initial evaluation of site grading and preparation for construction; design of the building foundations, shoreline bulkhead and parking lot pavement; and construction considerations for the project. The recommendations are based upon the exhibited geotechnical engineering properties of the soils and their anticipated response both during and after construction.

The proposed conceptual development plan is considered to be preliminary and subject to change as the applications for legislative approval of mixed use waterfront designations on the project site proceed through the multi-agency approval process. As such, the specific permit level development proposal should be brought to the attention of our firm to determine the effect, if any, on these preliminary recommendations. Additional exploration and/or engineering analyses may be warranted to provide recommendations for final design and construction of a specific project. The geotechnical engineer should review the grading plans, foundation plans, and project specifications and mitigation measures as they are available to verify that the recommendations presented in this report have been properly interpreted and incorporated in the project plans.

5.1 Earthwork

Assumed finished first floor elevations of the proposed retail/commercial and residential buildings (Table 1) are near existing grade and, therefore, significant cuts or fills are not expected as part of site grading. Preparation of proposed building areas prior to construction is recommended to include overexcavation and recompaction of the existing soils to develop a structural fill layer below foundations. The structural fill layer establishes a zone of soil that provides increased and more uniform support characteristics as compared to the on-site soils. Recommendations for site earthwork are provided in the following sections.

Construction of the conceptual parking structure will require excavation below grade to accommodate the one level of subterranean parking. Preparation of the parking structure building area in a similar manner (i.e., overexcavation and recompaction) is anticipated to encounter difficulties due to the presence of groundwater. As an alternative, a proprietary ground improvement technique

(Rammed Aggregate Piers) is presented and should be considered as design and development of a specific project moves forward.

5.1.1 Site Preparation

Prior to construction, the site should be cleared of all debris and remnants of previous construction, including slabs, foundations and pavements. Any existing utility and irrigation lines should be removed if they interfere with the proposed construction. The cavities resulting from removal of foundations and utility lines should be properly backfilled and compacted.

The existing pavement will require demolition and removal from the site. With proper processing, the asphalt concrete and underlying granular base materials may be reused as structural fill for foundation support, used as general site fill, or may be reused as base course for new pavement construction.

5.1.2 Overexcavation of At-Grade Building Pads

The preparation of the site for building construction is recommended to include removal of the existing soils to specific minimum depths below foundations and floor slab areas to develop a structural fill layer. The depth of overexcavation is recommended to be a minimum of 4 feet below the bottom of foundations. The overexcavation is recommended to extend to a minimum lateral extent of 4 feet beyond the outside edges of the foundations as measured at the overexcavation subgrade with the excavation sides sloped for stability and safety.

The recommended depth of overexcavation is based upon the assumed finished floor elevations and the design parameters provided for preliminary foundation design. The actual depth recommended for preparation of foundation areas may be revised depending upon the actual finished floor elevations.

5.1.3 Parking Structure Building Pad

Preparation of the proposed parking structure area may be performed in a manner similar to the recommendation for the remaining buildings that will be supported at-grade. Overexcavation and recompaction of soils in the parking structure area is recommended to be performed to a depth of 4 to 5 feet below bearing grade (bottom of footings) to remove shallow soils susceptible to liquefaction and improve support characteristics during seismic conditions. However, overexcavation to the recommended depth and the corresponding depth below grade indicates the potential need for dewatering to lower the groundwater table. Specific recommendations for dewatering will be dependent upon the actual groundwater conditions (i.e., elevation, fluctuations), the actual finished floor elevation and recommend depth of excavation, and the hydrogeologic characteristics of the soils. The design of a dewatering program will require additional field exploration that includes the installation of groundwater observation wells and conducting a field pump test to measure drawdown and recharge characteristics of the aquifer.

As an alternate to overexcavation and potential grading difficulties associated with groundwater, the proprietary ground improvement technique of Rammed Aggregate Piers (RAP) may be used to improve the bearing capacity of the soils and reduce the potential for liquefaction to occur within the depth of ground improvement. This ground improvement technique generally consists of compacting uniformly graded coarse aggregate in preformed holes to a specific depth below grade. The aggregate is compacted in lifts using a tamper specially designed for the compaction process. The end-product of the technique is a column of aggregate that fills the space previously occupied by soil. The soils that were displaced results in some densification in the zone around the aggregate pier. The aggregate piers also provide a reinforcing effect and increased foundation bearing capacity.

Preparation of the parking structure building pad for support of the floor slab is recommended to include recompaction of the soils to a depth of at least 1 foot below subgrade elevation

5.1.4 Subgrade Preparation

Exposed subgrade soil surfaces, including all excavation or removal bottoms, should be observed by a representative of the geotechnical engineer prior to placement of fill or construction of other improvements to verify that suitable soil is exposed. Prior to placement of fill soils, excavation bottoms should be scarified to a minimum depth of 8 inches, moisture-conditioned to above the optimum-moisture content and then compacted to a minimum of 90 percent relative compaction per ASTM D1557-09.

5.1.5 Fill Materials

On-site soil that is free of construction debris, organics, cobbles, boulders, rubble, or rock larger than 3 inches in largest dimension is suitable to be used as fill for support of structures.

Any imported soils should have an Expansion Index of 20 or less. Import soils should be evaluated and tested by Leighton before importing to the site.

Material used for the Rammed Aggregate Piers typically consist of fine gravel (nominal ¾-inch diameter) crushed aggregate.

5.1.6 Fill Placement and Compaction

All fill soil should be placed in loose lifts of 6 to 8 inches in thickness, moisture-conditioned to 1 to 2 percent above optimum moisture content, and compacted to a minimum of 90 percent relative compaction, as determined by ASTM Test Method D1557-09. Aggregate base should be compacted to a minimum of 95 percent relative compaction.

5.1.7 Backfill

All backfill should be mechanically compacted in layers. Proper compaction of backfill will be necessary to reduce the potential for settlement of the backfill and the overlying slabs and paving. Backfill should be compacted to at least 90 percent of the maximum dry density obtainable by the ASTM D1557-09 method of compaction. The exterior grades should be sloped to drain away from the foundations to prevent ponding of water.

5.2 Seismic Design Parameters

The following values are based on the CBC seismic design methodology and should be considered as the minimum for the seismic analysis of the subject site. Additional seismic analyses may be necessary based on structural requirements.

Table 2 - Seismic Design Parameters

2010 California Building Code		
Site Class	Table 1613.5.2	D
Mapped Spectral Response Accelerations		
0.2-second S_s	Figure 1613.5(3)	1.853
1.0-second S_1	Figure 1613.5(4)	0.695
Site Coefficient (F_a)	Table 1613.5.3(1)	1.0
Site Coefficient (F_v)	Table 1613.5.3(2)	1.5
Spectral Response Acceleration		
0.2-second SM_s	Equation 16-36	1.853
1.0-second SM_1	Equation 16-37	1.042
Design Spectral Response Acceleration		
0.2-second SD_s	Equation 16-38	1.236
1.0-second SD_1	Equation 16-39	0.695

5.3 Foundation Design

5.3.1 Structural Mat Foundation

Preparation of the building areas should be performed as described in Section 5.1 of this report. Upon completion of the building pad preparation, the structures proposed for the development are recommended to be supported by a structural mat foundation system. The structural engineer should design the thickness and reinforcement requirements for the mat foundations for the respective buildings based on the anticipated loading conditions (i.e., loads from moving vehicles, storage systems, and residency requirements). A modulus of vertical subgrade reaction (kv1) of 100 pounds per cubic inch (pci) may be used based on the recommended building pad preparation. The design may also be based upon a maximum allowable soil bearing pressure 2,500 psf.

The minimum embedment along the perimeters of the mat foundations is recommended to be 18 inches below the lowest adjacent exterior grade and at least 1 foot into the structural compacted fill. The allowable bearing pressure may be increased by one-third for wind or seismic loading.

Lateral loads may be resisted by friction between the footings and the supporting subgrade and passive resistance of the soil adjacent to the vertical side of the foundation provided the foundations are poured neat against properly compacted fill. We recommend an allowable frictional coefficient of 0.30 and allowable passive resistance equal to an equivalent fluid density of 250 pounds-per-cubic-foot (pcf) be used in design to a maximum of 2,500 psf. No reduction will be needed to any of the above two components for computing the total resistance to lateral loads.

The post-construction settlements for mat foundations designed and constructed in accordance with the recommendations presented in this report are estimated to be 1 inch total and ½ inch differential for static conditions. The differential settlement is anticipated to occur across a minimum span of 30 feet, but will be dependent upon the structural design. Additional settlement on the order of 1 to 2 inches should be expected due to seismic shaking should liquefaction occur.

The foundations are recommended to be underlain by synthetic sheeting to serve as a retarder to moisture vapor transmission in areas where a moisture-sensitive floor covering (such as vinyl, tile, or carpet) is used. The sheeting is recommended to be a minimum 10-mil-thick and consist of polyethylene or similar material. The sheeting may be underlain by a 2-inch thick layer of fine to medium sand to protect the sheeting from puncture. An additional 2-inch thick layer of clean, medium sand may be placed over the synthetic sheeting for concrete curing purposes. The sheeting should be evaluated prior to installation for the presence of punctures or tears. Installation of the sheeting should include proper overlap and taping of seams.

5.3.2 Spread Footings

A shallow spread footing foundation system may be used to support the proposed parking structure building area with preparation of the building area consisting of the proprietary Rammed Aggregate Pier ground improvement technique. Upon completion of the building pad preparation, the parking structure proposed for the development may be supported by a shallow spread footing foundation system in which walls are supported by continuous strip footings and columns are supported by square pad footings. Foundations may be designed on the basis of an allowable soil bearing pressure 3,000 psf for continuous strip footings and 4,000 psf for square pad footings. The minimum footing widths are recommended to be 18 inches for strip footings and 24 inches for square pad footings. All footings are recommended to be embedded at least 18 inches below adjacent exterior grade and 12 inches below interior floor slab elevation. The bearing capacity may be increased by one-third for short-term, transient wind or seismic loading.

Lateral loads may be resisted by friction between the footings and the supporting subgrade and passive resistance of the soil adjacent to the vertical side of the foundation provided the foundations are poured neat against properly compacted fill. We recommend an allowable frictional coefficient of 0.30 and allowable passive resistance equal to an equivalent fluid density of 200 pounds-per-cubic-foot (pcf) be used in design to a maximum of 2,000 psf. No reduction will be needed to any of the above two components for computing the total resistance to lateral loads.

The post-construction settlements designed and constructed in accordance with the recommendations presented in this report, are estimated to be 1 inch total and ½ inch differential. The differential settlement is anticipated to occur across a minimum span of 30 feet, but will be dependent upon the structural design. Some additional settlement may occur due to liquefaction of soils at depths below the depth to which ground improvement is performed.

5.4 Slabs-on-Grade

Both interior and exterior slabs-on-grade including concrete driveways should be placed on properly prepared subgrade soils as described in the Earthwork section of this report (Section 5.1). The slab-on-grade floor of the proposed parking structure (with preparation of foundation areas via the R.A.P. improvement technique) is recommended to be underlain by structural compacted fill placed in conjunction with building pad preparation as previously described.

The structural engineer should design the thickness and reinforcement requirements for the respective slabs under anticipated loading conditions (i.e., loads from moving vehicles and residency requirements). For slab-on-grade design, a modulus of vertical subgrade reaction (kv1) of 75 pounds per cubic inch (pci) may be used based on the recommended building pad preparation.

The floor slabs of the apartment building are recommended to be underlain by synthetic sheeting to serve as a retarder to moisture vapor transmission in areas where a moisture-sensitive floor covering (such as vinyl, tile, or carpet) is used. The sheeting is recommended to be a minimum 10-mil-thick and consist of polyethylene or similar material. The sheeting may be underlain by a 2-inch thick layer of fine to medium sand to protect the sheeting from puncture. An additional 2-inch thick layer of clean, medium sand may be placed over the synthetic sheeting for concrete curing purposes. The sheeting should be evaluated prior to installation for the presence of punctures or tears. Installation of the sheeting should include proper overlap and taping of seams.

5.5 Below-Grade Walls

The subterranean walls of the lower level of central parking structure will serve as retaining structures. If constructed via open-cut excavation techniques, the below-grade walls should be backfilled with granular, very low expansive soil. Select backfill soils should exhibit very low expansion potential (EI less than 20) and exhibit a Sand Equivalent (SE) greater than 30. The onsite sands excavated in conjunction with the construction of the subterranean parking level may be suitable as backfill for retaining walls and below-grade walls depending upon gradation and fines content; soils with significant silt and clay are generally not suitable for retaining wall backfill due to the greater magnitude of lateral pressure exerted by these types of soil. The onsite materials should be free of organics prior using as backfill. All soils selected for wall backfill (on-site and import) should be reviewed and approved by the geotechnical engineer prior to placement as fill. Backfill for retaining walls should be compacted to a minimum of 90 percent relative compaction (based on ASTM Test Method D1557). Relatively light construction equipment should be used to backfill the retaining walls and the walls should be properly braced during backfilling operations.

The design of the below-grade walls of the parking structure are recommended to be designed for At-Rest lateral earth pressure based upon an equivalent fluid pressure of either 50 or 59 psf per foot embedment if the backfill consists of select material such as crushed aggregate or common soils (such as the on-site free-draining sands), respectively, above the groundwater table. The design values are recommended to be 88 and 92 psf/ft for the portion of the pressure distribution below the water table.

The design and construction of the below grade walls is recommended to include provisions for submerged conditions and hydrostatic uplift. Such provisions typically require the use of water stops at all joints and waterproofing of exterior wall surfaces. On a preliminary basis, the design groundwater table is recommended to be El. +8 feet MSL for evaluation of uplift forces pending further evaluation of groundwater conditions via observation wells. Design may also include the use of pressure relief valves at regular intervals throughout the mat slab foundation to allow dissipation of water pressure should the actual groundwater elevations exceed the design basis.

Lateral pressures from surcharges and superimposed loads i.e., loads from vehicle traffic, the foundation bearing stresses of adjacent structures, etc., should be included in the design of the retaining structures in situations where the surface loads are located adjacent to or in close proximity. Uniformly distributed surface loads of large lateral extent (relative to the height of the wall) located adjacent to a retaining wall may be modeled as a uniform lateral pressure with magnitude equal to 47 percent of the vertical pressure intensity for the unrestrained and restrained conditions, respectively. The magnitude of the surcharge pressure for surface loads of limited lateral extent and at various distances from the retaining wall can be determined on a case-by-case basis and based on final project design of type and location of buildings.

5.6 Preliminary Bulkhead Design

The proposed development includes construction of a new bulkhead seawall along the northern and western shorelines of the property. Preliminary design parameters and recommendations are subsequently presented for static and pseudostatic conditions. However, the design of the bulkhead is expected to be controlled by the load demand upon the wall resulting from liquefaction and the associated lateral spread that is anticipated to occur as a result and provide edge containment for the property.

The design values for earth pressure presented herein do not contain an appreciable factor of safety; the structural engineer should apply the applicable factors of safety and/or load factors for use in design evaluation. Due to the presence of fill, significant variance may exist between the boring locations in areas that have not been explored. As a result, additional exploration may be warranted to verify the design parameters subsequently presented.

5.6.1 Lateral Earth Pressure

Static Conditions: The proposed bulkhead system is expected to consist of driven steel sheetpiling and will, therefore, be a cantilever structure. As such, the active earth pressure condition is considered to be appropriate for use in the evaluation of the stability. The evaluation of the wall stability may be based upon earth pressure modeled as a fluid with equivalent fluid weight of 38 pcf above the mud line and above the water table; a value of 82 pcf is recommended below the water table.

Seismic Conditions: The magnitude of the surcharge load subjected to the bulkhead system during a seismic event will be dependent upon the magnitude of the peak ground acceleration experienced at the site. The seismic load surcharge is typically modeled as an inverted triangular distribution with the resultant force acting at a distance approximately 60 percent of the retained height (0.6H). On the basis of the PGA calculated for the subject site, the seismic pressure distribution is recommended to be 15 pcf.

Liquefaction Conditions: Evaluation of the effect of liquefaction and lateral spreading was evaluated at three cross-sections along the anticipated alignment (Cross-Sections A1, B2, C3) as shown on Plate 1. The profiles modeled at each section location and further details of the analyses are presented in Appendix E. The locations of the bulkhead as shown on the cross-sections and analyses were approximated and may be subject to revision.

The results of the analyses indicated the proposed bulkhead structure will be subjected to lateral load demand that is anticipated to be in excess of the resultant lateral load attributed to static and pseudo-static conditions based upon the preliminary design parameters stated above and will, therefore, control design. The magnitudes of the load demand are presented in the table below for use in preliminary design.

Table 3 - Bulkhead Lateral Load Demand

Cross-Section Identification	Lateral Load (kips per lineal foot)	Stable Soils for Lateral Load Resistance	
		Depth (feet)	Elevation (msl)
A1 – A1'	30	15	-4
B2 – B2'	20	11.5	-0.5
C3 – C3'	14	11	-1.5

Notes:
Depth referenced to average site grade.
Elevation referenced to elevations shown on Plate 1
Stable Soils – Design embedment of sheetpiling for lateral load resistance begins at the indicated elevation; ignore all soils above this elevation in analyses for resistance.

Static Surcharges: In addition to the above lateral pressures from retained earth, lateral pressures from other superimposed loads, such as those from automobile traffic and adjacent structures should be added to the load imposed upon the wall, if the surcharge is located a distance from the back of the wall equal to or less than the height of the wall. The magnitude of the surcharge load depends upon the size of the surface area that is subjected to a vertical load relative to the wall height and distance from the wall.

The lateral surcharge may modeled as a uniform pressure distribution with a pressure intensity equivalent 33 percent of the vertical surcharge for loaded areas that are adjacent to the wall and of large lateral extent. The surcharge attributed to surface loads of limited lateral extent and/or situated at various distances from the wall requires analysis on a case-by-case basis.

5.6.2 Lateral Load Resistance

The resistance to the earth pressures of the retained soils is provided by the passive pressures that develop in front of the wall below the mud line for static and pseudostatic (non-liquefaction) conditions. In the case of liquefaction, the passive pressure should be neglected in analysis from the mudline to the depth at which the critical surface intersects the bulkhead (see Table 3). The passive pressure in front of the wall panels of the bulkhead may be calculated as an equivalent fluid with an effective unit weight of 190 pcf to from the mudline to the depth/elevation corresponding to the bottom of the critical liquefiable soils (see Table 3) and a value of 265 pcf below this elevation. The values stated above are ultimate, i.e., no factor-of-safety has been applied in the calculation of the parameters and the appropriate factors of safety should be applied by the structural engineer for the loading conditions, i.e., static vs. pseudostatic and liquefaction. The values of earth pressure below the water have been based upon the buoyant unit weight of the soils.

5.6.3 Preliminary Liquefaction Mitigation Recommendations

The liquefaction potential of the soils that underlie the area behind and below the bulkhead includes the potential for slope instability and significant increase in load demand on the bulkhead system which could result in significant distortions and/or distress to the system. The mitigation of the liquefaction potential consists of in-situ improvement of the soils via the techniques of vibro-replacement ("Stone columns") or compaction grouting. Recommendations are presented on a preliminary basis to provide a conceptual understanding of the available options.

Improvement of soils susceptible to liquefaction generally consists of in-situ techniques such as injection of grout, densification of the soils by vibration or displacement of the loose soils and placement of compacted coarse gravel. The general approaches to liquefaction mitigation by such in-situ techniques have been developed and refined by specialty contractors using proprietary techniques commonly referred to as Compaction or Chemical (Permeation) Grouting, Vibroflotation, and Vibro-replacement ("Stone Columns").

The use of in-situ techniques to improve the soils may be limited to the region near the shoreline where lateral spreading is likely to occur but should be performed to a sufficient lateral extent to encompass any adjacent structures for uniformity in support of those structures. In-situ improvement of the parking structure area may consist of similar technique in lieu of the R.A.P. technique previously discussed in the report.

Compaction grouting consists of injecting a low-slump grout at regular intervals throughout the area in which improvement is desired. The process begins by the insertion of a grout pipe (casing) by either drilling or driving techniques. The grout is pumped into the subsurface soil in a series of stages as the grout pipe is withdrawn. The end result is a series of grout bulbs that form a column. The injection of grout displaces the surrounding soils densifying the zone between successive grouting locations. Chemical grouting differs in that the grout consists of special fluid chemical mixtures that, after injection and permeation of the voids within the soil mass, alter the soil matrix typically resulting in a solidified soil mass. Care must however, be used with the use of methods that inject fluids under pressure to ensure that the bulkhead and adjacent improvements are not adversely affected or damaged.

Vibro-replacement is a process in which a vibratory probe is inserted into the subsurface and upon withdrawal uniformly graded crushed aggregate is introduced and densified. As the probe is withdrawn from the subsurface, a column of aggregate ("stone column") is left behind. The installation process densifies the soils to a radial distance from probe insertion and the granular column left in place provides an avenue for pore water pressure dissipation further reducing the potential for liquefaction to occur. The diameters of the stone columns typically is on the order of 3 to 4 feet with spacings typically 6 to 10 feet on-center.

The selection of the appropriate grout injection technique is recommended to be made by a contractor that specializes in the design and implementation of such ground improvement systems. The selection of a ground modification alternate is recommended to include an initial pilot program to allow evaluation of the response of the soils to the process and the effect on adjacent improvements.

Upon completion of the ground improvement process, a field verification program is recommended to be implemented to verify adequate improvement of the soils. The verification program typically consists of at least CPT soundings and perhaps test borings.

5.7 Pavement Design

Pavement Subgrade: The pavement subgrades should be prepared as described in Section 5.1 of this report. In accordance with the recommendations, preparation of the subgrade within the areas of new pavement construction are recommended to be overexcavated to a depth of 2 feet below the current grade or planned subgrade elevation, whichever is lower, to allow placement of a minimum of 2 feet of structural fill to develop a suitable bearing subgrade for pavement support.

Asphalt Pavements: Asphalt pavements are recommended in areas of the site that will be subjected primarily to automobile traffic with occasional delivery or supply truck traffic such as the parking lots that will be located around the perimeter of the site. Based on the anticipated subgrade conditions, the following recommendations of pavement design have been based on an R-value of 30 for the anticipated subgrade. R-value tests should be performed during grading to verify the design value is appropriate for the actual subgrade conditions. Based on the design procedures outlined in the current Orange County Highway Design Manual, and using an R-value of 78 for the pavement base course, the following flexible pavement sections may be used for Traffic Index values that correspond to various levels of vehicle traffic.

Table 4 - Asphalt Pavement Sections

Traffic Index	Asphalt Concrete (inches)	Aggregate Base (inches)
4 or less	3	4
5.0	3	6
6.0	4	8

Prior to placement of aggregate base, the subgrade soil should be processed to a minimum depth of 8 inches, moisture-conditioned to 1 to 2 percent above optimum moisture content, and recompacted to a minimum of 90 percent relative compaction. Aggregate base should be placed in thin lifts, moisture conditioned, as necessary, and compacted to a minimum of 95 percent relative compaction.

Portland Cement Concrete: Portland cement concrete is recommended in areas of the site that will be subjected to heavy truck traffic and where trucks maneuver due to the large shear stresses under the heavy wheel loads. The loading zone areas in front of the trash enclosure or other delivery areas are recommended to be paved with a minimum 6-inch-thick Portland Concrete Cement (PCC) pavement section reinforced with No. 4 rebar at a maximum on-center spaced at 24 inches in each direction. The subgrade should consist of a minimum 24 inches of properly compacted fill compacted to at least 90 percent relative compaction in accordance to ASTM Test Method D1557-09. The reinforcement should be evaluated by the civil/structural engineer to accommodate any additional structural loading requirements.

Construction and Performance: All pavement construction should be performed in accordance with the Standard Specifications for Public Works Construction or the project specifications as prepared by others. Field observation and periodic testing, as needed during placement of the base course materials, should be undertaken to ensure that the requirements of the project specifications are fulfilled.

The recommended pavement sections are based upon the assumed traffic intensity and the subgrade conditions that are expected to result upon completion of the recommended site preparation. The planned site grading may have an effect upon these recommendations and should be reviewed after the project plans have been prepared. The recommendations are also based upon a twenty-year design life. Periodic maintenance and repair of the pavements should be expected to achieve the desired service life, especially where the asphalt pavement sections are used. Care should be used in the selection of the pavement section to ensure the traffic intensity is consistent with the design assumption. Premature pavement wear and possible distress should be expected where the pavement section is not appropriate for the actual traffic conditions.

5.8 Temporary Excavations and Shoring Design

All temporary excavations, including utility trenches, retaining wall excavations, and other excavations should be performed in accordance with project plans, specifications and all Occupational Safety and Health Administration (OSHA) requirements.

Temporary excavations should be treated in accordance with the State of California version of OSHA excavation regulations, Construction Safety Orders for Excavation General Requirements, Article 6, Section 1541, effective October 1, 1995. The sides of excavations should be shored or sloped in accordance with OSHA regulations. OSHA allows the sides of unbraced excavations, up to a maximum height of 20 feet, to be cut to a ¾H:1V (horizontal:vertical) slope for Type A soils, 1H:1V for Type B soils, and 1½H:1V for Type C soils.

OSHA regulations are applicable in areas with no restriction of surrounding ground deformations. Shoring should be designed for areas with deformation restrictions. The soil type should be verified or revised based on geotechnical observation and testing during construction, as soil classifications may vary over short horizontal distances.

Typical cantilever shoring should be designed based on an active fluid pressure of 38 pcf, assuming level ground above the shoring. If excavations are braced at the top and at specific design intervals, the active pressure may then be approximated by a trapezoidal soil pressure distribution with the maximum pressure per foot of width equal to 25***H*** psf, where ***H*** is equal to the depth of the excavation being shored. The trapezoidal distribution is zero pressure at the top, linearly increasing to maximum pressure at 0.2H which is continuous to 0.8H, and then decreasingly linearly to zero pressure at the bottom.

Heavy construction loads, such as those resulting from stockpiles and heavy machinery, should be kept a minimum distance equivalent to the excavation height or 5 feet, whichever is greater, from the excavation unless the excavation is shored and these surcharges are considered in the design of the shoring system. Excavations that extend below an imaginary plane inclined at 45 degrees below the edge of any adjacent existing site foundation should be properly shored to maintain support of the adjacent structures.

5.9 Trench Backfill

Utility trenches can be backfilled with the onsite material, provided it is free of debris, organic material and oversized material (greater than 8 inches in diameter). Prior to backfilling the trench, pipes should be bedded in and covered with sand that exhibits a Sand Equivalent (SE) of 30 or greater. The pipe bedding may be densified in-place by jetting. The native backfill should be placed in lifts with maximum thickness of 8 inches, moisture conditioned as necessary, and mechanically compacted using a minimum standard of 90 percent relative compaction. The maximum lift thickness should also be determined based on the compaction equipment used in accordance with the latest edition of the Standard Specifications for Public Works Construction (SSPWC).

5.10 Corrosion Protection Measures

The chemical analysis test results performed on near-surface soils are included in Appendix C of this report. The test results are also summarized in the following table.

Table 5 - Summary of Corrosivity Test Results

Test Parameter	Test Results	General Classification of Hazard
Water-soluble sulfate content	141 to 250 ppm	Negligible sulfate exposure to buried concrete (per ACI 318)
Water-soluble chloride Content	51 to 162 ppm	Low-corrosive to buried concrete
pH	7.30 to 7.43	Neutral Soils
Minimum resistivity (in saturated condition)	1,900 to 2,430 ohm-cm	Moderate corrosive potential to buried ferrous pipes (per ASTM[1])

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

The results of the resistivity tests indicate that the near surface soil exhibits a low to moderate corrosive potential to buried ferrous metals. Based on the range of measured water-soluble sulfates from the soil samples, soil sulfate content is negligible per Table 4.3.1 of ACI 318R-05. Furthermore, the samples tested for water-soluble chloride content indicating a low possibility for corrosion of steel in concrete due to the chloride content with the tested soils.

Because of the limited testing performed and potential variability in chemical contents and resistivity in soils, we recommend that additional chemical and corrosion tests be performed during site grading operations and prior to the placement of concrete and buried metals to confirm the findings and recommendations provided in this report. A corrosion engineer should be consulted if mitigation measures are required.

5.11 Construction Considerations

Soil Moisture Sensitivity: The subsurface profile at several boring locations indicated the presence of a thin layer of clay and silt that exhibited high in-situ moisture content. If encountered during grading or construction operations, subgrade stability problems may occur. In areas where the subgrade soils exhibit high fines content, exposure to moisture increases could also result in subgrade stability problems and the need to either undercut unstable soils or perform special chemical or mechanical modification of the subgrade to allow grading activities to proceed. Chemical modification consists of the addition of either lime or Portland cement to a properly processed subgrade followed by recompaction. Mechanical stabilization consists of the placement of a coarse (2-

to 4-inch nominal particle diameter) crushed aggregate to serve as working mat. Depending upon the degree of instability, a geogrid may also be required in conjunction with the coarse aggregate.

Caving Soils: The granular, non-cohesive soils that underlie the site to the depths in which foundation, utility and parking structure excavations are anticipated could result in stability problems where steep, unbraced excavations are attempted. Recommendations for excavation and shoring design are presented in Section 5.8 of this report.

Concrete Slab Construction: Care should be taken to avoid slab curling if slabs are poured in hot weather. Frequent construction joints should be provided to minimize the potential for cracking. Slabs should be designed and constructed as promulgated by the Portland Cement Association (PCA). Prior to the slab pour, all utility trenches should be properly backfilled and compacted. Differential settlement of this material could result in movement and distress to hardscape and other improvements. The need to repair cracks, etc. should be anticipated.

Utility Connections: The potential for liquefaction and the associated settlement and ground oscillation/differential horizontal displacement, indicates utility connections to structures may be stressed should liquefaction occur. As a result, the use of flexible and extendible couplings and connections to structures are recommended for use at the site.

5.12 Additional Geotechnical Services

The geotechnical recommendations presented in this report are presented on a preliminary basis pending review of the proposed development as the plans are developed. In addition, the recommendations of this report have been based on subsurface conditions as interpreted from limited subsurface explorations and limited laboratory testing. Leighton should review the grading and foundation plans and specifications when final project design is available to comment on the geotechnical aspects. Our recommendations should be revised, as necessary, based on future site plans and final building locations, types and uses, and incorporated into the final design plans and specifications. Our conclusions and recommendations presented in this report should be reviewed and verified by Leighton during site construction and revised accordingly, if exposed geotechnical conditions vary from our preliminary findings and interpretations.

The recommendations presented in this report are only valid if Leighton verifies the site conditions during construction.

Geotechnical observation and testing should be provided during the following activities:

- Overexcavation and compaction.
- Compaction of all fill materials.
- Excavation and installation of foundations.
- After excavation of all slabs and footings and prior to placement of steel or concrete to confirm the slabs and footings are founded in suitable bearing soils.
- Utility trench backfilling and compaction.
- Pavement subgrade preparation and base course placement.
- When conditions are encountered during construction that are not consistent with the conditions described herein.

6.0 LIMITATIONS

Leighton's work was performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in this or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional opinions included in this report.

As in many projects, conditions revealed in excavations may be at variance with preliminary findings. If this occurs, the geotechnical consultant should evaluate the changed conditions and additional recommendations be obtained, as warranted.

The identification and testing of hazardous, toxic or contaminated materials were outside the scope of Leighton's work. Should such materials be encountered at any time, or their existence be suspected, and all measures stipulated in local, County, State and Federal regulations, as applicable, should be implemented.

This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the necessary design consultants for the project and incorporated into the plans; and that the necessary steps are taken to see that the contractors carry out such recommendations in the field.

The findings of this report are considered valid as of the report’s date. However, changes in the condition of a property can occur with the passage of time, whether due to natural processes or the work of man on the subject or adjacent properties. In addition, changes in standards of practice may occur from legislation or the broadening of knowledge. Accordingly, the findings of this report may at some future time be invalidated wholly or partially by changes outside Leighton's control.

The conclusions and recommendations in this report are based in part upon data that were obtained from a necessarily limited number of observations, site visits, excavations, samples and tests. Such data are strictly applicable only with respect to the specific locations explored, and therefore may not completely define all subsurface conditions throughout the site. The nature of many sites is that differing geotechnical or geological conditions can occur within small distances and under varying climatic conditions. Furthermore, 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 verify that our preliminary findings are representative of the site.

This report is intended only for the use of Bayside Marina Village, LLC and its representatives, and only as related expressly to the subject project.

Important Information about Your
Geotechnical Engineering Report

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

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

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

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

Read the Full Report

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

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

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

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

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

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

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

Subsurface Conditions Can Change

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

Most Geotechnical Findings Are Professional Opinions

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

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

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

Do Not Redraw the Engineer's Logs

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

Give Contractors a Complete Report and Guidance

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

Read Responsibility Provisions Closely

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

Geoenvironmental Concerns Are Not Covered

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

Obtain Professional Assistance To Deal with Mold

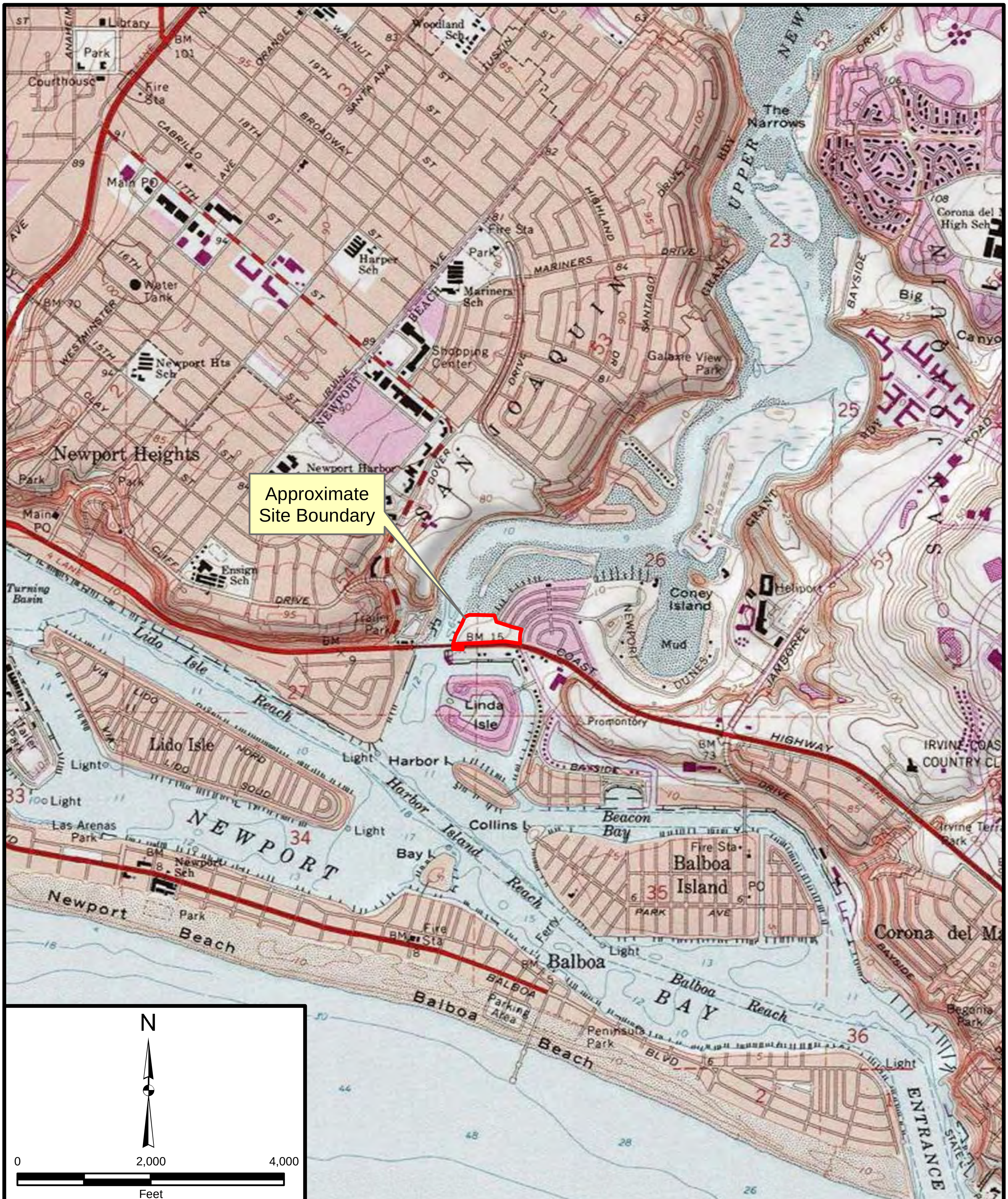
Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive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

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

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

ASFE
THE BEST PEOPLE ON EARTH

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org



Project: 602668-002	Eng/Geol: JEH/VPI
Scale: 1 " = 2,000 '	Date: March, 2012

Base Map: ESRI Resource Center, 2010
Thematic Info: Leighton
Author: btran (btran)

SITE LOCATION MAP

PROPOSED BACK BAY LANDING
BAYSIDE DRIVE AT PACIFIC COAST HIGHWAY (SR1)
NEWPORT BEACH, CALIFORNIA

Figure 1

Leighton

Map Saved as P:\Drafting\602668\002\GIS\of_2012-01-18\Figure-1-Site Location Map.mxd on 3/2/2012 4:20:54 PM

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Aerial Photographs

FLIGHT	PHOTO	DATE	SCALE
AXK	29-81	5/23/38	1:16,000
80033	214	2/26/80	1:24,000
AXK-6K	4	5/30/53	1:20,000

Appendix B

Logs of CPT Soundings

and Test Borings

Leighton Consulting, Inc.

2009, 2011

GEOTECHNICAL BORING LOG LBH-1

Date 11-18-09 **Sheet** 1 **of** 2

Project 602668-002 Bayside Village **Logged / Sampled By** JAR

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

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

Elevation Top of Hole 11.5' **Location** See Boring Location Map

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
	0								**Artificial fill (Af)** @ Surface: Approximately 3 inches of asphalt-concrete over 2 inches of aggregate base over SAND, light brown, dry, fine grained sand	CR
10				R-1 BB-1	4 7 8	113	1	SP	@ 1': SAND, medium dense, light brown, dry, fine grained sand, abundant shell debris, unconsolidated with clay pods, well graded	
				R-2	4 7 11	102	2	SP	@ 3.5': SAND, medium dense, light reddish brown, dry, fine grained sand, abundant shell debris, fine angular gravel, well graded	
	5									
5				R-3	3 5 6	96	3	SP-SM	@ 6': SAND with silt, loose, light brown, slightly moist, fine grained sand, trace amount of shell debris	
				R-4	0 3 6			CL SM	**Quaternary esturaine (Qes)** @ 8.5': Sandy CLAY with silt, soft, dark grey to reddish brown, wet, fine grained sand, oxidized with rootlets, encounter groundwater (low tide), with thinly bedded Silty SAND @9'	Tx, AL
	10									
0										
				S-1	4 4 5			SM	@ 13.5': Silty SAND, loose, dark grey, wet, fine grained sand, micaceous, 15.1% passing -200 sieve	-200
	15									
-5										
				R-5	2 10 17	108	20	SP-SM	@ 18.5': SAND with Silt, medium dense, dark grey, wet, fine grained sand, micaceous, 8.9% passing -200 sieve	-200
	20								@ 20': SAND, light grey, wet, coarse grained sand with shell fragments, moderatley graded	
-10								SP		
	25			S-2	9 16 26			SP	@ 25': SAND, dense, grey, wet, thin beds of fine to coarse sand with shell fragments, well rounded	
-15										
	30			R-6	6 15 36			SP	@ 28.5': SAND, dense, grey, wet, fine to coarse grained sand, some silt, some shells in matrix, well graded	

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

GEOTECHNICAL BORING LOG LBH-1

Date 11-18-09 **Sheet** 2 **of** 2

Project 602668-002 Bayside Village **Logged / Sampled By** JAR

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

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

Elevation Top of Hole 11.5' **Location** See Boring Location Map

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								Total depth of boring: 30 feet bgs. Groundwater encountered at 8.5 feet bgs during drilling Boring was backfilled with cuttings, tamped and capped with cold asphalt patch upon completion Excessive soil cuttings were disposed onsite	
-20										
	35									
-25										
	40									
-30										
	45									
-35										
	50									
-40										
	55									
-45										
	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

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

GEOTECHNICAL BORING LOG LBH-2

Date 11-18-09

Project 602668-002 Bayside Village

Logged / Sampled By JAR

Drilling Co. Martini Drilling Corp.

Type of Rig CME-75

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

Elevation Top of Hole 14.1' **Location** See Boring Location Map

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
	0								**Artificial fill (Af)** @ Surface: Approximately 3 inches asphalt-concrete over 5 inches of gravelly/cobbly aggregate base over SAND, light grey, dry, fine grained sand	RV
				R-1 BB-1	5 9 13	101	2	SP	@ 1': SAND, medium dense, light grey, dry, fine grained sand, trace amount of shells, slightly oxidized, poorly graded	
10	5			R-2	4 8 11	96	3	SP	@ 3.5': SAND, medium dense, light grey, slightly moist, fine grained sand, poorly graded	
				R-3	1 3 5	86	24	SP	**Quaternary estuarine (Qes)** @ 6': SAND with thinly bedded silt and clay, soft, orange brown to reddish gray brown, moist, fine grained sand, well oxidized with grey silty clay	
5	10			R-4	3 7 11			SM	@ 8.5': Silty SAND, medium dense, light brown to reddish brown, moist, fine grained sand, trace amount of shell debris with thin bedded well oxidized sandy silt	
0	15			S-1	2 5 6	103	22	SP-SM	@ 13.5': SAND with silt, medium dense, orange brown to grey @ 15': becomes wet, fine grained sand, encounter groundwater	DS
-5	20			R-5	5 12 24	104	23	SM	@ 18.5': Silty SAND, medium dense, gray, wet, fine grained sand	
-10	25			S-2	6 18 19			SP-SM	@ 25': SAND with silt, dense, grey, wet, fine grained sand, micaceous, trace shell debris	
-15	30			R-6	14 23 50			SP	@ 28.5': SAND, very dense, grey, wet, fine to coarse grained sand, abundant shell debris	

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				

GEOTECHNICAL BORING LOG LBH-2

Date	11-18-09	**Sheet**	2 of 2
Project	602668-002 Bayside Village	**Logged / Sampled By**	JAR
Drilling Co.	Martini Drilling Corp.	**Type of Rig**	CME-75
Hole Diameter	8"	**Drive Weight**	140 lb automatic hammer
Drop	30"		
Elevation Top of Hole	14.1'	**Location**	See Boring Location Map

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.

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	Type of Tests
	30							SP	@30': @ 28.5': SAND, very dense, grey, wet, fine to coarse grained sand, abundant shell debris	
-20										
	35			S-3	8 13 12			SP-SM	@ 35': SAND with Silt, medium dense, grey, wet, fine to medium grained sand, trace fine rounded gravel, 6.3% passing -200 sieve	-200
-25										
	40			R-7	10 29 50			SP	@ 40': SAND, very dense, grey, wet, coarse grained sand, abundant shell debris	
-30										
	45			S-4	4 12 20			SM	@ 45': Silty SAND, medium dense, grey, wet, fine grained sand	
-35										
	50			R-8	8 27 28			SP	@ 50': SAND, dense, grey, wet, medium to coarse grained sand, abundant shell debris	
									Total depth of boring: 51.5 feet bgs. Groundwater encountered at 15 feet bgs. Boring was backfilled with cuttings, tamped and capped with cold asphalt patch upon completion Excessive soil cuttings were disposed onsite	
-40										
	55									
-45										
	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

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

GEOTECHNICAL BORING LOG LBH-3

Date	11-18-09	**Sheet**	1 **of** 2
Project	602668-002 Bayside Village	**Logged / Sampled By**	JAR
Drilling Co.	Martini Drilling Corp.	**Type of Rig**	CME-75
Hole Diameter	8"	**Drive Weight**	140 lb automatic hammer — **Drop** 30"
Elevation Top of Hole	12.0'	**Location**	See Boring Location Map

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.

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	Type of Tests
	0								**Artificial fill(Af)** @ Surface: Approximately 2 inches of asphalt-concrete over 2 inches of aggregate base over SAND with silt, light brown, fine grained sand.	CR
10				R-1 BB-1	6 14 19	100	3	SP-SM	@ 1': SAND with silt, medium dense, light brown, moist, fine grained sand, abundant shell debris, some clay pods	
	5			R-2	5 9 11	100	2	SP	@ 3.5': SAND, medium dense, light orange brown, moist, fine grained sand, poorly graded	
5				R-3	2 6 7	96	4	ML-SM	@ 6': Silty SAND to Sandy SILT, loose, light brown, slightly moist, fine grained sand, abundant shell debris	DS
▽									**Quaternary esturine (Qes)**	
	10			R-4	2 2 2			ML	@ 8.5': Sandy SILT, soft, dark grey, wet, fine grained sand, micaceous, slight organic odor, trace amount of clay	AL
0										
	15			R-5	3 8 12	106	20	SP-SM	@ 13.5': SAND with Silt, medium dense, dark grey, wet, fine grained sand, mild organic odor	DS
-5										
	20			S-1	3 8 9			SP-SM	@ 18.5': SAND with silt, medium dense, grey, wet, fine to medium grained sand, abundant shells, 5.3% passsing -200 sieve	-200
-10										
	25			R-6	10 22 26	79	24		@ 25': SAND with Silt, dense, dark grey, wet, fine grained sand, thinly bedded coarse grained sand with abundant shells, 5.0% passing -200 sieve	-200
-15										
	30			S-2	10 20 25			SP-SM	@ 28.5': SAND with silt, dense, dark grey, wet, fine to medium grained sand	

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

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

GEOTECHNICAL BORING LOG LBH-3

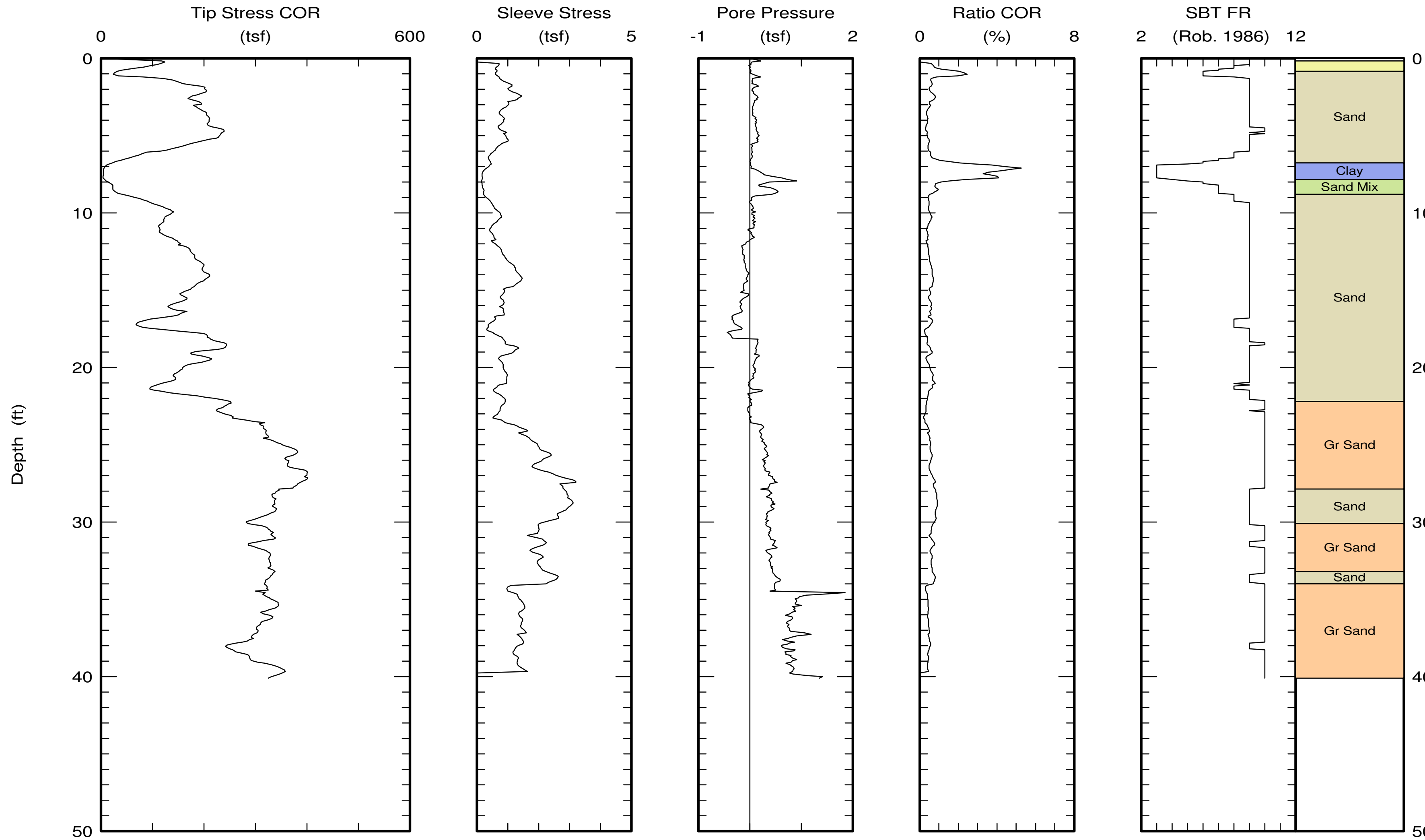
Date 11-18-09 **Sheet** 2 of 2
Project 602668-002 Bayside Village **Logged / Sampled By** JAR
Drilling Co. Martini Drilling Corp. **Type of Rig** CME-75
Hole Diameter 8" **Drive Weight** 140 lb automatic hammer **Drop** 30"
Elevation Top of Hole 12.0' **Location** See Boring Location Map

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							SP-SM	@30': SAND with silt, dense, dark grey, wet, fine to medium grained sand	
-20										
	35			R-7	19 50/6"			SP	@ 35': SAND, very dense, grey, wet, medium grained sand, some micaceous sand	
-25										
	40			S-3	8 18 27			SP	@ 40': SAND, dense, light grey, wet, fine to medium grained sand, trace amount of shells	
-30										
	45			R-8	7 20 35			SP	@ 45': SAND with gravel, dense, greenish grey, wet, medium to coarse grained sand with layered shell fragments, some fine rounded gravel and siltstone rock fragments	
-35										
	50			S-4	9 17 26			SP	@ 50': SAND, dense, grey, wet, medium grained sand	
-40									Total depth of boring: 51.5 feet bgs. Groundwater encountered at 8.5 feet bgs, during drilling Boring was backfilled with cuttings, tamped and capped with cold asphalt patch upon completion Excessive soil cuttings were disposed onsite	
	55									
-45										
	60									

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

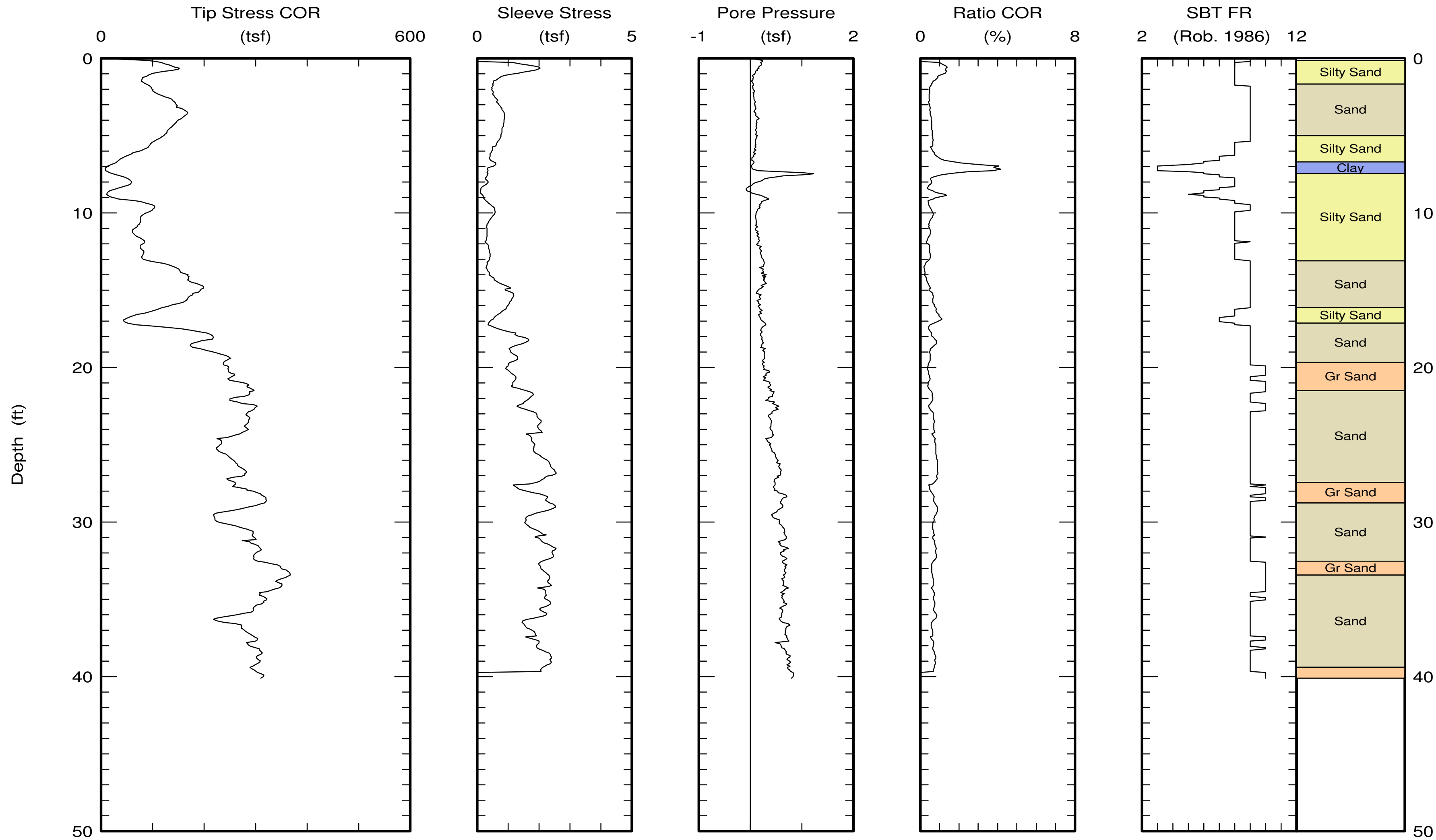
TYPE OF TESTS:
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
UC UNCONFINED COMPRESSIVE STRENGTH
SA SIEVE ANALYSIS
SE SAND EQUIVALENT
EI EXPANSION INDEX
RV R VALUE
-200 % FINES PASSING
AL ATTERBERG LIMITS
CO COLLAPSE
PP POCKET PENETROMETER

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 rich@kehoetesting.com skehoe@msn.com	CPT Data 30 ton rig	Date: 12/Nov/2009 Test ID: LCPT-1 Project: NewportBeach
	Customer: Leighton Consulting, Inc. Job Site: Bayside Village	



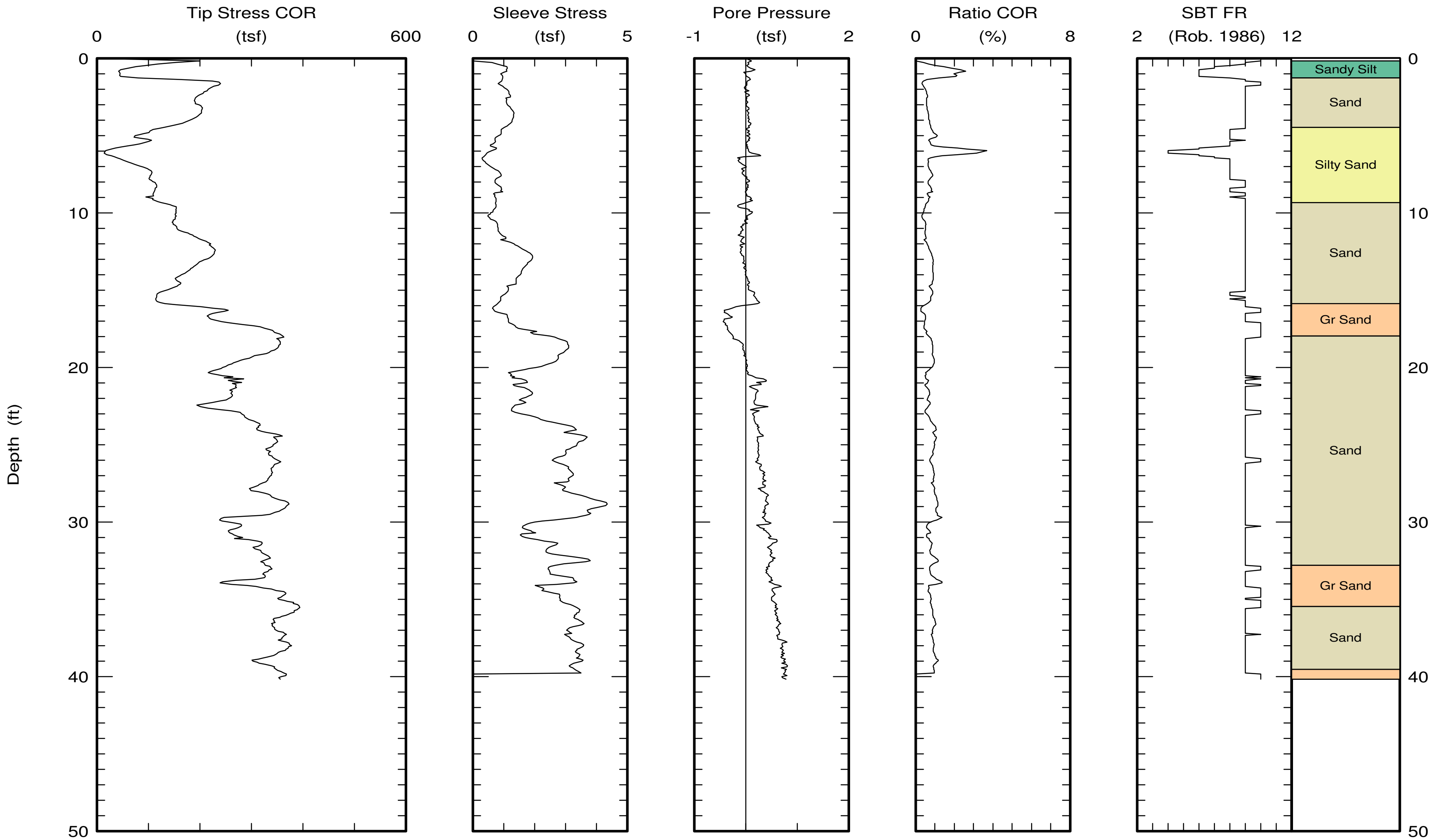
Maximum depth: 40.11 (ft)

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 rich@kehoetesting.com skehoe@msn.com	CPT Data 30 ton rig	Date: 12/Nov/2009 Test ID: LCPT-2 Project: NewportBeach
	Customer: Leighton Consulting, Inc. Job Site: Bayside Village	



Maximum depth: 40.10 (ft)

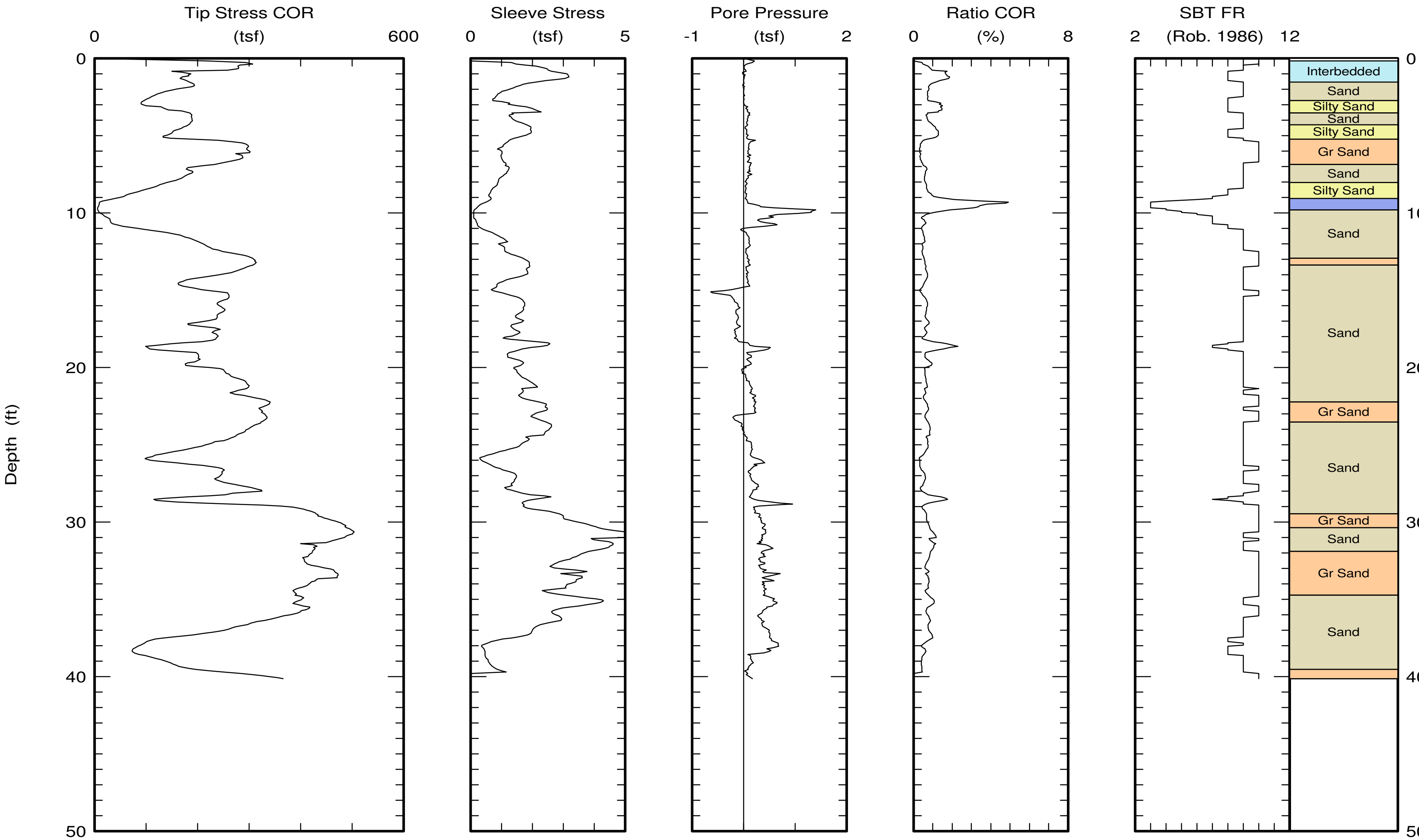
Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 rich@kehoetesting.com skehoe@msn.com	CPT Data 30 ton rig	Date: 12/Nov/2009 Test ID: LCPT-3 Project: NewportBeach
	Customer: Leighton Consulting, Inc. Job Site: Bayside Village	



Maximum depth: 40.17 (ft)

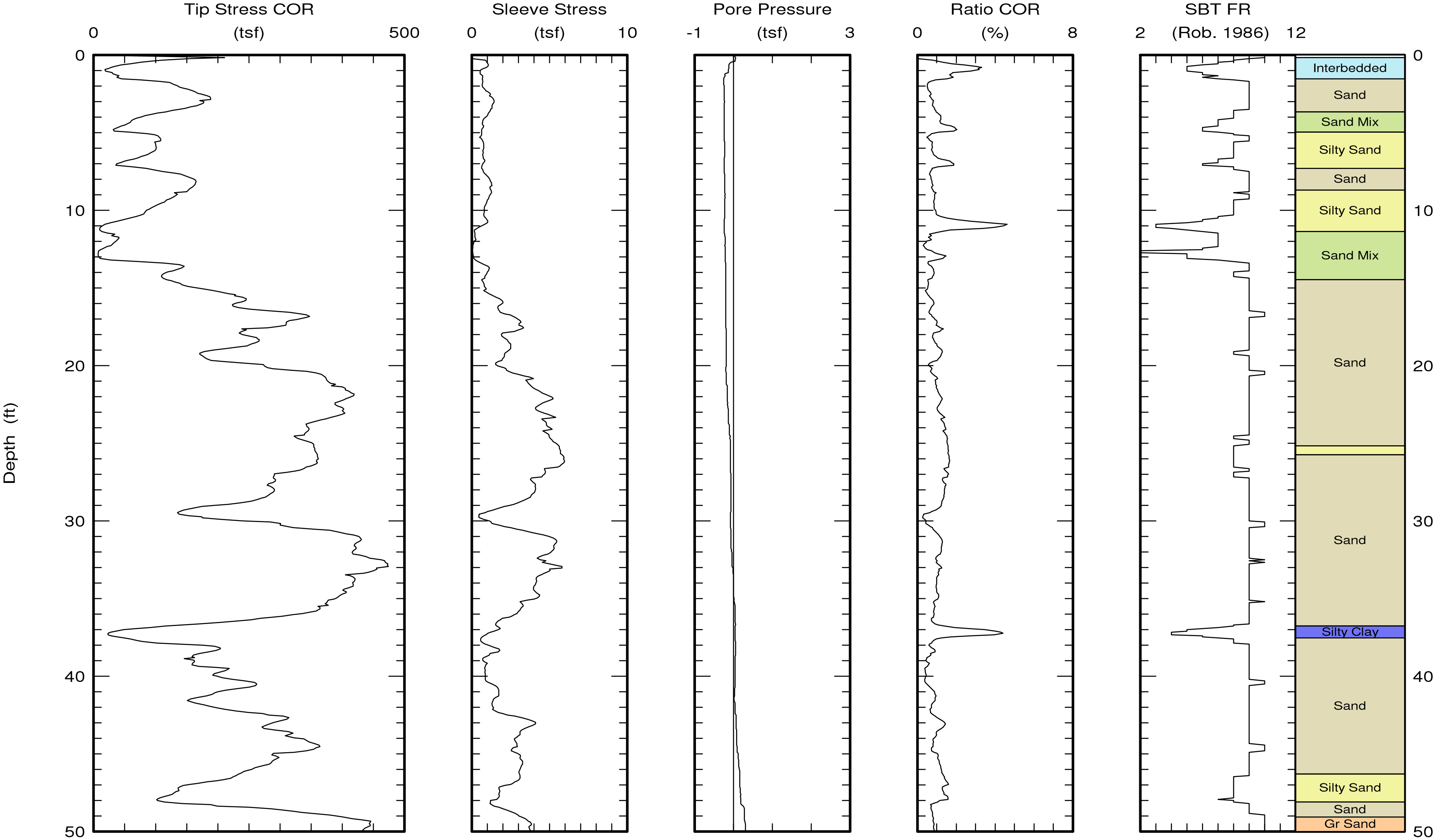
Kehoe Testing & Engineering
Office: (714) 901-7270
Fax: (714) 901-7289
rich@kehoetesting.com
skehoe@msn.com

CPT Data 30 ton rig		Date: 13/Nov/2009 Test ID: LCPT-4 Project: NewportBeach
Customer: Leighton Consulting, Inc. Job Site: Bayside Village		



Maximum depth: 40.16 (ft)

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 rich@kehoetesting.com www.kehoetesting.com	CPT Data 30 ton rig	Date: 03/Nov/2011 Test ID: L-CPT-5 Project: NewportBeach
	Customer: Leighton Consulting Job Site: Bayside Dr. & E Coast Highway	



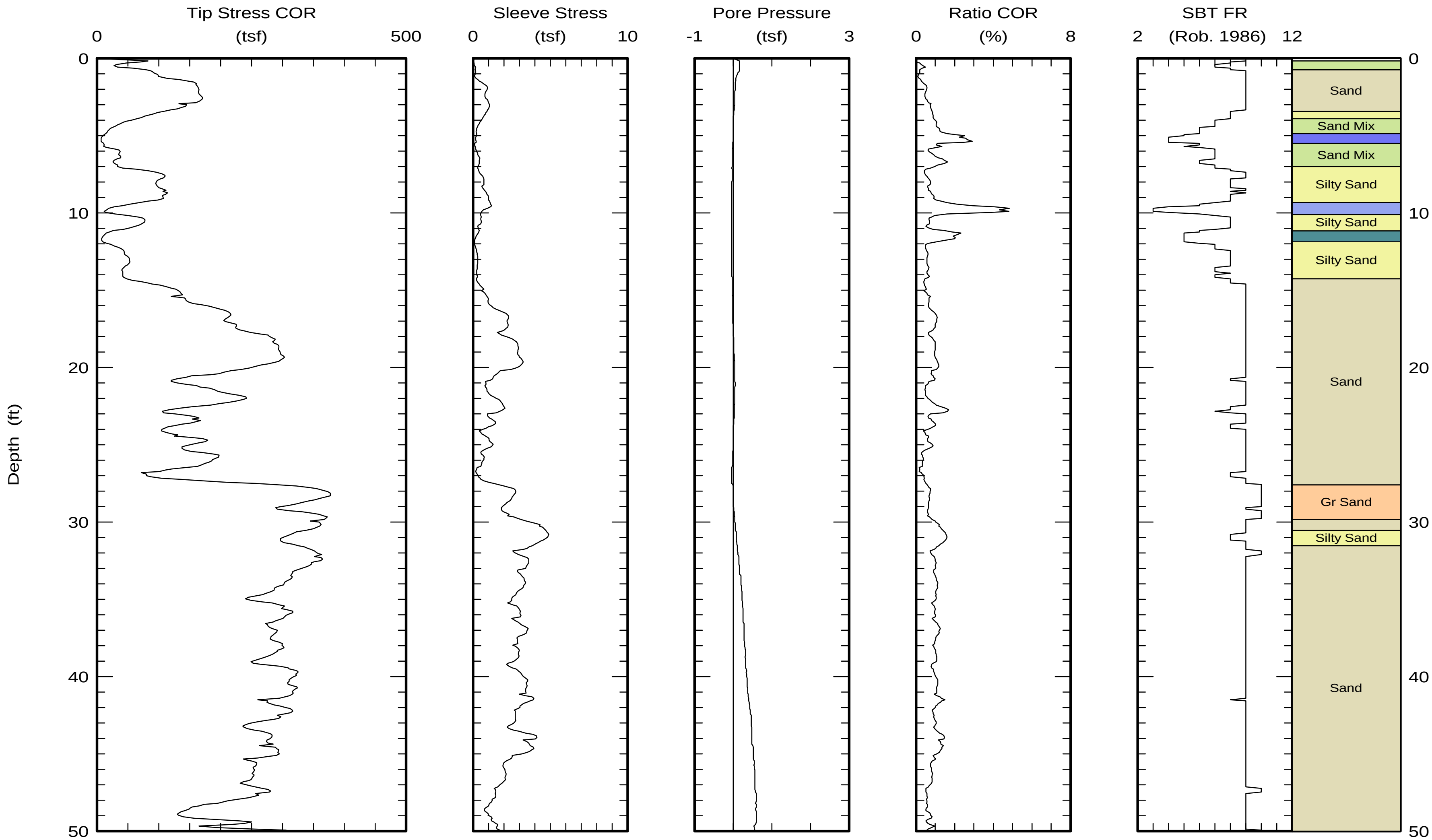
Maximum depth: 50.44 (ft)

Page 1 of 2

Test ID: L-CPT-5

File: Z03N1104C.ECP

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 rich@kehoetesting.com www.kehoetesting.com	CPT Data 30 ton rig	Date: 03/Nov/2011 Test ID: L-CPT-6 Project: NewportBeach
	Customer: Leighton Consulting Job Site: Bayside Dr. & E Coast Highway	



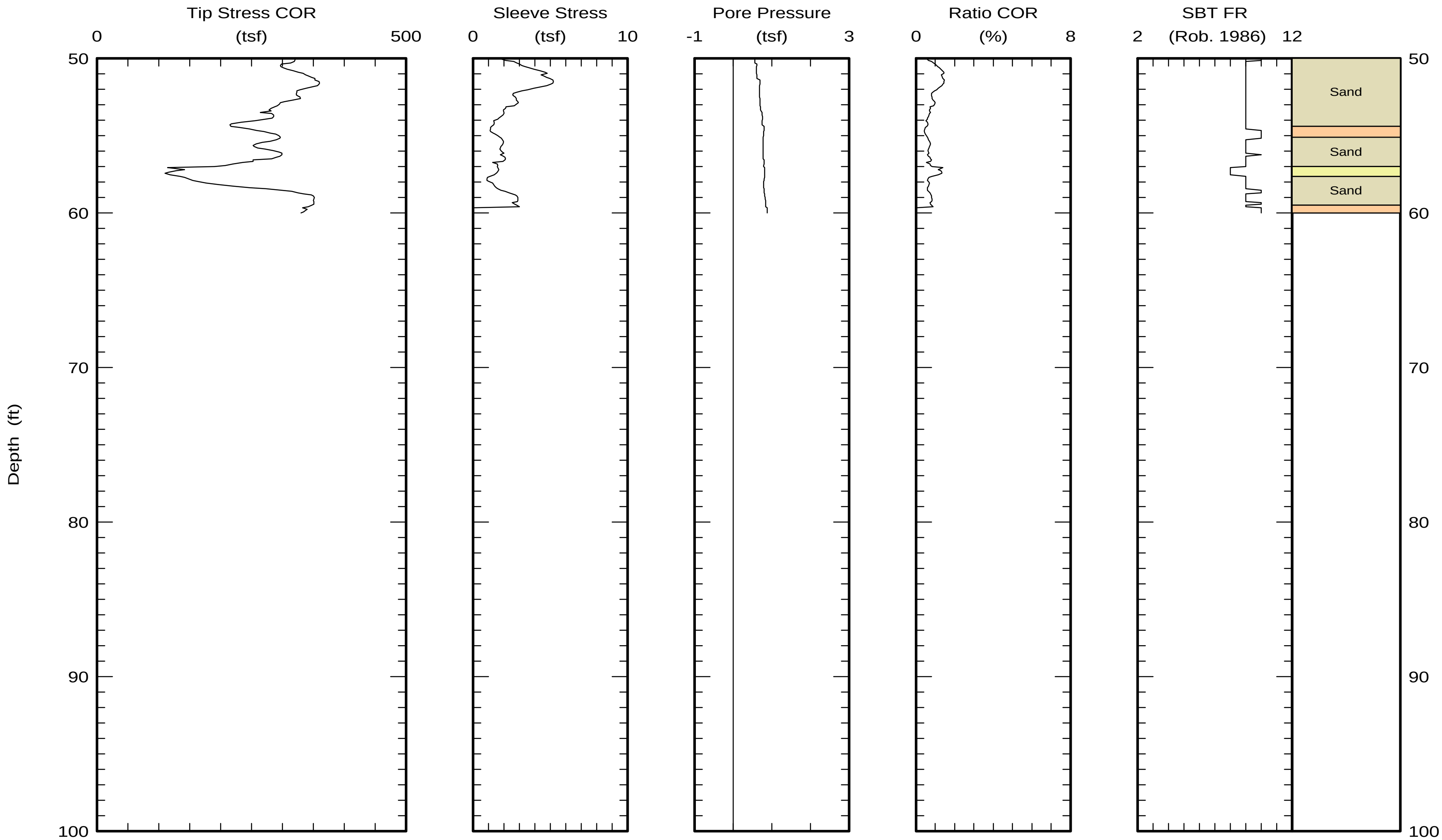
Maximum depth: 60.01 (ft)

Page 1 of 2

Test ID: L-CPT-6

File: Z03N1103C.ECP

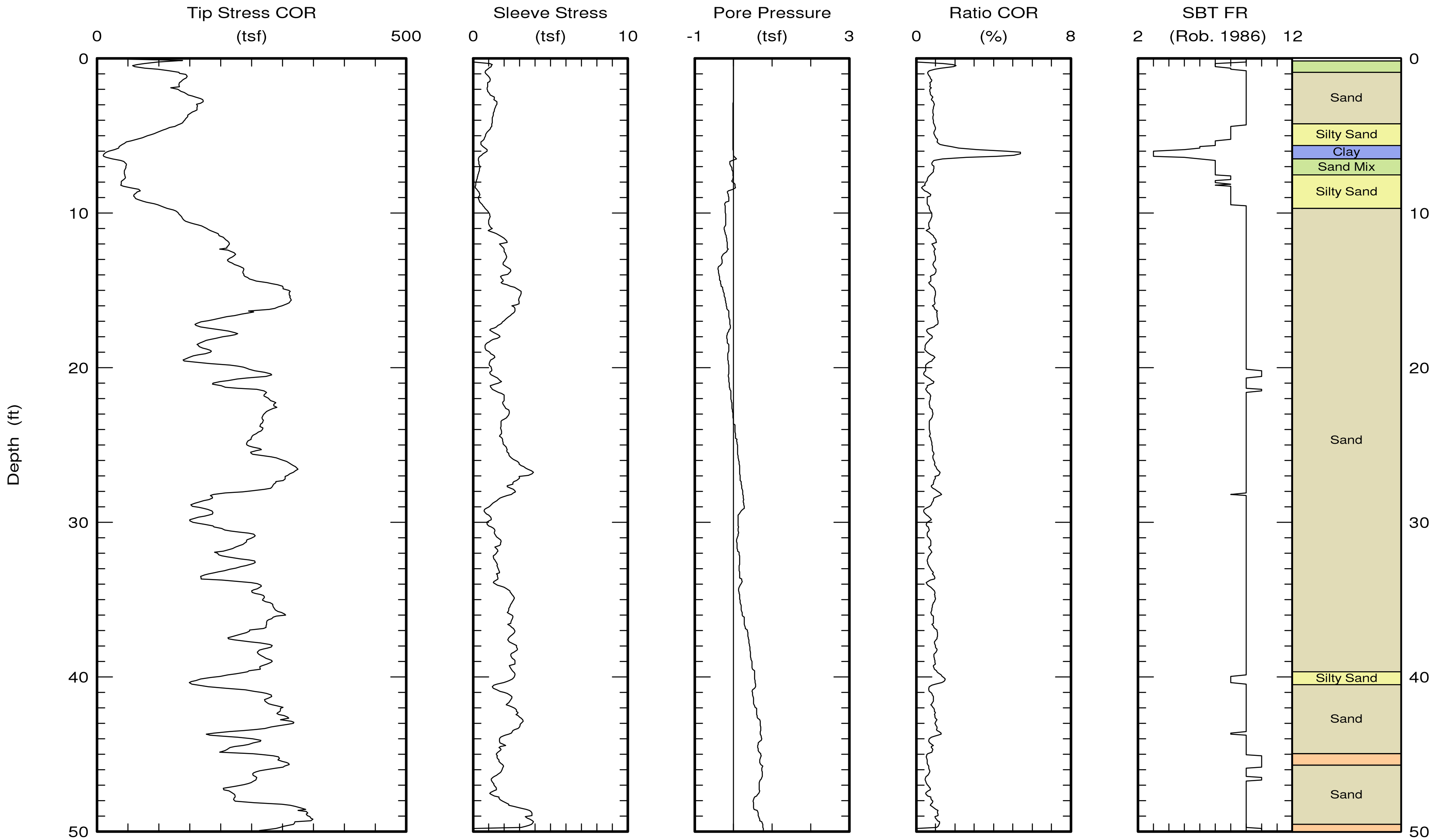
Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 rich@kehoetesting.com www.kehoetesting.com	CPT Data 30 ton rig	Date: 03/Nov/2011 Test ID: L-CPT-6 Project: NewportBeach
	Customer: Leighton Consulting Job Site: Bayside Dr. & E Coast Highway	



Maximum depth: 60.01 (ft)

Page 2 of 2

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 rich@kehoetesting.com www.kehoetesting.com	CPT Data 30 ton rig	Date: 03/Nov/2011 Test ID: L-CPT-7 Project: NewportBeach
	Customer: Leighton Consulting Job Site: Bayside Dr. & E Coast Highway	



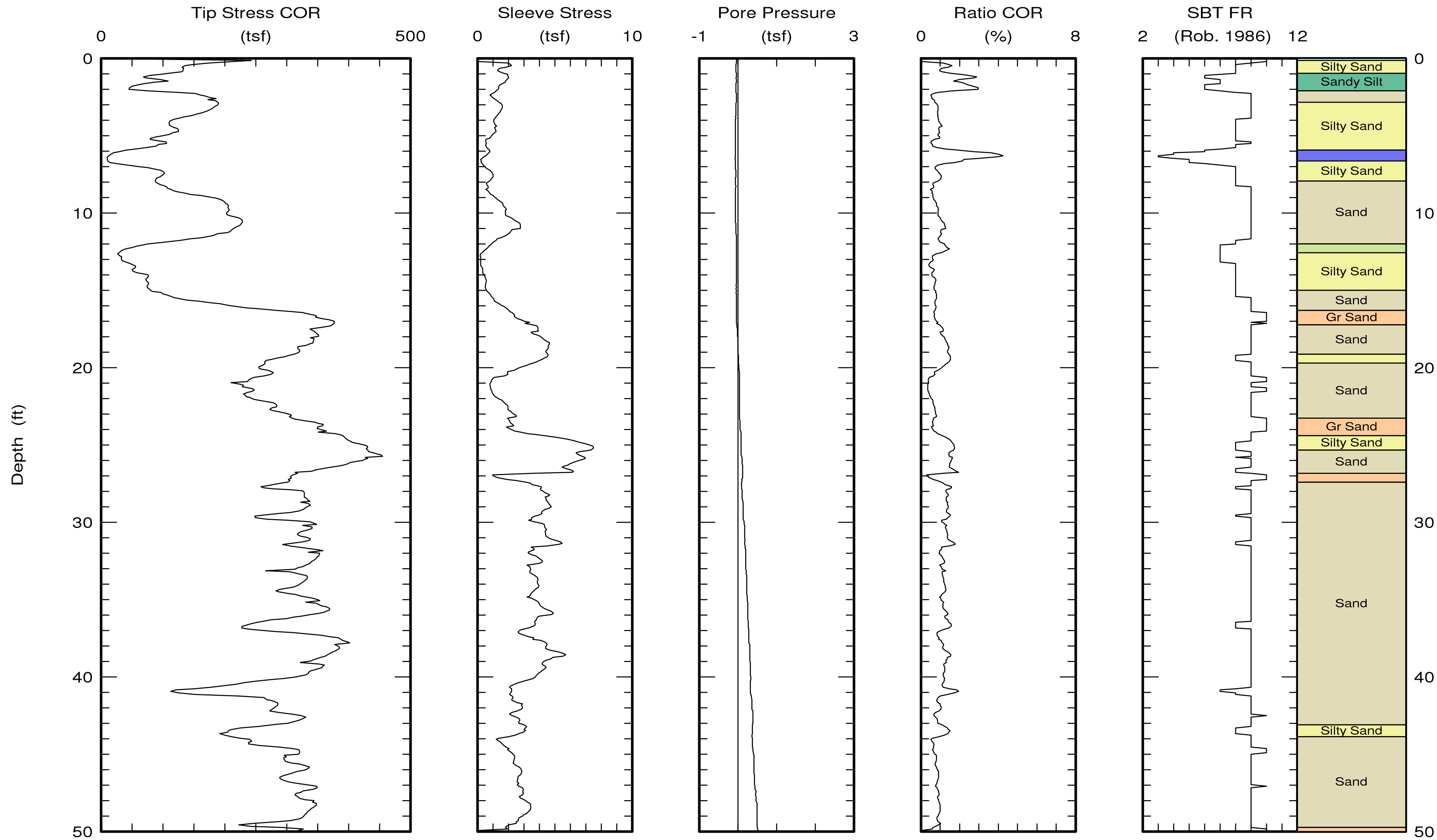
Maximum depth: 50.11 (ft)

Page 1 of 2

Test ID: L-CPT-7

File: Z03N1101C.ECP

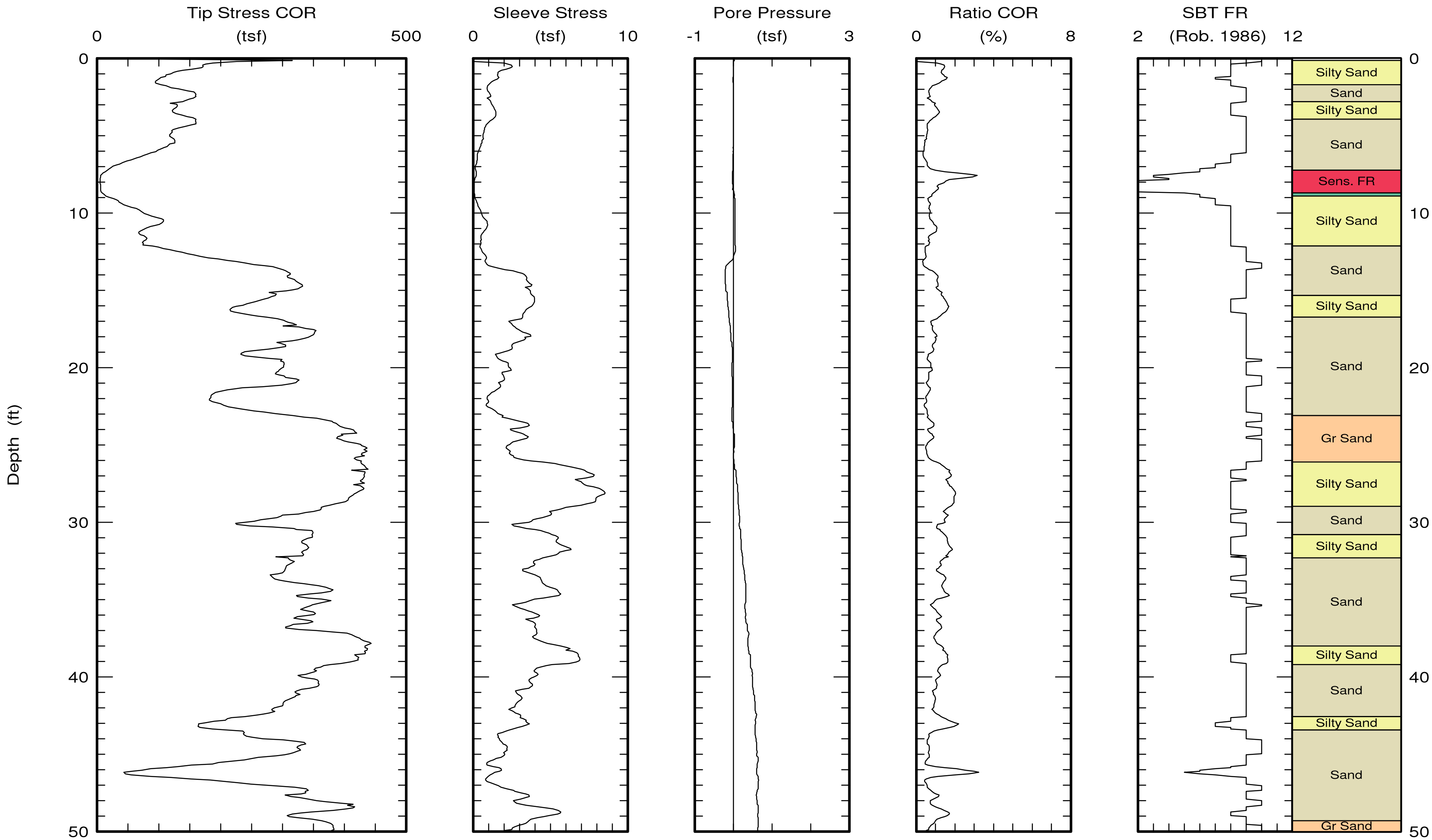
Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 rich@kehoetesting.com www.kehoetesting.com	CPT Data 30 ton rig	Date: 03/Nov/2011 Test ID: L-CPT-8 Project: NewportBeach
	Customer: Leighton Consulting Job Site: Bayside Dr. & E Coast Highway	



Maximum depth: 50.21 (ft)

Test ID: L-CPT-8
File: Z03N1105C.ecp

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 rich@kehoetesting.com www.kehoetesting.com	CPT Data 30 ton rig	Date: 03/Nov/2011 Test ID: L-CPT-9 Project: NewportBeach
	Customer: Leighton Consulting Job Site: Bayside Dr. & E Coast Highway	



Maximum depth: 50.94 (ft)

Test ID: L-CPT-9

File: Z03N1102C.ECP

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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):          2.750
"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\LCPT-1.CSV  |-------------------------------------------------
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" Depth " (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	75.073	0.481	0.641	8	18	27	9E9
1.500	133.600	0.893	0.668	9	26	39	9E9
2.500	189.007	1.222	0.646	9	36	54	9E9
3.500	199.193	0.851	0.427	9	38	57	9E9
4.500	222.644	0.826	0.371	9	43	65	9E9
5.500	179.413	0.829	0.462	9	34	51	9E9
6.500	52.287	0.444	0.849	7	17	26	9E9
7.500	6.487	0.229	3.486	3	6	9	0.406
8.500	30.900	0.221	0.712	7	10	15	9E9
9.500	110.840	0.545	0.491	9	21	32	9E9
10.500	123.147	0.669	0.543	9	24	35	9E9
11.500	129.953	0.519	0.399	9	25	36	9E9
12.500	173.544	0.813	0.469	9	33	45	9E9
13.500	199.413	1.214	0.609	9	38	50	9E9
14.500	194.613	1.297	0.667	9	37	47	9E9
15.500	158.633	0.862	0.543	9	30	37	9E9
16.500	134.425	0.774	0.576	9	26	31	9E9
17.500	126.567	0.471	0.372	9	24	28	9E9
18.500	227.953	1.071	0.470	9	44	50	9E9
19.500	190.653	0.884	0.464	9	37	41	9E9
20.500	146.731	0.966	0.658	9	28	30	9E9
21.500	135.093	0.722	0.534	9	26	27	9E9
22.500	239.560	0.845	0.353	10	38	39	9E9
23.500	288.493	0.933	0.323	10	46	46	9E9
24.500	330.387	1.708	0.517	10	53	51	9E9

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
25.500	372.493	2.224	0.597	10	59	56	9E9
26.500	382.667	2.112	0.552	10	61	56	9E9
27.500	384.960	2.921	0.759	10	61	55	9E9
28.500	339.173	3.037	0.895	9	65	57	9E9
29.500	322.881	2.718	0.842	9	62	53	9E9
30.500	322.420	1.982	0.615	10	51	43	9E9
31.500	312.700	2.046	0.654	10	50	41	9E9
32.500	330.760	2.057	0.622	10	53	43	9E9
33.500	330.438	2.429	0.735	10	53	42	9E9
34.500	322.200	1.265	0.393	10	51	40	9E9
35.500	335.393	1.505	0.449	10	54	41	9E9
36.500	318.640	1.475	0.463	10	51	38	9E9
37.500	288.375	1.507	0.522	10	46	34	9E9
38.500	274.073	1.293	0.472	10	44	32	9E9
39.500	341.860	1.077	0.315	10	55	39	9E9
40.500	334.600	0.000	0.000	10	9E9	9E9	9E9

```
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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:
"
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"SUMMARY SHEET
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"'a' for calculating Qt:                 0.830
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"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
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"Zone #1=Sensitive fine grained     Zone #7 =Silty sand
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"For soil classification, Rf values > 8 are assumed to be 8.
"
"( Note: 9E9 means Out Of Range )
"
INPUT FILE: C:\temp\LCPT-2.CSV  |--------------------------------------------------
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" Depth " (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	118.120	1.253	1.061	8	28	42	9E9
1.500	88.527	0.639	0.722	8	21	32	9E9
2.500	123.493	0.577	0.467	9	24	36	9E9
3.500	158.680	0.835	0.526	9	30	45	9E9
4.500	136.225	0.826	0.606	9	26	39	9E9
5.500	99.747	0.633	0.634	8	24	36	9E9
6.500	41.933	0.479	1.143	7	13	20	9E9
7.500	28.700	0.339	1.179	7	9	14	9E9
8.500	31.744	0.191	0.600	7	10	15	9E9
9.500	83.687	0.433	0.517	8	20	30	9E9
10.500	76.347	0.420	0.550	8	18	27	9E9

Depth " (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
11.500	71.020	0.317	0.446	8	17	24	9E9
12.500	80.100	0.395	0.493	8	19	26	9E9
13.500	134.887	0.345	0.256	9	26	34	9E9
14.500	181.453	0.711	0.392	9	35	45	9E9
15.500	170.327	1.101	0.646	9	33	41	9E9
16.500	84.275	0.736	0.873	8	20	24	9E9
17.500	142.333	0.774	0.544	9	27	31	9E9
18.500	193.460	1.355	0.700	9	37	42	9E9
19.500	239.860	1.158	0.483	9	46	51	9E9
20.500	253.387	1.124	0.443	10	40	43	9E9
21.500	284.800	1.503	0.528	10	45	47	9E9
22.500	282.013	1.563	0.554	10	45	46	9E9
23.500	284.240	1.993	0.701	9	54	53	9E9
24.500	253.037	1.826	0.722	9	48	46	9E9
25.500	237.407	1.954	0.823	9	45	42	9E9
26.500	271.640	2.426	0.893	9	52	48	9E9
27.500	262.013	1.746	0.666	9	50	45	9E9
28.500	312.433	2.185	0.699	10	50	44	9E9
29.500	239.837	1.951	0.813	9	46	40	9E9
30.500	276.693	1.858	0.671	9	53	45	9E9
31.500	300.167	2.296	0.765	9	58	48	9E9
32.500	313.980	2.234	0.711	9	60	49	9E9
33.500	355.987	2.261	0.635	10	57	46	9E9
34.500	328.147	2.221	0.677	10	52	41	9E9
35.500	301.573	2.229	0.739	9	58	45	9E9
36.500	250.660	1.695	0.676	9	48	36	9E9
37.500	291.456	1.880	0.645	9	56	42	9E9
38.500	305.820	2.240	0.732	9	59	43	9E9
39.500	302.633	1.623	0.536	10	48	35	9E9
40.500	315.000	0.000	0.000	10	9E9	9E9	9E9

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"     Program: Piezocone Interpretation
"    Web Site: www.civil.ubc.ca/home/in-situ
"
"Interpreter Name:
"
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"SUMMARY SHEET
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"Vertical Flow Gradient, i (- up):       +0.000
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"For Rf Zone & Bq Zone Classification
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"NOTE:
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"( Note: 9E9 means Out Of Range )
"
INPUT FILE: C:\temp\LCPT-3.CSV  |-------------------------------------------------
```

" Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	90.440	0.741	0.819	8	22	33	9E9
1.500	167.593	0.944	0.563	9	32	48	9E9
2.500	199.333	1.147	0.576	9	38	57	9E9
3.500	199.580	1.275	0.639	9	38	57	9E9
4.500	130.688	1.060	0.811	9	25	38	9E9
5.500	69.773	0.708	1.015	8	17	26	9E9
6.500	43.587	0.417	0.957	7	14	21	9E9
7.500	102.353	0.798	0.780	8	25	38	9E9
8.500	111.531	0.805	0.722	8	27	41	9E9
9.500	136.900	0.719	0.525	9	26	39	9E9
10.500	151.153	0.662	0.438	9	29	43	9E9

" Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
11.500	185.467	0.959	0.517	9	36	51	9E9
12.500	224.300	1.701	0.759	9	43	58	9E9
13.500	187.533	1.691	0.902	9	36	47	9E9
14.500	155.280	1.333	0.858	9	30	38	9E9
15.500	122.447	0.952	0.777	9	23	28	9E9
16.500	223.887	0.912	0.407	9	43	51	9E9
17.500	319.433	1.675	0.525	10	51	59	9E9
18.500	352.500	2.991	0.848	9	68	76	9E9
19.500	288.967	2.665	0.922	9	55	60	9E9
20.500	245.894	1.509	0.614	9	47	50	9E9
21.500	264.440	1.705	0.645	9	51	53	9E9
22.500	233.920	1.429	0.611	9	45	45	9E9
23.500	301.873	2.500	0.828	9	58	57	9E9
24.500	341.556	3.431	1.004	9	65	63	9E9
25.500	337.740	2.995	0.887	9	65	61	9E9
26.500	344.340	3.035	0.881	9	66	61	9E9
27.500	319.687	2.991	0.936	9	61	55	9E9
28.500	347.440	3.783	1.088	9	67	59	9E9
29.500	313.087	3.465	1.106	9	60	52	9E9
30.500	268.833	1.735	0.645	9	52	44	9E9
31.500	308.653	2.394	0.775	9	59	49	9E9
32.500	329.140	3.094	0.940	9	63	51	9E9
33.500	307.613	2.879	0.936	9	59	47	9E9
34.500	339.300	2.495	0.735	10	54	43	9E9
35.500	382.060	3.212	0.840	10	61	47	9E9
36.500	347.393	3.365	0.968	9	67	51	9E9
37.500	362.669	3.229	0.890	9	70	52	9E9
38.500	346.073	3.440	0.994	9	66	48	9E9
39.500	343.580	2.641	0.768	10	55	40	9E9
40.500	357.100	0.000	0.000	10	9E9	9E9	9E9

```
"
"Output file from CPTINT - Version 5.2
"====================================
"INPUT FILE: C:\temp\LCPT-4.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):           2.750
"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\LCPT-4.CSV  |-----------------------------------------------------
```

" Depth " (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	230.993	1.683	0.729	9	44	66	9E9
1.500	181.273	2.313	1.276	8	43	65	9E9
2.500	114.673	0.955	0.833	8	27	41	9E9
3.500	160.513	1.633	1.017	9	31	47	9E9
4.500	169.069	1.814	1.073	9	32	48	9E9
5.500	249.307	1.185	0.475	9	48	72	9E9
6.500	271.600	1.062	0.391	10	43	65	9E9
7.500	179.433	1.111	0.619	9	34	51	9E9
8.500	99.394	0.740	0.744	8	24	36	9E9
9.500	14.567	0.370	2.520	5	7	11	0.939
10.500	33.700	0.187	0.554	7	11	16	9E9

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
11.500	160.147	0.865	0.540	9	31	44	9E9
12.500	256.888	1.264	0.492	9	49	67	9E9
13.500	292.507	1.877	0.641	9	56	74	9E9
14.500	189.373	1.112	0.587	9	36	46	9E9
15.500	250.467	1.419	0.567	9	48	59	9E9
16.500	243.400	1.644	0.676	9	47	56	9E9
17.500	221.240	1.480	0.669	9	42	49	9E9
18.500	169.273	1.855	1.095	9	32	36	9E9
19.500	195.853	1.456	0.743	9	38	42	9E9
20.500	266.231	1.665	0.625	9	51	54	9E9
21.500	291.613	1.823	0.625	9	56	58	9E9
22.500	331.960	2.314	0.697	10	53	54	9E9
23.500	324.327	2.367	0.730	10	52	51	9E9
24.500	267.325	2.099	0.785	9	51	49	9E9
25.500	150.053	0.908	0.605	9	29	27	9E9
26.500	216.333	0.936	0.433	9	41	38	9E9
27.500	270.473	1.381	0.511	10	43	39	9E9
28.500	223.980	1.957	0.873	9	43	38	9E9
29.500	430.062	2.688	0.625	10	69	60	9E9
30.500	494.907	4.646	0.939	9	95	80	9E9
31.500	442.307	4.357	0.985	9	85	70	9E9
32.500	418.253	3.116	0.745	10	67	54	9E9
33.500	455.331	3.411	0.749	10	73	58	9E9
34.500	400.420	3.045	0.760	10	64	50	9E9
35.500	402.900	3.421	0.849	10	64	49	9E9
36.500	318.780	2.582	0.810	9	61	46	9E9
37.500	156.806	1.310	0.835	9	30	22	9E9
38.500	95.267	0.499	0.523	8	23	17	9E9
39.500	211.047	0.666	0.316	9	40	29	9E9
40.500	343.800	0.000	0.000	10	9E9	9E9	9E9

```
"Output file from CPTINT - Version 5.2
"=====================================
"INPUT FILE: C:\temp\L-CPT-5.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):           2.740
"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\L-CPT-5.CSV
```

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	79.750	0.738	0.926	8	19	29	9E9
1.500	74.283	0.662	0.891	8	18	27	9E9
2.500	168.717	1.128	0.669	9	32	48	9E9
3.500	132.817	1.213	0.914	9	25	38	9E9
4.500	50.350	0.722	1.435	7	16	24	9E9
5.500	101.150	0.687	0.679	8	24	36	9E9
6.500	79.133	0.765	0.967	8	19	29	9E9
7.500	101.667	0.805	0.792	8	24	36	9E9
8.500	157.217	1.235	0.786	9	30	45	9E9
9.500	114.933	1.000	0.870	8	28	42	9E9
10.500	56.114	0.853	1.521	7	18	26	9E9
11.500	25.750	0.235	0.914	7	8	11	9E9
12.500	16.583	0.092	0.555	6	6	8	1.050
13.500	100.050	0.738	0.738	8	24	32	9E9
14.500	127.150	0.815	0.641	9	24	31	9E9
15.500	221.333	1.417	0.640	9	42	52	9E9

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
16.500	285.283	2.052	0.719	9	55	66	9E9
17.500	285.333	3.008	1.054	9	55	64	9E9
18.500	251.250	2.298	0.915	9	48	54	9E9
19.500	191.100	2.040	1.068	9	37	41	9E9
20.500	337.986	2.791	0.826	9	65	70	9E9
21.500	403.783	4.255	1.054	9	77	81	9E9
22.500	398.683	4.558	1.143	9	76	77	9E9
23.500	367.650	4.850	1.319	9	70	70	9E9
24.500	339.333	5.045	1.487	9	65	63	9E9
25.500	357.517	5.723	1.601	8	86	82	9E9
26.500	342.967	5.407	1.577	8	82	76	9E9
27.500	288.450	4.132	1.432	8	69	63	9E9
28.500	269.900	3.642	1.349	9	52	46	9E9
29.500	160.850	1.175	0.731	9	31	27	9E9
30.500	332.433	2.510	0.755	10	53	45	9E9
31.500	423.343	5.256	1.241	9	81	68	9E9
32.500	455.083	4.890	1.075	9	87	71	9E9
33.500	427.250	4.485	1.050	9	82	66	9E9
34.500	405.017	4.142	1.023	9	78	62	9E9
35.500	367.200	3.262	0.888	9	70	54	9E9
36.500	206.750	1.942	0.939	9	40	31	9E9
37.500	55.233	0.910	1.648	7	18	14	9E9
38.500	178.383	1.267	0.710	9	34	25	9E9
39.500	185.133	0.870	0.470	9	35	26	9E9
40.500	234.733	1.228	0.523	9	45	32	9E9
41.499	178.129	1.516	0.851	9	34	24	9E9
42.499	275.267	2.675	0.972	9	53	37	9E9
43.499	299.450	3.310	1.105	9	57	39	9E9
44.499	343.867	2.782	0.809	9	66	45	9E9
45.499	282.450	3.192	1.130	9	54	36	9E9
46.499	216.150	2.988	1.382	8	52	34	9E9
47.499	127.600	1.795	1.406	8	31	20	9E9
48.499	240.250	1.888	0.786	9	46	29	9E9
49.499	430.933	3.608	0.837	10	69	43	9E9
50.499	423.900	3.760	0.887	9	81	50	9E9

```
"
"Output file from CPTINT - Version 5.2
"=====================================
"INPUT FILE: C:\temp\L-CPT-6.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):           2.740
"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\L-CPT-6.CSV
|-----------------------------------------------------------------------------
```

" Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	66.000	0.123	0.187	8	16	24	9E9
1.500	141.300	0.535	0.379	9	27	41	9E9
2.500	161.367	0.887	0.549	9	31	47	9E9
3.500	101.700	0.845	0.831	8	24	36	9E9
4.500	27.283	0.318	1.167	6	10	15	1.800
5.500	13.433	0.182	1.352	6	5	8	0.873
6.500	33.800	0.380	1.124	7	11	17	9E9
7.500	86.850	0.502	0.578	8	21	32	9E9
8.500	104.167	0.767	0.736	8	25	38	9E9
9.500	59.833	1.005	1.680	7	19	29	9E9
10.500	58.129	0.477	0.821	8	14	21	9E9
11.500	15.017	0.232	1.543	6	6	9	0.954
12.500	42.567	0.242	0.568	7	14	19	9E9
13.500	46.217	0.277	0.599	8	11	15	9E9
14.500	80.200	0.403	0.503	8	19	24	9E9

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
15.500	141.383	0.892	0.631	9	27	34	9E9
16.500	205.683	1.900	0.924	9	39	47	9E9
17.500	233.850	2.048	0.876	9	45	53	9E9
18.500	289.033	2.738	0.947	9	55	62	9E9
19.500	292.067	3.068	1.051	9	56	62	9E9
20.500	178.600	1.636	0.916	9	34	37	9E9
21.500	200.833	1.038	0.517	9	38	40	9E9
22.500	163.583	1.795	1.097	9	31	32	9E9
23.500	143.250	1.163	0.812	9	27	27	9E9
24.500	142.583	0.850	0.596	9	27	26	9E9
25.500	167.233	0.788	0.471	9	32	30	9E9
26.500	137.683	0.407	0.295	9	26	24	9E9
27.500	226.433	1.347	0.595	9	43	39	9E9
28.500	355.750	2.478	0.697	10	57	51	9E9
29.500	337.350	2.318	0.687	10	54	47	9E9
30.500	342.567	4.497	1.313	9	66	56	9E9
31.500	323.443	3.841	1.188	9	62	52	9E9
32.500	352.317	3.442	0.977	9	68	56	9E9
33.500	313.283	3.163	1.010	9	60	48	9E9
34.500	275.283	2.920	1.061	9	53	42	9E9
35.500	294.683	2.782	0.944	9	56	44	9E9
36.500	288.267	3.053	1.059	9	55	42	9E9
37.500	288.617	3.083	1.068	9	55	41	9E9
38.500	286.200	2.910	1.017	9	55	41	9E9
39.500	295.367	2.688	0.910	9	57	42	9E9
40.500	315.750	3.452	1.093	9	61	44	9E9
41.499	294.671	3.411	1.157	9	56	40	9E9
42.499	292.900	2.728	0.931	9	56	39	9E9
43.499	262.017	3.113	1.188	9	50	34	9E9
44.499	283.000	3.613	1.276	9	54	36	9E9
45.499	260.267	2.217	0.851	9	50	33	9E9
46.499	248.150	2.062	0.830	9	48	31	9E9
47.499	258.617	1.473	0.569	9	50	32	9E9
48.499	164.250	0.977	0.594	9	31	20	9E9
49.499	201.333	1.375	0.683	9	39	25	9E9
50.499	310.750	3.160	1.017	9	60	37	9E9
51.499	349.967	4.852	1.386	9	67	41	9E9
52.499	318.243	2.947	0.926	9	61	37	9E9
53.499	279.667	1.922	0.687	9	54	32	9E9
54.499	249.000	1.287	0.516	9	48	28	9E9
55.499	274.400	1.853	0.675	9	53	31	9E9
56.499	263.967	1.802	0.682	9	51	29	9E9
57.499	131.917	1.325	1.003	8	32	18	9E9
58.499	270.400	1.875	0.693	9	52	29	9E9
59.499	345.050	1.888	0.547	10	55	31	9E9

```
"
"Output file from CPTINT - Version 5.2
"======================================
"INPUT FILE: C:\temp\L-CPT-7.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):           2.740
"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\L-CPT-7.CSV  |
```

" Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	101.017	0.817	0.808	8	24	36	9E9
1.500	136.333	1.000	0.733	9	26	39	9E9
2.500	156.633	1.277	0.815	9	30	45	9E9
3.500	153.700	1.347	0.876	9	29	44	9E9
4.500	116.783	1.092	0.935	8	28	42	9E9
5.500	49.800	0.675	1.356	7	16	24	9E9
6.500	27.533	0.497	1.804	6	11	17	1.809
7.500	45.150	0.347	0.768	7	14	21	9E9
8.500	53.933	0.273	0.507	8	13	20	9E9
9.500	92.617	0.590	0.637	8	22	33	9E9
10.500	149.171	1.073	0.719	9	29	43	9E9
11.500	201.067	1.718	0.855	9	39	55	9E9
12.500	215.583	2.043	0.948	9	41	56	9E9
13.500	229.000	2.195	0.959	9	44	58	9E9
14.500	272.383	2.148	0.789	9	52	66	9E9
15.500	311.333	3.027	0.972	9	60	74	9E9

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
16.500	243.500	2.492	1.023	9	47	56	9E9
17.500	190.033	1.523	0.802	9	36	42	9E9
18.500	177.617	1.065	0.600	9	34	38	9E9
19.500	169.417	1.170	0.691	9	32	35	9E9
20.500	242.886	1.377	0.567	9	47	50	9E9
21.500	251.033	1.588	0.633	9	48	50	9E9
22.500	282.167	2.122	0.752	9	54	55	9E9
23.500	267.250	1.945	0.728	9	51	51	9E9
24.500	251.617	1.865	0.741	9	48	46	9E9
25.500	264.183	2.290	0.867	9	51	48	9E9
26.500	315.983	3.378	1.069	9	61	56	9E9
27.500	290.017	2.668	0.920	9	56	51	9E9
28.500	184.833	1.887	1.021	9	35	31	9E9
29.500	171.667	0.965	0.562	9	33	29	9E9
30.500	204.067	1.217	0.596	9	39	33	9E9
31.500	227.486	1.650	0.725	9	44	37	9E9
32.500	232.217	1.472	0.634	9	44	36	9E9
33.500	200.433	1.548	0.772	9	38	31	9E9
34.500	262.317	2.325	0.886	9	50	40	9E9
35.500	286.783	2.422	0.844	9	55	43	9E9
36.500	276.933	2.497	0.901	9	53	40	9E9
37.500	239.950	2.490	1.037	9	46	35	9E9
38.500	270.000	2.660	0.985	9	52	38	9E9
39.500	256.650	2.592	1.009	9	49	36	9E9
40.500	181.233	1.903	1.050	9	35	25	9E9
41.499	279.843	2.354	0.841	9	54	38	9E9
42.499	303.067	3.003	0.990	9	58	40	9E9
43.499	239.500	2.488	1.038	9	46	31	9E9
44.499	234.783	1.768	0.753	9	45	30	9E9
45.499	296.367	1.735	0.585	10	47	31	9E9
46.499	254.100	1.450	0.570	9	49	32	9E9
47.499	217.967	1.423	0.653	9	42	27	9E9
48.499	309.333	2.958	0.956	9	59	38	9E9
49.499	319.517	2.998	0.938	9	61	38	9E9
50.499	259.800	0.000	0.000	10	9E9	9E9	9E9

```
"
"Output file from CPTINT - Version 5.2
"=====================================
"INPUT FILE: C:\temp\L-CPT-8.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):           2.740
"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\L-CPT-8.CSV
```

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	153.167	1.458	0.952	9	29	44	9E9
1.500	71.583	1.693	2.366	6	27	41	4.766
2.500	161.667	1.175	0.727	9	31	47	9E9
3.500	158.317	1.400	0.884	9	30	45	9E9
4.500	115.850	1.118	0.966	8	28	42	9E9
5.500	82.983	0.643	0.776	8	20	30	9E9
6.500	19.200	0.445	2.318	5	9	14	1.253
7.500	90.900	0.845	0.930	8	22	33	9E9
8.500	115.267	0.717	0.622	9	22	33	9E9
9.500	199.350	1.587	0.796	9	38	57	9E9
10.500	218.543	2.380	1.089	9	42	62	9E9
11.500	157.783	1.587	1.006	9	30	42	9E9
12.500	38.117	0.408	1.072	7	12	16	9E9
13.500	51.633	0.288	0.558	8	12	16	9E9
14.500	75.783	0.533	0.704	8	18	23	9E9

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
15.500	131.633	1.017	0.772	9	25	31	9E9
16.500	308.867	2.235	0.724	9	59	71	9E9
17.500	358.100	3.658	1.022	9	69	80	9E9
18.500	334.283	4.463	1.335	9	64	72	9E9
19.500	285.767	4.077	1.427	8	68	75	9E9
20.500	252.157	1.671	0.663	9	48	51	9E9
21.500	238.067	0.992	0.417	9	46	48	9E9
22.500	279.150	1.947	0.697	9	53	54	9E9
23.500	334.450	2.182	0.652	10	53	52	9E9
24.500	391.317	4.865	1.243	9	75	72	9E9
25.500	436.083	6.977	1.600	9	84	79	9E9
26.500	364.750	5.143	1.410	9	70	65	9E9
27.500	291.483	2.963	1.017	9	56	51	9E9
28.500	330.150	4.497	1.362	9	63	56	9E9
29.500	294.650	4.042	1.372	9	56	49	9E9
30.500	332.667	4.293	1.290	9	64	54	9E9
31.500	329.971	4.334	1.313	9	63	53	9E9
32.500	338.367	3.763	1.112	9	65	53	9E9
33.500	316.800	3.713	1.172	9	61	49	9E9
34.500	311.500	3.642	1.169	9	60	47	9E9
35.500	357.000	4.323	1.211	9	68	53	9E9
36.500	265.333	3.663	1.380	9	51	39	9E9
37.500	359.650	3.520	0.979	9	69	52	9E9
38.500	369.183	4.920	1.332	9	71	52	9E9
39.500	343.117	4.192	1.221	9	66	48	9E9
40.500	223.267	2.762	1.237	9	43	31	9E9
41.499	237.257	2.463	1.038	9	45	32	9E9
42.499	306.000	2.530	0.827	9	59	41	9E9
43.499	221.867	2.672	1.204	9	43	29	9E9
44.499	280.800	1.808	0.644	9	54	36	9E9
45.499	311.817	2.475	0.794	9	60	40	9E9
46.499	304.683	2.715	0.891	9	58	38	9E9
47.499	328.967	2.870	0.872	9	63	41	9E9
48.499	340.167	3.313	0.974	9	65	41	9E9
49.499	291.383	2.018	0.692	9	56	35	9E9
50.499	340.100	0.000	0.000	10	9E9	9E9	9E9

```
"Output file from CPTINT - Version 5.2
"=====================================
"INPUT FILE: C:\temp\L-CPT-9.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):           2.740
"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\L-CPT-9.CSV
```

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	178.900	1.727	0.965	9	34	51	9E9
1.500	107.817	1.245	1.155	8	26	39	9E9
2.500	147.817	1.085	0.734	9	28	42	9E9
3.500	136.133	1.395	1.025	8	33	50	9E9
4.500	137.767	0.818	0.594	9	26	39	9E9
5.500	116.933	0.543	0.465	9	22	33	9E9
6.500	62.783	0.267	0.425	8	15	23	9E9
7.500	12.017	0.162	1.345	5	6	9	0.770
8.500	7.567	0.078	1.035	1	4	6	0.469
9.500	44.450	0.302	0.679	7	14	21	9E9
10.500	92.643	0.774	0.836	8	22	33	9E9
11.500	74.567	0.558	0.749	8	18	26	9E9
12.500	137.317	0.657	0.478	9	26	36	9E9
13.500	276.433	1.740	0.629	9	53	70	9E9
14.500	322.133	3.555	1.104	9	62	80	9E9
15.500	273.317	3.880	1.420	8	65	81	9E9

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
16.500	245.833	3.337	1.357	8	59	71	9E9
17.500	334.633	2.908	0.869	9	64	75	9E9
18.500	305.500	2.842	0.930	9	59	67	9E9
19.500	273.583	1.870	0.684	9	52	57	9E9
20.500	305.257	2.047	0.671	10	49	53	9E9
21.500	216.167	1.343	0.621	9	41	43	9E9
22.500	224.767	1.158	0.515	9	43	44	9E9
23.500	372.833	2.800	0.751	10	60	60	9E9
24.500	405.500	2.987	0.737	10	65	63	9E9
25.500	429.133	2.458	0.573	10	69	65	9E9
26.500	432.583	6.330	1.463	9	83	77	9E9
27.500	427.833	7.438	1.739	8	102	92	9E9
28.500	405.567	7.992	1.970	8	97	86	9E9
29.500	323.150	5.057	1.565	8	77	67	9E9
30.500	299.233	3.897	1.302	9	57	49	9E9
31.500	337.571	5.749	1.703	8	81	68	9E9
32.500	313.733	4.207	1.341	9	60	49	9E9
33.500	300.233	4.053	1.350	9	58	47	9E9
34.500	356.933	5.122	1.435	9	68	54	9E9
35.500	351.400	3.365	0.957	9	67	52	9E9
36.500	326.883	3.957	1.210	9	63	48	9E9
37.500	417.067	4.287	1.028	9	80	60	9E9
38.500	429.650	6.508	1.514	9	82	61	9E9
39.500	365.283	4.767	1.305	9	70	51	9E9
40.500	347.867	3.633	1.044	9	67	48	9E9
41.499	309.286	2.896	0.936	9	59	42	9E9
42.499	237.500	3.042	1.280	9	46	32	9E9
43.499	215.617	2.255	1.045	9	41	28	9E9
44.499	323.250	2.052	0.634	10	52	35	9E9
45.499	200.867	1.403	0.698	9	39	26	9E9
46.499	129.817	1.175	0.904	8	31	20	9E9
47.499	326.533	2.777	0.850	9	63	41	9E9
48.499	377.400	4.325	1.146	9	72	46	9E9
49.499	362.467	3.383	0.933	9	69	43	9E9
50.499	371.000	2.180	0.587	10	59	37	9E9

APPENDIX B

LOGS OF CPT SOUNDINGS

AND TEST BORINGS

MACTEC ENGINEERING AND CONSULTING

2004

M… … DIVISIONS			GROUP SYMBOLS	TYPICAL NA…ES
COARSE GRAINED SOILS (…ore than 50% of material is …RGER than No. 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravels, gravel - sand mixtures, little or no fines.
			GP	Poorly graded gravels or grave - sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amount of fines)	GM	Silty gravels, gravel - sand - silt mixtures.
			GC	Clayey gravels, gravel - sand - clay mixtures.
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 Sieve Size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand - silt mixtures.
			SC	Clayey sands, sand - clay mixtures.
FINE GRAINED SOILS (…ore than 50% of material is …MALLER than 200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 50)		ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts and with slight plasticity.
			CL	Inorganic lays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (Liquid limit GREATER than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils.

…UNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

SILT OR CLAY	SAND			GRAVEL		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

No 200 No 40 No 10 No 4 3/4" 3" 12"

U.S. STANDARD SIEVE SIZE

…ference: The Unified Soil Classification System, Corps of Engineers, U.S. Army Technical …morandum No. 3-357, Vol. 1, March, 1953 (Revised April, 1960)

Undisturbed Sample	Auger Cuttings
Split Spoon Sample	Bulk Sample
Rock Core	Crandall Sampler
Dilatometer	Pressure Meter
Packer	No Recovery
Water Table at time of drilling	Water Table after 24 hours

Correlation of Penetration Resistance with Relative Density and Consistency

SAND & GRAVEL		SILT & CLAY	
No. of Blows	Relative Density	No. of Blows	Consistency
0 - 4	Very Loose	0 - 1	Very Soft
5 - 10	Loose	2 - 4	Soft
11 - 20	Firm	5 - 8	Firm
21 - 30	Very Firm	9 - 15	Stiff
31 - 50	Dense	16 - 30	Very Stiff
Over 50	Very Dense	Over 31	Hard

KEY TO SYMBOLS AND DESCRIPTIONS

MACTEC

FIGURE A-2

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

BORING 1

DATE DRILLED: August 5, 2004
EQUIPMENT USED: Rotary Wash
HOLE DIAMETER (in.): 5
ELEVATION: 7.0 **

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD PEN TEST	MOISTURE (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	SAMPLE LOC.	USCS	DESCRIPTION
								3" Thick Asphalt Pavement and 5" Thick Coarse Base
							SP	POORLY GRADED SAND - medium dense, dry, yellowish brown, little shells
					15	⊠		
			4.9	111	17	⊠		
							CL	CLAY - medium stiff, wet, gray, few shells LL=40.8, PL=21.6, PI=19.2
			50.6		5	⊠		
							SM	SILTY SAND - medium dense, moist, dark gray
			23.4	102	12	⊠		▽ 13.1% passing No. 200 sieve
							SP	POORLY GRADED SAND - very dense, moist, gray
			20.9	101	35	⊠		6.5% passing No. 200 sieve
			25.7	100	36	⊠		
					14	◻		becomes medium dense, 5.4% passing No. 200 sieve, complete ring sample not recovered (loose bag sample obtained)
					44	⊠		becomes very dense
			16.6	106	38	⊠		3.4% passing No. 200 sieve
					48	⊠		
			19.3	107	58	⊠		

Depth scale (ft): 5, 10, 15, 20, 25, 30, 35, 40
Elevation scale (ft): 5, 0, -5, -10, -15, -20, -25, -30

Field Tech: GMC
Prepared By: GS
Checked By: CSL

(CONTINUED ON FOLLOWING FIGURE)

Bayside Village
Newport Beach, California

MACTEC

LOG OF BORING
Project: 4953-04-2401 Figure: A - 1.1a

BORING 1 (Continued)

DATE DRILLED: August 5, 2004
EQUIPMENT USED: Rotary Wash
HOLE DIAMETER (in.): 5
ELEVATION: 7.0 **

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD PEN TEST	MOISTURE (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	SAMPLE LOC.	DESCRIPTION
							3.2% passing No. 200 sieve
							3.2% passing No. 200 sieve
-35							
	45				48	▩	trace siltstone fragments
-40							
	50		16.1	111	53	▩	4.0% passing No. 200 sieve
-45							
	55						
-50							
	60						
-55							
	65						
-60							
	70						
-65							
	75						
-70							
	80						

End Boring at 50'

NOTES: Some caving and sloughing. Mud used during drilling. Water encountered at 11½' feet below the ground surface. Boring backfilled with grout.

* Number of blows required to drive the Crandall sampler 12 inches using a 400 pound hammer falling 24 inches.

** Boring elevations are based on survey by The Keith Companies.

Field Tech: GMC
Prepared By: GS
Checked By: c.s.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

BORING 2

DATE DRILLED: August 5, 2004
EQUIPMENT USED: Rotary Wash
HOLE DIAMETER (in.): 5
ELEVATION: 14.0 **

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	SAMPLE LOC.	USCS	DESCRIPTION
								3" Thick Asphalt Pavement and 2" Thick Base
							SM	SILTY SAND - medium dense, slightly moist, light brown, few shells
							SP	POORLY GRADED SAND - medium dense, slightly moist, brown
10					15	⊠		little shells
	5							layers of silt
					10	⊠		
							SP	POORLY GRADED SAND - medium dense, moist, yellowish brown, few shells
5								wet
	10	16/12"				☒		
							SM	SILTY SAND - loose, moist, dark gray, trace organics ▽
			25.1	97	5	⊠		12.8% passing No. 200 sieve
							SP	POORLY GRADED SAND - very dense, wet, light gray
0	15							
		51/12"				☒		
-5			18.0	109	34	⊠		2.8% passing No. 200 sieve
	20							
		62/12"				☒		
-10	25				67	⊠		
-15	30	5/12"				☒		layers of soft silt
								little shells
-20	35		18.9	108	47	⊠		2.8% passing No. 200 sieve
-25	40	69/12"				⊠		

(CONTINUED ON FOLLOWING FIGURE)

Field Tech: GMC
Prepared By: GS
Checked By: GS

Bayside Village
Newport Beach, California

MACTEC

LOG OF BORING
Project: 4953-04-2401 Figure: A - 1.2a

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

BORING 2 (Continued)

DATE DRILLED: August 5, 2004
EQUIPMENT USED: Rotary Wash
HOLE DIAMETER (in.): 5
ELEVATION: 14.0 **

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	SAMPLE LOC.
-30	45		21.6	103	43	⊠
-35	50	55/12"				⊠
-40	55					
-45	60					
-50	65					
-55	70					
-60	75					
-65	80					

dark brown, few siltstone fragments

End boring at 50½'

NOTES: Some caving and sloughing. Mud used during drilling. Water encountered at 12'3" feet below the ground surface. Boring backfilled with grout.

Field Tech.: GMC
Prepared By: GS
Checked By: GS

BZCOL CRANDALL ... TERRA VISTA.GPJ LAW CRAN.GDT 10/29/04

Bayside Village Newport Beach, California	MACTEC	LOG OF BORING Project 4953-04-2401 Figure: A - 1.2b

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

BORING 3

DATE DRILLED: August 5, 2004
EQUIPMENT USED: Rotary Wash
HOLE DIAMETER (in.): 5
ELEVATION: 12.0 **

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	MOISTURE (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	USCS	DESCRIPTION
	0					SP	2" Thick Asphalt Pavement POORLY GRADED SAND - medium dense, dry, yellowish brown, some Shells
10					17		
	5				9		
5						CL	CLAY - very soft, wet, gray, trace organics LL=43.7, PL=17.9, PI=25.8
			51.7	67	0		
	10					SP-SM	POORLY GRADED SAND with SILT - medium dense, moist, gray, few shells, slight organic odor
0		26/12"					
	15		21.7	105	17		
-5		33/12"					becomes dense
	20				27		becomes dense
-10		33/12"					becomes medium dense
	25						
-15			17.0	108	37		becomes very dense
	30	50/6"					
-20			18.8	100	13		layer of stiff silt
	35	85/10"					
-25					63		
	40						

Field Tech: GMC
Prepared By: GS
Checked By: CJL

(CONTINUED ON FOLLOWING FIGURE)

Bayside Village
Newport Beach, California

MACTEC

LOG OF BORING
Project: 4953-04-2401 Figure: A - 1.3a

BORING 3 (Continued)

DATE DRILLED August 5, 2004
EQUIPMENT USED Rotary Wash
HOLE DIAMETER (in.) 5
ELEVATION 12.0 **

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	MOISTURE (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	SAMPLE LOC.	DESCRIPTION
-30		50/5"				☒	
	45		19.2	104	56	☒	light gray
-35							
	50	50/5"				☒	few siltstone fragments
							End boring at 50'
-40							NOTES: Some caving and sloughing below 15'. Mud used during drilling. Water encountered at 11'2" feet below the ground surface. Boring backfilled with grout.
	55						
-45							
	60						
-50							
	65						
-55							
	70						
-60							
	75						
-65							
	80						

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Field Tech GMC
Prepared By GS
Checked By CB

Bayside Village
Newport Beach, California

MACTEC

LOG OF BORING
Project: 4953-04-2401 Figure: A - 1.3b

BORING 4

DATE DRILLED: September 20, 2004
EQUIPMENT USED: Rotary Wash
HOLE DIAMETER (in.): 5
ELEVATION: 6.0**

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN TEST	MOISTURE (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	SAMPLE LOC.	USCS	DESCRIPTION
5	0						SP	POSSIBLE FILL - POORLY GRADED SAND - medium dense, moist, light brown, few shell fragments
							CL	POSSIBLE FILL - SILTY CLAY - soft, moist, medium to dark gray
	5						CL	▽ SILTY CLAY - soft, moist, dark gray
0					4	⊠	SP	POORLY GRADED SAND - loose, moist, gray
					17	⊠		becomes medium dense
-5	10	17				⊠		
		37				⊠		becomes dense
-10	15	36				⊠		
-15	20	18				⊠		becomes medium dense, little shell fragments
		58				⊠		becomes very dense
-20	25	41				⊠		becomes dense
		48				⊠		
-25	30	31				⊠		becomes very dense
-30	35	34				⊠		becomes dense
								End Boring at 35½'
	40							

NOTES: Upper 5' of soil was hand-augered. Water encountered at a depth of 5'2" below ground surface. Boring backfilled with grout.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Field Tech: AR
Prepared By: LT
Checked By: CS

BORING 5

DATE DRILLED: September 20, 2004
EQUIPMENT USED: Rotary Wash
HOLE DIAMETER (in.): 5
ELEVATION: 13 ft **

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	MOISTURE (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	SAMPLE LOC.	USCS	DESCRIPTION
13	0						CL	FILL - SILTY CLAY - stiff, moist, reddish brown
							SP	POORLY GRADED SAND - medium dense, moist, gray, some shell fragments and rootlets
	5				11	☒	SP	POORLY GRADED SAND - medium dense, moist, light brownish yellow, few shell fragments
					4/9"	☒		loose, wet, bluish gray
							CL	SILTY CLAY - soft, wet, light and dark gray
	10	2				☒	SM-SP	SILTY SAND - medium dense, moist, gray ▽
								layer of silt
		12				☒		layer of silt
	15	28				☒		
	20	42				☒	SP	POORLY GRADED SAND - dense, moist, light gray
		62				☐		becomes very dense, sample not recovered
	25	44				☒		becomes medium dense
		15				☒		few shell fragments
	30	40				☒		becomes dense
	35	48				☒		End Boring at 35½'

NOTES: The upper 5' soil was hand-augered. Water encountered at a depth of 12'. Boring backfilled with grout.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Field Tech.: AR
Prepared By: LT
Checked By: CS

Bayside Village
Newport Beach, California

MACTEC

LOG OF BORING
Project: 4953-04-2401
Figure: A-1.5

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

BORING 6

DATE DRILLED: September 20, 2004
EQUIPMENT USED: Rotary Wash
HOLE DIAMETER (in.): 5
ELEVATION: 10.0 **

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD.PEN.TEST	MOISTURE (% of dry wt.)	DRY DENSITY (pcf)	BLOW COUNT* (blows/ft)	SAMPLE LOC.	USCS	DESCRIPTION
							SP	FILL - POORLY GRADED SAND - medium dense, moist, light and dark brown
							SP	POORLY GRADED SAND - medium dense, moist, light brown, few shell fragments
5	5							
					11	☒		
					3	☒		▽ 1' layer of soft clay, dark gray
0	10							
		14				☒		few shell fragments
		32				☒		becomes dense
-5	15							
		41				☒		
-10	20	46				☒		gray
		36				☒		
-15	25	26				☒		becomes medium dense
		63				☒		becomes very dense
-20	30							
		44				☒		becomes dense
-25	35	75				☒		becomes very dense
								End Boring at 35½'
								NOTES: The upper 5' of soil was hand-augered. Water encountered at a depth of 8'. Boring backfilled with grout.
	40							

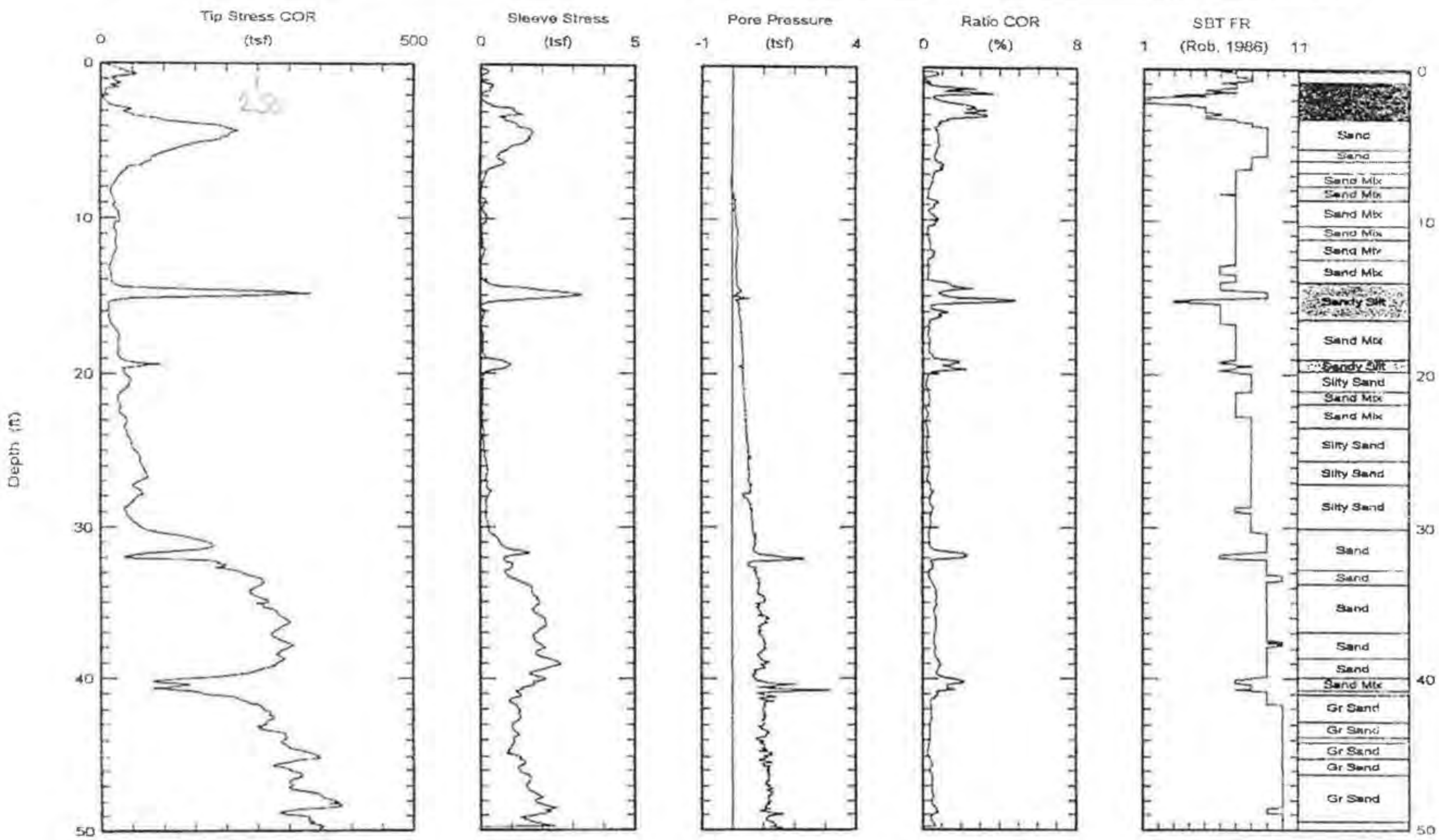
Field Tech.: AR
Prepared By: LT
Checked By: C.x.

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

CPT Data
30 ton rig

Date: 06/Aug/2004
Test ID: C-1
Project: NewportBeach

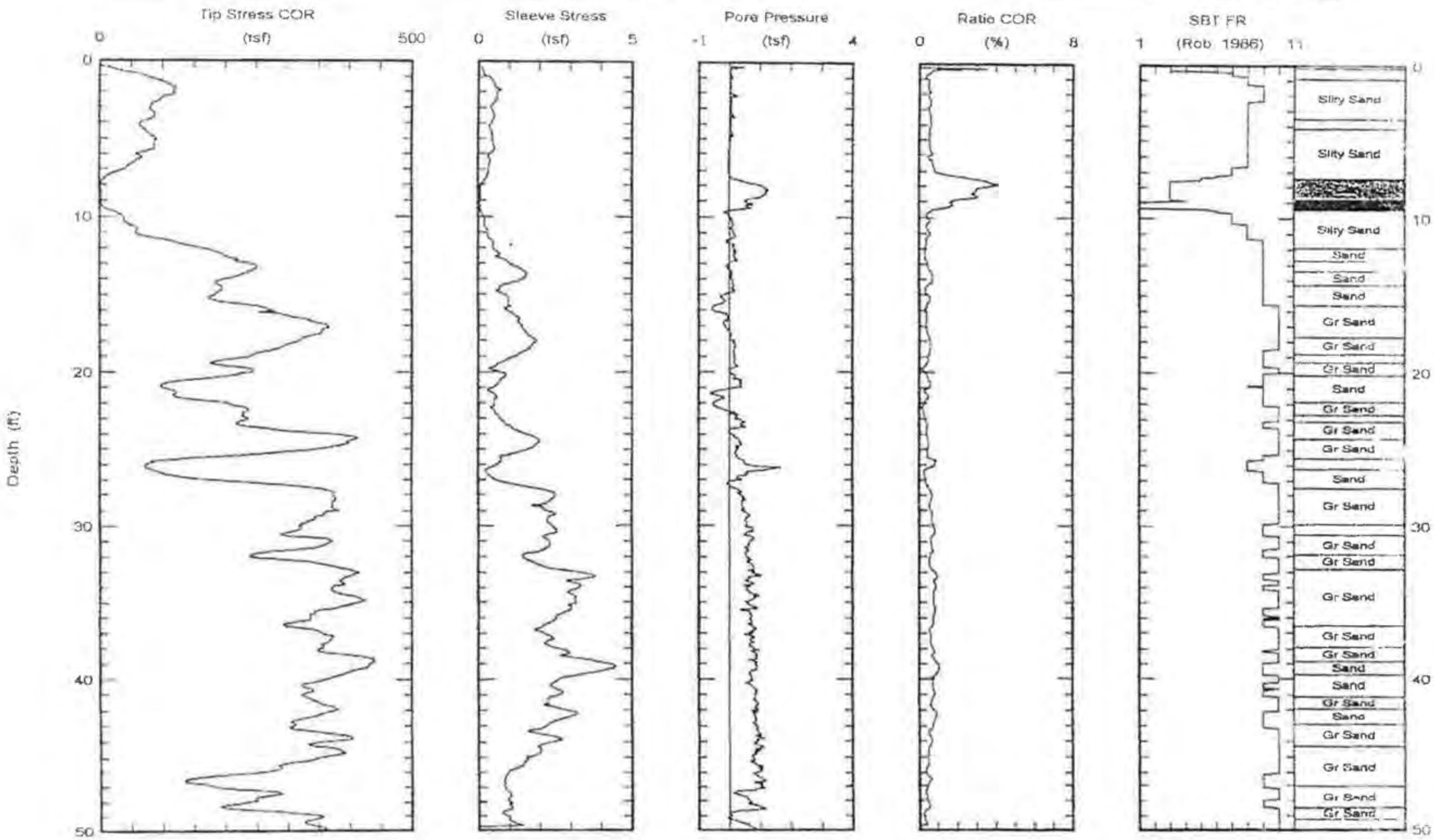
Client: MACTEC
Job Site: Bayside Village Project



Maximum depth: 50.08 (ft)

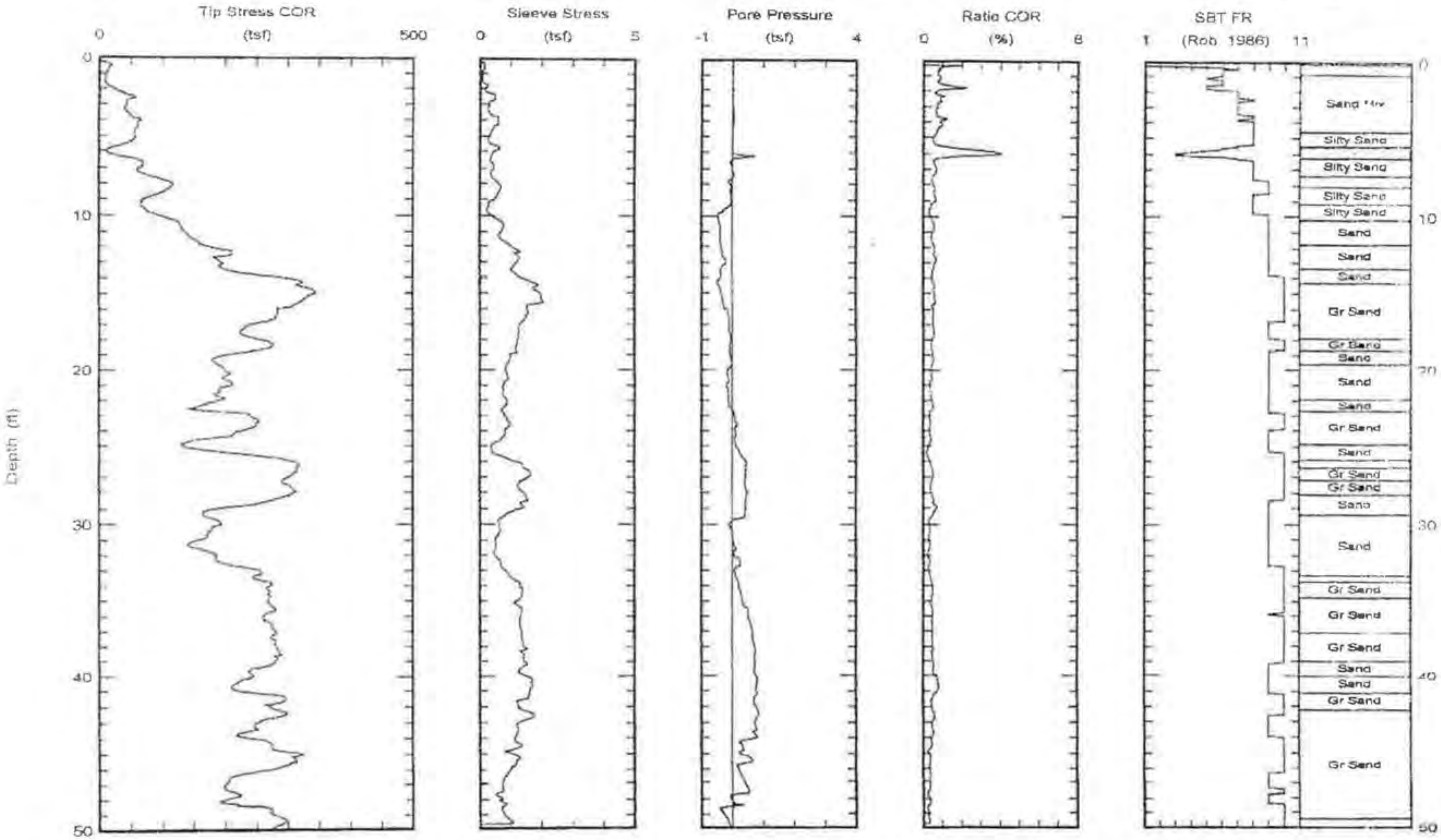
Test ID: C-1

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 skehoe@msn.com	CPT Data 30 ton rig	Date: 06/Aug/2004 Test ID: C-2 Project: NewportBeach
	Client: MACTEC Job Site: Bayside Village Project	



Maximum depth: 50.04 (ft)

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 skehoe@msn.com	CPT Data 30 ton rig	Date: 06/Aug/2004 Test ID: C-3 Project: NewportBeach
	Client: MACTEC Job Site: Bayside Village Project	



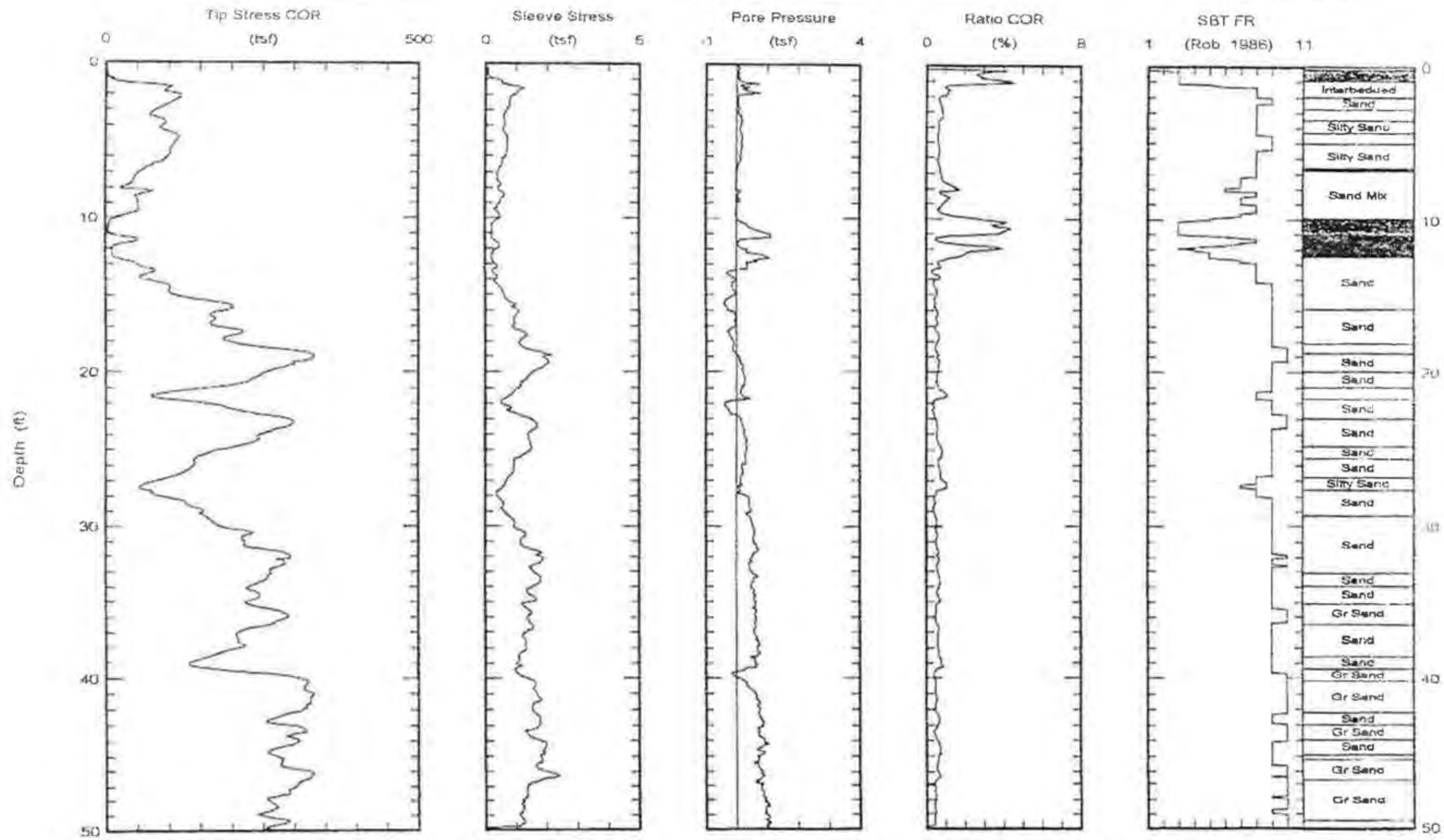
Maximum depth: 50.06 (ft)

Page 1 of 2

Test ID: C-3

File: C08-04055 ECP

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 skehoe@msn.com	CPT Data 30 ton rig	Date: 06/Aug/2004 Test ID: C-4 Project: NewportBeach
	Client: MACTEC Job Site: Bayside Village Project	



Maximum depth: 50.15 (ft)

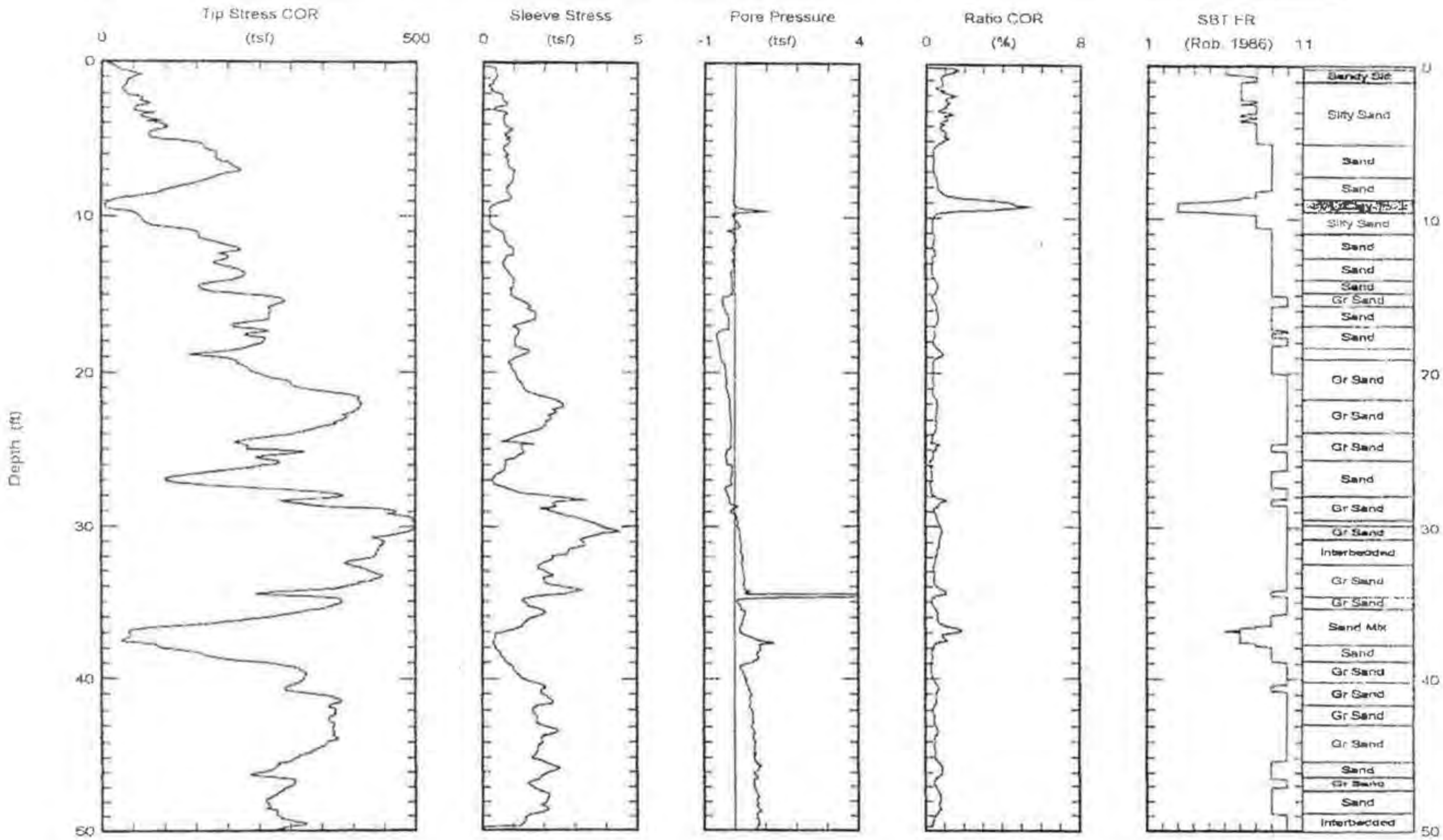
Test ID: C-4
File: [illegible]

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

CPT Data
30 ton rig

Date: 06/Aug/2004
Test ID: C-5
Project: NewportBeach

Client: MACTEC
Job Site: Bayside Village Project



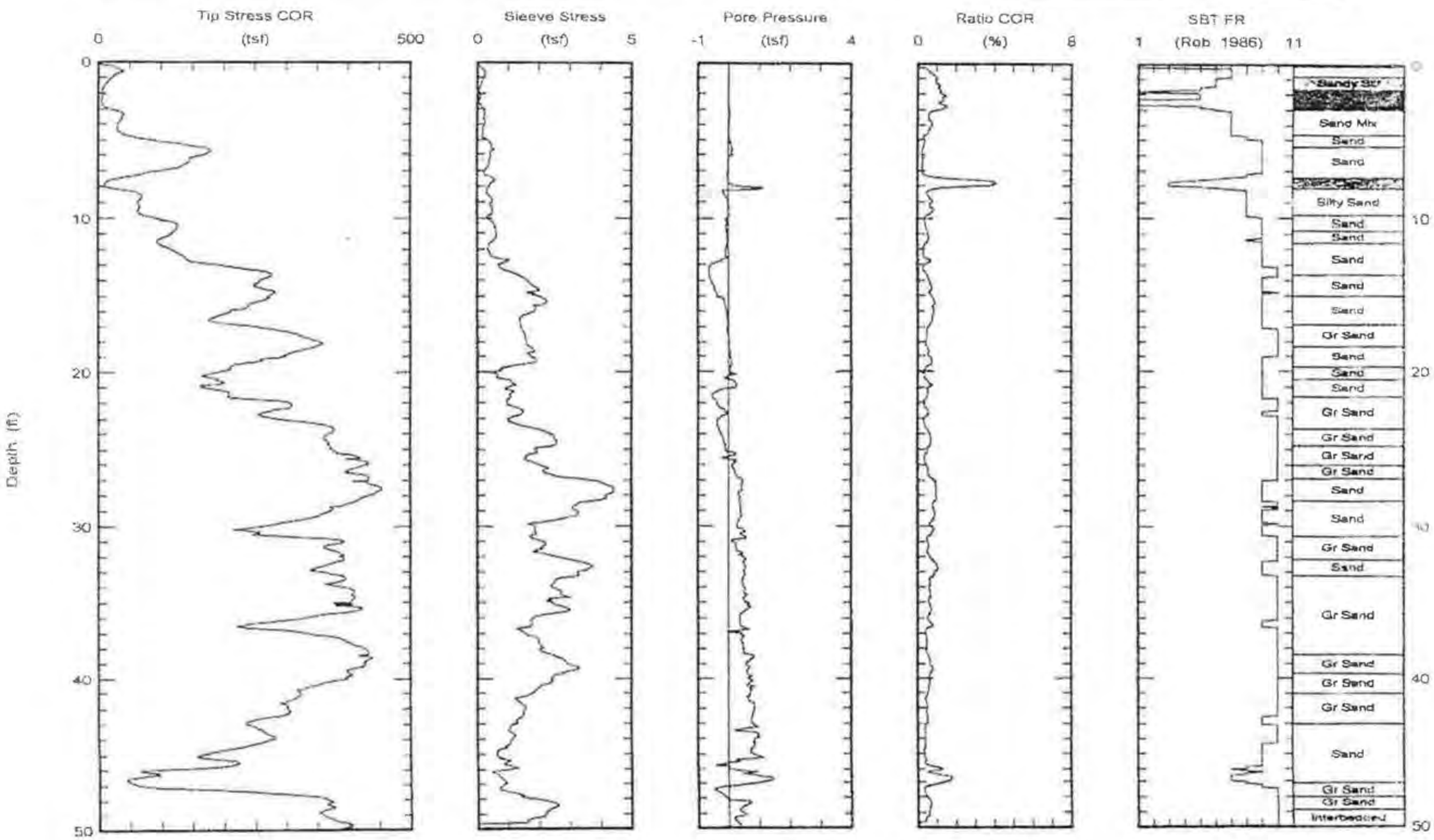
Maximum depth: 50.09 (ft)

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

CPT Data
30 ton rig

Date: 06/Aug/2004
Test ID: SCPT-6
Project: NewportBeach

Client: MACTEC
Job Site: Bayside Village Project



Maximum depth: 50.00 (ft)
Page 1 of 2

Test ID: SCPT-6

Appendix C

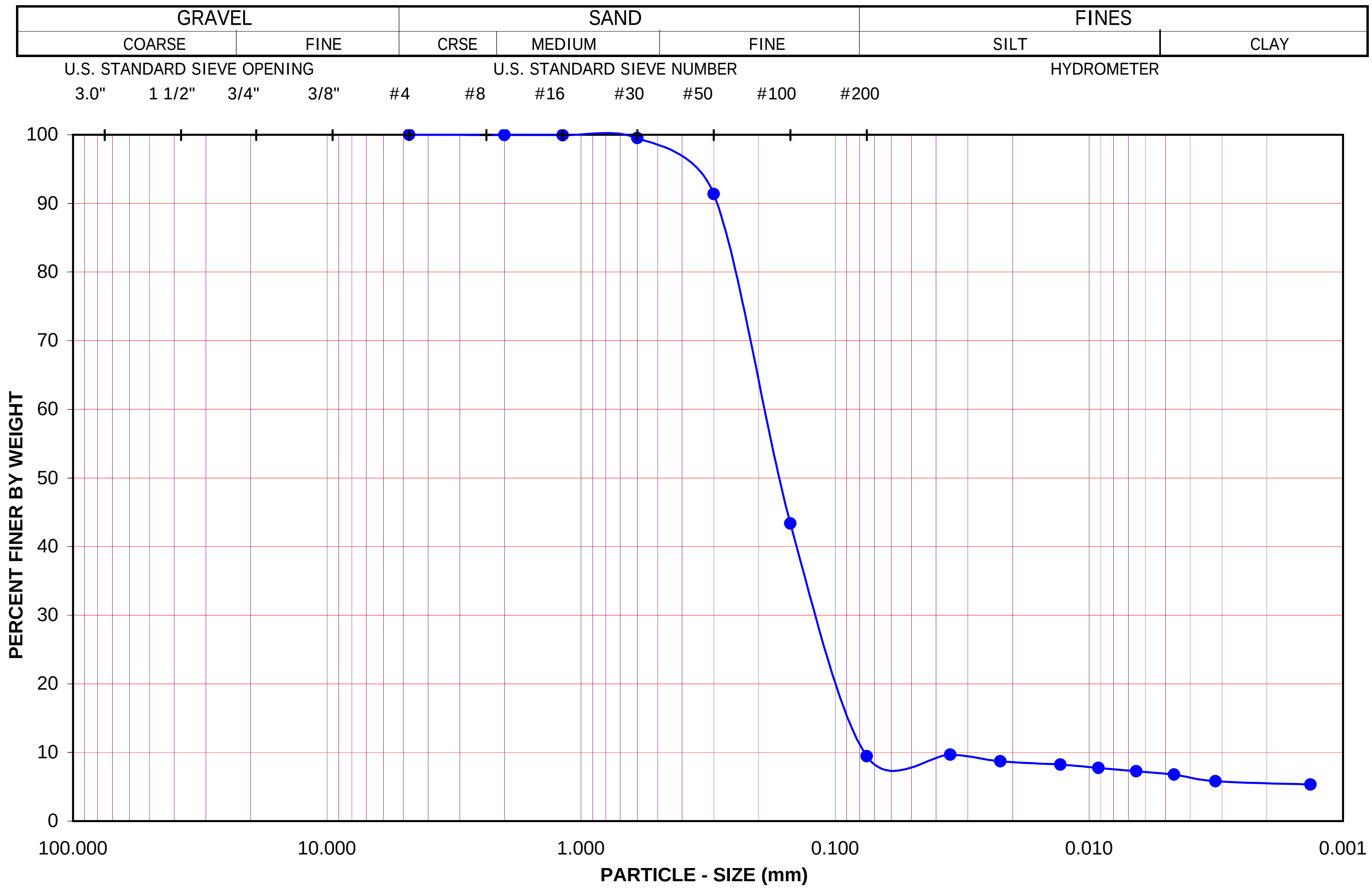
Laboratory Test Results

Boring No.	LBH-1	LBH-1	LBH-2	LBH-3	LBH-3			
Sample No.	S1	R5	S3	S1	R6			
Depth (ft.)	13.5	18.5	35	18.5	25			
Sample Type	SPT	Drive	SPT	SPT	Drive			
Soil Identification	Dark olive gray silty sand (SM)	Olive gray poorly-graded sand with silt (SP-SM), shells noted	Olive gray poorly-graded sand with silt (SP-SM)	Dark gray poorly-graded sand with silt (SP-SM), shells noted	Olive gray poorly-graded sand with silt (SP-SM), shells noted			
Moisture Correction								
Wet Weight of Soil + Container (g)	0.00	0.00	0.00	0.00	0.00			
Dry Weight of Soil + Container (g)	0.00	0.00	0.00	0.00	0.00			
Weight of Container (g)	1.00	1.00	1.00	1.00	1.00			
Moisture Content (%)	0.00	0.00	0.00	0.00	0.00			
Sample Dry Weight Determination								
Weight of Sample + Container (g)	573.90	696.20	583.40	596.80	639.60			
Weight of Container (g)	137.10	145.10	126.80	140.80	140.10			
Weight of Dry Sample (g)	436.80	551.10	456.60	456.00	499.50			
Container No.:								
After Wash								
Method (A or B)	B	B	B	B	B			
Dry Weight of Sample + Cont. (g)	507.80	647.40	554.70	572.50	614.60			
Weight of Container (g)	137.10	145.10	126.80	140.80	140.10			
Dry Weight of Sample (g)	370.70	502.30	427.90	431.70	474.50			
% Passing No. 200 Sieve	**15.1**	**8.9**	**6.3**	**5.3**	**5.0**			
% Retained No. 200 Sieve	84.9	91.1	93.7	94.7	95.0			

Leighton

PERCENT PASSING
No. 200 SIEVE
ASTM D 1140

Project Name: Bayside Village
Project No.: 602668-002
Client Name: LCI / Irvine
Tested By: S. Felter Date: 12/07/09



Project Name: Bayside Village

Project No.: 602668-002

Exploration No.: LBH-3 | Sample No.: R4

Depth (feet) : 8.5 | Soil Type : SP-SM

Soil Identification: Dark gray poorly-graded sand with silt (SP-SM)

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422

GR:SA:FI : (%) 0 : 91 : 9

Dec-09

ATTERBERG LIMITS
ASTM D 4318

Leighton

Project Name:	Bayside Village	Tested By:	V. Juliano	Date:	12/14/09
Project No. :	602668-002	Input By:	J. Ward	Date:	12/15/09
Boring No.:	LBH-1	Checked By:	J. Ward		
Sample No.:	R-4	Depth (ft.)	8.5		
Soil Identification:	Olive gray silty sand (SM)				

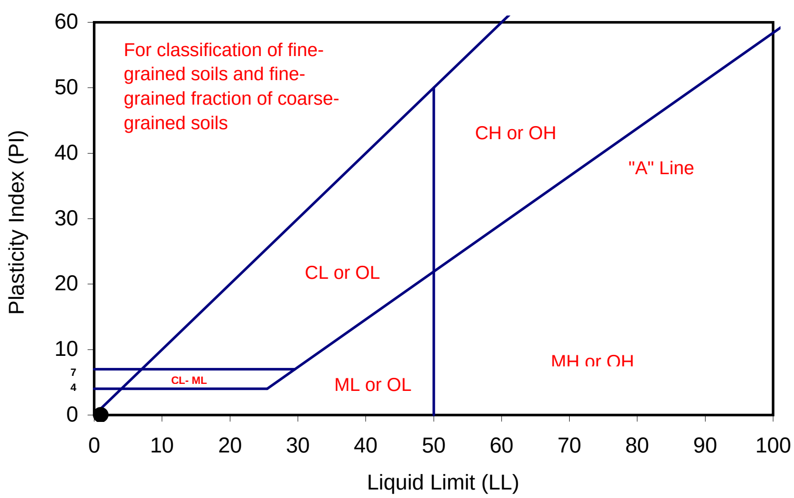
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			4			
Wet Wt. of Soil + Cont. (g)	**Cannot be rolled:**		14.19	**Cannot get more than 4 blows:**		
Dry Wt. of Soil + Cont. (g)	**NonPlastic**		11.67	**NonPlastic**		
Wt. of Container (g)			1.11			
Moisture Content (%) [Wn]			23.86			

Liquid Limit	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
Classification	**NP**

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

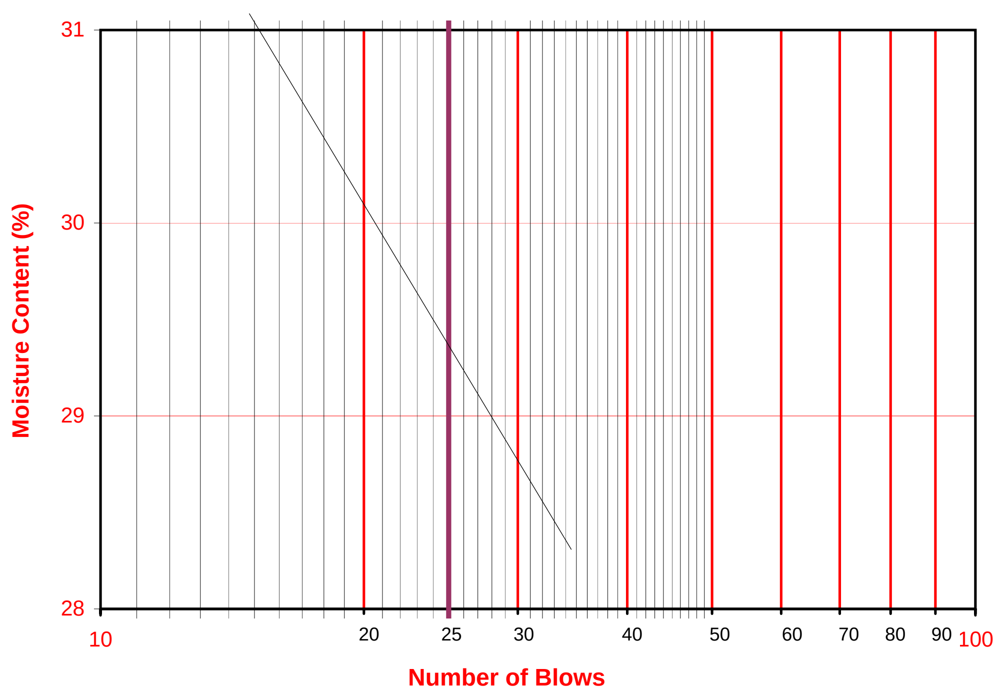
One - Point Liquid Limit Calculation

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



PROCEDURES USED

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



ATTERBERG LIMITS

ASTM D 4318

Leighton

Project Name:	Bayside Village	Tested By:	V. Juliano	Date:	12/14/09
Project No. :	602668-002	Input By:	J. Ward	Date:	12/15/09
Boring No.:	LBH-3	Checked By:	J. Ward		
Sample No.:	R-4	Depth (ft.)	5.0		
Soil Identification:	Dark gray poorly-graded sand with silt (SP-SM)				

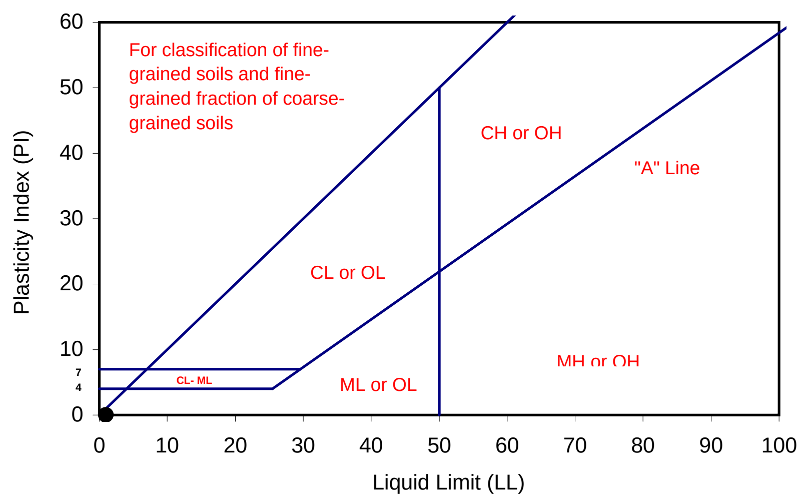
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			5			
Wet Wt. of Soil + Cont. (g)	**Cannot be rolled:**		13.89	**Cannot get more than 5 blows:**		
Dry Wt. of Soil + Cont. (g)	**NonPlastic**		10.74	**NonPlastic**		
Wt. of Container (g)			1.08			
Moisture Content (%) [Wn]			32.61			

Liquid Limit	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
Classification	**NP**

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

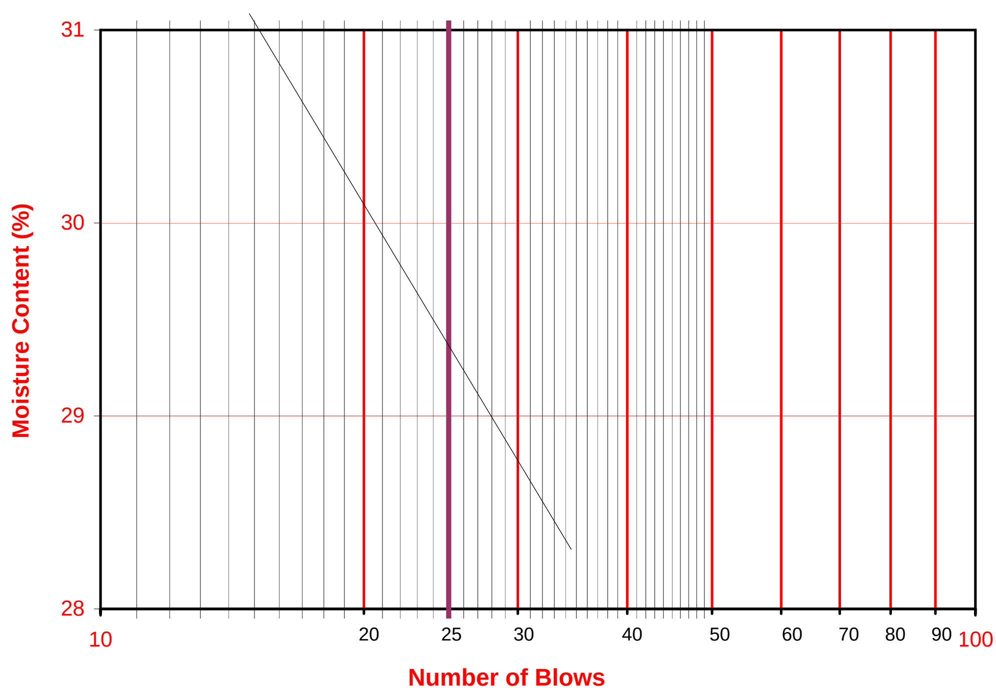
One - Point Liquid Limit Calculation

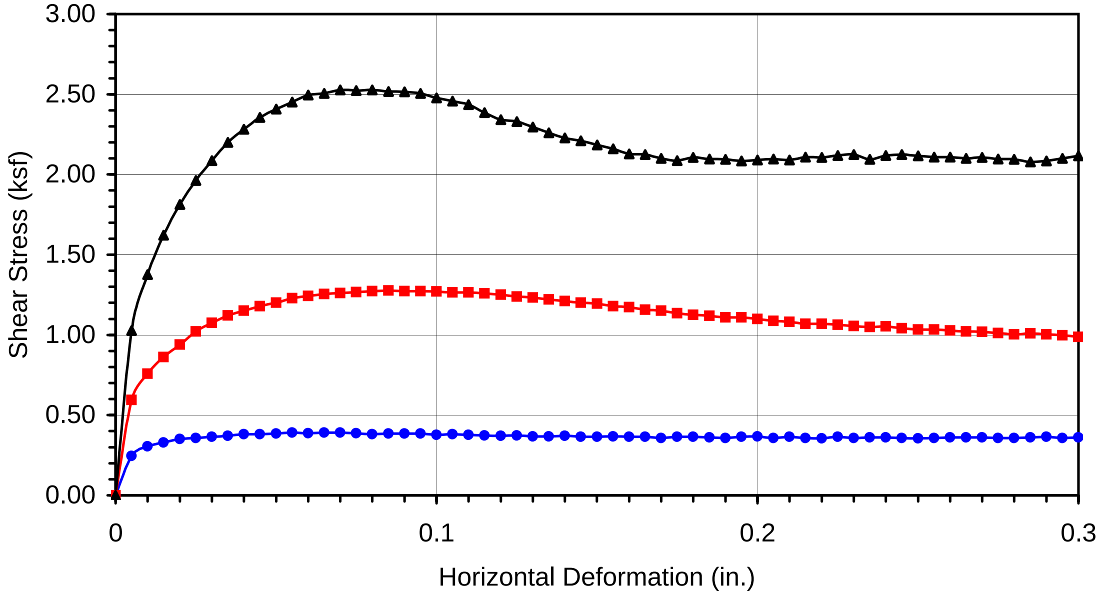
$LL = Wn(N/25)^{0.12}$

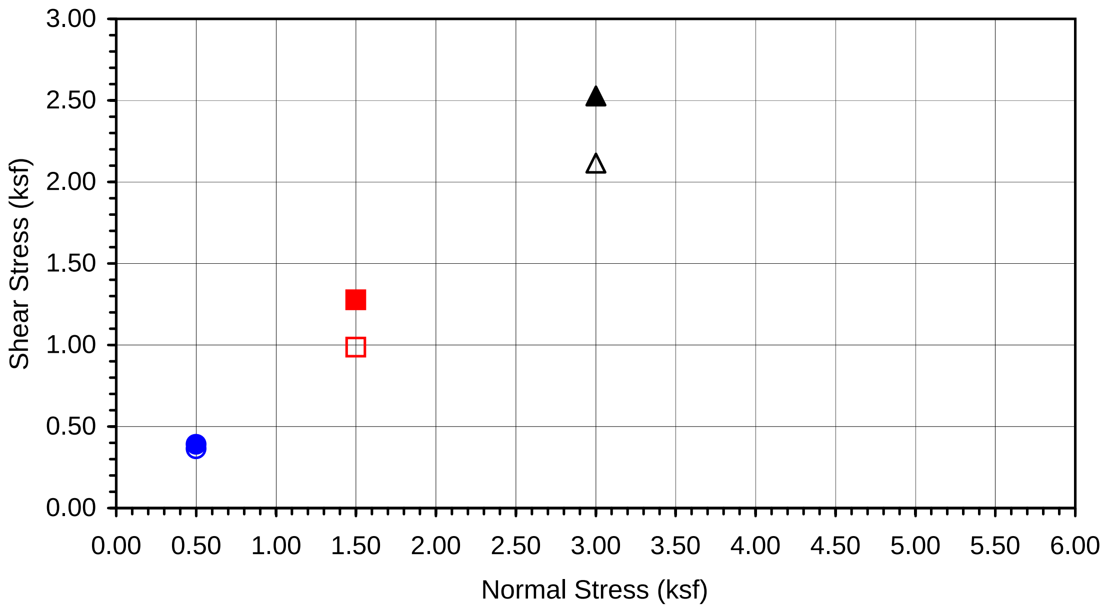


PROCEDURES USED

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







Boring No.	**LBH-2**
Sample No.	**R4**
Depth (ft)	**13.5**

Sample Type:

Drive

Soil Identification:
Yellowish brown poorly-graded sand with silt (SP-SM)

Normal Stress (kip/ft²)	0.500	1.500	3.000
Peak Shear Stress (kip/ft²)	● 0.390	■ 1.276	▲ 2.528
Shear Stress @ End of Test (ksf)	○ 0.362	□ 0.987	△ 2.116
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 (%)	22.19	22.19	22.19
Dry Density (pcf)	102.7	103.5	105.4
Saturation (%)	93.5	95.3	100.0
Soil Height Before Shearing (in.)	0.9920	0.9903	0.9867
Final Moisture Content (%)	23.4	22.5	22.8

Leighton

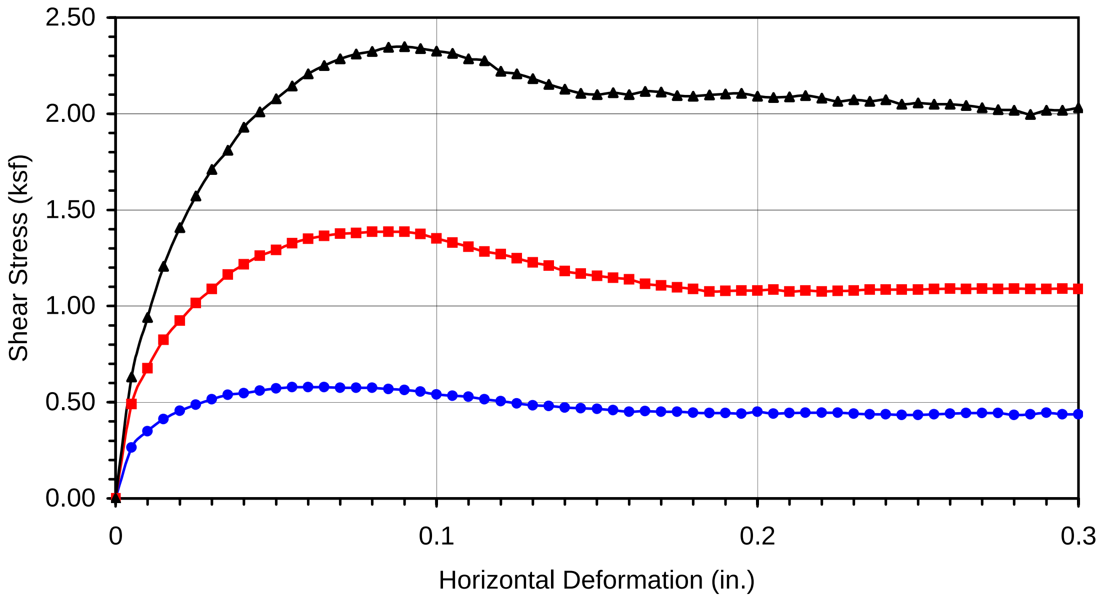
DIRECT SHEAR TEST RESULTS

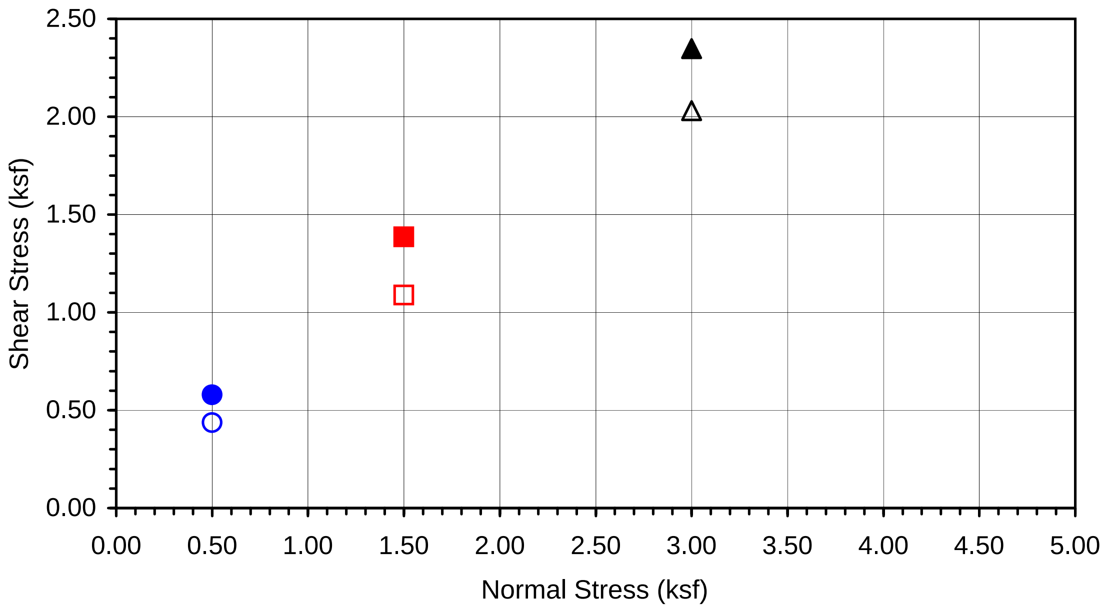
Consolidated Undrained

Project No.: 602668-002

Bayside Village

12-09





Boring No.	**LBH-3**
Sample No.	**R3**
Depth (ft)	**6**

Sample Type:

Drive

Soil Identification:

Olive gray silty sand (SM), shells noted

Normal Stress (kip/ft²)	0.500	1.500	3.000
Peak Shear Stress (kip/ft²)	● 0.578	■ 1.386	▲ 2.348
Shear Stress @ End of Test (ksf)	○ 0.437	□ 1.088	△ 2.031
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 (%)	3.67	3.67	3.67
Dry Density (pcf)	89.4	93.1	96.4
Saturation (%)	11.2	12.2	13.3
Soil Height Before Shearing (in.)	0.9937	0.9913	0.9868
Final Moisture Content (%)	25.6	23.2	22.6

Leighton

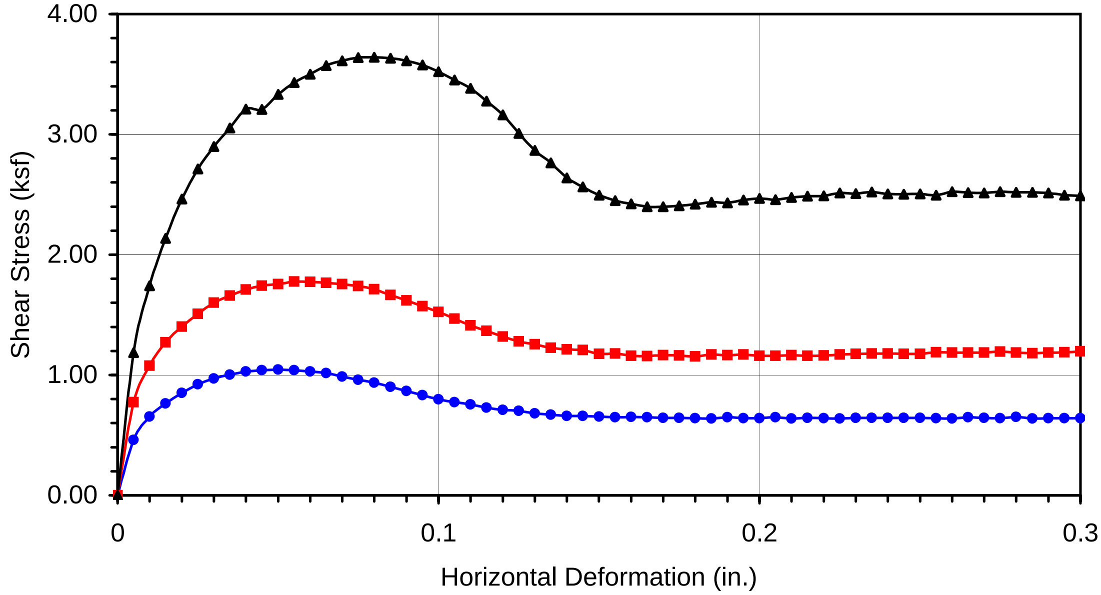
DIRECT SHEAR TEST RESULTS

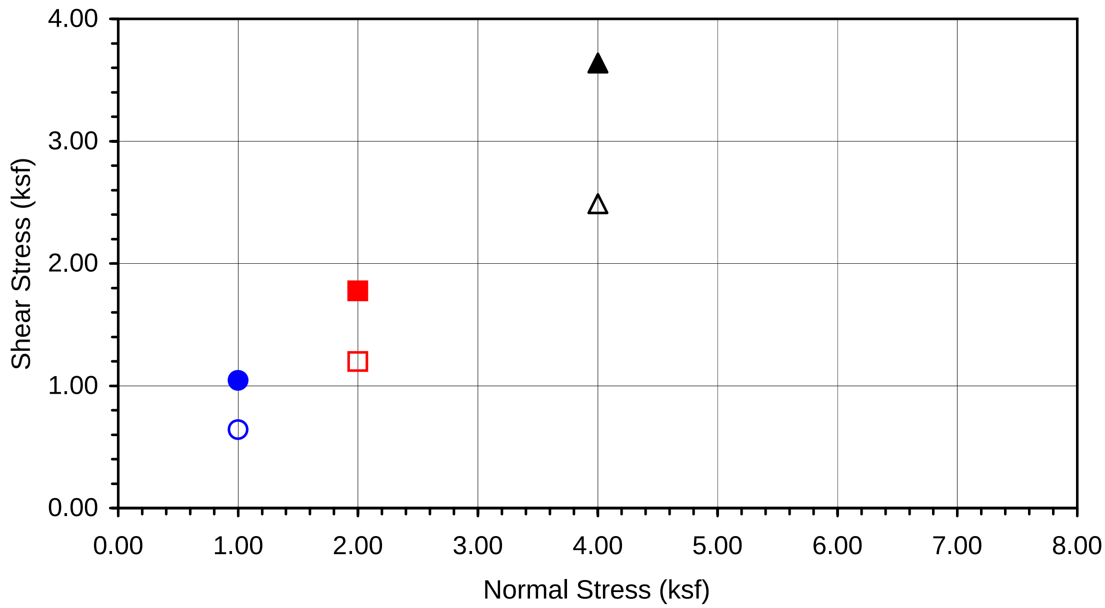
Consolidated Undrained

Project No.: 602668-002

Bayside Village

12-09





Boring No.	**LBH-3**
Sample No.	**R5**
Depth (ft)	**13.5**

Sample Type:

Drive

Soil Identification:
Dark olive gray poorly-graded sand with silt (SP-SM)

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 1.044	■ 1.776	▲ 3.640
Shear Stress @ End of Test (ksf)	○ 0.641	□ 1.198	△ 2.490
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 (%)	20.31	20.31	20.31
Dry Density (pcf)	106.3	105.2	107.2
Saturation (%)	93.6	91.1	95.9
Soil Height Before Shearing (in.)	0.9928	0.9876	0.9795
Final Moisture Content (%)	21.8	21.7	21.9

Leighton

DIRECT SHEAR TEST RESULTS
Consolidated Undrained

Project No.: 602668-002

Bayside Village

12-09

Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

ASTM D 2850

Project Name:	Bayside Village	Tested by: A. Santos	Date: 12/09/09
Project No:	602668-002	Checked by: J. Ward	Date: 12/11/09
Boring No.:	LBH-1	Sample Type: Drive	
Sample No.:	R4	Depth(ft): 8.5	
Sample Description:	Olive gray silty sand (SM)		

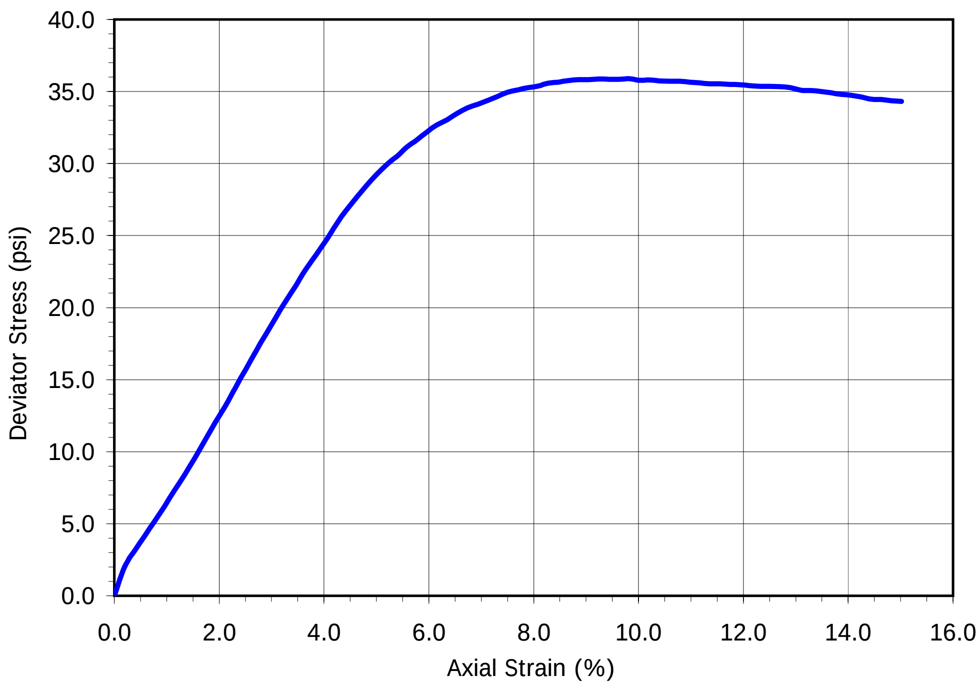
Diameter (in)	1	2.401
	2	2.407
	3	2.412
	Average	2.407
Height (in)	1	5.192
	2	5.194
	3	5.195
	Average	5.193
Weight of Sample + Tube / Rings (g)		1010.30
Weight of Tube / Rings (g)		258.10
Weight of Wet Sample + Container (g)		858.80
Weight of Dry Sample + Container (g)		694.80
Weight of Container (g)		108.51
Specific Gravity (assumed)		2.70
Confining Pressure (psi)		3.1
Rate of Deformation (in/min)		0.045

Sample Properties	
Moisture Content (%)	27.97
Dry Density (pcf)	94.8
Void Ratio	0.778
% Saturation	97.1

At Failure*	
Deviator stress (psi)	**35.88**
Minor principal total stress (psi)	**3.10**
Major principal total stress (psi)	**38.98**
Axial strain (%)	**9.82**

* Stress values have been corrected for membrane effects

Stress - Strain Curve



Leighton

R-VALUE TEST RESULTS

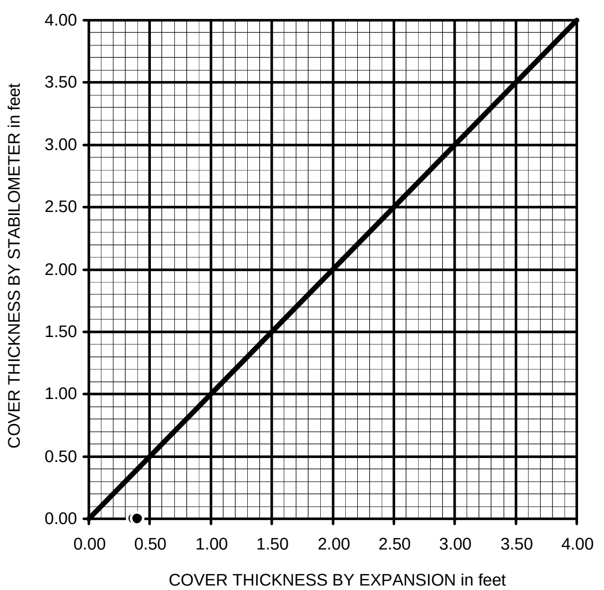
DOT CA 301

PROJECT NAME:	Bayside Village	PROJECT NUMBER:	602668-002
BORING NUMBER:	LBH-2	DEPTH (FT.):	0-5
SAMPLE NUMBER:	BB1	TECHNICIAN:	S. Felter
SAMPLE DESCRIPTION:	Light grayish brown silty sand (SM)	DATE COMPLETED:	12/9/2009

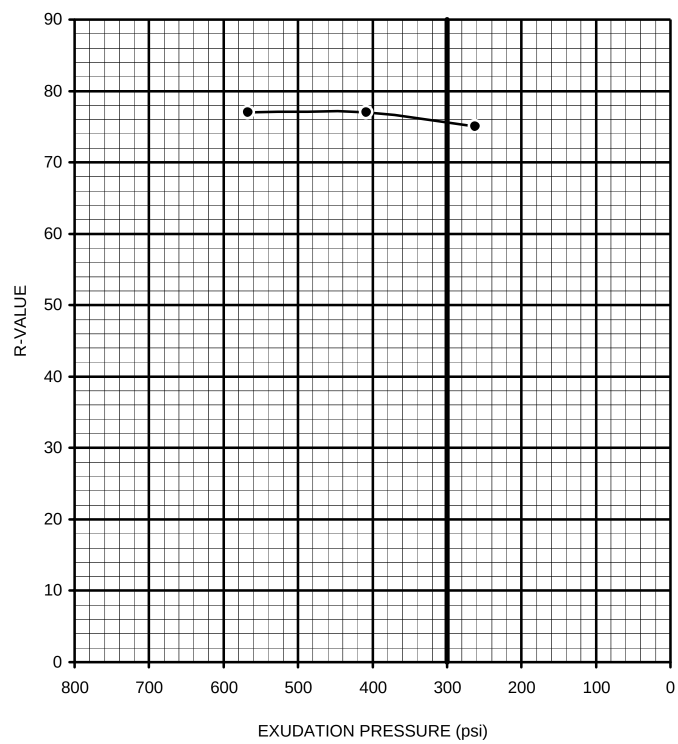
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	10.9	11.8	12.2
HEIGHT OF SAMPLE, Inches	2.65	2.60	2.69
DRY DENSITY, pcf	99.9	100.9	99.6
COMPACTOR PRESSURE, psi	200	150	100
EXUDATION PRESSURE, psi	567	409	262
EXPANSION, Inches x 10exp-4	0	0	0
STABILITY Ph 2,000 lbs (160 psi)	24	25	27
TURNS DISPLACEMENT	4.68	4.57	4.56
R-VALUE UNCORRECTED	75	75	73
R-VALUE CORRECTED	77	77	75

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.37	0.37	0.40
EXPANSION PRESSURE THICKNESS, ft.	0.00	0.00	0.00

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	N/A
R-VALUE BY EXUDATION:	76
EQUILIBRIUM R-VALUE:	76

SOIL RESISTIVITY TEST

DOT CA TEST 532 / 643

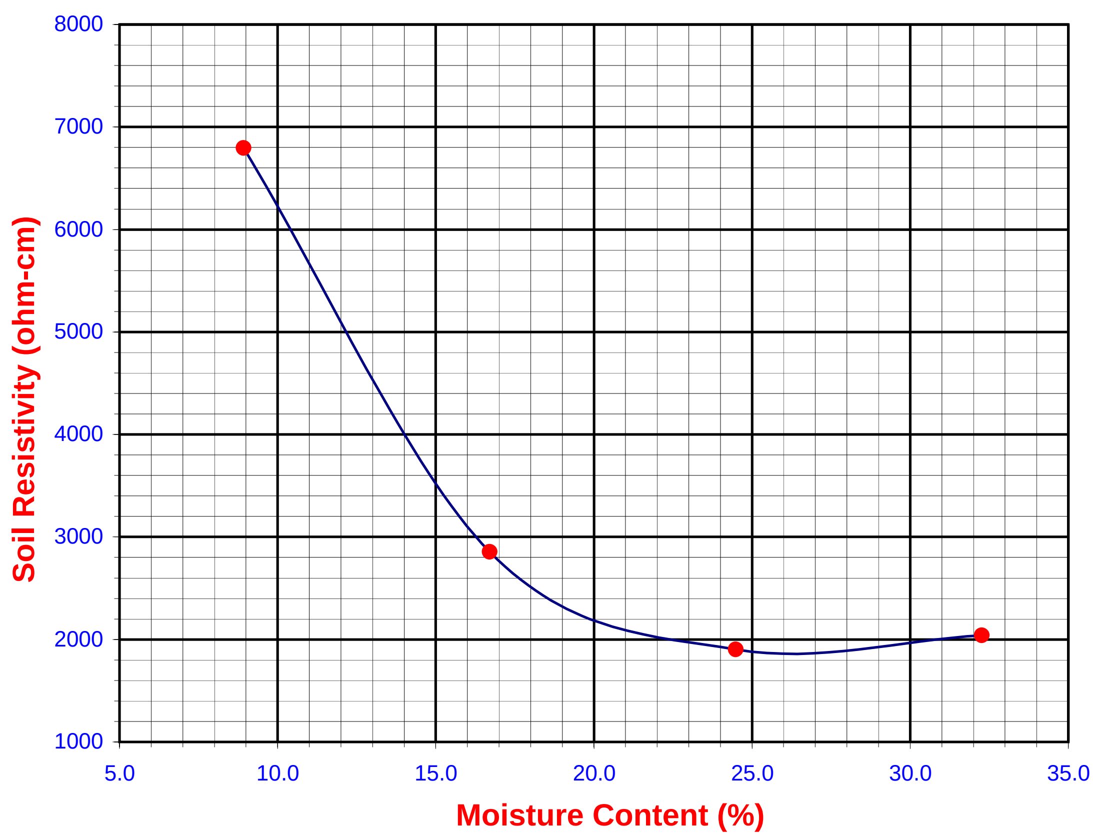
Leighton

Project Name:	Bayside Village	Tested By :	V. Juliano Date: 12/15/09
Project No. :	602668-002	Data Input By:	J. Ward Date: 12/16/09
Boring No.:	LBH-1	Depth (ft.) :	0-5
Sample No. :	BB1		
Soil Identification:	Brown (SP-SM)		

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	100	8.93	1000	6796
2	200	16.71	420	2854
3	300	24.49	280	1903
4	400	32.27	300	2039
5				

Moisture Content (%) (MCi)	1.15
Wet Wt. of Soil + Cont. (g)	188.00
Dry Wt. of Soil + Cont. (g)	186.30
Wt. of Container (g)	38.00
Container No.	
Initial Soil Wt. (g) (Wt)	1300.00
Box Constant	6.796
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	
1900	**26.2**	**250**	**162**	**7.43**	**19.1**



Leighton

SOIL RESISTIVITY TEST

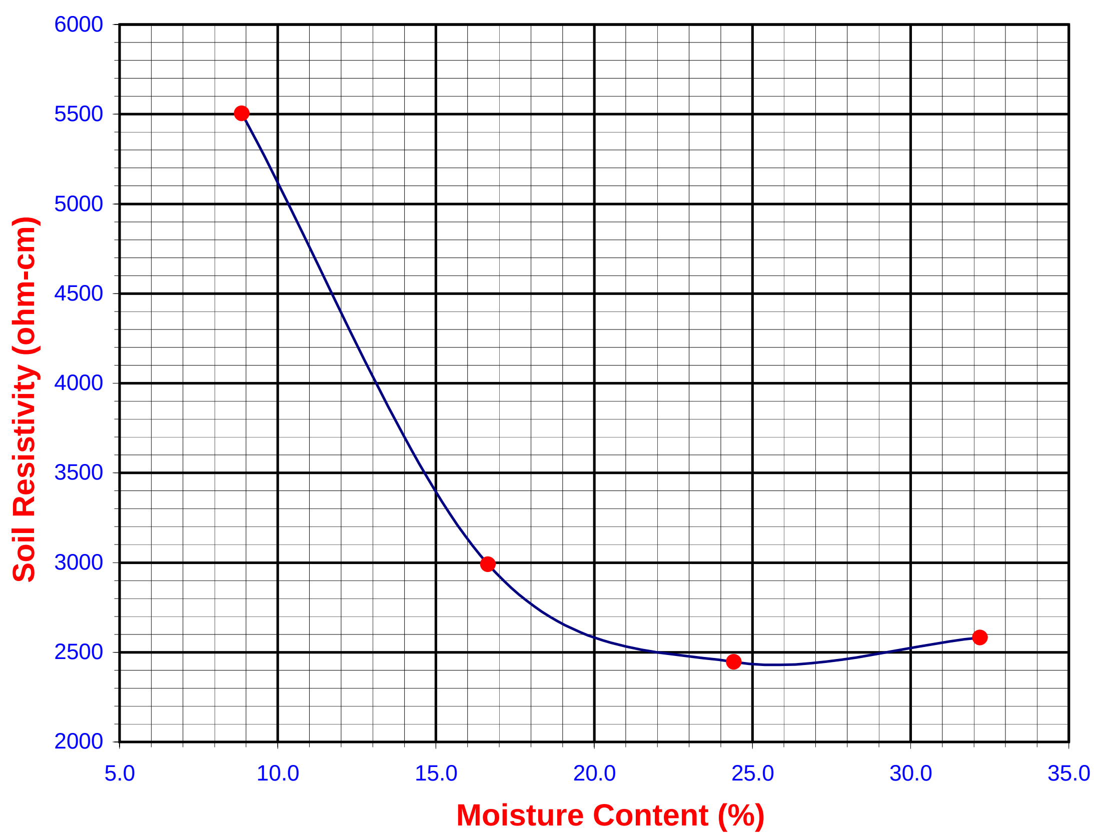
DOT CA TEST 532 / 643

Project Name:	Bayside Village	Tested By :	V. Juliano Date: 12/15/09
Project No. :	602668-002	Data Input By:	J. Ward Date: 12/16/09
Boring No.:	LBH-3	Depth (ft.) :	0-5
Sample No. :	BB1		
Soil Identification:	Olive brown (SM), shells noted		

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	100	8.87	810	5505
2	200	16.64	440	2990
3	300	24.42	360	2447
4	400	32.20	380	2582
5				

Moisture Content (%) (MCi)	1.09
Wet Wt. of Soil + Cont. (g)	190.70
Dry Wt. of Soil + Cont. (g)	189.30
Wt. of Container (g)	60.90
Container No.	
Initial Soil Wt. (g) (Wt)	1300.00
Box Constant	6.796
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	
2430	**25.8**	**141**	**51**	**7.30**	**19.2**



APPENDIX D

SEISMIC HAZARD ANALYSIS

APPENDIX D

SITE-SPECIFIC GROUND MOTION HAZARD ANALYSIS

Background

Leighton Consulting, Inc. has performed a site-specific ground motion study in accordance with the requirements of the 2010 California Building Code. A probabilistic seismic hazard analysis (PSHA) and deterministic seismic hazard analysis (DSHA) were performed concurrently to evaluate the likelihood of future earthquake ground motions at the project site. The PSHA and DSHA incorporate the results of three different attenuation relationships by Boore and Atkinson (2008), Campbell and Bozorgnia (2008), and Chiou and Youngs (2008).

Considering the size and orientation of the project site, we evaluated the site-specific ground motion hazard at a central location with site coordinates of 33.618733° N, 117.900931° W). The subsurface profile beneath the project site has been classified as Stiff Soil (CBC Site Class D).

Design Criteria

Shear wave velocities for the chosen location was obtained from the Southern California Earthquake Center's (SCEC's) Community Velocity Model (CVM), Version 4 (Magistrale et al, 2000; Magistrale, 2005). Based on the CVM, an average shear wave velocity (V_{S30}) for the upper 30 meters (100 feet) for the project site was chosen to be 332 meters-per-second (1,089 feet-per-second), $z_{v=1,000m/s}$ was selected to be 305 meters (1,000 feet) and $z_{v=2,500m/s}$ was selected to be 2.47 kilometers (1.53 miles).

The level of earthquake ground motion considered for the PSHA corresponds to the probabilistic Maximum Considered Earthquake (MCE), defined as an earthquake event having a 2 percent probability of being exceeded in 50 years. The MCE event has average return period of about 2,475 years.

The level of earthquake ground motion criteria considered for the DSHA corresponds to the deterministic MCE, defined as the maximum value of the 150-percent of the largest median value at each spectral period for all sources analyzed, but not less than the lower limit stipulated in Figure 21.2-1 of ASCE/SEI 7-10.

Methodology

The 2010 California Building Code (2010 CBC) permits the use of procedures outlined in Chapter 21 of ASCE/SEI 7-10, *Site-Specific Ground Motion Procedures for Seismic Design* of the *Minimum Design Loads for Buildings and Other Structures*, to determine the seismic design parameters when performing a site-specific ground motion hazard analysis. We first perform a PSHA and DSHA, then determine the general procedure (Chapter 11 of ASCE/SEI 7-10) seismic ground motion values, then process the results in accordance with Chapter 21 to determine the site-specific seismic design parameters for the project.

Probabilistic Seismic Hazard Analysis (PSHA)

A PSHA is a mathematical process based on probability and statistics that is used to estimate the mean number of events per year in which the level of some ground motion parameter, Z (peak ground acceleration and/or spectral acceleration in this study), exceeds a specified value z at the locations analyzed. This mean number of events per year, also referred to as "annual frequency of exceedance," is designated as "$\nu(Z \geq z)$." The inverse of this number is called the "average return period" (ARP), which is expressed in terms of years. Having the annual frequency of exceedance of a certain level of acceleration, $\nu(Z \geq z)$, the probability of exceeding that level, $\Pr(Z \geq z)$, within any time period of interest, t, is then obtained assuming a Poisson Distribution as follows:

$$\Pr(Z \geq z) = 1 - e^{-\nu(Z \geq z)t} \qquad \text{(Equation D-1)}$$

This procedure was originally proposed by Cornell (1968), which has been significantly improved during the recent years and is described in more detail by National Research Council (1988) and Earthquake Engineering Research Institute (1989).

PSHA procedures require the specification of probability functions to describe the uncertainty in both the time and location of future earthquake occurrences and the uncertainty in the ground motion level that will be produced at the site. The basic key elements of a PSHA are:

- Defining the location, geometry, and characteristics of earthquake sources relative to the site;
- Specifying an earthquake recurrence relationship for various magnitudes

on each source up to the maximum magnitude;

- Selecting appropriate attenuation relationships, which relate the variation of the earthquake ground motion parameter with earthquake distance, directivity, magnitude, site geology, and subsurface characterization; and
- Determining the probability of exceedence of peak ground accelerations and/or response spectral levels (i.e., seismic hazards) utilizing the above input parameters.

The frequencies of exceedence of different values of peak ground and spectral accelerations at the site were calculated by combining the following probability functions:

- The annual frequency of earthquakes of various magnitudes on a fault obtained from the fault recurrence relationships;
- Given an earthquake of a certain magnitude on a certain fault, the probability distribution of the location of the earthquake on the fault was obtained using the selected rupture area versus magnitude relationship and assuming equal likelihood of rupture along the length and some prescribed probabilities along the depth of the fault; and
- Given an earthquake of a certain magnitude occurring at a certain distance from the site, the probability distribution of ground motion at the site was obtained from the selected attenuation relationships.

The above process is repeated a sufficient number of times to cover all the sources, then summed to obtain the total seismic hazard at the site. This process results in a relationship between ground motion level and the probability of being exceeded.

The computer program EZ-FRISK Version 7.35 Build 001 (Risk Engineering, Inc., 2009) for earthquake hazard analysis was utilized to perform the PSHA.

Deterministic Seismic Hazard Analysis (DSHA)

The DSHA consists of a four-step process (Reiter, 1990):

- Defining the location, geometry, and characteristics of earthquake sources relative to the site;
- Determination of the site-to-source distance for each earthquake source

defined relative to the site;

- Selection of the controlling earthquake relative to the site as defined by some ground motion parameter. The controlling earthquake is defined by the seismic scenario based on the above two steps that produces the largest magnitude of the ground motion parameter being used; and
- Using the controlling earthquake, the ground motion at the site is obtained from the selected attenuation relationships.

The computer program EZ-FRISK incorporated the DSHA computation when performing the PSHA in the section above.

General Procedure Design Parameters

The seismic design parameters were computed as determined by Chapter 1613 of the 2010 CBC. These values are used to process the site-specific design response spectrum to ensure the design response spectrum and the MCE response spectrum meets minimum requirements. The Java program *Seismic Hazard Curves*, *Response Parameters and Design Parameters*, Version 5.0.9a, published by the United States Geological Survey (USGS) was used to determine the general procedure seismic design parameters. The following table provides the general procedure parameters determined from the program:

Table 1. 2010 CBC Seismic Coefficients

CBC Categorization/Coefficient	Site Class D
Site Longitude (decimal degrees)	**117.902° W**
Site Latitude (decimal degrees)	**33.617° N**
Site Class Definition (Table 1613.5.2)	**D**
Mapped Spectral Response Acceleration at 0.2s Period, S_s Figure 1613.5(3)	**1.853**
Mapped Spectral Response Acceleration at 1s Period, S_1 Figure 1613.5(4)	**0.695**
Short Period Site Coefficient at 0.2s Period, F_a (Table 1613.5.3(1))	**1.0**
Long Period Site Coefficient at 1s Period, F_v (Table 1613.5.3(2))	**1.5**
Adjusted Spectral Response Acceleration at 0.2s Period, S_{MS} (Eq. 16-37)	1.853
Adjusted Spectral Response Acceleration at 1s Period, S_{M1} (Eq. 16-38)	1.042
Design Spectral Response Acceleration at 0.2s Period, S_{DS} (Eq. 16-39)	1.235
Design Spectral Response Acceleration at 1s Period, S_{D1} (Eq. 16-40)	0.695

Attenuation Relationships

Attenuation relationships describe the relation of ground motion levels with earthquake magnitude and distance (distance between the site and seismic source), seismic source characteristics, site geology, and subsurface characterization. These relationships can be used to describe the variation of peak ground and response spectral acceleration with earthquake magnitude and distance, and to also incorporate the location geological conditions and near-source effects. Based upon the results of subsurface characterization at the site, attenuation relationships by Boore and Atkinson (2008), Campbell and Bozorgnia (2008), and Chiou and Youngs (2008) were used in the ground motion hazard analyses.

These attenuation relationships are based on the geometric mean of the rotated horizontal components. The selected attenuation relationships also provide an implicit measure of the near-field effects on ground motions.

Peak Ground Acceleration

Plots and tables resulting from the analyses are provided at the rear of this appendix. The contributions of the above mentioned attenuation relationships were averaged to determine both the probabilistic total shaking hazard and the deterministic total shaking hazard at the locations analyzed as described in this appendix. These parameters, along with the values determined by the general procedure, were used to develop the design peak ground acceleration (PGA) and the MCE PGA.

The design PGA for the project site may be taken as 0.495g and the MCE PGA may be taken as 0.743g.

Site-Specific Response Spectra

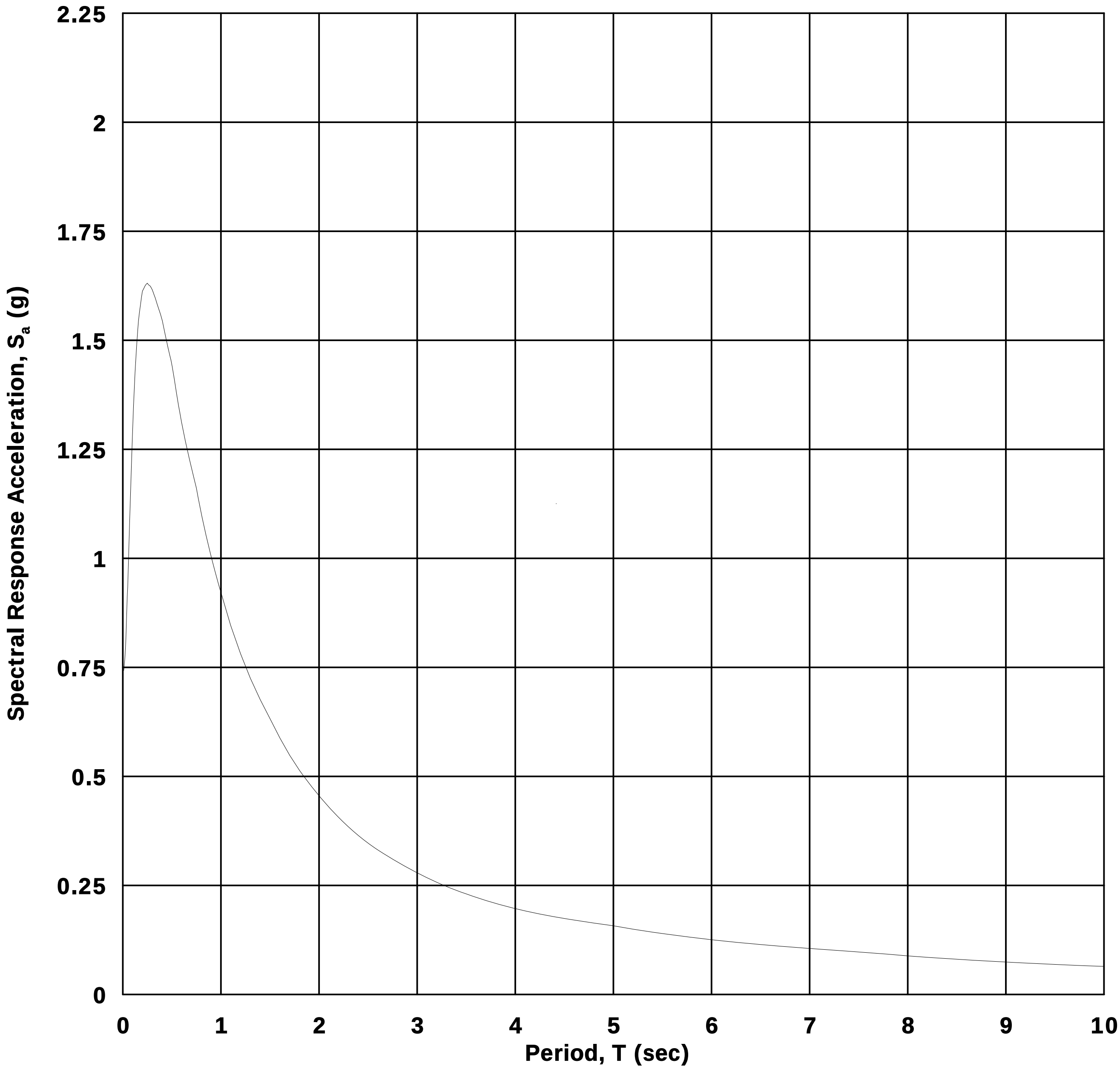
The site-specific design response spectra and MCE response spectra for the location analyzed was determined using the above methodology in accordance with the 2007 CBC and ASCE/SEI 7-05. Their digitized values are provided in this Appendix.

Site-Specific Seismic Design Parameters

When a site-specific ground motion hazard analysis is performed, the seismic design parameters (S_{DS}, S_{D1}, S_{MS}, and S_{M1}) are determined from the site-specific design response spectra. The following site-specific seismic design parameters are to be used for the seismic design of the project:

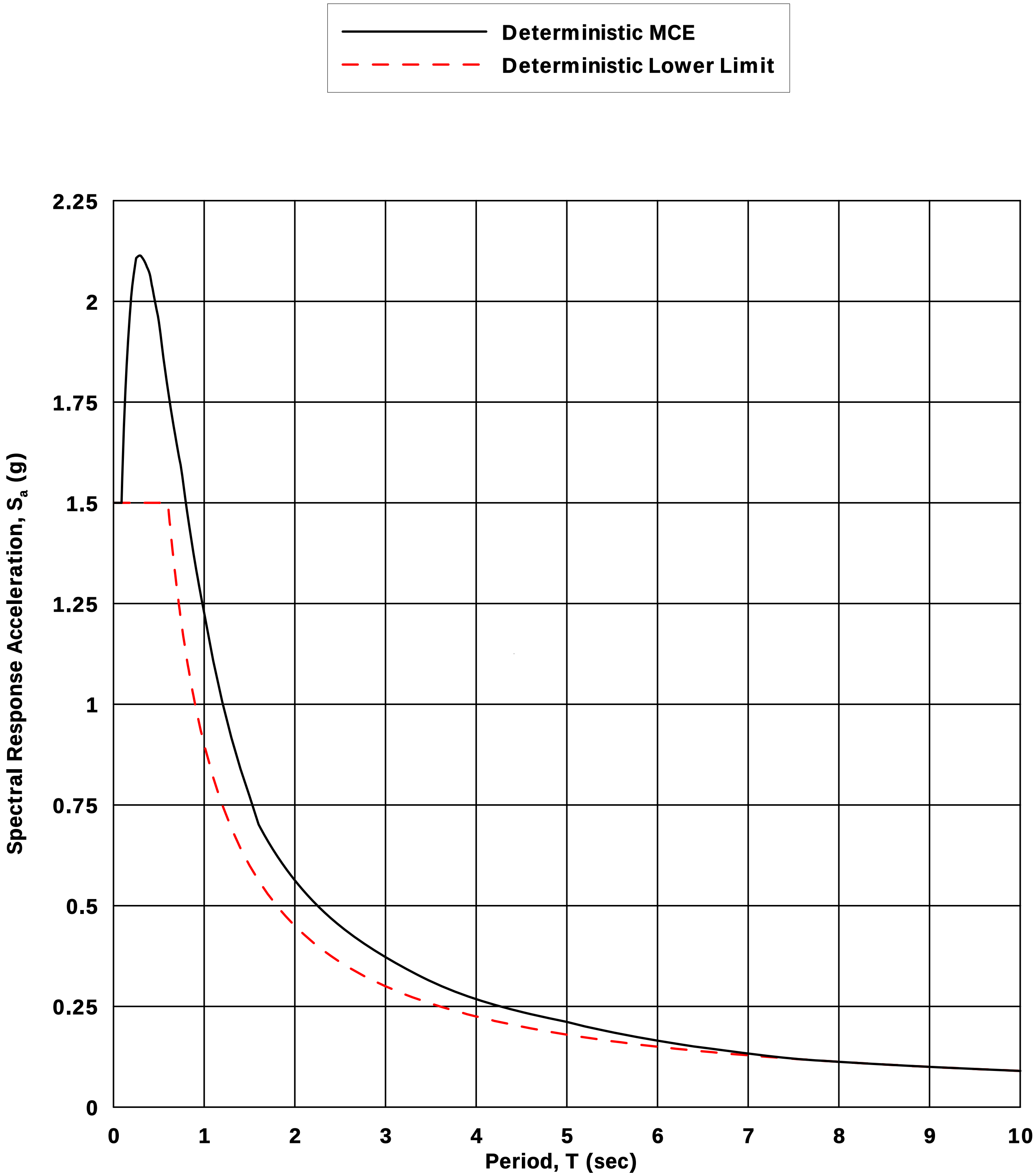
Table 2. Site-Specific Design Parameters

Parameter	Site Class D
MCE Spectral Response Acceleration Parameter for Short Periods, S_{MS}	1.614
MCE Spectral Response Acceleration Parameter at 1 s, S_{M1}	0.922
Design Earthquake Spectral Response Acceleration Parameter for Short Periods, S_{DS}	1.075
Design Earthquake Spectral Response Acceleration Parameter at 1 s, S_{D1}	0.614

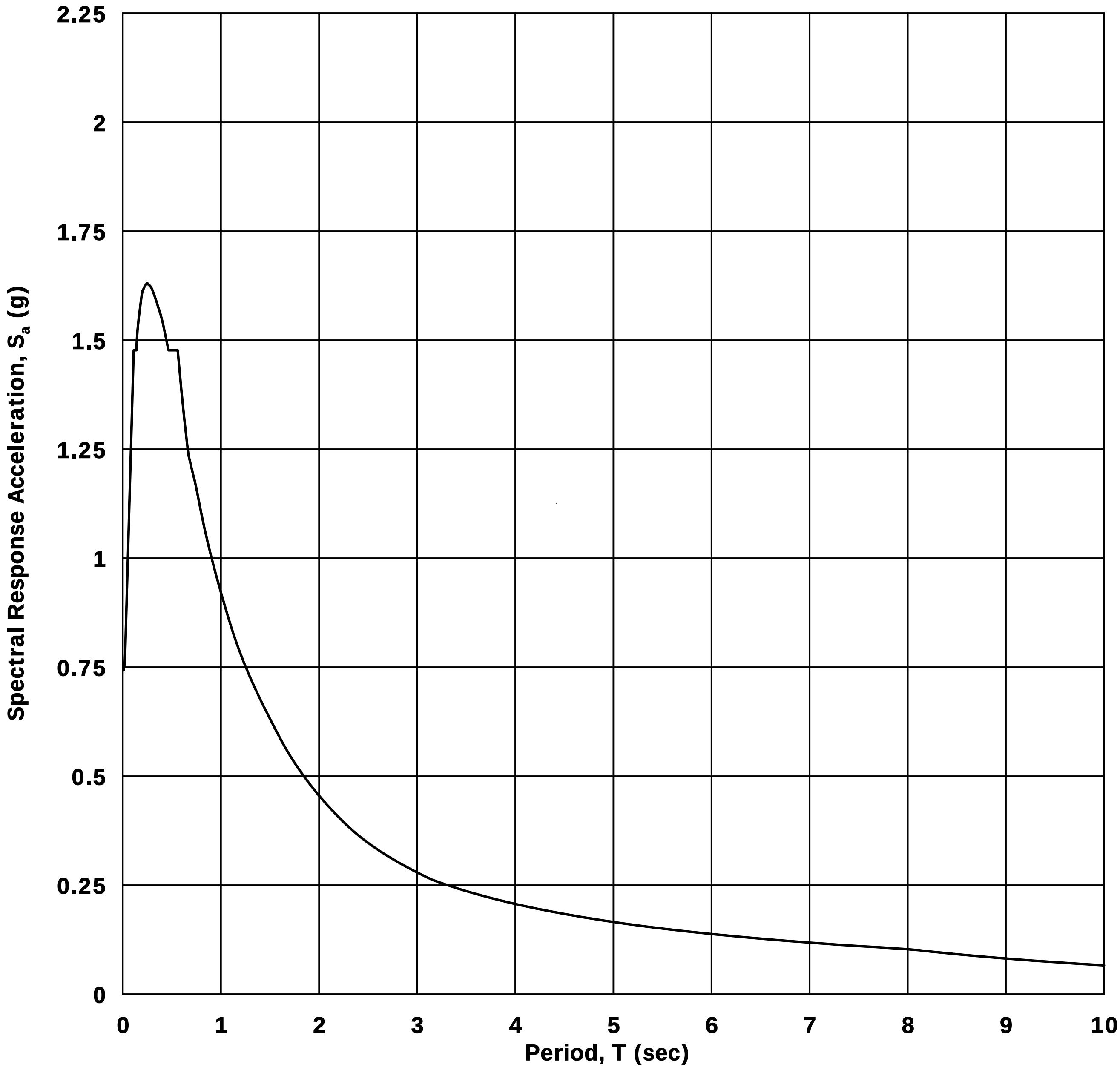


Probabilistic MCE Response Spectrum	Bayside Village Seawall Evaluation Newport Beach, California	Project No. 602668-002 Date: December 2009

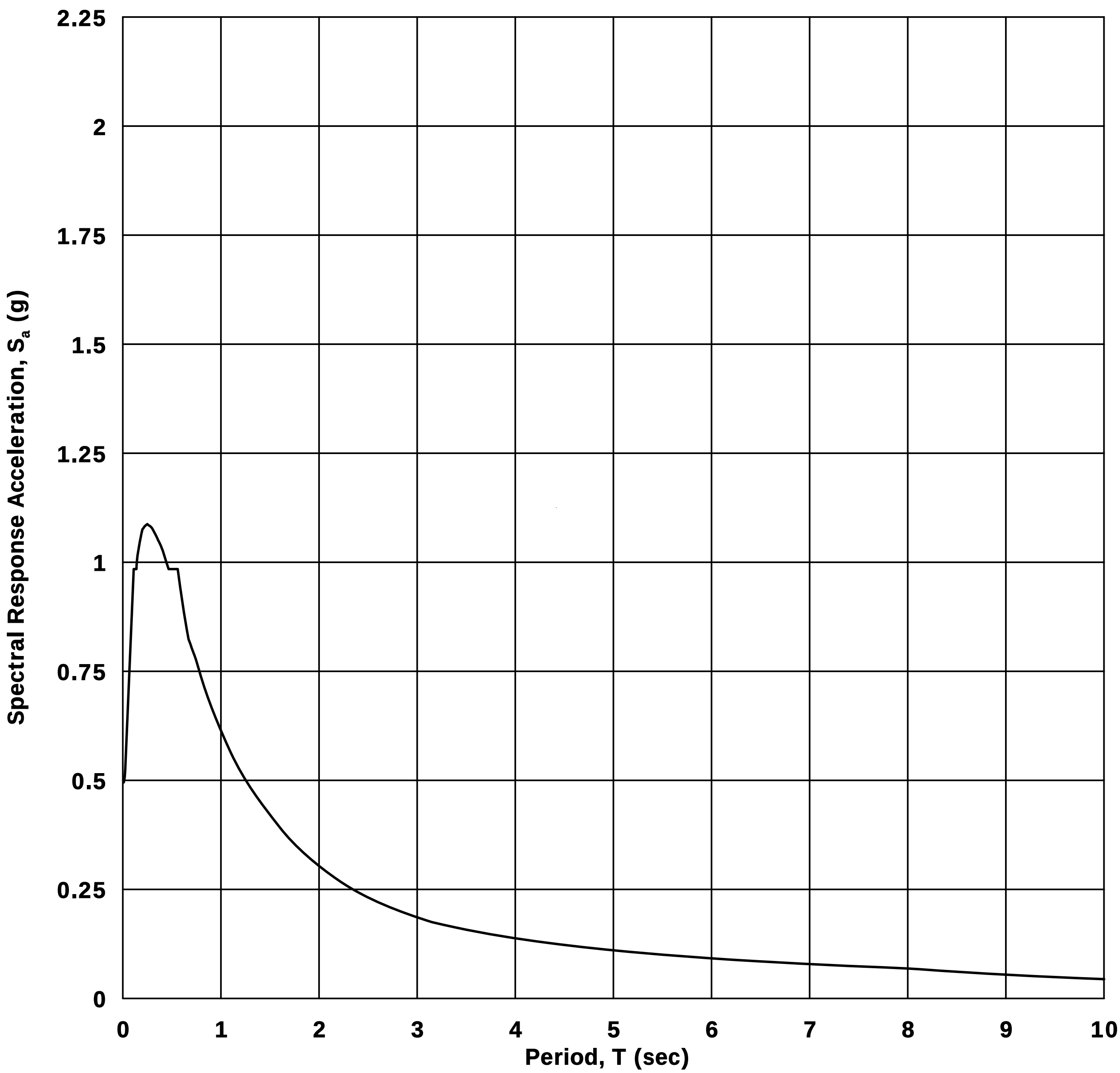
Figure D-1



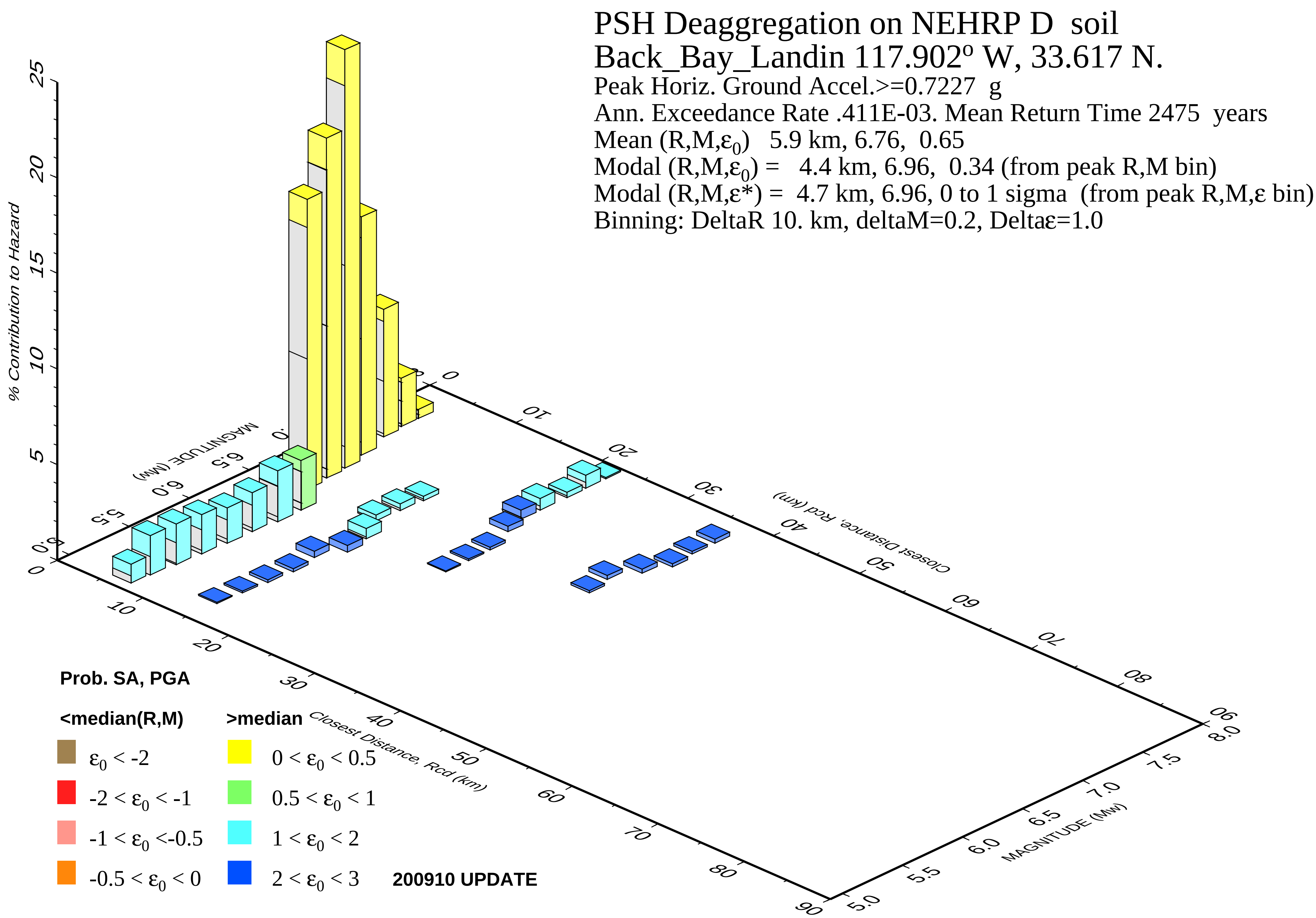
Determinisit MCE Response Spectrum and Deterministic Lower Limit	**Bayside Village Seawall Evaluation Newport Beach, California**	**Project No. 602668-002 Date: December 2009 Figure D-2**



Site-Specific MCE Response Spectrum	Bayside Village Seawall Evaluation Newport Beach, California	Project No. 602668-002 Date: December 2009 Figure D-3



Site-Specific Design Response Spectrum	Bayside Village Seawall Evaluation Newport Beach, California	Project No. 602668-002 Date: December 2009 Leighton Figure D-4



GMT 2012 Jan 18 20:58:46 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 332. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted

APPENDIX D

LIQUEFACTION ANALYSIS

Leighton Consulting, Inc.
Irvine, CA

Leighton

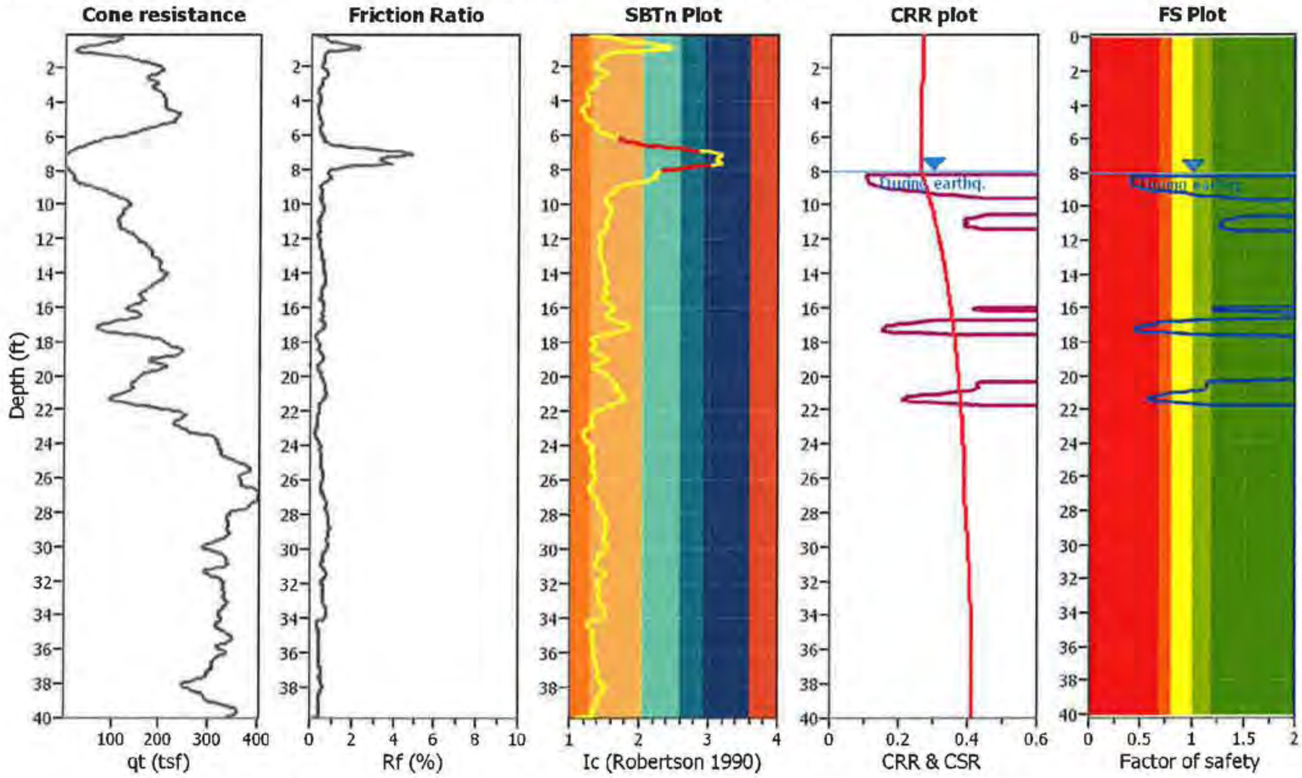
LIQUEFACTION ANALYSIS REPORT

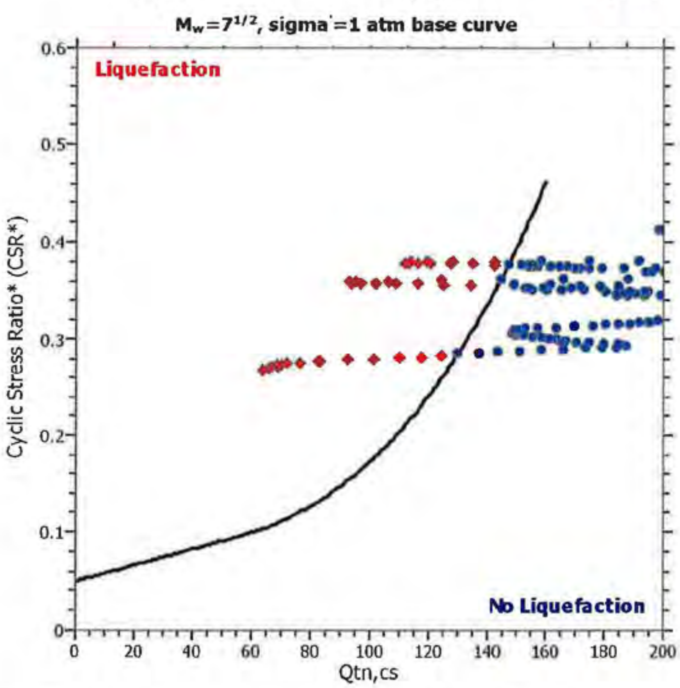
Project title : Bayside Village **Location : Newport Beach, CA**

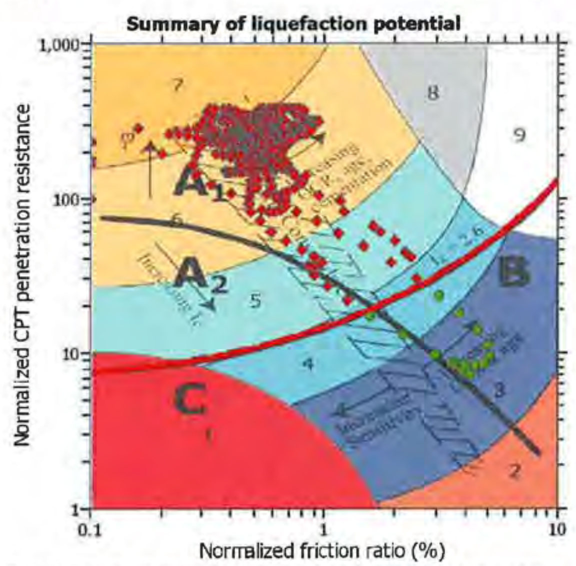
CPT file : LCPT-1

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	8.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes		
Peak ground acceleration:	0.49	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

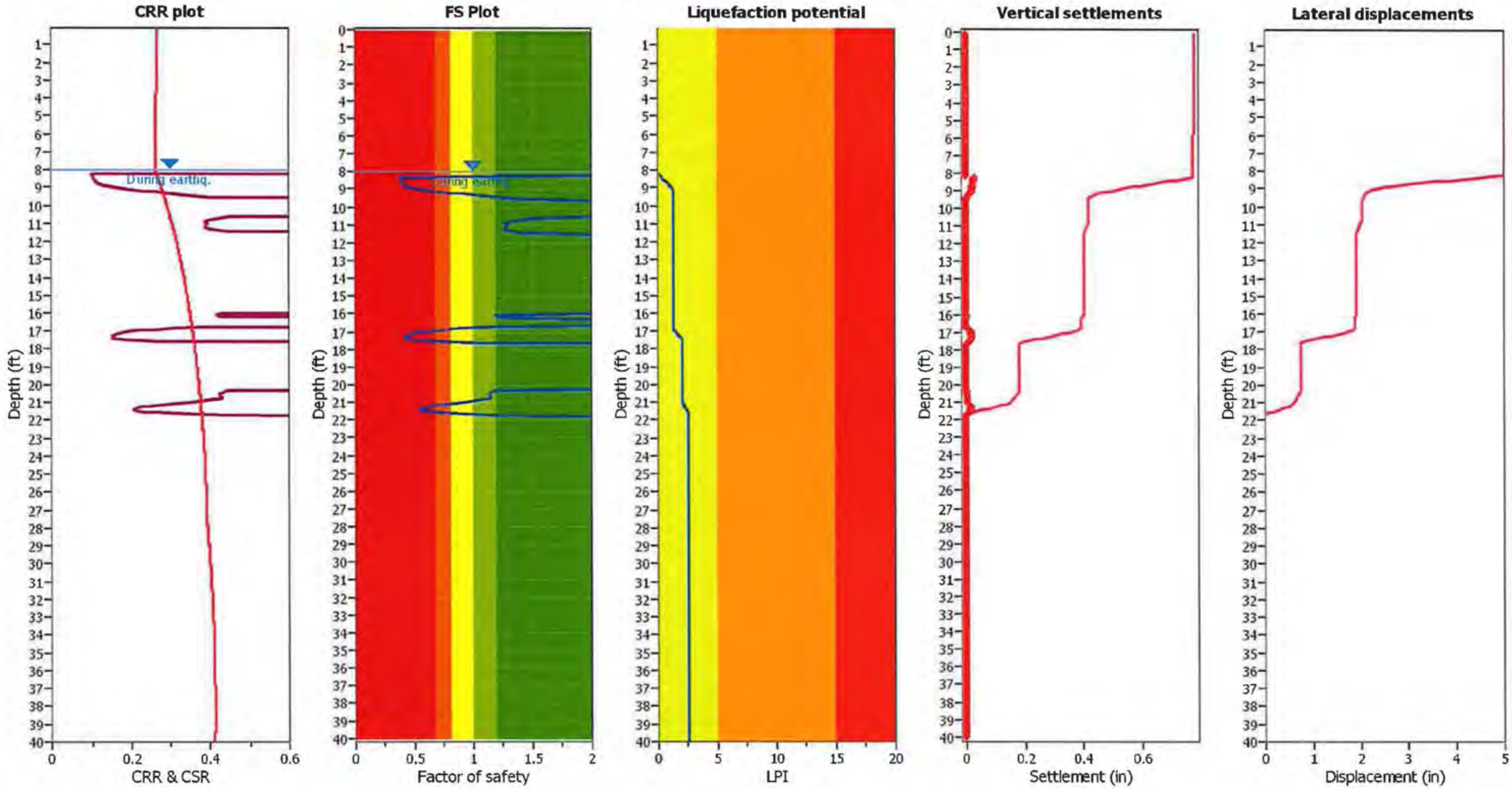






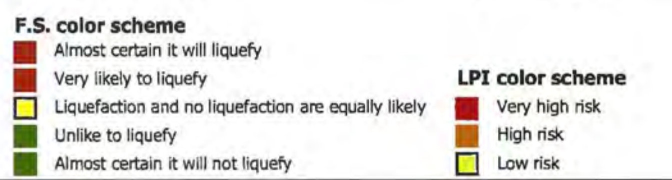
Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.49	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	N/A



Leighton Consulting, Inc.
Irvine, CA

Leighton

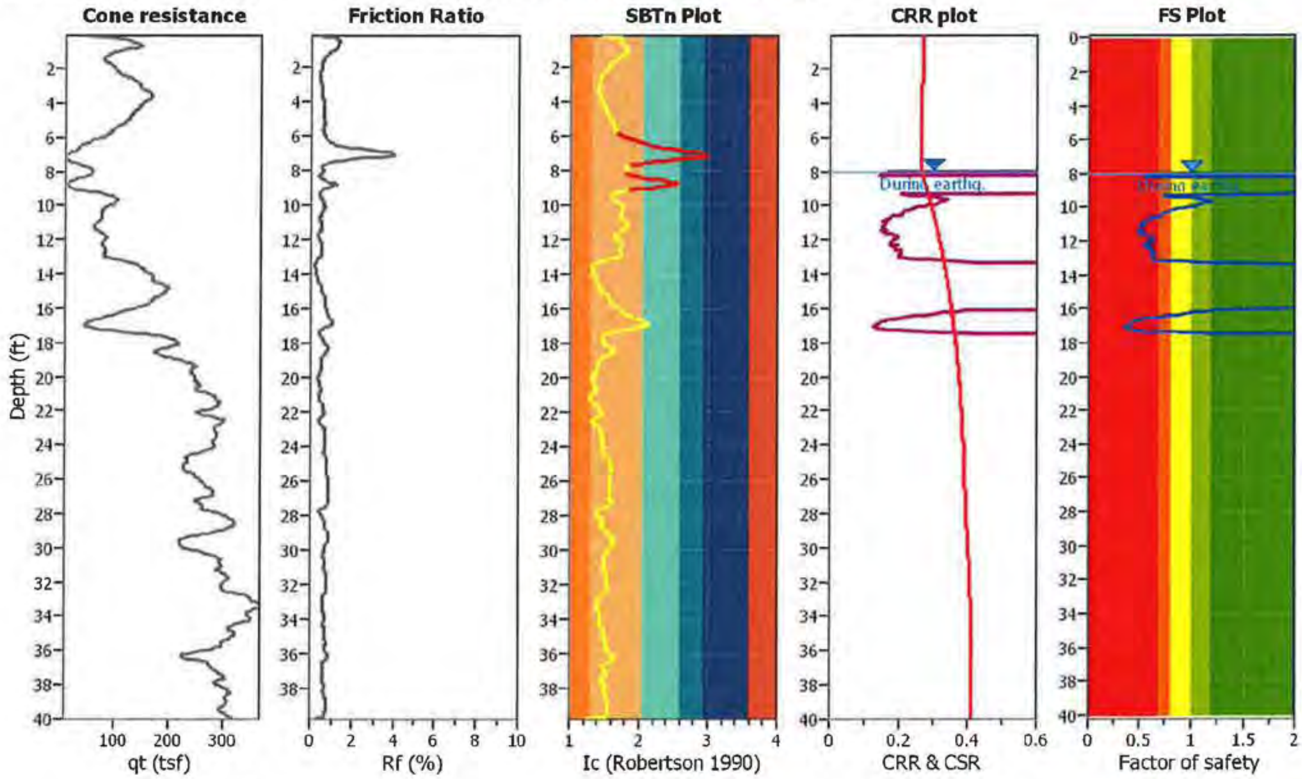
LIQUEFACTION ANALYSIS REPORT

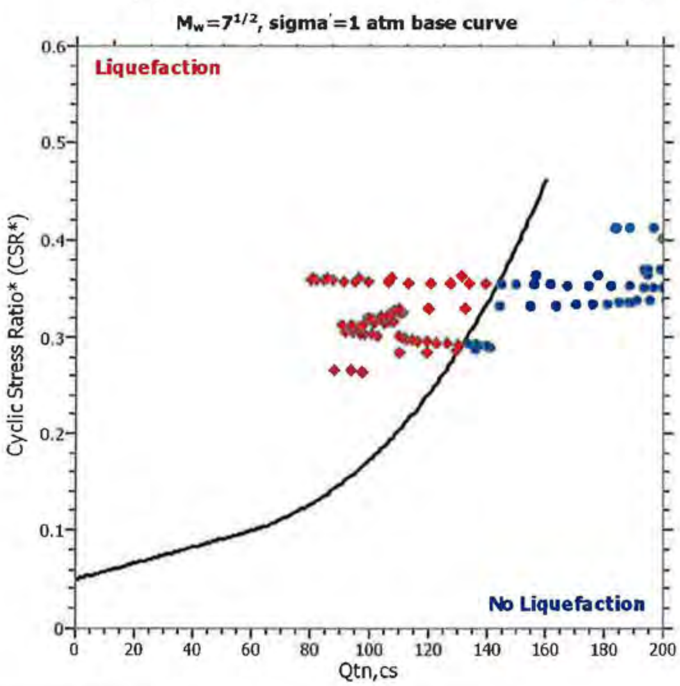
Project title : Bayside Village **Location : Newport Beach, CA**

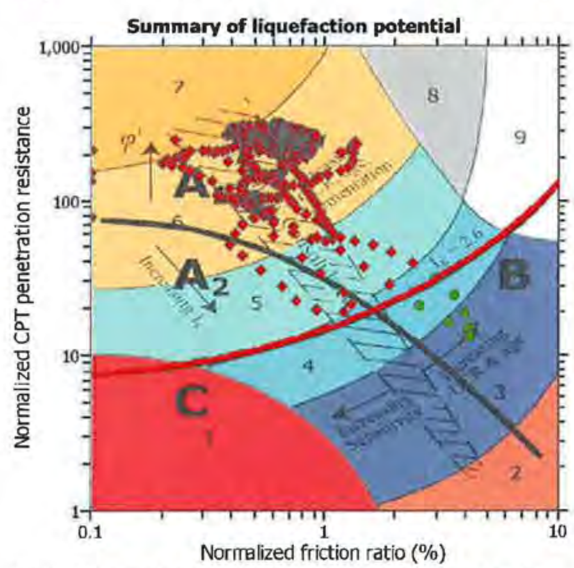
CPT file : LCPT-2

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	8.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes		
Peak ground acceleration:	0.49	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

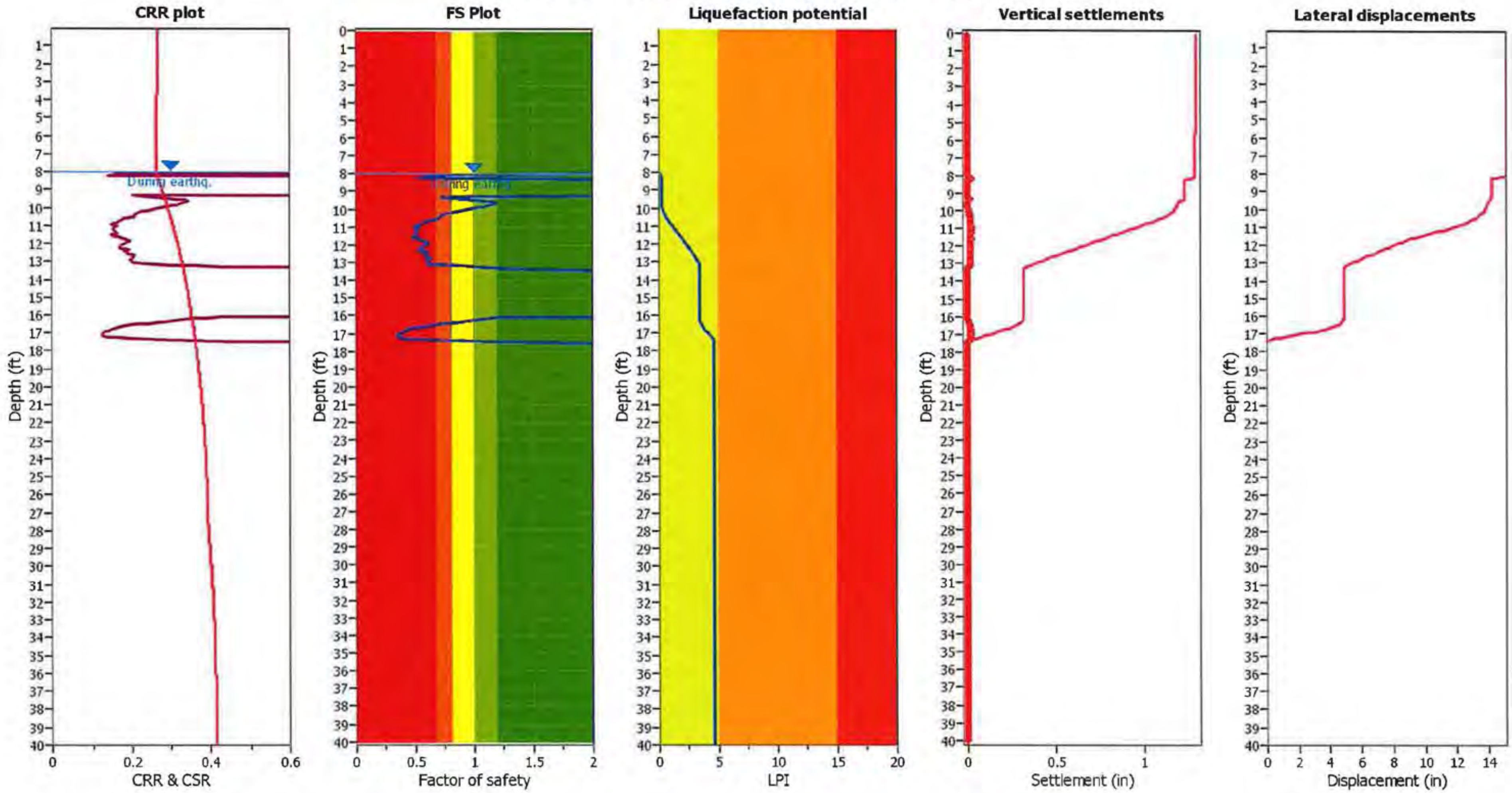






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A		
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes		
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes		
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only		
Peak ground acceleration:	0.49	Use fill:	No	Limit depth applied:	No		
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	N/A		

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liquefaction are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Leighton

Leighton Consulting, Inc.
Irvine, CA

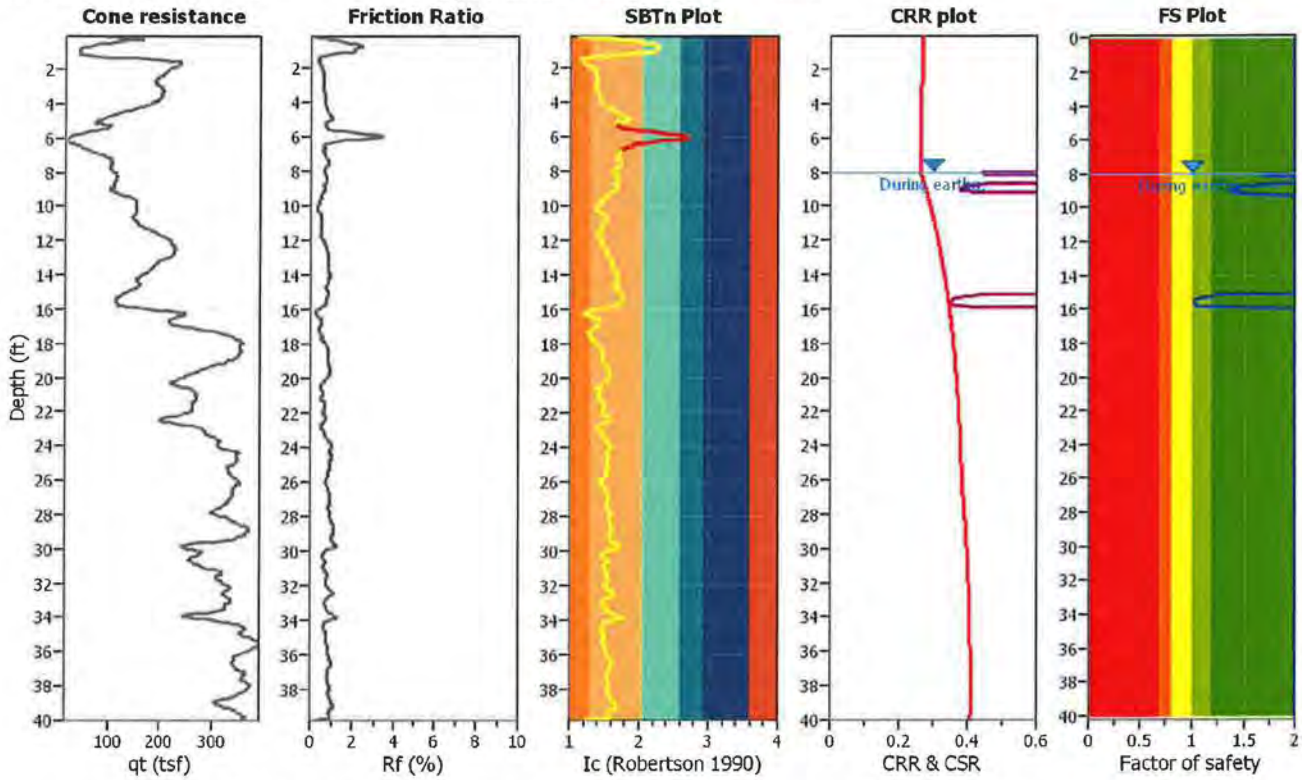
LIQUEFACTION ANALYSIS REPORT

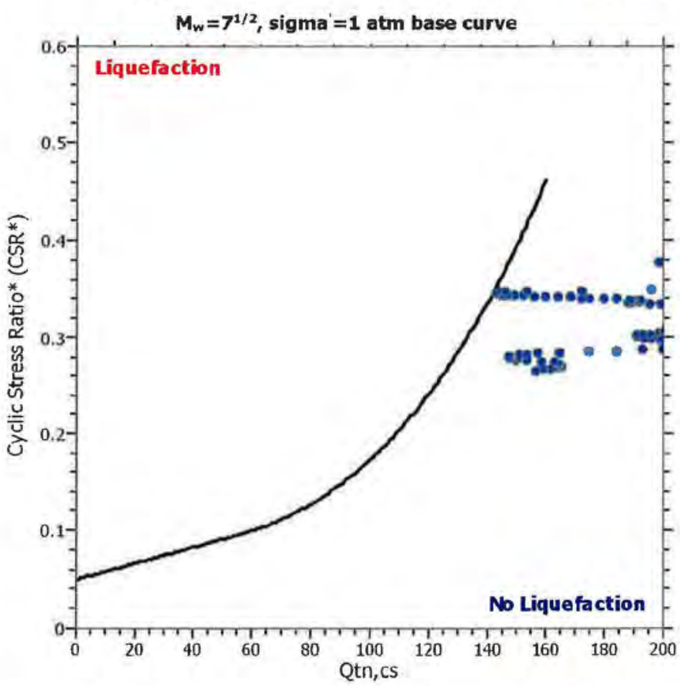
Project title : Bayside Village **Location : Newport Beach, CA**

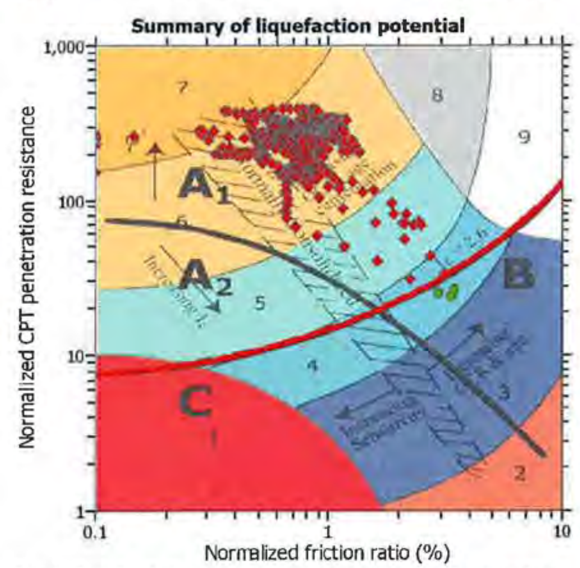
CPT file : LCPT-3

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	8.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes		
Peak ground acceleration:	0.49	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

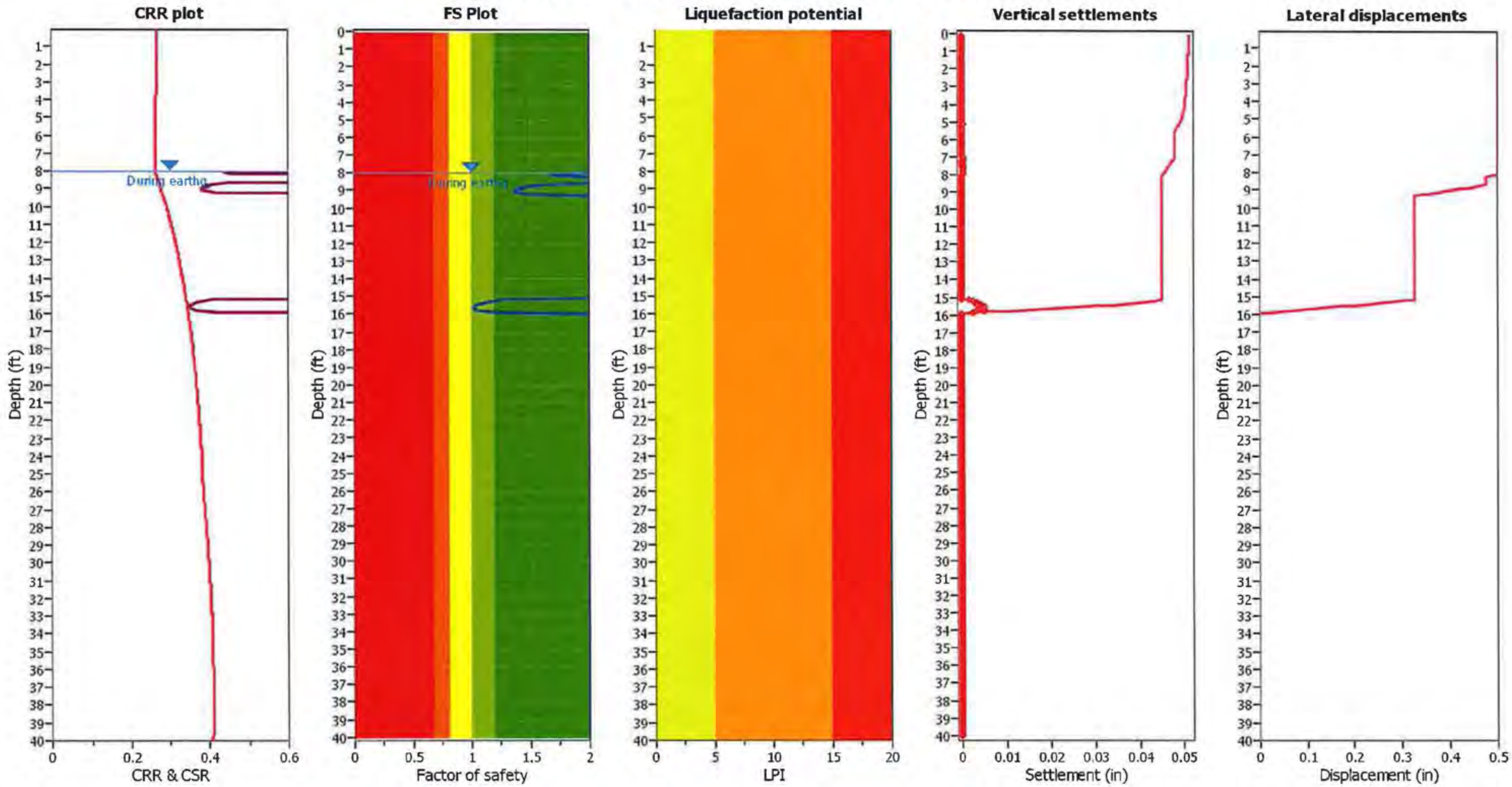






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.49	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liquefaction are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme
- Very high risk
- High risk
- Low risk

Leighton Consulting, Inc.
Irvine, CA

Leighton

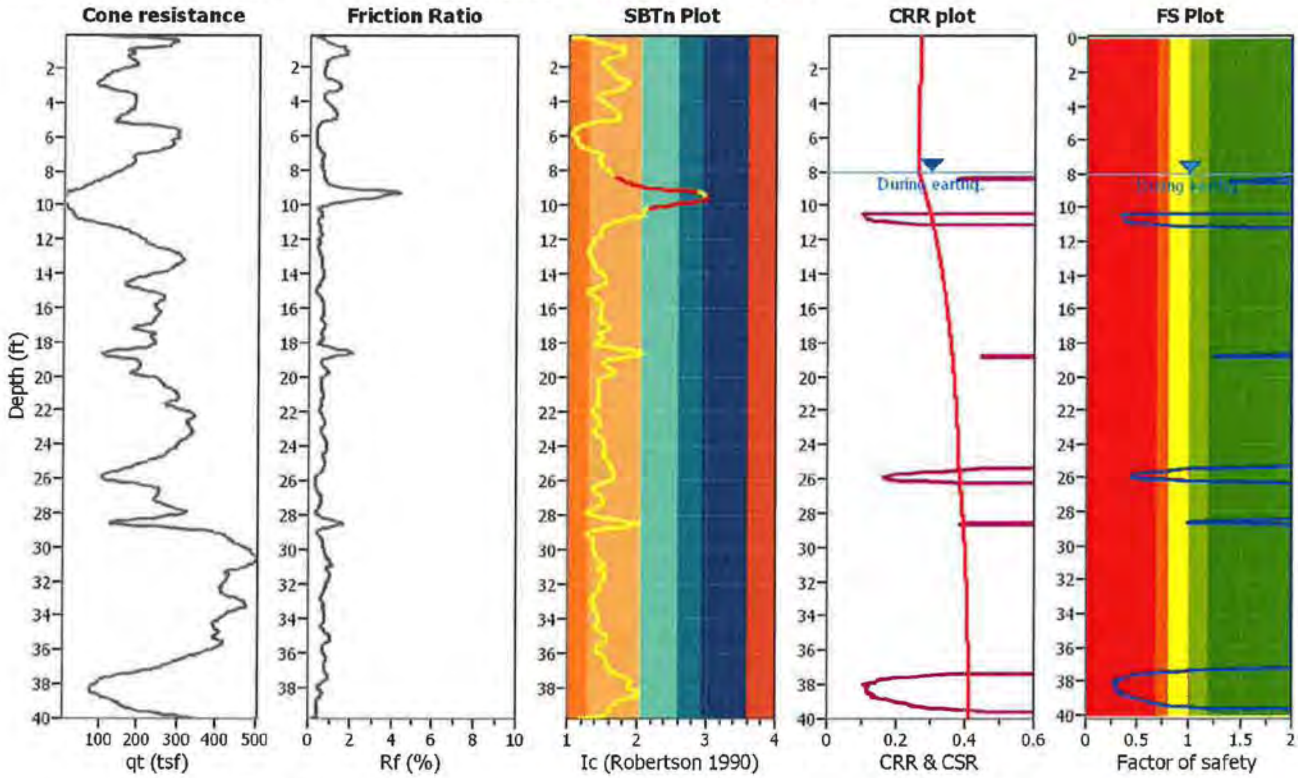
LIQUEFACTION ANALYSIS REPORT

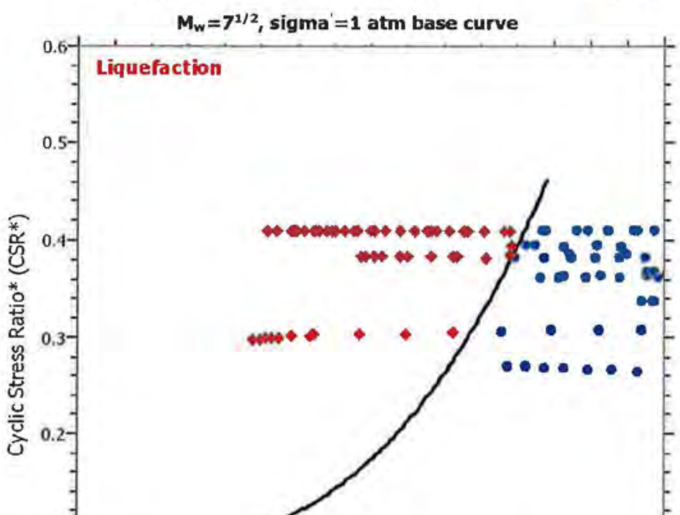
Project title : Bayside Village **Location : Newport Beach, CA**

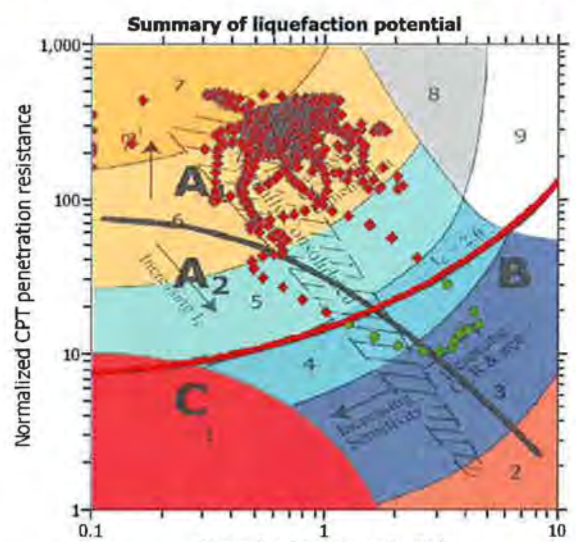
CPT file : LCPT-4

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	8.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes		
Peak ground acceleration:	0.49	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

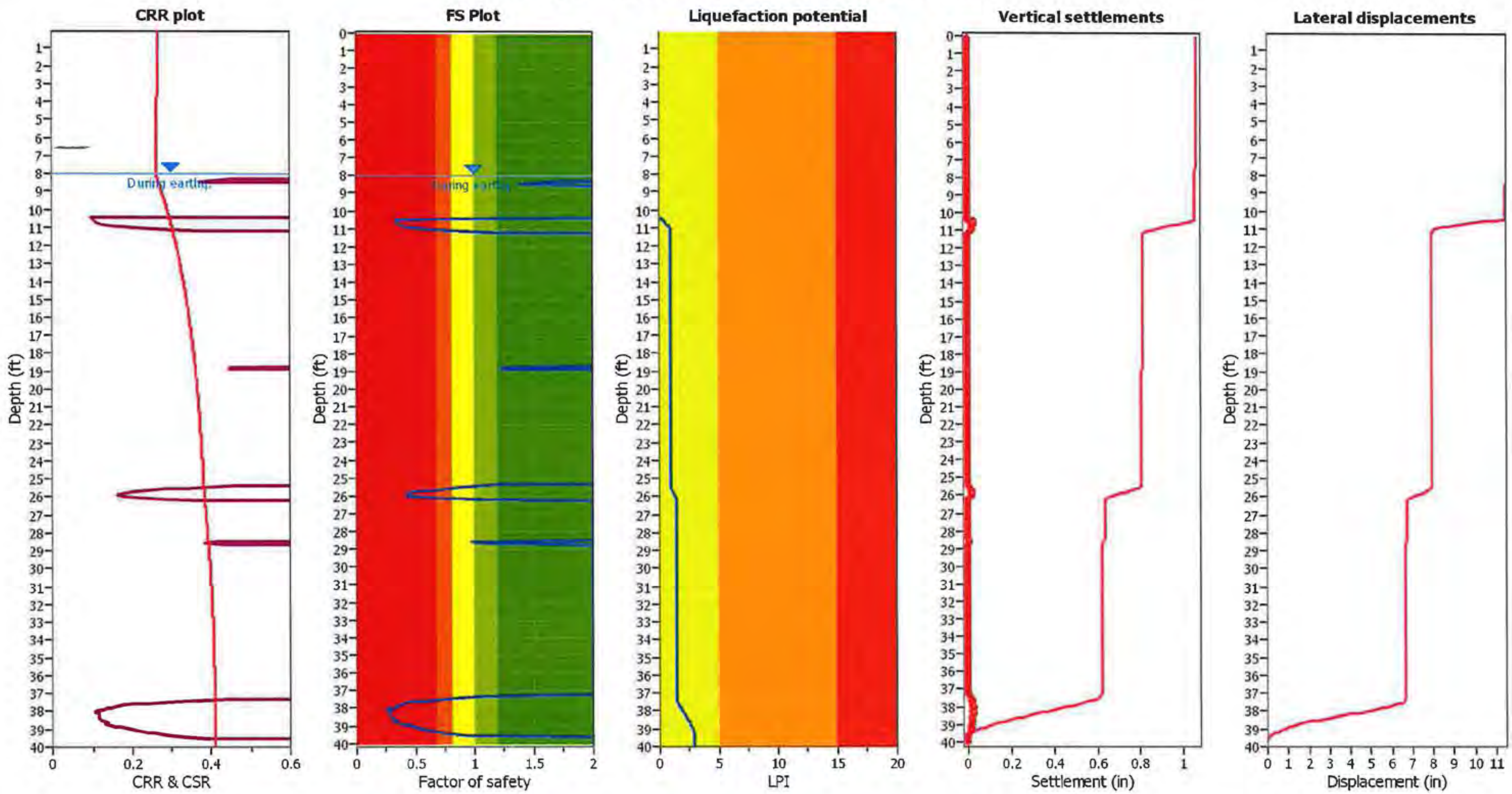






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.49	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liquefaction are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Leighton Consulting, Inc.
Irvine, CA

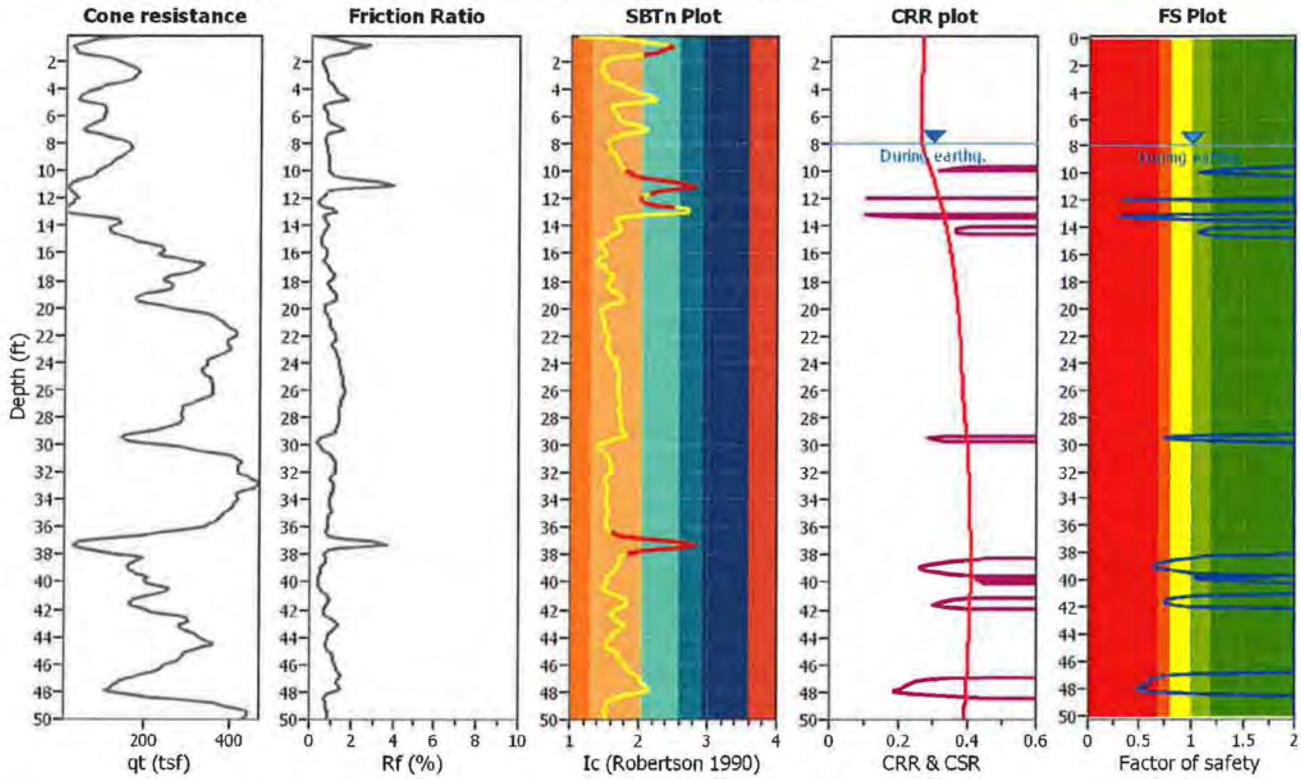
LIQUEFACTION ANALYSIS REPORT

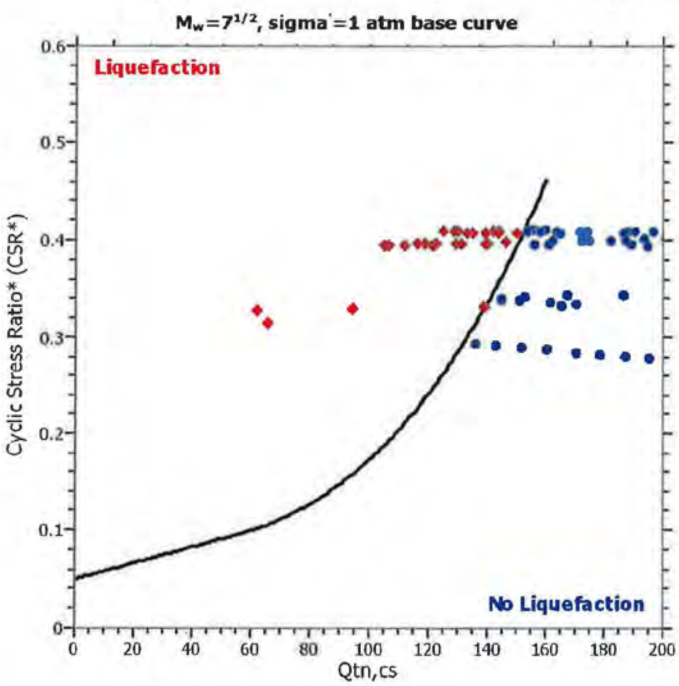
Project title : Bayside Village **Location : Newport Beach, CA**

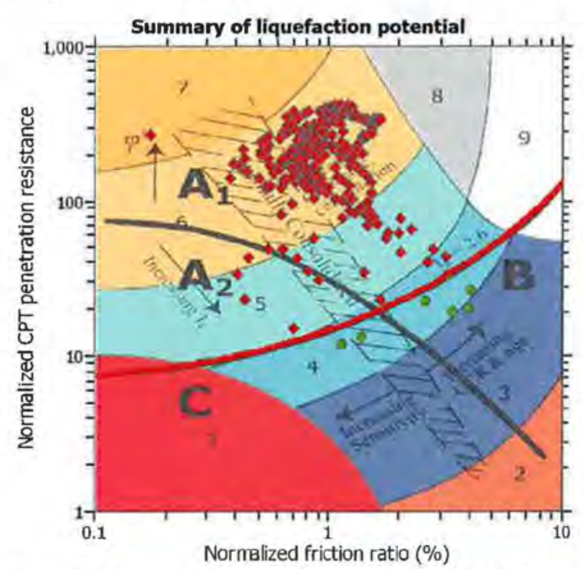
CPT file : LCPT-5

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	8.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes		
Peak ground acceleration:	0.49	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

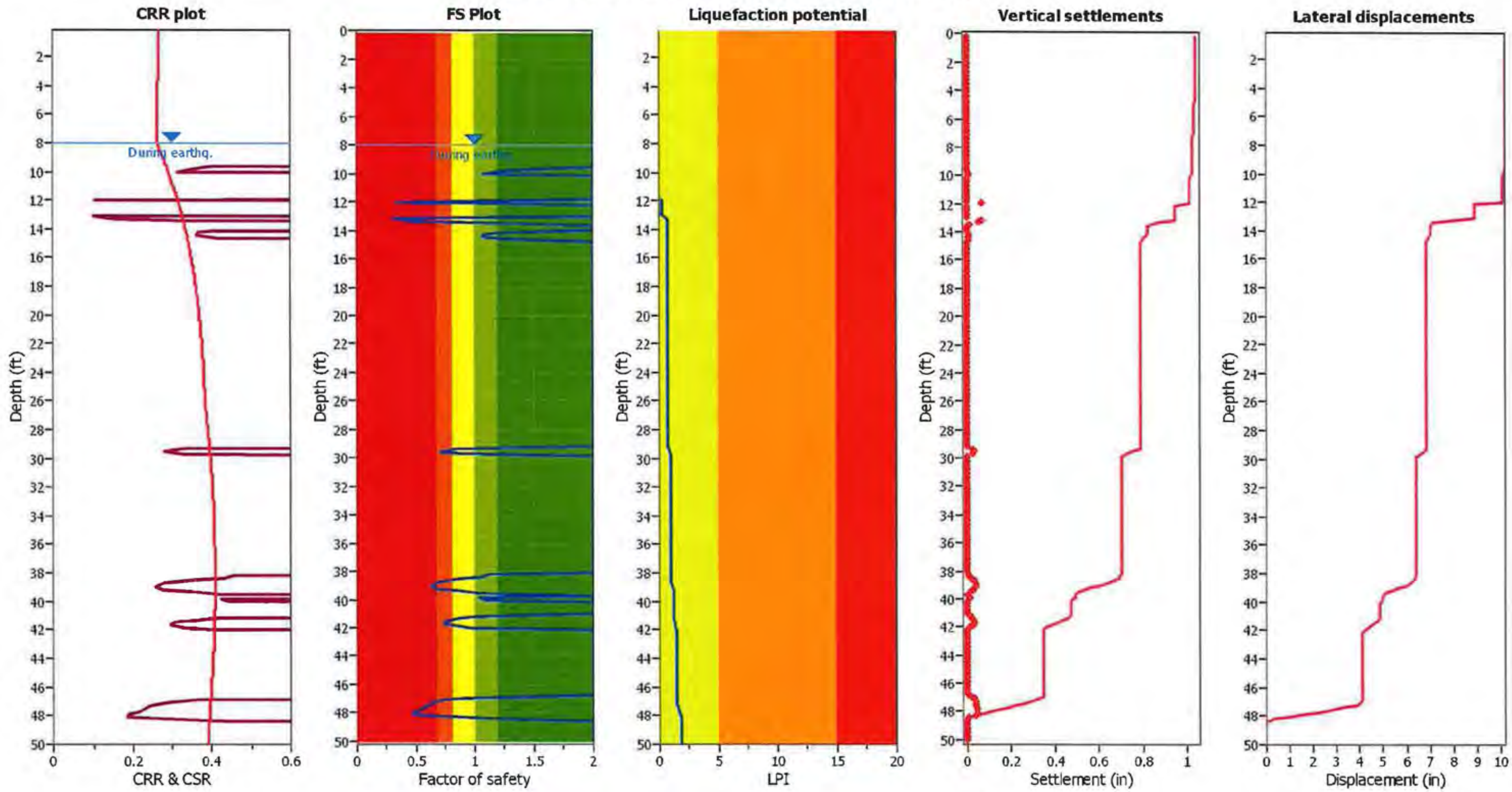






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.49	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liquefaction are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme
- Very high risk
- High risk
- Low risk

Leighton Consulting, Inc.
Irvine, CA

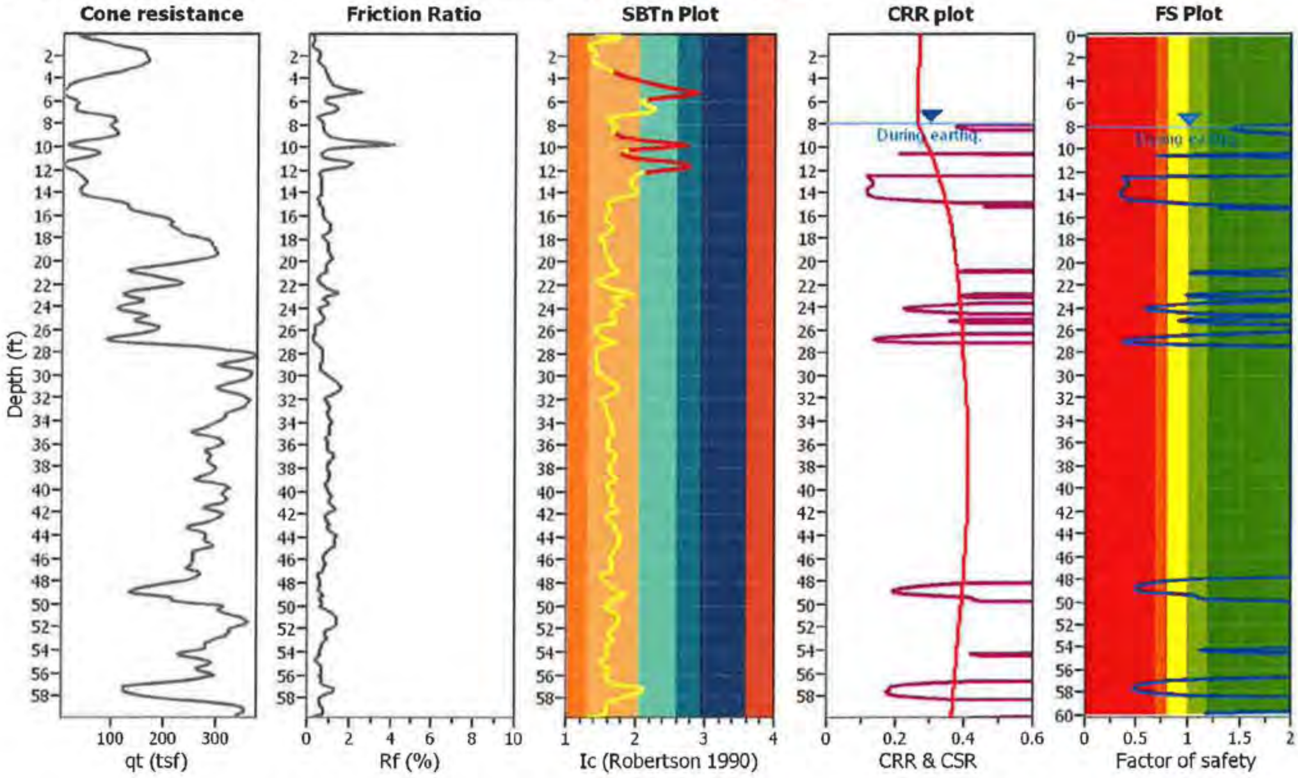
LIQUEFACTION ANALYSIS REPORT

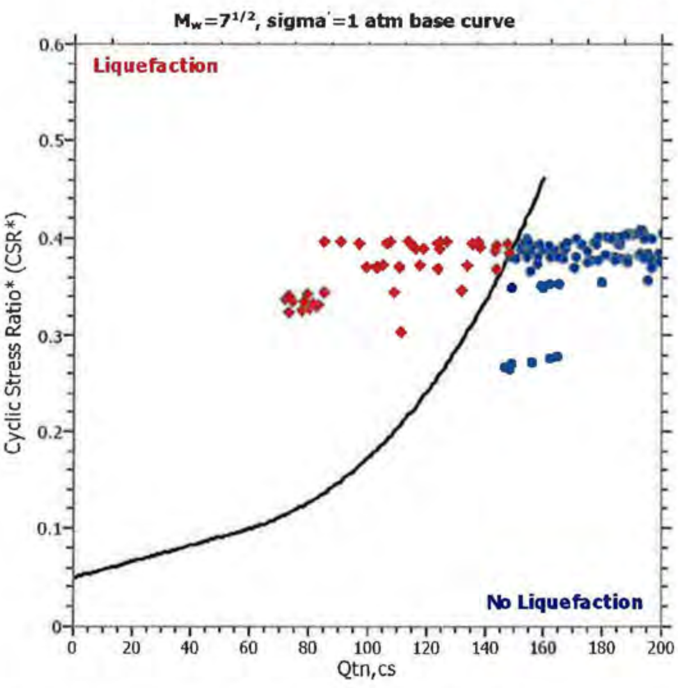
Project title : Bayside Village **Location : Newport Beach, CA**

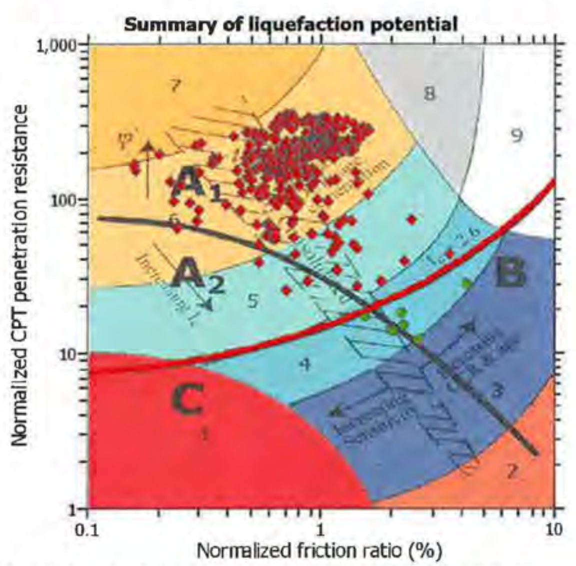
CPT file : LCPT-6

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	8.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes		
Peak ground acceleration:	0.49	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

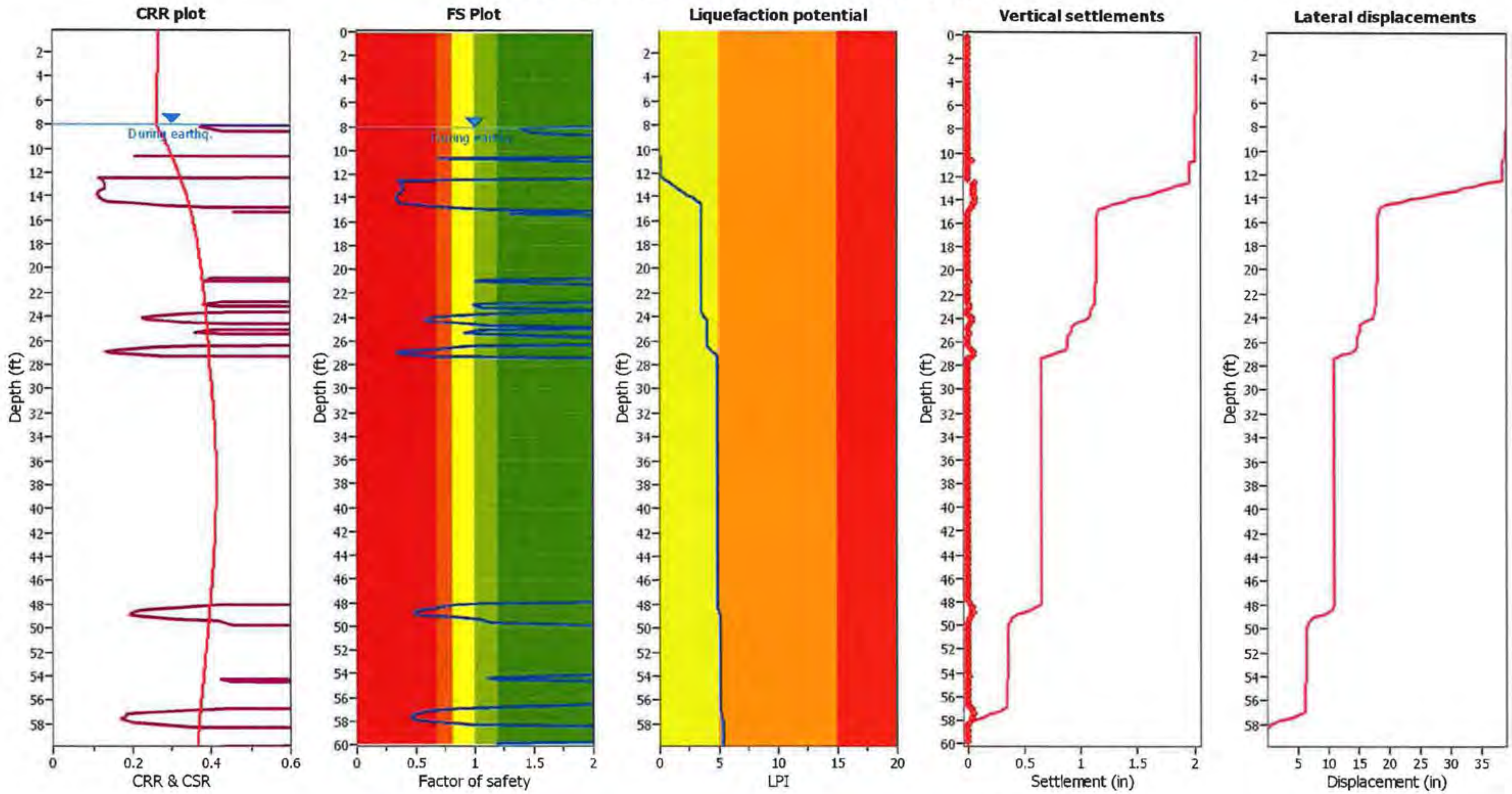






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.49	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liquefaction are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Leighton Consulting, Inc.
Irvine, CA

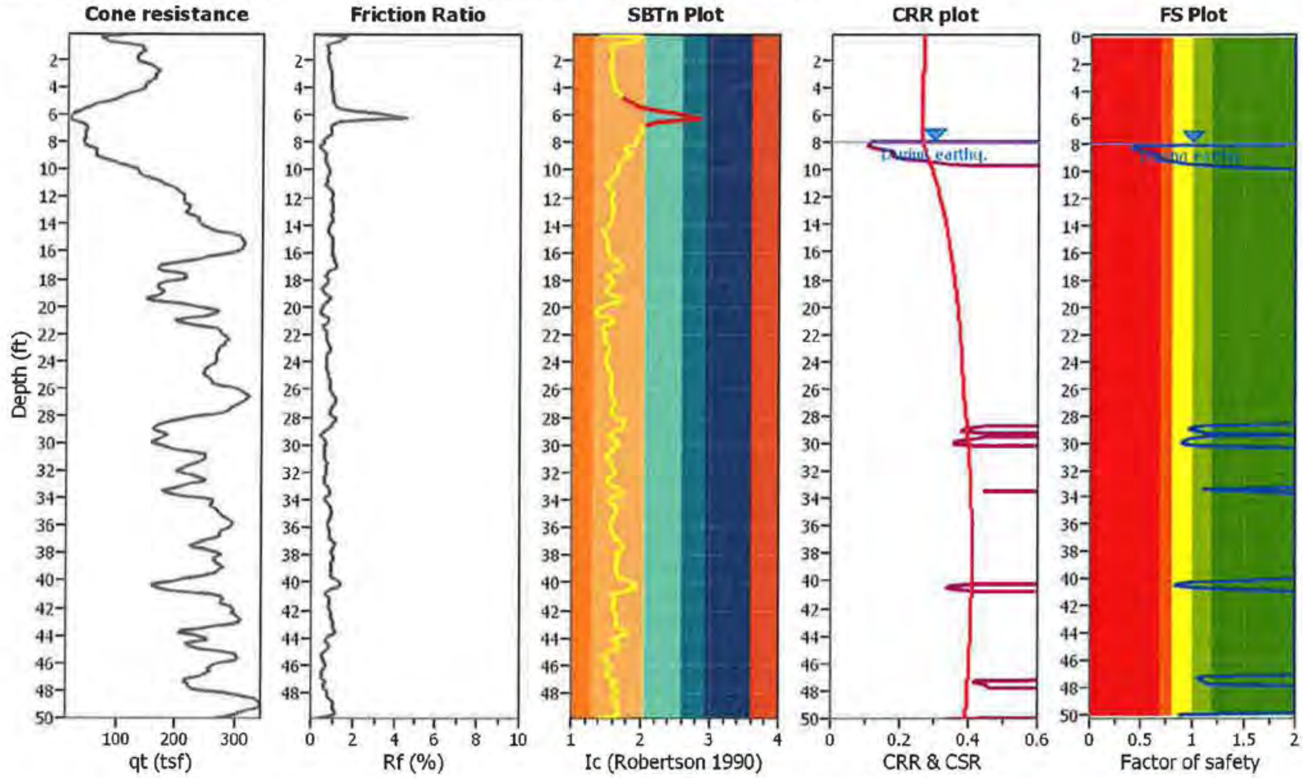
LIQUEFACTION ANALYSIS REPORT

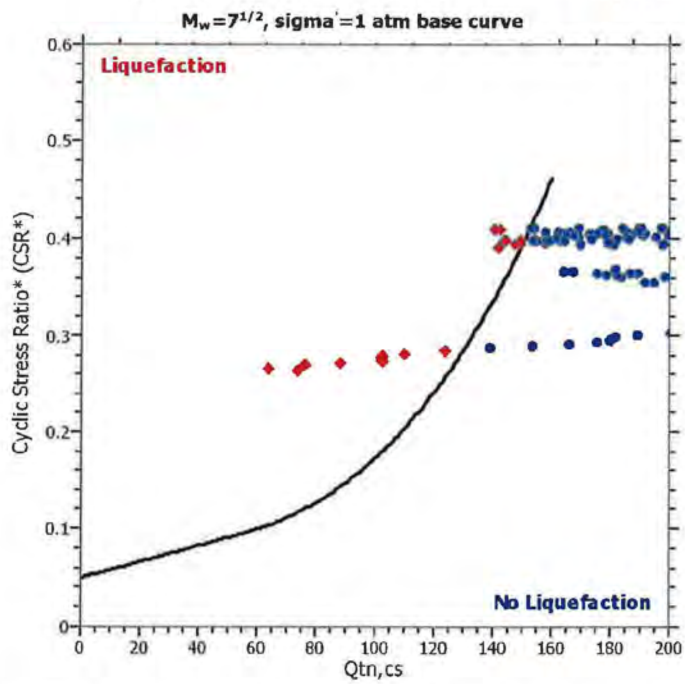
Project title : Bayside Village | **Location : Newport Beach, CA**

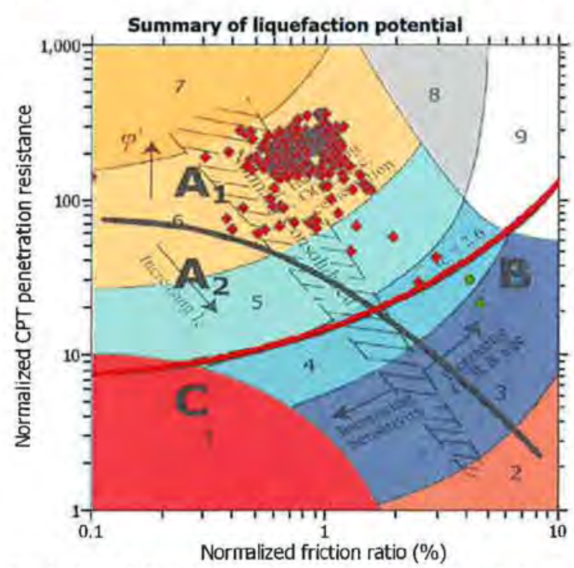
CPT file : LCPT-7

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	8.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes		
Peak ground acceleration:	0.49	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

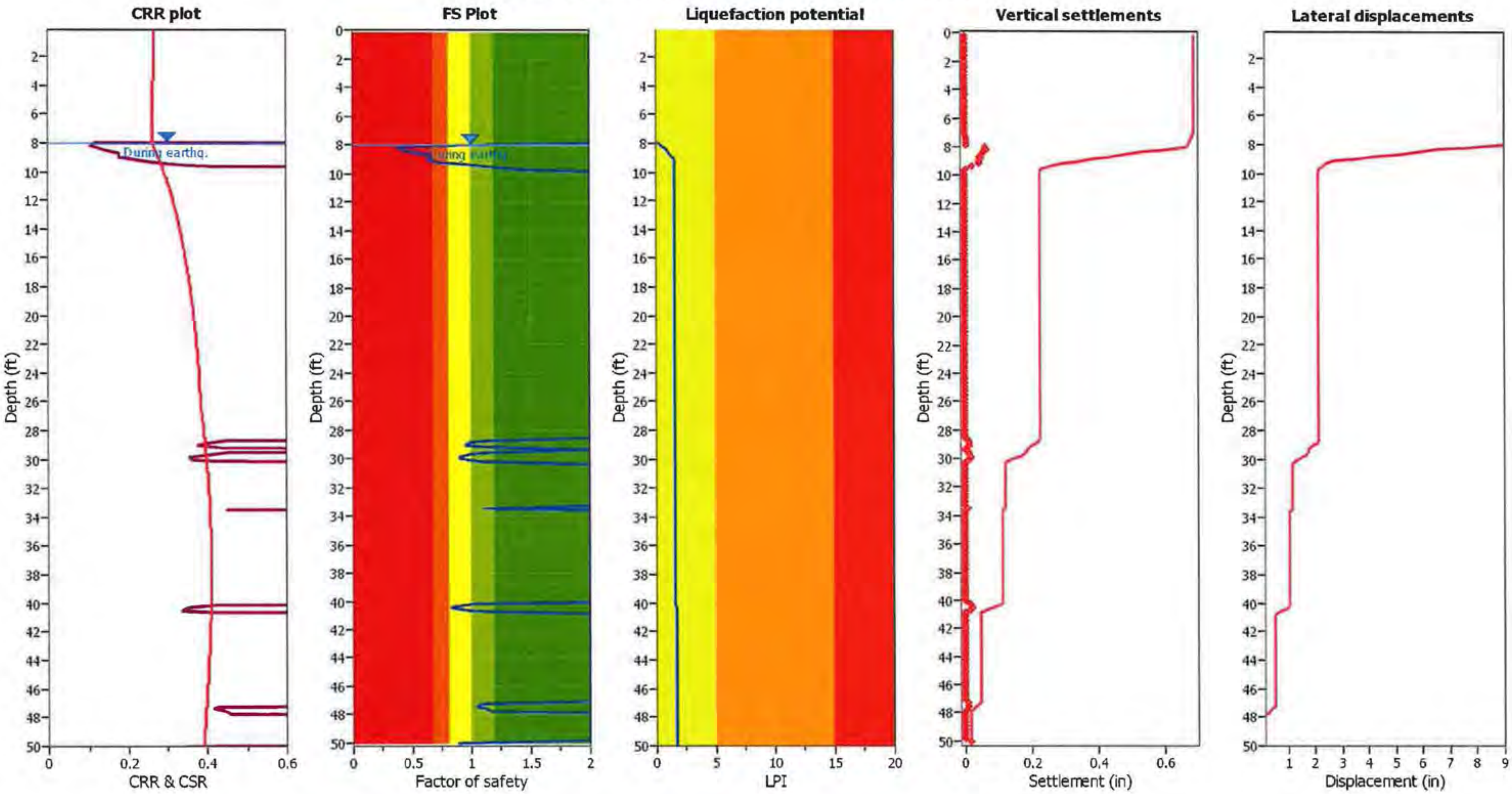






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.49	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liquefaction are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme
- Very high risk
- High risk
- Low risk

Leighton

Leighton Consulting, Inc.
Irvine, CA

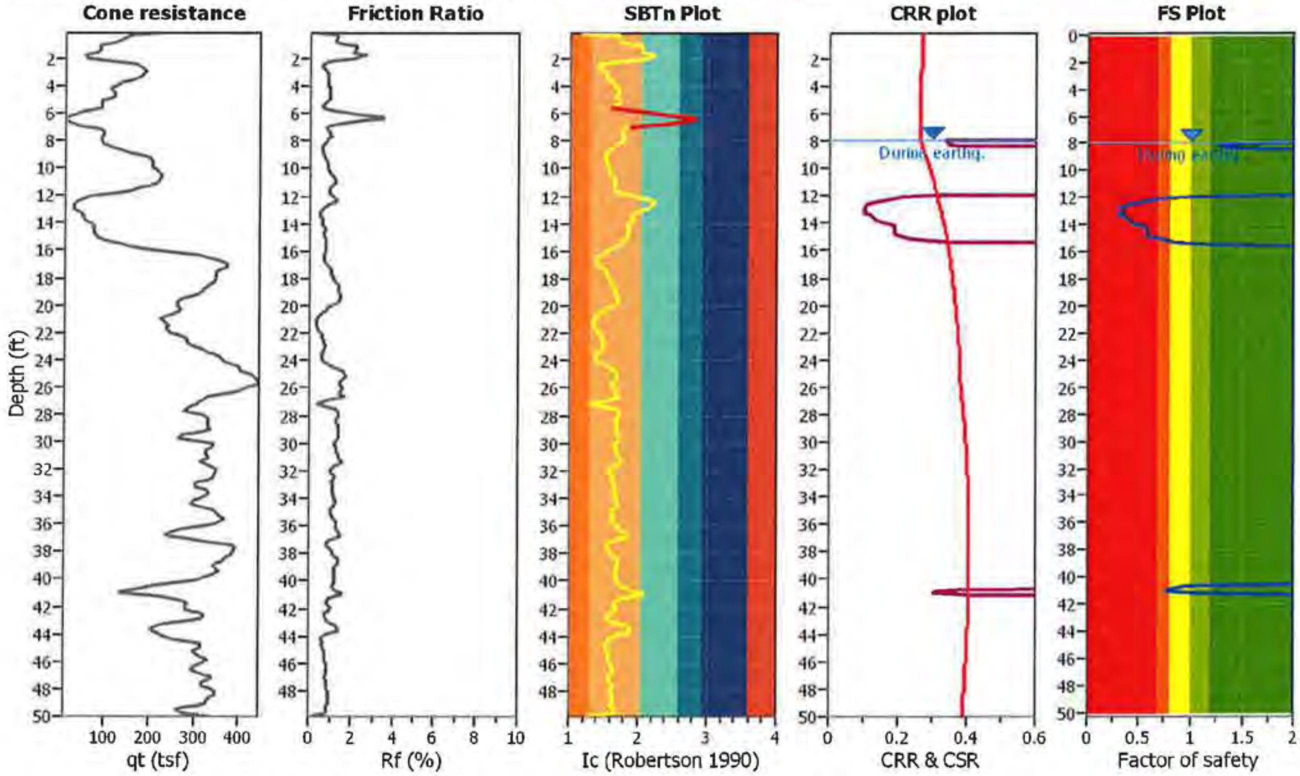
LIQUEFACTION ANALYSIS REPORT

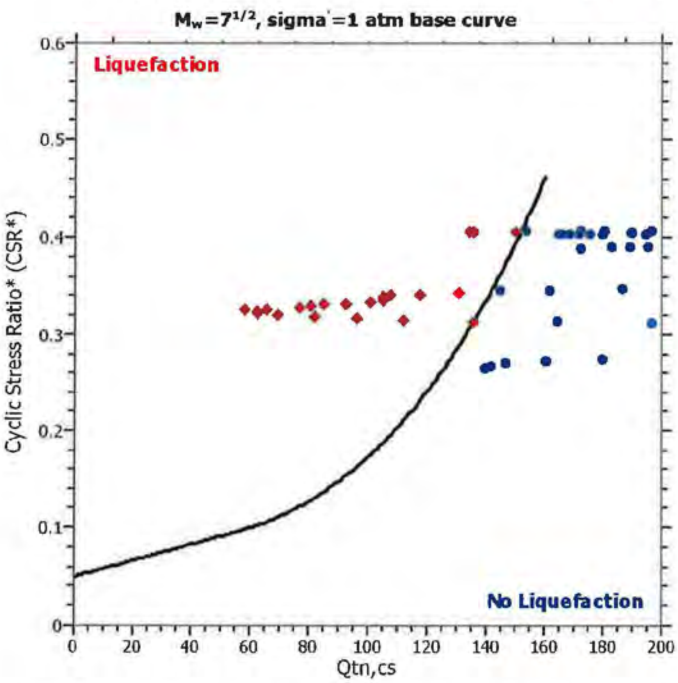
Project title : Bayside Village **Location : Newport Beach, CA**

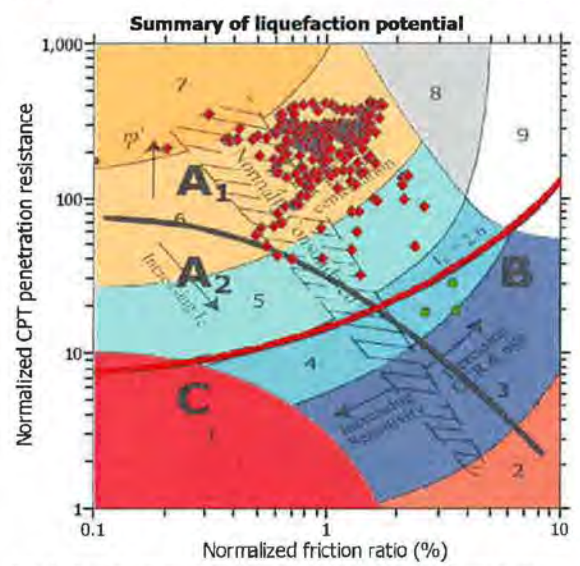
CPT file : LCPT-8

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	8.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes		
Peak ground acceleration:	0.49	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

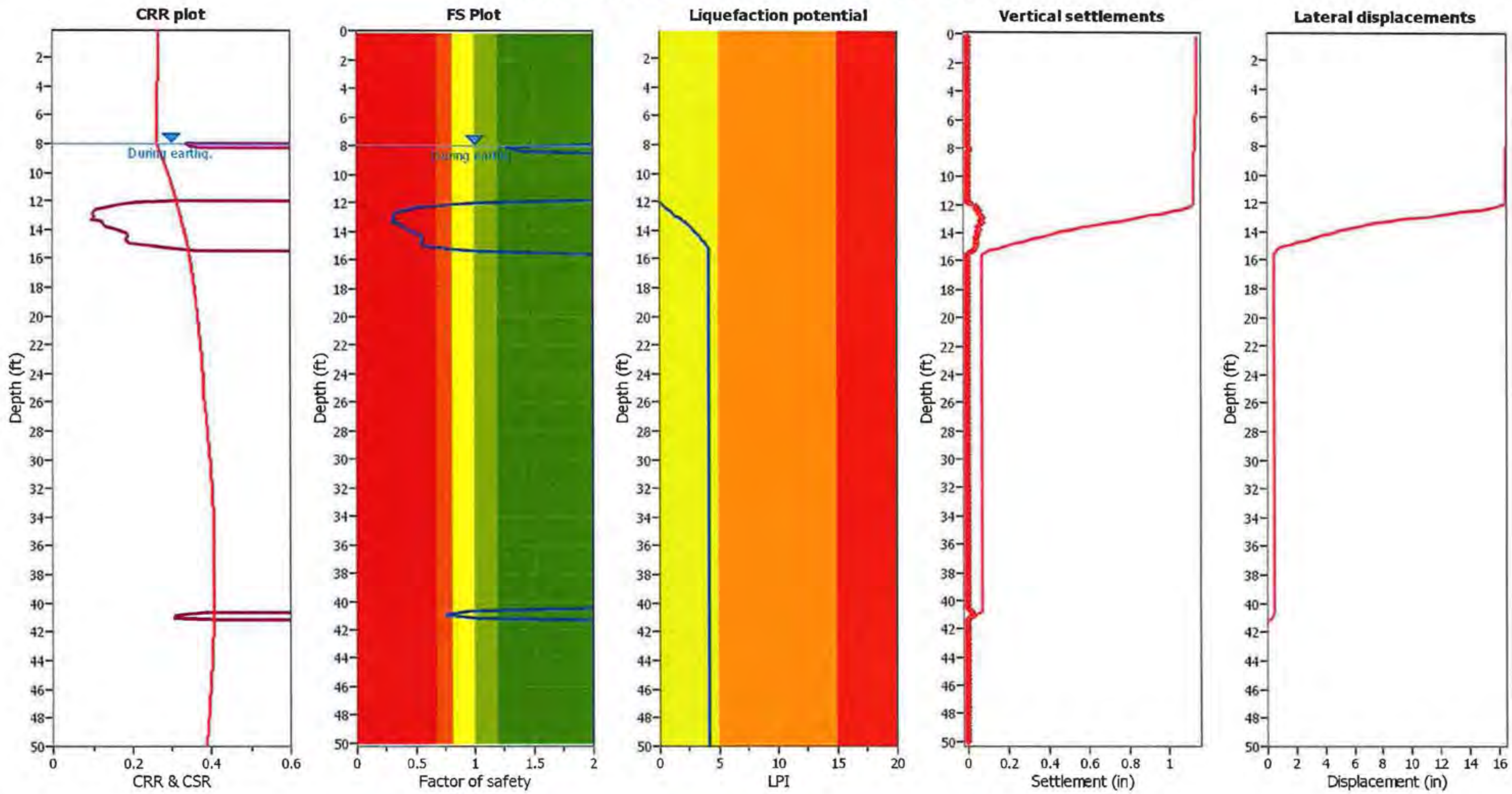






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A		
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes		
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes		
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only		
Peak ground acceleration:	0.49	Use fill:	No	Limit depth applied:	No		
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	N/A		

F.S. color scheme
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liquefaction are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme
- Very high risk
- High risk
- Low risk

Leighton Consulting, Inc.
Irvine, CA

Leighton

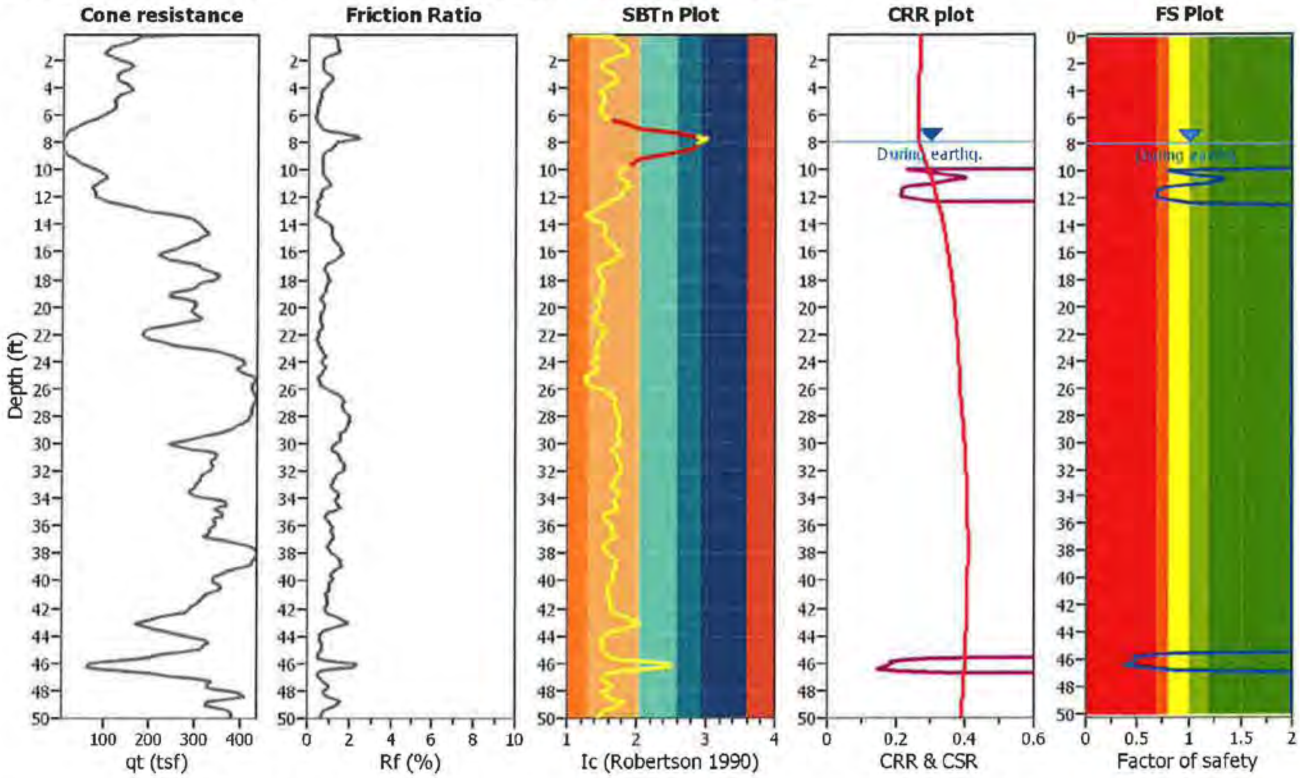
LIQUEFACTION ANALYSIS REPORT

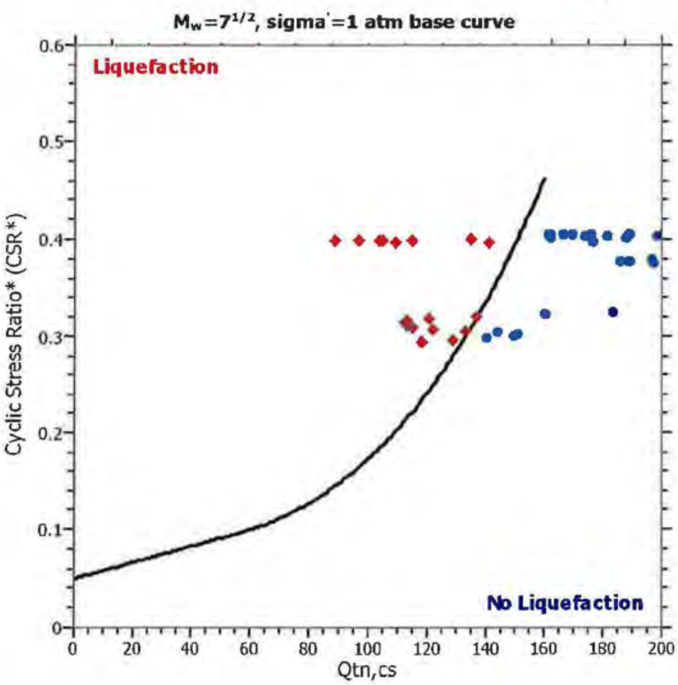
Project title : Bayside Village **Location : Newport Beach, CA**

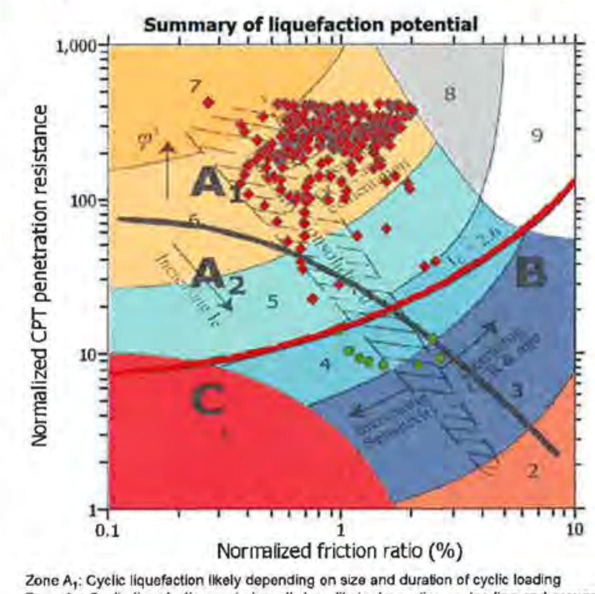
CPT file : LCPT-9

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	8.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes		
Peak ground acceleration:	0.49	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

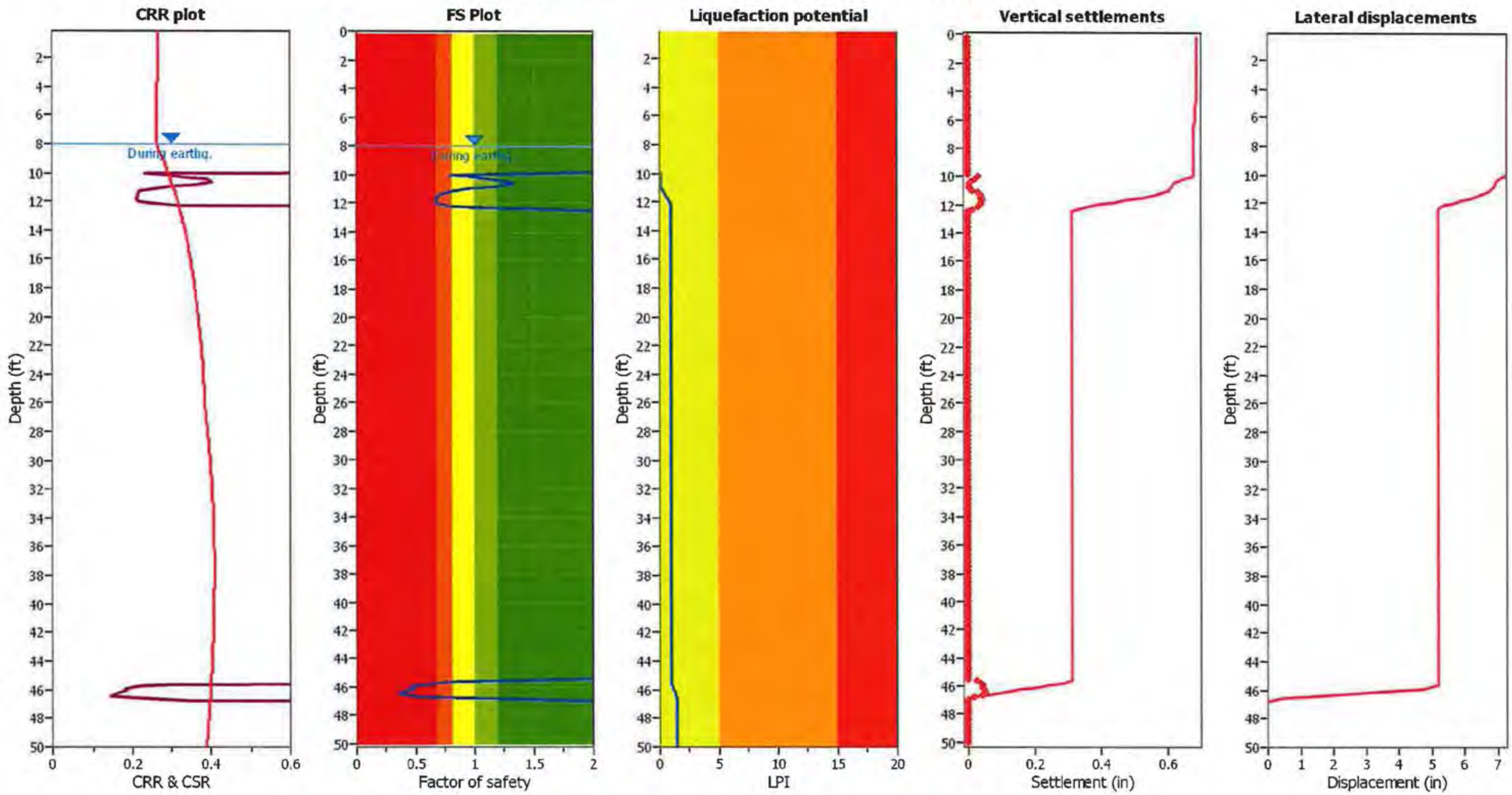






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.49	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liquefaction are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Appendix E

Slope Stability Analysis

APPENDIX E
SLOPE STABILITY ANALYSIS

Slope stability analyses were conducted to evaluate the effect of liquefaction and lateral spreading and the associated load demand on the proposed bulkhead to provide edge containment and protect the proposed development from excessive lateral displacement and structural damage. The analyses were conducted using the computer program *SLIDE v6.008* (Rocscience, 2011). *SLIDE* performs stability calculations using two-dimensional (2D) limit equilibrium techniques based on vertical slice equilibrium. Algorithms programmed into the software include techniques for optimization of critical failure surfaces identified by search routines to refine location and shape of critical surfaces and increase the potential that the minimum factor-of-safety is detected/calculated.

The slopes depicted in cross-sections A1-A1', B2-B2' and C3-C3' were analyzed using non-circular surfaces search technique programmed into the software. The non-circular model allows the analysis to consider the shear strength of specific horizontal planes or other planes of geologic discontinuity. In the case of the bulkhead stability, potential planes of weakness would be a continuous horizontal layer of liquefied soils. The analysis typically consisted of generating several thousand trial surfaces based upon specific search parameters input to the program. The factor-of-safety for each surface was calculated using Spencer's method of General Limit Equilibrium (GLE). The critical surface (lowest factor of safety) of each analysis was then optimized by the algorithm programmed into the software to refine the location, shape and calculated factor of safety.

The shear strength parameters used for the fill and native soils for the layers that were determined to not be susceptible to liquefaction and as used in the static analysis were determined by laboratory testing or correlation to field testing and engineering judgment. The strength parameters used in the analysis for soil layers that were determined to be susceptible to liquefaction were based upon the recommendations presented by Seed and Harder (1990; SCEC, 1999) and Idriss and Boulanger (2008). The methodology to estimate the post-liquefaction residual undrained shear strength for slope stability analysis requires the correlation of either the field N-value, corrected for overburden pressure, hammer efficiency, fines content, etc. [$(N1_{60})_{CS}$], or the corrected CPT tip resistance [$(q_{c1N})_{CS}$] to the residual undrained shear strength. The strength parameters are summarized in the output graphics of the various analyses.

The stability analysis was conducted in a series of three analyses: Initially, the post-liquefaction stability was analyzed. This analysis included the use of the residual undrained strength for soils layers susceptible to liquefaction and no inertial loading (i.e., k_h = 0.0g). The results of these analyses for all sections yielded a calculated factor of safety (FS) greater than 1.0 thereby indicating flow failure was not likely.

The second analysis consisted of assigning the undrained residual strengths to soil layers susceptible to liquefaction and applying a coefficient of horizontal acceleration (k_h) of 0.25. The coefficient was determined using the Bray and Travasarou procedure assuming the potential failure mass to be a rigid body. In addition, the seismic parameters used in this analysis were M_w 7.0 and PGA of 0.49g to determine the yield acceleration (k_y) corresponding to a maximum horizontal displacement of 5 cm (approximately 2 inches). This calculated value of k_y was then input as k_h in the slope stability analysis. The results of these analyses all indicated FS values less than 1.0. The critical surfaces identified by these analyses for each cross-section were then used as the basis to determine the load demand on the proposed bulkhead structure.

The third analysis consisted of using the critical surface identified in the second analysis above as the basis for analysis. A structural reinforcing element was input to the computer model to simulate the reinforcing effect of the proposed bulkhead structure. The load demand on the proposed bulkhead was the shear resistance required in the analysis in which the calculated FS was at least 1.0 using the undrained residual strengths of the liquefiable soils and $k_h = k_y$.

The results of the analysis are summarized in the following table with the output files of the individual analyses presented in this Appendix.

SUMMARY OF BULKHEAD STABILITY ANALYSIS

	Stability Analyses – Factor of Safety		Bulkhead Load Demand	
Cross-Section	Post-Liquefaction (k_h 0.0)	Liquefaction and Inertial Loading (k_h 0.25)	Shear Load[(1)] (kips/foot)	Elevation of Critical Surface[(2)] (feet, MSL)
A1-A1’	1.43	0.35	30	-4.0
B2-B2’	1.76	0.52	20	-0.5
C3-C3’	1.14	0.39	14	-1.5

NOTES:

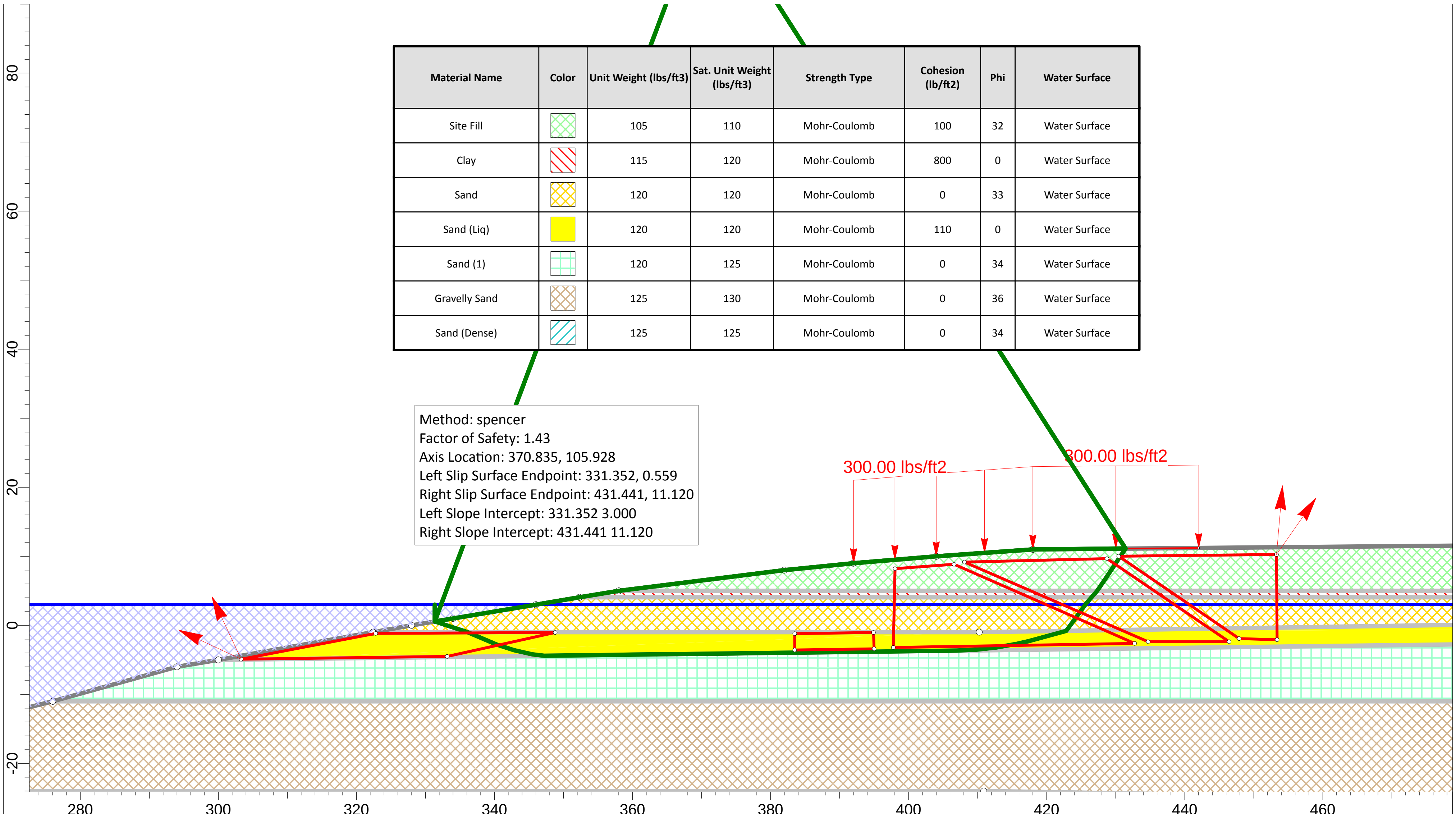
(1) Minimum shear resistance required of bulkhead structure for FS 1.0 and k_y 0.25

(2) Embedment depth for resistance to the Shear Load demand due to liquefaction should begin at this elevation at the respective cross-section locations.

Section A1 - Post-Liquefaction Stability

P:\Leighton Consulting\602000\602668.002 Bayside Village in Newport Beach\Analyses\Slope Stability\Section A1\Sec A1 - Z4 - LQ1 - PstLiq.slim

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi	Water Surface
Site Fill		105	110	Mohr-Coulomb	100	32	Water Surface
Clay		115	120	Mohr-Coulomb	800	0	Water Surface
Sand		120	120	Mohr-Coulomb	0	33	Water Surface
Sand (Liq)		120	120	Mohr-Coulomb	110	0	Water Surface
Sand (1)		120	125	Mohr-Coulomb	0	34	Water Surface
Gravelly Sand		125	130	Mohr-Coulomb	0	36	Water Surface
Sand (Dense)		125	125	Mohr-Coulomb	0	34	Water Surface



SLIDEINTERPRET 6.008

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Project **Bayside Village - Backbay Landing - Bulkhead Load Demand due to Liquefaction**			
Analyzed By JEH	*Units* feet	*Scale* 1:240	*Project No.:* **602668-002**
Date December 5, 2011	*Condition* **Liquefaction**		

Slide Analysis Information

Bayside Village - Backbay Landing - Bulkhead Load Demand due to Liquefaction

Project Summary

File Name: Sec A1 - Z4 - LQ1 - PstLiq
Slide Modeler Version: 6.008
Project Title: Bayside Village - Backbay Landing - Bulkhead Load Demand due to Liquefaction
Analysis: Section A1 - Post-Liquefaction Stability
Author: JEH
Company: Leighton Consulting, Inc.
Date Created: December 5, 2011
Comments:

Liquefaction
602668-002
Search for Critical Surface

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 50
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 115
Left Projection Angle (End Angle): 155
Right Projection Angle (Start Angle): 55
Right Projection Angle (End Angle): 85
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [lbs/ft2]: 300
Orientation: Vertical

Material Properties

Property	Embankment Fill	Site Fill	Clay	Sand	Sand (Liq)	Sand (1)	Gravelly Sand	Sand (Dense)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]		105	115	120	120	120	125	125
Saturated Unit Weight [lbs/ft3]		110	120	120	120	125	130	125
Cohesion [psf]	100	100	800	0	110	0	0	0
Friction Angle [deg]	32	32	0	33	0	34	36	34
Water Surface	None	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value		Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated
Ru Value	0							

Global Minimums

Method: spencer

FS: 1.432990
Axis Location: 370.835, 105.928
Left Slip Surface Endpoint: 331.352, 0.559
Right Slip Surface Endpoint: 431.441, 11.120
Left Slope Intercept: 331.352 3.000
Right Slope Intercept: 431.441 11.120
Resisting Moment=1.74638e+006 lb-ft
Driving Moment=1.21869e+006 lb-ft
Resisting Horizontal Force=13445.6 lb
Driving Horizontal Force=9382.85 lb

Global Minimum Coordinates

Method: spencer

X	Y
331.352	0.55862
336.106	-0.989878
340.332	-2.7869
342.856	-3.6138
345.512	-4.20473
347.209	-4.40976
351.276	-4.35898
354.185	-4.32259
357.105	-4.28608
360.029	-4.24957
362.947	-4.21306
365.864	-4.17658
368.79	-4.14006
371.708	-4.10354
374.635	-4.06702
377.551	-4.03051

380.471	-3.99402
383.395	-3.95748
386.314	-3.92097
389.238	-3.88446
390.482	-3.86886
394.625	-3.8171
397.095	-3.78624
402.029	-3.72453
406.984	-3.66262
409.844	-3.52679
412.716	-3.20624
415.65	-2.69054
417.402	-2.28675
422.831	-0.803014
425.751	3.18706
427.308	4.97168
428.464	6.67881
431.441	11.12

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 3215
Number of Invalid Surfaces: 1786

Error Codes:

Error Code -108 reported for 158 surfaces
Error Code -111 reported for 719 surfaces
Error Code -112 reported for 909 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.43299

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.37722	499.71	Sand	0	33	21.3022	30.5259	223.504	176.499	47.0053
2	2.37722	774.828	Sand	0	33	59.3631	85.0667	355.803	224.812	130.991
3	0.0218308	8.3932	Sand	0	33	84.6328	121.278	436.008	249.258	186.75
4	2.10185	943.416	Sand (Liq)	110	0	76.7626	110	497.949	277.436	220.513
5	2.10185	1211.28	Sand (Liq)	110	0	76.7626	110	628.192	333.214	294.978
6	2.52459	1771.61	Sand (Liq)	110	0	76.7626	110	744.663	386.902	357.761
7	2.65583	2155.68	Sand (Liq)	110	0	76.7626	110	843.248	431.138	412.11
8	1.69657	1501.14	Sand (Liq)	110	0	76.7626	110	904.163	455.972	448.191
9	2.03368	1895.71	Sand (Liq)	110	0	76.7626	110	934.727	461.577	473.15
10	2.03368	1972.23	Sand (Liq)	110	0	76.7626	110	972.326	459.993	512.333
11	2.9094	2953.07	Sand (Liq)	110	0	76.7626	110	1017.52	458.065	559.45
12	1.46003	1538.51	Sand (Liq)	110	0	76.7626	110	1056.24	456.36	599.881
13	1.46003	1576.17	Sand (Liq)	110	0	76.7626	110	1082.02	455.221	626.798
14	2.92399	3257.4	Sand (Liq)	110	0	76.7626	110	1116.47	453.512	662.956
15	2.91784	3352.03	Sand (Liq)	110	0	76.7626	110	1151.22	451.234	699.988
16	2.91671	3449.64	Sand (Liq)	110	0	76.7626	110	1185.11	448.957	736.152
17	1.46286	1767.39	Sand (Liq)	110	0	76.7626	110	1210.55	447.249	763.302
18	1.46286	1792.27	Sand (Liq)	110	0	76.7626	110	1227.55	446.11	781.44

19	2.91785	3649.19	Sand (Liq)	110	0	76.7626	110	1252.99	444.401	808.588
20	2.92731	3760.47	Sand (Liq)	110	0	76.7626	110	1286.95	442.122	844.828
21	2.91561	3844.47	Sand (Liq)	110	0	76.7626	110	1320.88	439.843	881.039
22	2.92065	3950.18	Sand (Liq)	110	0	76.7626	110	1354.78	437.565	917.218
23	1.46192	2014.5	Sand (Liq)	110	0	76.7626	110	1380.24	435.857	944.381
24	1.46192	2036.79	Sand (Liq)	110	0	76.7626	110	1395.48	434.717	960.76
25	2.91946	4125.04	Sand (Liq)	110	0	76.7626	110	1415.19	433.008	982.177
26	2.92369	4207.89	Sand (Liq)	110	0	76.7626	110	1441.46	430.73	1010.73
27	1.24401	1813.75	Sand (Liq)	110	0	76.7626	110	1460.19	429.104	1031.09
28	2.07164	3051.08	Sand (Liq)	110	0	76.7626	110	1550.58	427.809	1122.77
29	2.07164	3084.22	Sand (Liq)	110	0	76.7626	110	1791.8	426.194	1365.61
30	2.46919	3716.72	Sand (Liq)	110	0	76.7626	110	1808.25	424.424	1383.83
31	1.64474	2500.26	Sand (Liq)	110	0	76.7626	110	1823.15	422.82	1400.33
32	1.64474	2519.87	Sand (Liq)	110	0	76.7626	110	1835.07	421.536	1413.53
33	1.64474	2539.48	Sand (Liq)	110	0	76.7626	110	1846.99	420.253	1426.73
34	2.47779	3862.58	Sand (Liq)	110	0	76.7626	110	1861.8	418.645	1443.15
35	2.47779	3901.85	Sand (Liq)	110	0	76.7626	110	1877.42	416.713	1460.71
36	2.85955	4531.62	Sand (Liq)	110	0	76.7626	110	1881.17	411.51	1469.66
37	2.87169	4533.95	Sand (Liq)	110	0	76.7626	110	1863.93	397.271	1466.66
38	1.46701	2289.14	Sand (Liq)	110	0	76.7626	110	1834.38	379.225	1455.15
39	1.46701	2259.89	Sand (Liq)	110	0	76.7626	110	1814.63	363.135	1451.49
40	1.75262	2651.44	Sand (Liq)	110	0	76.7626	110	1777.9	342.492	1435.41
41	1.80941	2659.17	Sand (Liq)	110	0	76.7626	110	1727.5	314.462	1413.04
42	1.80941	2556.03	Sand (Liq)	110	0	76.7626	110	1671.08	283.601	1387.48
43	1.80941	2451.71	Sand (Liq)	110	0	76.7626	110	1614.27	252.739	1361.53
44	1.46034	1762.83	Sand	0	33	358.281	513.413	965.648	175.063	790.585
45	1.46034	1415.22	Sand	0	33	329.943	472.805	778.627	50.5725	728.055
46	0.75519	603.024	Sand	0	33	319.759	458.212	705.583	0	705.583
47	0.801995	556.951	Clay	800	0	558.273	800	362.398	0	362.398
48	1.15533	638.458	Site Fill	100	32	262.926	376.771	442.927	0	442.927
49	1.48851	517.481	Site Fill	100	32	209.546	300.278	320.511	0	320.511
50	1.48851	172.494	Site Fill	100	32	150.365	215.471	184.792	0	184.792

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.43299

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	331.352	0.55862	185.963	0	0
2	333.729	-0.215629	279.149	15.1162	3.0996
3	336.106	-0.989878	741.413	40.1483	3.0996
4	336.128	-0.999162	747.683	40.4878	3.0996
5	338.23	-1.89303	1386.26	75.0676	3.09961
6	340.332	-2.7869	2133.61	115.537	3.09959
7	342.856	-3.6138	2962.44	160.419	3.09959
8	345.512	-4.20473	3672.97	198.895	3.0996
9	347.209	-4.40976	3988.79	215.997	3.0996
10	349.242	-4.38437	4121.17	223.166	3.0996
11	351.276	-4.35898	4252.59	230.282	3.0996
12	354.185	-4.32259	4438.9	240.371	3.0996
13	355.645	-4.30434	4531.69	245.396	3.0996
14	357.105	-4.28608	4624.01	250.395	3.0996
15	360.029	-4.24957	4807.7	260.342	3.0996
16	362.947	-4.21306	4989.65	270.195	3.0996
17	365.864	-4.17658	5170.31	279.978	3.0996
18	367.327	-4.15832	5260.5	284.862	3.0996
19	368.79	-4.14006	5350.38	289.729	3.0996
20	371.708	-4.10354	5528.61	299.38	3.0996
21	374.635	-4.06702	5706.3	309.002	3.0996
22	377.551	-4.03051	5881.89	318.51	3.09959
23	380.471	-3.99402	6056.65	327.974	3.0996

24	381.933	-3.97575	6143.66	332.686	3.0996
25	383.395	-3.95748	6230.39	337.382	3.0996
26	386.314	-3.92097	6402.82	346.719	3.0996
27	389.238	-3.88446	6574.62	356.023	3.0996
28	390.482	-3.86886	6647.33	359.96	3.0996
29	392.554	-3.84298	6766.22	366.398	3.0996
30	394.625	-3.8171	6878.88	372.498	3.09959
31	397.095	-3.78624	7012.63	379.741	3.0996
32	398.739	-3.76567	7101.38	384.547	3.0996
33	400.384	-3.7451	7189.89	389.34	3.0996
34	402.029	-3.72453	7278.15	394.119	3.0996
35	404.507	-3.69358	7410.71	401.298	3.0996
36	406.984	-3.66262	7542.79	408.45	3.0996
37	409.844	-3.52679	7506.78	406.5	3.0996
38	412.716	-3.20624	7129.74	386.083	3.0996
39	414.183	-2.94839	6769.36	366.568	3.0996
40	415.65	-2.69054	6414.07	347.328	3.09959
41	417.402	-2.28675	5830.7	315.739	3.0996
42	419.212	-1.79217	5115.21	276.994	3.0996
43	421.021	-1.29759	4427.62	239.76	3.0996
44	422.831	-0.803014	3768.13	204.048	3.0996
45	424.291	1.19202	2364.83	128.058	3.0996
46	425.751	3.18706	1293.27	70.0319	3.0996
47	426.506	4.05255	924.072	50.0394	3.0996
48	427.308	4.97168	1038.71	56.2473	3.0996
49	428.464	6.67881	586.347	31.7513	3.0996
50	429.952	8.89941	186.531	10.1008	3.09958
51	431.441	11.12	0	0	0

List Of Coordinates

Water Table

X	Y
0	3
332.376	3
346	3
780	3

Line Load

X	Y
392.033	9.00277
404	10
418	11
442.036	11.2146

Block Search Window

X	Y
333.156	-4.508
348.808	-1.039
322.807	-1.183
303.306	-4.906

Block Search Window

X	Y
398.045	8.204
397.795	-3.209
432.762	-2.633
406.585	8.843

Block Search Window

X	Y
430.441	10.004
447.886	-1.921
453.386	-2.09
453.301	10.262

Block Search Window

X	Y
383.496	-3.577
395.003	-3.408
394.918	-1.039
383.496	-1.208

Block Search Window

X	Y
408.089	9.158
434.696	-2.375
446.431	-2.375
428.733	9.666

External Boundary

X	Y
0	-40
780	-40
780	-30
780	-11
780	1
780	4.05255
780	5
780	13
780	19
776	20
720	22
674	25
586	25
574	20
562	15
556	13
530	12
418	11
404	10
392	9
382	8
358	5
352.315	4.05255
346	3
334	1
328	0
322.405	-0.999162
300	-5
294	-6
276	-11
272	-12
250	-13
242	-14
230	-15
208	-15
192	-14

162	-14
131	-13
126	-12
114	-11
106	-10
96	-9
86	-8
76	-7
62	-6
50	-5
39	-4
35	-3
28	-2
8	-1
0	-1
0	-24

Material Boundary

X	Y
352.315	4.05255
741.802	4.05255
780	4.05255

Material Boundary

X	Y
358	5
780	5

Material Boundary

X	Y
556	13
780	13

Material Boundary

X	Y
322.405	-0.999162
410.234	-0.999162
741.802	4.05255

Material Boundary

X	Y
300	-5
780	1

Material Boundary

X	Y
276	-11
780	-11

Material Boundary

X	Y
0	-24
410.881	-24
780	-30

Section A1 - Critical Surface with Yield Acceleration (ky) 0.25

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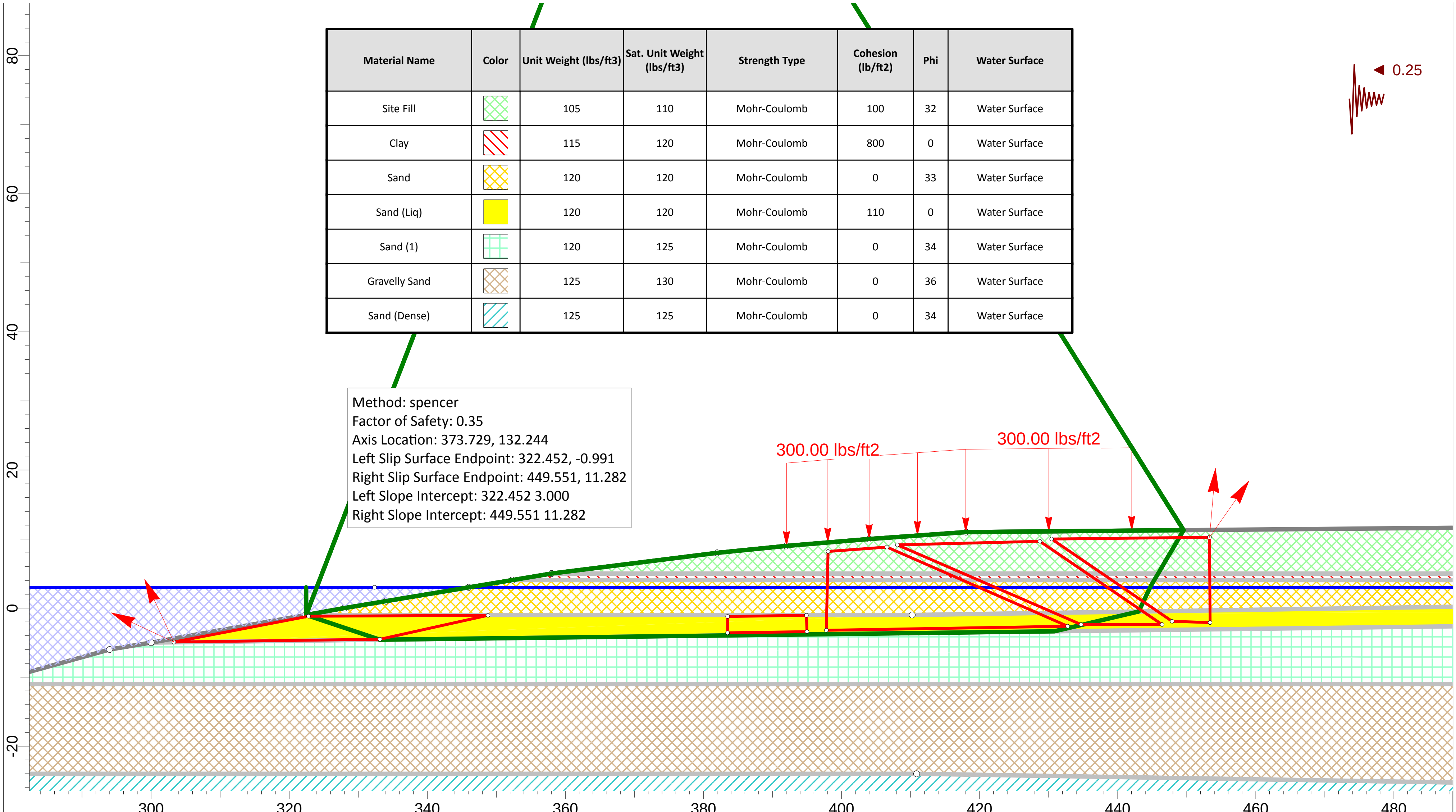
Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi	Water Surface
Site Fill		105	110	Mohr-Coulomb	100	32	Water Surface
Clay		115	120	Mohr-Coulomb	800	0	Water Surface
Sand		120	120	Mohr-Coulomb	0	33	Water Surface
Sand (Liq)		120	120	Mohr-Coulomb	110	0	Water Surface
Sand (1)		120	125	Mohr-Coulomb	0	34	Water Surface
Gravelly Sand		125	130	Mohr-Coulomb	0	36	Water Surface
Sand (Dense)		125	125	Mohr-Coulomb	0	34	Water Surface



SLIDEINTERPRET 6.008

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Project	**Bayside Village - Backbay Landing - Bulkhead Load Demand due to Liquefaction**		
Analyzed By JEH	*Units* feet	*Scale* 1:240	*Project No.:* **602668-002**
Date December 5, 2011	*Condition* **Liquefaction**		

Slide Analysis Information

Bayside Village - Backbay Landing - Bulkhead Load Demand due to Liquefaction

Project Summary

File Name: Sec A1 - Z4 - LQ1 - PS 025
Slide Modeler Version: 6.008
Project Title: Bayside Village - Backbay Landing - Bulkhead Load Demand due to Liquefaction
Analysis: Section A1 - Critical Surface with Yield Acceleration (ky) 0.25
Author: JEH
Company: Leighton Consulting, Inc.
Date Created: December 5, 2011
Comments:

Liquefaction
602668-002
Search for Critical Surface

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 50
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 115
Left Projection Angle (End Angle): 155
Right Projection Angle (Start Angle): 55
Right Projection Angle (End Angle): 85
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.25
1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [lbs/ft2]: 300
Orientation: Vertical

Material Properties

Property	Embankment Fill	Site Fill	Clay	Sand	Sand (Liq)	Sand (1)	Gravelly Sand	Sand (Dense)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]		105	115	120	120	120	125	125
Saturated Unit Weight [lbs/ft3]		110	120	120	120	125	130	125
Cohesion [psf]	100	100	800	0	110	0	0	0
Friction Angle [deg]	32	32	0	33	0	34	36	34
Water Surface	None	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value		Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated
Ru Value	0							

Global Minimums

Method: spencer

FS: 0.351055
Axis Location: 373.729, 132.244
Left Slip Surface Endpoint: 322.452, -0.991
Right Slip Surface Endpoint: 449.551, 11.282
Left Slope Intercept: 322.452 3.000
Right Slope Intercept: 449.551 11.282
Resisting Moment=2.10052e+006 lb-ft
Driving Moment=5.98345e+006 lb-ft
Resisting Horizontal Force=14277.2 lb
Driving Horizontal Force=40669.4 lb

Global Minimum Coordinates

Method: spencer

X	Y
322.452	-0.990631
333.158	-4.58388
392.551	-3.84307
430.839	-3.36338
443.041	-0.493754
444.803	3.20059
449.551	11.2817

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 2283
Number of Invalid Surfaces: 2718

Error Codes:

Error Code -108 reported for 54 surfaces
Error Code -111 reported for 907 surfaces
Error Code -112 reported for 1757 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 0.351055

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.6765	847.592	Sand (Liq)	110	0	313.341	110	584.685	277.043	307.642
2	2.6765	1209.8	Sand (Liq)	110	0	313.341	110	719.604	333.097	386.507
3	2.6765	1569.89	Sand (Liq)	110	0	313.341	110	853.178	389.152	464.026
4	2.6765	1927.19	Sand (Liq)	110	0	313.341	110	986.561	445.207	541.354
5	2.69966	2153.59	Sand (Liq)	110	0	313.341	110	840.825	472.184	368.641
6	2.69966	2212.65	Sand (Liq)	110	0	313.341	110	857.374	470.082	387.292
7	2.69966	2271.7	Sand (Liq)	110	0	313.341	110	873.92	467.981	405.939
8	2.69966	2330.76	Sand (Liq)	110	0	313.341	110	890.465	465.88	424.585
9	2.69966	2392.06	Sand (Liq)	110	0	313.341	110	907.877	463.779	444.098
10	2.69966	2505.21	Sand (Liq)	110	0	313.341	110	945.404	461.678	483.726
11	2.69966	2640.07	Sand (Liq)	110	0	313.341	110	991.351	459.576	531.775
12	2.69966	2772.44	Sand (Liq)	110	0	313.341	110	1036.45	457.475	578.975
13	2.69966	2901.25	Sand (Liq)	110	0	313.341	110	1080.34	455.374	624.963
14	2.69966	3016	Sand (Liq)	110	0	313.341	110	1119.43	453.273	666.158
15	2.69966	3101.65	Sand (Liq)	110	0	313.341	110	1148.61	451.172	697.438
16	2.69966	3186.4	Sand (Liq)	110	0	313.341	110	1177.49	449.07	728.416
17	2.69966	3271.14	Sand (Liq)	110	0	313.341	110	1206.36	446.969	759.389
18	2.69966	3355.89	Sand (Liq)	110	0	313.341	110	1235.23	444.868	790.365
19	2.69966	3440.64	Sand (Liq)	110	0	313.341	110	1264.1	442.767	821.338
20	2.69966	3525.39	Sand (Liq)	110	0	313.341	110	1292.98	440.665	852.315
21	2.69966	3610.14	Sand (Liq)	110	0	313.341	110	1321.86	438.564	883.292
22	2.69966	3694.89	Sand (Liq)	110	0	313.341	110	1350.73	436.463	914.265
23	2.69966	3771.74	Sand (Liq)	110	0	313.341	110	1376.91	434.362	942.552
24	2.69966	3837.44	Sand (Liq)	110	0	313.341	110	1399.3	432.261	967.036
25	2.69966	3903.06	Sand (Liq)	110	0	313.341	110	1421.65	430.159	991.494
26	2.69966	3968.41	Sand (Liq)	110	0	313.341	110	1501.43	428.058	1073.38
27	2.55256	3804.59	Sand (Liq)	110	0	313.341	110	1762.65	426.01	1336.64
28	2.55256	3851.81	Sand (Liq)	110	0	313.341	110	1779.66	424.014	1355.65
29	2.55256	3899.02	Sand (Liq)	110	0	313.341	110	1796.67	422.019	1374.66
30	2.55256	3946.24	Sand (Liq)	110	0	313.341	110	1813.69	420.023	1393.67
31	2.55256	3992.38	Sand (Liq)	110	0	313.341	110	1830.17	418.028	1412.14
32	2.55256	4032.41	Sand (Liq)	110	0	313.341	110	1844.46	416.032	1428.43
33	2.55256	4071.48	Sand (Liq)	110	0	313.341	110	1858.54	414.037	1444.5
34	2.55256	4110.55	Sand (Liq)	110	0	313.341	110	1872.62	412.041	1460.58
35	2.55256	4149.62	Sand (Liq)	110	0	313.341	110	1886.7	410.046	1476.65
36	2.55256	4188.67	Sand (Liq)	110	0	313.341	110	1900.75	408.05	1492.7
37	2.55256	4205.1	Sand (Liq)	110	0	313.341	110	1905.94	406.055	1499.89
38	2.55256	4201.41	Sand (Liq)	110	0	313.341	110	1904.61	404.059	1500.55
39	2.55256	4197.73	Sand (Liq)	110	0	313.341	110	1903.29	402.064	1501.22
40	2.55256	4194.04	Sand (Liq)	110	0	313.341	110	1901.95	400.068	1501.89
41	2.55256	4190.35	Sand (Liq)	110	0	313.341	110	1900.63	398.073	1502.55
42	2.44023	3922.95	Sand (Liq)	110	0	313.341	110	1685.15	379.168	1305.99
43	2.44023	3760.47	Sand (Liq)	110	0	313.341	110	1627.82	343.355	1284.46

44	2.44023	3597.99	Sand (Liq)	110	0	313.341	110	1570.48	307.543	1262.94
45	2.44023	3435.51	Sand (Liq)	110	0	313.341	110	1513.14	271.73	1241.41
46	2.44023	3273.03	Sand (Liq)	110	0	313.341	110	1340.59	235.917	1104.68
47	1.7626	1916.21	Sand	0	33	311.854	109.478	271.328	102.747	168.581
48	0.500527	408.148	Sand	0	33	339.414	119.153	183.48	0	183.48
49	0.556625	395.391	Clay	800	0	2278.85	800	-1657.98	0	-1657.98
50	3.6905	1210.7	Site Fill	100	32	242.836	85.2487	-23.6069	0	-23.6069

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 0.351055

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	322.452	-0.990631	496.864	0	0
2	325.129	-1.88894	1420.52	435.841	17.057
3	327.805	-2.78726	2837.49	870.59	17.0569
4	330.482	-3.68557	4246.04	1302.76	17.0569
5	333.158	-4.58388	5653.6	1734.62	17.0569
6	335.858	-4.55021	6067.24	1861.53	17.0569
7	338.558	-4.51654	6433.97	1974.05	17.0569
8	341.257	-4.48286	6753.8	2072.18	17.0569
9	343.957	-4.44919	7026.73	2155.92	17.0569
10	346.657	-4.41552	7253.1	2225.38	17.0569
11	349.356	-4.38184	7440.88	2282.99	17.0569
12	352.056	-4.34817	7593.39	2329.78	17.0569
13	354.756	-4.3145	7711.3	2365.96	17.0569
14	357.455	-4.28082	7795.52	2391.8	17.0569
15	360.155	-4.24715	7849.74	2408.44	17.0569
16	362.855	-4.21348	7881.56	2418.2	17.0569
17	365.554	-4.1798	7891.23	2421.17	17.0569
18	368.254	-4.14613	7878.73	2417.33	17.0569
19	370.954	-4.11246	7844.08	2406.7	17.0569
20	373.653	-4.07878	7787.27	2389.27	17.0569
21	376.353	-4.04511	7708.3	2365.04	17.0569
22	379.053	-4.01144	7607.16	2334.01	17.0569
23	381.752	-3.97776	7483.87	2296.18	17.0569
24	384.452	-3.94409	7340.49	2252.19	17.0569
25	387.152	-3.91042	7179.92	2202.92	17.0569
26	389.851	-3.87674	7002.2	2148.4	17.0569
27	392.551	-3.84307	6805.45	2088.03	17.0569
28	395.104	-3.81109	6597.76	2024.31	17.0569
29	397.656	-3.77911	6377.71	1956.79	17.0569
30	400.209	-3.74713	6145.32	1885.49	17.0569
31	402.761	-3.71515	5900.58	1810.4	17.0569
32	405.314	-3.68317	5643.78	1731.61	17.0569
33	407.866	-3.65119	5376.52	1649.61	17.0569
34	410.419	-3.61921	5099.03	1564.47	17.0569
35	412.971	-3.58723	4811.33	1476.2	17.0569
36	415.524	-3.55525	4513.41	1384.79	17.0569
37	418.077	-3.52328	4205.28	1290.25	17.0569
38	420.629	-3.4913	3892.87	1194.4	17.0569
39	423.182	-3.45932	3581.43	1098.85	17.057
40	425.734	-3.42734	3270.96	1003.59	17.057
41	428.287	-3.39536	2961.44	908.622	17.0569
42	430.839	-3.36338	2652.9	813.955	17.0569
43	433.28	-2.78945	1469.63	450.908	17.0569
44	435.72	-2.21553	359.895	110.422	17.0569
45	438.16	-1.6416	-676.315	-207.505	17.0569
46	440.6	-1.06768	-1639	-502.873	17.0569
47	443.041	-0.493754	-2462.03	-755.394	17.0569
48	444.803	3.20059	-3393.79	-1041.27	17.0569

49	445.304	4.05255	-3482.26	-1068.42	17.057
50	445.86	5	-741.8	-227.597	17.0569
51	449.551	11.2817	0	0	0

List Of Coordinates

Water Table

X	Y
0	3
332.376	3
346	3
780	3

Line Load

X	Y
392.033	9.00277
404	10
418	11
442.036	11.2146

Block Search Window

X	Y
333.156	-4.508
348.808	-1.039
322.807	-1.183
303.306	-4.906

Block Search Window

X	Y
398.045	8.204
397.795	-3.209
432.762	-2.633
406.585	8.843

Block Search Window

X	Y
430.441	10.004
447.886	-1.921
453.386	-2.09
453.301	10.262

Block Search Window

X	Y
383.496	-3.577
395.003	-3.408
394.918	-1.039
383.496	-1.208

Block Search Window

X	Y
408.089	9.158
434.696	-2.375
446.431	-2.375
428.733	9.666

External Boundary

X	Y
0	-40
780	-40
780	-30
780	-11
780	1
780	4.05255
780	5
780	13
780	19
776	20
720	22
674	25
586	25
574	20
562	15
556	13
530	12
418	11
404	10
392	9
382	8
358	5
352.315	4.05255
346	3
334	1
328	0
322.405	-0.999162
300	-5
294	-6
276	-11
272	-12
250	-13
242	-14
230	-15
208	-15
192	-14
162	-14
131	-13
126	-12
114	-11
106	-10
96	-9
86	-8
76	-7
62	-6
50	-5
39	-4
35	-3
28	-2
8	-1
0	-1
0	-24

Material Boundary

X	Y
352.315	4.05255
741.802	4.05255
780	4.05255

Material Boundary

X	Y
358	5
780	5

Material Boundary

X	Y
556	13
780	13

Material Boundary

X	Y
322.405	-0.999162
410.234	-0.999162
741.802	4.05255

Material Boundary

X	Y
300	-5
780	1

Material Boundary

X	Y
276	-11
780	-11

Material Boundary

X	Y
0	-24
410.881	-24
780	-30

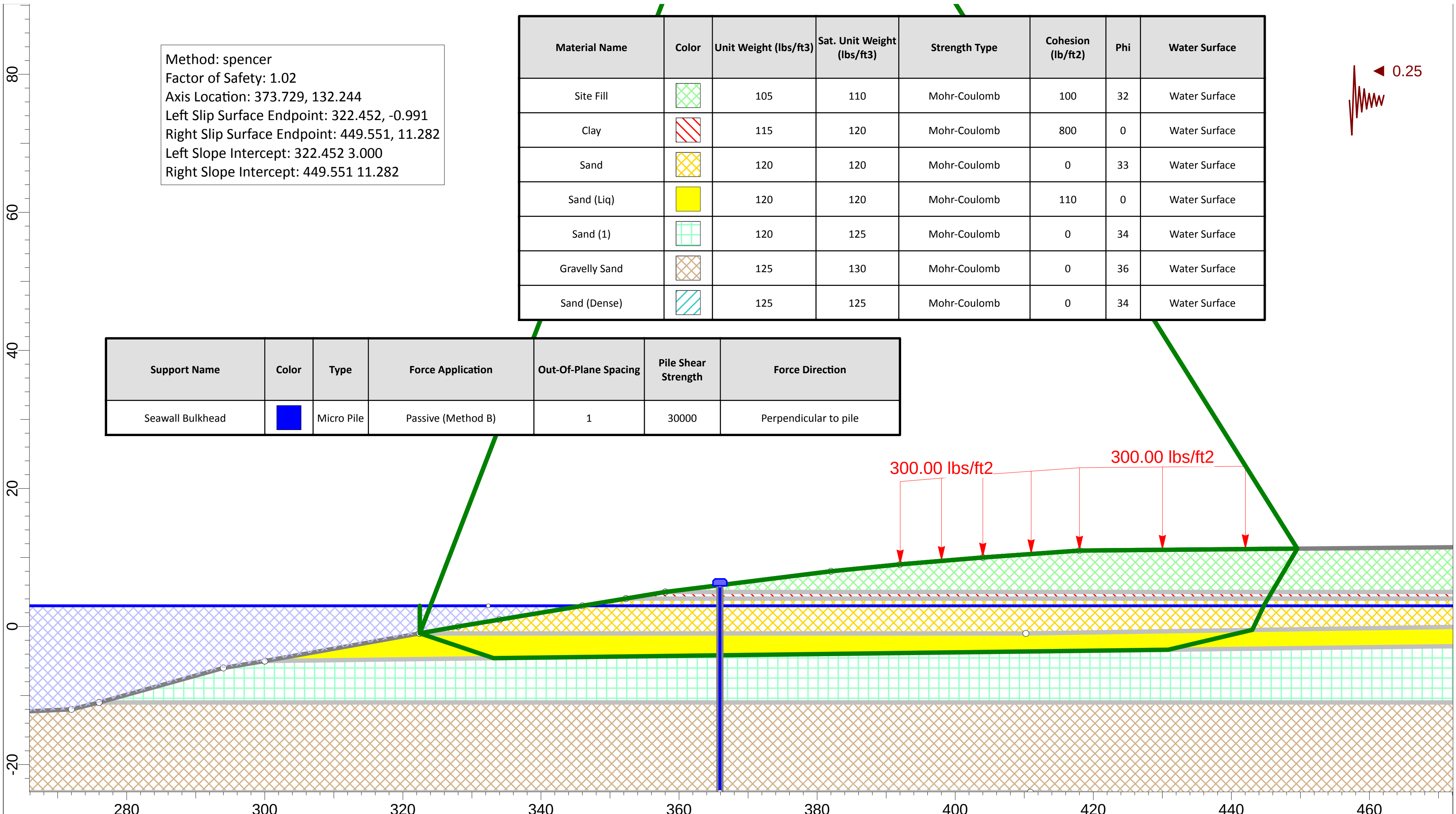
Section A1 - Load Demand for FS = 1.0 and Yield Accel. 0.25

P:\Leighton Consulting\602000\602668.002 Bayside Village in Newport Beach\Analyses\Slope Stability\Section A1\Sec A1 - Z4 - LQ1 - PS 025 - BK1 - SS.slim

Method: spencer
Factor of Safety: 1.02
Axis Location: 373.729, 132.244
Left Slip Surface Endpoint: 322.452, -0.991
Right Slip Surface Endpoint: 449.551, 11.282
Left Slope Intercept: 322.452 3.000
Right Slope Intercept: 449.551 11.282

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi	Water Surface
Site Fill		105	110	Mohr-Coulomb	100	32	Water Surface
Clay		115	120	Mohr-Coulomb	800	0	Water Surface
Sand		120	120	Mohr-Coulomb	0	33	Water Surface
Sand (Liq)		120	120	Mohr-Coulomb	110	0	Water Surface
Sand (1)		120	125	Mohr-Coulomb	0	34	Water Surface
Gravelly Sand		125	130	Mohr-Coulomb	0	36	Water Surface
Sand (Dense)		125	125	Mohr-Coulomb	0	34	Water Surface

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing	Pile Shear Strength	Force Direction
Seawall Bulkhead		Micro Pile	Passive (Method B)	1	30000	Perpendicular to pile



SLIDEINTERPRET 6.008

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Project	**Bayside Village - Backbay Landing - Load Demand on Bulkhead due to Liquefaction**
Analyzed By	JEH
Units	feet
Scale	1:240
Project No.:	**602668-002**
Date	December 5, 2011
Condition	**Liquefaction**

Slide Analysis Information

Bayside Village - Backbay Landing - Load Demand on Bulkhead due to Liquefaction

Project Summary

File Name: Sec A1 - Z4 - LQ1 - PS 025 - BK1 - SS
Slide Modeler Version: 6.008
Project Title: Bayside Village - Backbay Landing - Load Demand on Bulkhead due to Liquefaction
Analysis: Section A1 - Load Demand for FS = 1.0 and Yield Accel. 0.25
Author: JEH
Company: Leighton Consulting, Inc.
Date Created: December 5, 2011
Comments:

Liquefaction
602668-002
Specific Surface analyzed is Critical Surface identifed by search

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 50
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 1
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 115
Left Projection Angle (End Angle): 155
Right Projection Angle (Start Angle): 55
Right Projection Angle (End Angle): 85
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.25
1 Distributed Load present

Distributed Load 1

Distribution: Constant
Magnitude [lbs/ft2]: 300
Orientation: Vertical

Material Properties

Property	Embankment Fill	Site Fill	Clay	Sand	Sand (Liq)	Sand (1)	Gravelly Sand	Sand (Dense)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]		105	115	120	120	120	125	125
Saturated Unit Weight [lbs/ft3]		110	120	120	120	125	130	125
Cohesion [psf]	100	100	800	0	110	0	0	0
Friction Angle [deg]	32	32	0	33	0	34	36	34
Water Surface	None	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value		Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated
Ru Value	0							

Support Properties

Seawall Bulkhead

Support Type: Micro-Pile
Force Application: Passive
Out-of-Plane Spacing: 1 ft
Pile Shear Strength: 30000 lb
Force Direction: Perpendicular to Pile

Global Minimums

Method: spencer

FS: 1.015410
Axis Location: 373.729, 132.244
Left Slip Surface Endpoint: 322.452, -0.991
Right Slip Surface Endpoint: 449.551, 11.282
Left Slope Intercept: 322.452 3.000
Right Slope Intercept: 449.551 11.282
Resisting Moment=6.31105e+006 lb-ft
Driving Moment=6.21526e+006 lb-ft
Resisting Horizontal Force=44734.4 lb
Driving Horizontal Force=44055.4 lb

Global Minimum Coordinates

Method: spencer

X	Y
322.452	-0.990631
333.158	-4.58388
392.551	-3.84307
430.839	-3.36338
443.041	-0.493754

444.803	3.20059
449.551	11.2817

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 1
Number of Invalid Surfaces: 0

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.01541

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.6765	847.592	Sand (Liq)	110	0	108.331	110	399.585	277.043	122.542
2	2.6765	1209.8	Sand (Liq)	110	0	108.331	110	534.689	333.097	201.592
3	2.6765	1569.89	Sand (Liq)	110	0	108.331	110	668.698	389.152	279.546
4	2.6765	1927.19	Sand (Liq)	110	0	108.331	110	802.134	445.207	356.927
5	2.69966	2153.59	Sand (Liq)	110	0	108.331	110	787.36	472.184	315.176
6	2.69966	2212.65	Sand (Liq)	110	0	108.331	110	806.161	470.082	336.079
7	2.69966	2271.7	Sand (Liq)	110	0	108.331	110	824.962	467.981	356.981
8	2.69966	2330.76	Sand (Liq)	110	0	108.331	110	843.763	465.88	377.883
9	2.69966	2392.06	Sand (Liq)	110	0	108.331	110	863.415	463.779	399.636
10	2.69966	2505.21	Sand (Liq)	110	0	108.331	110	902.799	461.678	441.121
11	2.69966	2640.07	Sand (Liq)	110	0	108.331	110	950.442	459.576	490.866
12	2.69966	2772.44	Sand (Liq)	110	0	108.331	110	997.203	457.475	539.728
13	2.69966	2901.25	Sand (Liq)	110	0	108.331	110	1042.71	455.374	587.335
14	2.69966	3016	Sand (Liq)	110	0	108.331	110	1083.25	453.273	629.975
15	2.69966	3101.65	Sand (Liq)	110	0	108.331	110	1113.5	451.172	662.329
16	2.69966	3186.4	Sand (Liq)	110	0	108.331	110	1143.44	449.07	694.37
17	2.69966	3271.14	Sand (Liq)	110	0	108.331	110	3133.04	446.969	2686.07
18	2.69966	3355.89	Sand (Liq)	110	0	108.331	110	1203.32	444.868	758.452
19	2.69966	3440.64	Sand (Liq)	110	0	108.331	110	1233.26	442.767	790.492
20	2.69966	3525.39	Sand (Liq)	110	0	108.331	110	1263.2	440.665	822.532
21	2.69966	3610.14	Sand (Liq)	110	0	108.331	110	1293.14	438.564	854.572
22	2.69966	3694.89	Sand (Liq)	110	0	108.331	110	1323.08	436.463	886.615
23	2.69966	3771.74	Sand (Liq)	110	0	108.331	110	1350.23	434.362	915.866
24	2.69966	3837.44	Sand (Liq)	110	0	108.331	110	1373.44	432.261	941.175
25	2.69966	3903.06	Sand (Liq)	110	0	108.331	110	1396.62	430.159	966.46
26	2.69966	3968.41	Sand (Liq)	110	0	108.331	110	1477.32	428.058	1049.26
27	2.55256	3804.59	Sand (Liq)	110	0	108.331	110	1739.64	426.01	1313.63
28	2.55256	3851.81	Sand (Liq)	110	0	108.331	110	1757.29	424.014	1333.27
29	2.55256	3899.02	Sand (Liq)	110	0	108.331	110	1774.93	422.019	1352.91
30	2.55256	3946.24	Sand (Liq)	110	0	108.331	110	1792.57	420.023	1372.54
31	2.55256	3992.38	Sand (Liq)	110	0	108.331	110	1809.66	418.028	1391.64
32	2.55256	4032.41	Sand (Liq)	110	0	108.331	110	1824.49	416.032	1408.46
33	2.55256	4071.48	Sand (Liq)	110	0	108.331	110	1839.08	414.037	1425.05
34	2.55256	4110.55	Sand (Liq)	110	0	108.331	110	1853.68	412.041	1441.64
35	2.55256	4149.62	Sand (Liq)	110	0	108.331	110	1868.28	410.046	1458.23
36	2.55256	4188.67	Sand (Liq)	110	0	108.331	110	1882.85	408.05	1474.8
37	2.55256	4205.1	Sand (Liq)	110	0	108.331	110	1888.26	406.055	1482.2
38	2.55256	4201.41	Sand (Liq)	110	0	108.331	110	1886.88	404.059	1482.82
39	2.55256	4197.73	Sand (Liq)	110	0	108.331	110	1885.5	402.064	1483.44
40	2.55256	4194.04	Sand (Liq)	110	0	108.331	110	1884.13	400.068	1484.06
41	2.55256	4190.35	Sand (Liq)	110	0	108.331	110	1882.75	398.073	1484.67
42	2.44023	3922.95	Sand (Liq)	110	0	108.331	110	1757.4	379.168	1378.23
43	2.44023	3760.47	Sand (Liq)	110	0	108.331	110	1696.29	343.355	1352.93
44	2.44023	3597.99	Sand (Liq)	110	0	108.331	110	1635.18	307.543	1327.64
45	2.44023	3435.51	Sand (Liq)	110	0	108.331	110	1574.07	271.73	1302.34
46	2.44023	3273.03	Sand (Liq)	110	0	108.331	110	1394.36	235.917	1158.44

47	1.7626	1916.21	Sand	0	33	221.461	224.874	449.021	102.747	346.274
48	0.500527	408.148	Sand	0	33	218.994	222.369	342.418	0	342.418
49	0.556625	395.391	Clay	800	0	787.859	800	-427.031	0	-427.031
50	3.6905	1210.7	Site Fill	100	32	137.882	140.007	64.0245	0	64.0245

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.01541

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	322.452	-0.990631	496.864	0	0
2	325.129	-1.88894	706.102	124.794	10.0228
3	327.805	-2.78726	1408.81	248.989	10.0228
4	330.482	-3.68557	2103.5	371.766	10.0228
5	333.158	-4.58388	2797.24	494.376	10.0228
6	335.858	-4.55021	2659.79	470.084	10.0228
7	338.558	-4.51654	2475.37	437.489	10.0228
8	341.257	-4.48286	2243.96	396.591	10.0228
9	343.957	-4.44919	1965.58	347.39	10.0228
10	346.657	-4.41552	1640.56	289.947	10.0228
11	349.356	-4.38184	1276.88	225.672	10.0228
12	352.056	-4.34817	877.887	155.155	10.0228
13	354.756	-4.3145	444.225	78.5111	10.0228
14	357.455	-4.28082	-23.1708	-4.09515	10.0228
15	360.155	-4.24715	-520.62	-92.0129	10.0228
16	362.855	-4.21348	-1040.5	-183.895	10.0228
17	365.554	-4.1798	-1582.57	-279.699	10.0228
18	368.254	-4.14613	27787.2	4911.02	10.0228
19	370.954	-4.11246	27200.7	4807.37	10.0228
20	373.653	-4.07878	26592	4699.8	10.0228
21	376.353	-4.04511	25961.2	4588.31	10.0228
22	379.053	-4.01144	25308.1	4472.89	10.0228
23	381.752	-3.97776	24632.9	4353.55	10.0228
24	384.452	-3.94409	23937.5	4230.65	10.0228
25	387.152	-3.91042	23224.9	4104.71	10.0228
26	389.851	-3.87674	22495.2	3975.73	10.0228
27	392.551	-3.84307	21746.4	3843.39	10.0228
28	395.104	-3.81109	21016.6	3714.42	10.0228
29	397.656	-3.77911	20274.5	3583.26	10.0228
30	400.209	-3.74713	19520.1	3449.92	10.0228
31	402.761	-3.71515	18753.3	3314.4	10.0228
32	405.314	-3.68317	17974.4	3176.74	10.0228
33	407.866	-3.65119	17185	3037.22	10.0228
34	410.419	-3.61921	16385.3	2895.9	10.0228
35	412.971	-3.58723	15575.5	2752.77	10.0228
36	415.524	-3.55525	14755.4	2607.83	10.0228
37	418.077	-3.52328	13925.1	2461.08	10.0228
38	420.629	-3.4913	13090.5	2313.57	10.0228
39	423.182	-3.45932	12256.8	2166.24	10.0228
40	425.734	-3.42734	11424.2	2019.08	10.0228
41	428.287	-3.39536	10592.5	1872.08	10.0227
42	430.839	-3.36338	9761.74	1725.26	10.0228
43	433.28	-2.78945	8037.26	1420.48	10.0228
44	435.72	-2.21553	6388.47	1129.08	10.0228
45	438.16	-1.6416	4815.37	851.055	10.0228
46	440.6	-1.06768	3317.97	586.408	10.0228
47	443.041	-0.493754	1964.32	347.169	10.0228
48	444.803	3.20059	217.534	38.4464	10.0228
49	445.304	4.05255	-66.403	-11.7359	10.0228
50	445.86	5	678.738	119.958	10.0228
51	449.551	11.2817	0	0	0

List Of Coordinates

Water Table

X	Y
0	3
332.376	3
346	3
780	3

Line Load

X	Y
392.033	9.00277
404	10
418	11
442.036	11.2146

Non-Circular Failure Surface

X	Y
322.452	-0.990631
333.158	-4.58388
392.551	-3.84307
430.839	-3.36338
443.041	-0.493754
444.803	3.20059
449.551	11.2817

External Boundary

X	Y
0	-40
780	-40
780	-30
780	-11
780	1
780	4.05255
780	5
780	13
780	19
776	20
720	22
674	25
586	25
574	20
562	15
556	13
530	12
418	11
404	10
392	9
382	8
358	5
352.315	4.05255
346	3
334	1
328	0
322.405	-0.999162
300	-5
294	-6
276	-11

272	-12
250	-13
242	-14
230	-15
208	-15
192	-14
162	-14
131	-13
126	-12
114	-11
106	-10
96	-9
86	-8
76	-7
62	-6
50	-5
39	-4
35	-3
28	-2
8	-1
0	-1
0	-24

Material Boundary

X	Y
352.315	4.05255
741.802	4.05255
780	4.05255

Material Boundary

X	Y
358	5
780	5

Material Boundary

X	Y
556	13
780	13

Material Boundary

X	Y
322.405	-0.999162
410.234	-0.999162
741.802	4.05255

Material Boundary

X	Y
300	-5
780	1

Material Boundary

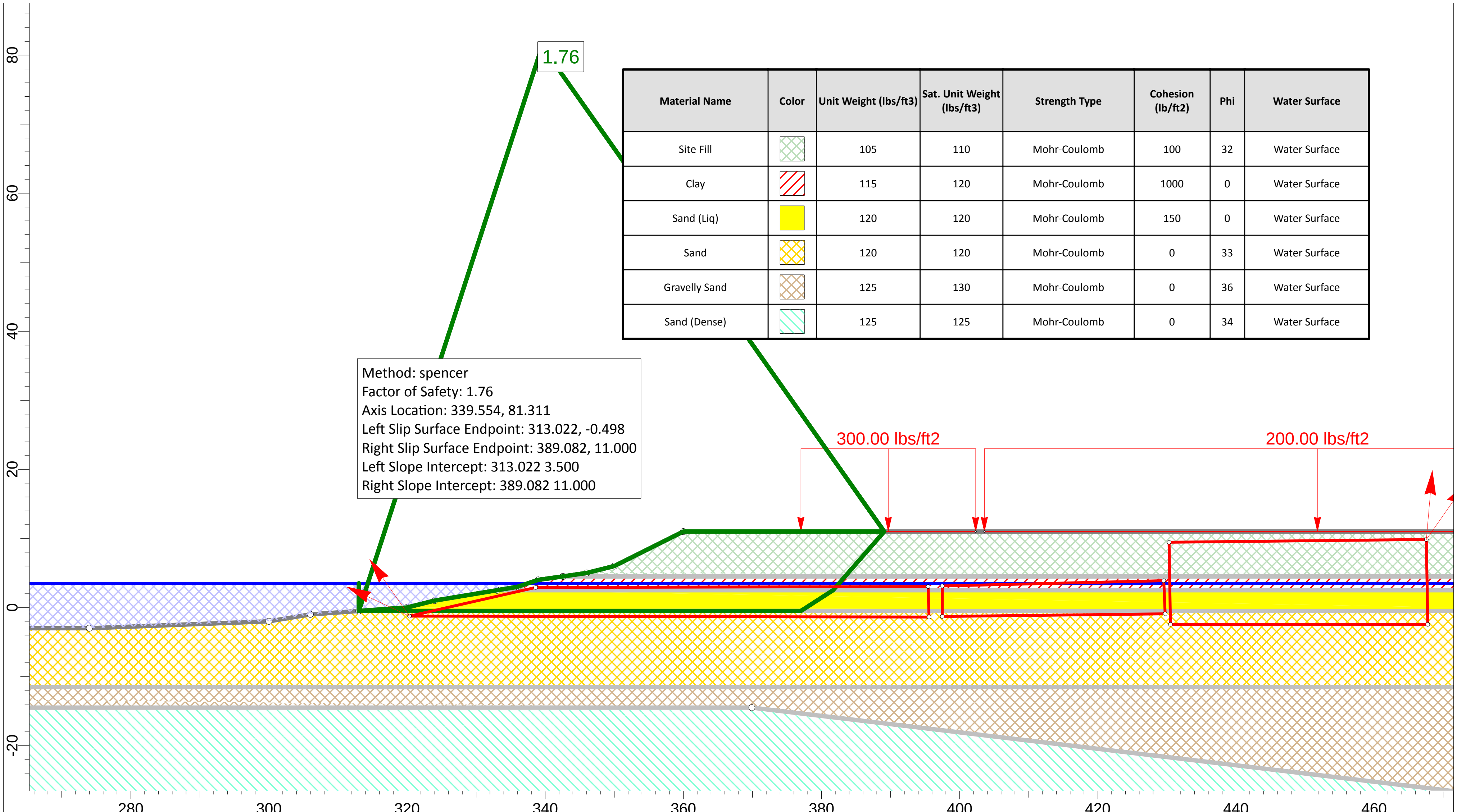
X	Y
276	-11
780	-11

Material Boundary

X	Y
0	-24
410.881	-24
780	-30

Section B2 - Post-Liquefaction Stability

P:\Leighton Consulting\602000\602668.002 Bayside Village in Newport Beach\Analyses\Slope Stability\Section B2\Sec B2 - X1 - LQ1 - PstLiq1.slim



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi	Water Surface
Site Fill		105	110	Mohr-Coulomb	100	32	Water Surface
Clay		115	120	Mohr-Coulomb	1000	0	Water Surface
Sand (Liq)		120	120	Mohr-Coulomb	150	0	Water Surface
Sand		120	120	Mohr-Coulomb	0	33	Water Surface
Gravelly Sand		125	130	Mohr-Coulomb	0	36	Water Surface
Sand (Dense)		125	125	Mohr-Coulomb	0	34	Water Surface

SLIDEINTERPRET 6.008

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Project Bayside Village - Backbay Landing - Load Demand on Bulkhead due to Liquefaction			
Analyzed By JEH	*Units* feet	*Scale* 1:240	*Project No.:* 602668-002
Date December 5, 2011	*Condition* **Liquefaction**		

Slide Analysis Information

Bayside Village - Backbay Landing - Load Demand on Bulkhead due to Liquefaction

Project Summary

File Name: Sec B2 - X1 - LQ1 - PstLiq1
Slide Modeler Version: 6.008
Project Title: Bayside Village - Backbay Landing - Load Demand on Bulkhead due to Liquefaction
Analysis: Section B2 - Post-Liquefaction Stability
Author: JEH
Company: Leighton Consulting, Inc.
Date Created: December 5, 2011
Comments:

Liquefaction
602668-002
Search for Critical Surface with Residual Strength

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 50
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 125
Left Projection Angle (End Angle): 155
Right Projection Angle (Start Angle): 55
Right Projection Angle (End Angle): 85
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

2 Distributed Loads present

Distributed Load 1

Distribution: Constant
Magnitude [lbs/ft2]: 300
Orientation: Vertical

Distributed Load 2

Distribution: Constant
Magnitude [lbs/ft2]: 200
Orientation: Vertical

Material Properties

Property	Site Fill	Clay	Sand (Liq)	Sand	Gravelly Sand	Sand (Dense)
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	105	115	120	120	125	125
Saturated Unit Weight [lbs/ft3]	110	120	120	120	130	125
Cohesion [psf]	100	1000	150	0	0	0
Friction Angle [deg]	32	0	0	33	36	34
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated

Global Minimums

Method: spencer

FS: 1.763540
Axis Location: 339.554, 81.311
Left Slip Surface Endpoint: 313.022, -0.498
Right Slip Surface Endpoint: 389.082, 11.000
Left Slope Intercept: 313.022 3.500
Right Slope Intercept: 389.082 11.000
Resisting Moment=1.16278e+006 lb-ft
Driving Moment=659342 lb-ft
Resisting Horizontal Force=11961 lb
Driving Horizontal Force=6782.39 lb

Global Minimum Coordinates

Method: spencer

X	Y
313.022	-0.498407
329.596	-0.499136
377.022	-0.495179
381.667	2.51185
389.082	11

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 2825
Number of Invalid Surfaces: 2176

Error Codes:

Error Code -107 reported for 929 surfaces
Error Code -108 reported for 727 surfaces
Error Code -111 reported for 16 surfaces
Error Code -112 reported for 504 surfaces

Error Codes

The following errors were encountered during the computation:

-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.76354

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.27315	577.796	Sand	0	33	2.41527	4.25942	256.063	249.504	6.55867
2	1.43003	374.396	Sand	0	33	5.30227	9.35077	263.908	249.509	14.3985
3	1.43003	382.821	Sand	0	33	7.53195	13.2829	269.967	249.513	20.4538
4	1.43003	391.245	Sand	0	33	9.76167	17.2151	276.025	249.517	26.5085
5	1.43003	404.974	Sand	0	33	14.3588	25.3223	288.513	249.521	38.9923
6	1.43003	433.549	Sand	0	33	22.1954	39.1424	309.798	249.525	60.2732
7	1.43003	463.007	Sand	0	33	29.8522	52.6455	330.596	249.528	81.0677
8	1.43003	488.374	Sand	0	33	36.036	63.5509	347.392	249.532	97.8599
9	1.43003	508.054	Sand	0	33	41.1544	72.5775	361.296	249.536	111.76
10	1.43003	527.697	Sand	0	33	46.3041	81.6592	375.284	249.54	125.744
11	1.43003	547.339	Sand	0	33	51.4539	90.741	389.273	249.544	139.729
12	1.50788	598.396	Sand	0	33	56.737	100.058	403.618	249.542	154.076
13	1.50788	620.201	Sand	0	33	62.1625	109.626	418.344	249.534	168.81
14	1.50788	642.006	Sand	0	33	67.5879	119.194	433.07	249.526	183.544
15	1.50788	663.81	Sand	0	33	73.0134	128.762	447.795	249.519	198.276
16	1.50788	691.8	Sand	0	33	80.0651	141.198	466.937	249.511	217.426
17	1.53412	761.016	Sand (Liq)	150	0	85.0562	150	504.118	249.503	254.615
18	1.53412	834.077	Sand (Liq)	150	0	85.0562	150	551.713	249.495	302.218
19	1.53412	873.916	Sand (Liq)	150	0	85.0562	150	577.682	249.487	328.195
20	1.53412	912.197	Sand (Liq)	150	0	85.0562	150	602.635	249.479	353.156
21	1.53412	947.96	Sand (Liq)	150	0	85.0562	150	625.947	249.471	376.476
22	1.53412	983.889	Sand (Liq)	150	0	85.0562	150	649.367	249.463	399.904
23	1.53412	1037.62	Sand (Liq)	150	0	85.0562	150	684.393	249.455	434.938
24	1.53412	1099.38	Sand (Liq)	150	0	85.0562	150	724.644	249.447	475.197
25	1.53412	1172.79	Sand (Liq)	150	0	85.0562	150	772.496	249.439	523.057
26	1.53412	1291.72	Sand (Liq)	150	0	85.0562	150	850.026	249.431	600.595
27	1.53412	1415.26	Sand (Liq)	150	0	85.0562	150	930.548	249.423	681.125
28	1.53412	1538.8	Sand (Liq)	150	0	85.0562	150	1011.08	249.415	761.661
29	1.53412	1662.33	Sand (Liq)	150	0	85.0562	150	1091.6	249.407	842.191
30	1.53412	1785.87	Sand (Liq)	150	0	85.0562	150	1172.13	249.399	922.727
31	1.53412	1908.84	Sand (Liq)	150	0	85.0562	150	1252.28	249.391	1002.89
32	1.53412	1959.33	Sand (Liq)	150	0	85.0562	150	1285.19	249.383	1035.81
33	1.53412	1959.31	Sand (Liq)	150	0	85.0562	150	1285.17	249.375	1035.8
34	1.53412	1959.28	Sand (Liq)	150	0	85.0562	150	1285.16	249.367	1035.79
35	1.53412	1959.26	Sand (Liq)	150	0	85.0562	150	1285.15	249.359	1035.79
36	1.53412	1959.24	Sand (Liq)	150	0	85.0562	150	1285.13	249.351	1035.78
37	1.53412	1959.21	Sand (Liq)	150	0	85.0562	150	1285.12	249.343	1035.77
38	1.53412	1959.19	Sand (Liq)	150	0	85.0562	150	1285.1	249.335	1035.77
39	1.53412	1959.16	Sand (Liq)	150	0	85.0562	150	1285.08	249.327	1035.76
40	1.53412	1959.14	Sand (Liq)	150	0	85.0562	150	1285.07	249.319	1035.75
41	1.53412	1959.12	Sand (Liq)	150	0	85.0562	150	1285.06	249.311	1035.75
42	1.53412	1959.09	Sand (Liq)	150	0	85.0562	150	1285.04	249.303	1035.73
43	1.54823	1884	Sand (Liq)	150	0	85.0562	150	1385.08	218.026	1167.05

44	1.54823	1697.77	Sand (Liq)	150	0	85.0562	150	1271.74	155.48	1116.26
45	1.54823	1511.55	Sand (Liq)	150	0	85.0562	150	1158.39	92.9334	1065.45
46	1.74448	1391.44	Clay	1000	0	567.041	1000	453.123	0	453.123
47	1.41772	845.509	Site Fill	100	32	257.012	453.251	565.319	0	565.319
48	1.41772	603.935	Site Fill	100	32	216.225	381.322	450.21	0	450.21
49	1.41772	362.361	Site Fill	100	32	175.439	309.394	335.1	0	335.1
50	1.41772	120.787	Site Fill	100	32	134.652	237.465	219.99	0	219.99

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.76354

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	313.022	-0.498407	498.803	0	0
2	315.295	-0.498507	45.2042	4.27296	5.39988
3	316.725	-0.49857	76.928	7.27167	5.39988
4	318.156	-0.498633	111.19	10.5103	5.39987
5	319.586	-0.498696	147.989	13.9888	5.39989
6	321.016	-0.498759	228.472	21.5965	5.39989
7	322.446	-0.498822	328.659	31.0667	5.39988
8	323.876	-0.498885	431.822	40.8183	5.39988
9	325.306	-0.498948	520.727	49.222	5.39987
10	326.736	-0.49901	611.773	57.8283	5.39988
11	328.166	-0.499073	706.641	66.7957	5.39988
12	329.596	-0.499136	805.328	76.1242	5.39988
13	331.104	-0.49901	913.439	86.3434	5.39988
14	332.611	-0.498885	1025.79	96.9633	5.39987
15	334.119	-0.498759	1142.38	107.984	5.39987
16	335.627	-0.498633	1263.2	119.405	5.39989
17	337.135	-0.498507	1393.27	131.699	5.39985
18	338.669	-0.498379	1524.15	144.071	5.39987
19	340.203	-0.498251	1654.57	156.399	5.39987
20	341.737	-0.498123	1784.98	168.726	5.39986
21	343.272	-0.497995	1915.39	181.053	5.39986
22	344.806	-0.497867	2045.79	193.38	5.39989
23	346.34	-0.497739	2176.2	205.706	5.39986
24	347.874	-0.497611	2306.59	218.032	5.39988
25	349.408	-0.497483	2436.99	230.358	5.39987
26	350.942	-0.497355	2567.37	242.683	5.39989
27	352.476	-0.497227	2697.75	255.007	5.39989
28	354.01	-0.497099	2828.12	267.33	5.39988
29	355.545	-0.496971	2958.47	279.652	5.39989
30	357.079	-0.496843	3088.82	291.973	5.39988
31	358.613	-0.496715	3219.16	304.293	5.39987
32	360.147	-0.496587	3349.48	316.612	5.39988
33	361.681	-0.496459	3479.8	328.931	5.39989
34	363.215	-0.496331	3610.13	341.249	5.39986
35	364.749	-0.496203	3740.45	353.568	5.39987
36	366.283	-0.496075	3870.77	365.887	5.39988
37	367.817	-0.495947	4001.09	378.206	5.39988
38	369.352	-0.495819	4131.41	390.524	5.39987
39	370.886	-0.495691	4261.73	402.843	5.39988
40	372.42	-0.495563	4392.05	415.162	5.39988
41	373.954	-0.495435	4522.38	427.481	5.39988
42	375.488	-0.495307	4652.7	439.799	5.39987
43	377.022	-0.495179	4783.02	452.118	5.39988
44	378.57	0.507165	3526.38	333.333	5.39987
45	380.119	1.50951	2383.35	225.288	5.39988
46	381.667	2.51185	1353.93	127.981	5.39987
47	383.411	4.50871	1438.3	135.956	5.39987
48	384.829	6.13153	885.256	83.6794	5.39988

49	386.247	7.75435	461.192	43.5944	5.39987
50	387.665	9.37718	166.106	15.7013	5.39988
51	389.082	11	0	0	0

List Of Coordinates

Water Table

X	Y
0	3.5
500	3.5

Line Load

X	Y
377.022	11
402.317	11

Line Load

X	Y
403.592	11
500	11

Block Search Window

X	Y
395.561	-1.375
395.435	3.035
338.614	2.909
320.345	-1.249

Block Search Window

X	Y
397.484	3.126
397.484	-1.291
429.744	-0.907
429.552	3.894

Block Search Window

X	Y
430.32	9.463
430.512	-2.443
467.766	-2.443
467.574	9.847

External Boundary

X	Y
0	-40
500	-40
500	-37.5
500	-30
500	-11.5096
500	-0.498507
500	2.50201
500	4.50871
500	11
360	11
350	6
346	5

342.561	4.50871
339	4
336	3
333.012	2.50201
324	1
320	0
313.021	-0.498507
306	-1
300	-2
274	-3
220	-3
216	-4
202	-5
190	-6
166	-7
140	-8
120	-9
108	-10
94	-11
86.8651	-11.5096
80	-12
60	-13
0	-13
0	-14.5
0	-37.5

Material Boundary

X	Y
342.561	4.50871
500	4.50871

Material Boundary

X	Y
333.012	2.50201
500	2.50201

Material Boundary

X	Y
313.021	-0.498507
500	-0.498507

Material Boundary

X	Y
86.8651	-11.5096
500	-11.5096

Material Boundary

X	Y
0	-14.5
369.915	-14.5
500	-30

Material Boundary

X	Y
0	-37.5
500	-37.5

Section B2 - Critical Surface with Yield Acceleration (ky) 0.25

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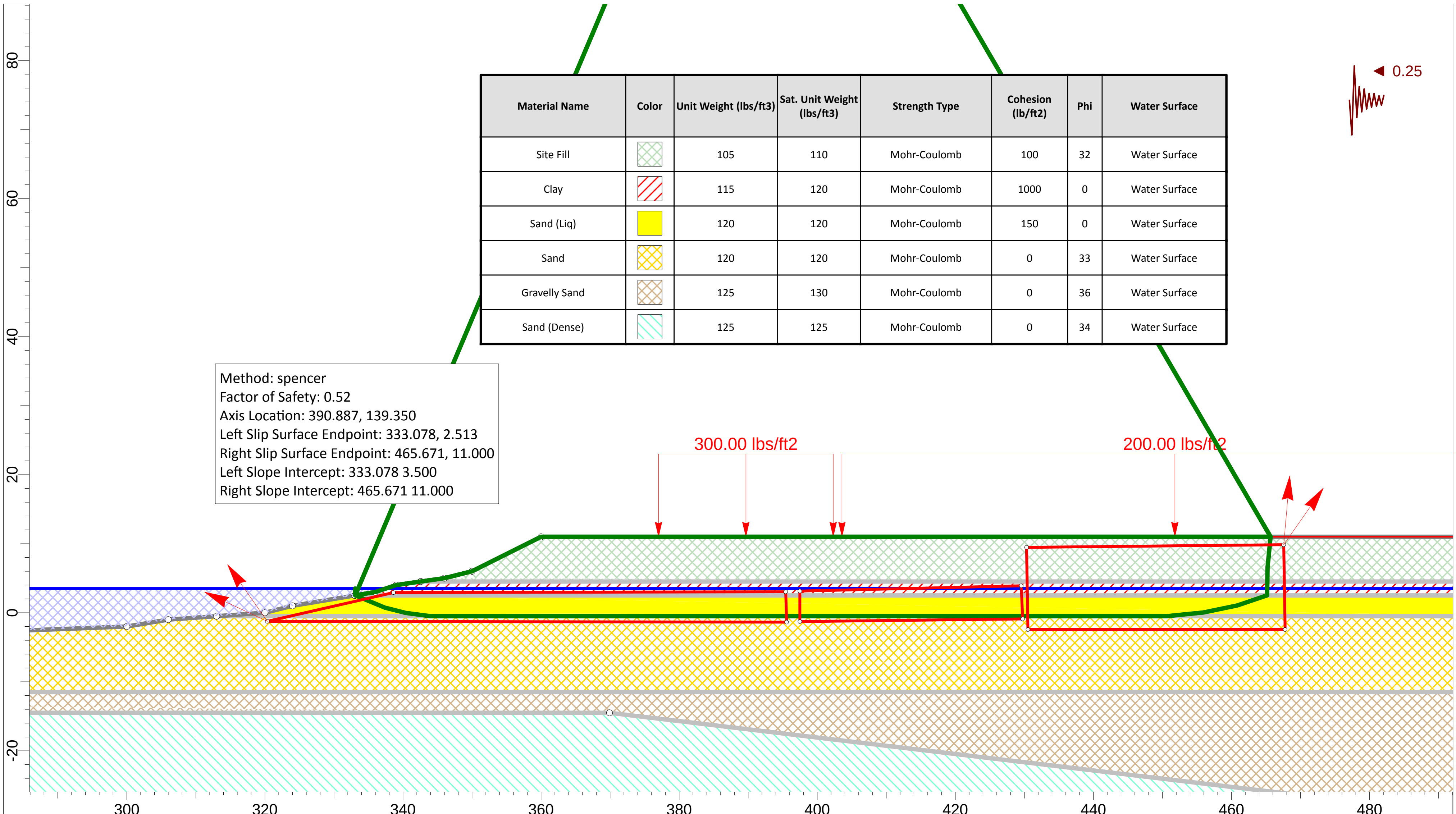

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi	Water Surface
Site Fill		105	110	Mohr-Coulomb	100	32	Water Surface
Clay		115	120	Mohr-Coulomb	1000	0	Water Surface
Sand (Liq)		120	120	Mohr-Coulomb	150	0	Water Surface
Sand		120	120	Mohr-Coulomb	0	33	Water Surface
Gravelly Sand		125	130	Mohr-Coulomb	0	36	Water Surface
Sand (Dense)		125	125	Mohr-Coulomb	0	34	Water Surface

Method: spencer
Factor of Safety: 0.52
Axis Location: 390.887, 139.350
Left Slip Surface Endpoint: 333.078, 2.513
Right Slip Surface Endpoint: 465.671, 11.000
Left Slope Intercept: 333.078 3.500
Right Slope Intercept: 465.671 11.000

SLIDEINTERPRET 6.008

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Project **Bayside Village - Backbay Landing - Load Demand on Bulkhead due to Liquefaction**			
Analyzed By JEH	*Units* feet	*Scale* 1:240	*Project No.:* **602668-002**
Date December 5, 2011	*Condition* **Liquefaction**		

Slide Analysis Information

Bayside Village - Backbay Landing - Load Demand on Bulkhead due to Liquefaction

Project Summary

File Name: Sec B2 - X1 - LQ1 - PS1
Slide Modeler Version: 6.008
Project Title: Bayside Village - Backbay Landing - Load Demand on Bulkhead due to Liquefaction
Analysis: Section B2 - Critical Surface with Yield Acceleration (ky) 0.25
Author: JEH
Company: Leighton Consulting, Inc.
Date Created: December 5, 2011
Comments:

Liquefaction
602668-002
Search for Critical Surface

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 50
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 125
Left Projection Angle (End Angle): 155
Right Projection Angle (Start Angle): 55
Right Projection Angle (End Angle): 85
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.25
2 Distributed Loads present

Distributed Load 1

Distribution: Constant
Magnitude [lbs/ft2]: 300
Orientation: Vertical

Distributed Load 2

Distribution: Constant
Magnitude [lbs/ft2]: 200
Orientation: Vertical

Material Properties

Property	Site Fill	Clay	Sand (Liq)	Sand	Gravelly Sand	Sand (Dense)
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	105	115	120	120	125	125
Saturated Unit Weight [lbs/ft3]	110	120	120	120	130	125
Cohesion [psf]	100	1000	150	0	0	0
Friction Angle [deg]	32	0	0	33	36	34
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated

Global Minimums

Method: spencer

FS: 0.515822
Axis Location: 390.887, 139.350
Left Slip Surface Endpoint: 333.078, 2.513
Right Slip Surface Endpoint: 465.671, 11.000
Left Slope Intercept: 333.078 3.500
Right Slope Intercept: 465.671 11.000
Resisting Moment=2.84936e+006 lb-ft
Driving Moment=5.52393e+006 lb-ft
Resisting Horizontal Force=19835.8 lb
Driving Horizontal Force=38454.7 lb

Global Minimum Coordinates

Method: spencer

X	Y
333.078	2.51294
337.385	0.735152
340.418	-0.0407162
343.971	-0.498457
352.269	-0.498455
359.288	-0.498452
370.226	-0.498458
374.348	-0.498456
378.541	-0.498458
393.698	-0.498452
399.894	-0.498454
402.317	-0.498461
409.308	-0.498442
409.349	-0.498461

410.582	-0.498452
425.468	-0.498457
428.511	-0.498452
450.639	-0.498457
455.939	0.0271391
460.835	1.05391
465.165	2.51093
465.218	6.50906
465.671	11

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 2899
Number of Invalid Surfaces: 2102

Error Codes:

Error Code -108 reported for 266 surfaces
Error Code -111 reported for 1085 surfaces
Error Code -112 reported for 751 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 0.515822

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.15382	269.798	Sand (Liq)	150	0	290.798	150	438.714	89.3262	349.388
2	2.15382	553.284	Sand (Liq)	150	0	290.798	150	576.39	144.793	431.597
3	3.03312	1288.61	Sand (Liq)	150	0	290.798	150	645.844	196.734	449.11
4	3.55233	1996.17	Sand (Liq)	150	0	290.798	150	700.218	235.222	464.996
5	2.76593	1766.91	Sand (Liq)	150	0	290.798	150	693.752	249.504	444.248
6	2.76593	1944.56	Sand (Liq)	150	0	290.798	150	751.256	249.504	501.752
7	2.76593	2212.93	Sand (Liq)	150	0	290.798	150	838.112	249.504	588.608
8	2.33979	2182.83	Sand (Liq)	150	0	290.798	150	957.043	249.504	707.539
9	2.33979	2470.25	Sand (Liq)	150	0	290.798	150	1067.01	249.504	817.51
10	2.33979	2757.67	Sand (Liq)	150	0	290.798	150	1176.98	249.503	927.478
11	2.73449	3479.73	Sand (Liq)	150	0	290.798	150	1261.08	249.503	1011.58
12	2.73449	3493.04	Sand (Liq)	150	0	290.798	150	1265.43	249.504	1015.93
13	2.73449	3493.05	Sand (Liq)	150	0	290.798	150	1265.43	249.504	1015.93
14	2.73449	3493.05	Sand (Liq)	150	0	290.798	150	1265.43	249.504	1015.93
15	4.12197	5265.41	Sand (Liq)	150	0	290.798	150	1265.43	249.504	1015.93
16	4.19343	5356.69	Sand (Liq)	150	0	290.798	150	1374.11	249.504	1124.6
17	3.03142	3872.34	Sand (Liq)	150	0	290.798	150	1565.44	249.504	1315.93
18	3.03142	3872.34	Sand (Liq)	150	0	290.798	150	1565.44	249.504	1315.93
19	3.03142	3872.34	Sand (Liq)	150	0	290.798	150	1565.44	249.504	1315.93
20	3.03142	3872.34	Sand (Liq)	150	0	290.798	150	1565.44	249.504	1315.93
21	3.03142	3872.34	Sand (Liq)	150	0	290.798	150	1565.44	249.503	1315.93
22	3.09791	3957.27	Sand (Liq)	150	0	290.798	150	1565.43	249.503	1315.93
23	3.09791	3957.27	Sand (Liq)	150	0	290.798	150	1565.43	249.503	1315.93
24	2.42246	3094.46	Sand (Liq)	150	0	290.798	150	1565.44	249.504	1315.93
25	3.49556	4465.24	Sand (Liq)	150	0	290.798	150	1392.49	249.504	1142.98
26	3.49556	4465.23	Sand (Liq)	150	0	290.798	150	1465.43	249.503	1215.93
27	0.0408886	52.2312	Sand (Liq)	150	0	290.798	150	1465.85	249.503	1216.35

28	1.23352	1575.71	Sand (Liq)	150	0	290.798	150	1465.43	249.504	1215.92
29	2.97721	3803.09	Sand (Liq)	150	0	290.798	150	1465.43	249.503	1215.93
30	2.97721	3803.09	Sand (Liq)	150	0	290.798	150	1465.43	249.504	1215.93
31	2.97721	3803.09	Sand (Liq)	150	0	290.798	150	1465.43	249.504	1215.93
32	2.97721	3803.09	Sand (Liq)	150	0	290.798	150	1465.43	249.504	1215.93
33	2.97721	3803.09	Sand (Liq)	150	0	290.798	150	1465.43	249.504	1215.93
34	3.04235	3886.31	Sand (Liq)	150	0	290.798	150	1465.43	249.504	1215.93
35	2.76606	3533.37	Sand (Liq)	150	0	290.798	150	1465.43	249.503	1215.93
36	2.76606	3533.37	Sand (Liq)	150	0	290.798	150	1465.43	249.503	1215.93
37	2.76606	3533.37	Sand (Liq)	150	0	290.798	150	1465.43	249.504	1215.93
38	2.76606	3533.37	Sand (Liq)	150	0	290.798	150	1465.43	249.504	1215.93
39	2.76606	3533.37	Sand (Liq)	150	0	290.798	150	1465.43	249.504	1215.93
40	2.76606	3533.37	Sand (Liq)	150	0	290.798	150	1465.43	249.504	1215.93
41	2.76606	3533.37	Sand (Liq)	150	0	290.798	150	1465.43	249.504	1215.93
42	2.76606	3533.37	Sand (Liq)	150	0	290.798	150	1465.43	249.504	1215.93
43	2.64981	3343.09	Sand (Liq)	150	0	290.798	150	1365.71	241.304	1124.41
44	2.64981	3259.53	Sand (Liq)	150	0	290.798	150	1338.61	224.906	1113.7
45	2.44842	2897.77	Sand (Liq)	150	0	290.798	150	1213.76	200.689	1013.07
46	2.44842	2746.93	Sand (Liq)	150	0	290.798	150	1163.06	168.654	994.409
47	2.165	2267.64	Sand (Liq)	150	0	290.798	150	1018.11	129.907	888.2
48	2.165	2078.37	Sand (Liq)	150	0	290.798	150	949.517	84.4476	865.069
49	0.0528169	36.288	Site Fill	100	32	59.1658	30.519	-111.193	0	-111.193
50	0.452655	106.724	Site Fill	100	32	89.8638	46.3537	-85.8519	0	-85.8519

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 0.515822

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	333.078	2.51294	30.398	0	0
2	335.231	1.62404	994.07	416.624	22.739
3	337.385	0.735152	2019.27	846.294	22.739
4	340.418	-0.0407162	3080.31	1290.99	22.7391
5	343.971	-0.498457	3934.8	1649.11	22.739
6	346.737	-0.498457	4297.4	1801.08	22.739
7	349.503	-0.498456	4615.58	1934.43	22.739
8	352.269	-0.498455	4866.68	2039.67	22.739
9	354.608	-0.498454	5001.37	2096.12	22.739
10	356.948	-0.498453	5064.22	2122.46	22.739
11	359.288	-0.498452	5055.2	2118.68	22.739
12	362.022	-0.498454	4980.46	2087.36	22.739
13	364.757	-0.498455	4902.38	2054.64	22.7391
14	367.491	-0.498456	4824.31	2021.91	22.739
15	370.226	-0.498458	4746.23	1989.19	22.739
16	374.348	-0.498456	4628.54	1939.87	22.7391
17	378.541	-0.498458	4508.81	1889.69	22.7391
18	381.573	-0.498457	4422.25	1853.41	22.7391
19	384.604	-0.498456	4335.7	1817.13	22.739
20	387.635	-0.498455	4249.14	1780.86	22.7391
21	390.667	-0.498453	4162.59	1744.58	22.739
22	393.698	-0.498452	4076.03	1708.3	22.739
23	396.796	-0.498453	3987.58	1671.23	22.739
24	399.894	-0.498454	3899.13	1634.16	22.739
25	402.317	-0.498461	3829.97	1605.18	22.7391
26	405.812	-0.498452	3730.15	1563.34	22.739
27	409.308	-0.498442	3630.33	1521.51	22.7391
28	409.349	-0.498461	3629.19	1521.03	22.739
29	410.582	-0.498452	3593.96	1506.26	22.739
30	413.559	-0.498453	3508.95	1470.64	22.7391
31	416.537	-0.498454	3423.95	1435.01	22.739
32	419.514	-0.498455	3338.94	1399.38	22.739

33	422.491	-0.498456	3253.94	1363.76	22.7391
34	425.468	-0.498457	3168.93	1328.13	22.739
35	428.511	-0.498452	3082.06	1291.72	22.739
36	431.277	-0.498453	3003.08	1258.62	22.739
37	434.043	-0.498453	2924.11	1225.52	22.739
38	436.809	-0.498454	2845.13	1192.42	22.739
39	439.575	-0.498455	2766.15	1159.32	22.739
40	442.341	-0.498455	2687.18	1126.22	22.739
41	445.107	-0.498456	2608.2	1093.12	22.739
42	447.873	-0.498457	2529.22	1060.02	22.739
43	450.639	-0.498457	2450.25	1026.92	22.739
44	453.289	-0.235659	2026.13	849.169	22.739
45	455.939	0.0271391	1630.02	683.157	22.739
46	458.387	0.540523	994.448	416.783	22.739
47	460.835	1.05391	422.613	177.121	22.739
48	463	1.78242	-256.42	-107.468	22.739
49	465.165	2.51093	-838.169	-351.285	22.739
50	465.218	6.50906	-399.552	-167.456	22.739
51	465.671	11	0	0	0

List Of Coordinates

Water Table

X	Y
0	3.5
500	3.5

Line Load

X	Y
377.022	11
402.317	11

Line Load

X	Y
403.592	11
500	11

Block Search Window

X	Y
395.561	-1.375
395.435	3.035
338.614	2.909
320.345	-1.249

Block Search Window

X	Y
397.484	3.126
397.484	-1.291
429.744	-0.907
429.552	3.894

Block Search Window

X	Y
430.32	9.463
430.512	-2.443
467.766	-2.443
467.574	9.847

External Boundary

X	Y
0	-40
500	-40
500	-37.5
500	-30
500	-11.5096
500	-0.498507
500	2.50201
500	4.50871
500	11
360	11
350	6
346	5
342.561	4.50871
339	4
336	3
333.012	2.50201
324	1
320	0
313.021	-0.498507
306	-1
300	-2
274	-3
220	-3
216	-4
202	-5
190	-6
166	-7
140	-8
120	-9
108	-10
94	-11
86.8651	-11.5096
80	-12
60	-13
0	-13
0	-14.5
0	-37.5

Material Boundary

X	Y
342.561	4.50871
500	4.50871

Material Boundary

X	Y
333.012	2.50201
500	2.50201

Material Boundary

X	Y
313.021	-0.498507
500	-0.498507

Material Boundary

X	Y

86.8651	-11.5096
500	-11.5096

Material Boundary

X	Y
0	-14.5
369.915	-14.5
500	-30

Material Boundary

X	Y
0	-37.5
500	-37.5

Section B2 - Load Demand for FS = 1.0 and Yield Accel. 0.25

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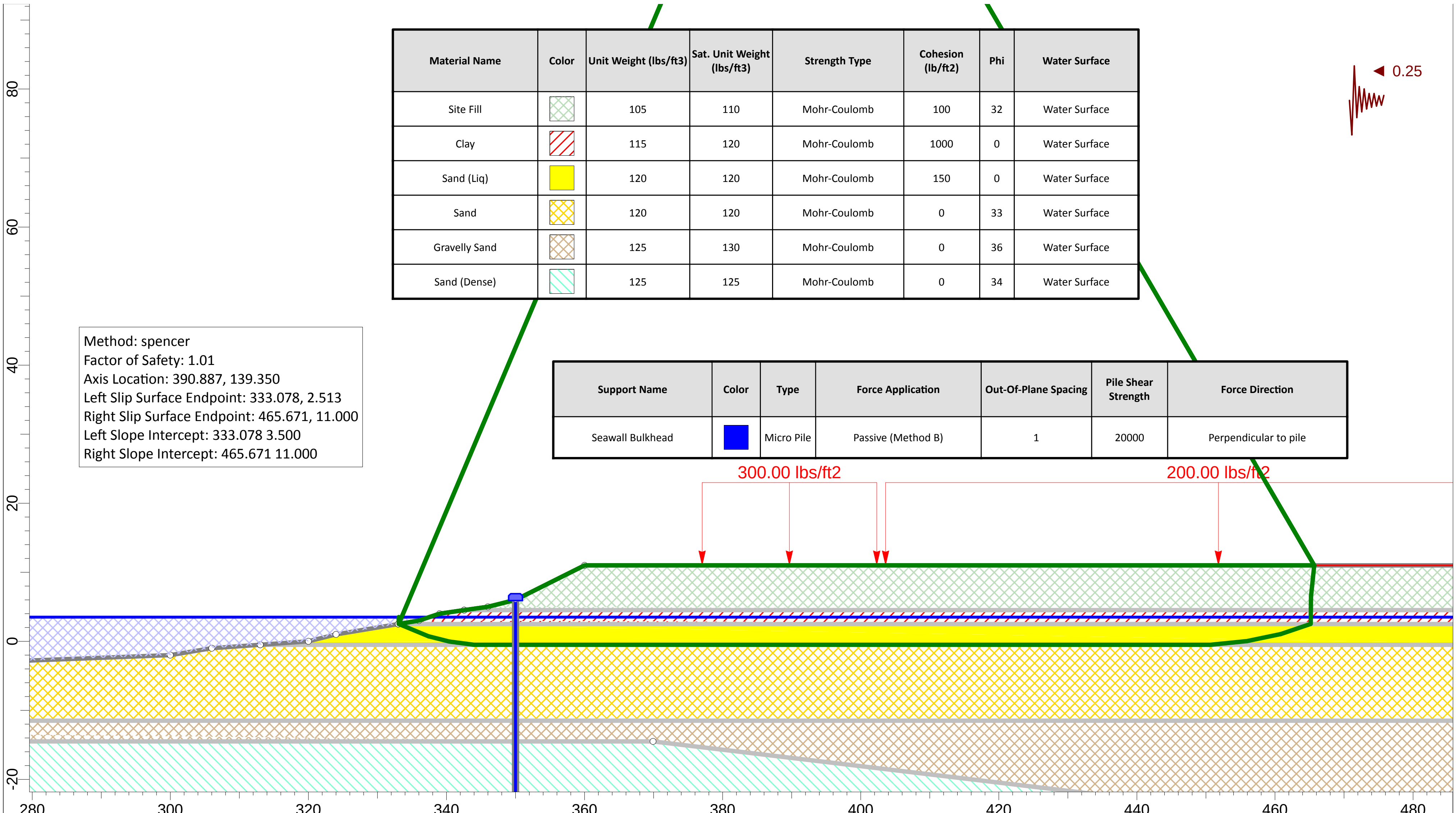

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi	Water Surface
Site Fill		105	110	Mohr-Coulomb	100	32	Water Surface
Clay		115	120	Mohr-Coulomb	1000	0	Water Surface
Sand (Liq)		120	120	Mohr-Coulomb	150	0	Water Surface
Sand		120	120	Mohr-Coulomb	0	33	Water Surface
Gravelly Sand		125	130	Mohr-Coulomb	0	36	Water Surface
Sand (Dense)		125	125	Mohr-Coulomb	0	34	Water Surface

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing	Pile Shear Strength	Force Direction
Seawall Bulkhead		Micro Pile	Passive (Method B)	1	20000	Perpendicular to pile

Method: spencer
Factor of Safety: 1.01
Axis Location: 390.887, 139.350
Left Slip Surface Endpoint: 333.078, 2.513
Right Slip Surface Endpoint: 465.671, 11.000
Left Slope Intercept: 333.078 3.500
Right Slope Intercept: 465.671 11.000

SLIDEINTERPRET 6.008

Leighton Consulting, Inc.
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Project	**Bayside Village - Backbay Landing - Load Demand on Bulkhead due to Liqefaction**		
Analyzed By JEH	*Units* feet	*Scale* 1:240	*Project No.:* **602668-002**
Date December 5, 2011	*Condition* **Liquefaction**		

Slide Analysis Information

Bayside Village - Backbay Landing - Load Demand on Bulkhead due to Liqefaction

Project Summary

File Name: Sec B2 - X1 - LQ1 - PS1 - SS a
Slide Modeler Version: 6.008
Project Title: Bayside Village - Backbay Landing - Load Demand on Bulkhead due to Liqefaction
Analysis: Section B2 - Load Demand for FS = 1.0 and Yield Accel. 0.25
Author: JEH
Company: Leighton Consulting, Inc.
Date Created: December 5, 2011
Comments:

Liquefaction
602668-002

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 50
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 1
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 125
Left Projection Angle (End Angle): 155
Right Projection Angle (Start Angle): 55
Right Projection Angle (End Angle): 85
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.25
2 Distributed Loads present

Distributed Load 1

Distribution: Constant
Magnitude [lbs/ft2]: 300
Orientation: Vertical

Distributed Load 2

Distribution: Constant
Magnitude [lbs/ft2]: 200
Orientation: Vertical

Material Properties

Property	Site Fill	Clay	Sand (Liq)	Sand	Gravelly Sand	Sand (Dense)
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	105	115	120	120	125	125
Saturated Unit Weight [lbs/ft3]	110	120	120	120	130	125
Cohesion [psf]	100	1000	150	0	0	0
Friction Angle [deg]	32	0	0	33	36	34
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated

Support Properties

Seawall Bulkhead

Support Type: Micro-Pile
Force Application: Passive
Out-of-Plane Spacing: 1 ft
Pile Shear Strength: 20000 lb
Force Direction: Perpendicular to Pile

Global Minimums

Method: spencer

FS: 1.012460
Axis Location: 390.887, 139.350
Left Slip Surface Endpoint: 333.078, 2.513
Right Slip Surface Endpoint: 465.671, 11.000
Left Slope Intercept: 333.078 3.500
Right Slope Intercept: 465.671 11.000
Resisting Moment=5.65259e+006 lb-ft
Driving Moment=5.58305e+006 lb-ft
Resisting Horizontal Force=39840.5 lb
Driving Horizontal Force=39350.4 lb

Global Minimum Coordinates

Method: spencer

X	Y
333.078	2.51294
337.385	0.735152
340.418	-0.0407162
343.971	-0.498457
352.269	-0.498455

359.288	-0.498452
370.226	-0.498458
374.348	-0.498456
378.541	-0.498458
393.698	-0.498452
399.894	-0.498454
402.317	-0.498461
409.308	-0.498442
409.349	-0.498461
410.582	-0.498452
425.468	-0.498457
428.511	-0.498452
450.639	-0.498457
455.939	0.0271391
460.835	1.05391
465.165	2.51093
465.218	6.50906
465.671	11

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 1
Number of Invalid Surfaces: 0

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.01246

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.15382	269.798	Sand (Liq)	150	0	148.154	150	217.988	89.3262	128.662
2	2.15382	553.284	Sand (Liq)	150	0	148.154	150	351.352	144.793	206.559
3	3.03312	1288.61	Sand (Liq)	150	0	148.154	150	486.309	196.734	289.575
4	3.55233	1996.17	Sand (Liq)	150	0	148.154	150	593.182	235.222	357.96
5	2.76593	1766.91	Sand (Liq)	150	0	148.154	150	637.185	249.504	387.681
6	2.76593	1944.56	Sand (Liq)	150	0	148.154	150	699.074	249.504	449.57
7	2.76593	2212.93	Sand (Liq)	150	0	148.154	150	1847.27	249.504	1597.77
8	2.33979	2182.83	Sand (Liq)	150	0	148.154	150	920.57	249.504	671.066
9	2.33979	2470.25	Sand (Liq)	150	0	148.154	150	1038.93	249.504	789.427
10	2.33979	2757.67	Sand (Liq)	150	0	148.154	150	1157.29	249.503	907.784
11	2.73449	3479.73	Sand (Liq)	150	0	148.154	150	1247.8	249.503	998.297
12	2.73449	3493.04	Sand (Liq)	150	0	148.154	150	1252.49	249.504	1002.99
13	2.73449	3493.05	Sand (Liq)	150	0	148.154	150	1252.49	249.504	1002.99
14	2.73449	3493.05	Sand (Liq)	150	0	148.154	150	1252.49	249.504	1002.99
15	4.12197	5265.41	Sand (Liq)	150	0	148.154	150	1252.49	249.504	1002.99
16	4.19343	5356.69	Sand (Liq)	150	0	148.154	150	1361.16	249.504	1111.66
17	3.03142	3872.34	Sand (Liq)	150	0	148.154	150	1552.49	249.504	1302.99
18	3.03142	3872.34	Sand (Liq)	150	0	148.154	150	1552.49	249.504	1302.99
19	3.03142	3872.34	Sand (Liq)	150	0	148.154	150	1552.49	249.504	1302.99
20	3.03142	3872.34	Sand (Liq)	150	0	148.154	150	1552.49	249.504	1302.99
21	3.03142	3872.34	Sand (Liq)	150	0	148.154	150	1552.49	249.503	1302.99
22	3.09791	3957.27	Sand (Liq)	150	0	148.154	150	1552.49	249.503	1302.99
23	3.09791	3957.27	Sand (Liq)	150	0	148.154	150	1552.49	249.503	1302.99
24	2.42246	3094.46	Sand (Liq)	150	0	148.154	150	1552.49	249.504	1302.99
25	3.49556	4465.24	Sand (Liq)	150	0	148.154	150	1379.54	249.504	1130.04
26	3.49556	4465.23	Sand (Liq)	150	0	148.154	150	1452.49	249.503	1202.99
27	0.0408886	52.2312	Sand (Liq)	150	0	148.154	150	1452.66	249.503	1203.16
28	1.23352	1575.71	Sand (Liq)	150	0	148.154	150	1452.49	249.504	1202.98
29	2.97721	3803.09	Sand (Liq)	150	0	148.154	150	1452.49	249.503	1202.99
30	2.97721	3803.09	Sand (Liq)	150	0	148.154	150	1452.49	249.504	1202.99

31	2.97721	3803.09	Sand (Liq)	150	0	148.154	150	1452.49	249.504	1202.99
32	2.97721	3803.09	Sand (Liq)	150	0	148.154	150	1452.49	249.504	1202.99
33	2.97721	3803.09	Sand (Liq)	150	0	148.154	150	1452.49	249.504	1202.99
34	3.04235	3886.31	Sand (Liq)	150	0	148.154	150	1452.49	249.504	1202.99
35	2.76606	3533.37	Sand (Liq)	150	0	148.154	150	1452.49	249.503	1202.99
36	2.76606	3533.37	Sand (Liq)	150	0	148.154	150	1452.49	249.503	1202.99
37	2.76606	3533.37	Sand (Liq)	150	0	148.154	150	1452.49	249.504	1202.99
38	2.76606	3533.37	Sand (Liq)	150	0	148.154	150	1452.49	249.504	1202.99
39	2.76606	3533.37	Sand (Liq)	150	0	148.154	150	1452.49	249.504	1202.99
40	2.76606	3533.37	Sand (Liq)	150	0	148.154	150	1452.49	249.504	1202.99
41	2.76606	3533.37	Sand (Liq)	150	0	148.154	150	1452.49	249.504	1202.99
42	2.76606	3533.37	Sand (Liq)	150	0	148.154	150	1452.49	249.504	1202.99
43	2.64981	3343.09	Sand (Liq)	150	0	148.154	150	1401.63	241.304	1160.33
44	2.64981	3259.53	Sand (Liq)	150	0	148.154	150	1371.7	224.906	1146.79
45	2.44842	2897.77	Sand (Liq)	150	0	148.154	150	1289.52	200.689	1088.83
46	2.44842	2746.93	Sand (Liq)	150	0	148.154	150	1232.04	168.654	1063.39
47	2.165	2267.64	Sand (Liq)	150	0	148.154	150	1122.11	129.907	992.206
48	2.165	2078.37	Sand (Liq)	150	0	148.154	150	1042.17	84.4476	957.719
49	0.0528169	36.288	Site Fill	100	32	32.8771	33.2867	-106.764	0	-106.764
50	0.452655	106.724	Site Fill	100	32	55.8472	56.5431	-69.5455	0	-69.5455

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.01246

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	333.078	2.51294	30.398	0	0
2	335.231	1.62404	491.59	71.7046	8.29879
3	337.385	0.735152	1010.47	147.39	8.2988
4	340.418	-0.0407162	1516.42	221.189	8.29879
5	343.971	-0.498457	1816.76	264.997	8.29878
6	346.737	-0.498457	1786.03	260.516	8.29882
7	349.503	-0.498456	1710.9	249.556	8.29878
8	352.269	-0.498455	21568.7	3146.06	8.29877
9	354.608	-0.498454	21370.6	3117.18	8.29881
10	356.948	-0.498453	21100.8	3077.81	8.29877
11	359.288	-0.498452	20759	3027.97	8.29881
12	362.022	-0.498454	20295.4	2960.34	8.29879
13	364.757	-0.498455	19828.5	2892.24	8.2988
14	367.491	-0.498456	19361.6	2824.13	8.29878
15	370.226	-0.498458	18894.6	2756.02	8.2988
16	374.348	-0.498456	18190.8	2653.36	8.29879
17	378.541	-0.498458	17474.7	2548.91	8.2988
18	381.573	-0.498457	16957.1	2473.41	8.2988
19	384.604	-0.498456	16439.5	2397.91	8.29879
20	387.635	-0.498455	15921.8	2322.4	8.2988
21	390.667	-0.498453	15404.2	2246.9	8.2988
22	393.698	-0.498452	14886.6	2171.4	8.29879
23	396.796	-0.498453	14357.6	2094.24	8.2988
24	399.894	-0.498454	13828.6	2017.08	8.2988
25	402.317	-0.498461	13415	1956.74	8.29876
26	405.812	-0.498452	12818.1	1869.68	8.29878
27	409.308	-0.498442	12221.2	1782.61	8.29876
28	409.349	-0.498461	12214.2	1781.6	8.29881
29	410.582	-0.498452	12003.6	1750.87	8.29876
30	413.559	-0.498453	11495.2	1676.72	8.29879
31	416.537	-0.498454	10986.8	1602.57	8.29882
32	419.514	-0.498455	10478.5	1528.42	8.29878
33	422.491	-0.498456	9970.09	1454.26	8.29877
34	425.468	-0.498457	9461.72	1380.11	8.29878
35	428.511	-0.498452	8942.21	1304.34	8.29882

36	431.277	-0.498453	8469.9	1235.44	8.29878
37	434.043	-0.498453	7997.58	1166.55	8.2988
38	436.809	-0.498454	7525.26	1097.65	8.29876
39	439.575	-0.498455	7052.94	1028.76	8.29879
40	442.341	-0.498455	6580.62	959.867	8.29879
41	445.107	-0.498456	6108.3	890.974	8.2988
42	447.873	-0.498457	5635.99	822.08	8.29879
43	450.639	-0.498457	5163.67	753.186	8.29878
44	453.289	-0.235659	4353.3	634.984	8.29879
45	455.939	0.0271391	3571.68	520.975	8.29879
46	458.387	0.540523	2549.05	371.811	8.29879
47	460.835	1.05391	1593.62	232.45	8.2988
48	463	1.78242	530.95	77.4458	8.29879
49	465.165	2.51093	-426.166	-62.1617	8.29879
50	465.218	6.50906	-6.641	-0.968675	8.2988
51	465.671	11	0	0	0

List Of Coordinates

Water Table

X	Y
0	3.5
500	3.5

Line Load

X	Y
377.022	11
402.317	11

Line Load

X	Y
403.592	11
500	11

Non-Circular Failure Surface

X	Y
333.078	2.51294
337.385	0.735152
340.418	-0.0407162
343.971	-0.498457
352.269	-0.498455
359.288	-0.498452
370.226	-0.498458
374.348	-0.498456
378.541	-0.498458
393.698	-0.498452
399.894	-0.498454
402.317	-0.498461
409.308	-0.498442
409.349	-0.498461
410.582	-0.498452
425.468	-0.498457
428.511	-0.498452
450.639	-0.498457
455.939	0.0271391
460.835	1.05391
465.165	2.51093
465.218	6.50906
465.671	11

External Boundary

X	Y
0	-40
500	-40
500	-37.5
500	-30
500	-11.5096
500	-0.498507
500	2.50201
500	4.50871
500	11
360	11
350	6
346	5
342.561	4.50871
339	4
336	3
333.012	2.50201
324	1
320	0
313.021	-0.498507
306	-1
300	-2
274	-3
220	-3
216	-4
202	-5
190	-6
166	-7
140	-8
120	-9
108	-10
94	-11
86.8651	-11.5096
80	-12
60	-13
0	-13
0	-14.5
0	-37.5

Material Boundary

X	Y
342.561	4.50871
500	4.50871

Material Boundary

X	Y
333.012	2.50201
500	2.50201

Material Boundary

X	Y
313.021	-0.498507
500	-0.498507

Material Boundary

X	Y

86.8651	-11.5096
500	-11.5096

Material Boundary

X	Y
0	-14.5
369.915	-14.5
500	-30

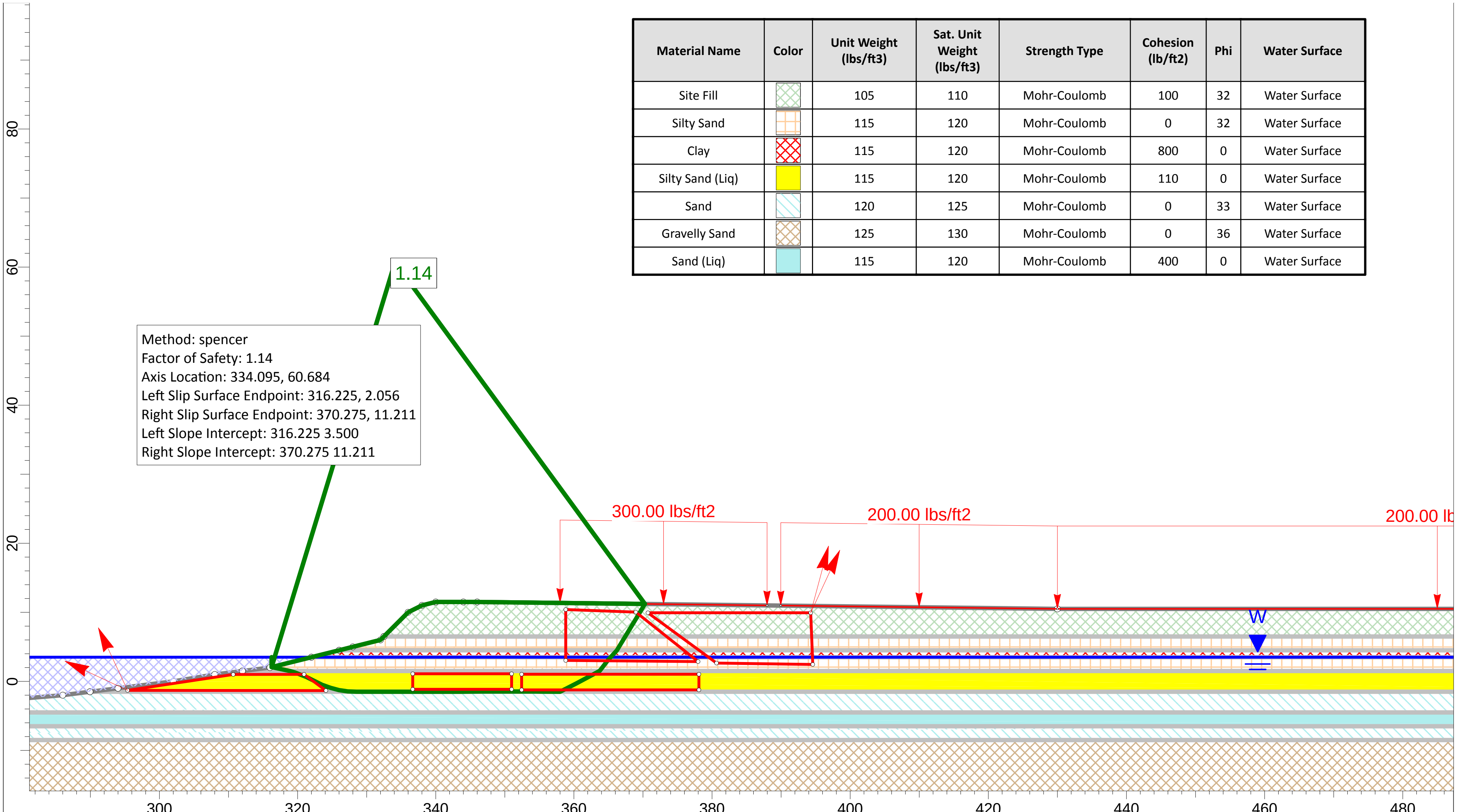
Material Boundary

X	Y
0	-37.5
500	-37.5

Section C3 - C3' Post-Liquefaction Stability

P:\Leighton Consulting\602000\602668.002 Bayside Village in Newport Beach\Analyses\Slope Stability\Section C3\Sec C3 - A4 - LQ1 - pstliq.slim

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi	Water Surface
Site Fill		105	110	Mohr-Coulomb	100	32	Water Surface
Silty Sand		115	120	Mohr-Coulomb	0	32	Water Surface
Clay		115	120	Mohr-Coulomb	800	0	Water Surface
Silty Sand (Liq)		115	120	Mohr-Coulomb	110	0	Water Surface
Sand		120	125	Mohr-Coulomb	0	33	Water Surface
Gravelly Sand		125	130	Mohr-Coulomb	0	36	Water Surface
Sand (Liq)		115	120	Mohr-Coulomb	400	0	Water Surface



SLIDEINTERPRET 6.008

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Project
Bayside Village - Backbay Landing - Load Demand on Seawall Bulkhead due to Liquefaction

Analyzed By JEH	*Units* feet	*Scale* 1:240	*Project No.:* **602668-002**
Date December 5, 2011	*Condition* **Liquefaction**		

Slide Analysis Information

Bayside Village - Backbay Landing - Load Demand on Seawall Bulkhead due to Liquefaction

Project Summary

File Name: Sec C3 - A4 - LQ1 - pstliq
Slide Modeler Version: 6.008
Project Title: Bayside Village - Backbay Landing - Load Demand on Seawall Bulkhead due to Liquefaction
Analysis: Section C3 - C3' Post-Liquefaction Stability
Author: JEH
Company: Leighton Consulting, Inc.
Date Created: December 5, 2011
Comments:

Liquefaction
602668-002

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 50
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 115
Left Projection Angle (End Angle): 155
Right Projection Angle (Start Angle): 65
Right Projection Angle (End Angle): 75
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

2 Distributed Loads present

Distributed Load 1

Distribution: Constant
Magnitude [lbs/ft2]: 300
Orientation: Vertical

Distributed Load 2

Distribution: Constant
Magnitude [lbs/ft2]: 200
Orientation: Vertical

Material Properties

Property	Site Fill	Silty Sand	Clay	Silty Sand (Liq)	Sand	Gravelly Sand	Sand (Liq)
Color							
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	105	115	115	115	120	125	115
Saturated Unit Weight [lbs/ft3]	110	120	120	120	125	130	120
Cohesion [psf]	100	0	800	110	0	0	400
Friction Angle [deg]	32	32	0	0	33	36	0
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated

Global Minimums

Method: spencer

FS: 1.142440
Axis Location: 334.095, 60.684
Left Slip Surface Endpoint: 316.225, 2.056
Right Slip Surface Endpoint: 370.275, 11.211
Left Slope Intercept: 316.225 3.500
Right Slope Intercept: 370.275 11.211
Resisting Moment=562705 lb-ft
Driving Moment=492545 lb-ft
Resisting Horizontal Force=7408.84 lb
Driving Horizontal Force=6485.09 lb

Global Minimum Coordinates

Method: spencer

X	Y
316.225	2.05613
318.897	1.50596
319.624	1.28894
321.315	0.619564
323.548	-0.494768
324.77	-0.932939
325.99	-1.26268
327.253	-1.45979
328.53	-1.50671
332.615	-1.50666
334.921	-1.50661
336.833	-1.50656
337.989	-1.50653

340.347	-1.5065
340.409	-1.50648
340.731	-1.5059
343.498	-1.49505
345.035	-1.48683
346.677	-1.47287
348.548	-1.46561
350.336	-1.46162
352.285	-1.46743
354.453	-1.47523
355.341	-1.4845
358	-1.50622
359.082	-0.951537
360.379	-0.279884
361.855	0.497354
363.731	1.50804
364.963	3.11933
366.206	4.48529
367.13	5.99269
368.288	7.89511
369.287	9.55578
370.275	11.211

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 2982
Number of Invalid Surfaces: 2019

Error Codes:

Error Code -108 reported for 367 surfaces
Error Code -111 reported for 810 surfaces
Error Code -112 reported for 842 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.14244

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.67254	380.436	Silty Sand	0	32	25.0634	28.6334	153.086	107.263	45.8228
2	0.0122949	2.39641	Silty Sand	0	32	52.4255	59.893	220.392	124.542	95.8495
3	0.714802	152.372	Silty Sand (Liq)	110	0	96.2851	110	255.738	131.314	124.424
4	1.69126	479.395	Silty Sand (Liq)	110	0	96.2851	110	339.418	158.855	180.563
5	1.11636	422.498	Silty Sand (Liq)	110	0	96.2851	110	450.824	197.123	253.701
6	1.11636	529.606	Silty Sand (Liq)	110	0	96.2851	110	550.458	231.89	318.568
7	1.22164	693.564	Silty Sand (Liq)	110	0	96.2851	110	626.492	262.944	363.548
8	1.22001	791.671	Silty Sand (Liq)	110	0	96.2851	110	696.401	286.903	409.498
9	1.26288	904.484	Silty Sand (Liq)	110	0	96.2851	110	747.307	303.341	443.966
10	1.27759	980.384	Silty Sand (Liq)	110	0	96.2851	110	780.336	310.955	469.381
11	1.42387	1151.94	Silty Sand (Liq)	110	0	96.2851	110	816.28	312.418	503.862
12	1.3305	1129.08	Silty Sand (Liq)	110	0	96.2851	110	855.872	312.417	543.455
13	1.3305	1196.21	Silty Sand (Liq)	110	0	96.2851	110	906.335	312.416	593.919
14	1.15306	1174.25	Silty Sand (Liq)	110	0	96.2851	110	1025.64	312.415	713.222

15	1.15306	1313.84	Silty Sand (Liq)	110	0	96.2851	110	1146.71	312.413	834.294
16	0.955714	1194.79	Silty Sand (Liq)	110	0	96.2851	110	1257.42	312.412	945.004
17	0.955714	1272.49	Silty Sand (Liq)	110	0	96.2851	110	1338.72	312.41	1026.31
18	1.15602	1603.75	Silty Sand (Liq)	110	0	96.2851	110	1394.56	312.408	1082.15
19	1.17913	1690.17	Silty Sand (Liq)	110	0	96.2851	110	1440.68	312.407	1128.27
20	1.17913	1725.09	Silty Sand (Liq)	110	0	96.2851	110	1470.29	312.406	1157.89
21	0.0616059	90.6058	Silty Sand (Liq)	110	0	96.2851	110	1477.91	312.405	1165.5
22	0.322612	474.464	Silty Sand (Liq)	110	0	96.2851	110	1477.59	312.386	1165.2
23	1.38359	2034.34	Silty Sand (Liq)	110	0	96.2851	110	1476.79	312.199	1164.59
24	1.38359	2033.44	Silty Sand (Liq)	110	0	96.2851	110	1476.14	311.86	1164.28
25	1.53709	2257.78	Silty Sand (Liq)	110	0	96.2851	110	1475.02	311.435	1163.58
26	1.64113	2408.13	Silty Sand (Liq)	110	0	96.2851	110	1472.86	310.742	1162.12
27	0.935835	1371.04	Silty Sand (Liq)	110	0	96.2851	110	1471.51	310.194	1161.32
28	0.935835	1369.54	Silty Sand (Liq)	110	0	96.2851	110	1469.91	309.967	1159.94
29	0.893732	1306.6	Silty Sand (Liq)	110	0	96.2851	110	1468.77	309.792	1158.98
30	0.893732	1305.39	Silty Sand (Liq)	110	0	96.2851	110	1467.4	309.667	1157.74
31	0.974682	1422.54	Silty Sand (Liq)	110	0	96.2851	110	1467.37	309.696	1157.68
32	0.974682	1421.69	Silty Sand (Liq)	110	0	96.2851	110	1466.5	309.877	1156.63
33	1.0842	1580.49	Silty Sand (Liq)	110	0	96.2851	110	1465.76	310.089	1155.67
34	1.0842	1579.53	Silty Sand (Liq)	110	0	96.2851	110	1464.87	310.333	1154.54
35	0.887333	1292.33	Silty Sand (Liq)	110	0	96.2851	110	1465.84	310.744	1155.1
36	1.32943	1935.96	Silty Sand (Liq)	110	0	96.2851	110	1465.19	311.372	1153.82
37	1.32943	1935.48	Silty Sand (Liq)	110	0	96.2851	110	1464.96	312.05	1152.91
38	1.08245	1538.97	Silty Sand (Liq)	110	0	96.2851	110	1617.15	295.082	1322.07
39	1.29692	1746.53	Silty Sand (Liq)	110	0	96.2851	110	1543.76	256.82	1286.94
40	1.47606	1856.89	Silty Sand (Liq)	110	0	96.2851	110	1456.71	211.615	1245.09
41	0.938005	1106.42	Silty Sand (Liq)	110	0	96.2851	110	1378.89	171.598	1207.3
42	0.938005	1048.44	Silty Sand (Liq)	110	0	96.2851	110	1319.49	140.065	1179.43
43	1.23146	1218.38	Silty Sand	0	32	372.654	425.735	755.345	74.026	681.319
44	0.346488	301.055	Silty Sand	0	32	384.951	439.783	715.678	11.877	703.801
45	0.896806	707.224	Clay	800	0	700.256	800	343.637	0	343.637
46	0.924366	595.417	Silty Sand	0	32	261.643	298.912	478.359	0	478.359
47	0.305915	161.459	Silty Sand	0	32	228.515	261.065	417.79	0	417.79
48	0.85195	361.802	Site Fill	100	32	249.705	285.273	296.499	0	296.499
49	0.999243	262.644	Site Fill	100	32	203.886	232.927	212.728	0	212.728
50	0.987963	86.4634	Site Fill	100	32	155.165	177.267	123.653	0	123.653

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.14244

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	316.225	2.05613	65.0447	0	0
2	318.897	1.50596	197.475	14.9035	4.31595
3	318.909	1.50229	199.077	15.0243	4.31592
4	319.624	1.28894	330.084	24.9115	4.31594
5	321.315	0.619564	730.218	55.1096	4.31593
6	322.432	0.0623977	1089.8	82.2476	4.31595
7	323.548	-0.494768	1503.99	113.506	4.31593
8	324.77	-0.932939	1896.13	143.101	4.31593
9	325.99	-1.26268	2243.23	169.297	4.31594
10	327.253	-1.45979	2512.13	189.591	4.31594
11	328.53	-1.50671	2671.75	201.638	4.31595
12	329.954	-1.5067	2808.84	211.983	4.31593
13	331.285	-1.50668	2936.93	221.65	4.31593
14	332.615	-1.50666	3065.02	231.317	4.31593
15	333.768	-1.50664	3176.02	239.694	4.31593
16	334.921	-1.50661	3287.01	248.071	4.31594
17	335.877	-1.50658	3378.99	255.013	4.31594
18	336.833	-1.50656	3470.98	261.955	4.31593
19	337.989	-1.50653	3582.25	270.353	4.31594

20	339.168	-1.50652	3695.76	278.92	4.31595
21	340.347	-1.5065	3809.28	287.486	4.31593
22	340.409	-1.50648	3815.17	287.931	4.31593
23	340.731	-1.5059	3845.38	290.211	4.31593
24	342.115	-1.50048	3970.59	299.661	4.31594
25	343.498	-1.49505	4095.8	309.11	4.31593
26	345.035	-1.48683	4231.67	319.364	4.31593
27	346.677	-1.47287	4369.12	329.738	4.31594
28	347.612	-1.46924	4453.89	336.136	4.31594
29	348.548	-1.46561	4538.67	342.534	4.31594
30	349.442	-1.46362	4621.79	348.807	4.31594
31	350.336	-1.46162	4704.91	355.08	4.31594
32	351.31	-1.46452	4803.02	362.484	4.31593
33	352.285	-1.46743	4901.13	369.888	4.31593
34	353.369	-1.47133	5011.23	378.198	4.31594
35	354.453	-1.47523	5121.34	386.508	4.31594
36	355.341	-1.4845	5220.37	393.982	4.31594
37	356.67	-1.49536	5364.29	404.843	4.31593
38	358	-1.50622	5508.2	415.705	4.31594
39	359.082	-0.951537	4715.41	355.873	4.31594
40	360.379	-0.279884	3803.42	287.044	4.31593
41	361.855	0.497354	2813.33	212.322	4.31593
42	362.793	1.0027	2206.83	166.55	4.31594
43	363.731	1.50804	1630.34	123.042	4.31594
44	364.963	3.11933	872.178	65.8233	4.31593
45	365.309	3.5	733.119	55.3286	4.31594
46	366.206	4.48529	1022.53	77.1705	4.31594
47	367.13	5.99269	543.306	41.0034	4.31594
48	367.436	6.49532	403.217	30.4308	4.31593
49	368.288	7.89511	200.916	15.1631	4.31592
50	369.287	9.55578	51.3755	3.87732	4.31594
51	370.275	11.211	0	0	0

List Of Coordinates

Water Table

X	Y
0	3.5
322	3.5
540	3.5

Line Load

X	Y
357.999	11.3572
387.965	11.0004

Line Load

X	Y
389.955	10.9767
430	10.5
540	10.5

Block Search Window

X	Y
295.385	-1.307
324.105	-1.341
320.93	1.015
310.688	0.991

Block Search Window

X	Y
336.663	-1.16
350.981	-1.16
350.981	1.094
336.663	1.094

Block Search Window

X	Y
358.809	10.399
358.809	3.034
377.986	2.859
368.971	10.029

Block Search Window

X	Y
352.426	-1.232
378.097	-1.232
378.097	1.036
352.426	1.036

Block Search Window

X	Y
370.713	9.927
380.649	2.654
394.58	2.449
394.273	9.927

External Boundary

X	Y
0	-40
540	-40
540	-8.5
540	-6.5
540	-4.50205
540	-1.5067
540	1.50229
540	3.5
540	4.50291
540	6.49532
540	10.5
430	10.5
346	11.5
344	11.5
340	11.5
338	11
336	10
332.495	6.49532
332	6
328	5
326.012	4.50291
322	3.5
316	2
312.018	1.50229
308	1
302	0
294	-1
289.946	-1.5067

286	-2
274	-3
240	-4
217.91	-4.50205
196	-5
164	-6
136	-6
120	-5
70	-2
64	-1
46	1
0	1
0	-6.5
0	-8.5

Material Boundary

X	Y
332.495	6.49532
540	6.49532

Material Boundary

X	Y
326.012	4.50291
540	4.50291

Material Boundary

X	Y
312.018	1.50229
540	1.50229

Material Boundary

X	Y
289.946	-1.5067
540	-1.5067

Material Boundary

X	Y
217.91	-4.50205
540	-4.50205

Material Boundary

X	Y
0	-6.5
540	-6.5

Material Boundary

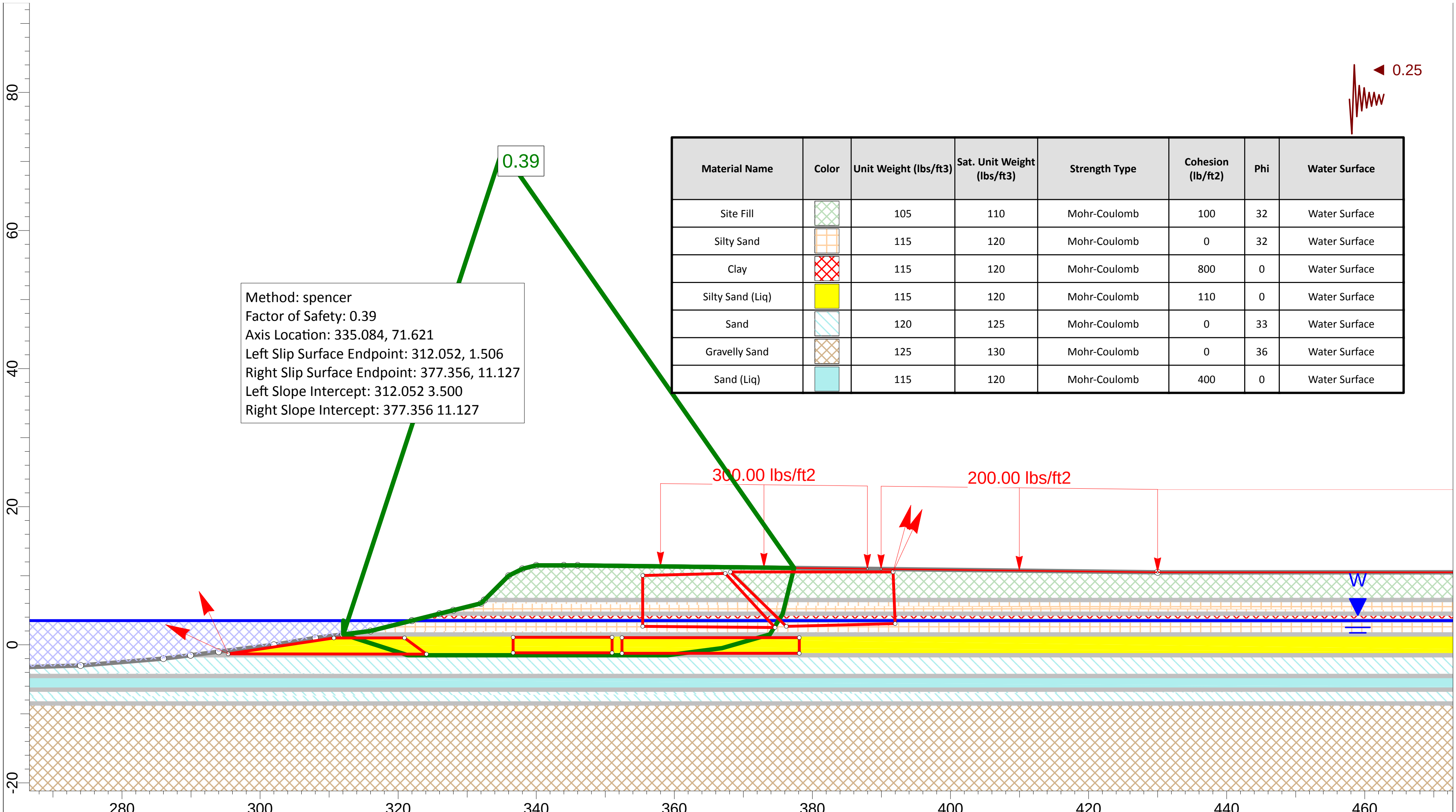
X	Y
0	-8.5
540	-8.5

Material Boundary

X	Y
322	3.5
540	3.5

Section C3 - C3' Upper Liquefiable Zone - Critical Surface - ky 0.25

P:\Leighton Consulting\602000\602668.002 Bayside Village in Newport Beach\Analyses\Slope Stability\Section C3\Sec C3 - A4 - LQ1 - PS025 - MC.slim



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi	Water Surface
Site Fill		105	110	Mohr-Coulomb	100	32	Water Surface
Silty Sand		115	120	Mohr-Coulomb	0	32	Water Surface
Clay		115	120	Mohr-Coulomb	800	0	Water Surface
Silty Sand (Liq)		115	120	Mohr-Coulomb	110	0	Water Surface
Sand		120	125	Mohr-Coulomb	0	33	Water Surface
Gravelly Sand		125	130	Mohr-Coulomb	0	36	Water Surface
Sand (Liq)		115	120	Mohr-Coulomb	400	0	Water Surface

SLIDEINTERPRET 6.008

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Project
Bayside Village - Backbay Landing - Load Demand on Seawall Bulkhead due to Liquefaction

Analyzed By JEH	*Units* feet	*Scale* 1:240	*Project No.:* **602668-002**
Date December 6, 2011	*Condition* **Liquefaction**		

Slide Analysis Information

Bayside Village - Backbay Landing - Load Demand on Seawall Bulkhead due to Liquefaction

Project Summary

File Name: Sec C3 - A4 - LQ1 - PS025 - MC
Slide Modeler Version: 6.008
Project Title: Bayside Village - Backbay Landing - Load Demand on Seawall Bulkhead due to Liquefaction
Analysis: Section C3 - C3' Upper Liquefiable Zone - Critical Surface - ky 0.25
Author: JEH
Company: Leighton Consulting, Inc.
Date Created: December 6, 2011
Comments:

Liquefaction
602668-002

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 50
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 115
Left Projection Angle (End Angle): 155
Right Projection Angle (Start Angle): 65
Right Projection Angle (End Angle): 75
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.25
2 Distributed Loads present

Distributed Load 1

Distribution: Constant
Magnitude [lbs/ft2]: 300
Orientation: Vertical

Distributed Load 2

Distribution: Constant
Magnitude [lbs/ft2]: 200
Orientation: Vertical

Material Properties

Property	Site Fill	Silty Sand	Clay	Silty Sand (Liq)	Sand	Gravelly Sand	Sand (Liq)
Color							
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	105	115	115	115	120	125	115
Saturated Unit Weight [lbs/ft3]	110	120	120	120	125	130	120
Cohesion [psf]	100	0	800	110	0	0	400
Friction Angle [deg]	32	32	0	0	33	36	0
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated

Global Minimums

Method: spencer

FS: 0.392090
Axis Location: 335.084, 71.621
Left Slip Surface Endpoint: 312.052, 1.506
Right Slip Surface Endpoint: 377.356, 11.127
Left Slope Intercept: 312.052 3.500
Right Slope Intercept: 377.356 11.127
Resisting Moment=629686 lb-ft
Driving Moment=1.60597e+006 lb-ft
Resisting Horizontal Force=7615.02 lb
Driving Horizontal Force=19421.6 lb

Global Minimum Coordinates

Method: spencer

X	Y
312.052	1.50649
321.419	-1.50675
327.194	-1.50675
343.519	-1.50675
353.219	-1.50675
359.022	-1.50675
366.924	-0.476476
373.846	1.50603
375.684	4.45078
377.356	11.1267

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 909
Number of Invalid Surfaces: 4092

Error Codes:

Error Code -108 reported for 218 surfaces
Error Code -111 reported for 1920 surfaces
Error Code -112 reported for 1954 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 0.39209

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	1.33817	207.469	Silty Sand (Liq)	110	0	280.548	110	427.751	137.825	289.926
2	1.33817	289.486	Silty Sand (Liq)	110	0	280.548	110	489.28	164.686	324.594
3	1.33817	371.518	Silty Sand (Liq)	110	0	280.548	110	551.109	191.547	359.562
4	1.33817	460.606	Silty Sand (Liq)	110	0	280.548	110	621.877	218.408	403.469
5	1.33817	555.515	Silty Sand (Liq)	110	0	280.548	110	690.129	245.269	444.86
6	1.33817	650.425	Silty Sand (Liq)	110	0	280.548	110	758.378	272.13	486.248
7	1.33817	745.335	Silty Sand (Liq)	110	0	280.548	110	826.636	298.991	527.645
8	1.44373	875.681	Silty Sand (Liq)	110	0	280.548	110	662.398	312.421	349.977
9	1.44373	933.185	Silty Sand (Liq)	110	0	280.548	110	697.554	312.421	385.133
10	1.44373	993.111	Silty Sand (Liq)	110	0	280.548	110	734.596	312.421	422.175
11	1.44373	1053.04	Silty Sand (Liq)	110	0	280.548	110	771.639	312.421	459.218
12	1.25575	964.654	Silty Sand (Liq)	110	0	280.548	110	806.268	312.421	493.847
13	1.25575	1009.99	Silty Sand (Liq)	110	0	280.548	110	838.488	312.421	526.067
14	1.25575	1055.33	Silty Sand (Liq)	110	0	280.548	110	870.707	312.421	558.286
15	1.25575	1102.69	Silty Sand (Liq)	110	0	280.548	110	904.369	312.421	591.948
16	1.25575	1232.73	Silty Sand (Liq)	110	0	280.548	110	996.784	312.421	684.363
17	1.25575	1398.69	Silty Sand (Liq)	110	0	280.548	110	1114.73	312.421	802.308
18	1.25575	1564.27	Silty Sand (Liq)	110	0	280.548	110	1232.4	312.421	919.983
19	1.25575	1689.48	Silty Sand (Liq)	110	0	280.548	110	1321.39	312.421	1008.97
20	1.25575	1769.05	Silty Sand (Liq)	110	0	280.548	110	1377.93	312.421	1065.51
21	1.25575	1818.02	Silty Sand (Liq)	110	0	280.548	110	1412.74	312.421	1100.32
22	1.25575	1846.1	Silty Sand (Liq)	110	0	280.548	110	1432.69	312.421	1120.27
23	1.25575	1846.91	Silty Sand (Liq)	110	0	280.548	110	1433.27	312.421	1120.85
24	1.25575	1846.91	Silty Sand (Liq)	110	0	280.548	110	1433.27	312.421	1120.85
25	1.38579	2038.17	Silty Sand (Liq)	110	0	280.548	110	1433.27	312.421	1120.85
26	1.38579	2038.12	Silty Sand (Liq)	110	0	280.548	110	1433.23	312.421	1120.81
27	1.38579	2036.46	Silty Sand (Liq)	110	0	280.548	110	1432.17	312.421	1119.75
28	1.38579	2034.06	Silty Sand (Liq)	110	0	280.548	110	1430.63	312.421	1118.21
29	1.38579	2031.66	Silty Sand (Liq)	110	0	280.548	110	1429.08	312.421	1116.66
30	1.38579	2029.26	Silty Sand (Liq)	110	0	280.548	110	1427.53	312.421	1115.11
31	1.38579	2026.86	Silty Sand (Liq)	110	0	280.548	110	1425.99	312.421	1113.57
32	1.4506	2119.08	Silty Sand (Liq)	110	0	280.548	110	1424.41	312.421	1111.98
33	1.4506	2116.45	Silty Sand (Liq)	110	0	280.548	110	1422.79	312.421	1110.36
34	1.4506	2113.82	Silty Sand (Liq)	110	0	280.548	110	1421.17	312.421	1108.75
35	1.4506	2111.19	Silty Sand (Liq)	110	0	280.548	110	1631.04	312.421	1318.62
36	1.31702	1900.94	Silty Sand (Liq)	110	0	280.548	110	1583.43	307.064	1276.37
37	1.31702	1871.63	Silty Sand (Liq)	110	0	280.548	110	1564.63	296.349	1268.28
38	1.31702	1842.33	Silty Sand (Liq)	110	0	280.548	110	1545.83	285.634	1260.19

39	1.31702	1813.02	Silty Sand (Liq)	110	0	280.548	110	1527.02	274.919	1252.1
40	1.31702	1783.72	Silty Sand (Liq)	110	0	280.548	110	1508.22	264.204	1244.01
41	1.31702	1754.41	Silty Sand (Liq)	110	0	280.548	110	1489.42	253.49	1235.93
42	1.38448	1794.73	Silty Sand (Liq)	110	0	280.548	110	1333.01	235.761	1097.25
43	1.38448	1726.46	Silty Sand (Liq)	110	0	280.548	110	1293.83	211.02	1082.81
44	1.38448	1658.19	Silty Sand (Liq)	110	0	280.548	110	1254.65	186.278	1068.37
45	1.38448	1589.92	Silty Sand (Liq)	110	0	280.548	110	1215.47	161.536	1053.94
46	1.38448	1521.65	Silty Sand (Liq)	110	0	280.548	110	1176.29	136.794	1039.5
47	1.24429	1187.06	Silty Sand	0	32	468.704	183.774	356.311	62.2118	294.099
48	0.593312	461.923	Clay	800	0	2040.35	800	-826.838	0	-826.838
49	0.512198	310.201	Silty Sand	0	32	159.592	62.5744	100.14	0	100.14
50	1.16025	282.955	Site Fill	100	32	180.866	70.9158	-46.5444	0	-46.5444

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 0.39209

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	312.052	1.50649	123.991	0	0
2	313.39	1.07603	567.487	244.166	23.2802
3	314.728	0.645567	1135.72	488.653	23.2802
4	316.066	0.215103	1705.59	733.843	23.2802
5	317.405	-0.21536	2288.5	984.647	23.2802
6	318.743	-0.645823	2863.09	1231.87	23.2802
7	320.081	-1.07629	3429.38	1475.52	23.2802
8	321.419	-1.50675	3987.34	1715.59	23.2802
9	322.863	-1.50675	4174.78	1796.24	23.2803
10	324.307	-1.50675	4346.52	1870.13	23.2802
11	325.75	-1.50675	4503.27	1937.57	23.2802
12	327.194	-1.50675	4645.05	1998.57	23.2802
13	328.45	-1.50675	4756.18	2046.39	23.2802
14	329.706	-1.50675	4855.98	2089.33	23.2802
15	330.961	-1.50675	4944.45	2127.39	23.2802
16	332.217	-1.50675	5021.07	2160.36	23.2802
17	333.473	-1.50675	5065.19	2179.34	23.2802
18	334.729	-1.50675	5067.81	2180.47	23.2802
19	335.984	-1.50675	5029.04	2163.79	23.2802
20	337.24	-1.50675	4958.97	2133.64	23.2802
21	338.496	-1.50675	4869.01	2094.93	23.2802
22	339.752	-1.50675	4766.8	2050.96	23.2802
23	341.007	-1.50675	4657.57	2003.96	23.2802
24	342.263	-1.50675	4548.14	1956.88	23.2802
25	343.519	-1.50675	4438.71	1909.8	23.2803
26	344.905	-1.50675	4317.95	1857.84	23.2803
27	346.29	-1.50675	4197.2	1805.88	23.2802
28	347.676	-1.50675	4076.87	1754.11	23.2802
29	349.062	-1.50675	3957.13	1702.59	23.2802
30	350.448	-1.50675	3837.99	1651.33	23.2802
31	351.834	-1.50675	3719.46	1600.33	23.2802
32	353.219	-1.50675	3601.52	1549.59	23.2803
33	354.67	-1.50675	3478.71	1496.75	23.2803
34	356.12	-1.50675	3356.56	1444.19	23.2802
35	357.571	-1.50675	3235.07	1391.92	23.2803
36	359.022	-1.50675	3114.24	1339.93	23.2802
37	360.339	-1.33504	2736.59	1177.44	23.2802
38	361.656	-1.16333	2369.51	1019.5	23.2802
39	362.973	-0.991613	2012.98	866.101	23.2802
40	364.29	-0.819901	1667	717.242	23.2802
41	365.607	-0.648188	1331.58	572.924	23.2802
42	366.924	-0.476476	1006.71	433.148	23.2803
43	368.308	-0.0799742	417.905	179.807	23.2802

44	369.693	0.316528	-138.303	-59.506	23.2802
45	371.077	0.713029	-661.908	-284.792	23.2802
46	372.462	1.10953	-1152.91	-496.051	23.2803
47	373.846	1.50603	-1611.31	-693.282	23.2803
48	375.091	3.5	-2035.35	-875.727	23.2802
49	375.684	4.45078	-154.129	-66.3155	23.2803
50	376.196	6.49532	-354.677	-152.603	23.2802
51	377.356	11.1267	0	0	0

List Of Coordinates

Water Table

X	Y
0	3.5
322	3.5
540	3.5

Line Load

X	Y
357.999	11.3572
387.965	11.0004

Line Load

X	Y
389.955	10.9767
430	10.5
540	10.5

Block Search Window

X	Y
295.385	-1.307
324.105	-1.341
320.93	1.015
310.688	0.991

Block Search Window

X	Y
336.663	-1.16
350.981	-1.16
350.981	1.094
336.663	1.094

Block Search Window

X	Y
355.417	10.042
355.417	2.677
374.594	2.502
367.384	10.349

Block Search Window

X	Y
352.426	-1.232
378.097	-1.232
378.097	1.036
352.426	1.036

Block Search Window

X	Y
368.124	10.552
376.222	2.672
391.991	3.074
391.684	10.552

External Boundary

X	Y
0	-40
540	-40
540	-8.5
540	-6.5
540	-4.50205
540	-1.5067
540	1.50229
540	3.5
540	4.50291
540	6.49532
540	10.5
430	10.5
346	11.5
344	11.5
340	11.5
338	11
336	10
332.495	6.49532
332	6
328	5
326.012	4.50291
322	3.5
316	2
312.018	1.50229
308	1
302	0
294	-1
289.946	-1.5067
286	-2
274	-3
240	-4
217.91	-4.50205
196	-5
164	-6
136	-6
120	-5
70	-2
64	-1
46	1
0	1
0	-6.5
0	-8.5

Material Boundary

X	Y
332.495	6.49532
540	6.49532

Material Boundary

X	Y

326.012	4.50291
540	4.50291

Material Boundary

X	Y
312.018	1.50229
540	1.50229

Material Boundary

X	Y
289.946	-1.5067
540	-1.5067

Material Boundary

X	Y
217.91	-4.50205
540	-4.50205

Material Boundary

X	Y
0	-6.5
540	-6.5

Material Boundary

X	Y
0	-8.5
540	-8.5

Material Boundary

X	Y
322	3.5
540	3.5

Section C3 - C3' Bulkhead Load Demand - Liquefaction in Upper Zone - ky 0.25

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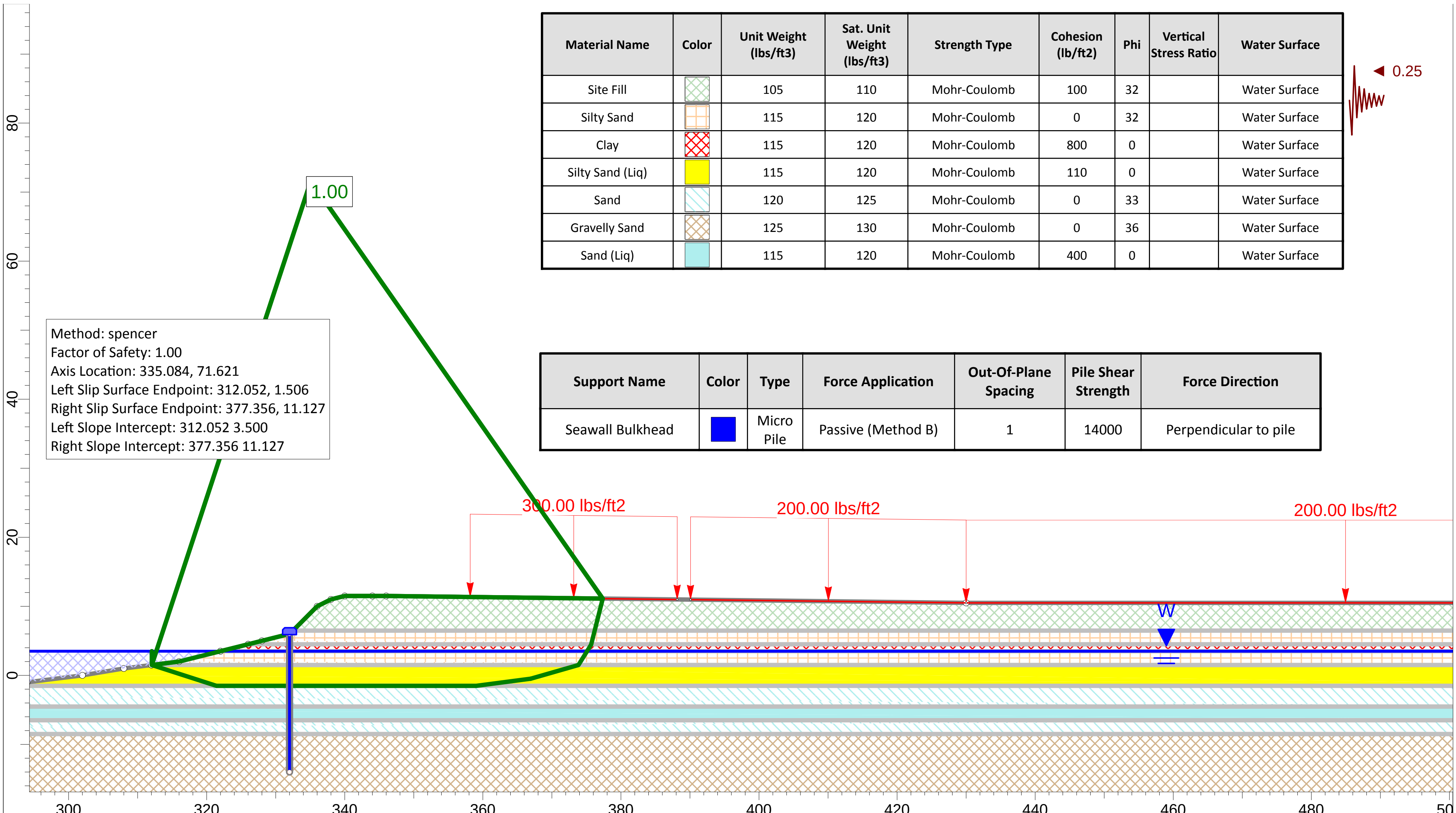

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi	Vertical Stress Ratio	Water Surface
Site Fill		105	110	Mohr-Coulomb	100	32		Water Surface
Silty Sand		115	120	Mohr-Coulomb	0	32		Water Surface
Clay		115	120	Mohr-Coulomb	800	0		Water Surface
Silty Sand (Liq)		115	120	Mohr-Coulomb	110	0		Water Surface
Sand		120	125	Mohr-Coulomb	0	33		Water Surface
Gravelly Sand		125	130	Mohr-Coulomb	0	36		Water Surface
Sand (Liq)		115	120	Mohr-Coulomb	400	0		Water Surface

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing	Pile Shear Strength	Force Direction
Seawall Bulkhead		Micro Pile	Passive (Method B)	1	14000	Perpendicular to pile

SLIDEINTERPRET 6.008

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Project
Bayside Village - Backbay Landing - Bulkhead Load Demand due to Liquefaction

Analyzed By JEH	*Units* feet	*Scale* 1:240	*Project No.:* **602668-002**
Date December 4, 2011	*Condition* **Liquefaction**		

Slide Analysis Information

Bayside Village - Backbay Landing - Bulkhead Load Demand due to Liquefaction

Project Summary

File Name: Sec C3 - A4 - BK1 - LQ1 - PS025 - MC2
Slide Modeler Version: 6.008
Project Title: Bayside Village - Backbay Landing - Bulkhead Load Demand due to Liquefaction
Analysis: Section C3 - C3' Bulkhead Load Demand - Liquefaction in Upper Zone - ky 0.25
Author: JEH
Company: Leighton Consulting, Inc.
Date Created: December 4, 2011
Comments:

Liquefaction
602668-002
Liquefaction with Seismic Load

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 50
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 1
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 115
Left Projection Angle (End Angle): 155
Right Projection Angle (Start Angle): 65
Right Projection Angle (End Angle): 80
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.25
2 Distributed Loads present

Distributed Load 1

Distribution: Constant
Magnitude [lbs/ft2]: 300
Orientation: Vertical

Distributed Load 2

Distribution: Constant
Magnitude [lbs/ft2]: 200
Orientation: Vertical

Material Properties

Property	Site Fill	Silty Sand	Clay	Silty Sand (Liq)	Sand	Gravelly Sand	Sand (Liq)
Color							
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	105	115	115	115	120	125	115
Saturated Unit Weight [lbs/ft3]	110	120	120	120	125	130	120
Cohesion [psf]	100	0	800	110	0	0	400
Friction Angle [deg]	32	32	0	0	33	36	0
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated

Support Properties

Seawall Bulkhead

Support Type: Micro-Pile
Force Application: Passive
Out-of-Plane Spacing: 1 ft
Pile Shear Strength: 14000 lb
Force Direction: Perpendicular to Pile

Global Minimums

Method: spencer

FS: 0.997553
Axis Location: 335.084, 71.621
Left Slip Surface Endpoint: 312.052, 1.506
Right Slip Surface Endpoint: 377.356, 11.127
Left Slope Intercept: 312.052 3.500
Right Slope Intercept: 377.356 11.127
Resisting Moment=1.69395e+006 lb-ft
Driving Moment=1.69811e+006 lb-ft
Resisting Horizontal Force=21863.2 lb
Driving Horizontal Force=21916.8 lb

Global Minimum Coordinates

Method: spencer

X	Y
312.052	1.50649
321.419	-1.50675

327.194	-1.50675
343.519	-1.50675
353.219	-1.50675
359.022	-1.50675
366.924	-0.476476
373.846	1.50603
375.684	4.45078
377.356	11.1267

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 1
Number of Invalid Surfaces: 0

Slice Data

Global Minimum Query (spencer) - Safety Factor: 0.997553

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	1.33817	207.469	Silty Sand (Liq)	110	0	110.27	110	237.501	137.825	99.6763
2	1.33817	289.486	Silty Sand (Liq)	110	0	110.27	110	298.919	164.686	134.233
3	1.33817	371.518	Silty Sand (Liq)	110	0	110.27	110	360.501	191.547	168.954
4	1.33817	460.606	Silty Sand (Liq)	110	0	110.27	110	429.303	218.408	210.895
5	1.33817	555.515	Silty Sand (Liq)	110	0	110.27	110	498.808	245.269	253.539
6	1.33817	650.425	Silty Sand (Liq)	110	0	110.27	110	568.314	272.13	296.184
7	1.33817	745.335	Silty Sand (Liq)	110	0	110.27	110	637.819	298.991	338.828
8	1.44373	875.681	Silty Sand (Liq)	110	0	110.27	110	596.603	312.421	284.182
9	1.44373	933.185	Silty Sand (Liq)	110	0	110.27	110	633.776	312.421	321.355
10	1.44373	993.111	Silty Sand (Liq)	110	0	110.27	110	672.746	312.421	360.325
11	1.44373	1053.04	Silty Sand (Liq)	110	0	110.27	110	711.718	312.421	399.297
12	1.25575	964.654	Silty Sand (Liq)	110	0	110.27	110	748.15	312.421	435.729
13	1.25575	1009.99	Silty Sand (Liq)	110	0	110.27	110	782.046	312.421	469.625
14	1.25575	1055.33	Silty Sand (Liq)	110	0	110.27	110	815.943	312.421	503.522
15	1.25575	1102.69	Silty Sand (Liq)	110	0	110.27	110	3576.92	312.421	3264.5
16	1.25575	1232.73	Silty Sand (Liq)	110	0	110.27	110	948.581	312.421	636.16
17	1.25575	1398.69	Silty Sand (Liq)	110	0	110.27	110	1072.67	312.421	760.245
18	1.25575	1564.27	Silty Sand (Liq)	110	0	110.27	110	1196.47	312.421	884.044
19	1.25575	1689.48	Silty Sand (Liq)	110	0	110.27	110	1290.07	312.421	977.654
20	1.25575	1769.05	Silty Sand (Liq)	110	0	110.27	110	1349.57	312.421	1037.15
21	1.25575	1818.02	Silty Sand (Liq)	110	0	110.27	110	1386.18	312.421	1073.76
22	1.25575	1846.1	Silty Sand (Liq)	110	0	110.27	110	1407.18	312.421	1094.75
23	1.25575	1846.91	Silty Sand (Liq)	110	0	110.27	110	1407.78	312.421	1095.36
24	1.25575	1846.91	Silty Sand (Liq)	110	0	110.27	110	1407.78	312.421	1095.36
25	1.38579	2038.17	Silty Sand (Liq)	110	0	110.27	110	1407.78	312.421	1095.36
26	1.38579	2038.12	Silty Sand (Liq)	110	0	110.27	110	1407.75	312.421	1095.33
27	1.38579	2036.46	Silty Sand (Liq)	110	0	110.27	110	1406.63	312.421	1094.21
28	1.38579	2034.06	Silty Sand (Liq)	110	0	110.27	110	1405	312.421	1092.58
29	1.38579	2031.66	Silty Sand (Liq)	110	0	110.27	110	1403.37	312.421	1090.95
30	1.38579	2029.26	Silty Sand (Liq)	110	0	110.27	110	1401.75	312.421	1089.33
31	1.38579	2026.86	Silty Sand (Liq)	110	0	110.27	110	1400.13	312.421	1087.71
32	1.4506	2119.08	Silty Sand (Liq)	110	0	110.27	110	1398.46	312.421	1086.04
33	1.4506	2116.45	Silty Sand (Liq)	110	0	110.27	110	1396.76	312.421	1084.33
34	1.4506	2113.82	Silty Sand (Liq)	110	0	110.27	110	1395.05	312.421	1082.63
35	1.4506	2111.19	Silty Sand (Liq)	110	0	110.27	110	1569.53	312.421	1257.1
36	1.31702	1900.94	Silty Sand (Liq)	110	0	110.27	110	1616.19	307.064	1309.13
37	1.31702	1871.63	Silty Sand (Liq)	110	0	110.27	110	1595.95	296.349	1299.6
38	1.31702	1842.33	Silty Sand (Liq)	110	0	110.27	110	1575.7	285.634	1290.07
39	1.31702	1813.02	Silty Sand (Liq)	110	0	110.27	110	1555.46	274.919	1280.54
40	1.31702	1783.72	Silty Sand (Liq)	110	0	110.27	110	1535.21	264.204	1271.01

41	1.31702	1754.41	Silty Sand (Liq)	110	0	110.27	110	1514.96	253.49	1261.47
42	1.38448	1794.73	Silty Sand (Liq)	110	0	110.27	110	1413.46	235.761	1177.69
43	1.38448	1726.46	Silty Sand (Liq)	110	0	110.27	110	1370.19	211.02	1159.17
44	1.38448	1658.19	Silty Sand (Liq)	110	0	110.27	110	1326.92	186.278	1140.64
45	1.38448	1589.92	Silty Sand (Liq)	110	0	110.27	110	1283.66	161.536	1122.12
46	1.38448	1521.65	Silty Sand (Liq)	110	0	110.27	110	1240.39	136.794	1103.59
47	1.24429	1187.06	Silty Sand	0	32	309.822	309.064	556.818	62.2118	494.606
48	0.593312	461.923	Clay	800	0	801.962	800	-29.2299	0	-29.2299
49	0.512198	310.201	Silty Sand	0	32	125.479	125.172	200.317	0	200.317
50	1.16025	282.955	Site Fill	100	32	123.123	122.822	36.522	0	36.522

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 0.997553

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	312.052	1.50649	123.991	0	0
2	313.39	1.07603	257.574	62.9699	13.7378
3	314.728	0.645567	515.845	126.11	13.7378
4	316.066	0.215103	775.645	189.624	13.7378
5	317.405	-0.21536	1047.64	256.12	13.7378
6	318.743	-0.645823	1311.87	320.715	13.7377
7	320.081	-1.07629	1568.31	383.41	13.7378
8	321.419	-1.50675	1816.99	444.204	13.7378
9	322.863	-1.50675	1758.41	429.884	13.7378
10	324.307	-1.50675	1684.15	411.728	13.7378
11	325.75	-1.50675	1594.9	389.909	13.7378
12	327.194	-1.50675	1490.67	364.428	13.7378
13	328.45	-1.50675	1387.83	339.287	13.7378
14	329.706	-1.50675	1273.66	311.374	13.7377
15	330.961	-1.50675	1148.15	280.691	13.7378
16	332.217	-1.50675	15010.8	3669.73	13.7378
17	333.473	-1.50675	14840.9	3628.2	13.7378
18	334.729	-1.50675	14629.6	3576.54	13.7378
19	335.984	-1.50675	14376.8	3514.75	13.7379
20	337.24	-1.50675	14092.8	3445.3	13.7378
21	338.496	-1.50675	13788.9	3371	13.7378
22	339.752	-1.50675	13472.7	3293.7	13.7378
23	341.007	-1.50675	13149.5	3214.69	13.7378
24	342.263	-1.50675	12826.1	3135.62	13.7377
25	343.519	-1.50675	12502.7	3056.56	13.7378
26	344.905	-1.50675	12145.8	2969.31	13.7378
27	346.29	-1.50675	11788.9	2882.06	13.7378
28	347.676	-1.50675	11432.4	2794.92	13.7378
29	349.062	-1.50675	11076.6	2707.92	13.7378
30	350.448	-1.50675	10721.3	2621.06	13.7378
31	351.834	-1.50675	10366.6	2534.36	13.7378
32	353.219	-1.50675	10012.6	2447.8	13.7378
33	354.67	-1.50675	9642.57	2357.35	13.7378
34	356.12	-1.50675	9273.25	2267.06	13.7378
35	357.571	-1.50675	8904.58	2176.93	13.7378
36	359.022	-1.50675	8536.57	2086.96	13.7378
37	360.339	-1.33504	7928.89	1938.4	13.7378
38	361.656	-1.16333	7332.01	1792.48	13.7378
39	362.973	-0.991613	6745.93	1649.2	13.7378
40	364.29	-0.819901	6170.66	1508.56	13.7378
41	365.607	-0.648188	5606.19	1370.56	13.7378
42	366.924	-0.476476	5052.52	1235.2	13.7378
43	368.308	-0.0799742	4195.91	1025.78	13.7377
44	369.693	0.316528	3373.51	824.732	13.7378
45	371.077	0.713029	2585.34	632.046	13.7378

46	372.462	1.10953	1831.39	447.726	13.7378
47	373.846	1.50603	1111.67	271.773	13.7378
48	375.091	3.5	89.7255	21.9354	13.7378
49	375.684	4.45078	477.343	116.697	13.7378
50	376.196	6.49532	54.4366	13.3083	13.7378
51	377.356	11.1267	0	0	0

List Of Coordinates

Water Table

X	Y
0	3.5
322	3.5
540	3.5

Line Load

X	Y
358.17	11.3551
388.141	10.9983

Line Load

X	Y
390.084	10.9752
430	10.5
539.88	10.5

Non-Circular Failure Surface

X	Y
312.052	1.50649
321.419	-1.50675
327.194	-1.50675
343.519	-1.50675
353.219	-1.50675
359.022	-1.50675
366.924	-0.476476
373.846	1.50603
375.684	4.45078
377.356	11.1267

External Boundary

X	Y
0	-40
540	-40
540	-8.5
540	-6.5
540	-4.50205
540	-1.5067
540	1.50229
540	3.5
540	4.50291
540	6.49532
540	10.5
430	10.5
346	11.5
344	11.5
340	11.5
338	11
336	10

332.495	6.49532
332	6
328	5
326.012	4.50291
322	3.5
316	2
312.018	1.50229
308	1
302	0
294	-1
289.946	-1.5067
286	-2
274	-3
240	-4
217.91	-4.50205
196	-5
164	-6
136	-6
120	-5
70	-2
64	-1
46	1
0	1
0	-6.5
0	-8.5

Material Boundary

X	Y
332.495	6.49532
540	6.49532

Material Boundary

X	Y
326.012	4.50291
540	4.50291

Material Boundary

X	Y
312.018	1.50229
540	1.50229

Material Boundary

X	Y
289.946	-1.5067
540	-1.5067

Material Boundary

X	Y
217.91	-4.50205
540	-4.50205

Material Boundary

X	Y
0	-6.5
540	-6.5

Material Boundary

X	Y
0	-8.5
540	-8.5

Material Boundary

X	Y
322	3.5
540	3.5

Section C3 - C3' Lower Liquefiable Zone - Critical Surface - ky 0.25

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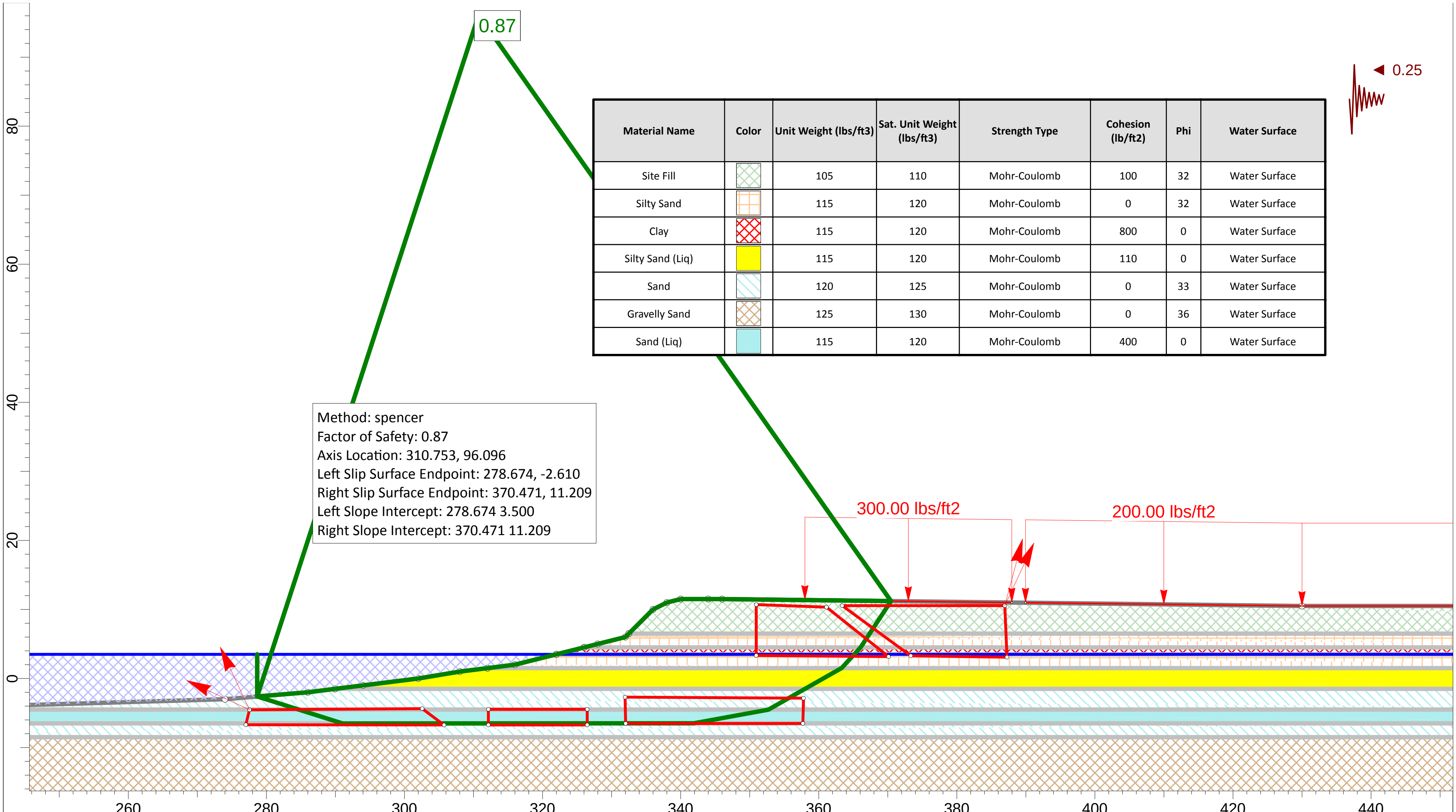


Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi	Water Surface
Site Fill		105	110	Mohr-Coulomb	100	32	Water Surface
Silty Sand		115	120	Mohr-Coulomb	0	32	Water Surface
Clay		115	120	Mohr-Coulomb	800	0	Water Surface
Silty Sand (Liq)		115	120	Mohr-Coulomb	110	0	Water Surface
Sand		120	125	Mohr-Coulomb	0	33	Water Surface
Gravelly Sand		125	130	Mohr-Coulomb	0	36	Water Surface
Sand (Liq)		115	120	Mohr-Coulomb	400	0	Water Surface

SLIDEINTERPRET 6.008

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Project **Bayside Village - Backbay Landing - Load Demand on Seawall Bulkhead due to Liquefaction**			
Analyzed By JEH	*Units* feet	*Scale* 1:240	*Project No.:* **602668-002**
Date December 5, 2011	*Condition* **Liquefaction**		

Slide Analysis Information

Bayside Village - Backbay Landing - Load Demand on Seawall Bulkhead due to Liquefaction

Project Summary

File Name: Sec C3 - A4 - LQ2 - PS025 - MC
Slide Modeler Version: 6.008
Project Title: Bayside Village - Backbay Landing - Load Demand on Seawall Bulkhead due to Liquefaction
Analysis: Section C3 - C3' Lower Liquefiable Zone - Critical Surface - ky 0.25
Author: JEH
Company: Leighton Consulting, Inc.
Date Created: December 5, 2011
Comments:

Liquefaction
602668-002

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 50
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 115
Left Projection Angle (End Angle): 155
Right Projection Angle (Start Angle): 65
Right Projection Angle (End Angle): 75
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.25
2 Distributed Loads present

Distributed Load 1

Distribution: Constant
Magnitude [lbs/ft2]: 300
Orientation: Vertical

Distributed Load 2

Distribution: Constant
Magnitude [lbs/ft2]: 200
Orientation: Vertical

Material Properties

Property	Site Fill	Silty Sand	Clay	Silty Sand (Liq)	Sand	Gravelly Sand	Sand (Liq)
Color							
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	105	115	115	115	120	125	115
Saturated Unit Weight [lbs/ft3]	110	120	120	120	125	130	120
Cohesion [psf]	100	0	800	110	0	0	400
Friction Angle [deg]	32	32	0	0	33	36	0
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated

Global Minimums

Method: spencer

FS: 0.870261
Axis Location: 310.753, 96.096
Left Slip Surface Endpoint: 278.674, -2.610
Right Slip Surface Endpoint: 370.471, 11.209
Left Slope Intercept: 278.674 3.500
Right Slope Intercept: 370.471 11.209
Resisting Moment=3.42266e+006 lb-ft
Driving Moment=3.93291e+006 lb-ft
Resisting Horizontal Force=30869.3 lb
Driving Horizontal Force=35471.3 lb

Global Minimum Coordinates

Method: spencer

X	Y
278.674	-2.61049
291.072	-6.51201
341.913	-6.49132
352.707	-4.51247
363.32	1.51272
366.051	4.47494
370.471	11.2087

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 2527
Number of Invalid Surfaces: 2474

Error Codes:

Error Code -108 reported for 330 surfaces
Error Code -111 reported for 328 surfaces
Error Code -112 reported for 1816 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 0.870261

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.00358	853.379	Sand	0	33	96.6878	84.1436	530.535	400.967	129.568
2	2.00358	1032.23	Sand	0	33	167.846	146.07	665.239	440.311	224.928
3	2.00358	1211.09	Sand	0	33	239.005	207.997	799.944	479.656	320.288
4	2.11626	1470.74	Sand (Liq)	400	0	459.632	400	1031.44	520.107	511.328
5	2.11626	1672.65	Sand (Liq)	400	0	459.632	400	1129.52	561.664	567.861
6	2.11626	1876.46	Sand (Liq)	400	0	459.632	400	1225.84	603.221	622.618
7	0.0381481	35.6802	Sand	0	33	507.657	441.794	1304.68	624.375	680.304
8	1.96681	1855.15	Sand	0	33	264.975	230.597	979.813	624.724	355.089
9	1.96681	1882.8	Sand	0	33	275.807	240.024	994.278	624.674	369.604
10	1.96681	1910.46	Sand	0	33	286.638	249.45	1008.74	624.624	384.119
11	1.96681	1938.11	Sand	0	33	297.471	258.877	1023.21	624.574	398.634
12	1.96681	1965.77	Sand	0	33	308.302	268.303	1037.67	624.524	413.149
13	1.96681	1994.34	Sand	0	33	320.453	278.878	1053.91	624.474	429.433
14	1.96681	2029.84	Sand	0	33	335.406	291.891	1073.9	624.425	449.474
15	1.96681	2066.78	Sand	0	33	349.655	304.291	1092.94	624.375	468.565
16	1.96681	2103	Sand	0	33	363.016	315.919	1110.8	624.325	486.471
17	1.96681	2132.37	Sand	0	33	373.517	325.057	1124.82	624.275	500.544
18	1.96681	2160.03	Sand	0	33	384.349	334.484	1139.28	624.225	515.059
19	1.96681	2187.68	Sand	0	33	395.18	343.91	1153.75	624.175	529.574
20	1.96681	2216.81	Sand	0	33	407.467	354.603	1170.17	624.125	546.041
21	1.96681	2265.99	Sand	0	33	427.898	372.383	1197.49	624.075	573.42
22	1.96681	2321.49	Sand	0	33	448.669	390.459	1225.28	624.025	601.256
23	1.93988	2345.98	Sand (Liq)	400	0	459.632	400	1251.39	623.975	627.419
24	1.93988	2439.4	Sand (Liq)	400	0	459.632	400	1295.31	623.926	671.383
25	1.93988	2547.4	Sand (Liq)	400	0	459.632	400	1347.33	623.877	723.45
26	1.93988	2655.41	Sand (Liq)	400	0	459.632	400	1399.35	623.828	775.518
27	1.93988	2763.42	Sand (Liq)	400	0	459.632	400	1451.36	623.778	827.581
28	1.93988	2873.39	Sand (Liq)	400	0	459.632	400	1504.32	623.729	880.592
29	1.93988	3163.67	Sand (Liq)	400	0	459.632	400	1644.12	623.68	1020.44
30	1.93988	3558.79	Sand (Liq)	400	0	459.632	400	1834.41	623.631	1210.78
31	1.93988	3845.68	Sand (Liq)	400	0	459.632	400	1972.59	623.581	1349.01
32	1.93988	3992.01	Sand (Liq)	400	0	459.632	400	2043.05	623.532	1419.52
33	1.93988	4042.58	Sand (Liq)	400	0	459.632	400	2067.42	623.483	1443.93
34	2.15878	4447.4	Sand (Liq)	400	0	459.632	400	1871.26	611.11	1260.15
35	2.15878	4344.84	Sand (Liq)	400	0	459.632	400	1828.91	586.414	1242.49
36	2.15878	4238.81	Sand (Liq)	400	0	459.632	400	1785.12	561.718	1223.41
37	2.15878	4130.46	Sand (Liq)	400	0	459.632	400	1740.38	537.022	1203.36
38	2.15878	4022.11	Sand (Liq)	400	0	459.632	400	1695.64	512.326	1183.31
39	0.0183594	33.7336	Sand (Liq)	400	0	459.632	400	1372.02	499.653	872.365
40	1.7587	3118.64	Sand	0	33	606.453	527.772	1280.88	468.176	812.7
41	1.7587	2895.28	Sand	0	33	580.936	505.566	1184.38	405.873	778.502

42	1.7587	2671.92	Sand	0	33	555.608	483.524	1088.13	343.57	744.561
43	1.77282	2471.78	Silty Sand (Liq)	110	0	126.399	110	1361.27	281.016	1080.26
44	1.77282	2253.73	Silty Sand (Liq)	110	0	126.399	110	1261.26	218.212	1043.05
45	1.77282	2035.69	Silty Sand (Liq)	110	0	126.399	110	1161.25	155.408	1005.84
46	1.83274	1771.15	Silty Sand	0	32	430.232	374.414	661.191	62.0033	599.188
47	0.899122	709.759	Clay	800	0	919.264	800	219.648	0	219.648
48	1.326	816.513	Silty Sand	0	32	272.619	237.25	379.679	0	379.679
49	1.54672	578.593	Site Fill	100	32	272.067	236.769	218.877	0	218.877
50	1.54672	192.864	Site Fill	100	32	199.499	173.616	117.81	0	117.81

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 0.870261

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	278.674	-2.61049	1164.95	0	0
2	280.678	-3.24101	566.063	148.627	14.7117
3	282.681	-3.87153	1307.96	343.422	14.7117
4	284.685	-4.50205	2225.69	584.385	14.7117
5	286.801	-5.16803	3771.74	990.321	14.7117
6	288.917	-5.83402	5339.38	1401.92	14.7116
7	291.034	-6.5	6907.1	1813.55	14.7117
8	291.072	-6.51201	6937.56	1821.55	14.7117
9	293.039	-6.5112	7212.44	1893.72	14.7117
10	295.005	-6.5104	7490.38	1966.7	14.7117
11	296.972	-6.5096	7771.38	2040.48	14.7117
12	298.939	-6.5088	8055.45	2115.07	14.7117
13	300.906	-6.508	8342.59	2190.46	14.7117
14	302.873	-6.5072	8642.56	2269.22	14.7117
15	304.84	-6.5064	8957.08	2351.8	14.7117
16	306.806	-6.5056	9273.61	2434.91	14.7117
17	308.773	-6.5048	9585.99	2516.93	14.7117
18	310.74	-6.504	9891.59	2597.17	14.7117
19	312.707	-6.5032	10200.2	2678.21	14.7118
20	314.674	-6.5024	10512	2760.06	14.7117
21	316.64	-6.5016	10835.7	2845.07	14.7118
22	318.607	-6.5008	11177	2934.68	14.7117
23	320.574	-6.5	11515.1	3023.44	14.7117
24	322.514	-6.49921	11827.2	3105.38	14.7117
25	324.454	-6.49842	12107.9	3179.1	14.7117
26	326.394	-6.49763	12361.6	3245.72	14.7118
27	328.334	-6.49684	12588.3	3305.23	14.7117
28	330.273	-6.49605	12788	3357.65	14.7117
29	332.213	-6.49526	12960.1	3402.84	14.7117
30	334.153	-6.49447	13059.5	3428.94	14.7117
31	336.093	-6.49368	13060	3429.07	14.7117
32	338.033	-6.4929	12988.6	3410.34	14.7117
33	339.973	-6.49211	12880.6	3381.98	14.7117
34	341.913	-6.49132	12760	3350.31	14.7117
35	344.072	-6.09555	11899.8	3124.45	14.7117
36	346.23	-5.69978	11082	2909.73	14.7117
37	348.389	-5.30401	10308.1	2706.52	14.7117
38	350.548	-4.90824	9578.9	2515.07	14.7117
39	352.707	-4.51247	8894.54	2335.38	14.7117
40	352.725	-4.50205	8880.24	2331.63	14.7117
41	354.484	-3.5036	7888.26	2071.17	14.7117
42	356.242	-2.50515	7003.59	1838.89	14.7117
43	358.001	-1.5067	6226.31	1634.8	14.7117
44	359.774	-0.500226	4462.37	1171.65	14.7116
45	361.547	0.506245	2853.59	749.249	14.7117
46	363.32	1.51272	1399.99	367.586	14.7117

47	365.152	3.5	431.731	113.357	14.7117
48	366.051	4.47494	866.678	227.558	14.7117
49	367.377	6.49532	256.947	67.465	14.7117
50	368.924	8.852	17.2883	4.53928	14.7117
51	370.471	11.2087	0	0	0

List Of Coordinates

Water Table

X	Y
0	3.5
322	3.5
540	3.5

Line Load

X	Y
357.999	11.3572
387.965	11.0004

Line Load

X	Y
389.955	10.9767
430	10.5
540	10.5

Block Search Window

X	Y
277.016	-6.697
305.736	-6.731
302.561	-4.375
277.552	-4.538

Block Search Window

X	Y
312.142	-6.729
326.46	-6.729
326.46	-4.475
312.142	-4.475

Block Search Window

X	Y
350.947	10.701
350.947	3.336
370.124	3.161
361.109	10.331

Block Search Window

X	Y
332.026	-6.527
357.697	-6.527
357.806	-2.855
331.953	-2.704

Block Search Window

X	Y

363.392	10.552
373.328	3.279
387.259	3.074
386.952	10.552

External Boundary

X	Y
0	-40
540	-40
540	-8.5
540	-6.5
540	-4.50205
540	-1.5067
540	1.50229
540	3.5
540	4.50291
540	6.49532
540	10.5
430	10.5
346	11.5
344	11.5
340	11.5
338	11
336	10
332.495	6.49532
332	6
328	5
326.012	4.50291
322	3.5
316	2
312.018	1.50229
308	1
302	0
294	-1
289.946	-1.5067
286	-2
274	-3
240	-4
217.91	-4.50205
196	-5
164	-6
136	-6
120	-5
70	-2
64	-1
46	1
0	1
0	-6.5
0	-8.5

Material Boundary

X	Y
332.495	6.49532
540	6.49532

Material Boundary

X	Y
326.012	4.50291
540	4.50291

Material Boundary

X	Y
312.018	1.50229
540	1.50229

Material Boundary

X	Y
289.946	-1.5067
540	-1.5067

Material Boundary

X	Y
217.91	-4.50205
540	-4.50205

Material Boundary

X	Y
0	-6.5
540	-6.5

Material Boundary

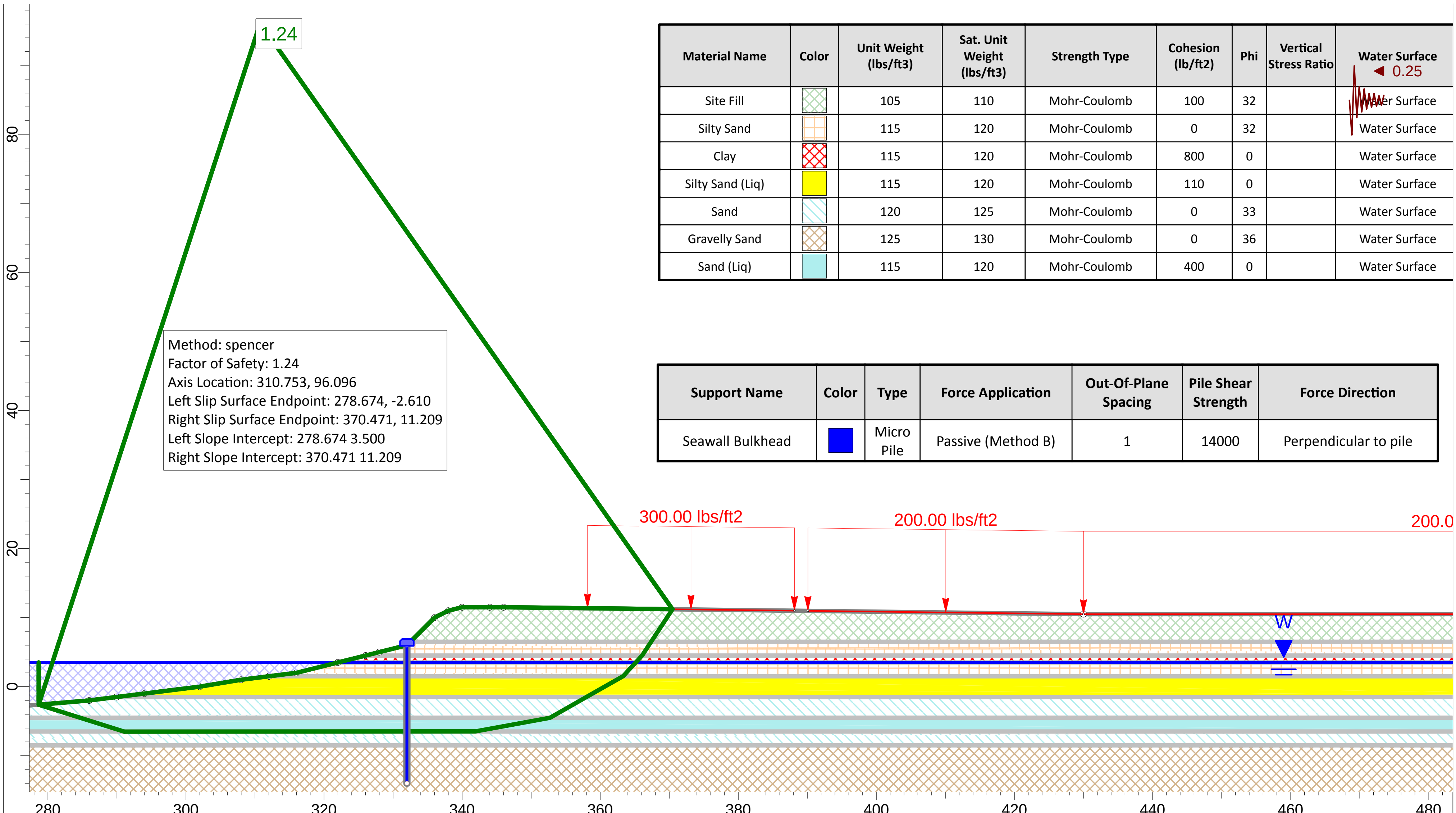
X	Y
0	-8.5
540	-8.5

Material Boundary

X	Y
322	3.5
540	3.5

Section C3 - C3' Bulkhead Load Demand - Liquefaction in Upper Zone - ky 0.25

P:\Leighton Consulting\602000\602668.002 Bayside Village in Newport Beach\Analyses\Slope Stability\Section C3\Sec C3 - A4 - BK1 - LQ2 - PS025 - MC2.slim



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi	Vertical Stress Ratio	Water Surface
Site Fill		105	110	Mohr-Coulomb	100	32		Water Surface
Silty Sand		115	120	Mohr-Coulomb	0	32		Water Surface
Clay		115	120	Mohr-Coulomb	800	0		Water Surface
Silty Sand (Liq)		115	120	Mohr-Coulomb	110	0		Water Surface
Sand		120	125	Mohr-Coulomb	0	33		Water Surface
Gravelly Sand		125	130	Mohr-Coulomb	0	36		Water Surface
Sand (Liq)		115	120	Mohr-Coulomb	400	0		Water Surface

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing	Pile Shear Strength	Force Direction
Seawall Bulkhead		Micro Pile	Passive (Method B)	1	14000	Perpendicular to pile

SLIDEINTERPRET 6.008

Leighton Consulting, Inc.
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Project
Bayside Village - Backbay Landing - Bulkhead Load Demand due to Liquefaction

Analyzed By JEH	*Units* feet	*Scale* 1:240	*Project No.:* **602668-002**
Date December 4, 2011	*Condition* **Liquefaction**		

Slide Analysis Information

Bayside Village - Backbay Landing - Bulkhead Load Demand due to Liquefaction

Project Summary

File Name: Sec C3 - A4 - BK1 - LQ2 - PS025 - MC2
Slide Modeler Version: 6.008
Project Title: Bayside Village - Backbay Landing - Bulkhead Load Demand due to Liquefaction
Analysis: Section C3 - C3' Bulkhead Load Demand - Liquefaction in Upper Zone - ky 0.25
Author: JEH
Company: Leighton Consulting, Inc.
Date Created: December 4, 2011
Comments:

Liquefaction
602668-002
Liquefaction with Seismic Load

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Right to Left
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 50
Tolerance: 0.005
Maximum number of iterations: 50
Check malpha < 0.2: Yes
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 1
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 115
Left Projection Angle (End Angle): 155
Right Projection Angle (Start Angle): 65
Right Projection Angle (End Angle): 80
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.25
2 Distributed Loads present

Distributed Load 1

Distribution: Constant
Magnitude [lbs/ft2]: 300
Orientation: Vertical

Distributed Load 2

Distribution: Constant
Magnitude [lbs/ft2]: 200
Orientation: Vertical

Material Properties

Property	Site Fill	Silty Sand	Clay	Silty Sand (Liq)	Sand	Gravelly Sand	Sand (Liq)
Color							
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	105	115	115	115	120	125	115
Saturated Unit Weight [lbs/ft3]	110	120	120	120	125	130	120
Cohesion [psf]	100	0	800	110	0	0	400
Friction Angle [deg]	32	32	0	0	33	36	0
Water Surface	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table	Water Table
Hu Value	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated

Support Properties

Seawall Bulkhead

Support Type: Micro-Pile
Force Application: Passive
Out-of-Plane Spacing: 1 ft
Pile Shear Strength: 14000 lb
Force Direction: Perpendicular to Pile

Global Minimums

Method: spencer

FS: 1.238310
Axis Location: 310.753, 96.096
Left Slip Surface Endpoint: 278.674, -2.610
Right Slip Surface Endpoint: 370.471, 11.209
Left Slope Intercept: 278.674 3.500
Right Slope Intercept: 370.471 11.209
Resisting Moment=4.79227e+006 lb-ft
Driving Moment=3.87003e+006 lb-ft
Resisting Horizontal Force=44151.4 lb
Driving Horizontal Force=35654.7 lb

Global Minimum Coordinates

Method: spencer

X	Y
278.674	-2.61049
291.072	-6.51201

341.913	-6.49132
352.707	-4.51247
363.32	1.51272
366.051	4.47494
370.471	11.2087

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 1
Number of Invalid Surfaces: 0

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.23831

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.00358	853.379	Sand	0	33	55.4393	68.651	506.678	400.967	105.711
2	2.00358	1032.23	Sand	0	33	95.5399	118.308	622.491	440.311	182.18
3	2.00358	1211.09	Sand	0	33	135.641	167.965	738.3	479.656	258.644
4	2.11626	1470.74	Sand (Liq)	400	0	323.021	400	960.728	520.107	440.621
5	2.11626	1672.65	Sand (Liq)	400	0	323.021	400	1059.07	561.664	497.41
6	2.11626	1876.46	Sand (Liq)	400	0	323.021	400	1155.39	603.221	552.172
7	0.0381481	35.6802	Sand	0	33	287.087	355.503	1171.8	624.375	547.426
8	1.96681	1855.15	Sand	0	33	174.556	216.154	957.574	624.724	332.85
9	1.96681	1882.8	Sand	0	33	181.642	224.929	971.032	624.674	346.358
10	1.96681	1910.46	Sand	0	33	188.727	233.703	984.495	624.624	359.871
11	1.96681	1938.11	Sand	0	33	195.814	242.478	997.959	624.574	373.385
12	1.96681	1965.77	Sand	0	33	202.9	251.253	1011.42	624.524	386.898
13	1.96681	1994.34	Sand	0	33	210.907	261.168	1026.64	624.474	402.166
14	1.96681	2029.84	Sand	0	33	220.751	273.358	1045.36	624.425	420.935
15	1.96681	2066.78	Sand	0	33	230.06	284.885	1063.06	624.375	438.684
16	1.96681	2103	Sand	0	33	238.753	295.65	1079.59	624.325	455.263
17	1.96681	2132.37	Sand	0	33	245.564	304.084	1092.52	624.275	468.248
18	1.96681	2160.03	Sand	0	33	252.649	312.858	1105.99	624.225	481.761
19	1.96681	2187.68	Sand	0	33	259.735	321.633	1119.44	624.175	495.27
20	1.96681	2216.81	Sand	0	33	267.826	331.651	1134.82	624.125	510.7
21	1.96681	2265.99	Sand	0	33	281.262	348.29	1160.39	624.075	536.319
22	1.96681	2321.49	Sand	0	33	294.795	365.048	1186.15	624.025	562.126
23	1.93988	2345.98	Sand (Liq)	400	0	323.021	400	1216.26	623.975	592.288
24	1.93988	2439.4	Sand (Liq)	400	0	323.021	400	1259.77	623.926	635.845
25	1.93988	2547.4	Sand (Liq)	400	0	323.021	400	1311.44	623.877	687.562
26	1.93988	2655.41	Sand (Liq)	400	0	323.021	400	1363.1	623.828	739.273
27	1.93988	2763.42	Sand (Liq)	400	0	323.021	400	1414.76	623.778	790.986
28	1.93988	2873.39	Sand (Liq)	400	0	323.021	400	3544.64	623.729	2920.91
29	1.93988	3163.67	Sand (Liq)	400	0	323.021	400	1606.22	623.68	982.544
30	1.93988	3558.79	Sand (Liq)	400	0	323.021	400	1795.22	623.631	1171.59
31	1.93988	3845.68	Sand (Liq)	400	0	323.021	400	1932.45	623.581	1308.87
32	1.93988	3992.01	Sand (Liq)	400	0	323.021	400	2002.45	623.532	1378.92
33	1.93988	4042.58	Sand (Liq)	400	0	323.021	400	2026.64	623.483	1403.16
34	2.15878	4447.4	Sand (Liq)	400	0	323.021	400	1848.19	611.11	1237.08
35	2.15878	4344.84	Sand (Liq)	400	0	323.021	400	1806.3	586.414	1219.88
36	2.15878	4238.81	Sand (Liq)	400	0	323.021	400	1762.99	561.718	1201.27
37	2.15878	4130.46	Sand (Liq)	400	0	323.021	400	1718.73	537.022	1181.7
38	2.15878	4022.11	Sand (Liq)	400	0	323.021	400	1674.47	512.326	1162.14
39	0.0183594	33.7336	Sand (Liq)	400	0	323.021	400	1393.52	499.653	893.865
40	1.7587	3118.64	Sand	0	33	440.609	545.61	1308.34	468.176	840.168
41	1.7587	2895.28	Sand	0	33	422.448	523.121	1211.41	405.873	805.535
42	1.7587	2671.92	Sand	0	33	404.286	500.632	1114.48	343.57	770.907
43	1.77282	2471.78	Silty Sand (Liq)	110	0	88.8307	110	1331.48	281.016	1050.46

44	1.77282	2253.73	Silty Sand (Liq)	110	0	88.8307	110	1257.36	218.212	1039.15
45	1.77282	2035.69	Silty Sand (Liq)	110	0	88.8307	110	1158.59	155.408	1003.18
46	1.83274	1771.15	Silty Sand	0	32	328.697	407.029	713.385	62.0033	651.382
47	0.899122	709.759	Clay	800	0	646.042	800	384.686	0	384.686
48	1.326	816.513	Silty Sand	0	32	214.043	265.051	424.169	0	424.169
49	1.54672	578.593	Site Fill	100	32	214.855	266.057	265.747	0	265.747
50	1.54672	192.864	Site Fill	100	32	31.7647	39.3345	-97.0852	0	-97.0852

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.23831

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	278.674	-2.61049	1164.95	0	0
2	280.678	-3.24101	468.46	134.854	16.0593
3	282.681	-3.87153	1038.67	299	16.0594
4	284.685	-4.50205	1710.64	492.437	16.0594
5	286.801	-5.16803	2921.01	840.863	16.0594
6	288.917	-5.83402	4153.13	1195.55	16.0594
7	291.034	-6.5	5385.35	1550.27	16.0594
8	291.072	-6.51201	5405.81	1556.16	16.0594
9	293.039	-6.5112	5503.12	1584.17	16.0594
10	295.005	-6.5104	5596.15	1610.95	16.0594
11	296.972	-6.5096	5684.88	1636.49	16.0594
12	298.939	-6.5088	5769.32	1660.8	16.0594
13	300.906	-6.508	5849.47	1683.87	16.0594
14	302.873	-6.5072	5934.31	1708.29	16.0593
15	304.84	-6.5064	6023.67	1734.02	16.0594
16	306.806	-6.5056	6105.35	1757.53	16.0594
17	308.773	-6.5048	6173.7	1777.21	16.0594
18	310.74	-6.504	6228.02	1792.85	16.0594
19	312.707	-6.5032	6278.06	1807.25	16.0594
20	314.674	-6.5024	6323.8	1820.42	16.0594
21	316.64	-6.5016	6373.35	1834.68	16.0594
22	318.607	-6.5008	6426.67	1850.03	16.0594
23	320.574	-6.5	6462.55	1860.36	16.0594
24	322.514	-6.49921	6510.12	1874.05	16.0594
25	324.454	-6.49842	6526.37	1878.73	16.0594
26	326.394	-6.49763	6515.57	1875.62	16.0594
27	328.334	-6.49684	6477.74	1864.73	16.0594
28	330.273	-6.49605	6412.86	1846.05	16.0594
29	332.213	-6.49526	20318.8	5849.12	16.0594
30	334.153	-6.49447	20153.7	5801.6	16.0594
31	336.093	-6.49368	19889.7	5725.59	16.0594
32	338.033	-6.4929	19553.8	5628.91	16.0594
33	339.973	-6.49211	19181.4	5521.69	16.0594
34	341.913	-6.49132	18796.2	5410.81	16.0594
35	344.072	-6.09555	17650.7	5081.07	16.0594
36	346.23	-5.69978	16547.5	4763.49	16.0594
37	348.389	-5.30401	15487.9	4458.47	16.0594
38	350.548	-4.90824	14473	4166.29	16.0593
39	352.707	-4.51247	13502.6	3886.95	16.0594
40	352.725	-4.50205	13485.6	3882.05	16.0593
41	354.484	-3.5036	12175.1	3504.8	16.0593
42	356.242	-2.50515	10985.2	3162.29	16.0594
43	358.001	-1.5067	9916.04	2854.51	16.0594
44	359.774	-0.500226	8115.6	2336.22	16.0594
45	361.547	0.506245	6444.27	1855.1	16.0594
46	363.32	1.51272	4926.87	1418.28	16.0593
47	365.152	3.5	3669.25	1056.26	16.0594
48	366.051	4.47494	3698.07	1064.55	16.0593

49	367.377	6.49532	2920.99	840.857	16.0594
50	368.924	8.852	2482.63	714.668	16.0594
51	370.471	11.2087	0	0	0

List Of Coordinates

Water Table

X	Y
0	3.5
322	3.5
540	3.5

Line Load

X	Y
358.17	11.3551
388.141	10.9983

Line Load

X	Y
390.084	10.9752
430	10.5
539.88	10.5

Non-Circular Failure Surface

X	Y
278.674	-2.61049
291.072	-6.51201
341.913	-6.49132
352.707	-4.51247
363.32	1.51272
366.051	4.47494
370.471	11.2087

External Boundary

X	Y
0	-40
540	-40
540	-8.5
540	-6.5
540	-4.50205
540	-1.5067
540	1.50229
540	3.5
540	4.50291
540	6.49532
540	10.5
430	10.5
346	11.5
344	11.5
340	11.5
338	11
336	10
332.495	6.49532
332	6
328	5
326.012	4.50291
322	3.5
316	2

312.018	1.50229
308	1
302	0
294	-1
289.946	-1.5067
286	-2
274	-3
240	-4
217.91	-4.50205
196	-5
164	-6
136	-6
120	-5
70	-2
64	-1
46	1
0	1
0	-6.5
0	-8.5

Material Boundary

X	Y
332.495	6.49532
540	6.49532

Material Boundary

X	Y
326.012	4.50291
540	4.50291

Material Boundary

X	Y
312.018	1.50229
540	1.50229

Material Boundary

X	Y
289.946	-1.5067
540	-1.5067

Material Boundary

X	Y
217.91	-4.50205
540	-4.50205

Material Boundary

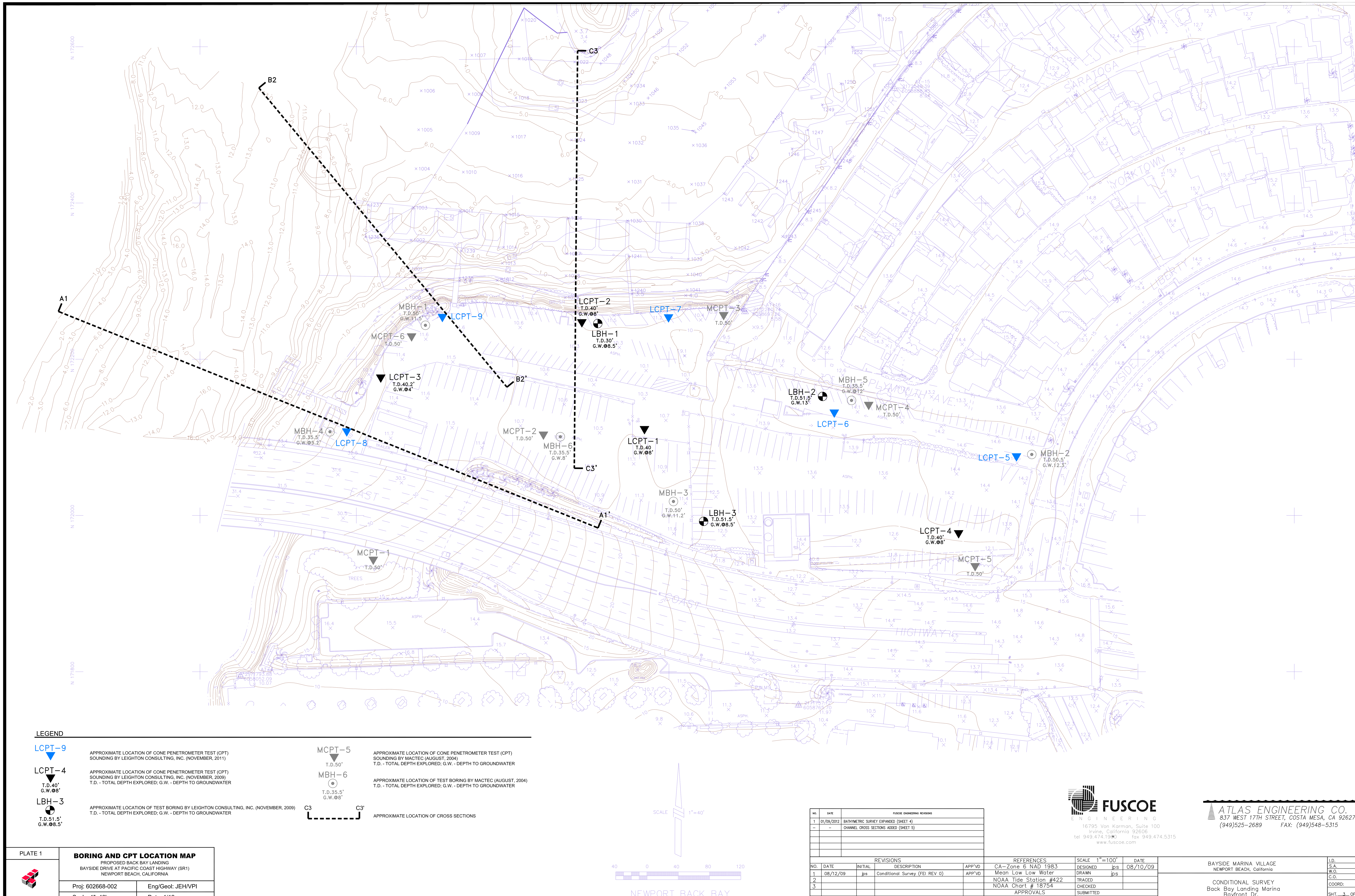
X	Y
0	-6.5
540	-6.5

Material Boundary

X	Y
0	-8.5
540	-8.5

Material Boundary

X	Y
322	3.5
540	3.5



LEGEND

LCPT−9	APPROXIMATE LOCATION OF CONE PENETROMETER TEST (CPT) SOUNDING BY LEIGHTON CONSULTING, INC. (NOVEMBER, 2011)
LCPT−4 T.D.40' G.W.@8'	APPROXIMATE LOCATION OF CONE PENETROMETER TEST (CPT) SOUNDING BY LEIGHTON CONSULTING, INC. (NOVEMBER, 2009) T.D. - TOTAL DEPTH EXPLORED; G.W. - DEPTH TO GROUNDWATER
LBH−3 T.D.51.5' G.W.@8.5'	APPROXIMATE LOCATION OF TEST BORING BY LEIGHTON CONSULTING, INC. (NOVEMBER, 2009) T.D. - TOTAL DEPTH EXPLORED; G.W. - DEPTH TO GROUNDWATER
MCPT−5 T.D.50'	APPROXIMATE LOCATION OF CONE PENETROMETER TEST (CPT) SOUNDING BY MACTEC (AUGUST, 2004) T.D. - TOTAL DEPTH EXPLORED; G.W. - DEPTH TO GROUNDWATER
MBH−6 T.D.35.5' G.W.@8'	APPROXIMATE LOCATION OF TEST BORING BY MACTEC (AUGUST, 2004) T.D. - TOTAL DEPTH EXPLORED; G.W. - DEPTH TO GROUNDWATER
C3 C3'	APPROXIMATE LOCATION OF CROSS SECTIONS

PLATE 1	BORING AND CPT LOCATION MAP PROPOSED BACK BAY LANDING BAYSIDE DRIVE AT PACIFIC COAST HIGHWAY (SR1) NEWPORT BEACH, CALIFORNIA	
Leighton	Proj: 602668-002	Eng/Geol: JEH/VPI
	Scale: 1"=40'	Date: 1/12
	Drafted By: BQT	Checked By: BQT P:\DRAFTING\602668\002\OF_2012-01-11\PLATE1.DWG (01-19-12 8:50:26AM) Plotted by: btran

NO.	DATE	FUSCOE ENGINEERING REVISIONS
1	01/09/2012	BATHYMETRIC SURVEY EXPANDED (SHEET 4)
–	–	CHANNEL CROSS SECTIONS ADDED (SHEET 5)

FUSCOE ENGINEERING
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ATLAS ENGINEERING CO.
837 WEST 17TH STREET, COSTA MESA, CA 92627
(949)525−2689 FAX: (949)548−5315

REVISIONS				
NO.	DATE	INITIAL	DESCRIPTION	APP'VD
1	08/12/09	jps	Conditional Survey (FEI REV 0)	APP'VD
2				
3				

REFERENCES
CA−Zone 6 NAD 1983
Mean Low Low Water
NOAA Tide Station #422
NOAA Chart # 18754

APPROVALS: DESIGN | OPER. | CONST. | R/W

SCALE 1"=100'		DATE
DESIGNED	jps	08/10/09
DRAWN	jps	
TRACED		
CHECKED		
SUBMITTED		
RECOMMENDED		

BAYSIDE MARINA VILLAGE
NEWPORT BEACH, California

CONDITIONAL SURVEY
Back Bay Landing Marina
Bayfront Dr.
Newport Beach, CA 92660

I.D.
S.A.
W.O.
C.O.
COORD:
SHT. 3 OF 5