APPENDIX G

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PRELIMINARY GEOTECHNICAL EVALUATION
BRISBANE BAYLANDS – FORMER RAILYARDS
Brisbane, California

Universal Paragon Corporation
San Francisco, California

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Treadwell&Rollo
Environmental & Geotechnical Consultants

PRELIMINARY GEOTECHNICAL EVALUATION
Brisbane Baylands – Former Railyards
Brisbane, California

This report presents the results of our preliminary geotechnical evaluation for the proposed development of the former railyards portion of the Brisbane Baylands properties in Brisbane, California. This investigation was performed in accordance with our proposal dated 25 September 2007. We previously submitted our preliminary findings in memorandums dated 16 January 2008, 22 January 2008, and 21 March 2008. In addition, we previously performed geotechnical consultation services for the site in accordance with our proposal dated 9 May 2007, and presented our findings in a letter report and memorandum dated 20 July 2007.

The Brisbane Baylands site is bound by U.S. Highway 101 to the east, Beatty Avenue to the north, Bayshore Boulevard to the west, and the Guadalupe Lagoon to the south. The site consists of an approximately 275-acre former landfill site and an approximately 180-acre former railyards area. The former railyards area occupies the western portion of the Brisbane Baylands site, and is bound by the Caltrain/Joint Powers Board (JPB) railroad tracks to the east, as shown on Figures 1 and 2.

Current elevations at the site range from approximately Elevation 7 feet[1] to Elevation 20 feet. The majority of the former railyards area is currently undeveloped; however, the southwest portion of the site is occupied by several industrial buildings, driveways, and parking areas. We understand current plans are to demolish and remove the existing improvements on the property and construct a new development consisting of eight million square feet of low- to high-density commercial, residential, office, retail, and corporate campus buildings of one to five stories in height, as described in a land use plan provided by Universal Paragon Corporation (UPC) on 23 September 2008. A proposed "flyover" will extend the existing Geneva Avenue across the northern portion of the site over the existing Caltrain/JPB railroad tracks. Based on the proposed grading plan obtained from BKF Engineers dated 29 May 2008, we understand the development of the former railyards area will include placement of up to approximately 26 feet of new fill.

SCOPE OF SERVICES

The purpose of our evaluation was to provide geotechnical information in support of the Environmental Impact Review (EIR) process. In addition, the results of our evaluation will be incorporated into the "Infrastructure Plan" to be compiled by others. Our geotechnical evaluation is based on existing subsurface information for the former railyards and landfill properties, available in the following reports:

- *Phase I Preliminary Geotechnical Report, Tuntex Properties, Inc., Brisbane, California*, prepared by Kleinfelder, Inc., dated 26 April 1990
- *Geotechnical Investigation, Proposed Future Grading, Former Bayshore Railyard, Brisbane, California*, prepared by Michelucci & Associates, Inc., dated 27 January 2004
- *Brisbane Baylands Phase I Specific Plan*, prepared by Universal Paragon Corporation and Wallace Roberts & Todd, LLC/Solomon E.T.C., dated 21 February 2006
- *Final Draft Geotechnical Investigation and Recommendations Report, Brisbane Landfill, Brisbane, California*, prepared by Geosyntec Consultants, Inc., dated 13 March 2006.

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[1] All elevations reference the National Geodetic Vertical Datum of 1929.

The results of our document review and engineering analyses were used to develop preliminary conclusions and recommendations regarding:

- regional geology and seismicity
- site seismicity
- seismic hazards, including soil liquefaction, lateral deformation, and cyclic densification
- seismic design criteria, including design parameters in accordance with the 2007 California Building Code (CBC)
- subsurface conditions for the former railyards property
- total and differential settlement for the former railyards property
- slope stability for the former railyards property
- pile and mat foundations, as appropriate
- site grading, including building pad preparation for both the former railyards and landfill properties, staging and effects of filling for former railyards property
- utilities
- concrete and asphalt pavements.

REGIONAL GEOLOGY

The site is in the Coast Ranges geomorphic province of California that is characterized by northwest-trending valleys and ridges. These topographic features are controlled by folds and faults that resulted from the collision of the Farallon plate and North American plate and subsequent, predominantly strike-slip, faulting along the San Andreas fault system. The San Andreas fault is more than 600 miles long and extends from Point Arena in the north to the Gulf of California in the south. The Coast Ranges province is bounded on the east by the Great Valley and on the west by the Pacific Ocean.

Geology in this portion of the San Francisco Bay Area has been mapped by Bonilla (1965, 1971, and 1998) and Wagner et al. (1990). The site is underlain by bedrock of the Cretaceous to Jurassic age (approximately 65 to 206 million years old) Franciscan Complex, as shown on the Regional Geology Map (Figure 3). The rocks of the Franciscan Complex represent a diverse assemblage of sea floor rocks that were scraped off of an east-dipping descending oceanic plate. Franciscan rocks mapped in the surrounding area include:

- *serpentinite:* hard to soft, generally greenish gray and containing bodies of gabbro, greenstone and diabase
- *sandstone and shale:* interbedded, hard and medium dark gray where fresh and intact, soft and olive gray to yellowish brown where weathered and sheared
- *sheared rocks (mélange):* small to large fragments of hard rock in matrix of sheared rock, derived mostly from shale, sandstone, and serpentinite (Bonilla, 1998).

The majority of the site is mapped as either artificial fill or artificial fill over tidal flat. Sandstone, shale, slope debris, and ravine fill are mapped on Ice House Hill, located in the southern portion of the former railyards site. The 1800s shoreline and former stream channels are mapped in the northwestern portion of the property, as shown on Figure 3.

SUBSURFACE CONDITIONS

Based on our review of the available geotechnical reports, the subsurface conditions vary significantly across the former railyard area. The site is blanketed by about six to 22 feet of undocumented artificial fill, which was placed between 1896 and 1914. The fill consists of heterogeneous mixtures of clay, silt, sand, rock fragments, organic matter, and man-made debris. The clayey and silty fill is soft to very stiff and the sandy fill is loose to dense. The fill is generally underlain by a layer of very soft to soft, compressible marine clay, locally known as Bay Mud. The thickness of the Bay Mud layer ranges from zero to about 50 feet, and generally increases in thickness toward the southern portion of the site. Site plans showing Bay Mud thicknesses across the site were previously prepared by others and are presented with the boring logs in Appendix A. The Bay Mud layer is generally underlain by native sand; however, Old Bay Clay, colluvium, and/or weathered bedrock were encountered beneath the Bay Mud in several of the borings. Groundwater was encountered in the borings within the fill layer between depths of two and nine feet below the ground surface. A summary of the subsurface conditions encountered in the borings drilled at the site by Kleinfelder, Inc. (1990) and Michelucci & Associates, Inc. (2004) is presented on Table 1. The logs of the Kleinfelder and Michelucci borings are provided in Appendix A.

TABLE 1

Summary of Subsurface Characteristics at Former Railyards Area

Boring No.	Total Boring Depth (feet)	Approximate Depth to Groundwater (feet)	Approximate Fill Thickness (feet)	Approximate Thickness of Weak Native Deposit (feet)	Approximate Depth to Bedrock (feet)
RRG-1	31.5	9	15	16.5	N/E
RRG-2	20	6	14	5	N/E
RRG-3	43	2.5	11	19	N/E
RRG-4	43	8	10	15	N/E
RRG-5	33	4	14	N/E	N/E
RRG-6	53	4	22	8	N/E
RRG-7	38	5	11	13	N/E
RRG-8	23	5	7	8	N/E
RRG-10	33	7	6	22	N/E
RRG-11	68	2.5	9	47	N/E
RRG-12	33	5	17	8	31
B-1	41.5	5	9	6	N/E
B-2	61.5	3	15	5	N/E
B-3	46.5	2	11	29	N/E
B-4	25	4	8	17	N/E
B-5	71.5	2	15	42	N/E
B-6	81.5	3	6	42	N/E
B-10	27	3.5	10	11	N/E
B-11	52.5	3	20	24	N/E
B-12	42.5	6	11	31	N/E

Notes: RRG = boring drilled at the site by Michelucci (2004)
B = boring drilled at the site by Kleinfelder (1990)
N/E = not encountered

REGIONAL SEISMICITY AND FAULTING

The major active faults in the area are the San Andreas, San Gregorio, and Hayward Faults. These and other faults of the region are shown on Figure 4. For each of the active faults, the distance from the site and estimated maximum Moment magnitude,[2] M_w, [2007 Working Group on California Earthquake Probabilities (WGCEP, 2007) and Cao et al. (2003)] are summarized in Table 2.

TABLE 2

Regional Faults and Seismicity

Fault Segment	Approximate Distance from Site (km)	Direction from Site	Maximum Magnitude
San Andreas – 1906 Rupture	7.1	West	7.9
San Andreas – Peninsula	7.1	West	7.2
Northern San Gregorio	15	West	7.2
Total San Gregorio	15	West	7.4
San Andreas – North Coast South	17	West	7.5
South Hayward	22	Northeast	6.7
Total Hayward	22	Northeast	6.9
Total Hayward – Rodgers Creek	22	Northeast	7.3
North Hayward	22	Northeast	6.5
Monte Vista – Shannon	33	Southeast	6.8
Total Calaveras	37	East	6.9
Mt Diablo – MTD	38	East	6.7
Concord/Green Valley	43	East	6.7
Rodgers Creek	43	North	7.0
Point Reyes	46	Northwest	6.8

Figure 4 also shows the earthquake epicenters for events with magnitude greater than 5.0 from January 1800 through January 1996. Since 1800, four major earthquakes have been recorded on the San Andreas Fault. In 1836, an earthquake with an estimated maximum intensity of VII on the Modified Mercalli (MM) scale (Figure 5) occurred east of Monterey Bay on the San Andreas Fault (Toppozada and Borchardt 1998). The estimated M_w for this earthquake is about 6.25. In 1838, an earthquake occurred with an estimated intensity of about VIII-IX (MM), corresponding to an M_w of about 7.5. The San Francisco Earthquake of 1906 caused the most significant damage in the history of the Bay Area in terms of loss of lives and property damage. This earthquake created a surface rupture along the San Andreas Fault from Shelter Cove to San Juan Bautista approximately 470 kilometers in length. It had a maximum

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[2] Moment magnitude is an energy-based scale and provides a physically meaningful measure of the size of a faulting event. Moment magnitude is directly related to average slip and fault rupture area.

intensity of XI (MM), an M_w of about 7.9, and was felt 560 kilometers away in Oregon, Nevada, and Los Angeles. The most recent significant earthquake to affect the Bay Area was the Loma Prieta Earthquake of 17 October 1989 with an M_w of 6.9. This earthquake occurred in the Santa Cruz Mountains approximately 88 km from the site.

In 1868, an earthquake with an estimated maximum intensity of X on the MM scale occurred on the southern segment (between San Leandro and Fremont) of the Hayward Fault. The estimated M_w for the earthquake is 7.0. In 1861, an earthquake of unknown magnitude (probably an M_w of about 6.5) was reported on the Calaveras Fault. The most recent significant earthquake on this fault was the 1984 Morgan Hill earthquake (M_w = 6.2).

The 2007 WGCEP at the U.S. Geologic Survey (USGS) predicted a 30-year probability of a magnitude 6.7 or greater earthquake occurring in the San Francisco Bay Area to be 63 percent. More specific estimates of the probabilities for different faults in the Bay Area are presented in Table 3.

TABLE 3

WGCEP (2007) Estimates of 30-Year Probability of a Magnitude 6.7 or Greater Earthquake

Fault	Probability (percent)
Hayward – Rodgers Creek	31
N. San Andreas	21
Calaveras	7
San Gregorio Connected	6
Green Valley Connected	3
Mount Diablo Thrust	1

The City College fault zone (CCFZ) mapped by Bonilla (1971) and Schlocker (1974) trends southeast from Lands End at the northwestern tip of the San Francisco Peninsula, through the campus of San Francisco City College, and intersects San Francisco Bay through the northern portion of the Brisbane Baylands site, as shown on Figure 3. The fault zone is characterized by serpentinite bodies and other sheared and metamorphosed rocks of the Franciscan Complex. The CCFZ is not considered to be active by the California Geological Survey and has not been zoned within an Alquist-Priolo Earthquake Fault Zone (CDMG, 1982).

CONCLUSIONS AND PRELIMINARY RECOMMENDATIONS

On the basis of the available subsurface information, we judge the site can be developed as planned. The primary geotechnical issues that should be addressed during design are the potential geologic hazards associated with the presence of loose, undocumented fill soil and compressible Bay Mud deposits, and the selection of appropriate foundation systems. Our conclusions and preliminary recommendations regarding geologic hazards, foundations, fill placement, and seismic design are presented in the remainder of this report.

Seismic Hazards

During a major earthquake on a segment of one of the nearby faults, strong to very strong shaking is expected to occur at the project site. Strong shaking during an earthquake can result in ground failure such as that associated with soil liquefaction,[3] lateral spreading,[4] and cyclic densification.[5]

The level of ground shaking that may occur at the site during future earthquakes is uncertain because the location, recurrence interval, and magnitude of future earthquakes are not known. A peak ground acceleration (PGA) of 0.41 times gravity was used in our liquefaction analysis. This PGA was calculated using the procedures specified in Section 1613 of the 2007 California Building Code (CBC) for the Design Earthquake, using site class D. We assumed an earthquake magnitude of 7.9, which is the maximum Moment magnitude for the San Andreas Fault as shown in Table 1. Groundwater levels used in the liquefaction analyses were based on the water levels measured in the borings by others.

The liquefaction analyses were performed in accordance with the methodology presented in *Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils*, prepared by the National Center for Earthquake Engineering Research (NCEER), dated 31 December 1997, and in Youd et al. (2001). These procedures are in general accordance with the procedure presented by Seed and Idriss (1982). In the soil borings previously drilled at the site by Kleinfelder (1990) and Michelucci (2004), saturated layers of loose to medium dense artificial fill consisting of sand, clayey sand, silty sand, gravelly sand, clayey gravel, and silty gravel, as well as saturated layers of medium stiff silt and sandy silt, were encountered. Some of these layers are below the groundwater level. Based on our liquefaction analyses, we preliminarily conclude that these fill layers have the potential to liquefy during a major earthquake. In addition, a 32-foot-thick layer of medium dense, potentially-liquefiable native sand was encountered at a depth of about 28 feet below the ground surface in Kleinfelder boring B-2.

We estimated the amount of ground surface settlement associated with post-liquefaction reconsolidation using the methodologies developed by Tokimatsu and Seed (1984). The computed liquefaction-induced ground settlement at the site generally ranges from approximately zero to four inches. However, approximately eight inches of liquefaction-induced settlement was calculated for a portion of the site represented by the Kleinfelder boring B-2.

The potential for liquefaction-induced ground rupture and sand boils to occur at the site depends on the thickness of the liquefiable soil layer relative to the thickness of the overlying non-liquefiable material. Ishihara (1985) presented an empirical relationship that provides criteria that can be used to evaluate whether liquefaction-induced surface ruptures and sand boils would be expected to occur under a given level of shaking for a liquefiable layer overlain by a non-liquefiable surficial layer. The potentially liquefiable soil layers encountered at the site generally consist of artificial fill located between two and nine feet beneath the ground surface (at the time of drilling by others). Therefore, we preliminarily conclude that the potential for surface manifestations of liquefaction to be high under the current site conditions.

Lateral spreading occurs when a continuous layer of soil liquefies at depth and the soil layers above move toward an unsupported face, such as an open slope cut, or in the direction of a regional slope or

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[3] Liquefaction is a transformation of soil from a solid to a liquefied state during which saturated soil temporarily loses strength resulting from the buildup of excess pore water pressure, especially during earthquake-induced cyclic loading. Soil susceptible to liquefaction includes loose to medium dense sand and gravel, low-plasticity silt, and some low-plasticity clay deposits.

[4] Lateral spreading is a phenomenon in which surficial soil displaces along a shear zone that has formed within an underlying liquefied layer. Upon reaching mobilization, the surficial blocks are transported downslope or in the direction of a free face by earthquake and gravitational forces.

[5] Cyclic densification is a phenomenon in which non-saturated, cohesionless soil is densified by earthquake vibrations, causing differential settlement.

gradient. At the former railyards site, construction of an approximately 26-foot-high fill slope is considered an unsupported face. The potential for lateral spreading to occur at a site is typically evaluated using an empirical relationship developed by Youd, Hansen, and Bartlett (2002). This relationship incorporates the thickness of the liquefiable layer, the fines content and mean grain-size diameter of the liquefiable soil, the relative density of the liquefiable soil, the magnitude and distance of the earthquake from the site, the slope of the ground surface, and boundary conditions (such as a free face or edge of shoreline), to estimate the horizontal ground movement. The available laboratory data from the borings drilled by Kleinfelder (1990) and Michelucci (2004) are provided in Appendix B. We judge the available laboratory data is insufficient to perform lateral spreading analyses using the Youd, Hansen, and Bartlett (2002) procedure, and recommend that additional subsurface exploration and standard laboratory sampling be performed to evaluate the lateral spreading potential at the site prior to final design and construction.

Cyclic densification of non-saturated sand (sand above the groundwater table) caused by earthquake vibrations may result in settlement. The fill above the water table encountered in the Kleinfelder and Michelucci borings generally consists of loose to medium dense sand, silty sand, gravelly sand, silty gravel, and medium stiff to stiff sandy silt. We compute that shallow foundations and surface improvements bearing within the non-saturated sand and silt layers may settle up to approximately 1/4-inch due to strong shaking from a large earthquake.

Settlement

As previously discussed, the artificial fill at the site is generally underlain by up to 50 feet of very soft to soft, compressible Bay Mud. We previously evaluated the total settlements expected to occur at the former railyards area and presented our results in draft memorandums dated 22 January 2008 and 21 March 2008. The settlements evaluated include: 1) consolidation of underlying Bay Mud deposits under the weight of existing and proposed fill, 2) post-liquefaction reconsolidation, 3) cyclic densification, and 4) compression of new and existing fill.

The consolidation settlements presented in our 21 March 2008 memorandum were based on a previous site grading plan. We have revised our preliminary consolidation calculations based on a conceptual grading plan prepared by BKF Engineers, the project civil engineer, dated 29 May 2008. Contours of anticipated consolidation settlement, based on our revised calculations, are presented on Figure 2.

Subsurface conditions at the site, including the fill and Bay Mud thicknesses and densities as well as Bay Mud consolidation parameters, were estimated using the borings logs and laboratory data provided in the Michelucci (2004) and Kleinfelder (1990) geotechnical reports. The approximate locations of the borings drilled by Michelucci and Kleinfelder are shown on Figure 2.

Consolidation test data were available for Michelucci borings RRG-3, RRG-4, RRG-7, RRG-10, and RRG-11, and Kleinfelder borings B-11 and B-12. The laboratory consolidation tests were corrected for effects of sample disturbance using the Casagrande (1936) and Schmertmann (1953) correction methods. Based on the laboratory data presented in the geotechnical reports, we estimate that the compression ratio ($C\varepsilon c$) ranges from 0.14 to 0.31, with an average value of 0.26. To analyze the rate of settlement, we used coefficients typical for Bay Mud of 15 feet squared per year (ft^2/yr). We evaluated the time rate of settlement assuming double-drainage conditions due to the presence of sand lenses within and underlying the Bay Mud layer, as observed on the majority of the boring logs.

Based on our interpretation of laboratory consolidation tests performed on samples of Bay Mud by Michelucci & Associates, we preliminarily conclude that the consolidation of the Bay Mud deposit, as a result of the placement of the existing fill in the early 1900s, is largely complete. However, placement of new fill at the site will result in additional consolidation settlement. Based on the proposed grading plan obtained from BKF Engineers dated 29 May 2008, we understand that the development of the former railyards portion of the site will include placement of as much as 26 feet of new fill. We calculate that for each new foot of fill placed at the site, up to approximately three to four inches of consolidation settlement will occur within a 30-year time frame, with an average value of about two inches of settlement per foot of new fill placed.

Based on our preliminary analyses, we conclude that significant settlements will occur at the site due to the placement of the proposed fill, as shown on Figure 2. Settlements may affect existing site improvements, such as the Caltrain/Joint Powers Board railroad tracks located along the eastern boundary of the former railyards area, depending on the proximity of the new fill to the railroad tracks, as discussed in a subsequent section of this report. Settlement will also affect proposed site improvements, such as the proposed buildings, the Geneva Avenue overcrossing located in the northern portion of the site, surface parking and roadways, underground utilities, and exterior slabs and sidewalks.

In addition to consolidation settlement of Bay Mud, elastic settlement of the existing undocumented fill and proposed engineered (compacted) fill may occur. We preliminarily conclude that near-surface site improvements supported on fill, in its current condition, may experience erratic settlements of up to two percent of the total existing fill thickness and up to 1/2 percent of the total proposed fill thickness. On the basis of our review of data provided on the boring logs by others, we conclude the existing fill at the former railyards area ranges in thickness from about 6 to 22 feet. We estimate that settlements associated with the compression of existing fill will range from about one to six inches. Based on the grading plan provided by BKF, up to approximately 26 feet of new engineered fill will be placed at the site. We estimate that settlements associated with the compression of proposed fill placed at the site will range from about zero to 1.6 inches.

Settlements associated with seismic hazards, such as liquefaction and cyclic densification, were discussed in the previous section of this report. The computed liquefaction-induced reconsolidation due to strong shaking from a large earthquake ranges from about zero to four inches, except at the Kleinfelder boring B-2, where approximately eight inches of liquefaction-induced settlement was calculated. Settlement associated with cyclic densification was computed to be approximately 1/4 inch.

Consolidation Settlement Mitigation

From our discussions with the project team and recommendations provided by BKF, we understand that consolidation-related settlement should be limited to less than 18 inches over the design-life of the development (30 years) at the Bayshore South Planning Area (BSS) in the southern portion of the site in order to maintain gently-sloping site grades and ADA access. In addition, we understand that consolidation-related settlement should be limited to negligible settlement at the Geneva/Bayshore North Planning Area (GBN) and Round House Area (RHO) at the northern portion of the site. As discussed in our previous memorandum dated 21 March 2008, options to reduce post-construction settlements at the site include: 1) surcharging the site with fill prior to the construction of the proposed improvements, 2) installing wick drains to increase the rate of consolidation-related Bay Mud settlements where approved by the regulatory agencies, 3) limiting thicknesses of new fill, 4) using light-weight fills, and 5) using soil improvement techniques, such as deep dynamic compaction to densify the near-surface fill or grouting techniques to reduce the potential for settlements associated with liquefaction and cyclic densification. In addition, we judge proposed structures may be supported on pile foundations to limit total and differential settlements, which is discussed in a subsequent section of this report.

We evaluated mitigation options 1, 2, and 3 (surcharging, wick draining, and limiting fill thickness) for the former railyards area. Surcharging without wick drains may be appropriate for select areas along the northwest edge of the site, where the Bay Mud and proposed fill thicknesses are relatively small, and calculated consolidation settlements in 30 years are less than about six inches, as shown on Figure 2. Where surcharging without wick drains is feasible, we preliminarily estimate that placement of about five feet of additional fill (over the proposed fill thickness) would be required to achieve adequate consolidation. Also, prior to final design and construction, we recommend that further subsurface exploration be performed to evaluate the portions of the site where surcharging with or without wick drains will be effective.

For the majority of the site, we preliminarily conclude that surcharging in combination with wick drains would be required to achieve adequate consolidation within a five-year development period. We performed preliminary analysis to estimate the wick drain spacing required to achieve 95 and 98 percent consolidation within a 0.5-, 1-, 2-, and 5-year period. Our preliminary conclusions regarding wick drain spacing are presented in Table 4.

TABLE 4

Calculated Wick Drain Spacing, Triangular Pattern

Time to Achieve Desired Consolidation (years)	Maximum Wick Drain Spacing (feet)	
	95 Percent Consolidation	98 Percent Consolidation
0.5	3.0	2.7
1	4.0	3.6
2	5.3	4.8
5	7.8	7.0

To evaluate the quantity of wick drains that may be required at the site, we have conservatively assumed that wick drains will be required at each of the lots until additional subsurface exploration can be performed to better define the subsurface conditions. An exception occurs at the Ice House South (IHS) district, which is located south of Ice House Hill; this lot is most likely outside the limits of compressible marine deposits, so it was not included in our wick drain and pile analyses. We have assumed that all the buildings shown on the eight million square foot land use plan provided by UPC (except those proposed for the IHS district) and half of Segment 5 of Geneva Avenue (the railroad overpass) will be pile-supported and that wicks will not be required beneath pile-supported structures. We have assumed that wicks will be required throughout the remaining land area to increase the rate of consolidation and to limit the post-construction consolidation settlement to within the previously-described tolerances (18 inches for the BSS district and negligible for the GBN and RHO districts).

The estimated wick drain quantities and lengths required per street and lot are provided in Tables 5 and 6, which are attached at the end of this report. The estimated wick drain lengths range from 15 to 94 feet and assume that the drains extend through the entire the Bay Mud layer (which is dependent on regulatory agency approval due to the presence of soil and groundwater contamination at the site) and that a drainage blanket or series of horizontal drains will be constructed at the base of the surcharge fill layer. We anticipate that approximately ten feet of surcharge fill will be used preload the site.

It may be possible to prevent the movement of soil and groundwater contamination by placing the portion of the wick that extends through the upper fill layer in a plastic sleeve, thereby isolating it from the surrounding soil. Based on a preliminary review of the available environmental reports prepared for the site, we estimate that plastic sleeves may be required at approximately 25 to 30 percent of the site. Groundwater that is expelled from the wicks into the drainage blanket may need to be collected, tested in an analytical laboratory, and treated prior to disposal. In addition, because the wick drains will remain in place throughout the lifetime of the development, the long-term effect of wick drains on contaminant migration should be considered.

As a viable alternative, we propose installing wicks that will not fully penetrate the Bay Mud layer. This alternate approach will provide a layer of low-permeability Bay Mud between the bottom of the wicks and the underlying native soil. This undisturbed portion of Bay Mud will reduce the potential for vertical movement of groundwater contaminants into the underlying strata; however, this soil layer will also remain as a potential source for long-term consolidation settlement.

Based on discussions with Mr. Jimmy Foster of Nilex, Inc., a manufacturer and distributor of geosynthetic products, on 13 and 14 October 2008, the current cost for materials and installation of wick drains is approximately $0.55 per linear foot of wick drain. Additional cost for the plastic sleeves is approximately $1.35 per linear foot. Mobilization costs depend on the rig size and are currently $10,000 to $25,000 per rig.

Fill Setback Distance at Railroad

Consolidation settlement associated with the placement of new fill may affect existing site improvements, such as the Caltrain/Joint Powers Board railroad tracks located along the eastern boundary of the former railyards area. We previously performed a preliminary evaluation of the effects of fill placement at the site on the existing railroad tracks. The results of this evaluation are summarized on Figure 6. Settlement of the soil beneath the railroad tracks depends on the thickness of new fill placed adjacent to the tracks, the thickness of the compressible Bay Mud deposit underlying the tracks, and the distance between the tracks and the toe of the new fill (setback distance). We evaluated stresses imposed on the soil underlying the railroad tracks by the proposed fill using the computer software STRESS, Version 3.0, by Prototype Engineering, Inc. Soil conditions underlying the railroad tracks were estimated using subsurface information from the nearest borings. The following three sections were evaluated:

1) a section at the proposed Geneva Overcrossing, with about 20 feet of new fill, 10 feet of existing fill, and 15 feet of Bay Mud (using subsurface data from Michelucci boring RRG-4)

2) a section with about 10 feet of new fill, 12.5 feet of existing fill, and 40 feet of Bay Mud (using subsurface data from Kleinfelder boring B-5)

3) a section with about 10 feet of new fill, 12.5 feet of existing fill, and 20 feet of Bay Mud (using subsurface data from Kleinfelder boring B-5 but limiting the Bay Mud thickness to 20 feet).

The results indicate that unless sufficient setbacks are planned, the placement of new fill will likely affect the existing railroad tracks. The calculated consolidation settlements presented on Figure 6 are associated with the proposed placement of an embankment fill along the western side of the tracks only. Fill placed along the eastern side of the tracks could result in additional settlement.

Slope Stability

As previously discussed, the proposed development of the former railyards area includes placement of up to 26 feet of new fill. Based on the grading plan provided by BKF, dated 29 May 2008, we understand the proposed 2:1 (horizontal to vertical) slope adjacent to the existing Joint Powers Board/Caltrain railroad tracks will have a maximum height of about 26 feet. We performed preliminary analyses of the short-term static stability of the proposed slope adjacent to the existing railroad tracks using chart solutions available in the Naval Facilities Engineering Command (NAVFAC) Design Manual 7.1, and subsurface conditions described in the Michelucci and Kleinfelder boring logs.

The proposed fill will be underlain by heterogenerous, potentially-liquefiable existing fill and soft, compressible Bay Mud. The results of our preliminary analyses indicate that the weak Bay Mud layer has the potential to fail under the proposed fill loads, which may result in slope failure. Likewise, we preliminarily conclude that slope failure may occur if the underlying weak fill liquefies during a major earthquake.

Possible options to improve slope stability include reducing the proposed fill thickness and/or the steepness of the fill slope, or placing the proposed fill in several stages, allowing the Bay Mud enough time to consolidate and gain strength under each increment of load before the next layer of fill is placed. The liquefaction potential of the existing fill may be mitigated using soil improvement techniques, as discussed in the following section. We recommend that prior to final design and construction, additional subsurface exploration and analyses be performed at the site to further evaluate the static and seismic stability of the proposed slopes, and to assist in the selection of the most appropriate mitigation option.

Soil Improvement

As previously discussed, some of the existing fill at the site is loose and may liquefy during a strong earthquake. Based on our preliminary calculations, we estimate that the ground may settle up to four inches due to liquefaction of the existing fill layer. In addition to settlement, the loss of strength in the liquefied fill layer may result in ground surface deformation or slope failure. We therefore preliminarily conclude that where existing and proposed site improvements could be adversely impacted by ground surface deformation or slope movements, additional subsurface exploration and engineering analyses should be performed to further evaluate the potential for liquefaction and associated hazards (including seismic slope deformations) and, if necessary, the fill should be improved to mitigate the hazards.

Methods to improve the potentially-liquefiable fill include stone columns, deep dynamic compaction, and rapid impact compaction. Stone columns are installed by a specialty contractor using a vibrating, cylindrical-shaped probe that is advanced to the desired depth of improvement using water or air jetting. The voids created through the densification of the surrounding soil are backfilled with compacted gravel or crushed rock while withdrawing the probe. This procedure creates dense stone columns typically three to four feet in diameter surrounded by densified soil. The stone columns serve as drains to allow rapid dissipation of pore pressure that may develop in the native soil during an earthquake. In addition, the stone columns reinforce the soil.

Dynamic compaction, also referred to as heavy tamping, involves repeated tamping with heavy weights onto the ground surface. Dynamic compaction can be achieved using methods such as Rapid Impact Compaction (RIC) or Deep Dynamic Compaction (DDC). RIC consists of a tamping device that is connected to an excavator. RIC consists of a five-foot-diameter “foot” that is placed on the ground surface and a 7.5-ton weight is dropped from a height of about one meter to impart energy to the ground surface. The energy is delivered at a rate of about 40 to 60 blows per minute. RIC is generally performed in a grid pattern with application points spaced approximately six to eight feet on center. DDC consists of dropping a six to nine ton weight onto the ground surface from heights of up to 30 to 60 feet. We can provide recommendations for liquefaction mitigation if the additional subsurface exploration and analyses indicate that soil improvement should be performed at the site.

Foundations

The project site is blanketed by approximately six to 22 feet of undocumented, heterogeneous fill underlain by up to 50 feet of compressible Bay Mud deposits. We conclude the primary geotechnical issues associated with the selection, design, and installation of new building foundations are:

- potential for ground settlement due to the underlying compressible Bay Mud beneath the proposed building locations
- potential for ground settlement due to elastic compression of the existing and proposed fill beneath the proposed building sites

- potential for liquefaction-induced reconsolidation settlement within the existing fill
- presence of compressible and weak Bay Mud that could result in settlement of the building pad subgrade and downdrag loads, if deep foundations are selected for the support of the proposed buildings
- existing surficial fill material may contain wood, concrete, or other types of debris and may be difficult to penetrate; therefore, predrilling may be required to minimize pile damage during driving.

To address these issues, we evaluated various foundation systems for support of the structures proposed in UPC's eight million square foot land use plan, including shallow mat foundations and deep pile foundations. On the basis of our study, we preliminarily conclude that the majority of the proposed structures should be supported on pile foundations. It may be possible to support structures with low to moderate loads on mat foundations, if they are located at regions of the site with minimal compressible Bay Mud deposits, and if they can be designed to tolerate the expected total and differential settlements associated with elastic compression and liquefaction-induced reconsolidation of the existing fill. However, for preliminary foundation design, we have assumed that the all of the buildings will be supported on piles, except for the buildings proposed for the Ice House South (IHS) district, which is located south of Ice House Hill and is most likely outside the limits of compressible marine deposits.

Although many types of piles are available, we judge the most economical pile foundation, when compared to other deep foundation systems, consists of driven 14-inch-square concrete piles. Other advantages of concrete piles include: 1) the potential for developing high end-bearing capacity in the dense sand layers underlying the Bay Mud and/or bedrock, and 2) high resistance to corrosion when compared to steel piles. We anticipate the 14-inch-square concrete piles will gain support through end-bearing in the dense sand or bedrock underlying the compressible Bay Mud, or through skin friction in the stiff to hard Old Bay Clay underlying the Bay Mud. Total settlements of properly-installed pile foundation systems are typically less than one inch, with differential settlements of about 1/2 inch between columns.

For preliminary pile design, we judge that an allowable pile capacity of about 200 kips per pile will be possible for the site. The actual allowable pile capacity should be re-evaluated for each building based on site-specific geotechnical investigations performed at each building site. Site-specific geotechnical investigations should be performed prior to the final design and construction of proposed buildings. To estimate the number of piles required for each building, we initially estimated the building loads based on the number of proposed floor levels, an assumed average floor load of 140 pounds per square foot, and the building footprint area. Floor loads for commercial and retail uses may be greater than those estimated in this study. The number of piles required was calculated by dividing the estimated building load by the estimated pile capacity. Pile lengths were estimated by evaluating the length of pile within the bearing soil layer (assuming an allowable skin friction capacity of 1,000 pounds per square foot [psf]) required to support a downdrag (negative skin friction) load of 300 psf within in the fill and Bay Mud layers plus a building load of 200 kips per pile. To estimate the total pile length, the thickness of proposed fill, existing fill, and Bay Mud were added to the pile length required within the supporting soil. To account for the thickness of the below-grade pile cap, four feet was subtracted from the total pile length. The results of our pile study for the proposed land use plan are summarized on Table 7, which is included at the end of this report. It should be noted that the estimated number of piles for each building is based on vertical load requirements only; in some situations, lateral load requirements could control the number of piles required for support of the buildings.

Considering the presence of contaminated soil and groundwater at the site, regulatory approval may be required prior to driving piles at the site. Where soil and groundwater contaminants are present, either tapered pile tips, or predrilling and casing through the impacted zones may be required to reduce the potential for contaminant migration. Also, considering the potential for encountering concrete and other debris within the existing fill at the site, we preliminarily recommend predrilling through the fill layer to prevent damaging the pile during driving.

It may be possible to support the proposed structures on mat foundations if the following conditions are met:

- The structure will have low to moderate foundation loads and will be located at a portion of the site outside the zone of compressible Bay Mud deposits, or where compressible deposits are relatively thin (less than five feet thick) and have been preloaded by surcharging

- The structure will have low to moderate foundation loads and will be located at a portion of the site that has been adequately preconsolidated using a combination of wick drains and surcharge fill.

We anticipate the average bearing pressures applied by mat foundations will be less than 1,000 pounds per square foot (psf). However, where required, we preliminarily recommend the maximum bearing pressure beneath the mat be limited to 1,500 psf for dead plus live load conditions. This pressure may be increased by one-third for total (including wind and seismic) load conditions. Use of mat foundations may require that soil improvement is performed to mitigate the potential for liquefaction-induced settlement. In addition, at sites underlain by thin Bay Mud deposits, preloading with a soil surcharge layer may be required to mitigate consolidation settlements associated with the compressible deposit, as previously discussed. We preliminarily conclude that proper treatment of the compressible deposits and potentially-liquefiable fill layer will reduce the total and differential settlement of the mat foundations to within tolerable limits.

Lateral loads can be resisted by a combination of friction along the base and passive resistance against the vertical faces of the pile cap or mat foundation. To calculate the passive resistance acting against the sides of the mat, we preliminarily recommend an equivalent fluid weight (triangular distribution) of 200 pounds per cubic foot (pcf). Friction along the bottom of the mat foundation may be calculated using a base friction factor 0.30, unless waterproofing is used. The passive pressure and frictional resistance values include a factor of safety of at least 1.5. Final recommendations for mat design, including modulus of subgrade reaction and lateral load resistance, should be provided in the final site-specific geotechnical reports.

Rough foundation costs have been estimated for each building as follows:

- Approximate cost per pile: $2,500

- Approximate cost for pile caps (per pile in pile cap): $1,000

- Approximate cost for grade beams (per square foot of building footprint): $10

- Approximate cost for floor slabs (per square foot of building footprint): $11

- Approximate costs for stiffened shallow foundations (IHS District, per square foot of building footprint): $21

The above costs were provided by a contractor in July 2008 and do not include contingency or design fees. In addition, because the cost of concrete and steel fluctuates over time, these rough cost estimates should be expected to vary.

Site and Subgrade Preparation

Site preparation should include removal of all existing buildings, foundations, slabs, pavements, and underground utilities. Underground utilities should be removed to the property line or service connections and properly capped or plugged with concrete. Where existing utility lines will not interfere with the proposed construction, they may be abandoned in-place provided the lines are filled with lean concrete or cement grout to the property line.

From a geotechnical standpoint, asphalt and concrete removed from the site may be crushed and reused providing it is free of organic material and rocks or lumps greater than four inches in greatest dimension. The acceptability of using crushed asphalt at the site should be verified by the environmental consultant. Where crushed asphalt pavement materials are used, particles between 1-1/2 and 4 inches in greatest dimension should comprise no more than 30 percent of the fill by weight.

Where fill is required, the exposed soil subgrade should be scarified to a depth of eight inches, moisture-conditioned to at least two percent above optimum moisture content, and compacted to at least 90 percent relative compaction.[6] The soil subgrade should be kept moist until it is covered with fill or other improvements. As previously discussed, soil improvement techniques may be required to reduce the potential for liquefaction-induced reconsolidation and elastic compression of the existing undocumented fill layer.

Fill Placement and Compaction

Select fill should consist of imported soil or on-site soil that is non-corrosive, free of organic matter or other deleterious or hazardous material, contains no rocks or lumps larger than four inches in greatest dimension, has a liquid limit of less than 40 and a plasticity index lower than 15, and is approved by the Geotechnical Engineer. Non-select fill may be acceptable for use at the site and should be evaluated on a case-by-case basis.

Select fill should be placed in horizontal lifts not exceeding eight inches in uncompacted thickness, moisture-conditioned to above optimum moisture content, and compacted to at least 90 percent relative compaction. Clean sand or gravel (defined as soil with less than 10 percent fines by weight) used as fill should be compacted to at least 90 percent relative compaction.

Prior to placing fill at the site, the following issues should be considered and addressed:

- Fill placement should be sequenced to avoid overstressing and failing the weak and compressible Bay Mud deposit, especially where ground movement is critical, such as adjacent to the existing Caltrain/JPB railroad tracks; we preliminarily recommend that the thickness of new fill be initially limited to ten feet. Additional fill may be placed after the Bay Mud is able to consolidate and gain strength under the initial fill load. Wick drains may be used (pending regulatory approval) to increase the rate of consolidation of the Bay Mud, as previously discussed.

- Where fill is used to surcharge the site prior to construction of improvements, the timing of fill placement should be considered so that the Bay Mud is sufficiently preloaded prior to the start of construction; wick drains may be used (pending regulatory approval) to increase the rate of consolidation of the Bay Mud, as previously discussed. Depending on the development schedule, it may be possible to reduce costs associated with importing fill by reusing the surcharge fill at multiple sites.

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[6] Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material, as determined by the ASTM D1557-07 laboratory compaction procedure.

The Geotechnical Engineer should be provided samples of all sources of fill, crushed rock, recycled Class 2 aggregate base at least three days before use at the site for approval. The grading contractor should provide analytical test results or other suitable environmental documentation indicating the imported fill is free of hazardous materials at least three days before use at the site. If this data is not available, up to two weeks should be allowed to perform analytical testing on the proposed import material. Bulk samples of all soil materials should be provided to the Geotechnical Engineer at least three working days before use at the site so a compaction curve and/or gradation analysis can be obtained.

Underground Utilities

New underground utilities are expected to settle due to:

- consolidation of weak native soil under the weight of proposed and existing fill
- elastic settlement of proposed and existing fill
- vibratory densification of existing fill during pile installation and/or vibratory ground improvement operations
- localized settlement associated with liquefaction-induced reconsolidation and cyclic densification.

The magnitude of settlement along utility alignments can vary depending upon several factors, including the thickness of compressible Bay Mud deposits, the settlement characteristics of the artificial fill and Bay Mud, and changes in site grades. Utility line alignments should be designed based on further geotechnical exploration and utility line settlement estimates. Utilities leading to pile-supported buildings and structures should have flexible connections that will permit differential movement between the structures and adjacent ground surface.

Where necessary, trench excavations should be shored and braced to prevent cave-ins and/or in accordance with current CAL-OSHA safety regulations. Where sheetpiling is used as shoring and will be removed after backfilling, it should be placed a minimum of two feet away from the pipes or conduits to reduce the potential for disturbing them as the sheetpiles are extracted.

To provide uniform support, pipes or conduits should be bedded on a minimum of four inches of sand or fine gravel. Where Bay Mud or weak soil deposit are exposed at the bottoms of proposed utility trench excavations, the bedding layer will need to be capable of spanning over the weak soil deposits without causing excessive deflection. A potential pipe bedding design may include a layer of geotextile tensile fabric (Mirafi 600X or equivalent) overlain by an 18- to 24-inch-thick layer of crushed rock or gravel (1/2- to 3/4-inch gradation). The final design of the pipe bedding layer will depend on the strength of the soil exposed at the bottom of the excavation, the groundwater elevation, and the size and weight of the proposed pipe.

After the pipes and conduits are tested, inspected (if required) and approved, they should be covered to a depth of six inches with sand or fine gravel, which should be mechanically compacted. Backfill for utility trenches and other excavations is also considered fill, and should be placed and compacted according to the preliminary recommendations previously presented. Jetting of trench backfill should not be permitted. Special care should be taken when backfilling utility trenches in pavement areas. Poor compaction may cause excessive settlements, resulting in damage to the pavement section.

Asphalt Pavement

The State of California resistance value (R-value) method for flexible pavement design was used to develop preliminary recommendations for asphalt concrete pavement sections. We anticipate the final soil subgrade in areas to receive asphalt concrete pavement will generally consist of sand and clay. For preliminary evaluation, we have assumed the fill soil to be placed at the site has a minimum R-value of 10. For final design, R-value tests should be performed on the material exposed at the pavement subgrade elevation.

For our calculations, we assumed a Traffic Index (TI) of 4.5 for automobile parking areas with occasional trucks, 5.5 for drive aisles that will receive isolated heavy traffic, and 6.5 for the main driveways; these TIs should be confirmed by the project civil engineer. Table 5 presents our recommendations for the asphalt pavement sections.

TABLE 5

Asphaltic Concrete Pavement Section Design
Design R-Value of Subgrade Soil = 10

TI	Asphaltic Concrete (inches)	Class 2 Aggregate Base (inches)
4.5	2.5	8.5
5.5	2.5	12.0
6.5	3.0	14.5

In all cases, the upper six inches of soil subgrade in roadways, driveways, and parking areas should be scarified to a depth of at least six inches, moisture-conditioned to above the optimum moisture content, compacted to at least 95 percent relative compaction, and rolled to provide a smooth non-yielding surface. The aggregate base should conform to Section 26 of Caltrans Standard Specifications and be compacted to at least 95 percent relative compaction.

Portland Cement Concrete Pavement

Ground surface settlement will tend to distort and crack exterior improvements, such as decking and sidewalks, unless they are supported on pile foundations or the site has been preconsolidated through the use of surcharge fill with or without wick drains. Periodic repairs and replacement of exterior slabs should be expected during the life of the project. Mastic joints or other positive separations should be provided to permit relative movements between exterior slabs and the pile-supported buildings. At areas adjacent to the building entries, articulated, ramp-like slabs should be provided. These slabs should be designed to permit rotation of the slab between pile-supported buildings and exterior ground surface, thereby, preventing vertical offsets at the entries.

Concrete pavement design is based on a maximum single-axle load of 18,000 pounds and a maximum tandem axle of 32,000 pounds (corresponds to a garbage truck). The recommended rigid pavement section for these axle loads is seven inches of Portland cement concrete over six inches of Class 2 aggregate base. If only passenger cars will use the pavement, such as in driveway areas, the recommended pavement section is five inches of Portland cement concrete over six inches of Class 2 aggregate base.

The modulus of rupture of the concrete should be at least 500 pounds per square inch (psi) at 28 days. Contraction joints should be constructed at 15-foot spacing. Where the outer edge of a concrete pavement meets asphalt pavement, the concrete slab should be thickened by 50 percent at a taper not to exceed a slope of 1 in 10. Preliminary recommendations for subgrade preparation and aggregate base compaction for concrete pavement are the same as those we have described previously for asphalt concrete pavement.

Seismic Design

Seismic design in accordance with the 2007 California Building Code will depend on the selection of an appropriate site classification, which is calculated by averaging the strength of the soil in the top 100 feet of the site profile. At the former railyards area, the site classification will vary depending on the thickness of underlying weak Bay Mud and potentially liquefiable soil. We anticipate that Site Class D will be appropriate where the soil profile includes minimal weak soil deposits, and that Site Class E will be appropriate where thick deposits of weak Bay Mud are encountered. Where liquefiable soil is present, Site Class F may be appropriate, unless soil improvement techniques are utilized to mitigate the hazards associated with liquefaction. We recommend that prior to final building design and construction, additional site-specific subsurface exploration should be performed at the site to evaluate the appropriate site classification for each lot at the site.

LIMITATIONS

The engineering analyses discussed in this report were performed based on existing subsurface information provided in reports prepared by others. In some cases, engineering judgment was used to estimate soil parameters when the information was absent from the available boring logs. We judge that the available information is adequate to perform preliminary geotechnical studies at the site; however, additional subsurface investigation, including additional soil borings and/or cone penetration tests (CPTs), should be performed to refine the evaluation prior to development of the site.

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Attachments: References
Table 5 – Wick Drain Summary – Proposed Street Alignment
Table 6 – Wick Drain Summary – Proposed 8 Million Plan
Table 7 – Pile Summary – Proposed 8 Million Plan
Figure 1 – Site Location Map
Figure 2 – Site Plan
Figure 3 – Geology Map
Figure 4 – Map of Major Faults and Earthquake Epicenters in the San Francisco Bay Area
Figure 5 – Modified Mercalli Intensity Scale
Figure 6 – Summary of Consolidation Settlements Adjacent to Fill Edge
Appendix A – Logs of Borings by Others
Appendix B – Laboratory Test Results

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TABLES

Table 5
WICK DRAIN SUMMARY - PROPOSED STREET ALIGNMENT
FORMER RAILYARDS AT BRISBANE BAYLANDS
Brisbane, California

Street Name	Segment Name	Approximate Area Requiring Drains[1] (square feet)	Estimated Wick Drain Length (feet)	Estimated Number of Wicks Based on Desired Wick Spacing					
				Spacing = 3 feet	Spacing = 4 feet	Spacing = 5.3 feet	Spacing = 2.7 feet	Spacing = 3.6 feet	Spacing = 4.8 feet
1	1-1	9,600	20	1,232	693	395	1,521	856	482
	1-2	10,600	15	1,361	766	436	1,680	945	532
	1-3	12,480	27	1,602	901	514	1,977	1,112	626
	1-4	9,800	34	1,258	708	403	1,553	874	492
	1-5	10,600	32	1,361	766	436	1,680	945	532
	1-6	10,600	33	1,361	766	436	1,680	945	532
	1-7	10,600	31	1,361	766	436	1,680	945	532
	1-8	10,080	32	1,294	728	415	1,597	899	506
2	2-1	12,105	26	1,554	874	498	1,918	1,079	607
	2-2	10,800	20	1,386	780	444	1,711	963	542
	2-3	14,400	27	1,848	1,040	592	2,281	1,284	722
	2-4	15,075	31	1,935	1,088	620	2,388	1,344	756
	2-5	11,025	34	1,415	796	454	1,747	983	553
	2-6	11,925	40	1,531	861	491	1,889	1,063	598
	2-7	11,925	41	1,531	861	491	1,889	1,063	598
	2-8	11,925	34	1,531	861	491	1,889	1,063	598
	2-9	14,535	35	1,865	1,050	598	2,303	1,296	729
3	3-1	12,105	29	1,554	874	498	1,918	1,079	607
	3-2	10,800	26	1,386	780	444	1,711	963	542
	3-3	7,605	29	976	549	313	1,205	678	382
4	4-1	8,460	35	1,086	611	348	1,341	754	425
	4-2	11,025	43	1,415	796	454	1,747	983	553
	4-3	11,925	44	1,531	861	491	1,889	1,063	598
	4-4	11,925	41	1,531	861	491	1,889	1,063	598
	4-5	11,925	42	1,531	861	491	1,889	1,063	598
	4-6	9,000	37	1,155	650	370	1,426	802	452
5	5-1	15,660	55	2,010	1,131	644	2,481	1,396	785
	5-2	16,320	41	2,094	1,178	671	2,586	1,455	818
	5-3	15,180	42	1,948	1,096	625	2,405	1,353	761
	5-4	17,040	36	2,187	1,230	701	2,700	1,519	855
	5-5	19,500	41	2,502	1,408	802	3,089	1,738	978
	5-6	14,880	48	1,910	1,074	612	2,357	1,326	746
6	6-1	15,720	49	2,017	1,135	647	2,491	1,401	788
	6-2	15,660	64	2,010	1,131	644	2,481	1,396	785
	6-3	15,780	56	2,025	1,139	649	2,500	1,406	791
	6-4	17,580	48	2,256	1,269	723	2,785	1,567	882
	6-5	19,980	48	2,564	1,442	822	3,165	1,781	1,002

Table 5
WICK DRAIN SUMMARY - PROPOSED STREET ALIGNMENT
FORMER RAILYARDS AT BRISBANE BAYLANDS
Brisbane, California

Street Name	Segment Name	Approximate Area Requiring Drains[1] (square feet)	Estimated Wick Drain Length (feet)	Estimated Number of Wicks Based on Desired Wick Spacing					
				Spacing = 3 feet	Spacing = 4 feet	Spacing = 5.3 feet	Spacing = 2.7 feet	Spacing = 3.6 feet	Spacing = 4.8 feet
	6-6	15,240	52	1,956	1,100	627	2,415	1,358	764
6 (cont.)	6-7	16,380	49	2,102	1,183	674	2,595	1,460	821
	6-8	16,380	41	2,102	1,183	674	2,595	1,460	821
	6-9	15,780	40	2,025	1,139	649	2,500	1,406	791
7	7-1	91,860	67	11,786	6,630	3,777	14,551	8,185	4,604
	7-2	82,920	74	10,639	5,985	3,409	13,135	7,389	4,156
8	8-1	91,860	73	11,786	6,630	3,777	14,551	8,185	4,604
	8-2	47,460	84	6,090	3,426	1,952	7,518	4,229	2,379
O	Street O-1	33,540	55	4,304	2,421	1,379	5,313	2,989	1,681
	Street O-2	20,100	46	2,579	1,451	827	3,184	1,791	1,008
P	Street P	20,440	38	2,623	1,476	841	3,238	1,822	1,025
Q	Street Q-1	20,360	60	2,613	1,470	837	3,226	1,815	1,021
	Street Q-2	15,160	36	1,946	1,095	624	2,402	1,351	760
R	Street R-1	27,240	55	3,495	1,966	1,120	4,315	2,428	1,366
	Street R-2	25,380	41	3,257	1,832	1,044	4,021	2,262	1,273
	Street R-3	9,000	24	1,155	650	370	1,426	802	452
	Street R-4	26,160	18	3,357	1,888	1,076	4,144	2,331	1,312
S	Street S-1	16,080	45	2,064	1,161	662	2,548	1,433	806
	Street S-2	15,240	38	1,956	1,100	627	2,415	1,358	764
	Street S-3	6,000	26	770	434	247	951	535	301
	Street S-4	9,000	25	1,155	650	370	1,426	802	452
	Street S-5	7,960	20	1,022	575	328	1,261	710	399
T	Street T-1	11,160	50	1,432	806	459	1,768	995	560
	Street T-2	11,200	46	1,438	809	461	1,775	998	562
	Street T-3	6,000	43	770	434	247	951	535	301
	Street T-4	9,000	30	1,155	650	370	1,426	802	452
	Street T-5	8,280	27	1,063	598	341	1,312	738	415
U	Street U-1	13,800	53	1,771	996	568	2,186	1,230	692
	Street U-2	14,280	44	1,833	1,031	588	2,262	1,273	716
	Street U-3	9,000	44	1,155	650	370	1,426	802	452
	Street U-4	13,500	42	1,733	975	555	2,139	1,203	677
	Street U-5	12,780	33	1,640	923	526	2,025	1,139	641
V	Street V-1	14,760	44	1,894	1,066	607	2,338	1,316	740
	Street V-2	6,000	39	770	434	247	951	535	301
	Street V-3	9,000	40	1,155	650	370	1,426	802	452
	Street V-4	8,840	32	1,135	638	364	1,401	788	444
W	Street W-1	16,260	40	2,087	1,174	669	2,576	1,449	815

Table 5
WICK DRAIN SUMMARY - PROPOSED STREET ALIGNMENT
FORMER RAILYARDS AT BRISBANE BAYLANDS
Brisbane, California

Street Name	Segment Name	Approximate Area Requiring Drains[1] (square feet)	Estimated Wick Drain Length (feet)	Estimated Number of Wicks Based on Desired Wick Spacing					
				Spacing = 3 feet	Spacing = 4 feet	Spacing = 5.3 feet	Spacing = 2.7 feet	Spacing = 3.6 feet	Spacing = 4.8 feet
	Street W-2	9,000	40	1,155	650	370	1,426	802	452
W (cont.)	Street W-3	13,500	34	1,733	975	555	2,139	1,203	677
	Street W-4	13,680	31	1,756	988	563	2,167	1,219	686
X	Street X-1	7,000	36	899	506	288	1,109	624	351
	Street X-2	6,000	35	770	434	247	951	535	301
	Street X-3	9,000	34	1,155	650	370	1,426	802	452
	Street X-4	9,440	31	1,212	682	389	1,496	842	474
Y	Street Y	9,840	77	1,263	711	405	1,559	877	494
Geneva Avenue[2]	Geneva Ave.-5	23,625	49	3,032	1,706	972	3,743	2,105	1,185
	Geneva Ave.-6	51,435	46	6,600	3,713	2,115	8,148	4,583	2,578
	Geneva Ave.-7	20,250	42	2,599	1,462	833	3,208	1,805	1,015
	Geneva Ave.-8	30,375	29	3,898	2,193	1,249	4,812	2,707	1,523
	Geneva Ave.-9	26,865	16	3,447	1,939	1,105	4,256	2,394	1,347
Roundhouse	Roundhouse Rd	119,025	43	15,272	8,591	4,893	18,854	10,606	5,966
Bayshore Boulevard[3]	Bayshore Blvd. 1	145,800	0	0	0	0	0	0	0
	Bayshore Blvd. 2	145,800	0	0	0	0	0	0	0
	Bayshore Blvd. 3	426,330	0	0	0	0	0	0	0
	Bayshore Blvd. 4	410,130	0	0	0	0	0	0	0

Notes: 1) Surface area estimated from site plan.

2) Geneva Avenue within Railyards Area only.

3) Assumes no additional fill placed on Bayshore Boulevard.

🟦 Indicates that less than six inches of consolidation settlement is anticipated, and surcharge without wick drains may be feasible, pending further lot-specific subsurface investigation.

Table 6
WICK DRAIN SUMMARY - PROPOSED 8 MILLION PLAN
FORMER RAILYARDS AT BRISBANE BAYLANDS
Brisbane, California

District Code	Lot No.	Approximate Area Requiring Drains[1] (square feet)	Estimated Wick Drain Length (feet)	Estimated Number of Wicks Based on Desired Wick Spacing					
				Spacing = 3 feet	Spacing = 4 feet	Spacing = 5.3 feet	Spacing = 2.7 feet	Spacing = 3.6 feet	Spacing = 4.8 feet
GBN[2]	1	8,759	35	1,124	633	361	1,388	781	439
	2	21,501	35	2,759	1,552	884	3,406	1,916	1,078
	3	21,523	43	2,762	1,554	885	3,410	1,918	1,079
	4	21,502	41	2,759	1,552	884	3,406	1,916	1,078
	5	19,505	45	2,503	1,408	802	3,090	1,738	978
	6	7,161	42	919	517	295	1,135	639	359
	7	5,542	29	712	400	228	878	494	278
	8	42,153	31	5,409	3,043	1,733	6,678	3,756	2,113
	9	44,288	38	5,683	3,197	1,821	7,016	3,947	2,220
	10	46,554	39	5,974	3,360	1,914	7,375	4,148	2,334
	11	46,094	47	5,915	3,327	1,895	7,302	4,107	2,311
	12	43,260	44	5,551	3,123	1,779	6,853	3,855	2,169
	13	44,737	35	5,740	3,229	1,840	7,087	3,987	2,243
	14	38,083	48	4,887	2,749	1,566	6,033	3,394	1,909
	15	8,317	32	1,068	601	342	1,318	742	417
	16	25,200	35	3,234	1,819	1,036	3,992	2,246	1,263
	17	16,455	31	2,112	1,188	677	2,607	1,467	825
	18	13,383	34	1,718	966	551	2,120	1,193	671
	19	15,622	32	2,005	1,128	643	2,475	1,392	783
	20	13,383	40	1,718	966	551	2,120	1,193	671
	21	15,132	31	1,942	1,093	623	2,397	1,349	759
	22	13,383	41	1,718	966	551	2,120	1,193	671
	23	15,763	33	2,023	1,138	648	2,497	1,405	791
	24	14,623	37	1,877	1,056	602	2,317	1,303	733
	25	0	26	0	0	0	0	0	0
	26	25,613	31	3,287	1,849	1,053	4,058	2,283	1,284
	27	17,302	24	2,220	1,249	712	2,741	1,542	868
	28	21,213	30	2,722	1,531	873	3,361	1,891	1,064
	29	8,872	37	1,139	641	365	1,406	791	445
	30	11,299	43	1,450	816	465	1,790	1,007	567
	31	21,757	42	2,792	1,571	895	3,447	1,939	1,091
	32	30,131	50	3,866	2,175	1,239	4,773	2,685	1,511
	33	18,705	46	2,400	1,350	769	2,963	1,667	938
	34	17,951	54	2,304	1,296	738	2,844	1,600	900
	35	37,840	47	4,856	2,731	1,556	5,994	3,372	1,897
	36	33,773	48	4,334	2,438	1,389	5,350	3,010	1,693
	37	43,219	44	5,546	3,120	1,777	6,846	3,851	2,167
	38	35,699	50	4,581	2,577	1,468	5,655	3,181	1,790

Table 6
WICK DRAIN SUMMARY - PROPOSED 8 MILLION PLAN
FORMER RAILYARDS AT BRISBANE BAYLANDS
Brisbane, California

District Code	Lot No.	Approximate Area Requiring Drains[1] (square feet)	Estimated Wick Drain Length (feet)	Estimated Number of Wicks Based on Desired Wick Spacing					
				Spacing = 3 feet	Spacing = 4 feet	Spacing = 5.3 feet	Spacing = 2.7 feet	Spacing = 3.6 feet	Spacing = 4.8 feet
IHS[3]	1	296,697	0	0	0	0	0	0	0
RHO[4]	1	113,815	44	14,603	8,215	4,679	18,029	10,141	5,705
	2	18,931	29	2,429	1,367	779	2,999	1,687	949
	3	19,000	26	2,438	1,372	782	3,010	1,693	953
	4	160,983	43	20,655	11,619	6,618	25,500	14,344	8,069
	5	47,602	42	6,108	3,436	1,957	7,541	4,242	2,386
	6	53,136	71	6,818	3,835	2,185	8,417	4,735	2,664
	7	30,214	49	3,877	2,181	1,243	4,786	2,693	1,515
	8	50,296	58	6,454	3,630	2,068	7,967	4,482	2,521
	9	14,231	19	1,826	1,028	586	2,255	1,268	714
	10	13,991	24	1,796	1,010	576	2,217	1,247	702
	11	40,542	43	5,202	2,926	1,667	6,422	3,613	2,032
	12	33,773	57	4,334	2,438	1,389	5,350	3,010	1,693
	13	43,985	56	5,644	3,175	1,809	6,968	3,920	2,205
	14	43,985	55	5,644	3,175	1,809	6,968	3,920	2,205
	15	50,760	53	6,513	3,664	2,087	8,041	4,523	2,545
BSS[5]	1	73,428	64	9,422	5,300	3,019	11,631	6,543	3,681
	2	71,351	64	9,155	5,150	2,934	11,302	6,358	3,577
	3	384,082	59	49,280	27,720	15,789	60,839	34,222	19,250
	4	247,213	81	31,719	17,842	10,163	39,159	22,027	12,390
	5	386,098	94	49,538	27,866	15,872	61,158	34,402	19,351
	6	431,275	76	55,335	31,126	17,730	68,314	38,427	21,615
	7	460,000	80	59,020	33,199	18,910	72,864	40,986	23,055
	8	226,151	86	29,017	16,322	9,297	35,823	20,151	11,335

Notes: 1) Surface area calculated by subtracting proposed building area from lot area.

2) GBN - Geneva/Bayshore North Planning Area

3) IHS - Ice House South

4) RHO - Round House Area

5) BSS - Bayshore South Planning Area

🟦 Indicates that less than six inches of consolidation settlement is anticipated, and surcharge without wick drains may be feasible, pending further lot-specific subsurface investigation.

Table 7
PILE SUMMARY - PROPOSED 8 MILLION PLAN
FORMER RAILYARDS AT BRISBANE BAYLANDS
Brisbane, California

District Code	Lot No.	Building Name	Building Footprint Area (square feet)	No. Building Floors	Estimated Building Bearing Pressure (psf)	Estimated Building Weight (kips)	Estimated Allowable Pile Capacity (kips)	Estimated No. Piles	Estimated Pile Length (feet)
Geneva Avenue	Segment 5	Geneva Avenue-5	23,625	N/A	320	7,560	200	38	47
GBN[1]	1	N/A	N/A	N/A	N/A	N/A	N/A	0	0
	2	N/A	N/A	N/A	N/A	N/A	N/A	0	0
	3	N/A	N/A	N/A	N/A	N/A	N/A	0	0
	4	N/A	N/A	N/A	N/A	N/A	N/A	0	0
	5	N/A	N/A	N/A	N/A	N/A	N/A	0	0
	6	N/A	N/A	N/A	N/A	N/A	N/A	0	0
	7	N/A	N/A	N/A	N/A	N/A	N/A	0	0
	8	Bldg A	14,142	0	0	0	N/A	0	0
	9	Bldg A	14,142	0	0	0	N/A	0	0
	10	Bldg A	14,142	0	0	0	N/A	0	0
	11	Bldg A	14,677	0	0	0	N/A	0	0
	12	Bldg A	10,400	0	0	0	N/A	0	0
	13	Bldg A	10,400	0	0	0	N/A	0	0
	14	Bldg A	10,400	0	0	0	N/A	0	0
	15	Bldg A	17,844	3	460	8,208	200	41	48
	16	Bldg A	25,955	3	460	11,939	200	60	52
	17	Bldg A	29,016	3	460	13,347	200	67	54
	18	Bldg A	25,230	3	460	11,606	200	58	52
	19	Bldg A	28,078	3	460	12,916	200	65	53
	20	Bldg A	25,230	3	460	11,606	200	58	52
	21	Bldg A	27,246	3	460	12,533	200	63	53
	22	Bldg A	25,230	3	460	11,606	200	58	52
	23	Bldg A	21,270	4	600	12,762	200	64	53
	24	Bldg A	20,398	4	600	12,239	200	61	52
	25	Bldg A	41,240	1	180	7,423	200	66*	47
	26	Bldg A	17,812	4	600	10,687	200	53	51
		Bldg B	4,624	3	460	2,127	200	11	42
	27	Bldg A	17,518	4	600	10,511	200	53	51
	28	Bldg A	17,812	4	600	10,687	200	53	51
		Bldg B	4,624	3	460	2,127	200	11	42
	29	Bldg A	16,314	3	460	7,504	200	38	47
	30	Bldg A	24,199	3	460	11,132	200	56	51
	31	Bldg A	18,127	3	460	8,338	200	42	48
		Bldg B	18,396	3	460	8,462	200	42	48

Table 7
PILE SUMMARY - PROPOSED 8 MILLION PLAN
FORMER RAILYARDS AT BRISBANE BAYLANDS
Brisbane, California

District Code	Lot No.	Building Name	Building Footprint Area (square feet)	No. Building Floors	Estimated Building Bearing Pressure (psf)	Estimated Building Weight (kips)	Estimated Allowable Pile Capacity (kips)	Estimated No. Piles	Estimated Pile Length (feet)
GBN	32	Bldg A	24,116	3	460	11,093	200	55	51
		Bldg B	24,492	3	460	11,266	200	56	51
	33	Bldg A	21,419	4	600	12,851	200	64	53
	34	Bldg A	21,075	4	600	12,645	200	63	53
	35	Bldg A	25,583	4	600	15,350	200	77	56
		Bldg B	4,630	0	0	0	N/A	0	0
	36	Bldg A	25,919	4	600	15,551	200	78	56
		Bldg B	4,663	0	0	0	N/A	0	0
	37	Bldg A	13,685	4	600	8,211	200	41	48
		Bldg B	12,785	4	600	7,671	200	38	48
		Bldg C	4,624	0	0	0	N/A	0	0
	38	Bldg A	13,685	4	600	8,211	200	41	48
		Bldg B	12,949	4	600	7,769	200	39	48
		Bldg C	4,338	0	0	0	N/A	0	0
IHS[2]	1	Bldg A	54,000	0	0	0	N/A	0	0
		Bldg B	20,000	0	0	0	N/A	0	0
		Bldg C	20,000	1	180	3,600	N/A	0	0
RHO[3]	1	Bldg A	28,220	1	180	5,080	200	45*	45
	2	N/A	N/A	N/A	N/A	N/A	N/A	0	0
	3	N/A	N/A	N/A	N/A	N/A	N/A	0	0
	4	Bldg A	12,795	3	460	5,886	200	29	46
		Bldg B	22,485	3	460	10,343	200	52	50
		Bldg D	9,091	3	460	4,182	200	21	44
		Bldg E	19,509	3	460	8,974	200	45	49
	5	Bldg A	23,908	3	460	10,998	200	55	51
		Bldg B	6,400	2	320	2,048	200	10	42
		Bldg C	5,600	2	320	1,792	200	9	41
		Bldg D	5,600	2	320	1,792	200	9	41
	6	Bldg A	18,271	3	460	8,405	200	42	48
		Bldg B	7,200	2	320	2,304	200	12	42
		Bldg C	6,400	2	320	2,048	200	10	42
		Bldg D	5,600	2	320	1,792	200	9	41
		Bldg E	5,600	2	320	1,792	200	9	41
	7	Bldg A	14,939	3	460	6,872	200	34	47
		Bldg B	5,600	2	320	1,792	200	9	41
		Bldg C	4,800	2	320	1,536	200	8	41

Table 7
PILE SUMMARY - PROPOSED 8 MILLION PLAN
FORMER RAILYARDS AT BRISBANE BAYLANDS
Brisbane, California

District Code	Lot No.	Building Name	Building Footprint Area (square feet)	No. Building Floors	Estimated Building Bearing Pressure (psf)	Estimated Building Weight (kips)	Estimated Allowable Pile Capacity (kips)	Estimated No. Piles	Estimated Pile Length (feet)
RHO	8	Bldg A	18,531	3	460	8,524	200	43	48
		Bldg B	5,600	2	320	1,792	200	9	41
		Bldg C	5,600	2	320	1,792	200	9	41
		Bldg D	5,600	2	320	1,792	200	9	41
		Bldg E	8,800	2	320	2,816	200	14	42
		Bldg F	3,200	2	320	1,024	200	5	40
	9	Bldg A	20,589	3	460	9,471	200	47	49
	10	Bldg A	20,132	3	460	9,261	200	46	49
	11	Bldg A	20,323	3	460	9,349	200	47	49
		Bldg B	4,800	2	320	1,536	200	8	41
		Bldg C	4,800	2	320	1,536	200	8	41
		Bldg D	5,600	2	320	1,792	200	9	41
	12	Bldg A	23,892	3	460	10,990	200	55	51
		Bldg B	5,600	2	320	1,792	200	9	41
		Bldg C	5,600	2	320	1,792	200	9	41
		Bldg D	7,200	2	320	2,304	200	12	42
	13	Bldg A	14,142	0	0	0	N/A	0	0
	14	Bldg A	14,472	0	0	0	N/A	0	0
	15	Bldg A	14,142	0	0	0	N/A	0	0
BSS[4]	1	N/A	N/A	N/A	N/A	N/A	N/A	0	0
	2	N/A	N/A	N/A	N/A	N/A	N/A	0	0
	3	Bldg A	42,145	3	460	19,387	200	97	60
		Bldg B	10,000	0	0	0	N/A	0	0
		Bldg C	60,000	0	0	0	N/A	0	0
	4	Bldg A	10,000	1	180	1,800	200	16*	41
		Bldg B	10,000	1	180	1,800	200	16*	41
		Bldg C	60,000	1	180	10,800	200	96*	51
		Bldg D	60,000	1	180	10,800	200	96*	51
	5	Bldg A	20,000	2	320	6,400	200	32	46
		Bldg B	20,604	2	320	6,593	200	33	46
	6	Bldg A	33,520	3	460	15,419	200	77	56
		Bldg B	22,541	2	320	7,213	200	36	47
		Bldg C	25,520	0	0	0	N/A	0	0
	7	Bldg A	20,000	2	320	6,400	200	32	46
		Bldg B	20,000	0	0	0	N/A	0	0
		Bldg C	20,000	2	320	6,400	200	32	46
		Bldg D	20,000	0	0	0	N/A	0	0

Table 7
PILE SUMMARY - PROPOSED 8 MILLION PLAN
FORMER RAILYARDS AT BRISBANE BAYLANDS
Brisbane, California

District Code	Lot No.	Building Name	Building Footprint Area (square feet)	No. Building Floors	Estimated Building Bearing Pressure (psf)	Estimated Building Weight (kips)	Estimated Allowable Pile Capacity (kips)	Estimated No. Piles	Estimated Pile Length (feet)
BSS	8	Bldg A	20,000	2	320	6,400	200	32	46
		Bldg B	20,000	0	0	0	N/A	0	0

Notes: 1) GBN - Geneva/Bayshore North Planning Area
2) IHS - Ice House South
3) RHO - Round House Area
4) BSS - Bayshore South Planning Area
* Estimated number of piles controlled by maximum 25' by 25' grid spacing, and not building load.

🟦 Indicates that it may be feasible to support the building on a shallow foundation, pending further lot-specific subsurface investigation and possible soil improvement to mitigate potential settlement associated with liquefaction reconsolidation.

FIGURES

Base map: The Thomas Guide
San Francisco County
1999

0 1/4 1/2 Mile

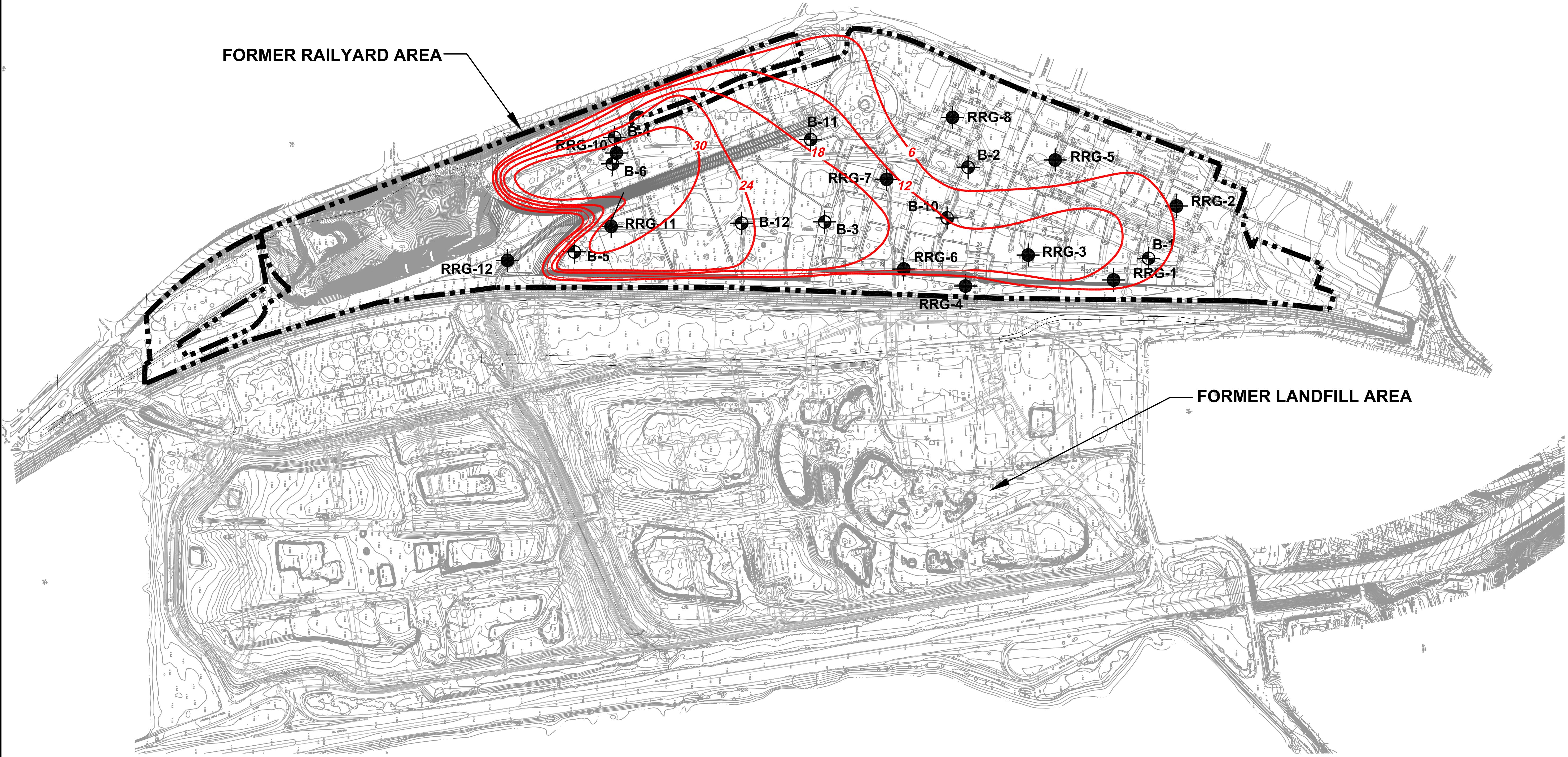
Approximate scale

FORMER RAILYARDS AT BRISBANE BAYLANDS
Brisbane, California

Treadwell&Rollo

SITE LOCATION MAP

Date 10/14/08	Project No. 4650.01	Figure 1



EXPLANATION

RRG-2 ● Approximate location of boring by Michelucci & Associates, Inc., March and April 2003

B-1 ⊕ Approximate location of boring by Kleinfelder, Inc., December 1989

▬ ▪ ▪ ▬ Site boundary

~6~ Contour of calculated consolidation settlement (inches) between Years 1 and 30 after fill placement, based on grading plan prepared by BKF dated 29 May 2008.

0 700 Feet
Approximate scale

FORMER RAILYARDS AT BRISBANE BAYLANDS
Brisbane, California

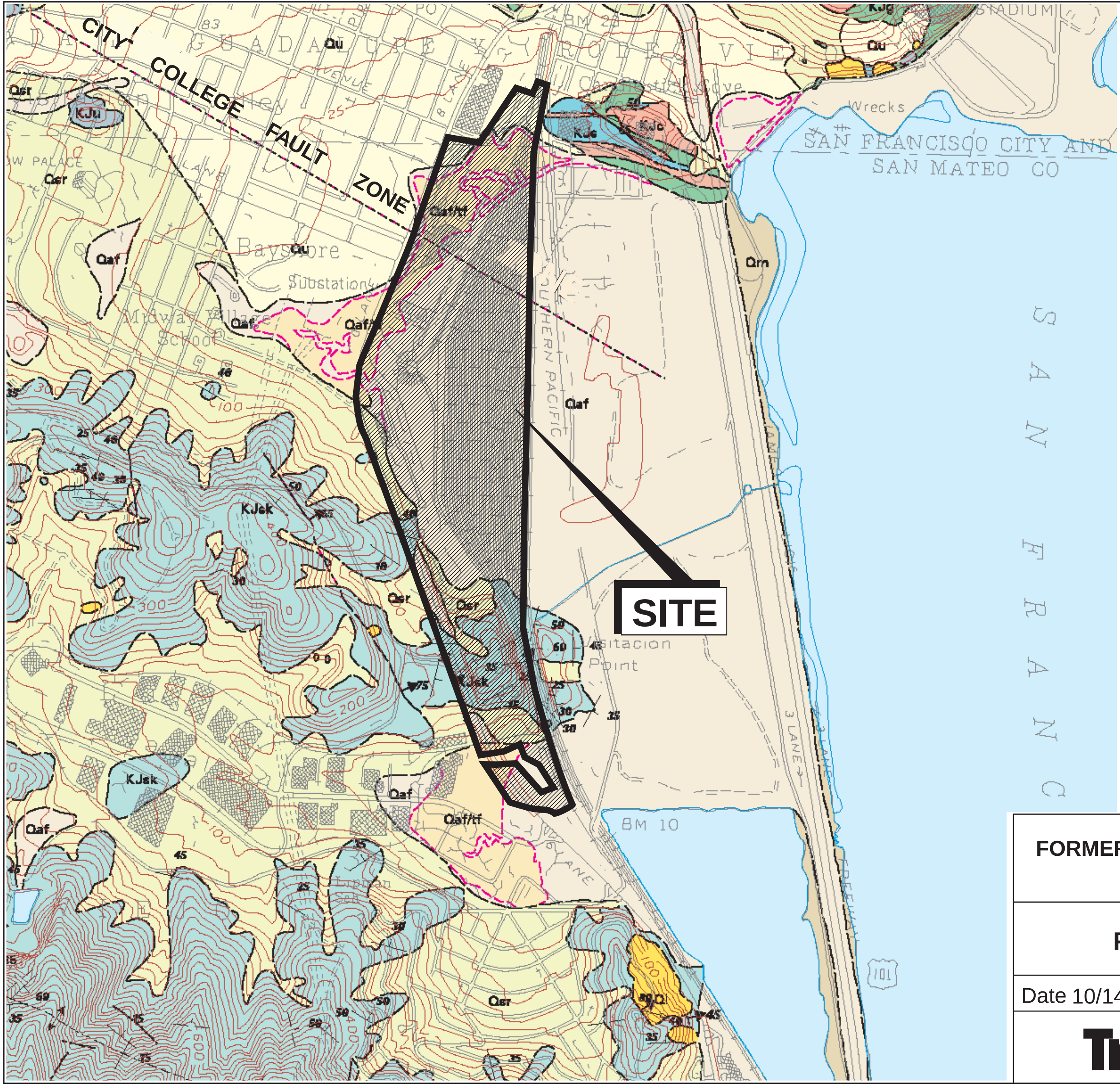
SITE PLAN

Date 10/25/08	Project No. 4650.01	Figure 2

Treadwell&Rollo

Reference: "Brisbane Baylands Development, Conceptual Grading Plan," by BKF, dated 29 May 2008.

S:\Trgraphics-Oak\4600's\4650.01\CAD_Site Plan\OAK-465001_SITE PLAN.dwg 11/10/08



EXPLANATION

Qaf	Artificial fill
Qsr	Slope debris and ravine fill
Qu	Sedimentary deposits, undifferentiated
Qaf/tf	Artificial fill over tidal flat

FRANCISCAN COMPLEX

KJs	Interbedded sandstone and shale
KJc	Chert
KJg	Greenstone
KJsk	Sandstone and shale

— — —	Geologic contact
....	Fault, dotted where concealed

N

Not to Scale

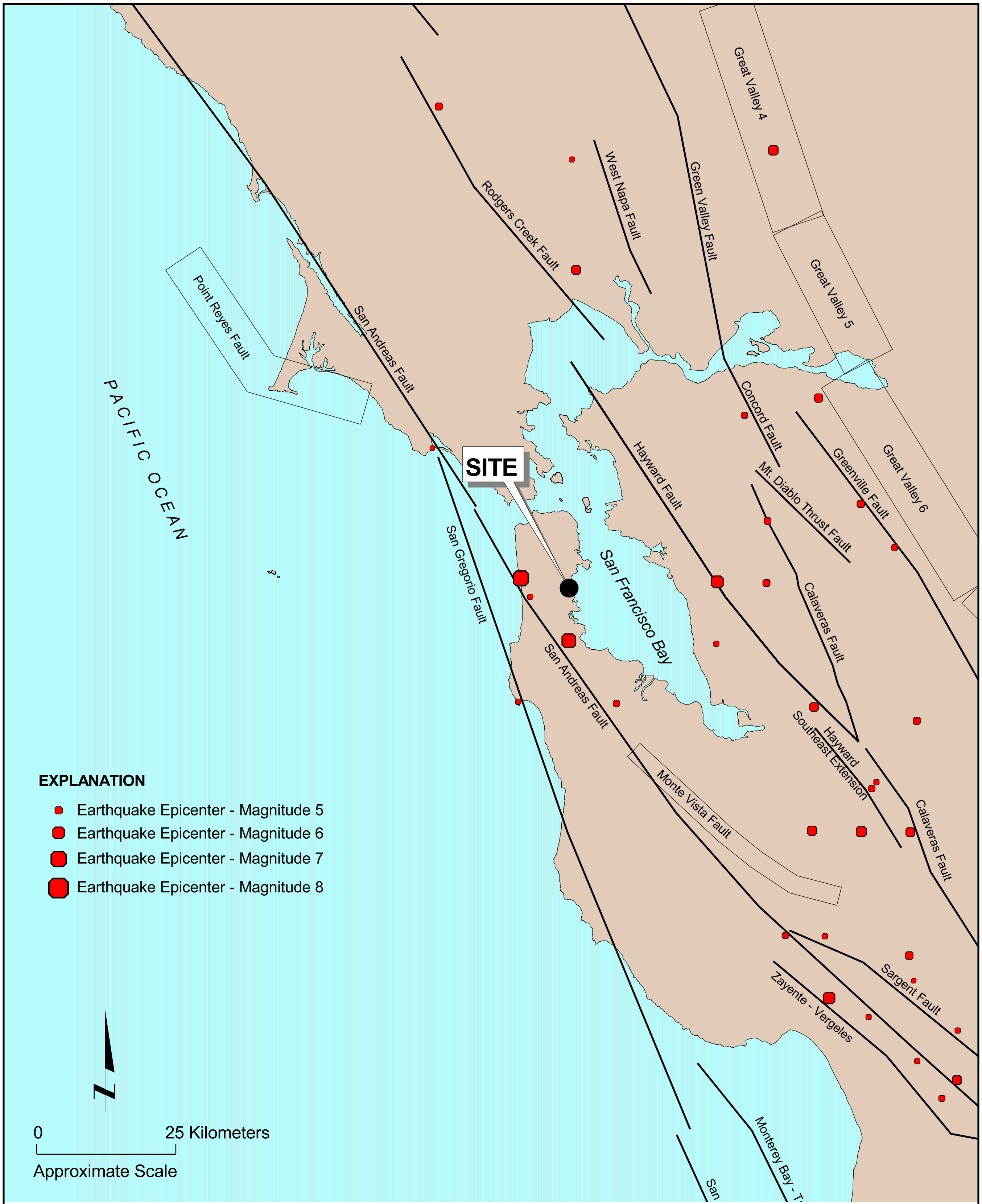
Reference: Bonilla (1998)

FORMER RAILYARDS AT BRISBANE BAYLANDS
Brisbane, California

REGIONAL GEOLOGY MAP

Date 10/14/08	Project No. 4650.01	Figure 3

Treadwell&Rollo



NOTES:
Digitized data for fault coordinates and earthquake catalog was developed by the California Department of Conservation Division of Mines and Geology. The historic earthquake catalog includes events from January 1800 to December 2000.

FORMER RAILYARDS AT BRISBANE BAYLANDS
Brisbane, California

Treadwell&Rollo

MAP OF MAJOR FAULTS AND EARTHQUAKE EPICENTERS IN THE SAN FRANCISCO BAY AREA

Date: 10/08/08 | Project No. 4650.01 | Figure: 4

I **Not felt by people, except under especially favorable circumstances. However, dizziness or nausea may be experienced.**

Sometimes birds and animals are uneasy or disturbed. Trees, structures, liquids, bodies of water may sway gently, and doors may swing very slowly.

II **Felt indoors by a few people, especially on upper floors of multi-story buildings, and by sensitive or nervous persons.**

As in Grade I, birds and animals are disturbed, and trees, structures, liquids and bodies of water may sway. Hanging objects swing, especially if they are delicately suspended.

III **Felt indoors by several people, usually as a rapid vibration that may not be recognized as an earthquake at first. Vibration is similar to that of a light, or lightly loaded trucks, or heavy trucks some distance away. Duration may be estimated in some cases.**

Movements may be appreciable on upper levels of tall structures. Standing motor cars may rock slightly.

IV **Felt indoors by many, outdoors by a few. Awakens a few individuals, particularly light sleepers, but frightens no one except those apprehensive from previous experience. Vibration like that due to passing of heavy, or heavily loaded trucks. Sensation like a heavy body striking building, or the falling of heavy objects inside.**

Dishes, windows and doors rattle; glassware and crockery clink and clash. Walls and house frames creak, especially if intensity is in the upper range of this grade. Hanging objects often swing. Liquids in open vessels are disturbed slightly. Stationary automobiles rock noticeably.

V **Felt indoors by practically everyone, outdoors by most people. Direction can often be estimated by those outdoors. Awakens many, or most sleepers. Frightens a few people, with slight excitement; some persons run outdoors.**

Buildings tremble throughout. Dishes and glassware break to some extent. Windows crack in some cases, but not generally. Vases and small or unstable objects overturn in many instances, and a few fall. Hanging objects and doors swing generally or considerably. Pictures knock against walls, or swing out of place. Doors and shutters open or close abruptly. Pendulum clocks stop, or run fast or slow. Small objects move, and furnishings may shift to a slight extent. Small amounts of liquids spill from well-filled open containers. Trees and bushes shake slightly.

VI **Felt by everyone, indoors and outdoors. Awakens all sleepers. Frightens many people; general excitement, and some persons run outdoors.**

Persons move unsteadily. Trees and bushes shake slightly to moderately. Liquids are set in strong motion. Small bells in churches and schools ring. Poorly built buildings may be damaged. Plaster falls in small amounts. Other plaster cracks somewhat. Many dishes and glasses, and a few windows break. Knickknacks, books and pictures fall. Furniture overturns in many instances. Heavy furnishings move.

VII **Frightens everyone. General alarm, and everyone runs outdoors.**

People find it difficult to stand. Persons driving cars notice shaking. Trees and bushes shake moderately to strongly. Waves form on ponds, lakes and streams. Water is muddied. Gravel or sand stream banks cave in. Large church bells ring. Suspended objects quiver. Damage is negligible in buildings of good design and construction; slight to moderate in well-built ordinary buildings; considerable in poorly built or badly designed buildings, adobe houses, old walls (especially where laid up without mortar), spires, etc. Plaster and some stucco fall. Many windows and some furniture break. Loosened brickwork and tiles shake down. Weak chimneys break at the roofline. Cornices fall from towers and high buildings. Bricks and stones are dislodged. Heavy furniture overturns. Concrete irrigation ditches are considerably damaged.

VIII **General fright, and alarm approaches panic.**

Persons driving cars are disturbed. Trees shake strongly, and branches and trunks break off (especially palm trees). Sand and mud erupts in small amounts. Flow of springs and wells is temporarily and sometimes permanently changed. Dry wells renew flow. Temperatures of spring and well waters varies. Damage slight in brick structures built especially to withstand earthquakes; considerable in ordinary substantial buildings, with some partial collapse; heavy in some wooden houses, with some tumbling down. Panel walls break away in frame structures. Decayed pilings break off. Walls fall. Solid stone walls crack and break seriously. Wet grounds and steep slopes crack to some extent. Chimneys, columns, monuments and factory stacks and towers twist and fall. Very heavy furniture moves conspicuously or overturns.

IX **Panic is general.**

Ground cracks conspicuously. Damage is considerable in masonry structures built especially to withstand earthquakes; great in other masonry buildings - some collapse in large part. Some wood frame houses built especially to withstand earthquakes are thrown out of plumb, others are shifted wholly off foundations. Reservoirs are seriously damaged and underground pipes sometimes break.

X **Panic is general.**

Ground, especially when loose and wet, cracks up to widths of several inches; fissures up to a yard in width run parallel to canal and stream banks. Landsliding is considerable from river banks and steep coasts. Sand and mud shifts horizontally on beaches and flat land. Water level changes in wells. Water is thrown on banks of canals, lakes, rivers, etc. Dams, dikes, embankments are seriously damaged. Well-built wooden structures and bridges are severely damaged, and some collapse. Dangerous cracks develop in excellent brick walls. Most masonry and frame structures, and their foundations are destroyed. Railroad rails bend slightly. Pipe lines buried in earth tear apart or are crushed endwise. Open cracks and broad wavy folds open in cement pavements and asphalt road surfaces.

XI **Panic is general.**

Disturbances in ground are many and widespread, varying with the ground material. Broad fissures, earth slumps, and land slips develop in soft, wet ground. Water charged with sand and mud is ejected in large amounts. Sea waves of significant magnitude may develop. Damage is severe to wood frame structures, especially near shock centers, great to dams, dikes and embankments, even at long distances. Few if any masonry structures remain standing. Supporting piers or pillars of large, well-built bridges are wrecked. Wooden bridges that "give" are less affected. Railroad rails bend greatly and some thrust endwise. Pipe lines buried in earth are put completely out of service.

XII **Panic is general.**

Damage is total, and practically all works of construction are damaged greatly or destroyed. Disturbances in the ground are great and varied, and numerous shearing cracks develop. Landslides, rock falls, and slumps in river banks are numerous and extensive. Large rock masses are wrenched loose and torn off. Fault slips develop in firm rock, and horizontal and vertical offset displacements are notable. Water channels, both surface and underground, are disturbed and modified greatly. Lakes are dammed, new waterfalls are produced, rivers are deflected, etc. Surface waves are seen on ground surfaces. Lines of sight and level are distorted. Objects are thrown upward into the air.

FORMER RAILYARDS AT BRISBANE BAYLANDS
Brisbane, California

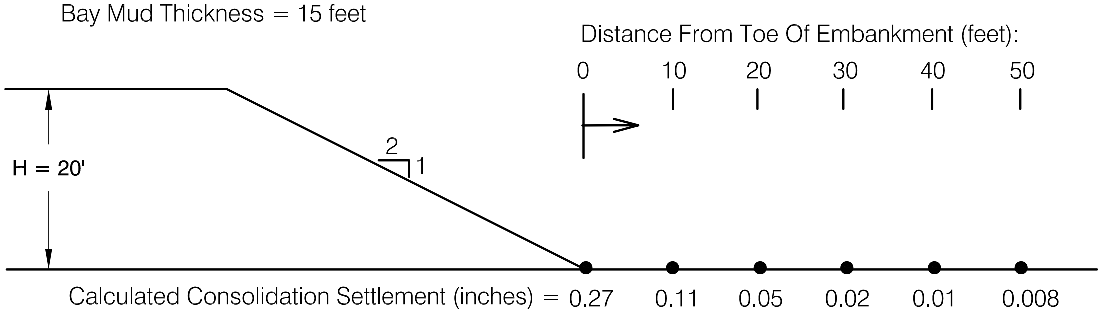
Treadwell&Rollo

MODIFIED MERCALLI INTENSITY SCALE

Date: 10/08/08
Project No. 4650.01
Figure: 5

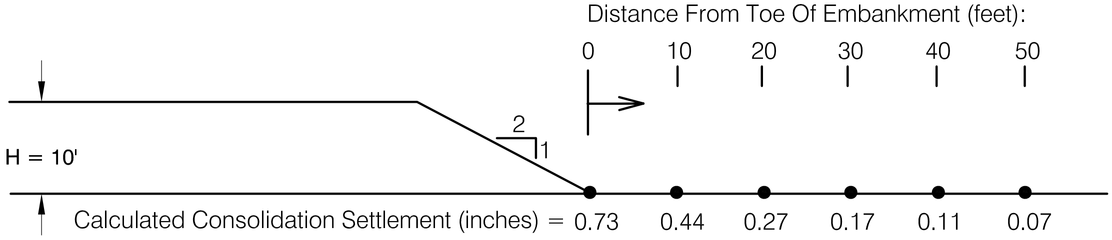
SECTION 1 GENEVA OVERCROSSING

Embankment Height = 20 feet
Existing Fill Thickness = 10 feet
Bay Mud Thickness = 15 feet



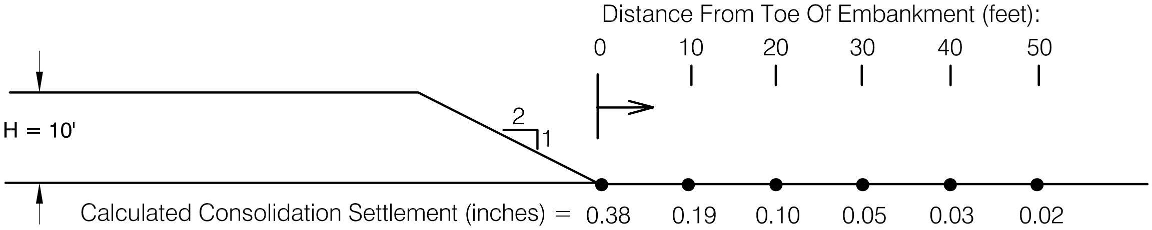
SECTION 2 SECTION WITH 40 FEET OF BAY MUD

Embankment Height = 10 feet
Existing Fill Thickness = 12.5 feet
Bay Mud Thickness = 40 feet



SECTION 3 SECTION WITH 20 FEET OF BAY MUD

Embankment Height = 10 feet
Existing Fill Thickness = 12.5 feet
Bay Mud Thickness = 20 feet



FORMER RAILYARDS AT
BRISBANE BAYLANDS
Brisbane, California

Treadwell&Rollo

SUMMARY OF CONSOLIDATION
SETTLEMENT ADJACENT TO FILL EDGE

Date 10/24/08 | Project No. 4650.01 | Figure 6

S: □Trgraphics–Oak□4600's□4650.01□4605.01_CONSOLIDATION SETTLEMENT.dwg 11/10/08

APPENDIX A
Logs of Borings by Others

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		LTR	ID	DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	⁙	Well-graded gravels or gravel sand mixtures, little or no fines.
		GP	⁙	Poorly-graded gravels or gravel sand mixture, little or no fines.
		GM	⁙	Silty gravels, gravel-sand-clay mixtures.
		GC	▨	Clayey gravels, gravel-sand-clay mixtures.
	SAND AND SANDY SOILS	SW	░	Well-graded sands or gravelly sands, little or no fines.
		SP	⁙	Poorly-graded sands or gravelly sands, little or no fines.
		SM	▥	Silty sands, sand-silt mixtures.
		SC	▨	Clayey sands, sand-clay mixtures.

MAJOR DIVISIONS		LTR	ID	DESCRIPTION
FINE GRAINED SOILS	SILTS AND CLAYS LL<50	ML	▥	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
		CL	▨	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		OL	▨	Organic silts and organic silt-clays of low plasticity
	SILTS AND CLAYS LL>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.
HIGHLY ORGANIC SOILS		Pt	≝	Peat and other highly organic soils.

▧	Standard Penetration Split Spoon Sampler
■	Modified California Sampler
▯	Shelby Tube Sampler
∇	Water level first observed in boring
▼	Water level observed in boring following drilling

Note: Blow count represents the number of blows of a 140 pound hammer falling 30 inches per blow required to drive a sampler through the last 12 inches of an 18-inch penetration, unless otherwise noted.

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

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

BORING LOG LEGEND

PLATE

B-1

Date Completed: 12/4/89

Logged By: Mike James

Total Depth: 41.5 ft

Sampler: Modified California - 2.5" OD, 2.0" ID

Hammer Wt: 140 lbs, drop 30 in

Depth, ft	FIELD		LABORATORY				Pen, tsf	DESCRIPTION
	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests		Surface Elevation: Estimated 11 feet (MSLD)
	■	41						**FILL: SILTY SAND (SM)** Medium dense, very dark brown, damp, fine grained, with gravel to 3/4", some glass fragments and wood chips
5	■	4		▼				-loose
								FILL: SILTY SANDY CLAY (CL) Soft, medium brown, wet, trace fine gravel
10	■	5						**SILTY SAND (SM-ML)** Loose, dark brown, damp, fine grained, with frequent roots
15	■	9	71	41				**SANDY CLAY (CL)** Firm, dark brown, moist, fine grained sand, trace silt, occasional roots
				▽				
20	■	15	112	20				**SAND (SP)** Medium dense, light brown, wet, medium grained
25	■	75						-dense
30	■	86						
35								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-1

PLATE

B-2

	FIELD		LABORATORY					
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf	DESCRIPTION (Continued from previous plate)
								...Sand (SP)
40	■	37	124	16		-#200:10%		**SILTY SAND (SM)** Dense, light brown, wet
								Bottom of boring at 41.5 feet
45								
50								
55								
60								
65								
70								
75								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-1

PLATE

B-3

Sampler: Modified California - 2.5" OD, 2.0" ID

Date Completed: 12/4/89

Logged By: Mike James

Total Depth: 61.5 ft

Hammer Wt: 140 lbs, drop 30 in

	FIELD		LABORATORY					DESCRIPTION
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf	Surface Elevation: Estimated 10 feet (MSLD)
	■	31					1.5	**FILL: SAND (SW)** Medium dense, grey-brown, damp, trace of gravel to 3/4" and of silt
5	■	6						-loose, black, wet, with glass fragments
10	■	6						
15	■	4	75	43			0.6	**CLAYEY SILT (MH-CH) - BAY MUD** Soft, dark blue-grey, damp
20	■	30				-#200: 7%		**GRAVELLY SAND (SP)** Medium dense, black, wet, coarse grained, with some silt
25	■	26	114	18				**SAND (SP)** Medium dense, mixed grey and brown with slight orange-brown mottling, wet, trace silt -Lens of Silty Sand (SM-ML) Medium dense, grey and brown, wet
30	■	18						-dark grey
35								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-2

PLATE

B-4

Depth, ft	FIELD Sample	FIELD Blows/ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Compress. Strength tsf	LABORATORY Other Tests	Pen, tsf	DESCRIPTION (Continued from previous plate)
	■	19	110	21				...Sand (SP) -trace fine gravel
40	■	26	118	17				
45	■	15						-trace clay, few pieces of glazed pottery
50	■	27	106	21		-#200: 3%		
55								
60	■	36	90	10		Ø=35 deg c =360psf		**SILTY CLAYEY SAND (SC-CL)** Medium dense, grey with orange-brown mottling, wet
								Bottom of boring at 61.5 feet
65								
70								
75								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-2

PLATE

B-5

Date Completed: 12/4/89

Logged By: Mike James

Total Depth: 46.5 ft

Sampler: Modified California - 2.5" OD, 2.0" ID

Hammer Wt: 140 lbs, drop 30 in

Depth, ft	FIELD		LABORATORY				Pen, tsf
	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	
	■	10	▼				
			▽				
5	■	24	123	13			
10	■	6					
15	■	4	71	51			
20	■	4				LL = 72 PI = 39	
25	■	13	61	61			
30	■	6					
35							

DESCRIPTION

Surface Elevation: Estimated 9 feet (MSLD)

FILL: SILTY GRAVEL (GM)
Medium dense, medium brown, damp, gravel to 1", trace sand

FILL: SAND (SP)
Medium dense, dark brown, wet, medium grained

FILL: SILTY GRAVEL (GM-ML)
Medium dense, dark brown, wet, gravel to 3/4", with some clayey areas

SILTY CLAY (CH) - BAY MUD
Soft, dark blue-grey, wet, with frequent shells

-trace fine grained sand
-less frequent shells

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-3

PLATE

B-6

Depth, ft	FIELD		LABORATORY				Pen, tsf		DESCRIPTION
	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests			(Continued from previous plate)
								▨	...Bay Mud
								▨	-siltier
40	■	33	103	21				░	**SAND (SP)** Dense, light brown, wet, fine grained, trace clay
45	■	60	103	23		-#200: 17%		░	-mixed light brown and grey
									Bottom of boring at 46.5 feet
50									
55									
60									
65									
70									
75									

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-3

PLATE

B-7

Date Completed: 12/5/89

Logged By: Mike James

Total Depth: 25.0 ft

Sampler: Modified California - 2.5" OD, 2.0" ID

Hammer Wt: 140 lbs, drop 30 in

Depth, ft	FIELD Sample	FIELD Blows/ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Compress. Strength tsf	LABORATORY Other Tests	Pen, tsf	DESCRIPTION Surface Elevation: Estimated 9 feet (MSLD)
	■	15						**FILL: GRAVELY SAND (SP)** Medium dense, mixed browns, damp, coarse grained, gravel to 1", trace silt and clay
			▼					
5	■	4	▽					-loose
								BAY MUD: SILTY CLAY (CH) Very soft, medium blue-grey, wet
10	■	2					0.1	
15	■	2	56	72			0.1	
20	■	3					0.1	-with some shells and pockets of peat
25								Bottom of boring at 25 feet
30								
35								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-4

PLATE

B-8

Date Completed: 12/5/89

Logged By: Mike James

Total Depth: 71.5 ft

Sampler: Modified California - 2.5" OD, 2.0" ID

Hammer Wt: 140 lbs, drop 30 in

Depth, ft	FIELD Sample	 Blows/ft	LABORATORY Dry Density pcf	 Moisture Content %	 Compress. Strength tsf	 Other Tests	Pen, tsf	DESCRIPTION Surface Elevation: Estimated 8 feet (MSLD)
	■	10	▼					**FILL: GRAVELLY SAND (SW)** Loose, medium grey-brown, moist, coarse grained, gravel to 1/2", trace silt
5	■	18	123 ▽	9				**FILL: CLAYEY GRAVEL (GC-CH)** Loose, grey-brown, wet, gravel to 1", with some coarse sand
10	■	4	129	13				-clayier
15	■	4						**SILTY CLAY (CH) - BAY MUD** Very soft, dark grey, wet, with some shells
20	■	4	51	82				
25	■	4					0.2	-medium grey, occasional shells
30	■	4	55	73			0.2	
35								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-5

PLATE

B-9

Depth, ft	FIELD		LABORATORY				Pen, tsf	DESCRIPTION
	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests		(Continued from previous plate)
		5					0.2	...Bay Mud
40		6	59	73		LL = 67 PI = 37		
45		8					0.3	-firm
50		6						
55		14	53	75				
								SILTY SAND (SM-ML) / SANDY SILT (ML) Firm, dark grey, damp, with fine grained sand
60		34						
								SAND (SP) Dense, orange-brown and grey, damp, fine grained, trace silt
65		100	111	17			2.0	
70		33					2.2	**SILTY CLAY (CL) - (OLD BAY CLAY)** Very stiff, medium grey, damp, moderate plasticity
								Bottom of boring at 71.5 feet
75								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-5

PLATE

B-10

Date Completed: 12/6/89

Logged By: Mike James

Total Depth: 81.5 ft

Sampler: Modified California - 2.5" OD, 2.0" ID

Hammer Wt: 140 lbs, drop 30 in

Surface Elevation: Estimated 9 feet (MSLD)

Depth, ft	FIELD Sample	 Blows/ft	LABORATORY Dry Density pcf	 Moisture Content %	 Compress. Strength tsf	 Other Tests	Pen, tsf	DESCRIPTION
	■	11						**FILL: GRAVELLY SAND (SP)** Medium dense, mixed browns, moist, coarse grained, gravel to 1", trace silt
				▼				**FILL: CLAYEY SILT (ML)** Firm, dark brown, moist, with some gravel to 1-1/2", with fragments of glass
5	■	25					0.3	
								CLAYEY SILT (MH-CH) - BAY MUD Soft, blue-grey with some brown areas, moist, moderately organic
10	■	2						
15	■	6	60	69				-dark blue-grey, damp
20	■	2						
25	■	4						-dark grey
30	■	6	56	70				-firm
35								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-6

PLATE

B-11

	FIELD		LABORATORY					DESCRIPTION
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf	(Continued from previous plate)
	■	6						...Bay Mud
40	■	6	54	74				-occasional shells, with pockets of silt
45	■	8						
								SILTY CLAY (CL-ML) - (OLD BAY CLAY)
50	■	23	54	76			3.5	Stiff, grey and orange-brown, moist
55								
60	■	26	57	74				
65								
70	■	20						
75								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-6

PLATE

B-12

FIELD		LABORATORY							
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf		DESCRIPTION (Continued from previous plate)
								▨	...Silty Clay (CL-ML)
80	■	33	96	28				▨	Lens of Sand (SP) Dense, dark grey, moist, fine grained
									Bottom of boring at 81.5 feet
85									
90									
95									
100									
105									
110									
115									

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-6

PLATE

B-13

Date Completed: 12/7/89

Logged By: Mike James

Total Depth: 61.5 ft

Sampler: Modified California - 2.5" OD, 2.0" ID

Hammer Wt: 140 lbs, drop 30 in

Surface Elevation: Estimated 13 feet (MSLD)

Depth, ft	FIELD		LABORATORY				Pen, tsf	DESCRIPTION
	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests		
			99	0				**FILL: GRAVELLY SILT (ML)** Firm, medium brown, moist, gravel to 1/2", trace sand
		28	100	10		Ø= 36 deg c=1050psf		-grey, siltier
5		14						**FILL: REFUSE AND SOIL** Primarily paper, glass fragments, wood fibers, pieces of metal and rubble mixed with... Clayey Silty Sand (SM-ML) Loose, dark brown, wet, fine grained
10		50/ 6"						-rubble
15		7		▽				
20		17	59	69				**SILTY CLAY (CH) - BAY MUD** Very soft, medium blue-grey, wet, with shells, with pockets of refuse consisting of wood fibers, paper, glass fragments, etc.
25		4						-soft, without refuse
30		4	61	64			0.5	
35								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-7

PLATE B-14

Depth, ft	FIELD Sample	FIELD Blows/ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Compress. Strength tsf	LABORATORY Other Tests	Pen, tsf	DESCRIPTION (Continued from previous plate)
		2					0.9	...Bay Mud -firm
40								
45						LL = 62 PI = 32	0.5	
50								
55						LL = 65 PI = 38		-sandy
								SILTY SAND (SM-ML) Medium dense, medium blue-grey with some brown and black, fine grained
60		24	79	17				
								Bottom of boring at 61.5 feet
65								
70								
75								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-7

PLATE

B-15

Date Completed: 12/7/89

Logged By: Mike James

Total Depth: 66.5 ft

Sampler: Modified California - 2.5" OD, 2.0" ID
Shelby Tube - 2.8" DIA (nominal)

Hammer Wt: 140 lbs, drop 30 in

	FIELD		LABORATORY					DESCRIPTION
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf	Surface Elevation: Estimated 23 feet (MSLD)
	■	22	100	7		Ø=34 deg c=490psf		**FILL: SILTY SAND (SM-ML)** Medium dense, orange-brown, moist, medium grained, with some clayey pockets and rock fragmets to 1-1/2"
5	■	40	120	11				Lens of Sandy Silt (ML) Very stiff, dark grey, moist, with some gravel to 1/2" -Clayey Sand (SC)
10	■	36						Lens of Sand (SP) Dense, medium brown, moist
15	■	23	112	20				**FILL: REFUSE AND SOIL** Primarily paper, wood fibers, glass fragments and pieces of metal mixed with... Silty Clay (CH) Soft to firm, dark grey and black, damp, with some gravel to 1/2" and sandy areas
20	■	17		▽				
25	■	15	58	68				
30	■	10						
35								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-8

PLATE

B-16

Depth, ft	FIELD Sample	 Blows/ft	LABORATORY Dry Density pcf	 Moisture Content %	 Compress. Strength tsf	 Other Tests	Pen, tsf	DESCRIPTION (Continued from previous plate)
	■	14						...Fill: Refuse and Soil
40	■	28	102	20				
45	■	9						
50	■	7						**SILTY CLAY (CH) - BAY MUD** Firm, medium blue-grey, damp
55	■	4	49	81			0.5	-dark blue-grey
60	▮		49	90		LL = 102 PI = 59		Lens of Silty Clayey Sand (SC-CL) Medium dense, dark brown, wet, fine grained -light blue-grey
65	■	32	110	17				**SILTY SAND (SM)** Medium dense, moist, medium blue-grey, fine grained
								Bottom of boring at 66.5 feet
70								
75								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-8

PLATE

B-17

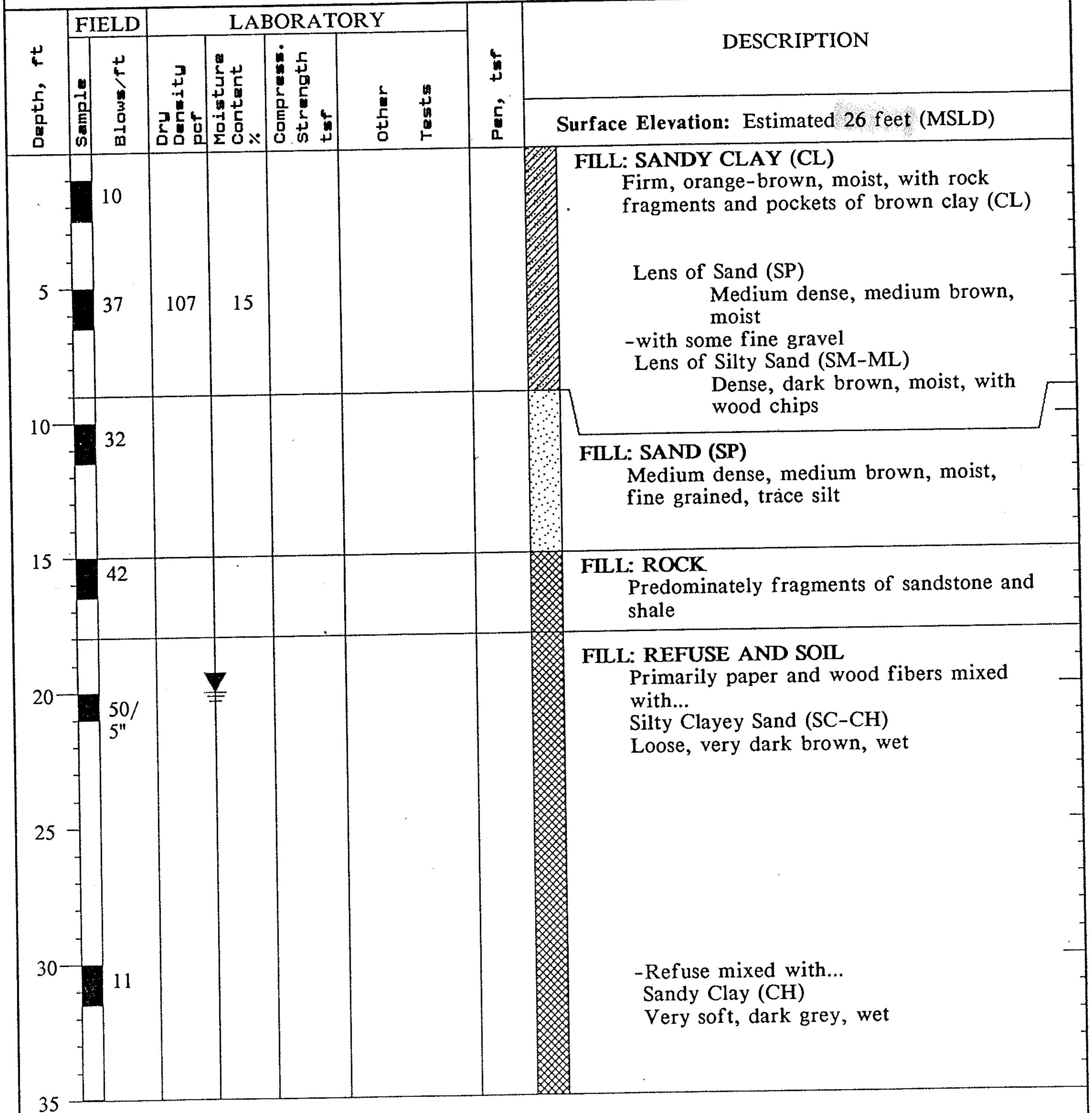
Date Completed: 12/8/89

Logged By: Mike James

Total Depth: 81.5 ft

Sampler: Modified California - 2.5" OD, 2.0" ID
Shelby Tube - 2.8" DIA (nominal)

Hammer Wt: 140 lbs, drop 30 in



Depth, ft	FIELD Sample	 Blows/ft	LABORATORY Dry Density pcf	 Moisture Content %	 Compress. Strength tsf	 Other Tests	Pen, tsf
	■	10					
5	■	37	107	15			
10	■	32					
15	■	42					
20	■	50/ 5"		▼			
25							
30	■	11					
35							

DESCRIPTION

Surface Elevation: Estimated 26 feet (MSLD)

FILL: SANDY CLAY (CL)
Firm, orange-brown, moist, with rock fragments and pockets of brown clay (CL)

Lens of Sand (SP)
Medium dense, medium brown, moist
-with some fine gravel
Lens of Silty Sand (SM-ML)
Dense, dark brown, moist, with wood chips

FILL: SAND (SP)
Medium dense, medium brown, moist, fine grained, trace silt

FILL: ROCK
Predominately fragments of sandstone and shale

FILL: REFUSE AND SOIL
Primarily paper and wood fibers mixed with...
Silty Clayey Sand (SC-CH)
Loose, very dark brown, wet

-Refuse mixed with...
Sandy Clay (CH)
Very soft, dark grey, wet

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-9

PLATE

B-18

Depth, ft	FIELD		LABORATORY				Pen, tsf	DESCRIPTION
	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. strength tsf	Other Tests		(Continued from previous plate)
		50/ 6"						...Fill: Refuse and Soil
								SILTY CLAY (CH) - BAY MUD Soft to firm, medium blue-grey, moist, mixed with pockets of refuse containing paper, glass fragments, etc.
40								
45								-firm, dark grey, with some roots, without refuse
50								-dark blue-grey, with some shells, with some refuse (paper)
55								-mixed with refuse (paper, wood fibers, metal, plastic)
60								-firm, without refuse
65		5	61	62		Torvane 1.8 tsf		
70		5				Torvane 1.7 tsf		
75								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-9

PLATE

B-19

Depth, ft	FIELD		LABORATORY				Pen, tsf		DESCRIPTION
	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests			(Continued from previous plate)
	■	4	67	52				▨	...Bay Mud -dark grey, trace fine grained sand
80	■	30	104	22				▨	**SILTY CLAY (CL-ML) - (OLD BAY CLAY)** Very stiff, blue-grey, moist
									Bottom of boring at 81.5 feet
85									
90									
95									
100									
105									
110									
115									

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-9

PLATE

B-20

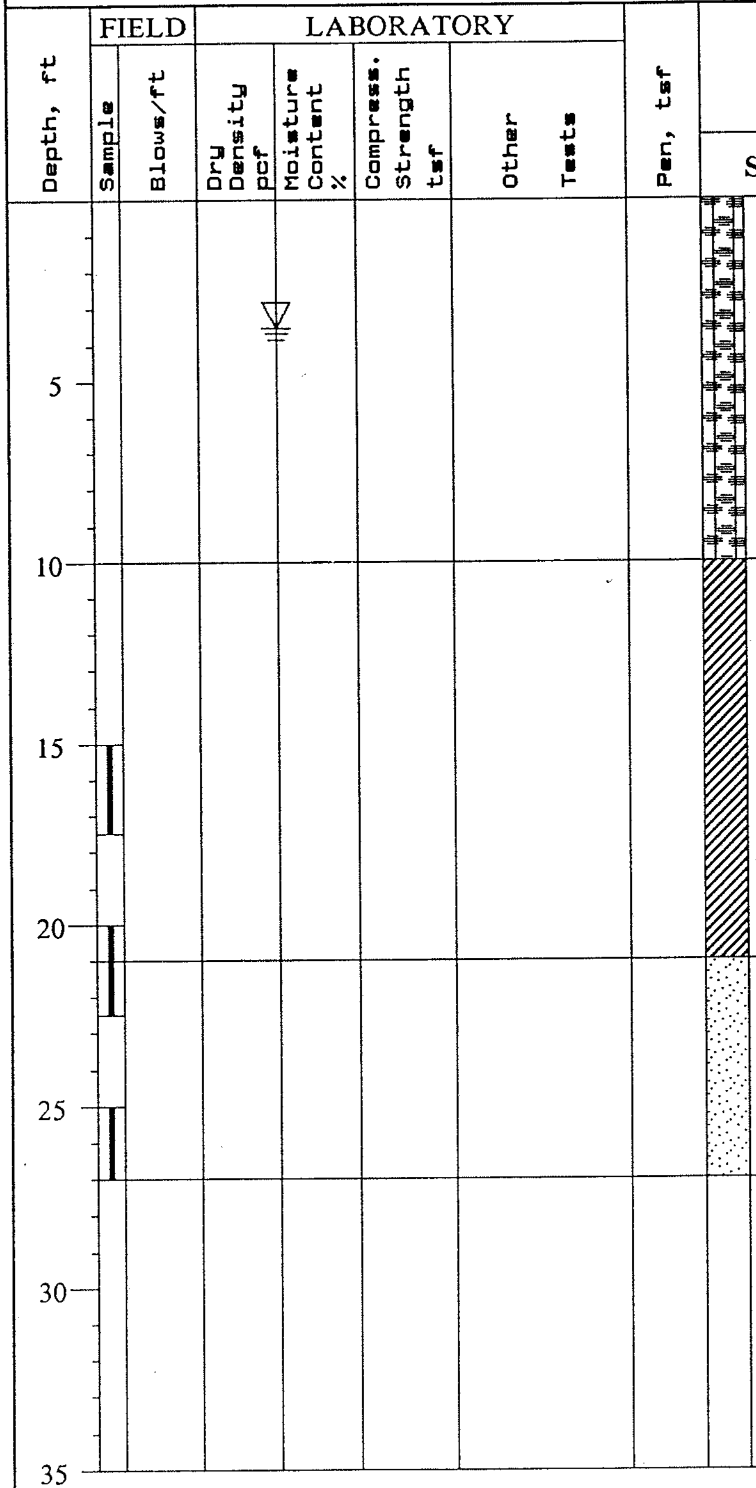
Date Completed: 12/13/89

Logged By: Mike James

Total Depth: 27.0 ft

Sampler: Sheby Tube - 2.8" DIA (nominal)

Hammer Wt: 140 lbs, drop 30 in



DESCRIPTION

Surface Elevation: Estimated 9 feet (MSLD)

FILL: SILTY GRAVEL (GM-ML)
Medium dense, medium brown, moist, gravel to 1", trace fine grained sand
-dark brown, damp

-rubble

SILTY CLAY (CH) - BAY MUD
Soft, dark grey, wet

-firm

SAND (SP)
Medium dense, medium blue-grey, wet, fine grained, trace silt

Bottom of boring at 27.0 feet

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-10

PLATE

B-21

Date Completed: 12/13/89

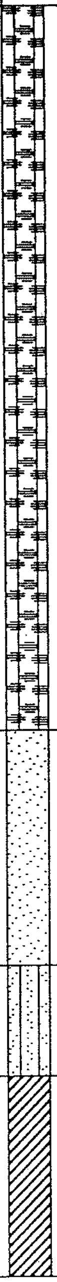
Logged By: Mike James

Total Depth: 52.5 ft

Sampler: Standard Split Spoon - 2.0" OD, 1.4" ID
Shelby Tube - 2.8" DIA (nominal)

Hammer Wt: 140 lbs, drop 30 in

Surface Elevation: Estimated 9 feet (MSLD)



Depth, ft	FIELD Sample	 Blows/ft	LABORATORY Dry Density pcf	 Moisture Content %	 Compress. Strength tsf	 Other Tests	Pen, tsf	DESCRIPTION
								FILL: SILTY GRAVEL (GM-ML) Medium dense, medium to dark brown, moist, gravel to 1", trace fine grained sand
				▽				-wet
5								
10								-gravel to 1/2", less silt, with glass fragments
15								
20								**SAND (SP)** Loose to medium dense, mixed browns, wet, coarse grained, with some gravel to 1/2", trace silt
25	▮							
	▨	4						**SILTY SAND (SM-ML)** Loose, grey-brown and grey, wet, fine grained
30	▮							**SILTY CLAY (CL) - BAY MUD** Firm, dark grey, moist, with some shells
35								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-11

PLATE

B-22

Depth, ft	FIELD Sample	FIELD Blows/ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Compress. Strength tsf	LABORATORY Other Tests	Pen, tsf	DESCRIPTION
								(Continued from previous plate)
								...Bay Mud
40								
45								-trace fine grained sand
50			85	34				SILTY CLAY (CL-ML) - (OLD BAY CLAY) Stiff, orange-brown and grey, moist, trace fine grained sand
								Bottom of boring at 52.5 feet
55								
60								
65								
70								
75								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-11

PLATE

B-23

Date Completed: 12/13/89

Logged By: Mike James

Total Depth: 42.5 ft

Sampler: Shelby Tube - 2.8" DIA (nominal)

Hammer Wt: 140 lbs, drop 30 in

	FIELD		LABORATORY						DESCRIPTION
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf		Surface Elevation: Estimated 9 feet (MSLD)
								▦	**FILL: SILTY GRAVEL (GM)** Medium dense, light to medium brown, moist, gravel to 1"
5			▽					▦	-wet, slightly clayey
10								▦	
								▨	**SILTY CLAY (CH) - BAY MUD** Firm, dark grey, moist, with frequent shells and occasional pockets of silt (ML)
15								▨	
20	▮		52	82				▨	
25								▨	
30								▨	
35									

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-12

PLATE

B-24

	FIELD		LABORATORY						DESCRIPTION
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf		(Continued from previous plate)
								▨	...Bay Mud
40	▮							▨	Lens of: Sand (SP) Medium dense, grey, wet, fine grained
									SAND (SP) Dense, grey-brown, wet, fine grained
45									Bottom of boring at 42.5 feet
50									
55									
60									
65									
70									
75									

KLEINFELDER

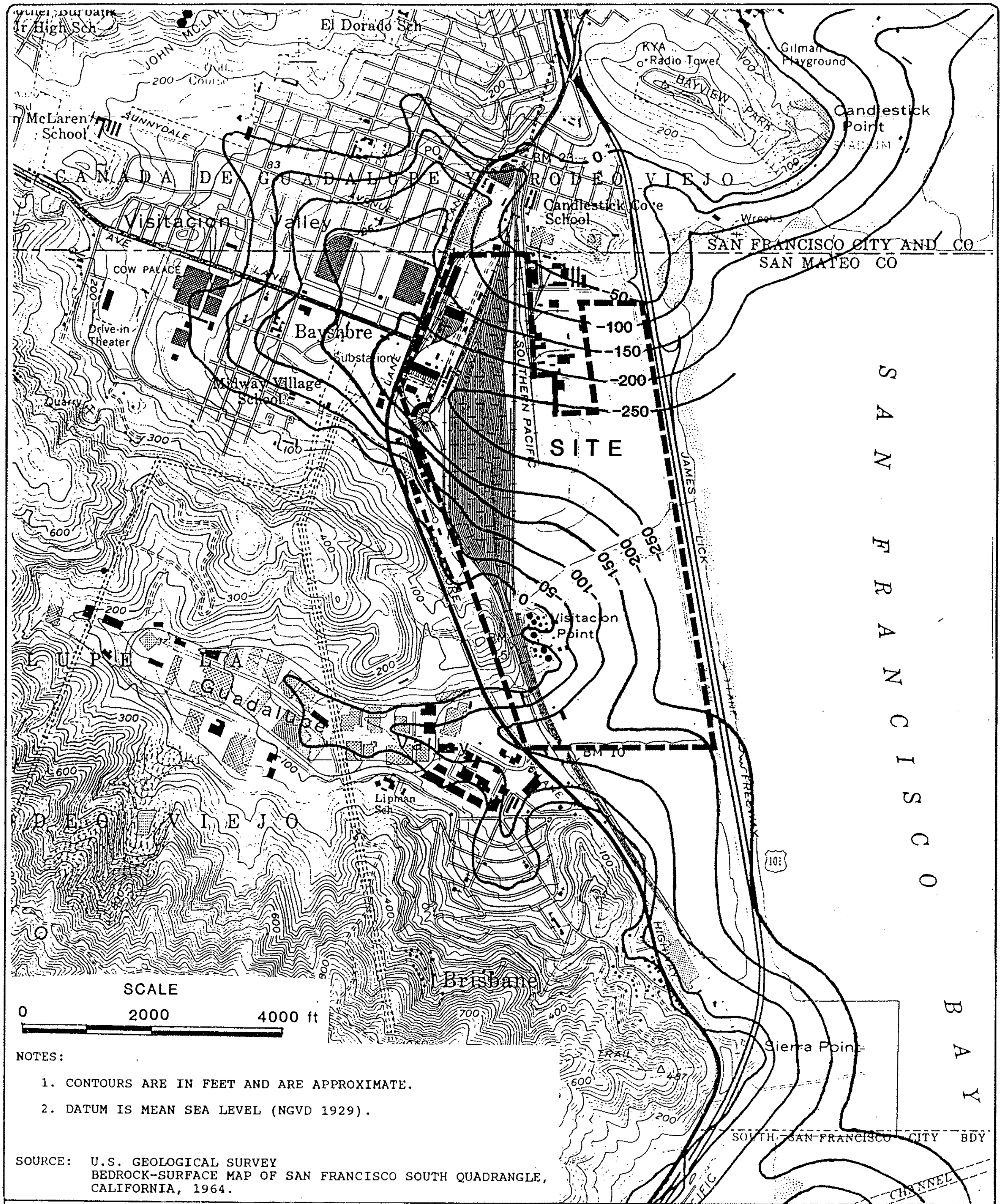
PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-12

PLATE

B-25



NOTES:

1. CONTOURS ARE IN FEET AND ARE APPROXIMATE.
2. DATUM IS MEAN SEA LEVEL (NGVD 1929).

SOURCE: U.S. GEOLOGICAL SURVEY
BEDROCK-SURFACE MAP OF SAN FRANCISCO SOUTH QUADRANGLE, CALIFORNIA, 1964.

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

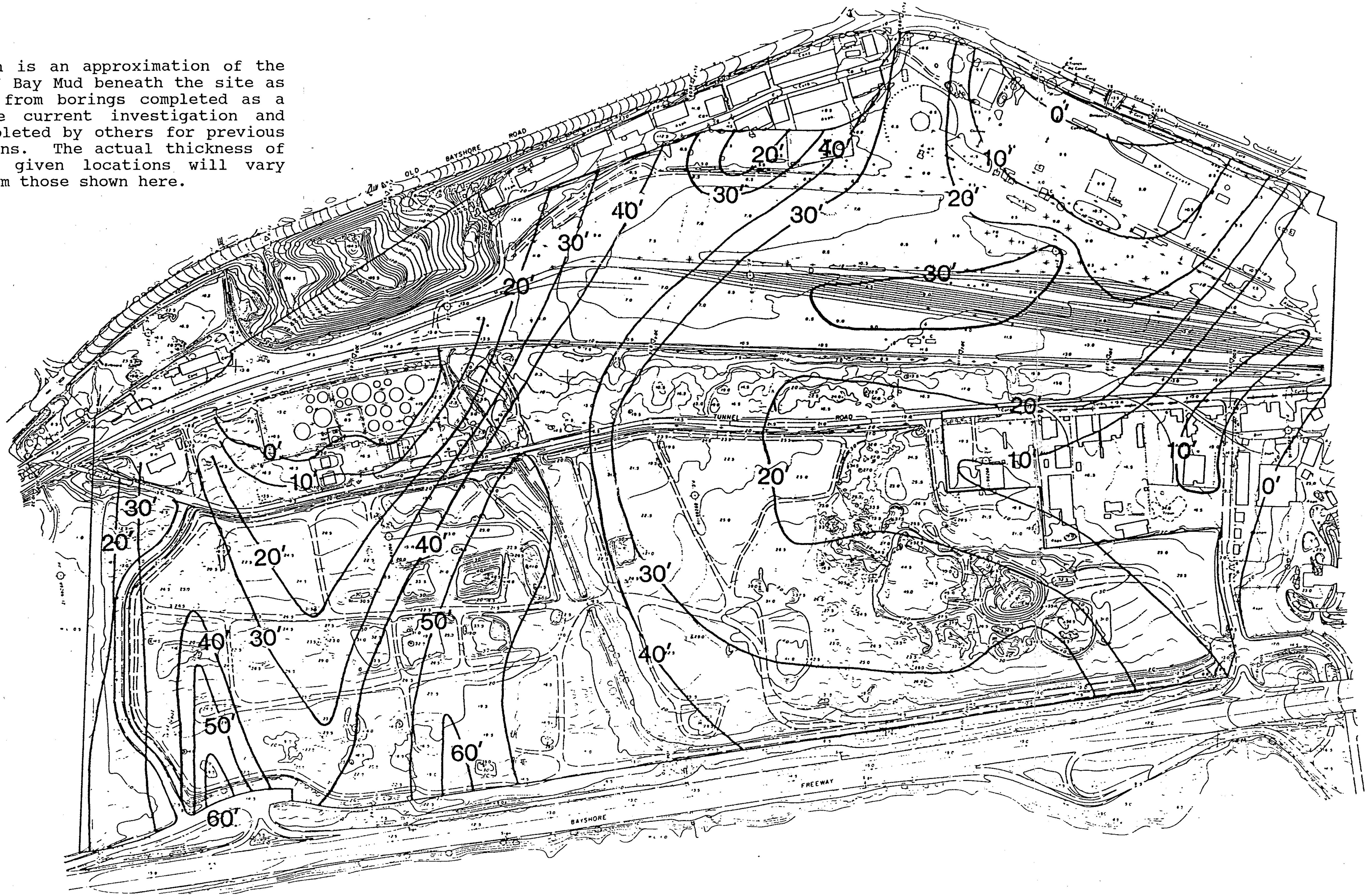
BEDROCK CONTOURS

PLATE

3

NOTE:

This isopach is an approximation of the thickness of Bay Mud beneath the site as interpreted from borings completed as a part of the current investigation and borings completed by others for previous investigations. The actual thickness of Bay Mud at given locations will vary somewhat from those shown here.



North

SCALE
0 600 1200 ft

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

ISOPACH OF BAY MUD

PLATE
10

PROJECT Former Bayshore Railyard, Brisbane, California

BORING NO. RRG-1

BORING SUPERVISOR DK/JP

TYPE OF BORING 8" Hollow Stem Auger

DATE OF BORING 3-27-03

HAMMER WEIGHT 140 lb. Automatic Hammer

SURFACE ELEVATION ---

GROUNDWATER DEPTH	3-27-03	9 feet

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
Firm, brown, sandy silty clay with rootlets and organics, damp **(Fill)**		▨	1) 2.5"	5	---	14	----	
Loose, grey to dark grey, slightly clayey silty sand with pebbles, rock fragments and minor debris (brick, glass, etc.), moist **(Fill)**	5	▨	2) 2.5"	37	102	6	----	
Firm to medium dense, brown to reddish brown, clayey fine sandy silt to silty fine sand with abundant rock fragments and pieces of debris (glass, plastic, etc.), damp to moist **(Fill)**	10	▨	3) 2.5"	6	---	21	----	
Soft, olive brown to olive grey with minor orange brown, fine sandy clayey silt with rock fragments, very moist to wet **(Fill)**	15							
Very soft, very dark grey, silty clay with minor decomposing organics, very moist to wet **(Bay Mud)**		▨	4) 2.5"	1	60	67	490	**PI (Fig. 18)**
Loose, dark grey, silty medium grained sand, wet **(Sand)**	20	▨	5) 2.5"	7	45	89	880	
Very soft to soft, grey to light grey, organic rich layer with abundant shells and other decomposing materials, wet		▨	6) spt*	5	96	22	----	
Very soft to soft, very dark grey, silty clay with minor decomposing organics, very moist to wet **(Bay Mud)** - slight color change to dark olive brown with depth	25	▨	7) 2.5"	4	41	99	1610	
Loose, dark grey to black, silty fine sand with minor organics, wet **(Sand)**	30	▨	8) 2.5"	7	93	23	1230	
Boring terminated at 31 feet 6 inches * spt denotes Standard Penetration Test	35							

Job No. **03-3324**

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Figure **6**

PROJECT	Former Bayshore Railyard, Brisbane, California	**BORING NO.**	RRG-2
BORING SUPERVISOR	DK/JP	TYPE OF BORING	8" Hollow Stem Auger
HAMMER WEIGHT	140 lb. Automatic Hammer	DATE OF BORING	3-27-03
SURFACE ELEVATION	---		
GROUNDWATER DEPTH	3-27-03	5 feet	

DESCRIPTION OF MATERIALS

Firm, dark brown, sandy silty clay with rootlets and rock fragments, damp
(Fill)

Loose, mottled greyish brown, slightly clayey silty sand with rock fragments, pebbles and coarse sand, moist
(Fill)

Loose, greyish brown, silty sand with rock fragments and pebbles, wet
(Fill)

Very soft, dark grey to very dark grey, silty clay with minor decomposing organics, very moist to wet
(Bay Mud)

Boring terminated at 20 feet

DEPTH IN FT.	SAMPLE	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
	▨	1) 2.5"	19	---	7	----	
5							
	▨	2) 2.5"	8	97	19	----	
10							
	▨	3) 2.5"	10	117	15	----	
15							
	▨	4) 2.5"	3	41	97	----	
20	▨	5) 2.5"	2	42	97	----	**PI (Fig. 18)**
25							
30							
35							

Job No. **03-3324**

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Figure 7

PROJECT	Former Bayshore Railyard, Brisbane, California	**BORING NO.**	RRG-3
BORING SUPERVISOR	DK/JP	TYPE OF BORING	8" Hollow Stem Auger
HAMMER WEIGHT	140 lb. Automatic Hammer	DATE OF BORING	3-27-03
SURFACE ELEVATION	---		
GROUNDWATER DEPTH	3-27-03 2 feet 6 inches		

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
Firm, brown, sandy silty clay with rootlets and organics, damp to moist **(Fill)**		▨	1) 2.5"	3	92	23	----	
Soft, brown, sandy silt with rock and brick fragments, minor pebbles, moist **(Fill)**	5	▨	2) 2.5"	46	---	8	----	
Loose to medium dense, olive brown, silty fine sand with rock fragments, wet **(Fill)**	10							
Firm to medium dense, olive brown, slightly clayey fine sandy silt to silty fine sand with abundant rock fragments, moist to wet **(Fill)**		▨	3) 2.5"	4	---	46	----	
Very soft, very dark grey, silty clay with orange brown decomposing organics, very moist to wet **(Bay Mud)**	15	▨	4) 2.5"	2	54	75	840	**PI (Fig. 18)**
Loose, very dark grey to black, slightly silty fine sand with abundant shell fragments, very moist to wet **(Sand)**	20	▨	5) 2.5"	4	---	--	----	**Consolidation (Fig. 19)**
Very soft to soft, very dark grey, silty clay with minor orange brown decomposing organics, very moist to wet **(Bay Mud)** - dark grey slightly silty fine sand layer with minor shells and decaying organics at 20 feet 6 inches	25	▨	6) 2.5"	12	103	19	850	
Loose to medium dense, dark olive grey, silty fine sand, wet **(Sand)**	30							
Medium dense, olive brown to yellowish brown, slightly silty fine sand, mottled with grey fine sand, very moist to wet **(Sand)**		▨	7) 2.5"	33	103	18	1520	
Boring continued on Figure 8A	35							

Job No. **03-3324**

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Figure **8**

PROJECT	Former Bayshore Railyard, Brisbane, California	**BORING NO.**	RRG-3 (cont'd)
BORING SUPERVISOR	DK/JP	TYPE OF BORING 8" Hollow Stem Auger	DATE OF BORING 3-27-03
HAMMER WEIGHT	140 lb. Automatic Hammer		
SURFACE ELEVATION	---		
GROUNDWATER DEPTH	3-27-03	2 feet 6 inches	

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
- Continued from Figure 8		▨	8) 2.5"	38	103	18	470	
- sand color gradually grades to olive grey with depth	40							
Boring terminated at 43 feet		▨	9) 2.5"	40	110	19	790	
		▨	10) spt*	46	---	20	----	
* spt denotes Standard Penetration Test	45							
	50							
	55							
	60							
	65							
	70							

Job No. 03-3324

Michelucci & Associates, Inc.

Figure **8A**

PROJECT Former Bayshore Railyard, Brisbane, California

BORING NO. RRG-4

BORING SUPERVISOR DK/JP

TYPE OF BORING 8" Hollow Stem Auger

DATE OF BORING 3-28-03

HAMMER WEIGHT 140 lb. Automatic Hammer

SURFACE ELEVATION ---

GROUNDWATER DEPTH	3-28-03	8 feet

DESCRIPTION OF MATERIALS

Firm, dark brown, sandy silty clay with rootlets and rock fragments, damp to moist
(Fill)

Medium stiff to stiff, olive brown to olive grey, sandy clayey silt with abundant rock fragments, damp to moist
(Fill)

Loose to medium dense, reddish brown, clayey silty fine sand, very moist
(Fill)

Loose, orange brown, slightly clayey silty fine sand, very moist
(Fill)

Very soft, very dark grey, silty clay, very moist to wet
(Bay Mud)
- minor shell fragments at 15 feet

Medium dense, olive brown to olive grey, slightly silty fine sand, very moist to wet
(Sand)
- minor rock fragments and organics present in Sample 6
- grades to yellowish brown to orange brown in color at 30 feet
- minor orange brown iron staining at 31 feet

DEPTH IN FT.	SAMPLE	SAMPLE NUMBER- SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
	▨	1) 2"	29	---	7	----	
5							
	▨	2) 2"	6	118	18	800	
10							
	▨	3) 2.5"	1/18"	48	87	680	**Consolidation (Fig. 20)**
15							
	▨	4) 2.5"	3	---	67	----	**PI (Fig. 18)**
20							
	▨	5) 2.5"	2	56	67	1180	
25							
	▨	6) 2.5"	37	107	16	840	
30							
	▨	7) 2"	28	111	20	1220	
35							

Boring continued on Figure 9A

PROJECT Former Bayshore Railyard, Brisbane, California

BORING NO. RRG-4 (cont'd)

BORING SUPERVISOR DK/JP

TYPE OF BORING 8" Hollow Stem Auger

DATE OF BORING 3-28-03

HAMMER WEIGHT 140 lb. Automatic Hammer

SURFACE ELEVATION ---

GROUNDWATER DEPTH 3-28-03 8 feet

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
- Continued from Figure 9		▨	8) 2"	26	110	21	2330	
- slight increase in clay content beyond 37 feet - grades to light olive brown in color at 40 feet	40							
Boring terminated at 43 feet		▨	9) 2"	36	115	18	5350	
		▨	10) spt*	29	118	19	----	
* spt denotes Standard Penetration Test	45							
	50							
	55							
	60							
	65							
	70							

Job No. **03-3324**

Michelucci & Associates, Inc.

Figure **9A**

PROJECT Former Bayshore Railyard, Brisbane, California

BORING NO. RRG-5

BORING SUPERVISOR DK/JP

TYPE OF BORING 8" Hollow Stem Auger

DATE OF BORING 3-31-03

HAMMER WEIGHT 140 lb. Automatic Hammer

SURFACE ELEVATION ---

GROUNDWATER DEPTH 3-31-03 4 feet

DESCRIPTION OF MATERIALS

Firm, brown to dark olive brown, sandy clayey silt to sandy silty clay with rootlets and rock fragments, damp to moist
(Fill)

Firm to stiff, olive brown to olive grey, sandy clayey silt to sandy silty clay with abundant rock fragments, damp to moist
(Fill)

- dark brown silty clay lense with strong brown fine sand at 2 feet
- seepage at 4 feet
- abundant rock fragments at 5 feet

Soft, very dark grey to black, sandy silty clay with rock fragments, wood chips, glass and pottery pieces, minor organics, very moist to wet
(Fill)

Medium dense to dense, olive grey to grey, silty fine sand with minor organics, very moist to wet
(Sand)

- rock fragments within Sample 4
- color changes to olive brown and orange brown at 20 feet
- dense at 20 feet
- very dense at 31 feet

Boring terminated at 33 feet

* spt denotes Standard Penetration Test

DEPTH IN FT.	SAMPLE	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
	▨	1) 2"	47	120	10	----	
5							
	▨	2) 2"	12	---	--	----	
10							
	▨	3) 2"	4	76	43	490	
15							
	▨	4) 2.5"	17	100	19	310	
20							
	▨	5) 2.5"	36	101	20	1480	
25							
	▨	6) 2"	32	109	19	1100	
30							
	▨	7) 2"	24	110	21	2350	
	▨	8) spt*	58	116	23	----	
35							

Job No. **03-3324**

Michelucci & Associates, Inc.

Figure **10**

PROJECT	Former Bayshore Railyard, Brisbane, California	**BORING NO.**	RRG-6
BORING SUPERVISOR	DK/JP	TYPE OF BORING	8" Hollow Stem Auger
HAMMER WEIGHT	140 lb. Automatic Hammer	DATE OF BORING	3-28-03
SURFACE ELEVATION	---		
GROUNDWATER DEPTH	3-28-03	4 feet	

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE	SAMPLE NUMBER- SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
Firm, olive grey to olive brown, sandy silty clay to sandy clayey silt with rootlets and rock fragments, damp to moist **(Fill)**		▨	1) 2"	33	123	8	1870	
	5							
Firm to medium stiff, olive grey and olive brown, sandy clayey silt with lenses of orange brown and reddish brown sand and silt and abundant rock fragments, damp **(Fill)** - seepage at 4 feet		▨	2) 2"	11	---	9	----	
	10							
Firm to medium stiff, dark grey, silty clay with abundant rock fragments, wet **(Fill)**		▨	3) 2.5"	6	---	--	----	
	15							
Medium stiff, olive brown, sandy clayey silt with abundant rock fragments, wet **(Fill)**		▨	4) 2.5"	23	---	15	----	
	20							
Very soft to soft, very dark grey, silty clay with shell fragments, very moist to wet **(Bay Mud)**		▨	5) 2.5"	17	---	13	----	
	25							
Medium dense to dense, mottled orange brown to strong brown, clayey silty fine sand, very moist **(Sand)** - lenses of olive grey to grey silty fine sand in Sample 8		▨	6) 2.5"	4	64	53	1450	
	30							
		▨	7) 2.5"	26	109	16	3960	
	35							

Boring continued on Figure 11A

PROJECT Former Bayshore Railyard, Brisbane, California

BORING NO. RRG-6
(cont'd)

BORING SUPERVISOR DK/JP

TYPE OF BORING 8" Hollow Stem Auger

DATE OF BORING 3-28-03

HAMMER WEIGHT 140 lb. Automatic Hammer

SURFACE ELEVATION ---

GROUNDWATER DEPTH	3-28-03	4 feet

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
- Continued from Figure 11		▨	8) 2"	43	110	20	3860	
Medium dense to dense, olive grey and olive brown, silty fine sand, very moist **(Sand)**	40							
Boring terminated at 53 feet		▨	9) 2"	27	108	21	900	
* spt denotes Standard Penetration Test	45							
		▨	10) 2"	48	108	20	1550	
	50							
		▨	11) 2"	32	112	19	2770	
		▨	12) spt*	26	111	21	----	
	55							
	60							
	65							
	70							

Job No. **03-3324**

Michelucci & Associates, Inc.

Figure **11A**

PROJECT	Former Bayshore Railyard, Brisbane, California	BORING NO. RRG-7

BORING SUPERVISOR	DK/JP	TYPE OF BORING 8" Hollow Stem Auger	DATE OF BORING 3-31-03
HAMMER WEIGHT	140 lb. Automatic Hammer		
SURFACE ELEVATION	---		
GROUNDWATER DEPTH	3-31-03	5 feet	

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
Medium dense, olive grey to olive brown, silty clayey very fine sand with abundant rock fragments, moist to very moist **(Fill)**		▨	1) 2"	21	---	9	----	
Soft, dark brown, sandy silt with abundant rock fragments, very moist to wet **(Fill)**	5	▨	2) 2"	7	---	--	----	
Very soft to soft, very dark grey, silty clay with minor decomposing organics, very moist to wet **(Bay Mud)** - minor shell fragments at 15 feet	10	▨	3) 2.5"	3	50	77	420	
Loose, mottled olive grey and minor brown, slightly clayey silty fine sand with minor organics, very moist to wet **(Sand)**	15	▨	4) 2.5"	2/18"	42	98	490	**Consolidation (Fig. 21)**
Medium dense, dark olive grey, slightly clayey silty fine sand, very moist **(Sand)** - grades to yellowish brown in color at 30 feet - minor pebbles in Sample 8	20	▨	5) 2.5"	6	105	18	1650	
	25	▨	6) 2"	36	122	15	4880	
	30	▨	7) 2"	30	107	21	2290	
	35							

Boring continued on Figure 12A

PROJECT	Former Bayshore Railyard, Brisbane, California	**BORING NO.**	RRG-7 (cont'd)
BORING SUPERVISOR	DK/JP	TYPE OF BORING 8" Hollow Stem Auger	DATE OF BORING 3-31-03
HAMMER WEIGHT	140 lb. Automatic Hammer		
SURFACE ELEVATION	---		
GROUNDWATER DEPTH	3-31-03	5 feet	

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
- Continued from Figure 12		▨	8) 2"	30	101	23	270	
Boring terminated at 38 feet		▨	9) spt*	50	---	21	----	
	40							
* spt denotes Standard Penetration Test								
	45							
	50							
	55							
	60							
	65							
	70							

PROJECT	Former Bayshore Railyard, Brisbane, California	**BORING NO.**	RRG-8
BORING SUPERVISOR	DK/JP	TYPE OF BORING	8" Hollow Stem Auger
HAMMER WEIGHT	140 lb. Automatic Hammer	DATE OF BORING	3-31-03
SURFACE ELEVATION	---		
GROUNDWATER DEPTH	3-31-03	5 feet	

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
Medium dense to firm, brown to very dark brown, silty very fine sand to fine sandy silt with abundant rock fragments, rootlets and pieces of wood debris, damp **(Fill)** - lenses of black fine sand in Sample 1 - fragments of concrete debris		▨	1) 2"	19/3"	98	13	----	
	5	▨	2) 2"	9	---	12	----	
Firm, olive grey, sand and silt with abundant rock and concrete fragments, wet **(Fill)** - heavy seepage at 5 feet	10							
Loose, very dark grey to black, very clayey and silty fine sand with abundant shell fragments, very moist to wet **(Sand)**		▨	3) 2"	1/18"	86	35	500	
Loose, very dark grey, silty fine sand with minor shells, very moist to wet **(Sand)**	15	▨	4) 2.5"	17	101	20	4320	
Medium dense, mottled olive and strong brown, clayey silty fine sand with dark yellowish brown mottling, minor decomposing rootlets and organics, very moist to wet **(Sand)**	20	▨	5) 2.5"	41	106	17	2390	
		▨	6) spt*	46	121	17	----	
Dense, olive brown and dark yellowish brown, slightly clayey silty fine sand, very moist to wet **(Sand)**	25							
Boring terminated at 23 feet								
* spt denotes Standard Penetration Test	30							
	35							

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Figure 13

PROJECT Former Bayshore Railyard, Brisbane, California

BORING NO. RRG-9

BORING SUPERVISOR

TYPE OF BORING

DATE OF BORING

HAMMER WEIGHT

SURFACE ELEVATION ---

GROUNDWATER DEPTH

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
	5							
	10							
	15							
	20							
	25							
	30							
	35							

BORING

ELIMINATED

Job No. 03-3324

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Figure 14

PROJECT	Former Bayshore Railyard, Brisbane, California	**BORING NO.**	RRG-10

BORING SUPERVISOR	DK/JP	TYPE OF BORING	8" Hollow Stem Auger
HAMMER WEIGHT	140 lb. Automatic Hammer	DATE OF BORING	4-2-03
SURFACE ELEVATION	---		
GROUNDWATER DEPTH	4-2-03	7 feet	

DESCRIPTION OF MATERIALS

Firm, olive grey to grey, sandy clayey silt with gravel, rock fragments and minor rootlets, damp
(Fill)

Medium dense, olive brown to brown, silty clayey fine sand with abundant rock fragments and pieces of debris (brick, concrete, etc.), damp
(Fill)

Firm, very dark brown to black, sandy silt with gravel, moist
(Fill)
- glass fragments at the bottom of Sample 1

Soft, mottled dark grey, silty clay, moist to very moist
(Bay Mud)
- increase in moisture content at 7 feet
- grades to very dark grey at 15 feet
- minor shell fragments in Sample 4
- grades to dark grey at 20 feet
- dark brown decomposing organics in Sample 6

Stiff, greenish grey, sandy silty clay with minor olive brown mottling and minor rock fragments, damp to moist
(Older Bay Mud)

Very stiff, olive brown to olive grey, silty clay with minor yellowish brown fine sand and strong brown mottling and scattered rock fragments, damp to moist
(Probable Colluvium)

Boring terminated at 33 feet

* spt denotes Standard Penetration Test

DEPTH IN FT.	SAMPLE	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
	▨	1) 2"	21	---	3	----	
5							
	▨	2) 2"	12	72	51	540	
10							
	▨	3) 2.5"	2	49	75	620	**PI (Fig. 18)**
15							
	▨	4) 2.5"	1/18"	48	82	550	
20							
	▨	5) 2.5"	2/18"	46	86	840	**Consolidation (Fig. 22)**
25							
	▨	6) 2.5"	5	40	103	950	
30							
	▨	7) 2"	35	113	19	4490	
	▨	8) spt*	33	106	21	----	
35							

Job No. **03-3324**

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Figure **15**

PROJECT	Former Bayshore Railyard, Brisbane, California	**BORING NO.**	RRG-11

BORING SUPERVISOR DK/JP

TYPE OF BORING 8" Hollow Stem Auger

DATE OF BORING 4-1-03

HAMMER WEIGHT 140 lb. Automatic Hammer

SURFACE ELEVATION ---

GROUNDWATER DEPTH	4-1-03	2 feet 6 inches

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
Medium dense to firm, brown, slightly clayey silty fine sand to fine sandy silt with abundant rock fragments, damp **(Fill)**		▨	1) 2"	16	130	10	1210	
Loose, mottled greyish brown, silty sand with rock fragments, very moist to wet **(Fill)** - seepage at 2 feet 6 inches - sand grades coarser in Sample 2 and increase in rock fragment content - brick fragments also present in Sample 2	5							
		▨	2) 2"	3	---	14	----	
Very soft, very dark grey, silty clay, very moist to wet **(Bay Mud)** - abundant shell fragments in Sample 4	10							
		▨	3) 2"	1/18"	62	65	550	
	15							
		▨	4) 2.5"	1/18"	62	62	440	
	20							
		▨	5) 2.5"	1/18"	54	69	1000	**Consolidation (Fig. 23)**
	25							
		▨	6) 2.5"	2	54	71	370	
- minor shell fragments in Samples 6 to 8	30							
		▨	7) 2.5"	3	52	74	430	**PI (Fig. 18)**
	35							

Boring continued on Figure 16A

PROJECT Former Bayshore Railyard, Brisbane, California

BORING NO. RRG-11
(cont'd)

BORING SUPERVISOR DK/JP

TYPE OF BORING 8" Hollow Stem Auger

DATE OF BORING 4-1-03

HAMMER WEIGHT 140 lb. Automatic Hammer

SURFACE ELEVATION ---

GROUNDWATER DEPTH 4-1-03 2 feet 6 inches

DESCRIPTION OF MATERIALS

- Continued from Figure 16

- minor orange brown mottling in Sample 9

- grades to dark greyish brown in color and sandier within top of Sample 12

Medium dense, mottled very dark grey with olive grey, clayey silty fine sand, moist to very moist
(Sand)

Dense, greyish brown to olive brown, slightly silty fine sand, moist
(Sand)
- sand grades coarser with depth

Stiff to very stiff, very dark greyish brown, fine sandy clayey silt, moist
(Older Bay Mud)
- dark greyish brown sand lens from 66 feet 6 inches to 67 feet 6 inches

Boring terminated at 68 feet

DEPTH IN FT.	SAMPLE	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
	▨	8) 2.5"	3	54	68	370	
40							
	▨	9) 2.5"	6	58	64	390	**Consolidation (Fig. 24)**
45							
	▨	10) 2"	4	59	67	740	
50							
	▨	11) 2.5"	8	56	64	630	
55							
	▨	12) 2.5"	6	111	18	470	
60							
	▨	13) 2.5"	53	108	16	790	
65							
	▨	14) 2"	17	102	26	1920	
	▨	15) 2"	31	102	26	950	
70							

PROJECT Former Bayshore Railyard, Brisbane, California

BORING NO. RRG-12

BORING SUPERVISOR	DK/JP		
TYPE OF BORING	8" Hollow Stem Auger		
DATE OF BORING	4-1-03		
HAMMER WEIGHT	140 lb. Automatic Hammer		
SURFACE ELEVATION	---		
GROUNDWATER DEPTH	4-1-03	5 feet	

DESCRIPTION OF MATERIALS

Firm, olive brown, fine sandy clayey silt with abundant rock fragments, damp
(Fill)

Firm, dark greyish brown to olive brown, sandy silty clay to clayey silt with abundant rock fragments, moist
(Fill)
- heavy seepage at 5 feet
- abundant rock fragments between 7 feet and 11 feet

Firm, mottled dark grey, silty clay with rock fragments, moist to wet
(Fill)

Soft, very dark grey, silty clay with minor decaying organics, wet
(Bay Mud)

Very soft, very dark grey, silty clay with minor sand, very moist to wet
(Older Bay Mud)
- grades sandier with depth
- grades into dark grey silty clayey fine sand with minor shells and decaying brown organics at 26 feet

Very dense, greenish grey to olive grey, silty fine sand, moist to wet
(Sand)
- grades to yellowish brown to olive brown in color

Very dense, yellowish brown, deeply weathered siltstone with grey clayey veins, damp
(Weathered Bedrock)

Boring terminated at 33 feet 1 inch

* spt denotes Standard Penetration Test

DEPTH IN FT.	SAMPLE	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
	▨	1) 2"	42	---	3	----	
5	▨	2) 2"	17	---	18	----	
10	▨	3) 2"	20	---	10	----	
15	▨	4) 2"	28	100	27	----	
20	▨	5) 2.5"	19	74	41	330	
25	▨	6) 2.5"	2/18"	63	56	1150	
30	▨	7) 2.5"	81	99	23	320	
	▨	8) 2"	50/4"	121	14	6370	
	▨	9) spt*	50/3"	---	--	----	
35							

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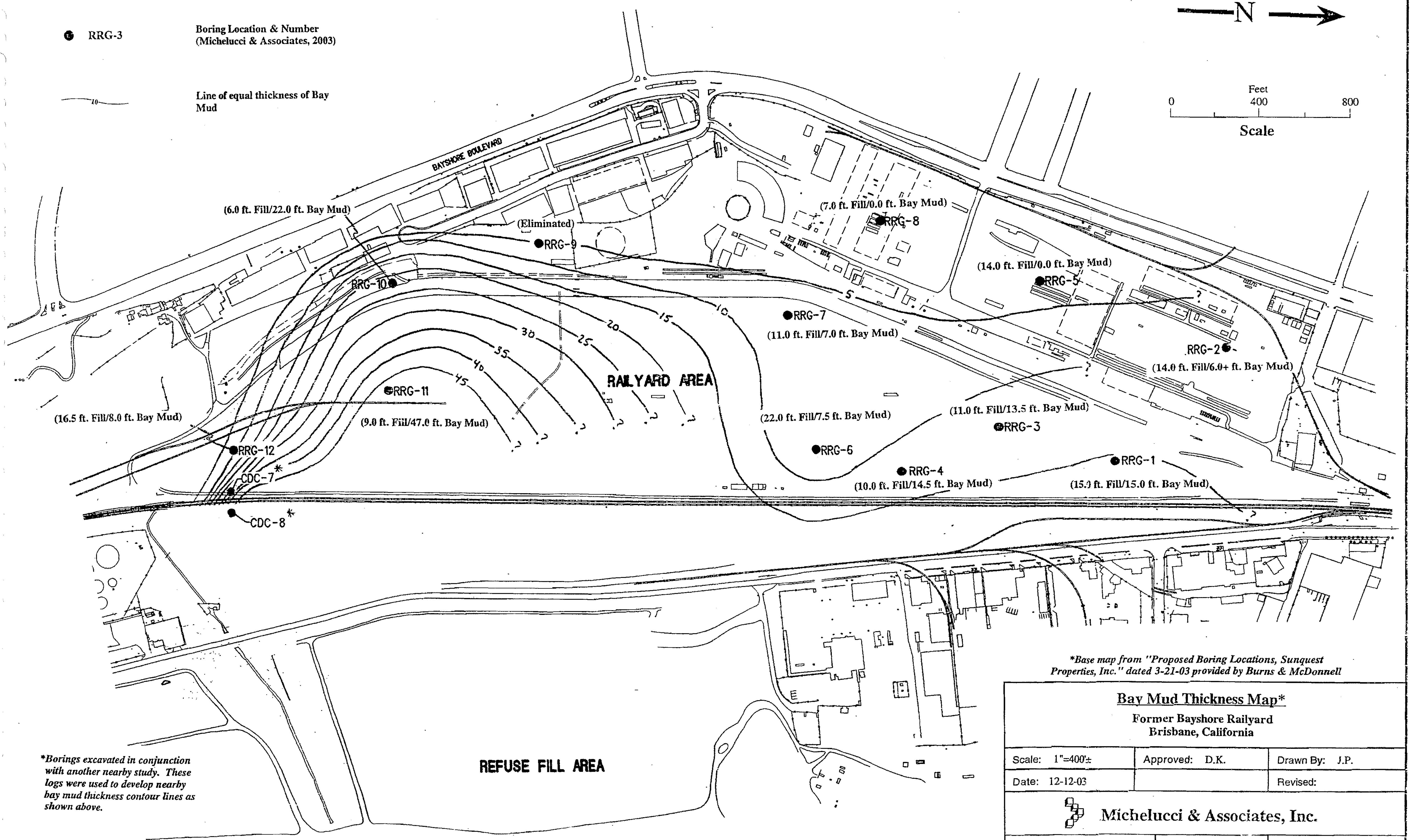
Figure **17**

EXPLANATION

● RRG-3 Boring Location & Number (Michelucci & Associates, 2003)

—10— Line of equal thickness of Bay Mud



Borings excavated in conjunction with another nearby study. These logs were used to develop nearby bay mud thickness contour lines as shown above.

Base map from "Proposed Boring Locations, Sunquest Properties, Inc." dated 3-21-03 provided by Burns & McDonnell

Bay Mud Thickness Map*

Former Bayshore Railyard
Brisbane, California

Scale: 1"=400'±	Approved: D.K.	Drawn By: J.P.
Date: 12-12-03		Revised:

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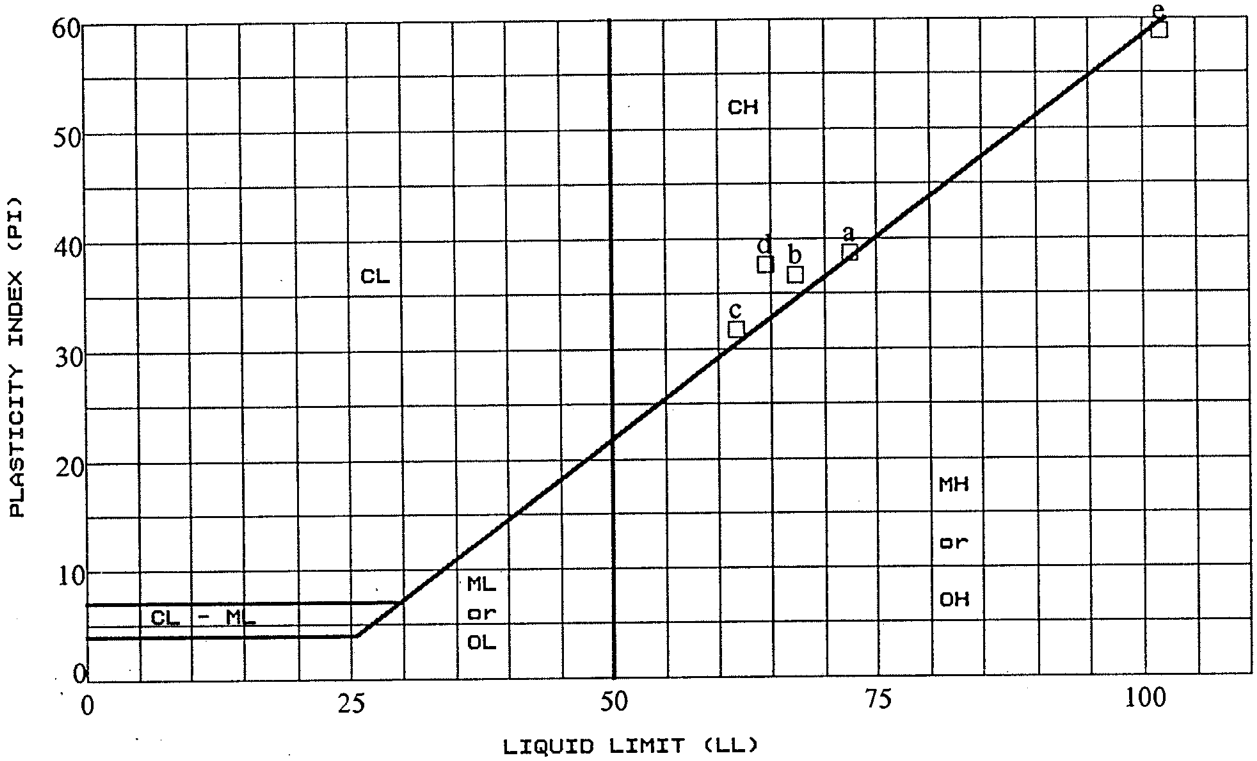
Job No. 03-3324		Figure 5

APPENDIX B
Laboratory Test Results



Symbol	Boring	Depth	LL	PL	PI	Sample Description
a	B-3	20.00	72	34	39	Dark blue-grey SILTY CLAY (CH) - BAY MUD
b	B-5	40.00	67	31	37	Medium grey SILTY CLAY (CH) - BAY MUD
c	B-7	45.00	62	30	32	Medium blue-grey SILTY CLAY (CH) - BAY MUD
d	B-7	55.00	65	27	38	Dark grey CLAYEY SAND (SC) - BAY MUD
e	B-8	60.00	102	43	59	Dark blue-grey CLAYEY SILT (MH-CH) - BAY MUD

Unified Soil Classification

Fine Grained Soil Groups

Symbol	LL < 50	Symbol	LL > 50
ML	Inorganic clayey silts to very fine sands of slight plasticity	MH	Inorganic silts and clayey silts
CL	Inorganic clays of low to medium plasticity	CH	Inorganic clays of high plasticity
OL	Organic silts and organic silty clays of low plasticity	OH	Organic clays of medium to high plasticity, organic silts

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PROJECT NO. 11-2147-02

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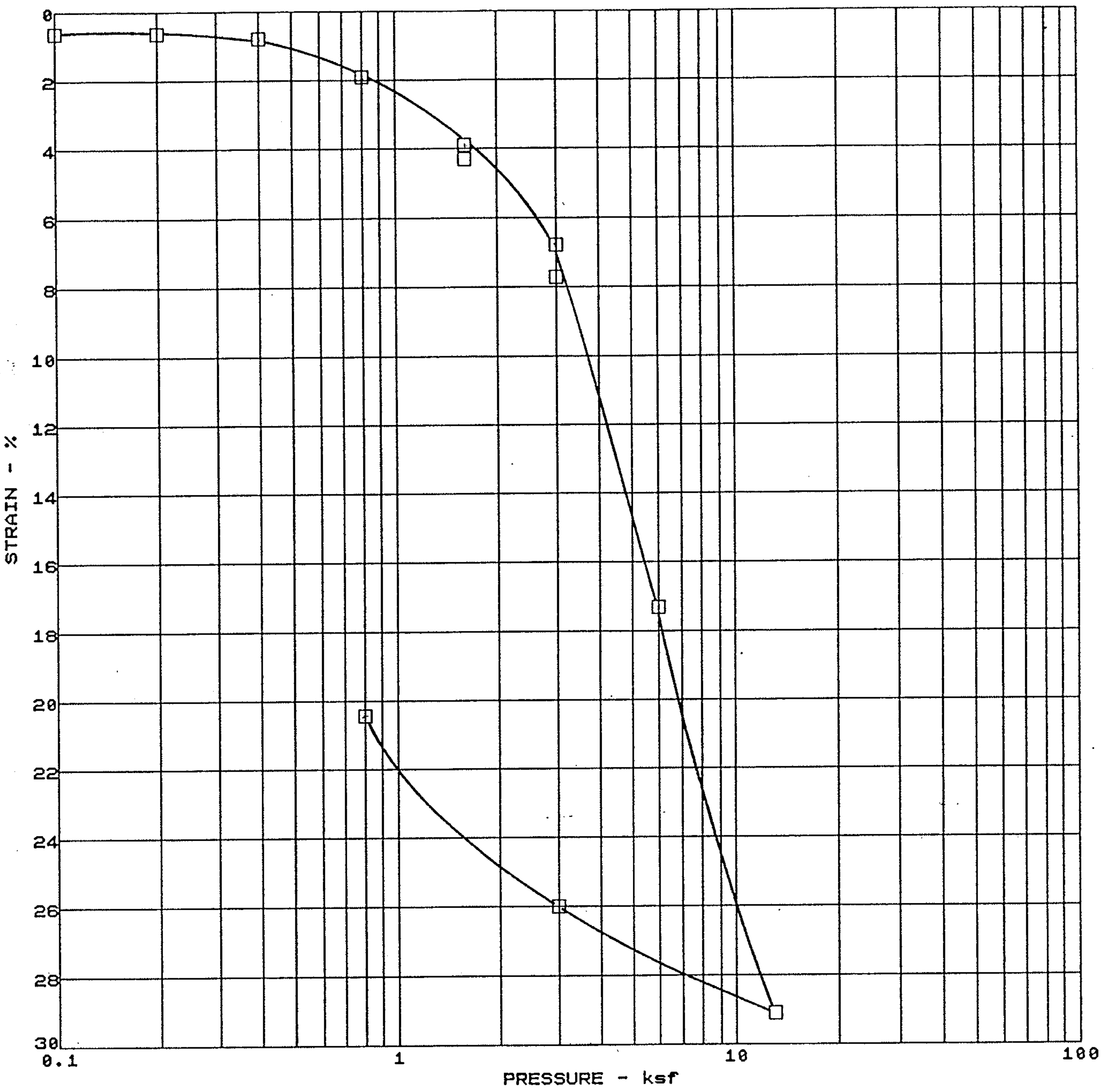
Brisbane, California

PLASTICITY CHART

PLATE

C-1



BORING NO. B-8

DEPTH 60.0 ft

DESCRIPTION Dark blue-grey CLAYEY SILT (MH-CH) - BAY MUD

PRECONSOLIDATION PRESSURE ksf

COMPRESSION RATIO= C_c /1+e_0

RECOMPRESSION RATIO= C_r /1+e_0

LL = 102 PL = 43

	INITIAL	FINAL
DRY DENSITY, lb/ft^3	48.5	60.9
WATER CONTENT, %	89.9	68.7
VOID RATIO	2.809	2.034
DEG. OF SAT., %	94.7	100.0
SAMPLE HEIGHT, in.	0.770	0.610

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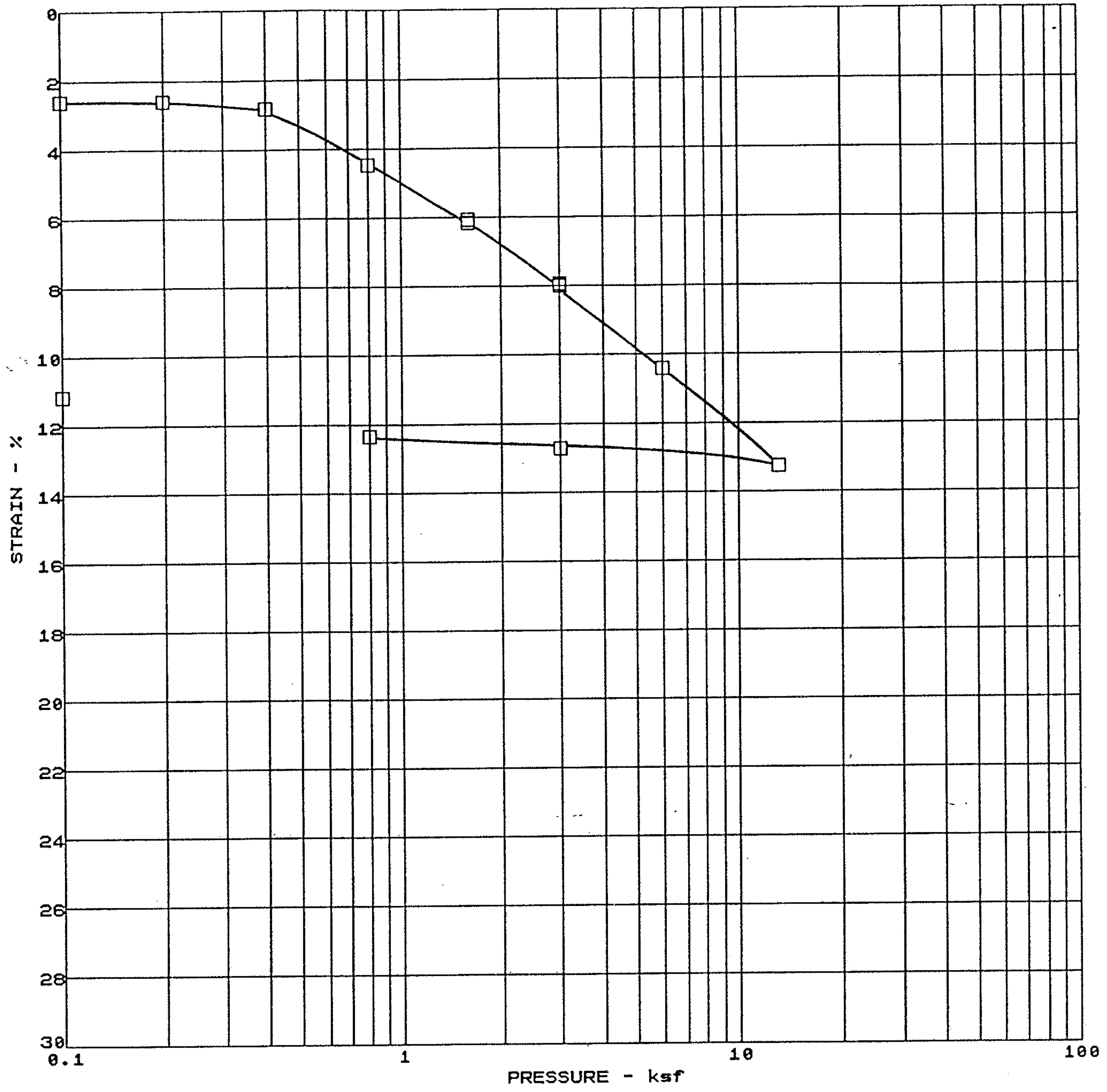
CONSOLIDATION TEST

PLATE

C-2



BORING NO. B-11

DEPTH 50.0 ft

DESCRIPTION Dark grey SILTY CLAY (CH) - BAY MUD

PRECONSOLIDATION PRESSURE ________ ksf

COMPRESSION RATIO= C_c /1+e_0 ________

RECOMPRESSION RATIO= C_r /1+e_0 ________

LL = ________ PL = ________

	INITIAL	FINAL
DRY DENSITY, lb/ft^3	84.8	95.1
WATER CONTENT, %	33.7	27.2
VOID RATIO	0.966	0.753
DEG. OF SAT., %	93.2	96.5
SAMPLE HEIGHT, in.	0.770	0.684

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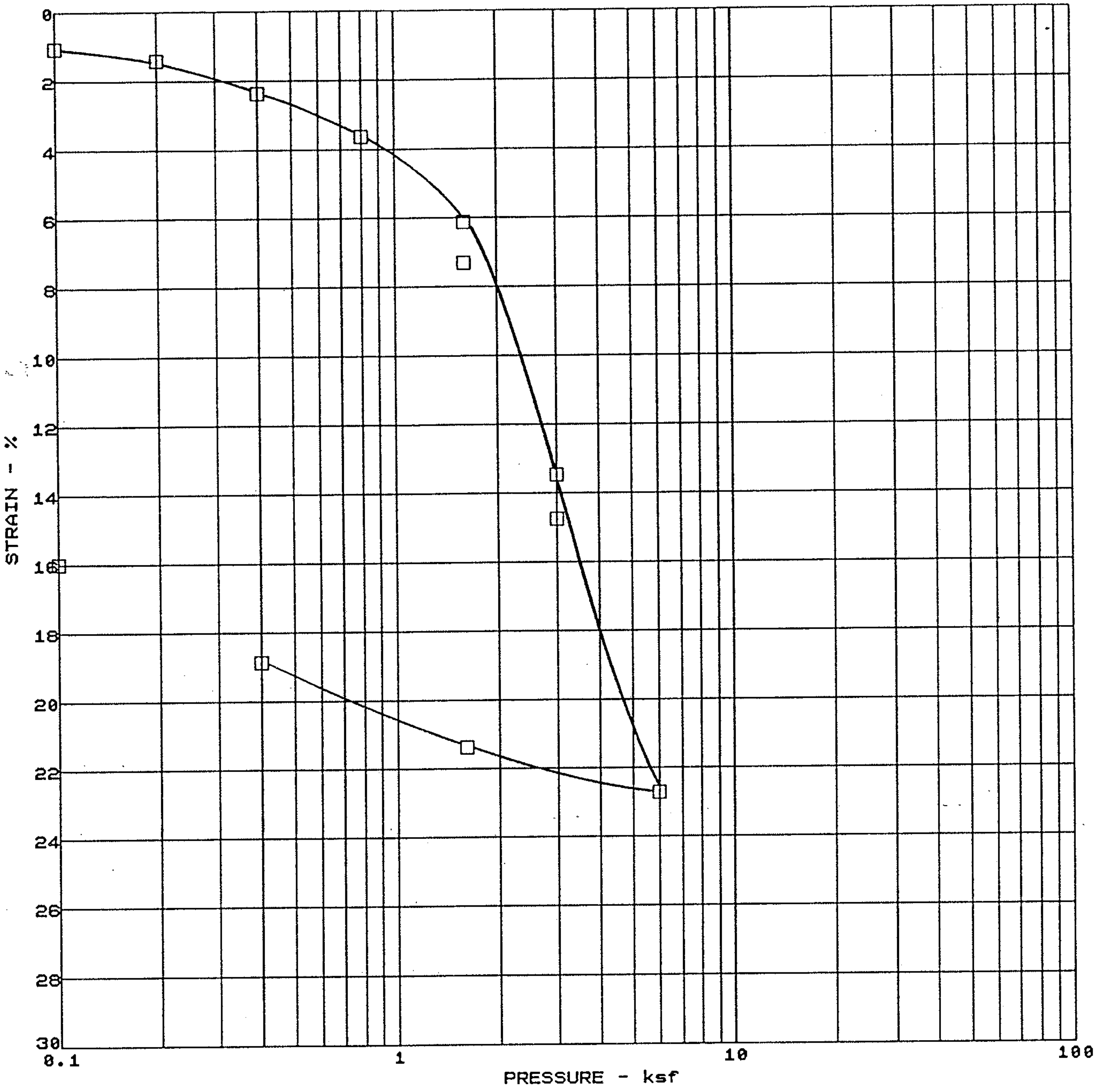
Brisbane, California

CONSOLIDATION TEST

PLATE

C-3



BORING NO. B-12

DEPTH 20.0 ft

DESCRIPTION Dark grey SILTY CLAY (CH) - BAY MUD

PRECONSOLIDATION PRESSURE ______ ksf

COMPRESSION RATIO= C_c /1+e_0 ______

RECOMPRESSION RATIO= C_r /1+e_0 ______

LL = ______ PL = ______

	INITIAL	FINAL
DRY DENSITY, lb/ft^3	51.9	61.4
WATER CONTENT, %	82.5	66.3
VOID RATIO	2.398	1.872
DEG. OF SAT., %	97.2	100.0
SAMPLE HEIGHT, in.	0.750	0.630

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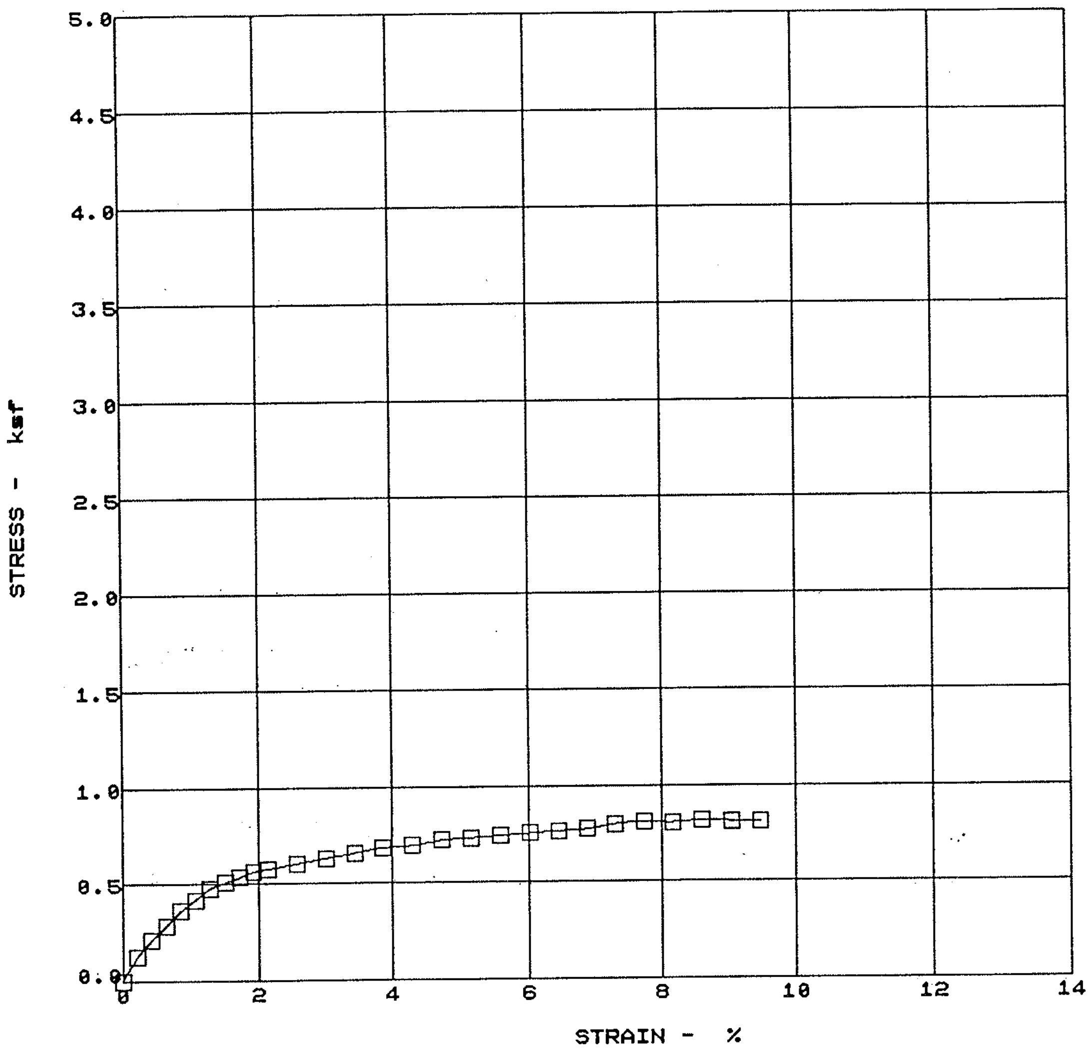
CONSOLIDATION TEST

PLATE

C-4



BORING NO. B-6

DEPTH - ft 80.0

SOIL DESCRIPTION Dark grey SILTY CLAY (CL-ML), trace sand

DRY DENSITY - pcf 96

WATER CONTENT - % 28

MAX. UC STRENGTH= 0.8 ksf AT 8.6 % STRAIN

KLEINFELDER

PROJECT NO. 11-2147-02

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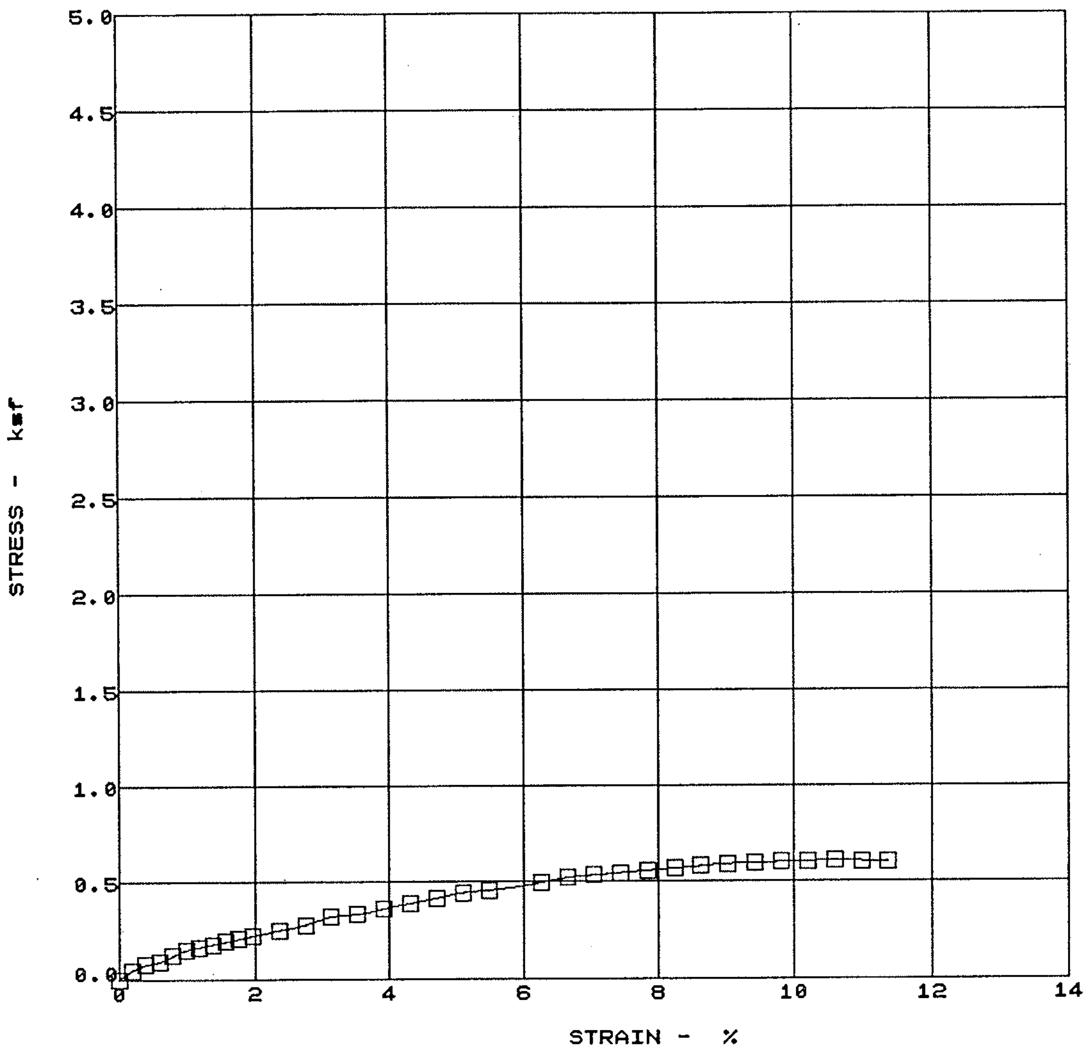
Brisbane, California

UNCONFINED COMPRESSION TEST

PLATE

C-5



BORING NO. B-7

DEPTH - ft 0.0

SOIL DESCRIPTION Medium blue-grey SILTY CLAY (CH) - BAY MUD

DRY DENSITY - pcf 99

WATER CONTENT - % 0

MAX. UC STRENGTH= 0.6 ksf AT 10.6 % STRAIN

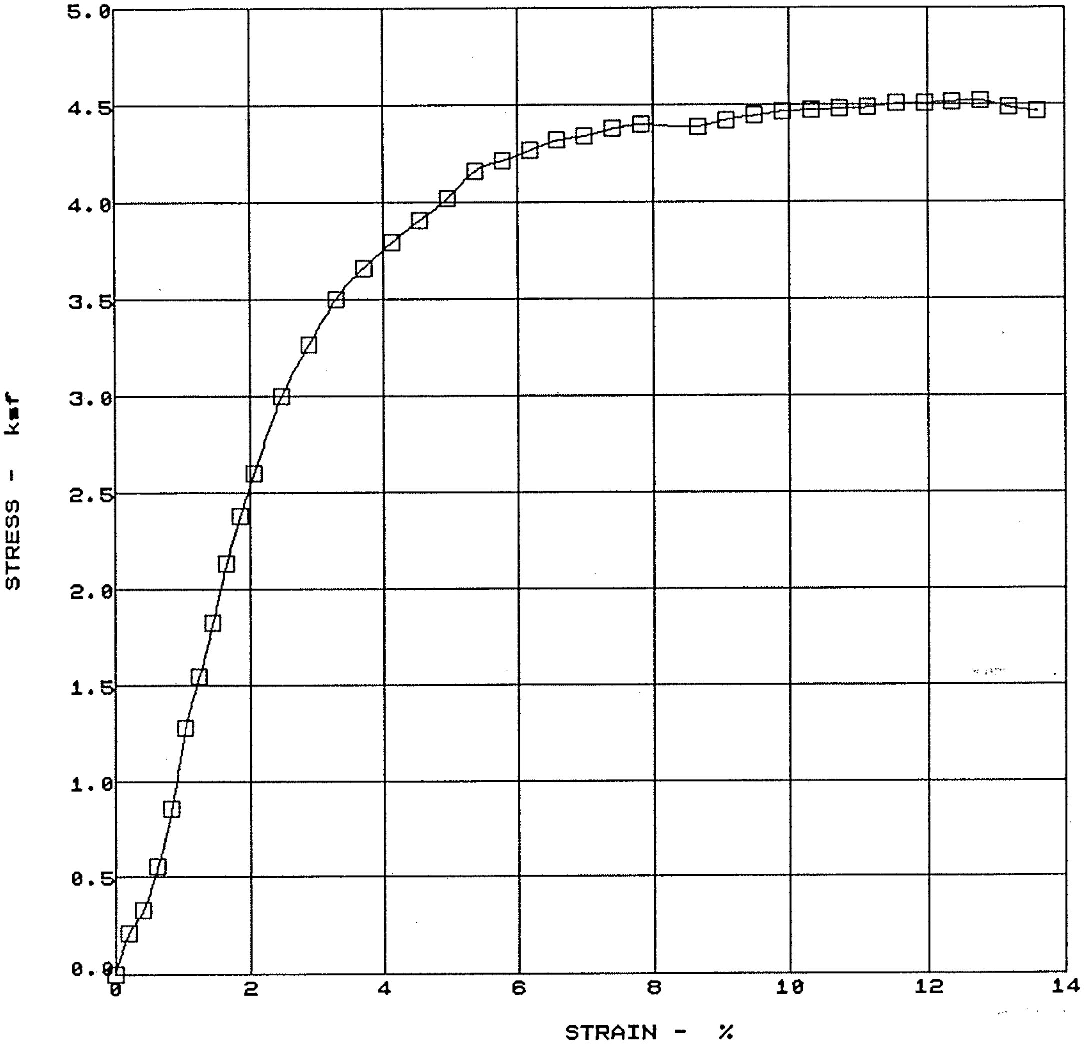
KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

UNCONFINED COMPRESSION TEST

PLATE C-6



BORING NO. B-9

DEPTH - ft 80.0

DRY DENSITY - pcf 104

WATER CONTENT - % 22

SOIL DESCRIPTION Blue-grey SILTY CLAY (CL-ML)

MAX. UC STRENGTH= 4.5 ksf AT 12.8 % STRAIN

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PROJECT NO. 11-2147-02

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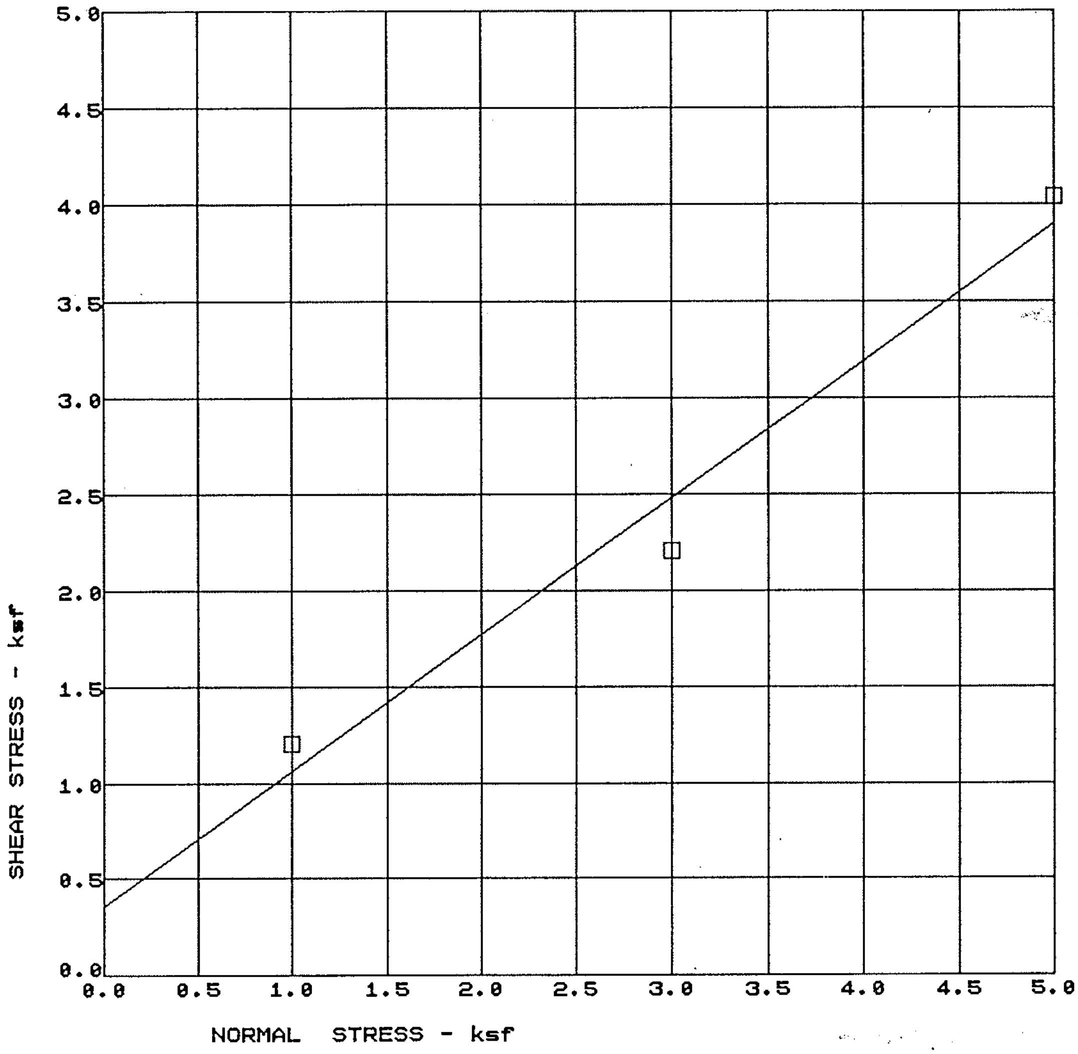
UNCONFINED COMPRESSION TEST

PLATE C-7



TEST TYPE: CU / RESIDUAL

RATE OF SHEAR - in/min 0.0048

DRY DENSITY - pcf	108.8	109.3	113.7
INITIAL WATER CONTENT - %	20.2	20.2	18.0
FINAL WATER CONTENT - %	18.2	18.5	16.0
NORMAL STRESS - psf	1000	3000	5000
MAXIMUM SHEAR - psf	1205	2201	4035

BORING NO: B-2
DEPTH: 60.0 ft
SILTY CLAYEY SAND (SC-CL)

FRICTION ANGLE = 35 deg.

COHESION= 0.36 ksf

KLEINFELDER

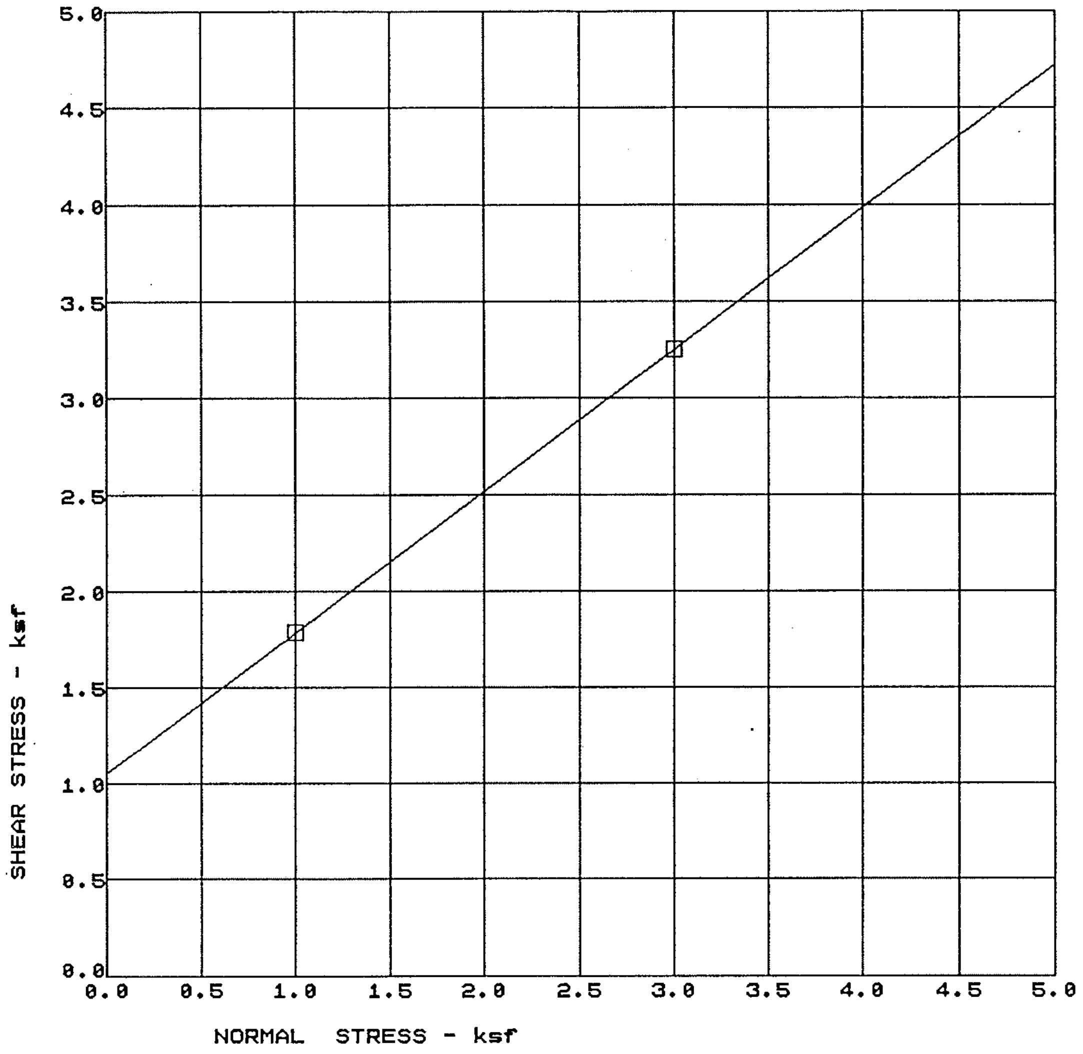
PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

DIRECT SHEAR TEST

PLATE

C-8



TEST TYPE: CU / STAGED

RATE OF SHEAR - in/min 0.0032

DRY DENSITY - pcf	105.0		
INITIAL WATER CONTENT - %	15.6		
FINAL WATER CONTENT - %	15.4		
NORMAL STRESS - psf	1000		3000
MAXIMUM SHEAR - psf	1781		3249

BORING NO: B-7
DEPTH: 1.0 ft
GRAVELLY SILT (ML)

FRICTION ANGLE = 36 deg.

COHESION= 1.05 ksf

KLEINFELDER

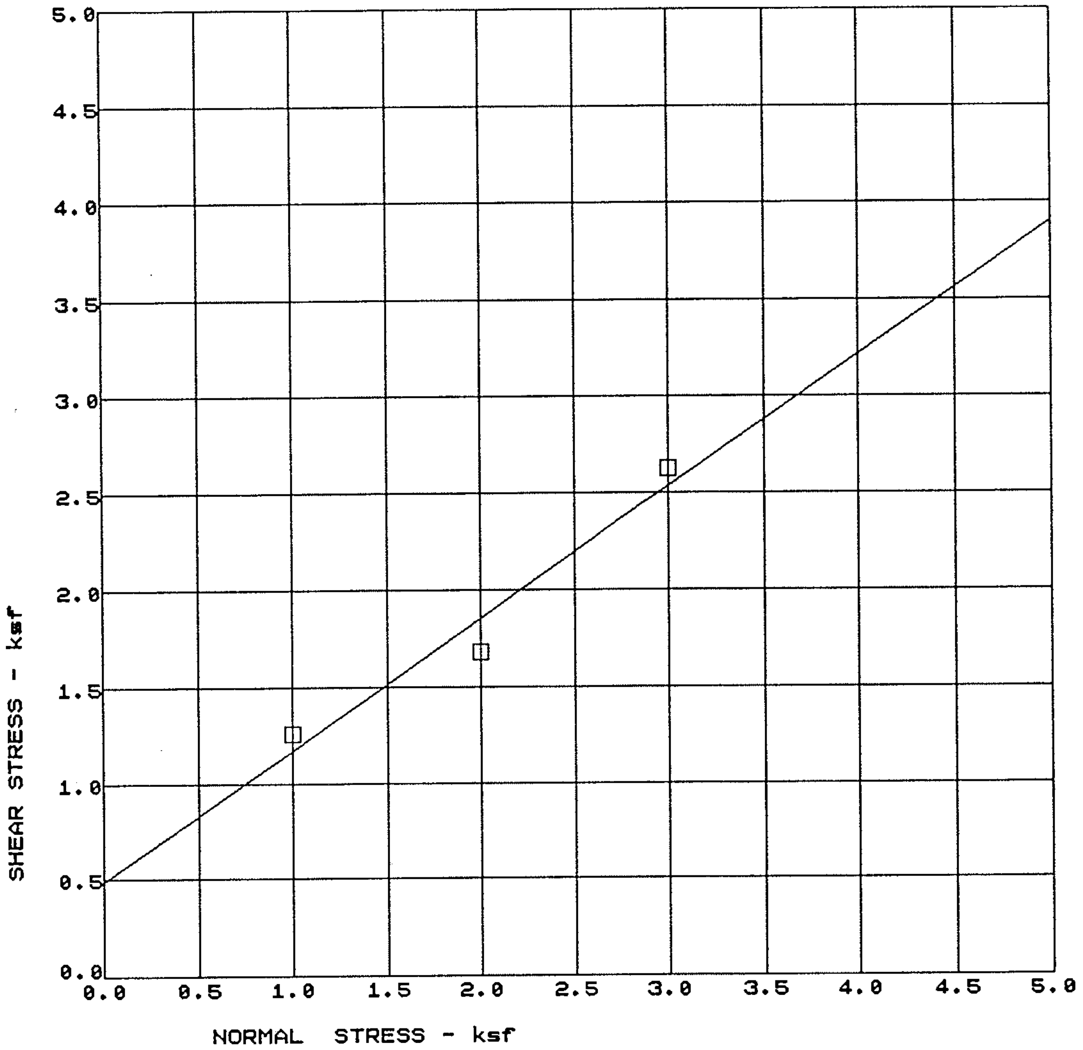
PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

DIRECT SHEAR TEST

PLATE

C-9



TEST TYPE: CU / RESIDUAL

RATE OF SHEAR - in/min 0.0048

DRY DENSITY - pcf	99.6	101.7	103.8
INITIAL WATER CONTENT - %	6.8	7.9	8.9
FINAL WATER CONTENT - %	5.6	7.0	8.9
NORMAL STRESS - psf	1000	2000	3000
MAXIMUM SHEAR - psf	1258	1677	2621

BORING NO: B-8
DEPTH: 1.0 ft
Brown SILTY SAND (SM)

FRICTION ANGLE = 34 deg.

COHESION= 0.49 ksf

KLEINFELDER

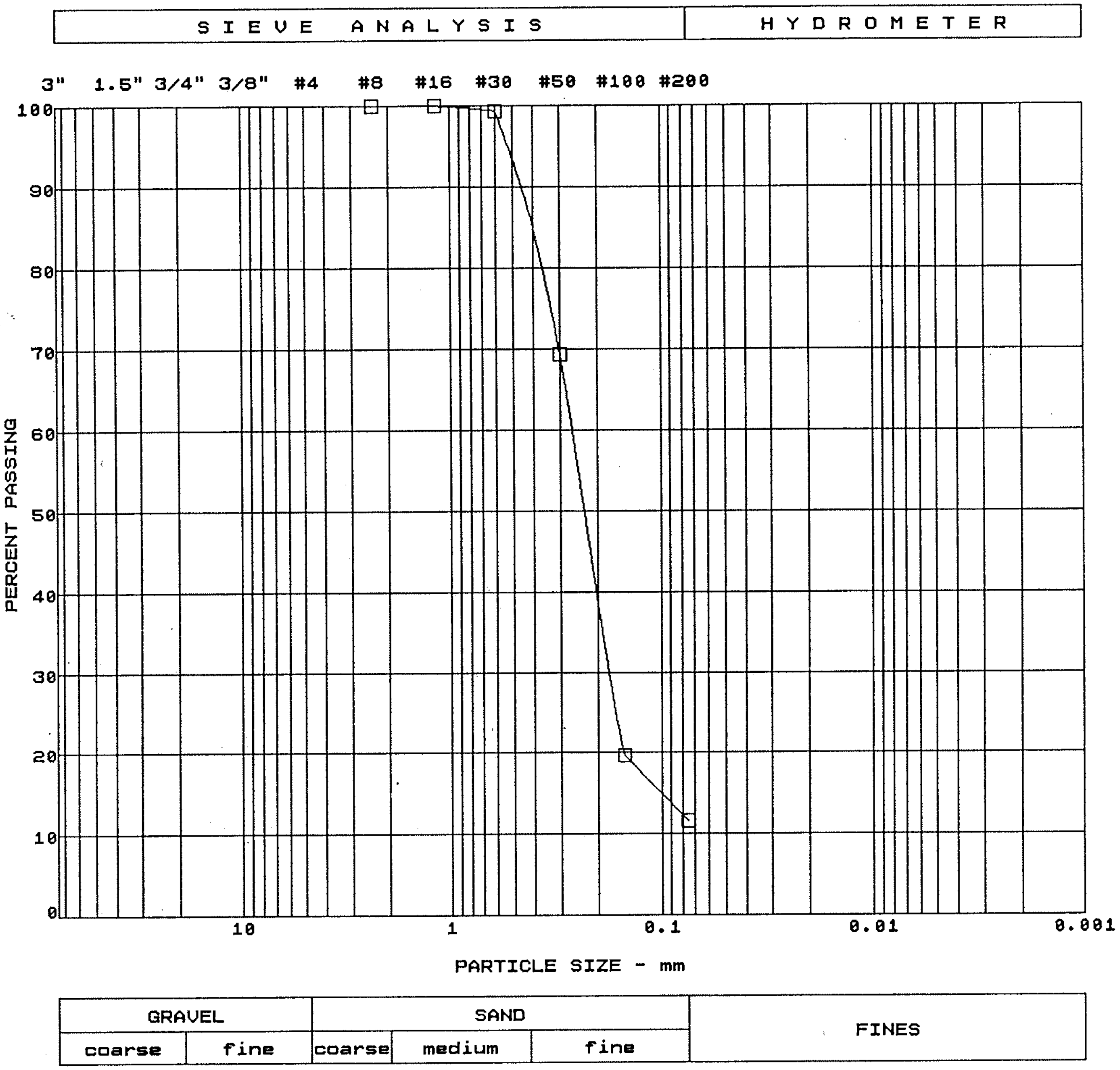
PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

DIRECT SHEAR TEST

PLATE

C-10



SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION
□	B-7	55.00	Dark grey CLAYEY SAND (SC) - BAY MUD

KLEINFELDER

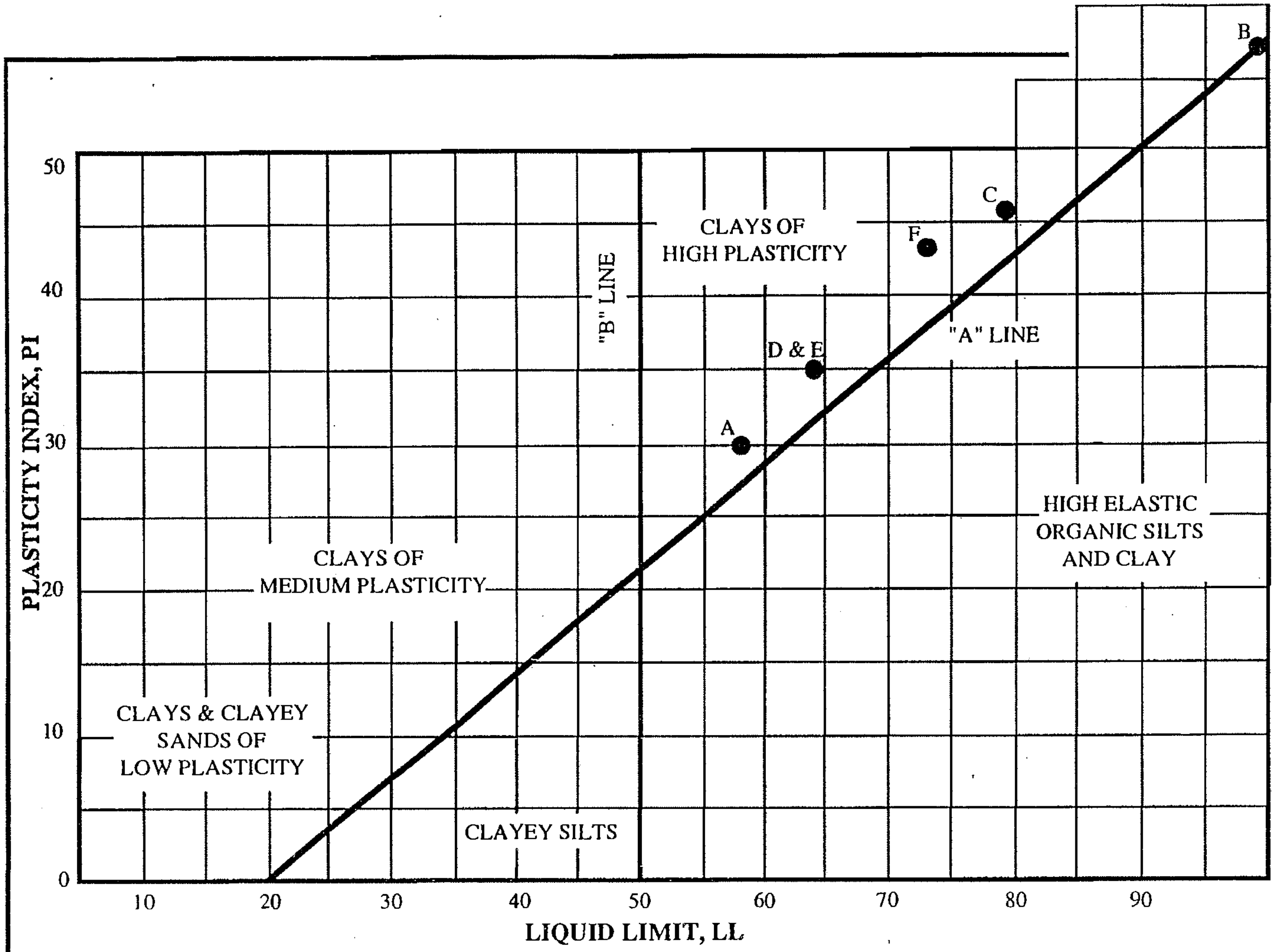
PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

GRAIN SIZE DISTRIBUTION

PLATE

C-11

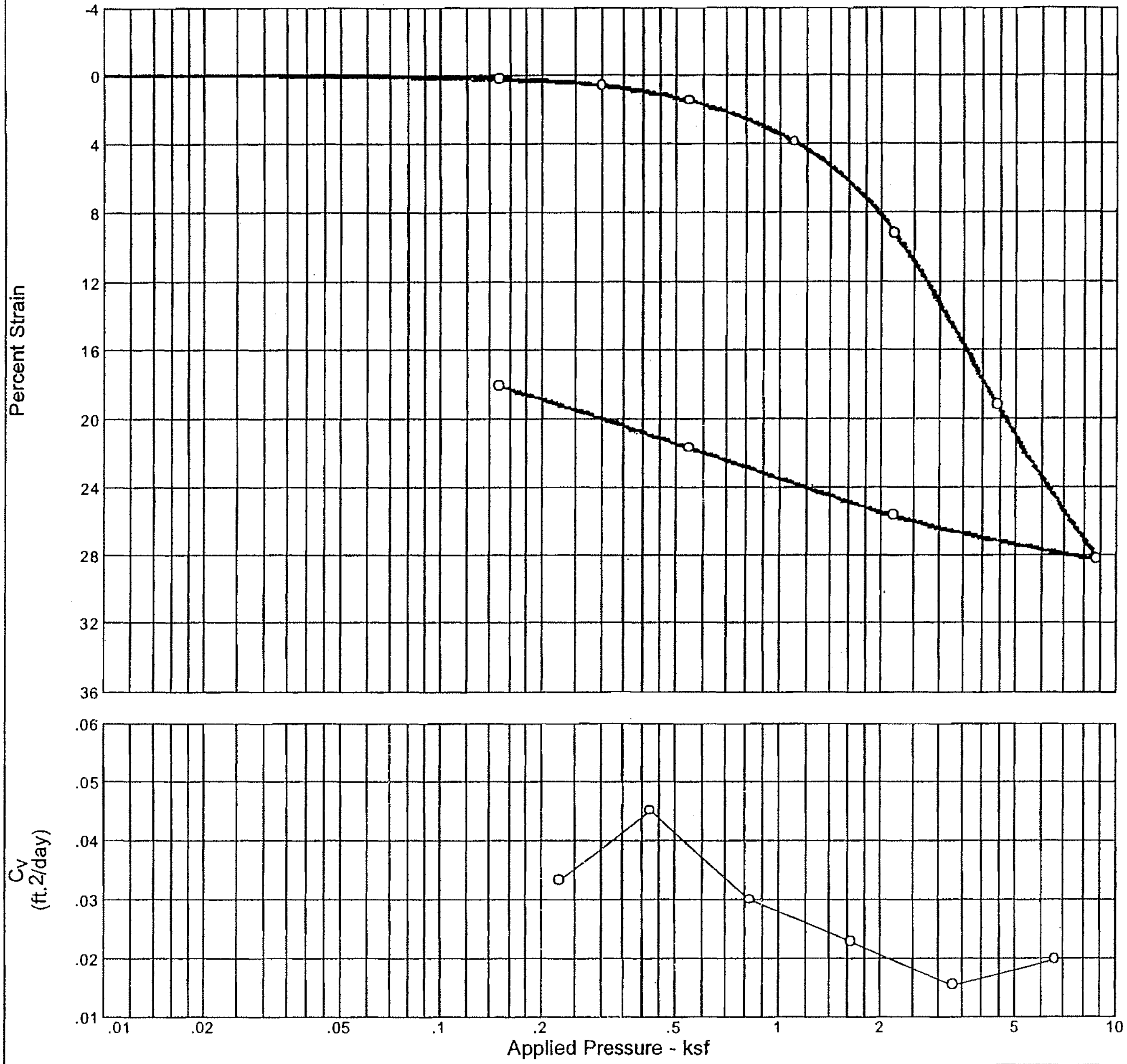


CLASSIFICATION TEST RESULTS									
SAMPLE IDENTIFICATION			ATTERBERG LIMITS			GRAIN SIZES % DRY WT.			
SAMPLE	LETTER DESIGNATION	DESCRIPTION	LIQUID LIMIT	PLASTICITY INDEX	SHRINKAGE LIMIT	SAND	SILT	CLAY	COLLOIDAL
1-4	A	Dark grey silty clay	58	30	--	--	--	--	--
2-5	B	Very dark grey silty clay	99	57	--	--	--	--	--
3-4	C	Very dark grey silty clay	79	46	--	--	--	--	--
4-4	D	Very dark grey silty clay	64	35	--	--	--	--	--
10-3	E	Dark grey silty clay	64	35	--	--	--	--	--
11-7	F	Dark grey silty clay	73	43	--	--	--	--	--

PLASTICITY CLASSIFICATION

Job No. 03-3324	Michelucci & Associates, Inc.	Figure 18

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
96.5 %	94.1 %	46.4			2.7			2.634

MATERIAL DESCRIPTION

gray CLAY

Project No. 073-025 **Client:** Michelucci

Project: 03-3324

Source: 03-3324 **Sample No.:** 3-5-4

Remarks:

CONSOLIDATION TEST REPORT

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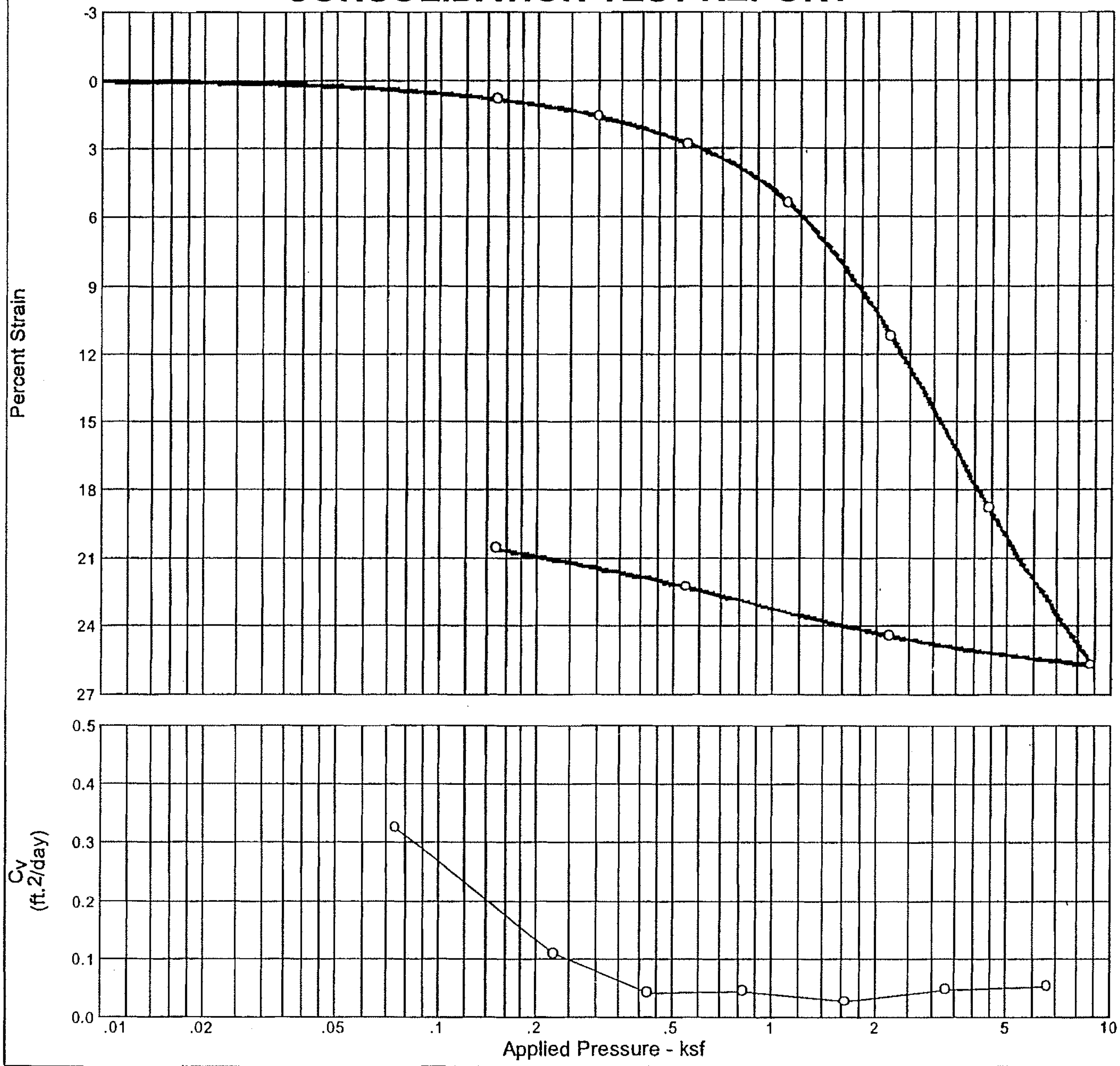
Plate

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
99.9 %	71.4 %	57.6			2.7			1.928

MATERIAL DESCRIPTION

gray CLAY, bay mud

Project No. 073-025 **Client:** Michelucci

Project: 03-3324

Source: 03-3324 **Sample No.:** 4A-1-3

Remarks:

Sample disturbed. Sampled with mod Cal?

CONSOLIDATION TEST REPORT

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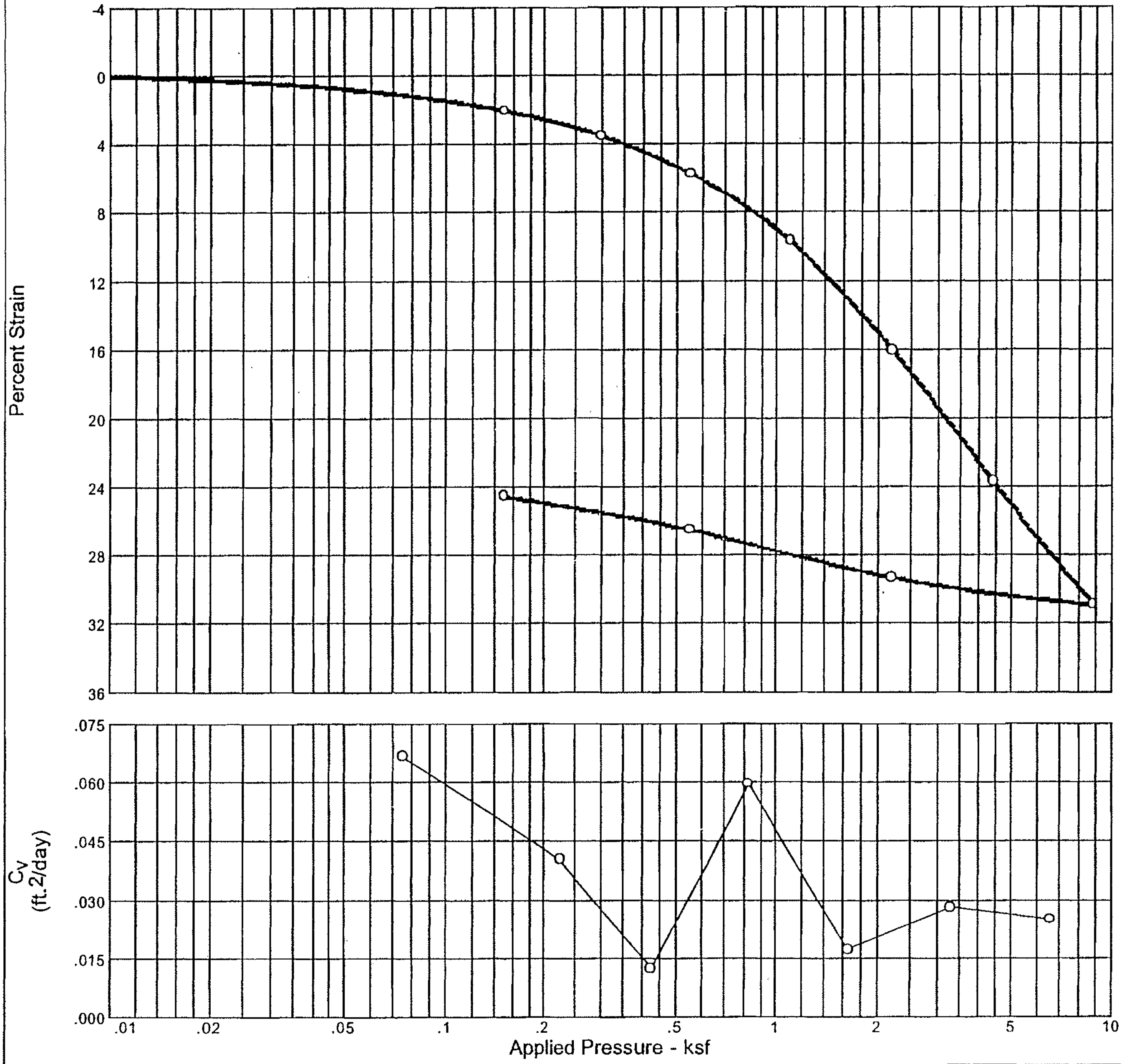
CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
97.7 %	90.5 %	48.1			2.7			2.503

MATERIAL DESCRIPTION

gray CLAY, bay mud

Project No. 073-025 **Client:** Michelucci

Project: 03-3324

Source: 03-3324 **Sample No.:** 7-4-3

CONSOLIDATION TEST REPORT

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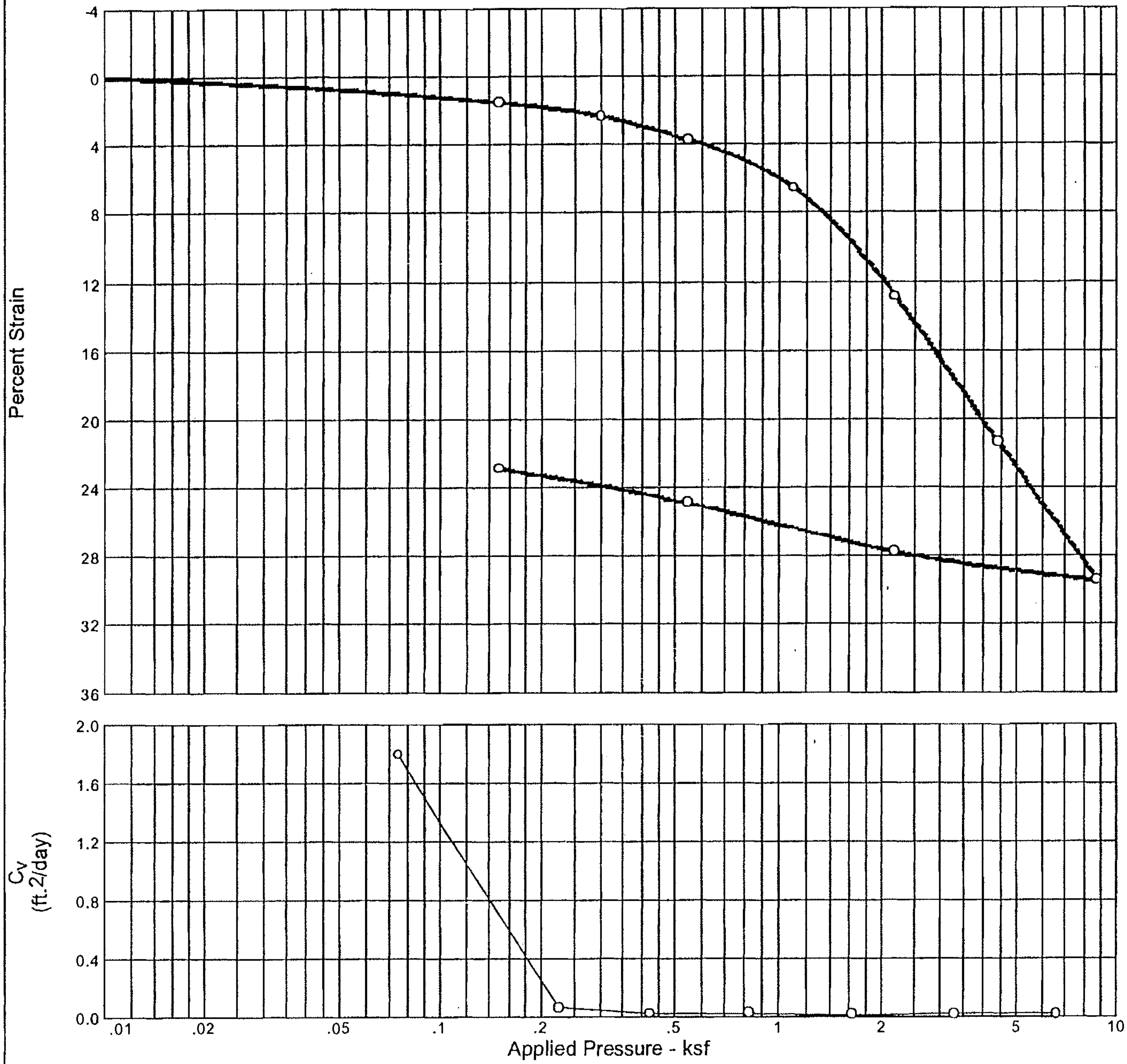
Remarks:

Sample disturbed, taken with mod Cal?

Plate

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
97.9 %	89.4 %	48.6			2.7			2.467

MATERIAL DESCRIPTION

gray CLAY, bay mud

Project No. 073-025 **Client:** Michelucci

Project: 03-3324

Source: 03-3324 **Sample No.:** 10-5-3

Remarks:

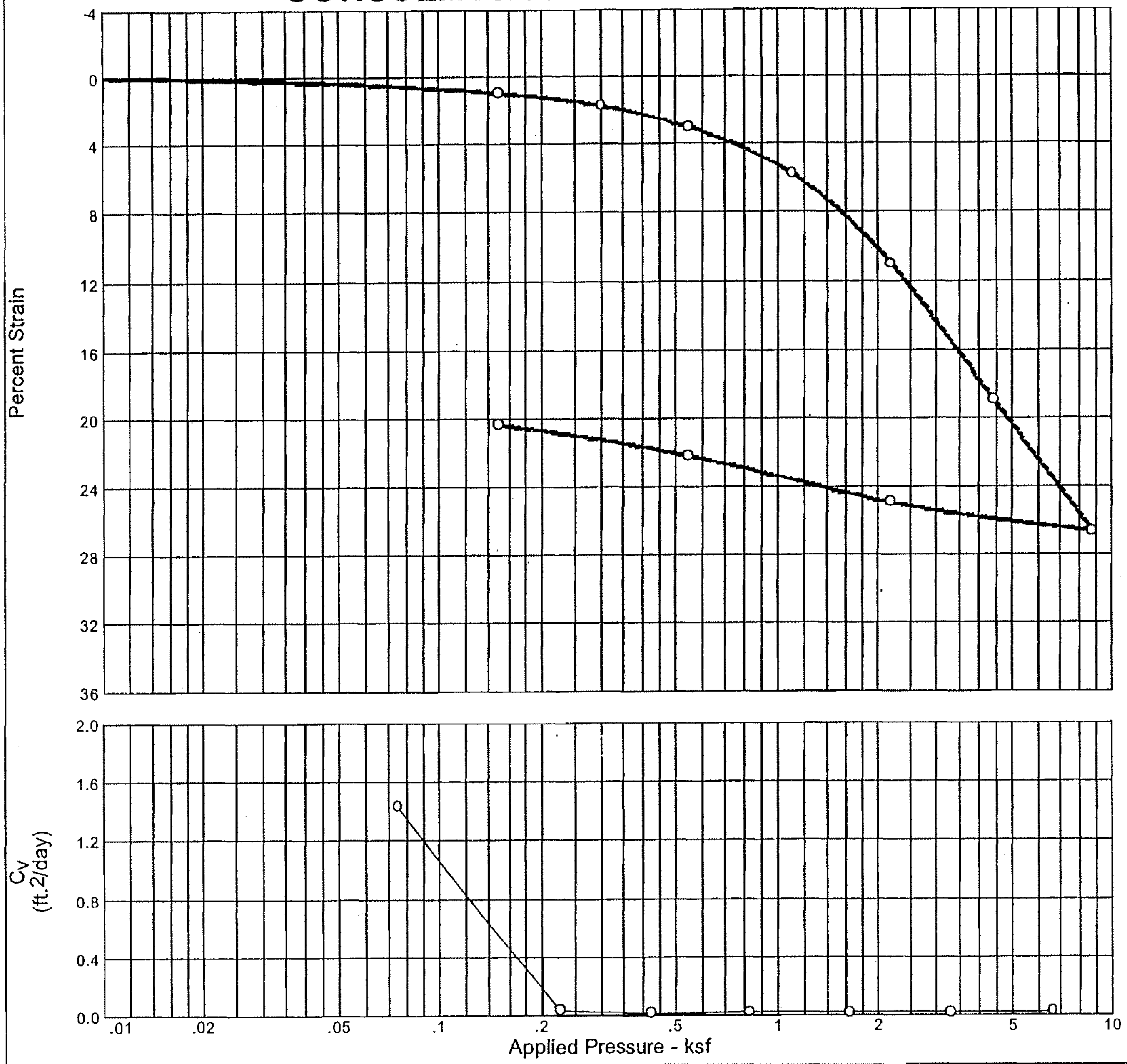
Sample disturbed, sampled with mod Cal sampler?

CONSOLIDATION TEST REPORT

COOPER TESTING LABORATORY

Plate

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
97.9 %	80.7 %	52.3			2.7			2.225

MATERIAL DESCRIPTION

gray CLAY

Project No. 073-025 **Client:** Michelucci

Project: 03-3324

Source: 03-3324 **Sample No.:** 11-5-3

Remarks:

Sample disturbed, sampled with mod Cal sampler?

CONSOLIDATION TEST REPORT

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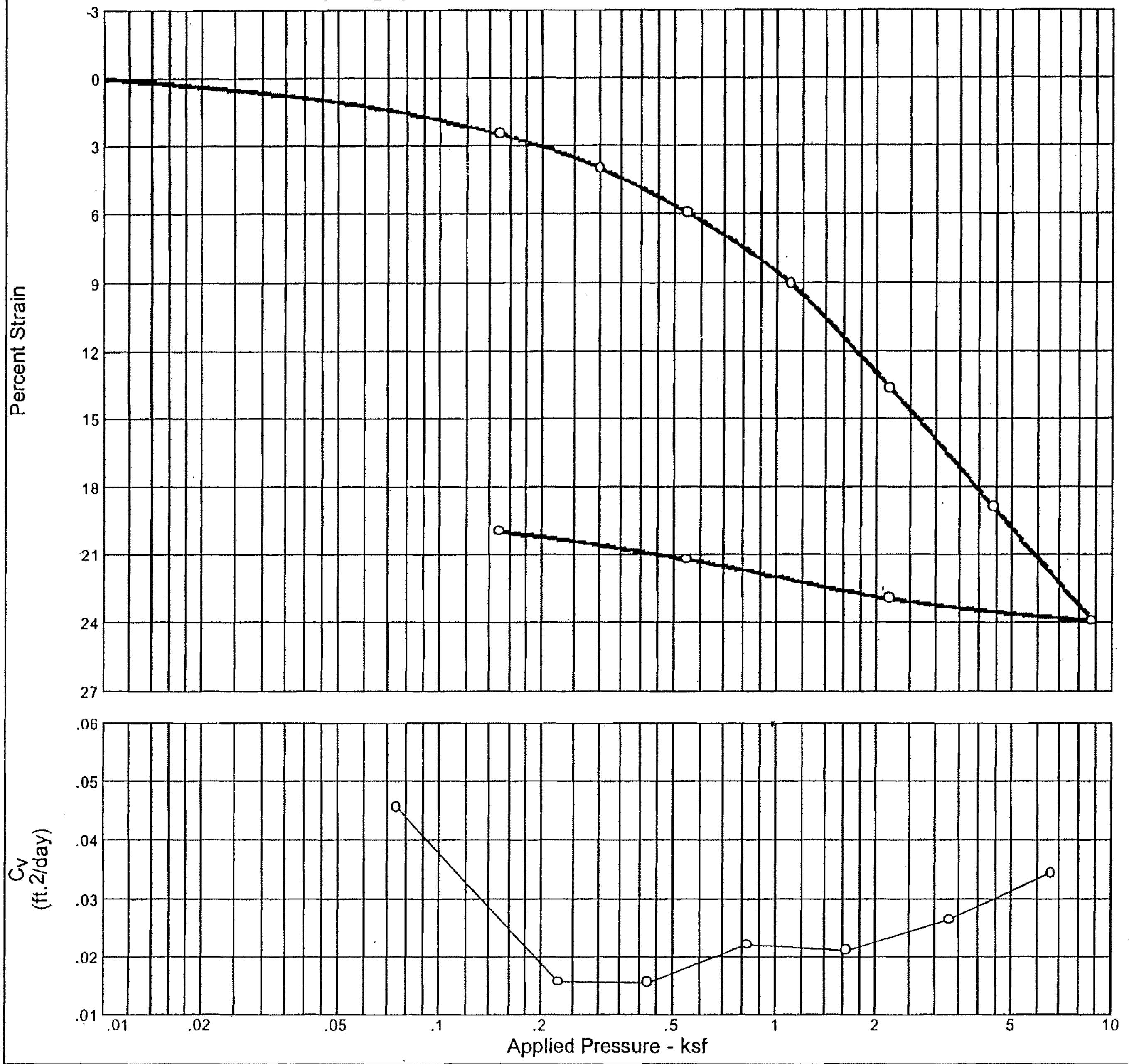
Job No. **03-3324** Michelucci & Associates, Inc. Figure **23**

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
94.2 %	56.2 %	64.5			2.7			1.612

MATERIAL DESCRIPTION

gray CLAY, bay mud

Project No. 073-025 **Client:** Michelucci

Project: 03-3324

Source: 03-3324 **Sample No.:** 11-9-3

Remarks:

Sample disturbed, taken with mod Cal sampler? The sample may indicate underconsolidation due to disturbance.

CONSOLIDATION TEST REPORT

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Plate

Job No. **03-3324** Michelucci & Associates, Inc. Figure **24**