Wallace Kuhl & Associates

Geotechnical Engineering Report

HIGHLANDS RANCH II

(TUSCANY MEADOWS)

WKA No. 9328.01

February 3, 2012

Prepared For:

West Coast Home Builders, Inc.

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Pittsburg, California

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Geotechnical Engineering Report
HIGHLANDS RANCH II
(TUSCANY MEADOWS)
Southerly of Buchanan Road
Pittsburg, California
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INTRODUCTION

We have completed a geotechnical engineering investigation for the approximately 170-acre site located southerly of Buchanan Road, west of Somersville Road in Pittsburg, California. The purposes of our investigation have been to explore the existing site, soil and groundwater conditions across the property; to provide geotechnical engineering conclusions on the suitability of the property for future residential development; and, to provide recommendations for use by other members of the design team to prepare plans and specifications for development of the property. This report presents the results of our work.

Work Scope

Our scope of work included the following tasks:

1. site reconnaissance;
2. review of previous reports prepared for the project site;
3. review of USGS topographic maps, geologic maps, historical aerial photographs and available groundwater level measurements;
4. subsurface exploration, including the drilling and sampling of 11 borings to depths of 15 to 20 feet, and one boring to a maximum depth of approximately 51 feet below the existing ground surface;
5. bulk sampling of anticipated pavement subgrade soils;
6. laboratory testing of selected soil samples to determine various soil engineering properties;
7. engineering analyses; and,
8. preparation of this report.

Supplemental information used in the preparation of this report included review of the following reports prepared by others:

- *Report of Testing and Observation Services Provided During Mass Grading* (Engeo Geotechnical and Environmental Consultants, Inc. Project No. 5021.2.002.02, dated November 30, 2004) prepared for the earthwork operations performed on Black Diamond Ranch subdivision, located adjacent to the south of the subject site;
- *Clarification to Geotechnical Recommendations RE: Treatment of Colluvial Deposits* (Engeo Geotechnical and Environmental Consultants, Inc. Project No. 4360-E3, dated August 14, 1998) prepared for Phase 1 of the Highlands Ranch residential development, located adjacent to the west edge of the subject site;
- *Geotechnical Exploration* (Engeo Geotechnical and Environmental Consultants, Inc. Project No. 4360-E2, dated July 1, 1998) prepared for Phase 1 of the Highlands Ranch residential development, located adjacent to the west edge of the subject site; and,
- *Geotechnical Investigation* (Harding Lawson Associates (HLA) Job No. 18329,001.03, dated January 11, 1988) prepared for the Meadowland Development, which includes the subject site.
- *Summary of On-site Remediation Activities Excavation/Stockpile Phase* (Engeo Geotechnical and Environmental Consultants, Inc. Project No. 4360.000.001, dated May 14, 2009) prepared for a portion of the remediation activities performed on the subject site;

Figures and Attachments

This report contains a Vicinity Map as Figure 1; a Site Plan showing the approximate boring and bulk sample locations as Figure 2; and, Logs of Soil Borings as Figures 3 through 14. An explanation of the symbols and classification system used on the logs is contained on Figure 15. Figure 16 is a geologic map and Figure 17 is a fault location map.

Appendix A contains general information regarding project concepts, exploratory methods used during our field investigation, and laboratory test results not included on the logs. Appendix B contains *Guide Earthwork Specifications* that may be used in the preparation of project plans and contract documents. Appendix C contains the logs of borings from the 1988 HLA investigation that are within the site and are shown on Figure 2.

Project Description

Based on our conversations with representatives of West Coast Home Builders, Inc., and review of the preliminary site plan prepared by Isakson and Associates, the site will be developed with approximately 1450 lots for single-family home construction. An apartment complex with approximately 400 units also is planned on the northeasterly portion of the site. Park/detention basins are indicated in the northwestern and northeastern portions of the site. Highlands Ranch Drive is shown connecting the Buchanan Road Bypass to Buchanan Road in the westerly portion of the property. An existing Chevron property "out-parcel" is located near the center of the northern portion of the property and is not included in the proposed development.

We anticipate the single family residential construction will consist of one- and two-story, wood-framed structures with interior post-tension concrete slab foundations. Structural loads for the residential structures are anticipated to be relatively light and consistent with this type of construction. The multi-family apartment buildings will be three to four story, wood-framed structures on post-tensioned slab foundations.

Below-grade basements for the residential structures are not anticipated, however some retaining walls are expected. Associated development will include construction of interior roads, exterior flatwork, underground utilities, pole-mounted lighting and landscaping typical of residential development.

The preliminary grading study performed by Isakson & Associates indicates maximum excavations on the order of eight feet and maximum fills on the order of 14 feet for development of the site.

Site History

Historically, the site was previously developed with petroleum storage tanks. Review of an aerial photograph taken in 1993 indicates the tanks had been removed and the site was fallow undeveloped land.

Our review of previous environmental investigations indicates that a Remedial Action Plan (RAP) was prepared for the site by Risk Based Decisions, Inc. on August 4, 2006. Between

September 22, 2008, and January 8, 2009, Engeo Geotechnical and Environmental Consultants, Inc. observed the excavation of 24 former tank sites and four wax pond sites for the presence of petroleum hydrocarbon contamination. The sites explored were identified in the RAP as having actionable levels of contamination for impact to the site, in addition to four former tank site and two pond sites that were requested by West Coast Home Builders, Inc. to be investigated. The tank and pond site were excavated to depths of approximately 5 to 24 feet below existing grades. Soils exceeding the allowable contamination limits were stockpiled in the center of the site for ex-situ bio-remediation. Once the excavations were completed, engineered fill consisting of approved overburden from the existing excavations; remediated soil from a previous cleanup project for the property located west of the site; and clean, on-site borrow material from outside of former tank and pond areas.

Review of aerial photographs taken in 2002, 2004, 2008 and 2009 show the construction of the adjacent subdivisions, as well as the soil remediation activity as described in the previous paragraph.

FINDINGS

Site Description

The property encompasses a total area of approximately 170 acres and is located on the south side of Buchanan Road, west of Somersville Road in Pittsburg, California (Figure 1). The property is bounded to the north by Buchanan Road and the Chevron out-parcel; to the east by a portion of the Contra Costa Canal and Somersville Road; and, to the south and west by existing residential subdivisions. Topography across the site is gently rolling with a gradual slope from the south to the north, with the exception of elevated areas along the southern boundary of the site, adjacent to the existing residential subdivision. Site elevations range from approximately +110 feet relative to mean sea level (msl) in the northern portions of the site to approximately +195 feet msl in the southern portions of the site based on review of topographic information prepared by Iskason & Associates, Inc.

During our field investigation on November 22 and 23, 2011, the site consisted of vacant land covered with low-lying vegetation. Nearly all of the surface soils on the property had recently

been disced. Existing wire fences were observed along the northern and eastern boundaries of the site. A large engineered fill slope approximately 20 to 30 feet tall was observed along the southern boundary of the site, near the southwestern corner of the property, which was likely constructed during development of the adjacent subdivision.

Low-lying areas were observed in the northwestern and northeastern portions of the site. The center of the site supported rows of stockpiled soils from previous remediation activities performed on the site. Two recently excavated temporary drainage ditches were observed in the southeastern portion of the site. We have been informed that the ditches will be replaced with underground piping during development of the property.

A gravel covered access road also was observed through the center of site, extending from the west side of the Chevron out-parcel in the north to end of Summit Way at the south edge of the site. Based on conversations with representatives of West Coast Home Builders, Inc., an existing temporary sewer line and manholes are located within the alignment of the gravel road, which reportedly serves the Black Diamond Ranch project to the south.

Review of Engeo's *Final Report of Testing and Observation Services Provided During Mass Grading* performed for the Black Diamond Ranch subdivision located adjacent to the south of the site, indicates subdrains were installed within toe keys for fill slope construction during grading operations. This included the construction of toe keys and subdrains within the limits of the site. We have been informed by West Coast Home Builders that the existing subdrains will be located and tied into the drainage system for the project.

Soil Conditions

Our borings performed across the site encountered surface and near-surface soils consisting of silty clays. The near-surface silty clays are underlain by alternating layers of silty sands and sandy and clayey silts to the maximum depth explored of approximately 51 feet below site grades. Boring D5 encountered sandy silts at the surface, extending approximately 5½ feet below existing site grades. Boring D7 encountered silty sands at the surface extending at least 15 feet below existing site grades. Discontinuous layers of clean, cohesionless sands were encountered in Boring D5 approximately 5½ feet below existing grades and in Boring D1 at a depth of approximately 33½ feet below existing grades.

For more detail regarding the soil conditions at a specific location, please refer to the Logs of Soil Borings, Figures 3 through 14.

Groundwater

Groundwater was not encountered within our borings performed at the site on November 22 and 23, 2011, to the maximum depth explored of approximately 51 feet below existing grades.

Review of available groundwater levels measured in monitoring wells installed along the northern and eastern boundaries of the site by HLA in 1987 indicates groundwater was encountered at depths between 102½ to 113½ feet below existing site grades at the wells.

General Site Geology

The United States Geologic Survey (USGS[1]) as mapped the site as being underlain by Late-Pleistocene alluvial fan deposits (Qpf – see Figure 16). The southwest corner of the site is indicated to be underlain by bedrock on the USGS map. The *Quaternary Geology of Contra Costa County, and Surrounding Parts of Alameda, Marin, Sonoma, Solano, Sacramento, and San Joaquin Counties, California, Derived from the Digital Database Open-file Report 97-98* (Helley and Graymer, 1997) indicates the bedrock unit to be the Ploocene aged Tulare Formation. The Tulare formation is described as "non-marine siltstone, sandstone, and conglomerate.". The soil conditions encountered during our recent field investigation are generally consistent with the mapped geology.

CONCLUSIONS

Bearing Capacity and Building Support

Based on our field investigation and laboratory test results, it is our opinion the project soils are capable of supporting the proposed structures and pavements provided the following recommendations regarding site preparation and engineered fill placement are carefully followed.

[1] Knudsen, K.L, et al, 2000, Preliminary Maps of Quaternary Deposits and Liquefaction Susceptibility, Nine-County San Francisco Bay Region, California; a Digital Database, USGS Open-File Report 00-444.

In our opinion, the existing stockpiled fill materials on the site can be used as fill after completion of bio-remediation, provided that they have first been completely removed to expose native, undisturbed soils. The remaining areas of the site have been subjected to disturbances and are in a relatively loose condition due to discing and previous construction activities. The depth of disturbance in these areas is likely to be shallow (near surface) and we will recommend processing and compaction of these soils. Compaction of subgrades will need to be performed under observation of the Geotechnical Engineer to verify the stability of the subgrades prior to further construction or fill placement.

Excavations for exploration and removal of soils for remediation performed by Engeo between September 22, 2008, and January 8, 2009, have been reported to have been backfilled with clean engineered fill after the exploration was completed and the remaining soils were tested to be within allowable environmental limits prior to use as fill material in the excavations.

Our work indicates that engineered fill, properly placed and compacted in accordance with the recommendations of this report, will be capable of supporting the proposed structures and pavements. Specific recommendations for overexcavation, scarification, moisture conditioning, and compaction are provided in the Site Clearing and Site Preparation section of this report. Recompaction of disturbed near-surface soils will be necessary to provide uniform support for the planned structures and pavements.

Seismic Code Parameters

We anticipate the design of the residential structures will be performed using the 2010 edition of the California Building Code (CBC). Based on the 2010 CBC and Chapter 11 of the American Society of Civil Engineers (ASCE) 7-05, *Seismic Design Criteria*, the site parameters may be determined based on the site latitude and longitude using a public domain computer program developed by the United States Geological Survey (USGS). The following parameters may be used for seismic design of the proposed structures using the 2010 CBC.

TABLE 1 SEISMIC DESIGN PARAMETERS				
Latitude 37.9941°N, Longitude -121.8547°W	ASCE 7-05 Table/Figure	2010 CBC Table/Figure	Factor/Coefficient	Value
Short-Period MCE at 0.2s	Figure 22-3	Figure 1613.5(3)	S_S	1.500 g
1.0s Period MCE	Figure 22-4	Figure 1613.5(4)	S_1	0.556 g
Site Class	Table 20.3-1	Table 1613A.5.2	D	--
Site Coefficient	Table 11.4-1	Table 1613A.5.3(1)	F_a	1.0
Site Coefficient	Table 11.4-2	Table 1613A.5.3(2)	F_v	1.5
Adjusted MCE Spectral Response Parameters	Equation 11.4-1	Equation 16A-36	S_{MS}	1.500 g
	Equation 11.4-2	Equation 16A-37	S_{M1}	0.833 g
Design Spectral Acceleration Parameters	Equation 11.4-3	Equation 16A-38	S_{DS}	1.000 g
	Equation 11.4-4	Equation 16A-39	S_{D1}	0.556 g
Seismic Design Category	Table 11.6-1	Section 1613A.5.6	Occupancy I to IV	D
	Table 11.6-2	Section 1613A.5.6	Occupancy I to IV	D

Seismic Hazards

No active or potentially active faults are known to underlie the site based on the published records, geologic maps or aerial photographs that we reviewed. A map showing the location of active faults in the vicinity of the site is shown on Figure 17. The site is not located within an Alquist-Priolo Earthquake Fault Zone, and we observed no surface evidence of faulting during our site reconnaissance. Therefore, it is our opinion that ground rupture at the site resulting from seismic activity is unlikely.

The site is underlain by stiff and dense soil and groundwater is deeper than 100 feet below existing site grades; therefore, it is our opinion that liquefaction of soils beneath the site during strong earthquake ground shaking is highly unlikely.

On-Site Soil Suitability for Engineered Fill Construction

The on-site soils are considered suitable for use as engineered fill provided they are free of significant quantities of organics, rubble and deleterious debris. The stockpiled soils are also considered suitable for use as engineered fill provided they are free of significant organics,

rubble, rubbish, or other unsuitable materials and within the acceptable environmental limits for use as engineered fill, as determined by others.

Excavation Conditions

The on-site surface and near-surface soils should be readily excavatable with conventional construction equipment. In our opinion, shallow excavations less than five feet in depth will stand at a near vertical inclination for short periods of time required for utility construction.

Excavations deeper than five feet that will be entered by workers should be sloped, braced or shored in accordance with current CAL/OSHA regulations. The contractor must provide an adequately constructed and braced shoring system in accordance with federal, state and local safety regulations for individuals working in an excavation that may expose them to the danger of moving ground.

Excavated materials should not be stockpiled directly adjacent to open trenches to prevent surcharge loading of trench sidewalls. Excessive truck and equipment traffic should also be avoided near open trenches. If material is stored or heavy equipment is operated near an excavation, stronger shoring would be needed to resist additional pressures due to the superimposed loads.

Expansive Soils

Laboratory tests indicate the on-site clays are moderately plastic with a moderate to high expansion potential when tested in accordance with ASTM D4318 and ASTM D4829 (Figures A1 through A4). Based on our experience and the results of the laboratory testing, on-site clays are considered capable of exerting significant expansion pressures upon building foundations and concrete slabs. Specific recommendations to reduce the effects of expansive soils are presented in later sections of this report.

Pavement Subgrade Quality

Laboratory tests performed on two representative bulk samples of anticipated pavement subgrade soil indicate these materials possess Resistance ("R") values of 11 and 12 when tested in

accordance with California Test 301 (Figure A5). Based on the R-value test results, the anticipated natural variations in soils quality, and our experience in the area, we have selected an R-value of 10 for design of asphalt concrete pavements.

Soil Corrosion Potential

Three soil samples were tested to determine resistivity, pH, chloride, and sulfate concentrations to help evaluate the potential for corrosive attack upon reinforced concrete and buried metal. The results of the corrosivity testing are summarized in the following table. Copies of corrosion potential test results performed by Sunland Analytical of Rancho Cordova, California, are presented on Figures A7 through A9.

TABLE 2
SOIL CORROSIVITY TESTING

		Sample Identification		
Analyte	Test Method	D1 (1' -3')	D2 (1' -3')	D12 (1' -3')
pH	CA DOT 643 Modified*	5.85	7.09	6.71
Minimum Resistivity	CA DOT 643 Modified*	2470 Ω-cm	1420 Ω-cm	1310 Ω-cm
Chloride	CA DOT 417	14.3 ppm	17.2 ppm	14.9 ppm
Sulfate	CA DOT 422	3.6 ppm	6.2 ppm	0.3 ppm

* = Small cell method
Ω-cm = Ohm-centimeters
ppm = Parts per million

Published literature[2] defines a corrosive area as an area where the soil and/or water contains more than 500 ppm of chlorides, more than 2000 ppm of sulfates, or has a pH of less than 5.5. The corrosivity test results suggest that the native soils are not defined as corrosive to steel reinforcement properly embedded within Portland cement concrete for the samples tested. Table 4.3.1 – *Requirement for Concrete Exposed to Sulfate-Containing Solutions*, American Concrete Institute (ACI) 318, Section 4.3, as referenced in Section 1904.3 of the 2010 CBC, indicates the

[2] California Department of Transportation, Division of Engineering Services, Materials Engineering and Testing Services, Corrosion Technology Branch, *Corrosion Guidelines,* version 1.0, September 2003.

sulfate exposure for the samples tested is *Negligible*. Ordinary Type I-II Portland cement is considered suitable for use on this project, assuming a minimum concrete cover is maintained over the reinforcement.

Groundwater

Our borings and review of available groundwater depth information indicates that the local groundwater table should not be a factor in design or construction of the proposed development at this site.

Seasonal Water

During the wet season, infiltrating surface runoff water will create saturated surface conditions. Grading operations attempted following the onset of winter rains and prior to prolonged drying periods will be hampered by high soil moisture contents. Such soils, intended for use as engineered fill, will require considerable aeration and/or drying or chemical amendment to reach a moisture content that will permit the soils to be properly compacted. This condition does not constitute a changed condition and should be anticipated by the various contractors working on the project.

RECOMMENDATIONS

General

The geotechnical engineer referenced in the flowing sections is the geotechnical engineer and his or her representatives retained to provide consultation, testing and inspection services during construction. The geotechnical engineer should review grading and structural foundation plans to verify that the recommendations in this report, and any supplemental recommendations have been incorporated into the plans.

Based on existing site topography, we anticipate excavations on the order of one to six feet and maximum fills on the order of 30 to 40 feet for development of the site. The recommendations contained in this report are based upon this assumption.

The recommendations presented below are appropriate for typical construction in the late spring through fall months. The on-site soils likely will be saturated by rainfall in the winter and early spring months, and will not be compactable without drying by aeration or the addition of lime (or a similar product). Should the construction schedule require work to continue during the wet months, additional recommendations should be provided by the geotechnical engineer, as conditions dictate.

Site Clearing and Site Preparation

Prior to grading, areas of the site to receive the site should be stripped of surface vegetation and organically contaminated topsoil; strippings may be stockpiled for later use or disposed of off-site. *Strippings should not be used in general fill construction or those fills used to support sound walls, but may be used in landscaped areas, provided they are kept at least five feet from any structures, including flatwork and pavements, and are moisture conditioned and compacted.*

Discing of the organics into the surface soils is a suitable alternate to stripping, provided that the organic content of the soil is limited to less than four percent by weight. *The decision to utilize discing in lieu of stripping should be approved by the geotechnical engineer at the time of earthwork construction.* Discing operations, if approved, should be observed by the geotechnical engineer, and be continuous until the organics are adequately mixed into the surface soils to provide a compactable mixture of soil containing minor amounts of organic matter. Pockets or concentrations of organics will not be allowed.

After the stripping or discing of surface vegetation, the site should be cleared surface debris, rubble, rubbish and underground utilities to be relocated or abandoned including utility trench backfill, and disposed of so as to leave the areas that have been disturbed with a neat and finished appearance, free from unsightly debris. Adequate removal of existing debris may require laborers and hand-picking to clear the subgrade soils, prior to further site preparation. Demolition debris should be hauled off site.

The existing stockpiled soils must be completely removed to expose firm undisturbed soil, as determined by the geotechnical engineer. The stockpiled soils may be used as engineered fill, provided they are free of significant organics, rubble, rubbish, or other unsuitable materials and within the acceptable environmental limits for use as engineered fill, as determined by others.

Testing and observation by the geotechnical engineer is necessary during clearing and grading operations to verify adequate removal of existing debris and determine the need for additional sub-excavation. Excavations resulting from the clearing operations should be cleaned out to expose firm, undisturbed soil and the excavations backfilled in accordance with the recommendations of this report. During clearing operations the exposed subgrades should be evaluated by the geotechnical engineer. Loose, disturbed, soft or otherwise unsuitable materials should be removed to expose a firm base for the support of the fill needed to restore the areas to the required grades.

Existing low lying areas and drainages present on-site should be cleaned of organics, saturated and unstable soils to expose firm, native materials, as determined by our representative. The exposed surface should be scarified to a depth of at least twelve inches, moisture conditioned to at least the optimum moisture content and compacted to at least 90 percent of the ASTM D1557 maximum dry density. It is possible that the excavated soils from the bottom of drainage ditches will be saturated, and will require aeration and a period of drying to allow proper compaction. Our representative will provide alternative recommendations for stabilizing the bottom of the excavations, as conditions warrant. Recompaction operations should be performed in the presence of our representative who will evaluate the performance of the materials under compactive load. Unstable soil deposits, as determined by our representative, should be excavated to expose a firm base, and grade restored with engineered fill in accordance with these recommendations.

Areas designated to receive fill, remain at-grade or achieved by excavation should be scarified to a depth of 12 inches, uniformly moisture conditioned to at least two percent over the optimum moisture content, and compacted to at least 90 percent of the maximum dry density per ASTM D1557 specifications. Compaction should be performed using a heavy, self-propelled sheepsfoot compactor (Caterpillar 815, or equivalent-sized compactor).

Compaction of the existing grade must be observed and tested by the geotechnical engineer to evaluate the performance of the subgrade under compactive loads and identify loose or unstable soil conditions that could require additional excavation. Subgrades must be properly compacted and stable prior to further construction or fill placement.

Engineered Fill Construction

Engineered fill should be placed in lifts that do not exceed six inches in compacted thickness. The thickness of loose lifts will be dependent on the equipment used and the moisture content of the soil. On-site materials should be thoroughly moisture conditioned to at least two percent over the optimum moisture content and uniformly compacted to at least 90 percent of the maximum dry density, as defined above.

If construction begins during the summer or fall, there is a potential that the near-surface clay soils may be desiccated deeper than the recommended depth of scarification. Should this condition exist, the site should be continuously watered for a sufficient period of time to close the desiccation cracks to within 12 inches of the surface. Prewatering of the site should not be necessary if grading operations begin in the early spring months prior to the soils having a chance to dry significantly.

On-site soils are considered suitable for use in engineered fill construction, if free of significant concentrations of organic materials, rubble or debris. Imported fill materials, if required, should be well graded granular materials with non-plastic fines or at least should be similar to, but less expansive than, the native soils and free of particles greater than three inches in maximum dimension. Import fill materials that will be used within pavement areas should have a minimum Resistance value of 10 when tested in accordance with California Test 301. Imported fill should be free of contamination with proper documentation and should be observed, tested and approved by the Geotechnical Engineer prior to being transported to the site.

Sloping ground steeper than four horizontal to one vertical (4:1) should be benched prior to receiving engineered fill. Benching should be done by cutting relatively level steps at least two feet into the existing slopes. Benching should be done progressively up the slope as the fill reaches the level of firm natural ground on the high side. On slopes steeper than four horizontal to one vertical (4:1), the fill should be keyed into the natural ground at the toe, as well as benched. Engineered fill should begin with the construction of a base key at the toe of the slope. The base key should be at least 10 feet wide or the width of the construction equipment, whichever is wider, and should extend into undisturbed native soils, or at least two feet below existing grades. Base key depth must be verified by the geotechnical engineer prior to fill construction who should determine the need for scarification and compaction of the bottom of

the key. Engineered fill should be properly benched into the existing slope to remove loose surficial soils. Each bench should consist of a level terrace excavated at least 12 inches into the slope. For every three feet of vertical height of fill a larger bench should be constructed, extending at least five feet into the existing slope. The geotechnical engineer should observe the benching of the slopes to evaluate the need for additional or larger benches into the hillside, based on exposed conditions and can evaluate the need for base key construction based on the height of fill and exposed site conditions, at the time of grading. Both procedures should be observed and approved by the geotechnical engineer prior to commencing fill operations.

Differential Fill Control

To reduce the potential for differential settlement of building foundations, the building pads constructed partially by cut and partially by fill that exceed five feet in thickness, and fill differentials that exceed five feet should be avoided. Building pads with either of these conditions may require over-excavation so that the fill differential across the building pad does not exceed five feet. Remedial grading plans should be prepared by the geotechnical engineer that show all areas that require remedial grading to reduce differential settlement. The geotechnical engineer should work with the contractor to determine the areas, if any, requiring additional over-excavation.

Subdrains

Subdrains should be installed within natural swales where the swales will be buried by engineered fill. The subdrains should consist of a trench at least 24 inches wide and 24 inches deep, with a minimum six-inch diameter perforated rigid pipe with perforations placed downward. The drainpipe should be placed on a minimum four-inch layer of drainrock, and covered by at least 1½ feet of drain rock. Drainrock should consist of Class 2 permeable material (Caltrans Specification 68-1.025), or ½-inch by ¾-inch crushed rock, provided the drainrock and drainpipe are enveloped within an approved, non-woven geotextile filter fabric (Mirafi 140N, or an equivalent). The drainpipe should be sloped to drain at a gradient of at least two percent. Water collected in the subdrains should empty to an appropriate discharge point. The last 10 feet of drainpipe should be non-perforated rigid solid pipe covered by compacted native soils or lean concrete to block water flowing within the drainrock, allowing the water to exit through the drainpipe.

Flatwork Subgrade

The upper 12 inches of final building pads and subgrades supporting exterior flatwork should be brought to at least two percent over the optimum moisture content and uniformly compacted to not less than 90 percent of the maximum dry density, as determined by ASTM D1557, regardless of whether final grade is completed by excavation, filling or left at existing grade. The moisture content of the subgrade soils must be maintained until covered by slabs.

Pavement Subgrade

The upper six inches of pavement subgrades should be uniformly compacted to at least 95 percent of the ASTM D1557 maximum dry density at a moisture content of at least the optimum moisture, and must be stable under construction traffic prior to placement of aggregate base. Final pavement subgrade processing and compaction should be performed just prior to placement of aggregate base, after construction of underground utilities is complete. The moisture content of the subgrade soils must be maintained until covered by aggregate base.

Excavation and Fill Slopes

Permanent excavation and fill slopes should be constructed no steeper than two horizontal to one vertical (2:1), and should be vegetated as soon as practical following grading to minimize erosion. Slopes should be over-built and cutback to design grades and inclinations.

Geotechnical Engineering Observation

Site preparation should be accomplished in accordance with the recommendations of this section and the *Guide Earthwork Specifications* provided in Appendix B. The geotechnical engineer or his or her representative should be present during site preparation and all grading operations to observe and test the fill to verify compliance with the recommendations of this report and the job specifications.

Utility Trench Backfill

Utility trench backfill within structural areas should be mechanically compacted as engineered fill in accordance with the following recommendations. Bedding of utilities and initial backfill around and over the pipe should be in accordance with the manufacturer's recommendations for the pipe materials selected, and applicable City of Pittsburg requirements.

We recommend that native soil be used as trench backfill where trenches cross from landscape areas to structural areas (buildings, areas supporting exterior flatwork, driveways, etc.) to help minimize soil moisture variations beneath the structures. The native soil backfill should extend at least three feet horizontally inside and outside the perimeter foundation lines. Utility trench backfill should be placed in maximum six-inch lifts (compacted thickness), moisture conditioned to at least two percent over the optimum moisture content and mechanically compacted to at least 90 percent of the maximum dry density as determined by ASTM D1557. Within the upper six inches of pavement and sidewalk areas the minimum compaction should be increased to 95 percent of ASTM D1557.

We recommend that underground utility trenches that are aligned nearly parallel with foundations be at least three feet from the outer edge of foundations, wherever possible. As a general rule, trenches should not encroach into the zone extending outward at a 1:1 inclination below the bottom of the foundations. Please be aware that trenches in clay soils that are allowed to desiccate can adversely affect adjacent structures, and should therefore be protected from drying.

Foundation Design – Post Tensioned Slabs

We have computed the following post-tensioned concrete foundation/floor slab system design parameters presented as Table 3, based on the characteristics of the on-site soils. Specific design of post-tensioned foundation/slab systems should performed by a qualified structural engineer using the following geotechnical engineering parameters, which were derived from the results of laboratory tests and guidelines contained in the *Post-Tensioning Institute Design Manual (Third Edition)* published in 2004.

TABLE 3 PT SLAB DESIGN PARAMETERS	
1.	Thornthwaite Moisture Index = -20
2.	Average Edge Moisture Variation Distance (Em): Center Lift = 9.0 feet Edge Lift = 4.6 feet
3.	Plasticity Index = 25
4.	Plastic Limit = 17
5.	Liquid Limit = 42
6.	Percent Clay = 34% (≤ 0.002 mm; predominantly montmorillonite)
7.	Activity Ratio (Ac) = 0.53
8.	Zone = II
9.	Approximate Depth to Constant Moisture = 4.0 feet
10.	Approximate Soil Suction = 3.9 pF
11.	Anticipated Swell (Ym): Center Lift = 0.25 inches Edge Lift = 0.6 inches

The post-tensioned slab foundation should not exert more than 1500 pounds per square foot (psf) on the building pad soils for the dead plus live load conditions. The allowable post-tensioned slab bearing capacity may be increased to 1300 psf to evaluate all loads, including wind or seismic forces.

The common post-tensioned foundation used in recent years has consisted of a minimum 10-inch thick slab. The thickness of the post-tensioned slab, reinforcement, and other foundation details should be determined by the structural engineer. We recommend that post-tensioned slabs be underlain by a durable vapor barrier (at least 10 mils thick) placed directly on the soil subgrade, covered with two inches of damp, clean sand or pea gravel. Prior to placement of the vapor barrier, the subgrade soils should be compact and maintained in a moist condition. If this is not the case, the building pads should be re-moisture conditioned prior to foundation construction. During the drier months, the building pads should not be allowed to desiccate or dry. The geotechnical engineer should confirm the subgrade soils are at the appropriate moisture content within 48 hours of slab construction.

Although the 10-inch post-tensioned slabs are commonly used in this area, other designs may be applicable. If alternate designs are being considered, additional design recommendations can be provided, as desired.

Floor Slab Moisture Penetration Resistance

It is considered likely that floor slab subgrade soils will become wet to near-saturated at some time during the life of the structures. This is a certainty when slabs are constructed during the wet seasons or when constantly wet ground or poor drainage conditions exist adjacent to the structure. For this reason, it should be assumed that all slabs in living areas, as well as those intended for moisture-sensitive floor coverings or materials, require protection against moisture or moisture vapor penetration. Standard practice includes the sand/gravel and vapor retarder membrane as suggested above.

Recommendations contained in this report concerning foundation and floor slab design are presented as *minimum* requirements, only from the geotechnical engineering standpoint. The effectiveness of the moisture vapor retarder systems will be dependent on the selected system. Any warranty as to the level protection against moisture vapor intrusion should be provided by the manufacturer.

Exterior Flatwork (Non-Pavement)

Soil subgrades supporting exterior concrete flatwork (i.e., sidewalks, patios, etc.) should be brought to an over optimum moisture condition and uniformly compacted prior to the placement of the concrete. *Proper moisture conditioning of the subgrade soils is considered essential to the performance of exterior flatwork.* Expansion joints should be provided to allow for minor vertical movement of the flatwork. Exterior flatwork should be constructed independent of the perimeter building foundation and isolated column foundations by the placement of a layer of felt material between the flatwork and the foundation.

Consideration should be given to thickening the edges of sidewalks and patios to at least twice the slab thickness and reinforcing the slabs for crack control. Slab reinforcement for crack control, if desired, should consist of No. 3 reinforcing bars at 18-inch centers each way or welded wire fabric, located at the mid-depth of the concrete.

Areas adjacent to new exterior flatwork should be landscaped to maintain more uniform soil moisture conditions adjacent to and under flatwork. We recommend final landscaping plans not allow fallow ground adjacent to exterior concrete flatwork.

Practices recommended by the Portland Cement Association for proper placement, curing, joint depth and spacing, construction, and placement of concrete should be followed during exterior concrete flatwork construction.

Retaining Wall Design

Retaining walls capable of slight rotation about their base (unrestrained at the top or sides) should be capable of resisting an "active" lateral earth pressure equal to an equivalent fluid pressure of 40 psf per foot of wall backfill for horizontal backfill conditions. Retaining walls that are fixed at the top should be capable of resisting an "at-rest" lateral earth pressure equal to an equivalent fluid pressure of 60 psf per foot for horizontal backfill conditions.

Retaining walls could experience additional surcharge loading if vehicles are parked or at-grade foundations are constructed within a one horizontal to one vertical (1:1) projection from the bottom of the retaining walls. Surcharge loading under these circumstances should be included in the design of the walls.

Retaining wall foundations should extend at least 12 inches below lowest adjacent compacted soil grade. Retaining wall foundations may be sized using a maximum allowable soil bearing pressure of 2000 psf with a 1/3 increase for wind or seismic forces.

Lateral resistance of foundations may be computed using an allowable friction factor of 0.25, which may be multiplied by the effective vertical load on the foundation. Additional lateral resistance may be assumed to develop against the vertical face of the foundations and may be computed using a "passive" equivalent fluid pressure of 250 psf per foot of depth with the understanding that the upper 12 inches should be neglected. These two modes of resistance should not be added unless the frictional component is reduced by 50 percent since full mobilization of the passive resistance requires some horizontal movement, which significantly diminishes the frictional resistance.

Where storm or irrigation water can enter the wall backfill, the retaining walls should be fully drained to prevent the build-up of hydrostatic pressure behind the wall. Retaining walls should be provided with a drainage blanket (Class 2 permeable material, Caltrans Specification Section 68-1.025) at least one foot wide extending from the base of wall to within one foot of the top of the wall. The top foot above the drainage layer should consist of compacted on-site materials. Weep holes or perforated rigid pipe should be provided near the base of the wall to allow drainage of accumulated water. Drain pipes, if used, should slope to discharge at no less than a one percent fall to suitable drainage facilities. Open-graded ½-inch to ¾-inch crushed rock may be used in lieu of the Class 2 permeable material, if the rock and drain pipe are completely enveloped in an approved non-woven geotextile filter fabric.

Structural backfill materials for retaining walls, other than the drainage layer, should consist of on-site or imported granular soils free of significant quantities of rubbish, rubble, organics and rock over four inches in size. Structural backfill should be placed in lifts not exceeding 12 inches in compacted thickness, and should be mechanically compacted to at least 90 percent relative compaction per ASTM D1557. The top six inches of backfill in pavement areas should be compacted to not less than 95 percent relative compaction.

We recommend that the geotechnical engineer review retaining wall structural plans to verify the applicability of these recommendations and to provide supplemental recommendations, as necessary.

Pier Foundations

Based upon results of our investigation and our experience with similar projects, we anticipate sound walls and pole-mounted lights used near walkways or within parking areas will be supported upon drilled, cast-in-drilled-hole (CIDH) reinforced concrete piers. Piers for support of sound walls and pole-mounted lights should be at least 16 inches in diameter and extend at least six feet below lowest adjacent soil grade. The diameter and reinforcement of the piers should be determined by the structural engineer. Drilled pier foundations should be structurally isolated from any adjacent concrete flatwork by a felt strip or similar material.

Drilled piers may be sized utilizing a maximum allowable vertical bearing capacity of 2000 psf and an allowable skin friction of 250 psf for dead plus live loads, which may be applied over the surface of the pier. Those values may be increased by one-third to include short-term wind or

seismic forces. The weight of foundation concrete below grade may be disregarded in sizing computations.

Uplift resistance of pier foundations may be computed using the following resisting forces, where applicable: 1) weight of the pier concrete (150 pounds per cubic foot) and, 2) the allowable skin friction of 250 psf applied over the shaft area of the pier. Increased uplift resistance can be achieved by increasing the diameter of the pier or increasing the depth.

The upper 12 inches of skin friction should be neglected unless the pier is completely surrounded by slab concrete or pavements for a distance of at least three feet from the edge of the foundation pier.

Sizing of piers to resist lateral loads can be evaluated using Section 1807.1 of the 2010 California Building Code (CBC). A value of 150 pcf for lateral bearing as defined in Table 1806.2 of the CBC may be used for the coefficients S_1 and S_3 for the nonconstrained and constrained conditions, respectively. Per Table 1804.2 of the 2010 CBC, an increase of 1/3 is permitted when using the alternate load combinations in Section 1605.3.2 that include wind or earthquake loads. The upper 12 inches of the subgrade should be neglected for the nonconstrained condition.

Reinforcement and concrete should be placed in the pier excavations as soon as possible after excavation is completed to minimize the chances of sidewall caving into the excavations. Although we do not anticipate excessive sloughing of the sidewalls during pier construction, we recommend that the pier contractor be prepared to case the pier holes if conditions require.

To minimize the amount of sidewall caving, we recommend that a maximum elapsed time of 48 hours between completion of the pier excavation and the start of concrete placement. The bottom of the pier excavations should be free of loose or disturbed soils prior to placement of the concrete. Cleaning of the bearing surface should be verified by the geotechnical engineer prior to concrete placement.

To reduce lateral movement of the drilled shafts, it is necessary to place the concrete for the drilled shafts in intimate contact with the surrounding soil. Any voids or enlargements in the

shafts due to excavation or temporary casing installation shall be filled with concrete at the time shaft concrete is placed.

We estimate total settlement for drilled pier foundations using the recommended maximum net allowable bearing pressure and skin friction presented above, should be less than one inch. The settlement estimate is based on the available soil information, our experience with similar structures and soil conditions, and field verification of suitable bearing soils during foundation construction.

The geotechnical engineer should be present during pier drilling to verify adequate depth of penetration into competent bearing soils or rock. Concrete reinforcing steel should not be placed in any pier excavation until approved by the geotechnical engineer..

Pavement Design

The following preliminary pavement sections presented as Table 4 have been calculated based on the R-value test results for subgrade soils, minimum traffic indices (TI) for residential streets contained in the City of Pittsburg standards, and the procedures contained within Chapters 600 to 670 of the *California Highway Design Manual*, dated July 1, 2008. The project civil engineer should determine the appropriate traffic index based on anticipated traffic conditions.

TABLE 4
PRELIMINARY PAVEMENT DESIGN ALTERNATIVES

Traffic Index (TI)	Street Classification	Soil Subgrades Estimated R-value = 10	
		Type B Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
4.5	Local	3	9
6.0	Minor Collector	3½	12
7.0	Major Collector	4	15
8.0	Arterial	5	18
9.5	Major Arterial	6	22

Asphalt thickness includes Caltrans Factor of Safety.

Final pavement sections should be developed by the geotechnical engineer based upon the as-built soil conditions, collection of samples from the roadway areas, and testing of those soils to determine the actual design subgrade R-values.

We emphasize that the performance of the pavement is critically dependent upon uniform and adequate compaction of the soil subgrade, as well as all engineered fill and utility trench backfill within the limits of the pavements. We recommend that pavement subgrade preparation, i.e. scarification, moisture conditioning and compaction, be performed after underground utility construction is completed and just prior to aggregate base placement. The upper six inches of pavement subgrade soils should be compacted to at least 95 percent relative compaction at no less than the optimum moisture content. All aggregate base should be compacted to at least 95 percent of the maximum dry density. Materials quality and construction of the structural section should conform to the applicable provisions of the *Caltrans Standard Specifications* and the City/County standards, latest editions.

Portland cement concrete pavements for driveways or garage slabs should be at least four inches thick and supported on a compacted soil subgrade and at least four inches of compacted Class 2 aggregate base. We suggest the concrete slabs be constructed with thickened edges in accordance with American Concrete Institute (ACI) design standards. Reinforcing for crack control, if desired, should consist of No. 4 reinforcing bars placed on maximum 24-inch centers each way throughout the slab. Reinforcement must be located at mid-slab depth to be effective. Joint spacing and details should conform with the current PCA or ACI guidelines. Portland cement concrete should achieve a minimum compressive strength of 3500 pounds per square inch at 28 days.

Pavement Drainage

Efficient drainage of all surface water to avoid infiltration and saturation of the supporting aggregate base and subgrade soils is important to pavement performance. Weep holes should be provided at drainage inlets, located at the subgrade-base interface, to allow accumulated water to drain from beneath the pavements.

Site Drainage

Final site grading should be accomplished to provide positive drainage of surface water away from structures and prevent ponding of water adjacent to foundations, slabs or pavements. The grade adjacent to houses should be sloped away from foundations at a minimum two percent slope for a distance of at least five feet, where possible. Roof gutter downspouts and surface drains should drain onto pavements or be connected to rigid non-perforated piping directed to an appropriate drainage point away from the houses. Ponding of surface water should not be allowed adjacent to the buildings or pavements. Landscape berms, if planned, should not be constructed in such a manner as to promote drainage toward structures.

Geotechnical Engineering Observation and Testing During Earthwork

Site preparation should be accomplished in accordance with the recommendations of this report and the *Guide Earthwork Specifications* provided in Appendix B. Representatives of the geotechnical engineering consultant retained to provide construction services should be present during site preparation and all grading operations to observe and test the fill to verify compliance with our recommendations and the job specifications. These services are beyond the scope of work authorized for this investigation.

In the event that Wallace-Kuhl & Associates is not retained to provide geotechnical engineering observation and testing services during construction, the Geotechnical Engineer retained to provide these services should indicate in writing that they agree with the recommendations of this report, or prepare supplemental recommendations as necessary. A final report by the Geotechnical Engineer should be prepared upon completion of each phase of the project.

LIMITATIONS

Our recommendations are based upon the information provided regarding the proposed construction, combined with our analysis of site conditions revealed by the field exploration and laboratory testing programs. We have used prudent engineering judgment based upon the information provided and the data generated from our investigation. This report has been prepared in substantial compliance with generally accepted geotechnical engineering practices

existing in the area of the project at the time the report was prepared. No warranty, either express or implied, is provided.

If the proposed construction is modified or relocated or, if it is found during construction that subsurface conditions differ from those we encountered at the boring and test pit locations, we should be afforded the opportunity to review the new information or changed conditions to determine if our conclusions and recommendations must be modified.

We emphasize that this report is applicable only to the proposed construction and the investigated site. This report should not be utilized for construction on any other site. This report may require updates to reflect changes in the applicable building code or changes in the standard of care of geotechnical engineering.

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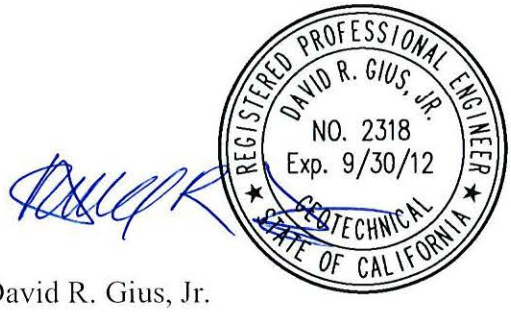
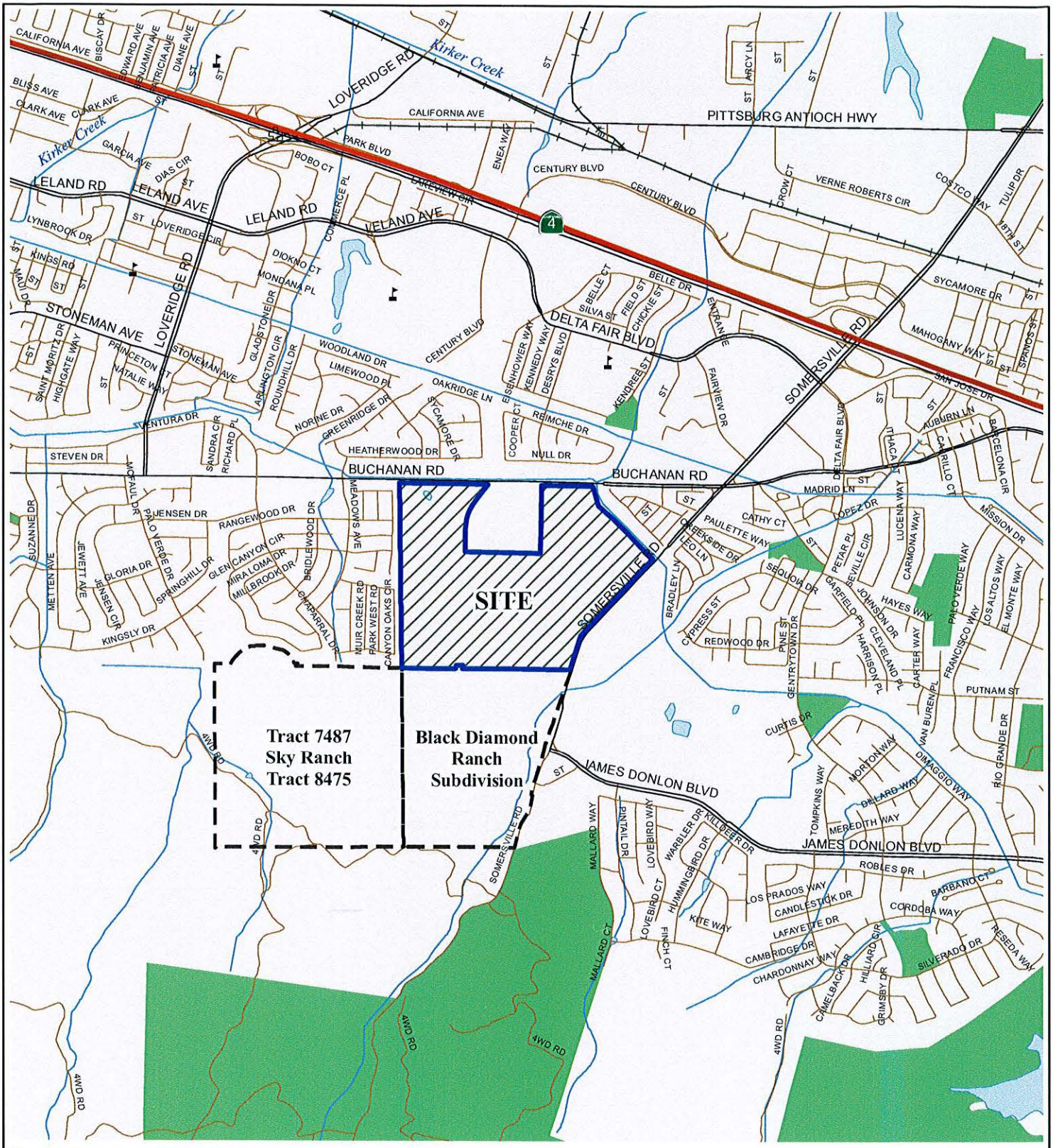


David R. Gius, Jr.
Senior Engineer



Street data courtesy of ESRI, 2010.
Hydrography courtesy of the U.S. Geological Service acquired from the GIS Data Depot, December, 2007.
Projection: NAD 83, California State Plane, Zone III

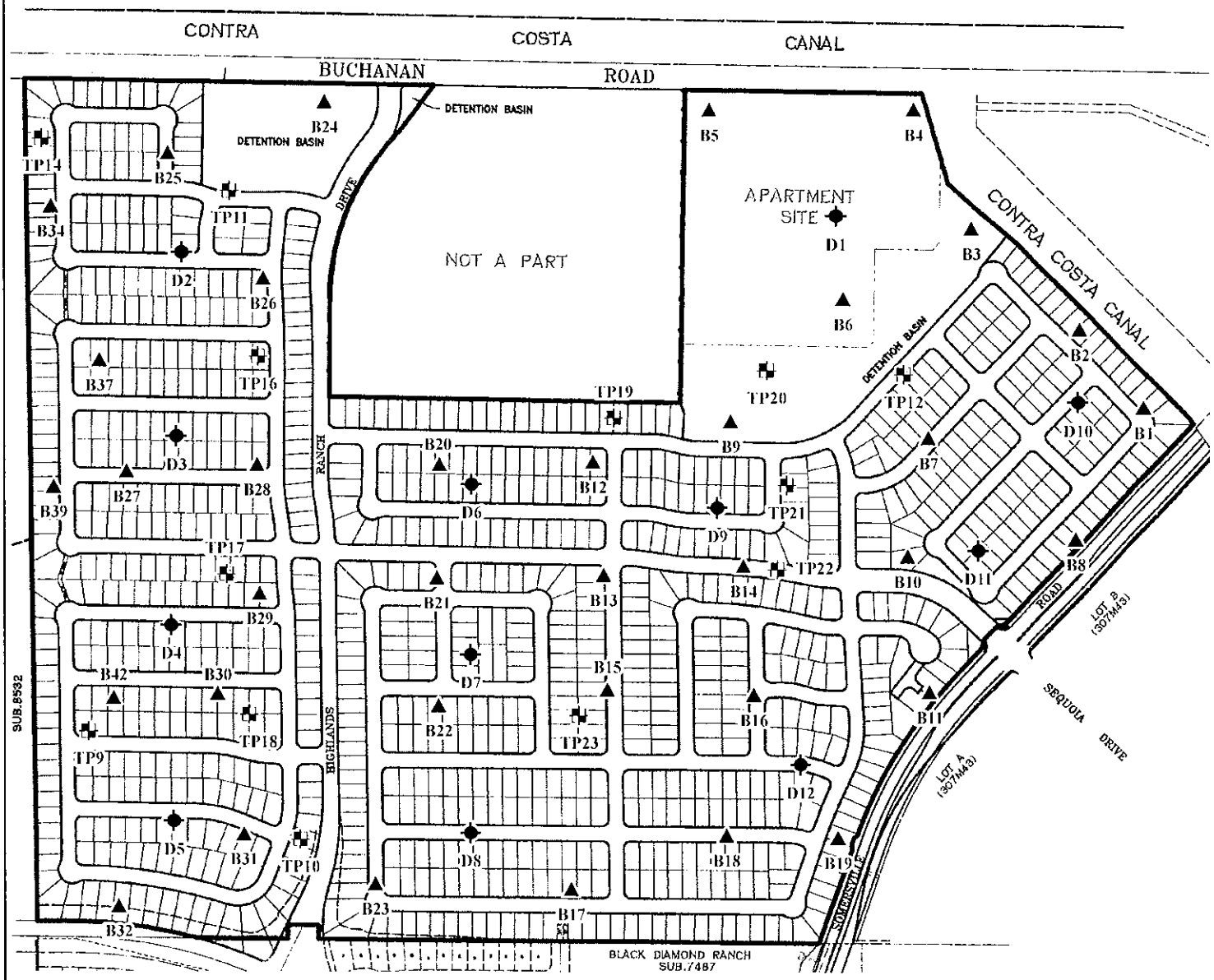
N

0 1,000 2,000
Feet

WallaceKuhl & ASSOCIATES

VICINITY MAP
HIGHLANDS RANCH II
(TUSCANY MEADOWS)
Pittsburg, California

FIGURE	1
DRAWN BY	TJC
CHECKED BY	DJP
PROJECT MGR	DRG
DATE	1/12
WKA NO. 9328.01	



Adapted from a drawing provided by West Coast Home Builders.
Projection: NAD 83, California State Plane, Zone III

Legend

- Approximate soil boring location
- Approximate HLA boring location (1988)
- Approximate HLA test pit location (1988)

N

0 250 500

Feet

WallaceKuhl & Associates

SITE PLAN

HIGHLANDS RANCH II

(TUSCANY MEADOWS)

Pittsburg, California

FIGURE	2
DRAWN BY	TJC
CHECKED BY	DJP
PROJECT MGR	DRG
DATE	1.12
WKA NO. 9328.01	

Project: Highlands Ranch II (Tuscany Meadows)
Project Location: Pittsburg, CA
WKA Number: 9328.01

LOG OF SOIL BORING D1

Sheet 1 of 1

Date(s) Drilled	11/22/11	Logged By	CJK	Checked By	DRG
Drilling Method	Hollow Stem Auger	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole	51.0 feet
Drill Rig Type	CME-75	Diameter(s) of Hole, inches	8"	Approx. Surface Elevation, ft MSL	Not Determined
Groundwater Depth [Elevation], feet	Not Encountered []	Sampling Method(s)	Standard Penetration Test (SPT)	Drill Hole Backfill	cement grout
Remarks				Driving Method and Drop	140-lb automatic hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Dark brown, moist, silty clay (CL)						
	5		Brown, slightly moist, medium dense, silty fine sand (SM)		D1-1I	14			
	10				D1-2I	11			
	15				D1-3I	20			
	20				D1-4I	25			
	25				D1-5I	14			
	30				D1-6I	30			
	35		Light brown, slightly moist, dense, poorly graded sand with silt, and some gravels (SM-SP)		D1-7I	43			
	40		Light brown, slightly moist, dense, silty fine sand (SM)		D1-8I	28			
	45				D1-9I	36			
	50		Brown, slightly moist, very stiff, clayey silt (ML)		D1-10I	26			

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FIGURE 3

Project: Highlands Ranch II (Tuscany Meadows)
Project Location: Pittsburg, CA
WKA Number: 9328.01

LOG OF SOIL BORING D2

Sheet 1 of 1

Date(s) Drilled	11/23/11	Logged By	CJK	Checked By	DRG
Drilling Method	Solid Flight Auger	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole	20.0 feet
Drill Rig Type	CME-75	Diameter(s) of Hole, inches	6"	Approx. Surface Elevation, ft MSL	Not Determined
Groundwater Depth [Elevation], feet	Not Encountered []	Sampling Method(s)	California Modified	Drill Hole Backfill	cement grout
Remarks				Driving Method and Drop	140-lb automatic hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Dark brown, slightly moist, very stiff, silty clay (CL)						
					D2-1I	29	13.4	111	UCC 9.2 (tsf)
			Brown, slightly moist, medium dense, silty fine sand (SM)						
	5				D2-2I	36	9.7	110	
	10				D2-3I	23			
	15				D2-4I	23	9.0	96	
	20				D2-5I	30			

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FIGURE 4

Project: Highlands Ranch II (Tuscany Meadows)
Project Location: Pittsburg, CA
WKA Number: 9328.01

LOG OF SOIL BORING D3

Sheet 1 of 1

Date(s) Drilled	11/23/11	Logged By	CJK	Checked By	DRG
Drilling Method	Solid Flight Auger	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole	15.0 feet
Drill Rig Type	CME-75	Diameter(s) of Hole, inches	6"	Approx. Surface Elevation, ft MSL	Not Determined
Groundwater Depth [Elevation], feet	Not Encountered []	Sampling Method(s)	California Modified	Drill Hole Backfill	cement grout
Remarks				Driving Method and Drop	140-lb automatic hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Dark brown, slightly moist, very stiff, silty clay (CL)						
					D3-1I	26	13.7	124	UCC 5.5 (tsf)
	5		Brown, slightly moist, medium dense, silty fine sand (SM)		D3-2I	26	13.4	97	
	10		light brown		D3-3I	21			
	15				D3-4I	17	17.7	86	

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FIGURE 5

Project: Highlands Ranch II (Tuscany Meadows)
Project Location: Pittsburg, CA
WKA Number: 9328.01

LOG OF SOIL BORING D4

Sheet 1 of 1

Date(s) Drilled	11/23/11	Logged By	CJK	Checked By	DRG
Drilling Method	Solid Flight Auger	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole	20.0 feet
Drill Rig Type	CME-75	Diameter(s) of Hole, inches	6"	Approx. Surface Elevation, ft MSL	Not Determined
Groundwater Depth [Elevation], feet	Not Encountered []	Sampling Method(s)	California Modified	Drill Hole Backfill	cement grout
Remarks				Driving Method and Drop	140-lb automatic hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Dark brown, slightly moist, silty clay (CL)						
			Brown, slightly moist, loose, silty fine sand (SM)	■	D4-1I	11			
	5		Light brown, slightly moist, dense, sandy silt (ML)	■	D4-2I	52			
	10			■	D4-3I	70	17.1	102	
	15			■	D4-4I	40			
	20			■	D4-5I	29	15.3	99	

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FIGURE 6

Project: Highlands Ranch II (Tuscany Meadows)
Project Location: Pittsburg, CA
WKA Number: 9328.01

LOG OF SOIL BORING D5

Sheet 1 of 1

Date(s) Drilled	11/23/11	Logged By	CJK	Checked By	DRG
Drilling Method	Solid Flight Auger	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole	15.0 feet
Drill Rig Type	CME-75	Diameter(s) of Hole, inches	6"	Approx. Surface Elevation, ft MSL	Not Determined
Groundwater Depth [Elevation], feet	Not Encountered []	Sampling Method(s)	California Modified	Drill Hole Backfill	cement grout
Remarks				Driving Method and Drop	140-lb automatic hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Light brown, slightly moist, medium dense, sandy silt (ML)						
					D5-1I	19	11.5	101	UCC 2.8 (tsf)
	5		Grayish brown, slightly moist, medium dense, poorly graded sand with silt (SM-SP)		D5-2I	34	11.1	101	
			Dark brown / Dark grayish brown, slightly moist, very stiff, silty clay (CL)						
	10				D5-3I	35	17.9	97	
	15		Light brown, slightly moist, medium dense, sandy silt (ML)		D5-4I	36			

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FIGURE 7

Project: Highlands Ranch II (Tuscany Meadows)
Project Location: Pittsburg, CA
WKA Number: 9328.01

LOG OF SOIL BORING D6

Sheet 1 of 1

Date(s) Drilled	11/22/11	Logged By	CJK	Checked By	DRG
Drilling Method	Solid Flight Auger	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole	20.0 feet
Drill Rig Type	CME-75	Diameter(s) of Hole, inches	6"	Approx. Surface Elevation, ft MSL	Not Determined
Groundwater Depth [Elevation], feet	Not Encountered []	Sampling Method(s)	California Modified	Drill Hole Backfill	cement grout
Remarks				Driving Method and Drop	140-lb automatic hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Dark brown, slightly moist, very stiff, silty clay (CL)		D6-1I	25	14.2	111	
	5		Brown, slightly moist, medium dense, silty fine sand (SM)		D6-2I	24			
	10				D6-3I	38	18.5	104	
	15				D6-4I	38			
	20				D6-5I	27			

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FIGURE 8

Project: Highlands Ranch II (Tuscany Meadows) Project Location: Pittsburg, CA WKA Number: 9328.01	**LOG OF SOIL BORING D7** Sheet 1 of 1

Date(s) Drilled: 11/22/11	Logged By: CJK	Checked By: DRG
Drilling Method: Solid Flight Auger	Drilling Contractor: V&W Drilling	Total Depth of Drill Hole: 15.0 feet
Drill Rig Type: CME-75	Diameter(s) of Hole, inches: 6"	Approx. Surface Elevation, ft MSL: Not Determined
Groundwater Depth [Elevation], feet: Not Encountered []	Sampling Method(s): California Modified	Drill Hole Backfill: cement grout
Remarks		Driving Method and Drop: 140-lb automatic hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Dark brown, slightly moist, loose, clayey, silty fine sand (SM)						
					D7-1I	13	16.9	97	
					D7-2I	14	17.2	90	UCC 2.0 (tsf)
	5		silty fine sand						
					D7-3I	24			
	10								
					D7-4I	18	19.8	96	
	15								

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FIGURE 9

Project: Highlands Ranch II (Tuscany Meadows)
Project Location: Pittsburg, CA
WKA Number: 9328.01

LOG OF SOIL BORING D8

Sheet 1 of 1

Date(s) Drilled	11/22/11	Logged By	CJK	Checked By	DRG
Drilling Method	Solid Flight Auger	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole	20.0 feet
Drill Rig Type	CME-75	Diameter(s) of Hole, inches	6"	Approx. Surface Elevation, ft MSL	Not Determined
Groundwater Depth [Elevation], feet	Not Encountered []	Sampling Method(s)	California Modified	Drill Hole Backfill	cement grout
Remarks				Driving Method and Drop	140-lb automatic hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Dark brown, slightly moist, stiff, silty clay (CL)		D8-1I	19			
	5		Brown, slightly moist, very stiff, clayey silt (ML)		D8-2I	27	23.0	90	
			Light brown, slightly moist, medium dense, silty fine sand (SM)		D8-3I	10	12.7	90	
	15				D8-4I	21			
			Brown, slightly moist, very stiff, clayey silt (ML)						
	20				D8-5I	28			

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FIGURE 10

Project: Highlands Ranch II (Tuscany Meadows)
Project Location: Pittsburg, CA
WKA Number: 9328.01

LOG OF SOIL BORING D9

Sheet 1 of 1

Date(s) Drilled	11/22/11	Logged By	CJK	Checked By	DRG
Drilling Method	Solid Flight Auger	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole	20.0 feet
Drill Rig Type	CME-75	Diameter(s) of Hole, inches	6"	Approx. Surface Elevation, ft MSL	Not Determined
Groundwater Depth [Elevation], feet	Not Encountered []	Sampling Method(s)	California Modified	Drill Hole Backfill	cement grout
Remarks				Driving Method and Drop	140-lb automatic hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Dark brown, slightly moist, stiff, silty clay (CL)						
					D9-1I	16	19.5	103	UCC 3.1 (tsf)
	5		sandy, silty clay		D9-2I	16	14.8	101	
			Light brown, slightly moist, medium dense, sandy silt (ML)						
	10				D9-3I	29			
			Light brown, slightly moist, medium dense, silty fine sand (SM)						
	15				D9-4I	21	11.5	96	
			Light brown, slightly moist, medium dense, sandy silt (ML)						
	20				D9-5I	18			

BORING LOG 9328.01 - HIGHLANDS RANCH II SUBDIVISION.GPJ WKA.GDT 1/23/12 4:14 PM

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FIGURE 11

Project: Highlands Ranch II (Tuscany Meadows) Project Location: Pittsburg, CA WKA Number: 9328.01	**LOG OF SOIL BORING D10** Sheet 1 of 1

Date(s) Drilled: 11/22/11	Logged By: CJK	Checked By: DRG
Drilling Method: Solid Flight Auger	Drilling Contractor: V&W Drilling	Total Depth of Drill Hole: 15.0 feet
Drill Rig Type: CME-75	Diameter(s) of Hole, inches: 6"	Approx. Surface Elevation, ft MSL: Not Determined
Groundwater Depth [Elevation], feet: Not Encountered []	Sampling Method(s): California Modified	Drill Hole Backfill: cement grout
Remarks		Driving Method and Drop: 140-lb automatic hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Dark brown, slightly moist, stiff, silty clay (CL)						
				■	D10-1I	12	19.8	102	UCC 3.2 (tsf)
	5		sandy, silty clay	■	D10-2I	17	16.3	103	
			Brown, slightly moist, medium dense, silty fine sand (SM)						
	10			■	D10-3I	17	8.6	96	
				■	D10-4I	23			
	15								

BORING LOG 9328.01 - HIGHLANDS RANCH II SUBDIVISION.GPJ WKA.GDT 1/23/12 4:14 PM

Wallace Kuhl & Associates

FIGURE 12

Project: Highlands Ranch II (Tuscany Meadows)
Project Location: Pittsburg, CA
WKA Number: 9328.01

LOG OF SOIL BORING D11

Sheet 1 of 1

Date(s) Drilled	11/22/11	Logged By	CJK	Checked By	DRG
Drilling Method	Solid Flight Auger	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole	20.0 feet
Drill Rig Type	CME-75	Diameter(s) of Hole, inches	6"	Approx. Surface Elevation, ft MSL	Not Determined
Groundwater Depth [Elevation], feet	Not Encountered []	Sampling Method(s)	California Modified	Drill Hole Backfill	cement grout
Remarks				Driving Method and Drop	140-lb automatic hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Dark brown, slightly moist, stiff, silty clay (CL)						
					D11-1I	22			
			Light brown, slightly moist, medium dense, silty fine sand (SM)						
	5				D11-2I	14	14.2	84	
			Light brown, slightly moist, dense, sandy silt (ML)						
	10				D11-3I	41			
			Light brown, slightly moist, medium dense, silty fine sand (SM)						
	15				D11-4I	27	7.4	95	
					D11-5I	31			
	20								

BORING LOG 9328.01 - HIGHLANDS RANCH II SUBDIVISION.GPJ WKA.GDT 1/23/12 4:14 PM

Wallace Kuhl & Associates

FIGURE 13

Project: Highlands Ranch II (Tuscany Meadows)
Project Location: Pittsburg, CA
WKA Number: 9328.01

LOG OF SOIL BORING D12

Sheet 1 of 1

Date(s) Drilled: 11/22/11	Logged By: CJK	Checked By: DRG
Drilling Method: Solid Flight Auger	Drilling Contractor: V&W Drilling	Total Depth of Drill Hole: 15.0 feet
Drill Rig Type: CME-75	Diameter(s) of Hole, inches: 6"	Approx. Surface Elevation, ft MSL: Not Determined
Groundwater Depth [Elevation], feet: Not Encountered []	Sampling Method(s): California Modified	Drill Hole Backfill: cement grout
Remarks		Driving Method and Drop: 140-lb automatic hammer

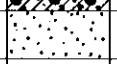
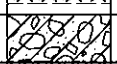
ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Dark brown, slightly moist, hard, sandy, silty clay (CL)	■	D12-1I	37	14.4	112	
	5		Brown, slightly moist, medium dense, sandy silt (ML)	■	D12-2I	21			
			Light brown, slightly moist, medium dense, silty fine sand (SM)	■	D12-3I	23	15.8	94	
	10								
	15			■	D12-4I	34			

BORING LOG 9328.01 - HIGHLANDS RANCH II SUBDIVISION.GPJ WKA.GDT 1/23/12 4:14 PM

Wallace Kuhl & Associates

FIGURE 14

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		SYMBOL	CODE	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of soil > no. 200 sieve size)	GRAVELS (More than 50% of coarse fraction > no. 4 sieve size)	GW		Well graded gravels or gravel - sand mixtures, little or no fines
		GP		Poorly graded gravels or gravel - sand mixtures, little or no fines
		GM		Silty gravels, gravel - sand - silt mixtures
		GC		Clayey gravels, gravel - sand - clay mixtures
	SANDS (50% or more of coarse fraction < no. 4 sieve size)	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
FINE GRAINED SOILS (50% or more of soil < no. 200 sieve size)	SILTS & 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 silty clays of low plasticity
	SILTS & 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, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt		Peat and other highly organic soils
ROCK		RX		Rocks, weathered to fresh
FILL		FILL		Artificially placed fill material

OTHER SYMBOLS

 = Drive Sample: 2-1/2" O.D. Modified California sampler

 = Drive Sampler: no recovery

 = SPT Sampler

 = Initial Water Level

 = Final Water Level

— — — = Estimated or gradational material change line

——— = Observed material change line

Laboratory Tests

PI = Plasticity Index
EI = Expansion Index
UCC = Unconfined Compression Test
TR = Triaxial Compression Test
GR = Gradational Analysis (Sieve)
K = Permeability Test

GRAIN SIZE CLASSIFICATION

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL coarse (c) fine (f)	3" to No. 4 3" to 3/4" 3/4" to No. 4	76.2 to 4.76 76.2 to 19.1 19.1 to 4.76
SAND coarse (c) medium (m) fine (f)	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.074 4.76 to 2.00 2.00 to 0.420 0.420 to 0.074
SILT & CLAY	Below No. 200	Below 0.074

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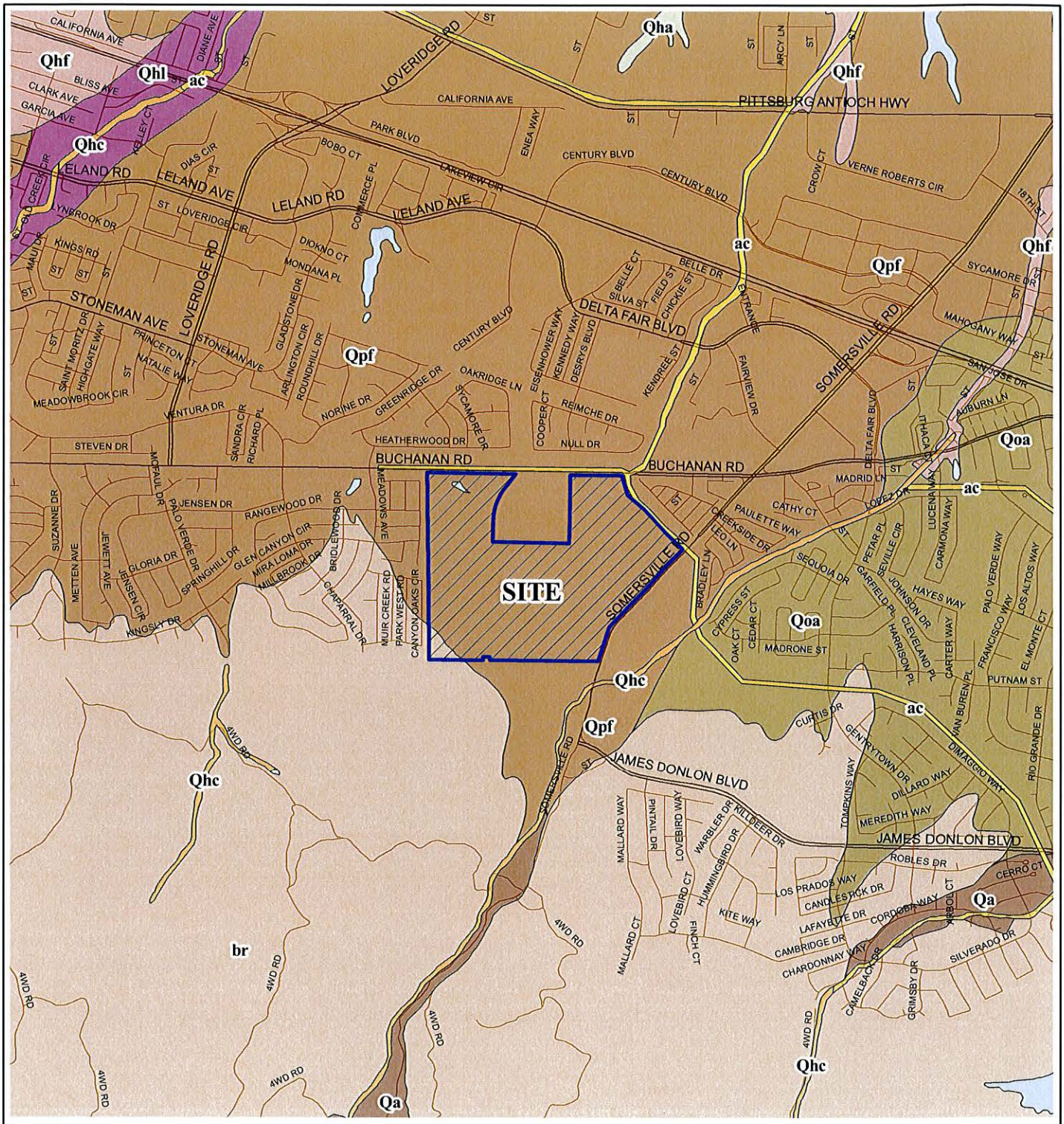
UNIFIED SOIL CLASSIFICATION SYSTEM
HIGHLANDS RANCH II
(TUSCANY MEADOWS)
Pittsburg, California

FIGURE	15
DRAWN BY	TJC
CHECKED BY	DJP
PROJECT MGR	DRG
DATE	1-12
WKA NO. 9328.01	



Legend

- Qa - Alluvium
- Qha - Holocene Alluvium
- Qhc - Modern Stream Channel Deposits
- Qhf - Holocene Alluvial Fan Deposits
- Qhl - Holocene Levee Deposits
- Qoa - Pleistocene Older Alluvial Fan Deposits
- Qpf - Late Pleistocene Alluvial Fan Deposits
- ac - Artificial Stream Channel
- br - Bedrock

Adapted from Preliminary Maps of Quaternary Deposits and Liquefaction Susceptibility, Nine-County San Francisco Bay Region, California (2000), U.S. Geological Survey, OFR00-444.
Projection: NAD 83, California State Plane, Zone III

N

0 1,000 2,000
Feet

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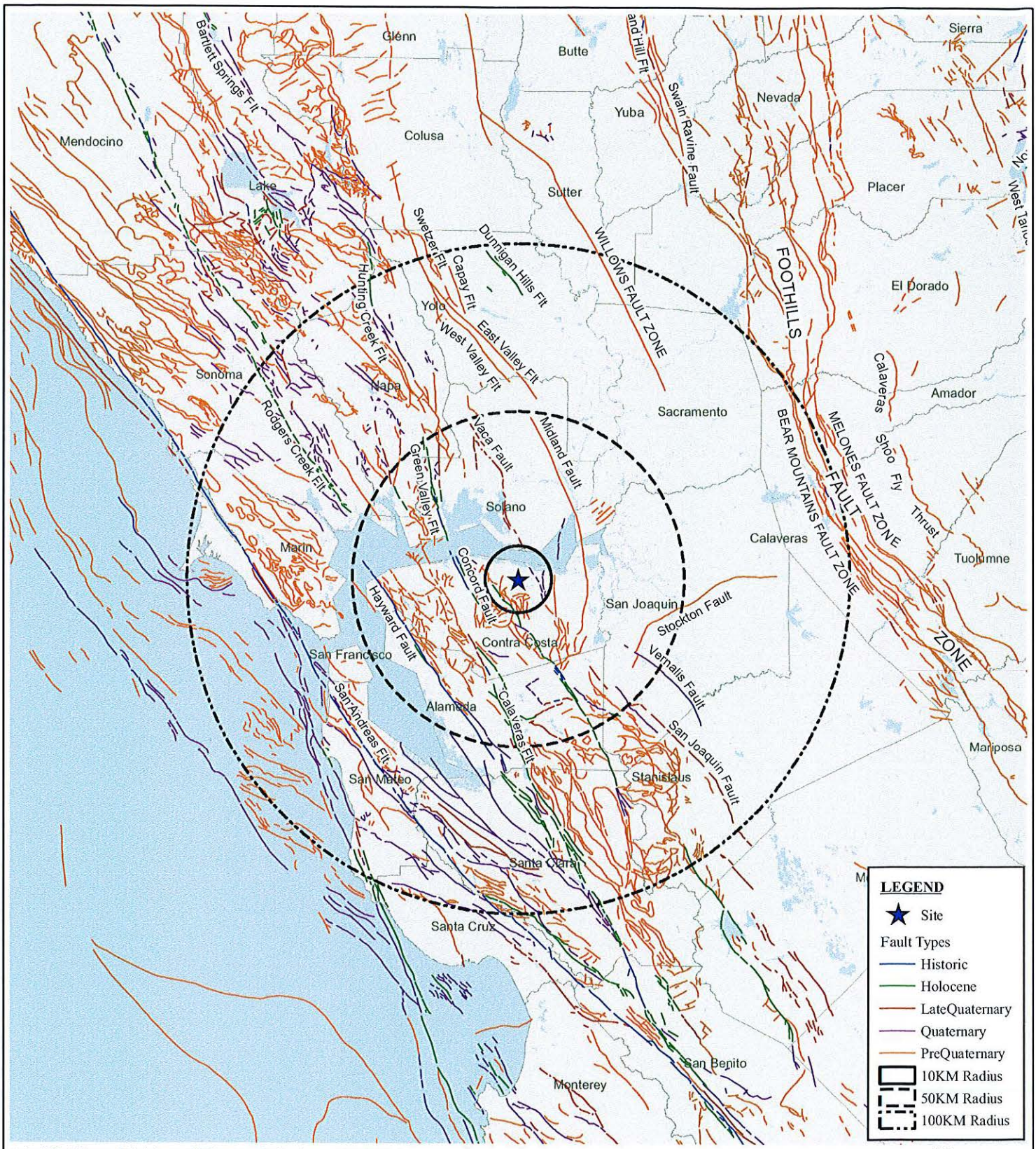
GEOLOGIC MAP
HIGHLANDS RANCH II
(TUSCANY MEADOWS)
Pittsburg, California

FIGURE	16
DRAWN BY	TJC
CHECKED BY	DJP
PROJECT MGR	DRG
DATE	1/12
WKA NO. 9328.01	



Modified from, Division of Mines and Geology, CD-ROM 2000-08 (2000), Digital database of faults from the Fault Activity Map of California and Adjacent Areas.
Projection: NAD 83, California State Plane, Zone III

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FAULT MAP
HIGHLANDS RANCH II
(TUSCANY MEADOWS)
Pittsburg, California

FIGURE	17
DRAWN BY	TJC
CHECKED BY	DJP
PROJECT MGR	DRG
DATE	1/12
WKA NO. 9328.01	

APPENDICES

APPENDIX A
General Information, Field Exploration and Laboratory Testing

APPENDIX A

A. GENERAL INFORMATION

The performance of a geotechnical engineering investigation and pavement design for the proposed Highlands Ranch II (Tuscany Meadows) residential development, located on the south side of Buchanan Road, west of Somersville Road, in Pittsburg, California, was authorized by our client West Coast Home Builders on November 22, 2011. Authorization was for an investigation as described in our proposal letter dated October 28, 2011, sent to our client, whose mailing address is 4021 Port Chicago Highway, Concord, California 94524; telephone (925) 671-7711; facsimile (925) 689-5979.

B. FIELD EXPLORATION

A total of 12 borings were drilled on November 22 and 23, 2011, at the approximate locations indicated on Figure 2 to maximum depths of approximately 15 to 51 feet below existing site grades, utilizing a CME-75 truck-mounted drill rig equipped with six-inch diameter solid helical augers and eight-inch diameter hollow-stem augers. At various intervals, relatively undisturbed soil samples were recovered with a 2-inch O.D., 1 3/8-inch I.D. Standard Penetration Sampler (ASTM D1586), or a 2½-inch O.D., 2-inch I.D., modified California sampler (ASTM D3550) driven by an automatic 140-pound hammer freely falling 30 inches. The number of blows of the hammer required to drive the 18-inch long sampler each 6-inch interval was recorded. The sum of the blows required to drive the sampler the lower 12-inch interval, or portion thereof, is designated the penetration resistance or "blow count" for that particular drive. The actual blow counts recorded with the larger sampler are presented on the boring logs.

The samples obtained with the modified California sampler were retained in 2-inch diameter by 6-inch long, thin-walled brass tubes contained within the sampler. Immediately after recovery, the field engineer visually classified the soil in the tubes and the ends of the tubes were sealed to preserve the natural moisture contents. Samples obtained with the Standard Penetration Sampler were placed in plastic bags and sealed. Disturbed bulk samples of the surface materials also were obtained at various locations and depths. Soil samples were taken to our laboratory for additional classification (ASTM D2488) and selection of samples for testing.

The Logs of Soil Borings, Figures 3 through 14, contain descriptions of the soils encountered in each boring. A Legend explaining the Unified Soil Classification System and the symbols used on the logs is contained on Figure 15.

C. LABORATORY TESTING

Selected undisturbed samples of the soils were tested to determine dry unit weight (ASTM D2937), natural moisture content (ASTM D2216) and unconfined compressive strength (ASTM D2166). The results of these tests are included on the boring logs at the depth each sample was obtained.

Three bulk samples of the near-surface soil were subjected to Plasticity Index testing (ASTM D4318). The results of these tests are presented on Figure A1.

Three bulk samples of the near-surface soil were subjected to Expansion Index testing (ASTM D4829); the results of these tests are presented on Figures A2 through A4.

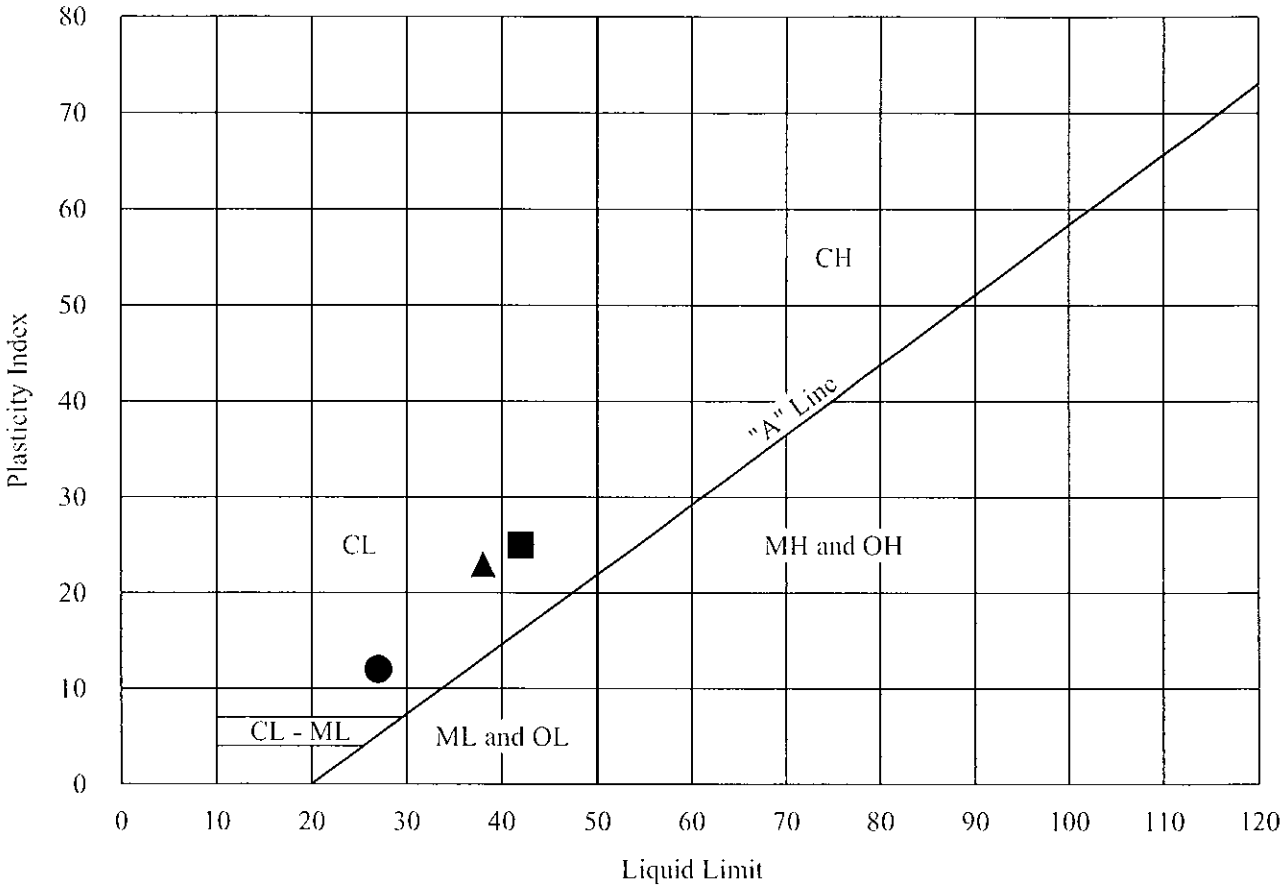
Two bulk samples of anticipated pavement subgrade soils were subjected to Resistance-value ("R") testing in accordance with California Test 301. The results of the R-value tests, which were used in the pavement design, are presented as Figure A5.

Three representative samples of near-surface soils were tested for grain-size distribution (ASTM D422, ASTM C136). The results of the gradation (grain-size) tests are contained on Figure A6.

Three representative samples of near-surface soils were submitted to Sunland Analytical to determine the soil pH and minimum resistivity (California Test 643), Sulfate concentration (California Test 417) and Chloride concentration (California Test 422). Results of these tests are included as Figures A7 through A9.

ATTERBERG LIMITS

ASTM D4318



KEY SYMBOL	LOCATION	SAMPLE DEPTH	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		PASSING No. 200 SIEVE (%)	UNIFIED SOIL CLASSIFICATION SYMBOL
				LIQUID LIMIT (%)	PLACTICITY INDEX (%)		
●	D1	1' - 3'	---	27	12	58.1	CL
▲	D2	1' - 3'	---	38	23	62.0	CL
■	D12	1' - 3'	---	42	25	72.8	CL

Wallace Kuhl & Associates

ATTERBERG LIMITS
HIGHLANDS RANCH II
(TUSCANY MEADOWS)
Pittsburg, California

FIGURE	A1
DRAWN BY	TJC
CHECKED BY	DJP
PROJECT MGR	DRG
DATE	1/12
WKA NO. 9328.01	

EXPANSION INDEX TEST RESULTS

ASTM D4829

MATERIAL DESCRIPTION: Dark brown, silty clay

LOCATION: D1

Sample Depth	Pre-Test Moisture (%)	Post-Test Moisture (%)	Dry Density (pcf)	Expansion Index
1'-3'	11.0	19.9	106.3	**28**

CLASSIFICATION OF EXPANSIVE SOIL *

EXPANSION INDEX	POTENTIAL EXPANSION
0 - 20	Very Low
21 - 50	**Low**
51 - 90	Medium
91 - 130	High
Above 130	Very High

* From ASTM D4829, Table 1

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EXPANSION INDEX TEST RESULTS
HIGHLANDS RANCH II
(TUSCANY MEADOWS)
Pittsburg, California

FIGURE	A2
DRAWN BY	TJC
CHECKED BY	DJP
PROJECT MGR	DRG
DATE	1/12
WKA NO. 9328.01	

EXPANSION INDEX TEST RESULTS

ASTM D4829

MATERIAL DESCRIPTION: Dark brown, silty clay

LOCATION: D2

Sample Depth	Pre-Test Moisture (%)	Post-Test Moisture (%)	Dry Density (pcf)	Expansion Index
1'-3'	11.6	29.1	101.8	**92**

CLASSIFICATION OF EXPANSIVE SOIL *

EXPANSION INDEX	POTENTIAL EXPANSION
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	**High**
Above 130	Very High

* From ASTM D4829, Table 1

Wallace Kuhl & Associates

EXPANSION INDEX TEST RESULTS
HIGHLANDS RANCH II
(TUSCANY MEADOWS)
Pittsburg, California

FIGURE	A3
DRAWN BY	TJC
CHECKED BY	DJP
PROJECT MGR	DRG
DATE	1-12
WKA NO. 9328.01	

EXPANSION INDEX TEST RESULTS

ASTM D4829

MATERIAL DESCRIPTION: Dark brown, sandy, silty clay

LOCATION: D12

Sample Depth	Pre-Test Moisture (%)	Post-Test Moisture (%)	Dry Density (pcf)	Expansion Index
1'-3'	12.5	27.5	99.1	**75**

CLASSIFICATION OF EXPANSIVE SOIL *

EXPANSION INDEX	POTENTIAL EXPANSION
0 - 20	Very Low
21 - 50	Low
51 - 90	**Medium**
91 - 130	High
Above 130	Very High

* From ASTM D4829, Table 1

WallaceKuhl & ASSOCIATES

EXPANSION INDEX TEST RESULTS
HIGHLANDS RANCH II
(TUSCANY MEADOWS)
Pittsburg, California

FIGURE	A4
DRAWN BY	TJC
CHECKED BY	DJP
PROJECT MGR	DRG
DATE	1/12
WKA NO. 9328.01	

RESISTANCE VALUE TEST RESULTS
(California Test 301)

MATERIAL DESCRIPTION: Dark brown, silty clay

LOCATION: D1 (1'-3')

Specimen No.	Dry Unit Weight (pcf)	Moisture @ Compaction (%)	Exudation Pressure (psi)	Expansion Pressure (dial)	Expansion Pressure (psf)	R Value
1	110	15.8	225	0	0	4
2	114	14.6	267	8	35	9
3	118	13.4	419	10	43	21

R-Value at 300 psi exudation pressure = 11

MATERIAL DESCRIPTION: Dark brown, silty clay

LOCATION: D4 (1'-3')

Specimen No.	Dry Unit Weight (pcf)	Moisture @ Compaction (%)	Exudation Pressure (psi)	Expansion Pressure (dial)	Expansion Pressure (psf)	R Value
1	100	18.2	166	4	17	8
2	105	16.9	286	12	52	12
3	109	15.3	559	27	117	28

R-Value at 300 psi exudation pressure = 12

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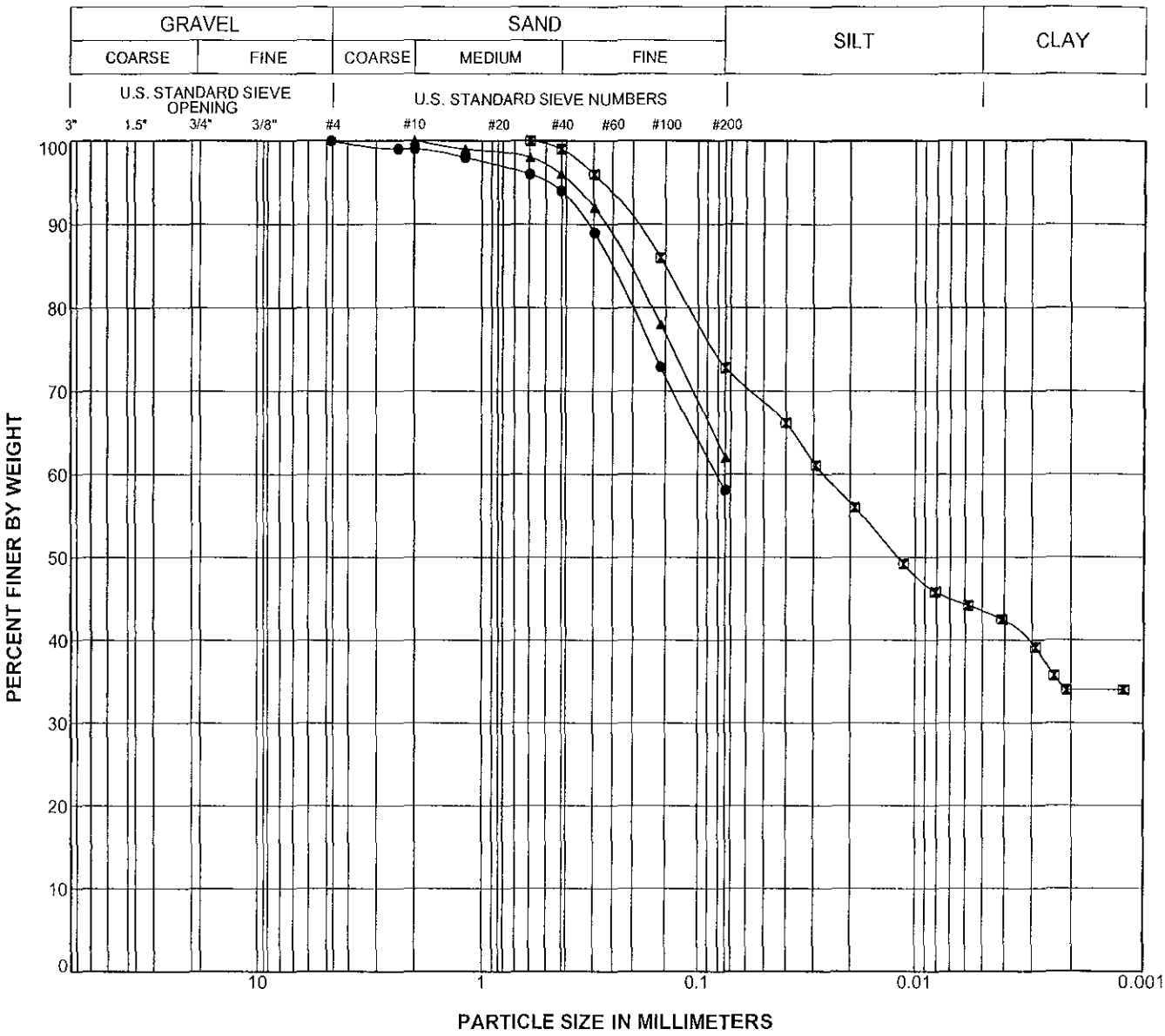
RESISTANCE VALUE TEST RESULTS
HIGHLANDS RANCH II
(TUSCANY MEADOWS)
Pittsburg, California

FIGURE	A5
DRAWN BY	TJC
CHECKED BY	DJP
PROJECT MGR	DRG
DATE	1/12
WKA NO. 9328.01	



Boring Number	Sample Number	USCS	Depth (feet)	Symbol	LL	PI	Classification
D1	D1 (1'-3')	CL	2.0	●	27	12	Dark brown, silty clay
D12	D12 (1'-3')	CL	2.0	⊠	42	25	Dark brown, silty clay
D2	D2 (1'-3')	CL	2.0	▲	38	23	Dark brown, silty clay

PARTICLE SIZE DISTRIBUTION

Project: Highlands Ranch II (Tuscany Meadows)
WKA No. 9328.01

FIGURE A6

Wallace Kuhl & ASSOCIATES

GRAIN SIZE 9328.01 - HIGHLANDS RANCH II SUBDIVISION.GPJ WKA.GDT 2/3/12 3:19 PM

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 12/07/2011
Date Submitted 12/02/2011

To: Dominic Potestio
Wallace-Kuhl & Assoc.
3050 Industrial Blvd.
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 9328.01/H.LAND RCHII Site ID : D1 @ 1-3'.
Your purchase order number is 2194.
Thank you for your business.

* For future reference to this analysis please use SUN # 61453-126300.

EVALUATION FOR SOIL CORROSION

Soil pH	5.85		
Minimum Resistivity	2.47 ohm-cm (x1000)		
Chloride	14.3 ppm	00.00143	%
Sulfate	3.6 ppm	00.00036	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Wallace Kuhl & Associates

CORROSION TEST RESULTS
HIGHLANDS RANCH II
(TUSCANY MEADOWS)
Pittsburg, California

FIGURE	A7
DRAWN BY	TJC
CHECKED BY	DJP
PROJECT MGR	DRG
DATE	1/12
WKA NO. 9328.01	

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 12/07/2011
Date Submitted 12/02/2011

To: Dominic Potestio
Wallace-Kuhl & Assoc.
3050 Industrial Blvd.
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 9328.01/H.LAND RCHII Site ID : D2 @ 1-3'.
Your purchase order number is 2194.
Thank you for your business.

* For future reference to this analysis please use SUN # 61453-126301.

EVALUATION FOR SOIL CORROSION

Soil pH	7.09	
Minimum Resistivity	1.42 ohm-cm (x1000)	
Chloride	17.2 ppm	00.00172 %
Sulfate	6.2 ppm	00.00062 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Wallace Kuhl & Associates

CORROSION TEST RESULTS
HIGHLANDS RANCH II
(TUSCANY MEADOWS)
Pittsburg, California

FIGURE	A8
DRAWN BY	TJC
CHECKED BY	DJP
PROJECT MGR	DRG
DATE	1/12
WKA NO. 9328.01	

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 12/07/2011
Date Submitted 12/02/2011

To: Dominic Potestio
Wallace-Kuhl & Assoc.
3050 Industrial Blvd.
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 9328.01/H.LAND RCHII Site ID : D12 @ 1-3'.
Your purchase order number is 2194.
Thank you for your business.

* For future reference to this analysis please use SUN # 61453-126302.

EVALUATION FOR SOIL CORROSION

Soil pH	6.71		
Minimum Resistivity	1.31 ohm-cm (x1000)		
Chloride	14.9 ppm	00.00149	%
Sulfate	0.3 ppm	00.00003	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Wallace Kuhl & Associates

CORROSION TEST RESULTS
HIGHLANDS RANCH II
(TUSCANY MEADOWS)
Pittsburg, California

FIGURE	A9
DRAWN BY	TJC
CHECKED BY	DJP
PROJECT MGR	DRG
DATE:	1/12
WKA NO. 9328.01	

APPENDIX B
Guide Earthwork Specifications

APPENDIX B

GUIDE EARTHWORK SPECIFICATIONS

HIGHLANDS RANCH II

(TUSCANY MEADOWS)

South of Buchanan Road, West of Somersville Road

Pittsburg, California

WKA No. 9328.01

PART 1: GENERAL

1.1 SCOPE

a. General Description

This item shall include the clearing of remaining building remnants, slabs, any utilities to be abandoned, trees, shrubbery and associated items; preparation of surfaces to be filled, filling, spreading, compaction, observation and testing of the fill; and all subsidiary work necessary to complete the grading of the building and pavement areas to conform with the lines, grades and slopes as shown on the accepted Drawings.

b. Related Work Specified Elsewhere

(1) Trenching and backfilling for sanitary sewer system: Section _____.

(2) Trenching and backfilling for storm sewer system: Section _____.

(3) Trenching and backfilling for underground water, natural gas, and electric supplies: Section _____.

c. Geotechnical Engineer

Where specific reference is made to "Geotechnical Engineer" this designation shall be understood to be the Geotechnical Engineer retained to provide services during construction or his or her representatives.

1.2 PROTECTION

a. Adequate protection measures shall be provided to protect workmen and passers-by the site. Streets and adjacent property shall be fully protected throughout the operations.

b. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.

c. Any construction review of the Contractor's performance conducted by the Geotechnical Engineer or the Owner is not intended to include review of the adequacy of the Contractor's safety measures, in, on or near the construction site.

d. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.

e. Surface drainage provisions shall be made during the period of construction in a manner to avoid creating a nuisance to adjacent areas.

f. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance.

1.3 GEOTECHNICAL REPORT

a. A Geotechnical Engineering Report (WKA No. 9328.01, dated February 3, 2012) has been prepared for this site by Wallace - Kuhl & Associates, of West Sacramento, California [(916) 372-1434]. A copy is available for review at the office of Owner or Wallace - Kuhl & Associates.

b. The information contained in this report was obtained for design purposes only. The contractor is responsible for any conclusions he may draw from this report; should he prefer not to assume such risk, he shall employ his own experts to analyze available information and/or to make additional test pits or borings upon which to base his conclusions, all at no cost to the Owner.

1.4 EXISTING SITE CONDITIONS

The Contractor shall acquaint himself with all site conditions. If unshown active utilities are encountered during the work, the Architect shall be promptly notified for instructions.

Failure to notify will make the Contractor liable for damage to these utilities arising from Contractor's operations subsequent to his discovery of such unshown utilities.

1.5 SEASONAL LIMITS

Fill material shall not be placed, spread or rolled during unfavorable weather conditions. When heavy rains interrupt the work, fill operations shall not be resumed until field tests indicate that the moisture contents of the subgrade and fill materials are satisfactory.

PART 2: PRODUCTS

2.1 MATERIALS

a. Fill shall be of approved local materials from required excavations, supplemented by imported fill, if necessary. Approved local materials are defined as on-site soils free from significant quantities of rubble, rubbish and vegetation. Remediated soils present on site can be reused as engineered fill, provided they meet the requirements of these specifications. Clods, rocks or hard lumps exceeding four inches (4") in final size shall not be allowed in the upper two feet (2') of any fill placed in structural areas.

b. Imported fill materials shall meet the above requirements and shall have properties similar to the on-site soils. Imported soils shall be approved by the Geotechnical Engineer prior to transportation to the project site. Imported soils shall be certified by the Contractor that they are free of environmental contamination that would make the soils unfit for use in a residential subdivision.

c. Capillary barrier material under floor slabs shall be provided to the thickness shown on the Drawings. This material shall be clean gravel or crushed rock of one-inch (1") maximum size, with no material passing a Number four (#4) sieve.

d. Asphalt concrete, aggregate base, and other paving products shall comply with the appropriate provisions of the State of California (Caltrans) Standard Specifications, latest edition.

PART 3: EXECUTION

3.1 LAYOUT AND PREPARATION

Lay out all work, establish grades, locate existing underground utilities, set markers and stakes, set up and maintain barricades and protection of utilities prior to beginning actual earthwork operations.

3.2 CLEARING, GRUBBING AND PREPARING, LOTS, BUILDING PADS AND PAVEMENT AREAS

a. Items including but not limited to rubble and rubbish; underground utilities; associated trench backfill; concrete slabs and foundations; irrigation piping; and other items encountered during site work and deemed unacceptable by the Owner and Geotechnical Engineer, shall be removed and disposed of so as to leave the disturbed areas with a neat and finished appearance, free from unsightly debris. Trees that are designated for removal shall include the rootball and all associated root systems ½-inch or greater. The upper twelve inches (12") of soil subgrade within areas of removed items and irrigation/drainage ditches shall be thoroughly ripped and cross-ripped to expose any subsurface structures, building foundations, concrete and other remnants or root systems. Exposed remnants shall be removed and debris and roots cleared from the site. Excavations and depressions resulting from the removal of such items, as well as existing excavations or loose soil deposits, as determined by the Geotechnical Engineer, shall be cleaned out to firm, undisturbed soil and backfilled with suitable materials in accordance with these specifications.

b. The surfaces upon which fill is to be placed, as well as at-grade areas or areas achieved by excavation, shall be plowed or scarified to a depth of at least twelve inches (12"), until the surface is free from ruts, hummocks or other uneven features, which would tend to prevent uniform compaction by the selected equipment.

c. When the moisture content of the subgrade is below that required to achieve the specified density, water shall be added until the proper moisture content is achieved. Granular soils shall be moisture conditioned to at least the optimum moisture content and clay soils to at least two percent above the optimum moisture content.

d. When the moisture content of the subgrade is too high to permit the specified compaction to be achieved, the subgrade shall be aerated by blading or other methods until the moisture content is satisfactory for compaction.

e. After the foundations for fill have been cleared, plowed, or scarified, they shall be disced or bladed until uniform and free from large clods, brought to at least two percent (2%) over the optimum moisture content and compacted to not less than ninety percent (90%) of the maximum dry density as determined by the ASTM D1557 Test Method.

3.3 REMEDIAL GRADING

a. Sloping ground steeper than four horizontal to one vertical (4:1) shall be benched prior to receiving engineered fill. Benching shall be performed by cutting relatively level steps at least two feet into the existing slopes. Benching shall be performed progressively up the slope as the fill reaches the level of firm natural ground on the high side. On slopes steeper than four horizontal to one vertical (4:1), the fill shall be keyed into the natural ground at the toe, as well as benched. A base key shall be constructed at the toe of the slope. The base key shall be at least 10 feet wide or the width of the construction equipment, whichever is wider, and shall extend into undisturbed native soils, or at least two feet below existing grades. The base key depth must be verified by the geotechnical engineer prior to fill construction who shall determine the need for scarification and compaction of the bottom of the key. Engineered fill shall be properly benched into the existing slope to remove loose surface soils. Each bench shall consist of a level terrace excavated at least 12 inches into the slope. For every three feet of vertical height

of fill, a larger bench shall be constructed, extending at least five feet into the existing slope. The geotechnical engineer shall observe the benching of the slopes to evaluate the need for additional or larger benches into the hillside, based on exposed conditions and can evaluate the need for base key construction based on the height of fill and exposed site conditions, at the time of grading. Both procedures shall be observed and approved by the geotechnical engineer prior to commencing fill operations.

b. To reduce the potential for differential settlement of building foundations, the building pads constructed partially by cut and partially by fill that exceed five feet in thickness, and fill differentials that exceed five feet shall be avoided. Building pads with either of these conditions will require over-excavation so that the fill differential across the building pad does not exceed five feet. Remedial grading plans prepared by the geotechnical engineer will show all areas that require remedial grading to reduce differential settlement. The geotechnical engineer shall work with the contractor to determine other areas, if any, requiring additional over-excavation.

c. Subdrains shall be installed within natural swales where the swales will be buried by engineered fill. These swales shall be located on the remedial grading plan prepared by the Geotechnical Engineer. The subdrains shall consist of a trench at least 24 inches wide and 24 inches deep, with a minimum six-inch diameter perforated rigid pipe with perforations placed downward. The drainpipe shall be placed on a minimum four-inch layer of drain rock, and covered by at least 1½ feet of drain rock. Drain rock shall consist of Class 2 permeable material (Caltrans Specification 68-1.025), or ½-inch by ¾-inch crushed rock, provided the drain rock and drainpipe are enveloped within an approved, non-woven geotextile filter fabric (Mirafi 140N, or an equivalent). The drainpipe shall be sloped to drain at a gradient of at least two percent. Water collected in the subdrains shall empty to an appropriate discharge point. The last 10 feet of drainpipe shall be non-perforated rigid solid pipe covered by compacted native soils or lean concrete

to block water flowing within the drain rock, allowing the water to exit through the drainpipe.

d. Engineered fill placed during remedial grading shall be performed in accordance with Sections 3.2 and 3.4 of these specifications.

3.4 PLACING, SPREADING AND COMPACTING FILL MATERIAL

a. The selected soil fill material shall be placed in layers which when compacted shall not exceed six inches (6") in thickness. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to promote uniformity of material in each layer.

b. When the moisture content of the fill material is below that required to achieve the specified density, water shall be added until the proper moisture content is achieved. Granular soils shall be moisture conditioned to at least the optimum moisture content and clay soils to at least two percent (2%) above the optimum moisture content as determined by the ASTM D1557 test method.

c. When the moisture content of the fill material is too high to permit the specified degree of compaction to be achieved, the fill material shall be aerated by blading or other methods until the moisture content is satisfactory.

d. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to at least ninety percent (90%) as determined by the ASTM D1557 test method. Compaction shall be undertaken with a heavy self-propelled sheeps-foot compactor (Caterpillar 815 or equivalent or superior) capable of achieving the specified density and shall be accomplished while the fill material is at the required moisture content. Each layer shall be compacted over its entire area until the desired density has been obtained.

e. The filling operations shall be continued until the fills have been brought to the finished slopes and grades as shown on the accepted Drawings.

3.4 FINAL SUBGRADE PREPARATION

a. The upper twelve inches (12") of final building pad subgrades and the upper six inches (6") of all final subgrades supporting pavement sections shall be brought to a uniform moisture content, and shall be uniformly compacted to not less than:

building pads	90%
pavement areas	95%
exterior concrete flatwork	90%

as determined by the ASTM D1557 test method, regardless of whether final subgrade elevations are attained by filling, excavation or are left at existing grades.

b. Subgrade soils must be maintained at the compacted moisture content until covered by aggregate base or capillary break rock.

c. Subgrade soils that are allowed to desiccate must be scarified, moisture conditioned and recompacted to the specified level before placing aggregate base or capillary break rock.

3.5 UTILITY TRENCH BACKFILL

a. Utility trench backfill within structural areas, including building pads, exterior flatwork and pavements, shall be mechanically compacted as engineered fill in accordance with the following specifications.

b. Bedding of utilities and initial backfill around and over the pipe should be in accordance with the manufacturer's recommendations for the pipe materials selected, and applicable City of Pittsburg requirements.

c. We recommend that native soil be used as trench backfill where trenches cross from landscape areas to structural areas (buildings, areas supporting exterior flatwork, driveways, etc.) to help minimize soil moisture variations beneath the structures. The native soil backfill should extend at least three feet horizontally inside and outside the perimeter foundation lines. Utility trench backfill using on-site soils shall be placed in maximum six-inch (6") lifts (compacted thickness),

moisture conditioned to at least two percent over the optimum moisture content and mechanically compacted to at least 90 percent of the maximum dry density as determined by ASTM D1557. Utility trench backfill using imported sand shall be placed in maximum twelve-inch (12") lifts (compacted thickness), moisture conditioned to at least two percent over the optimum moisture content and mechanically compacted to at least 90 percent of the maximum dry density as determined by ASTM D1557.

d. Trenches shall not encroach into the zone extending outward at a 1:1 inclination below the bottom of existing foundations.

3.6 TESTING AND OBSERVATION

a. Grading operations shall be observed by the Geotechnical Engineer, serving as the representative of the Owner.

b. Field density tests shall be made by the Geotechnical Engineer after compaction of each layer of fill. Additional layers of fill shall not be spread until the field density tests indicate that the minimum specified density has been obtained.

c. Earthwork shall not be performed without the notification or approval of the Geotechnical Engineer. The Contractor shall notify the Geotechnical Engineer at least two (2) working days prior to commencement of any site earthwork.

d. If the Contractor shall fail to meet the technical or design requirements embodied in this document and on the applicable plans, he shall make the necessary readjustments until all work is deemed satisfactory, as determined by the Geotechnical Engineer and the Owner. No deviation from the specifications shall be made except upon written approval of the Geotechnical Engineer or the Owner.

APPENDIX C
Harding Lawson Associates – Logs of Test Pits and Logs of Borings

Equipment 6 inch Flight Auger

Elevation 129 feet** Date 8/18/87

Laboratory Tests	* Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample	
				0		DARK BROWN SANDY CLAY (CL) dry, very stiff
LL=45, PI=23	20			5		
	12			10		BROWN SILTY SAND (SM) moist to dry, medium dense, fine-grained
	29	18	108	15		DARK BROWN SANDY CLAY (CL) moist, very stiff
	33			20		BROWN SILTY SAND/SANDY SILT (SM-ML) moist dense/very stiff, fine grained sand
				25		Bottom of boring at 19.5 feet
				30		
				35		
				40		

* Blows/foot corrected to approximate standard penetration test blow counts.

** Elevation pursuant to National Geodetic Vertical Datum

Harding Lawson Associates
Engineers, Geologists & Geophysicists

Log of Boring 1

Seeno-Chevron Property
Pittsburg, California

PLATE **A-1**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	8/87		

Equipment 6 inch Flight Auger

Elevation 129 feet Date 8/18/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample
	13			0	
	37	14	114	5	
	37			10	
	22			15	
	34			20	
	27			25	
	41			30	
				35	
				40	

DARK BROWN SILTY CLAY (CL)
dry, very stiff

BROWN SILTY SAND (SM)
moist dense, fine-grained

BROWN SILTY SAND/SANDY SILT (SM-ML)
moist medium dense/very stiff, fine grained sand

Bottom of boring at 31.5 feet

Harding Lawson Associates
Engineers, Geologists
& Geophysicists

Log of Boring 2

Seeno-Chevron Property
Pittsburg, California

PLATE
A-2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	8/87		

Equipment 6 inch Flight Auger

Elevation 114 feet Date 8/18/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft) / Sample	
				0	DARK BROWN SILTY CLAY (CL) dry, hard
	29			5	
	63	15	118	10	
					BROWN SILTY SAND/SANDY SILT (SM-ML) moist dense/hard, fine-grained sand
	34			15	
	27			20	grading with gravel
	20			25	Bottom of boring at 24.5 feet
				30	
				35	
				40	

Harding Lawson Associates
Engineers, Geologists & Geophysicists

Log of Boring 3

Seeno-Chevron Property
Pittsburg, California

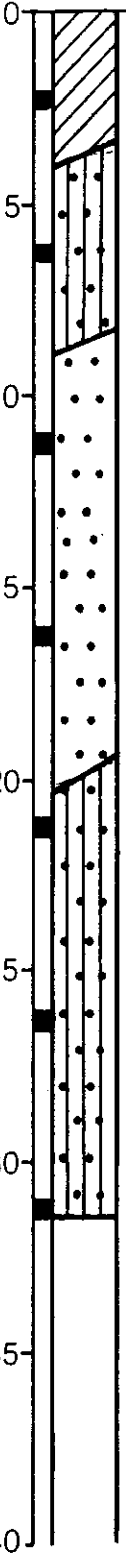
PLATE **A-3**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TA	8/87		

Equipment 6 inch Flight Auger

Elevation 125 feet Date 8/17/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample
	39			0
	18	11	91	5
	23			10
	23			15
	40			20
	20			25
	40			30
				35
				40



DARK BROWN SILTY CLAY (CL)
dry hard

BROWN SILTY SAND/SANDY SILT (SM-ML)
moist medium dense/stiff, fine grained sand

LIGHT BROWN SILTY SAND (SP)
moist medium dense, fine grained

BROWN SILTY SAND/SANDY SILT (SM-ML)
moist dense/very stiff, fine grained sand

Bottom of boring at 31.5 feet

Harding Lawson Associates
Engineers, Geologists & Geophysicists

Log of Boring 4

Seeno-Chevron Property
Pittsburg, California

PLATE **A-4**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	8/87		

Equipment 6 inch Flight Auger

Elevation 128 feet Date 8/17/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample
				0	
					DARK BROWN SILTY CLAY (CH) dry very stiff
LL=55, PI=28	24			5	
	20	23	92	10	
	31			15	
	36			20	Bottom of boring at 19.5 feet
				25	
				30	
				35	
				40	

Harding Lawson Associates
Engineers, Geologists & Geophysicists

Log of Boring 5
Seeno-Chevron Property
Pittsburg, California

PLATE
A-5

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	8/87		

Equipment 6 inch Flight Auger

Elevation 134 feet Date 8/17/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample	
				0	DARK BROWN SILTY CLAY (CL) dry very stiff
Swell 6.6% (300)	24	12	111		
				5	BROWN SANDY SILT (ML) dry very stiff
TxUU 5140 (300) (Plate B-3)	29	13	108		
				10	BROWN SILTY SAND/SANDY SILT (SM-ML) moist very dense/hard, fine grained sand
	34/5"				
				15	BROWN SILTY SAND (SM) moist medium dense, fine-grained
	24	6	102		
				20	BROWN SANDY SILT (ML) moist hard
	34/5"				
				25	BROWN SILTY SAND/SANDY SILT (SM-ML) moist medium dense/stiff, fine grained sand
	27				
				30	Bottom of boring at 31.5 feet
	29				
				35	
				40	

Harding Lawson Associates
Engineers, Geologists & Geophysicists

Log of Boring 6
Seeno-Chevron Property
Pittsburg, California

PLATE **A-6**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	8/87		

Equipment 6 inch Flight Auger

Elevation 137 feet Date 8/17/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample	
	26	10		0		DARK BROWN SANDY SILT (ML) dry, very stiff
	61			5		BROWN SILTY SAND/SANDY SILT (SM-ML) dry very dense/hard, fine grained sand
	49			10		
	53			15		BROWN SILTY SAND (SM) moist very dense, fine grained
	23			20		Bottom of boring at 21.5 feet
				25		
				30		
				35		
				40		

Harding Lawson Associates
Engineers, Geologists & Geophysicists

Log of Boring 7

Seeno-Chevron Property
Pittsburg, California

PLATE **A-7**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	8/87		

Equipment 6 inch Flight Auger

Elevation 143 feet Date 8/17/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft) / Sample	
				0	DARK BROWN SANDY SILT (ML) dry fine-grained sand
	37				
				5	
	24				BROWN SILTY SAND/SANDY SILT (SM-ML) moist medium dense/very stiff, fine-grained sand
				10	
	12				BROWN SILTY SAND (SM) dry medium dense to dense, fine grained
				15	
	38	11	100		
				20	with fine gravel
	43				
				25	
	52				
				30	Bottom of boring at 30.0 feet
				35	
				40	

Harding Lawson Associates
Engineers, Geologists & Geophysicists

Log of Boring 8
Seeno-Chevron Property
Pittsburg, California

PLATE **A-8**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	8/87		

Equipment 6 inch Flight Auger

Elevation 144 feet Date 8/19/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample	
	33			0	DARK BROWN SILTY CLAY (CL) dry, hard
Consol (Plate B-8)	12	9	99	5	BROWN SANDY SILT (ML) moist stiff
	49			10	BROWN SILTY SAND/SANDY SILT (SM-ML) moist dense/hard, fine-grained sand
	31	12	104	15	
	34/5"			20	Bottom of boring at 21.0 feet
				25	
				30	
				35	
				40	

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& Geophysicists

Log of Boring 9
Seeno-Chevron Property
Pittsburg, California

PLATE **A-9**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	8/87		

Equipment 6 inch Flight Auger

Elevation 150 feet Date 8/19/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample	
	18			0	DARK BROWN SILTY CLAY (CL) dry very stiff
	22	16	108	5	MOTTLED RUST & BROWN SANDY SILT (ML) moist very stiff
					grading to silty sand
	23			10	
	26			15	
	27			20	
	29	19	86	25	GRAY SILTY SAND (SP) moist, dense, fine-grained, with fine gravel
	27			30	Bottom of boring at 30.5 feet
				35	
				40	

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& Geophysicists

Log of Boring 10
Seeno-Chevron Propety
Pittsburg, California

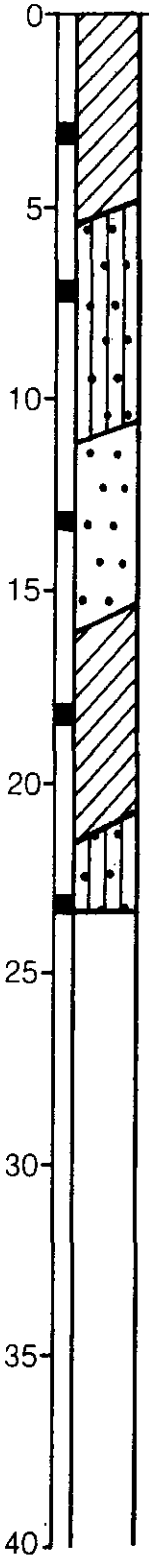
PLATE
A-10

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	8/87		

Equipment 6 inch Flight Auger

Elevation 156 feet Date 8/19/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample
LL=36, PI=19	25	14	105	0
				5
	68/5"			
				10
MA (Plate B-10)	23	8	96	
				15
	37			
				20
	37			
				25
				30
				35
				40



DARK BROWN SILTY CLAY (CL)
moist very stiff

BROWN SANDY SILT (SM)
moist hard

LIGHT BROWN SAND (SP)
moist medium dense very fine grained

LIGHT BROWN SILTY CLAY (CL)
moist hard

BROWN SILTY SAND/SANDY SILT (SM-ML)
moist dense/hard, fine-grained sand

Bottom of boring at 23.5 feet

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Log of Boring 11
Seeno-Chevron Property
Pittsburg, California

PLATE
A-11

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	8/87		

Equipment 6 inch Flight Auger

Elevation 147 feet Date 8/19/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample
	18	20		0	
	24			5	
	40			10	
	48			15	
	29			20	
				25	
				30	
				35	
				40	

DARK BROWN SANDY SILT (ML)
dry very stiff

LIGHT BROWN SILTY CLAY (CL)
moist very stiff, slight hydrocarbon odor

BROWN SILTY SAND/SANDY SILT (SM-ML)
moist medium dense/very stiff, fine grained sand

Bottom of boring at 21.5 feet

Harding Lawson Associates
Engineers, Geologists & Geophysicists

Log of Boring 12
Seeno-Chevron Property
Pittsburg, California

PLATE
A-12

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	8/87		

Equipment 6 inch Flight Auger

Elevation 155 feet Date 8/20/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft) / Sample
				0
				DARK BROWN SANDY SILT (ML) dry stiff to very stiff
Swell 0.5% (300)	10	13	91	5
	31	18	100	10
	31			15
	31			Bottom of boring at 19.5 feet
				20
				25
				30
				35
				40

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Log of Boring 13
Seeno-Chevron Property
Pittsburg, California

PLATE
A-13

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	8/87		

Equipment 6 inch Flight Auger

Elevation 153 feet Date 8/19/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample	
				0		LIGHT BROWN SILTY CLAY (CL) dry hard
	41	12	96	5		
						BROWN SILTY SAND (SM) moist medium dense, fine grained
	17			10		
	23			15		
	12			20		
						BROWN SILTY SAND/SANDY SILT (SM-ML) moist very dense/hard, fine grained sand
	61			25		
	56			30		Bottom of boring at 29.5 feet
				35		
				40		

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Engineers, Geologists & Geophysicists

Log of Boring 14
Seeno-Chevron Property
Pittsburg, California

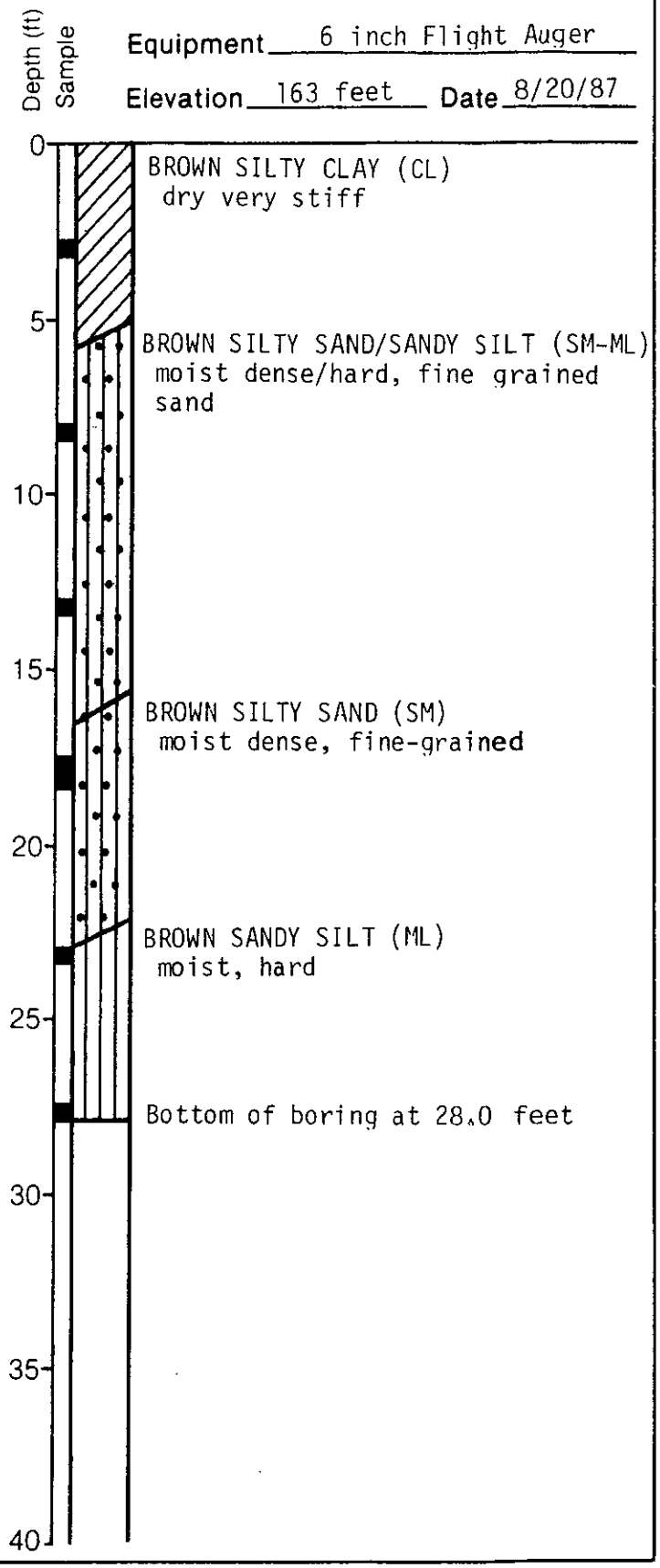
PLATE
A-14

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	8/87		

Equipment 6 inch Flight Auger

Elevation 163 feet Date 8/20/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)
TxUU 6811 (300) (Plate B-4)	20	14	109
	32	12	93
	28		
	20		
	41		
	34/5"		



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Log of Boring 15

Seeno-Chevron Property
Pittsburg, California

PLATE **A-15**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.04	TAT	8/87		

Equipment 6 inch Flight Auger

Elevation 163 feet Date 8/19/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample	
	14			0	DARK BROWN SILTY CLAY (CL) dry stiff
	36	12	116	5	BROWN SANDY SILT (ML) moist hard
	22			10	BROWN SILTY SAND/SANDY SILT (SM-ML) moist medium dense/very stiff, fine grained sand, with fine gravel
	33			15	
	26			20	Bottom fo boring at 21.5 feet
				25	
				30	
				35	
				40	

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Log of Boring 16
Seeno-Chevron Property
Pittsburg, California

PLATE
A-16

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.04	TAT	8/87		

Equipment 6 inch Flight Auger

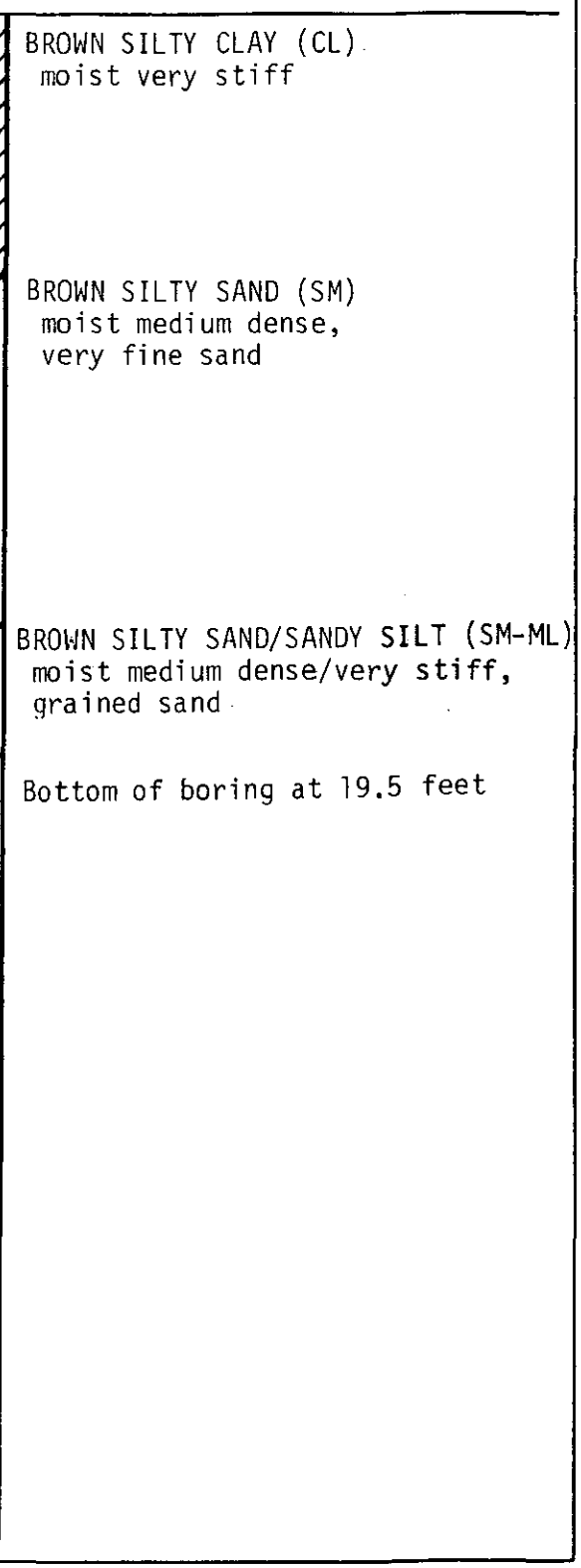
Elevation 172 feet Date 8/20/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample	
				0	DARK BROWN SILTY CLAY (CH) dry stiff
LL=64, PI=39	11				
	33			5	
				10	BROWN SILTY SAND/SANDY SILT (SM-ML) moist medium desne/very stiff, fine grained sand
	18				
				15	BROWN SAND CLAY (CL) moist very stiff
	24	19	92		
				20	
	21				
				25	
	28				
				30	
	29				Bottom of boring at 31.5 feet
				35	
				40	

Equipment 6 inch Flight Auger

Elevation 168 feet Date 8/20/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample
	24			0	
				5	
	16	11	87	10	
	28			15	
	29			20	
				25	
				30	
				35	
				40	



BROWN SILTY CLAY (CL)
moist very stiff

BROWN SILTY SAND (SM)
moist medium dense,
very fine sand

BROWN SILTY SAND/SANDY SILT (SM-ML)
moist medium dense/very stiff,
grained sand

Bottom of boring at 19.5 feet

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Log of Boring 18

Seeno-Chevron Property
Pittsburg, California

PLATE
A-18

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.04	TAT	8/87		

Equipment 6 inch Flight Auger

Elevation 166 feet Date 8/19/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample
				0
	28	20	98	5
	29			10
	12			15
	23			20
	26			25
	22			30
				35
				40

DARK BROWN SILTY CLAY (CL)
moist very stiff

BROWN SILTY SAND/SANDY SILT (SM-ML)
moist medium dense/stiff,
fine-grained sand

Bottom of boring at 29.5 feet

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Log of Boring 19
Seeno-Chevron Property
Pittsburg, California

PLATE
A-19

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.04	TAT	8/87		

Equipment 6 inch Flight Auger

Elevation 149 feet Date 8/20/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample
LL=42, PI=26	18			0
				DARK BROWN SILTY CLAY (CL) dry very stiff
MA (Plate B-11)	24			5
				BROWN SILTY SAND/SANDY SILT (SM-ML) moist medium dense/very stiff, fine-grained sand, with fine gravel
	34/6"			10
	34/6"			15
				BROWN SILTY SAND (SM) moist dense, fine-grained
	37			20
	51	11	109	25
				BROWN SILTY CLAY (CL) moist hard
	34/6"			30
				Bottom of boring at 31.5 feet
				35
				40

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Log of Boring 20

Seeno-Chevron Property
Pittsburg, California

PLATE **A-20**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.04	TAT	8/87		

Equipment 6 inch Flight Auger

Elevation 156 feet Date 8/20/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample	
				0	GRAY BROWN SANDY SILT (ML) moist stiff with organic traces
	12	19	74	5	
					BROWN SILTY SAND/SANDY SILT (SM-ML) moist medium dense/stiff, fine grained sand
	18			10	GRAY BROWN SILTY SAND (SM) moist medium dense, fine grained
	15	16	89	15	BROWN SILTY SAND/SANDY SILT (SM-ML) moist medium dense/stiff, fine grained sand
	20			20	
					BROWN CLAYEY SILT (MH) moist, very stiff
	22			25	
	24			30	Bottom of boring at 29.5 feet
				35	
				40	

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Log of Boring 21
Seeno-Chevron Property
Pittsburg, California

PLATE
A-21

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	9/87		

Equipment 6 inch Flight Auger

Elevation 166 feet Date 8/20/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample
	16			0
	25	16	104	5
	21			10
	33			15
	17			20
				25
				30
				35
				40

DARK BROWN SANDY SILT (ML)
dry very stiff

BLACK SILTY CLAY (CH)
dry hard

BROWN SILTY SAND/SANDY SILT(SM-ML)
moist medium dense/very stiff,
fine grained sand

BROWN SANDY SILT (ML)
moist hard

BROWN SILTY SAND/SANDY SILT (SM-ML)
moist medium dense/stiff

Bottom of boring at 21.5 feet

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Log of Boring 22
Seeno-Chevron Property
Pittsburg, California

PLATE
A-22

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	9/87		

Equipment 6 inch Flight Auger

Elevation 172 feet Date 8/21/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample	
	18			0		DARK BROWN SILTY CLAY (CL) dry very stiff
	15	16	93	5		BROWN SANDY SILT (ML) moist stiff
	39			10		MOTTLED GRAY BROWN SILTY CLAY (CL) moist, hard w/fine gravel
	16			15		BROWN SAND (SP) moist medium dense very fine grained
	24			20		BROWN SILTY SAND/SANDY SILT (SM-ML) moist medium dense/very stiff, fine grained sand
						Bottom fo boring at 21.5 feet
				25		
				30		
				35		
				40		

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Log of Boring 23
Seeno-Chevron Property
Pittsburg, California

PLATE
A-23

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	9/87		

Equipment 6 inch Flight Auger

Elevation 172 feet Date 8/21/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample
LL=48, PI=31	46			0
				5
	14	10	87	10
	44			15
	33			20
				25
				30
				35
				40

DARK BROWN SILTY CLAY (CL)
dry hard

BROWN SILTY SAND/SANDY SILT (SM-ML)
moist medium dense/stiff, very fine grained sand, w/fine gravel

Bottom of boring at 19.5 feet

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Log of Boring 24
Seeno-Chevron Property
Pittsburg, California

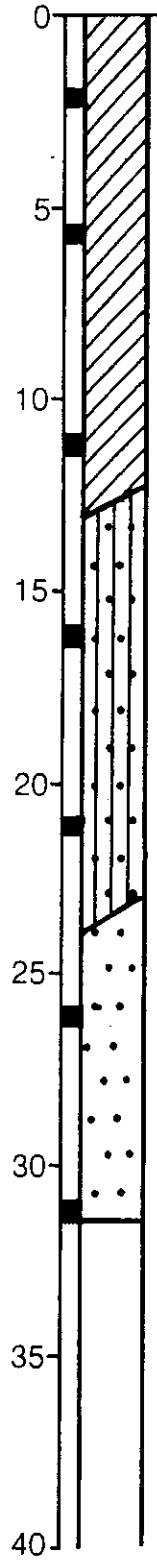
PLATE
A-24

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	9/87		

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample
	7	23	96	
Consol (Plate B-9)	14	20	105	
	20			
	16			
	10			
	26			
	28			

Equipment 6 inch Flight Auger

Elevation 109 feet Date 8/24/87



DARK BROWN SILTY CLAY (CL)
moist medium stiff

BROWN SILTY SAND/SANDY SILT (SM-ML)
moist medium dense/stiff, fine grained sand

GRAY BROWN SAND (SP)
moist medium dense, fine grained

grading w/ fine gravel

Bottom of boring at 31.5 feet

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Log of Boring 25
Seeno-Chevron Property
Pittsburg, California

PLATE
A-25

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	9/87		

Equipment 6 inch Flight Auger

Elevation 137 feet Date 8/21/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample	
	14			0	DARK BROWN SILTY CLAY (CL) dry stiff, has a distinct petroleum odor
				5	GREENISH BROWN SILTY CLAY (CL) dry, stiff, distinct petroleum odor at 3.0 feet
	17				Has a slight petroleum odor at 6.0 feet
				10	BROWN SILTY SAND/SANDY SILT (SM-ML) moist dense/hard, fine grained sand
	34				
				15	
	61				
				20	
	23				grading w/gravel
					REDDISH BROWN SILTY CLAY (CL) moist hard
	34/6"			25	
				30	
	46				Bottom of boring at 31.5 feet
				35	
				40	

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Log of Boring 26

Seeno-Chevron Property
Pittsburg, California

PLATE **A-26**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	9/87		

Equipment 6 inch Flight Auger

Elevation 143 feet Date 8/24/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample	
				0		BROWN SILTY CLAY (CL) dry very stiff
	18	14	109			
				5		BROWN SANDY SILT (ML) moist very stiff
	18			10		GRAY BROWN SILTY SAND (SM) moist medium dense, fine grained
	17			15		
	15	11	92			
				20		LIGHT BROWN SAND (SM) moist medium dense very fine grained
	18			25		BROWN SILTY SAND/SANDY SILT (SM-ML) moist medium dense/stiff, fine grained sand
	20					Bottom of boring at 29.5 feet
				30		
				35		
				40		

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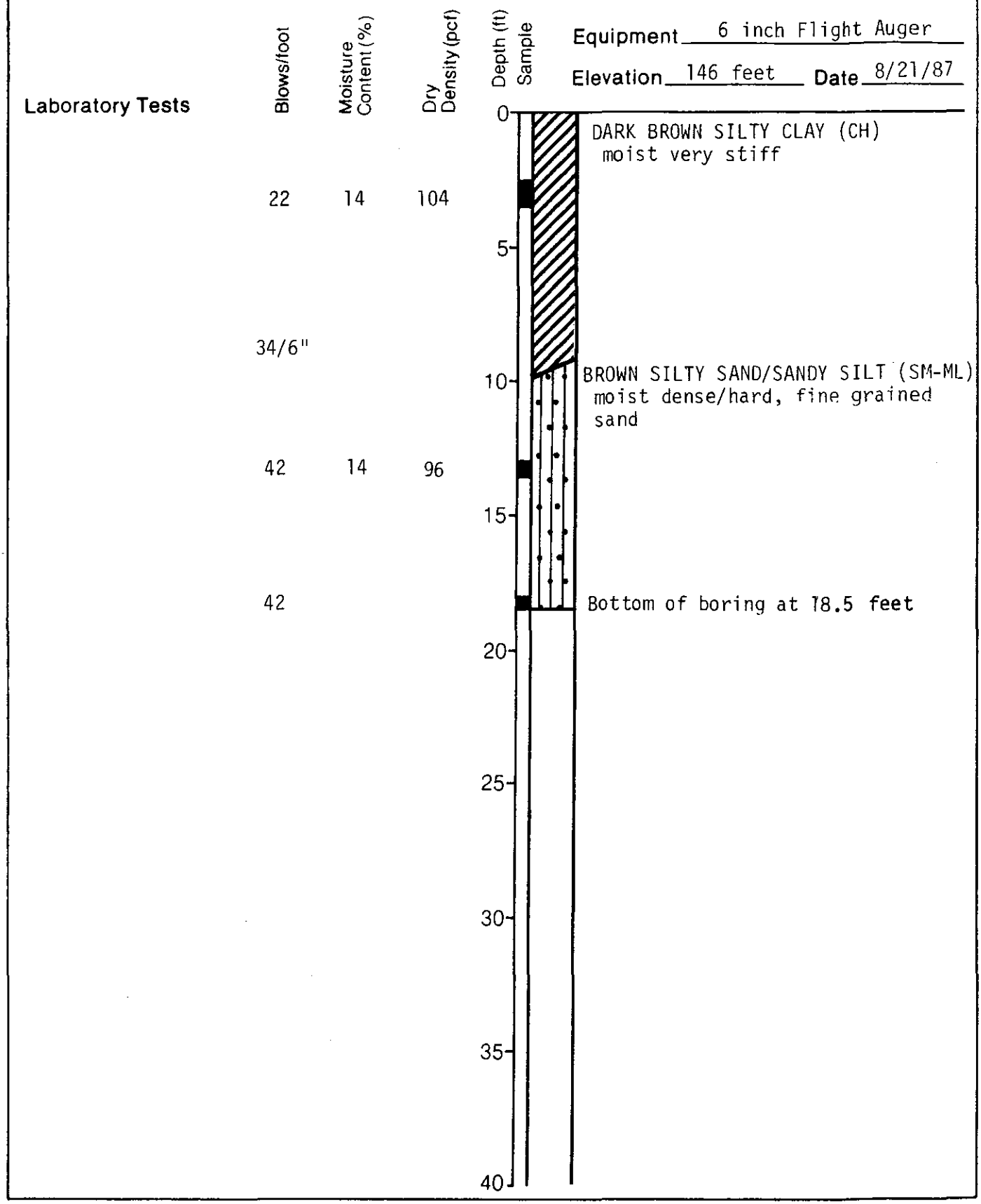
Log of Boring 27
Seeno-Chevron Property
Pittsburg, California

PLATE
A-27

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	9/87		

Equipment 6 inch Flight Auger

Elevation 146 feet Date 8/21/87



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Log of Boring 28

Seeno-Chevron Property
Pittsburg, California

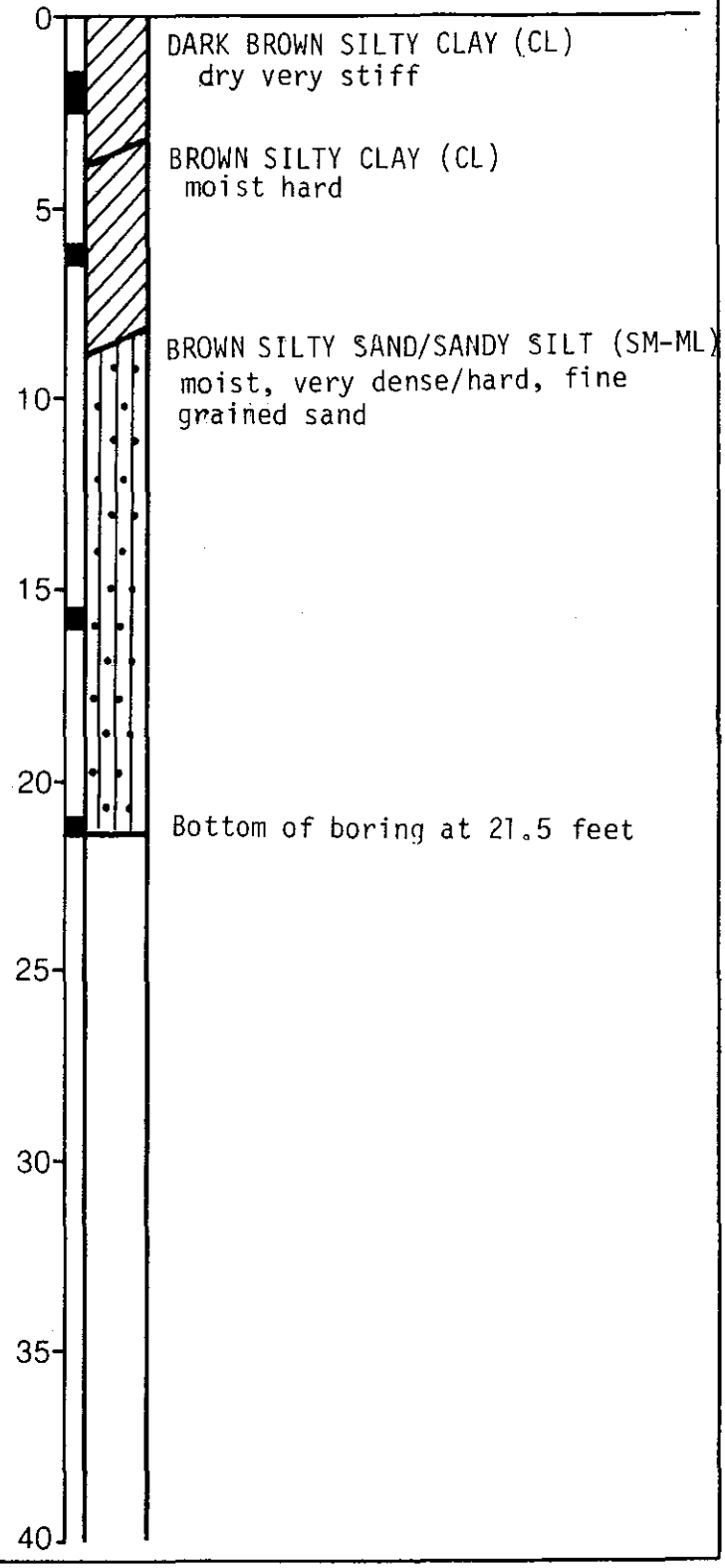
PLATE
A-28

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	JAT	9/87		

Equipment 6 inch Flight Auger

Elevation 153 feet Date 8/21/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)
R-value= < 5 LL=45, PI=27	21	14	109
Swell 3.6% (300)*		14	118
Compaction: γ_{dry} =119 pcf Moisture=12%	46	9	107
	34/6"		
	34/6"		
	47		



* Swell, Moisture and Density Tests performed on Compaction Test Sample

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Log of Boring 29
Seeno-Chevron Property
Pittsburg, California

PLATE
A-29

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	JAT	9/87		

Equipment 6 inch Flight Auger

Elevation 159 feet Date 8/21/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample
				0
	22	16	98	5
	21			10
	23			15
	23	17	93	20
	22			25
	33			30
				35
				40

DARK BROWN SANDY CLAY (CL)
moist very stiff

BROWN SILTY SAND (SM)
moist medium dense, fine grained

BROWN SANDY SILT (ML)
moist very stiff

BROWN SILTY SAND (SM)
moist medium dense, fine grained

Bottom of boring at 29.5 feet

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Log of Boring 30
Seeno-Chevron Property
Pittsburg, California

PLATE
A-30

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	9/87		

Equipment 6 inch Flight Auger

Elevation 149 feet Date 8/26/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample
	20	13	103	0
				5
	39			10
	28			15
	41			20
				25
				30
				35
				40

DARK BROWN SANDY SILT (ML)
dry very stiff

DARK BROWN SANDY SILT/SILTY CLAY (ML-CL)
dry hard

MOTTLED GRAY/RUST SILTY SAND (SM)
moist dense, very fine grained

Bottom of boring at 19.5 feet

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Log of Boring 31
Seeno-Chevron Property
Pittsburg, California

PLATE
A-31

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	9/87		

Equipment 6 inch Flight Auger

Elevation 173 feet Date 8/26/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample
TxUU 3566 (500) (Plate B-5)	16	15	115	0
				5
	26			
				10
	25	22	97	
				15
	21			
				20
	54			
				25
				30
				35
				40

MOTTLED ORANGE BROWN SILTY SAND/ SANDY SILT (SM-ML) dry medium dense/stiff, fine grained sand

BROWN SILTY SAND (SM) moist medium dense, fine grained

YELLOWISH BROWN SILTY SAND/ SANDY SILT (SM-ML) moist medium dense/stiff, fine grained sand, w/fine gravel

Bottom of boring at 23.5 feet

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Log of Boring 32
Seeno-Chevron Property
Pittsburg, California

PLATE
A-32

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	9/87		

Equipment 6 inch Flight Auger

Elevation 127 feet Date 8/24/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample	
				0		BROWN SILTY CLAY (CL) dry very stiff w/fine gravel
	27			5		
						BROWN SILTY SAND/SANDY SILT (SM-ML) moist dense/hard, fine grained sand
	33	12	102	10		
						LIGHT BROWN SILTY SAND (SM) moist medium dense, very fine grained
	17			15		
	16			20		Bottom of boring at 19.5 feet
				25		
				30		
				35		
				40		

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Log of Boring 34
Seeno-Chevron Property
Pittsburg, California

PLATE
A-34

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	9/87		

Equipment 6 inch Flight Auger

Elevation 136 feet Date 8/24/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample	
	17	16	107	0		DARK BROWN SILTY CLAY (CL) dry very stiff, w/organic traces
	18			5		BROWN SILTY SAND/SANDY SILT (SM-ML) moist medium dense/stiff, very fine grained sand
	16			10		GRAY BROWN SAND (SP) moist medium dense, fine grained
	31			15		
	27			20		BROWN SILTY CLAY (CL) moist very stiff
				25		Bottom of boring at 21.5 feet
				30		
				35		
				40		

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Log of Boring 37
Seeno-Chevron Property
Pittsburg, California

PLATE
A-37

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	9/87		

Equipment 6 inch Flight Auger

Elevation 141 feet Date 8/24/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample
				0	
Swell-0.6% (200)	23	13	112	5	
	8	11	90	10	
	21			15	
	29			20	
				25	
				30	
				35	
				40	

DARK BRONW SANDY SILT (ML)
dry very stiff

BROWN SILTY SAND/SANDY SILT (SM-ML)
moist medium dense/medium stiff,
fine grained sand

GRAY BROWN SAND (SP)
moist medium dense,
fine-medium grained, with
gravel

Bottom of boring at 19.5 feet

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Log of Boring 39
Seeno-Chevron Property
Pittsburg, California

PLATE
A-39

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	9/87		

Equipment 6 inch Flight Auger

Elevation 130 feet Date 8/25/87

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample
	21	8	120	0	
	16				
				5	
	26				
				10	
	11				
				15	
				20	
				25	
				30	
				35	
				40	

DARK BROWN SANDY SILT (ML)
dry very stiff

BROWN SILTY SAND/SANDY SILT (SM-ML)
dry medium dense/very stiff, fine grained sand

GRAY BROWN SILTY SAND (SM)
moist medium dense. fine grained w/fine gravel

Bottom of boring at 11.5 feet

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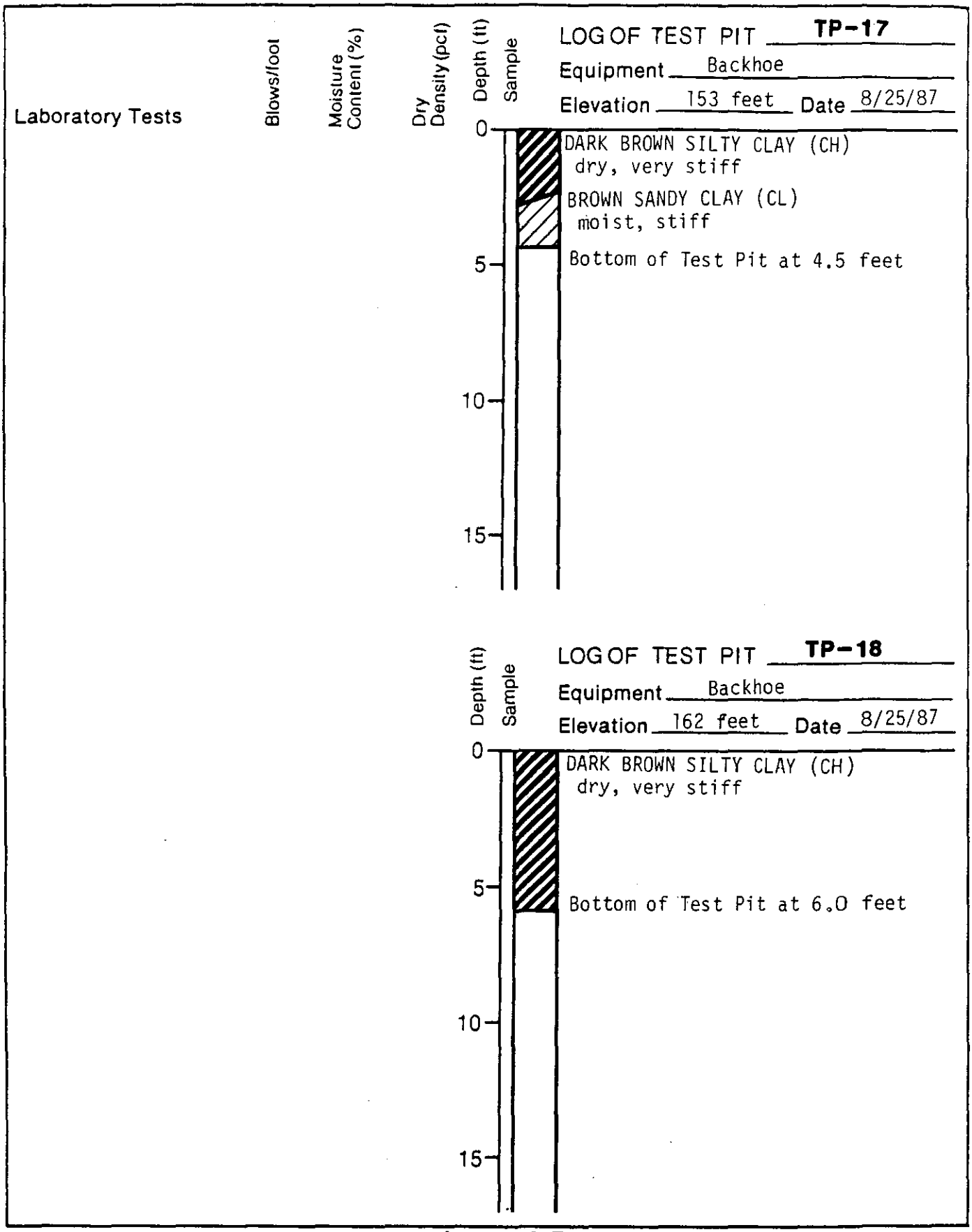
Log of Boring 42
Seeno-Chevron Property
Pittsburg, California

PLATE
A-42

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	9/87		



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Logs of Test Pits
TP-17 & TP-18
Seeno-Chevron Property
Pittsburg, California

PLATE
A-67

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	9/87		

Laboratory Tests | Blows/foot | Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample

LOG OF TEST PIT TP-19

Equipment Backhoe

Elevation 139 feet Date 8/25/87

DARK BROWN SILTY CLAY (CH)
dry, very stiff

BROWN SANDY CLAY (CL)
dry, very stiff

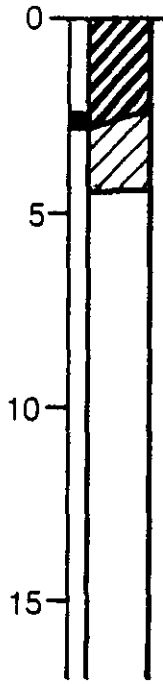
Bottom of Test Pit at 6.0 feet

Depth (ft) | Sample

LOG OF TEST PIT TP-20

Equipment Backhoe

Elevation 139 feet Date 8/25/87



DARK BROWN CLAY (CH)
dry, stiff

BROWN SANDY CLAY (CL)
dry, stiff

Bottom of Test Pit at 4.5 feet

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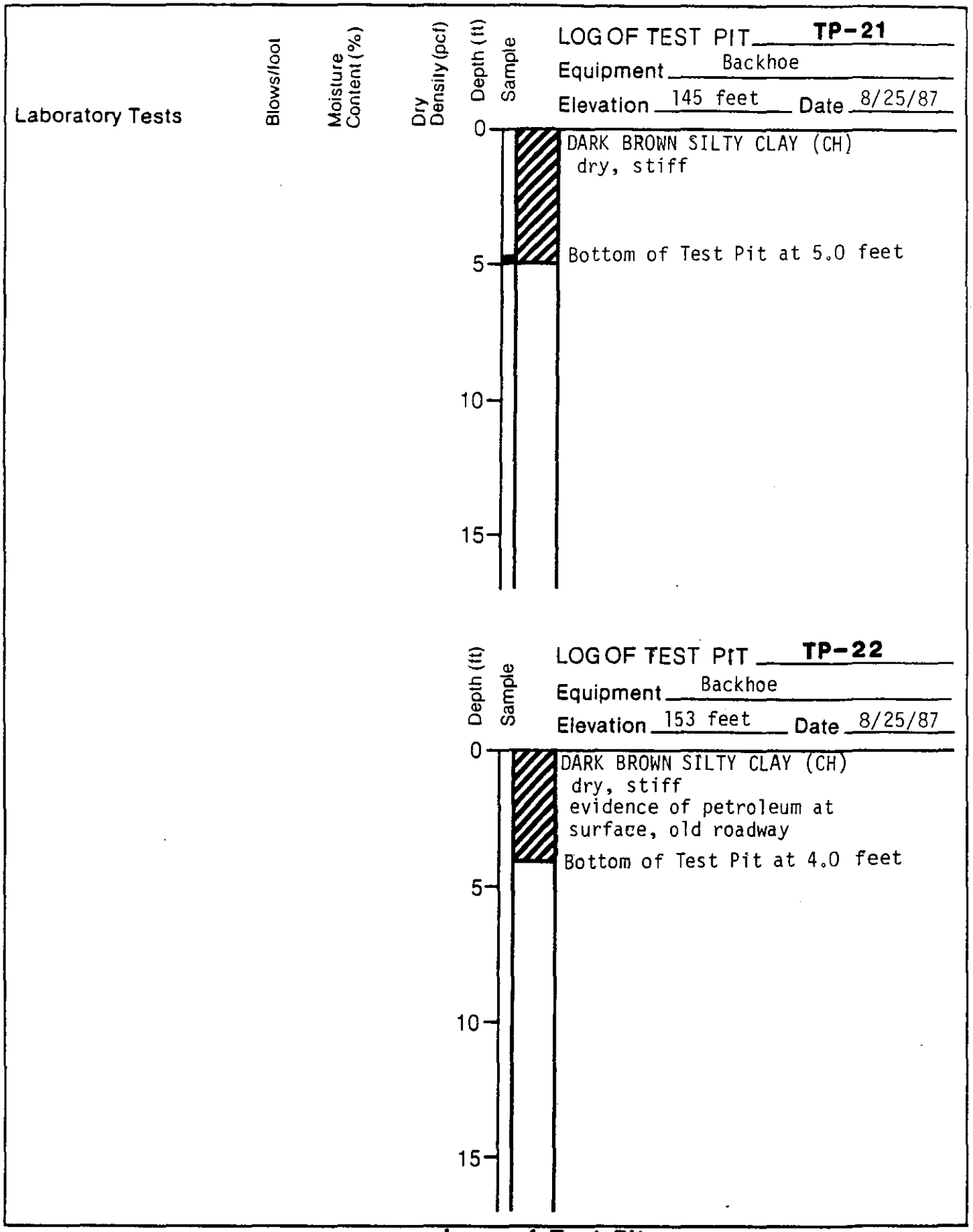
Logs of Test Pits
TP-19 & TP-20
Seeno-Chevron Property
Pittsburg, California

PLATE
A-68

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	9/87		



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Logs of Test Pits
TP-21 & TP-22
Seeno-Chevron Property
Pittsburg, California

PLATE
A-69

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	9/87		

Laboratory Tests | Blows/foot | Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample

LOG OF TEST PIT TP-23

Equipment Backhoe

Elevation 165 feet Date 8/25/87

0 – BROWN SILTY CLAY (CL-CH)
dry, stiff
evidence of petroleum at surface, old roadway

Bottom of Test Pit at 3.5 feet

5

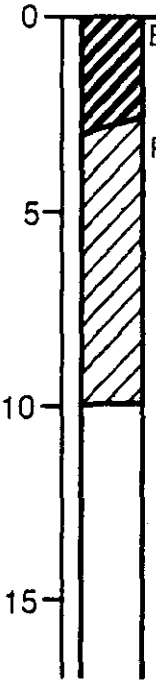
10

15

LOG OF TEST PIT TP-24

Equipment Backhoe

Elevation 149 feet Date 9/10/87



0 – BLACKISH GRAY SANDY CLAY (CH)
dry, hard, with abundent gravel up to 2 inches size

REDDISH BROWN SANDY CLAY (CL)
moist, stiff, with gravel up to 6 inches size

5

10

15

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Logs of Test Pits TP-23 & TP-24
Seeno-Chevron Property
Pittsburg, California

PLATE **A-70**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	18329,001.03	TAT	9/87		