UPDATED GEOTECHNICAL AND GEOLOGIC STUDY
PROPOSED SITE DEVELOPMENT

TIFFANY PARK ESTATE PROPERTY
EAST WARREN AVENUE
FREMONT, CALIFORNIA

Prepared For:

Mr. Dennis Liu
c/o Mr. Hayes Shair, Project Manager
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Fremont, California

18 January 2018
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18 January 2018
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Mr. Dennis Liu
c/o Mr. Hayes Shair, Project Manager
41868 Osgood Road
Fremont, CA 94539

SUBJECT: UPDATED GEOTECHNICAL AND GEOLOGIC STUDY
PROPOSED SITE DEVELOPMENT
TIFFANY PARK ESTATE PROPERTY
EAST WARREN AVENUE
FREMONT, CALIFORNIA

Dear Mr. Liu:

As you requested, we have performed an updated geologic and geotechnical study for the development of the Tiffany Park Estate property that is adjacent to Interstate 680, south of East Warren Avenue in Fremont, California. The accompanying report presents the results of our study and testing, and our conclusions and recommendations concerning the geologic and geotechnical engineering aspects of the project. The findings and recommendations presented in this report are contingent upon our review of the final grading, foundation, and drainage control plans; our observation of the grading; and the installation of the foundation and drainage control systems.

This report includes information that is vital to the success of your project. We strongly urge you to thoroughly read and understand its contents. Please refer to the text of the report for detailed findings and recommendations.

Sincerely,
Upp Geotechnology
a division of C2Earth, Inc.

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1. INTRODUCTION

This report presents the results of our updated geologic and geotechnical study for the development of the Tiffany Park Estate property that is adjacent to Interstate 680 and south of East Warren Avenue in Fremont, California (see Figure 1, Site Location Map). The purpose of our study was to further explore the geotechnical and geologic conditions on the subject property in the area of the proposed improvements and to develop findings and recommendations for the earthwork and foundation engineering aspects of the proposed development.

The site is in a geologically complex area. A trace of the active Hayward fault crosses the property and portions of the property are impacted by shallow landslides. Several geologic and geotechnical studies have been previously performed for the development of the site by us and others. We previously conducted a geotechnical study for a prior owner of the subject property between 2003 and 2005 and submitted the results of that study in our report dated 28 March 2005. During that study, we explored the subsurface conditions by logging numerous exploration pits and borings. At the time of that study, the development concept consisted of mitigating the landslide hazards using engineered buttress fill methods, subdividing the parcel, and constructing seven single-family homes.

Based on our conversations with you and your project manager Mr. Hayes Shair, and our review of conceptual development plans that were provided to us, we understand that the current development concept consists of subdividing the parcel into seventeen single-family home lots to be constructed within the lower, western portion of the subject property. Each of the residences will be three stories tall with the lowest level consisting of a garage that will be constructed into the hillside. The western sides of the garages will daylight to driveways at the front of each of the homes. We understand that a new shared roadway will be constructed along the western margin of the property and connect with Omaha Way, near the west central portion of the development.

Backyard terraces will be constructed behind the homes, at elevations generally corresponding with each home's second story floor elevation. Tiered concrete retaining walls will be constructed behind the backyards for the northern fourteen lots. The slope behind three southern lots will be re-graded as a cut slope with a 2:1 gradient. We also anticipate that low landscape retaining walls, and/or cut slopes, may be constructed between the proposed residences to accommodate differences in pad elevations between the front and backyard areas.

We issue this report with the understanding that it is your responsibility (as the owner or owner's representative) to ensure that the information and recommendations contained in this report are brought to the attention of the project architect and engineer and are incorporated into the plans and specifications of the development. You must also ensure that the contractor and sub-contractors follow the recommendations during construction.

2. SCOPE OF SERVICES

We conducted this study in accordance with the scope and conditions presented in our proposal dated 6 August 2015 (Document Id. 14042C-02P2). The methodology of our evaluation is discussed in the body of this report. We make no other warranty, either expressed or implied. Our scope of services for this study included:

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- Reviewing selected geologic literature, aerial photographs, our prior report and previous consultants' reports of the site, to evaluate the prevailing geotechnical and geologic conditions;
- performing an engineering geologic reconnaissance and mapping of the subject property;
- preparing a site plan and four slope profiles;
- conducting subsurface exploration including numerous borings, trenches, and pits;
- consulting with the City's reviewing geologist during and after their observations of the trenches, pits, and boring/core samples;
- performing field and laboratory testing;
- analyzing geologic and geotechnical engineering properties from collected data;
- evaluating quantitative slope stability based upon published and laboratory data; and
- preparing this report.

We have prepared this report as a product of our service for your exclusive use in designing and constructing the proposed improvements. Other parties may not use this report, nor may the report be used for other purposes, without prior written authorization from Upp Geotechnology, a division of C2Earth, Inc (C2).

Because of possible future changes in site conditions or the standards of practice for geotechnical engineering and engineering geology, the findings and recommendations of this report may not be considered valid beyond three years from the report date, without review by C2. In addition, in the event that any changes in the nature or location of the proposed improvements are planned, the conclusions and recommendations of this report may not be considered valid unless we review such changes, and modify or verify in writing the conclusions and recommendations presented in this report.

Our study excluded an evaluation of hazardous or toxic substances, corrosion potential, chemical properties, and other environmental assessments of the soil, subsurface water, surface water, and air on or around the subject property. The lack of comments in this report regarding the above does not indicate an absence of such substances and/or conditions.

3. GEOLOGY AND SEISMICITY

We reviewed selected geologic maps, aerial photographs, and our prior report and other consultants' reports to evaluate the prevailing geologic conditions of the site and in the vicinity. Various geologic and geologic hazard maps are presented on Figures 2 through 7.

3.1. Geology

The subject property is situated on a west-facing slope along the base of the western foothills of the Diablo Mountain Range, a northwest-trending range within the California Coast Ranges geomorphic province (see Figure 1). According to the Preliminary Geologic Map Emphasizing Bedrock Formations in Alameda County (Graymer et. al., 1996) and the Quaternary Geology of Alameda County and Surrounding Areas (Helley and Graymer, 1997), the site is underlain by

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Pleistocene to Pliocene age (10,000 to 5.3 million years old) Irvington gravels formation (formerly mapped as the Santa Clara formation in this vicinity) at depth (see Figure 2, Regional Geologic Map). The Irvington gravels formation is generally described as gray coarse-grained sand with distinctly bedded pebbles and cobbles. On the lower western portion of the site, the geologic maps show Pleistocene age (10,000 to 2.6 million years old) alluvial fan deposits overlying the Irvington gravels materials (see Figure 2 and Figure 3, Regional Quaternary Geologic Map). These alluvial deposits generally consist of unsorted boulders, gravel, sand, silt, and soil emanating from the mountains and being deposited onto adjacent lowlands.

The Irvington gravels formation and alluvial fan deposits are overlain by soil, slope debris (colluvium), and shallow landslide debris on portions of the subject property. Where the these materials are located on moderate to steep slopes, they are subject to downhill creep or renewed landslide movement, a process by which the soil moves downslope at an imperceptibly slow rate as a result of gravity.

3.2. Landsliding

According to the Landslide Inventory Map of the Milpitas Quadrangle (CGS, 2011), no landslides are mapped on the subject property; however, several landslides of various age, size, and activity are mapped east and southeast of the site (see Figure 4, Landslide Inventory Map).

While no landslides were shown on the subject site on the above map, we observed evidence that several shallow (about 10 feet thick or less) dormant landslides exist on the site. The locations and limits of the landslides were defined during our current and previous extensive subsurface exploration on the site as well based upon information gathered during our review of other previous consultants' reports for the property. Further descriptions of these landslides are provided below.

You should note that the western half of the subject property is mapped within the State Seismic Hazard Zone for earthquake-induced landsliding (see Figure 5, Regional Seismic Hazard Zones Map). These zones were established to minimize the loss of life and property by identifying and mitigating seismic hazards related to landslides. Because of the potential landslide hazard and history of shallow landsliding on the property, we have conducted quantitative slope stability analyses of four proposed slope configurations along the western-facing slope to evaluate the risk of landsliding to the proposed development (see Section 6).

3.3. Seismicity

Geologists and seismologists recognize the greater San Francisco Bay Area as one of the most active seismic regions in the United States. The seismicity in the region is related to activity within the San Andreas fault system, a major rift in the earth's crust that extends for at least 700 miles along the California Coast. Faults within this system are characterized predominantly by right-lateral, strike-slip movement. The four major faults that pass through the Bay Area in a northwest direction have produced approximately 12 earthquakes per century strong enough to cause structural damage. These major faults are the San Andreas, Hayward, Calaveras, and San Gregorio faults.

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The site can be expected to experience periodic minor earthquakes or even a major earthquake (Moment magnitude 6.7 or greater) on one of the nearby active or potentially active faults during the design life of the proposed project. The Moment magnitude scale is directly related to the amount of energy released during an earthquake and provides a physically meaningful measure of the size of an earthquake event.

The U.S. Geological Survey (2016) estimates that by 2043, the probability of a Moment magnitude 6.0 earthquake occurring on one of the active faults in the San Francisco region is 98%. The probability of a Moment magnitude 6.7 or greater earthquake occurring on one of the active faults in the San Francisco region is 72%. The following table provides corresponding estimates for the probability of a major earthquake (Moment magnitude 6.7 or greater) for three major faults in the Bay Area.

Fault	Probability (%)
Hayward	33
Calaveras	26
San Andreas	22
San Gregorio	6

30-Year Probability of Magnitude 6.7 or Greater Earthquake

The property is within the Hayward fault zone. According to the Regional Geologic Map, the site is situated between two traces of the Hayward fault (see Figure 2). According to mapping by Lienkaemper (1992), the two main traces of the Hayward fault are mapped east of the site, with the western most trace mapped beneath Interstate 680 (see Figure 6, Regional Fault Map). Lienkaemper mapped the location of the fault trace nearest the site based on geomorphic expressions of linear hillside benches, notches, and right-laterally offset stream channels. As discussed further in Section 5.3, an additional subsidiary fault trace has been identified beneath the eastern portion of the subject site.

Because of the site's proximity to mapped traces of the Hayward fault, the California State Special Studies Zones Map by the California Division of Mines and Geology shows that the site is mapped within the current Alquist-Priolo Earthquake Fault Zone for areas prone to earthquake ground rupture (see Figure 7, Regional Special Studies Zones Map). The following table indicates the approximate distance and direction from the site to other active faults in the greater site vicinity.

Fault	Approx. Distance To Fault	Direction From Site
Calaveras	4½ miles	Northeast
San Andreas	18 miles	Southwest
San Gregorio	28 miles	Southwest

Regional Fault Distances and Directions

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Because of the site's proximity to the Hayward fault and the site's geology, maximum anticipated ground shaking intensities for the area are characterized as very strong and equal to a Modified Mercalli (MM) intensity of VIII (Association of Bay Area Governments, 2012). An earthquake having a MM intensity of VIII generally causes considerable damage to well-built ordinary structures, and slight damage to specially designed earthquake-resistant structures (Yanev, 1974) (see Table I, Modified Mercalli Scale of Earthquake Intensities).

The intensity of an earthquake differs from the Moment magnitude, in that intensity is a measure of the effects of an earthquake, rather than a measure of the energy released. These effects can vary considerably based on the earthquake magnitude, distance from the earthquake's epicenter, and site geology.

Since 1800, four major earthquakes have been recorded on the San Andreas fault. In 1836, an earthquake with an estimated maximum intensity of VII on the MM scale occurred east of the Monterey Bay on the San Andreas fault (Toppozada and Borchardt, 1998). The estimated Moment magnitude (M_w) for this earthquake is about 6.25. In 1838, an earthquake occurred with an estimated intensity of about VIII-IX (MM), corresponding to a M_w of about 7.5. The San Francisco Earthquake of 1906 caused the most significant damage in the history of the Bay Area in terms of lives lost and cost of property damage. This earthquake created a surface rupture along the San Andreas fault from Shelter Cove to San Juan Bautista, about 290 miles in length. It had a maximum intensity of XI (MM), a M_w of about 7.9, and was felt as far away as Oregon, Nevada, and Los Angeles. The most recent earthquake to affect the Bay Area was the Loma Prieta earthquake of 17 October 1989, occurring in the Santa Cruz Mountains, which had a M_w of about 6.9. Ground shaking equal to an MM intensity of VI was felt at the site during the Loma Prieta Earthquake (Stover, et al., 1990).

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

4. PRIOR REPORTS

As part of our study, we reviewed prior geologic and geotechnical reports prepared by us and other consultants for the subject property. Additionally we reviewed a report prepared by URS for the widening of a California Department of Water Resources bridge beneath Interstate 680 about 1,600 feet southeast of the project site. The following is a summary of pertinent information from our report review.

4.1. Earth Systems Consultants, 1987

A geotechnical investigation was conducted at the subject property by Earth Systems Consultants (ESC) and the results of their investigation were presented in a report dated 24 December 1987. As part of their investigation, ESC drilled eight test borings and excavated eight short exploration trenches (pits) plus one long fault exploration trench. The locations of the borings

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and trenches are shown on Figure 8, Site Plan and Engineering Geologic Map, and the logs of the borings, pits, and trench are provided in Appendix A.

According to the logs in their report, the subsurface excavations encountered fill, highly expansive colluvial soil, and claystone and sandstone bedrock. The exploration pits did not encounter any evidence of faulting. ESC describes creep zones at a depth of approximately 5 feet in Trench 1 located in the southern portion of the property and Pit 5 located in the central portion of the site. The trench logs depict these zones as landslide failure planes.

ESC performed laboratory testing, which included four direct shear strength tests on samples from 4 to 14 feet deep and a slope stability analysis. Direct shear testing performed on samples of the landslide debris, colluvium, and bedrock yielded cohesions ranging from 500 to 800 psf and angles of internal friction ranging from 10 to 25 degrees. The results of ESC's laboratory testing are also presented in Appendix A. ESC performed slope stability analyses using the results of their laboratory testing, and concluded that the proposed 3:1 slopes on the property would be stable under static and seismic loading conditions.

Based on the results of their investigation, ESC concluded that the site was suitable for residential development. ESC further concluded that there was a low potential for ground rupture through the site during an earthquake and that the potential for earthquake-induced landsliding on the site was low, provided that proposed slopes should be constructed flatter than 3:1 (horizontal to vertical).

4.2. Frank Lee & Associates, 1998-1999

Frank Lee and Associates (FLA) performed a study for the property, and presented the results of their study in a report dated October 30, 1998. As part of their study, FLA logged twenty-six exploratory pits, two fault trenches, and ten exploratory borings. Groundwater monitoring wells were installed in each of the ten borings. The locations of the pits, trenches, and borings are shown on Figure 8, and the logs of the FLA borings, pits, and trenches are included in Appendix B.

Based on their subsurface exploration, FLA reported that the site was blanketed with clayey soil underlain by weathered siltstone/mudstone bedrock. According to the report, the soil varies from 2 to 16 feet deep with the thicker soils occurring at the base of the slope along the west side of the property. During the course of their investigation, FLA identified high groundwater, six possible landslides (which they designated as landslides A through F), and a fault trace near the top of the slope in the eastern portion of the property.

FLA's Trench 1, excavated within the northern portion of the subject property, encountered a 30-foot wide zone of fault-related deformation in the eastern-most portion of the trench. They describe the deformation as both warping and brittle deformation of the weathered bedrock. Trench 2, excavated in the southern portion of the subject property, encountered two zones of shearing approximately 30 feet apart within the eastern portion of the trench.

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Based on the results of their investigation, FLA concluded that the site was suitable for residential development but that site development was constrained by the identified landslides and fault zone. To mitigate the landslide hazard, FLA recommended avoidance or stabilization. To mitigate the fault rupture hazard, FLA recommended a 30-foot building setback from the identified fault traces. They also recommended that any proposed cut or fill slopes be constructed at gradients no steeper than 3:1.

The City's consultant questioned FLA's recommendations for a 30-foot building setback rather than a more common 50-foot building setback. In a letter dated March 29, 1999, FLA revised their recommended building setback from the western margin of the identified fault zone from 30 feet to 50 feet, following discussions and correspondence with the City's reviewing geologist. On that same date, FLA prepared a separate letter, which presented an analysis and findings relating to the slope stability at the site. FLA analyzed the stability of the two largest landslides identified during their investigation, landslides A and B, using material strengths derived from laboratory testing.

The results of two direct shear tests on samples of the landslide debris were presented with their hand-tabulated analyses. The first test performed on a sample from a depth of 7 feet in Boring 8 (located in landslide B) yielded a cohesion of 537 psf and a friction angle of 10.9 degrees. The second test on a sample from a depth of 6 feet in Boring 9 (located in landslide A) yielded a cohesion of 209 psf and a friction angle of 19.0 degrees. Using 60% of the laboratory derived soil strength parameters, FLA analyzed the stability of the existing landslides and derived factors of safety greater than 1.5 for static conditions and factors of safety of approximately 1.1 for pseudo-static conditions. FLA argued that their analyses were sufficiently conservative and concluded that the results were acceptable. However, they recommended that all landslide areas should be repaired and provided with subsurface drainage.

4.3. Associated Terra Consultants, Inc., 2001

On 21 March 2001, Associated Terra Consultants, Inc. (ATCI) submitted a brief letter and a revised Site Geologic Map to the City of Fremont in response to a review letter by the City's geologic reviewing consultant. ATCI's lead investigator was the same engineering geologist who was working with FLA during FLA's investigation of the property. Rather than evaluate and provide justification for the 30-foot building setback, ATCI modified their building setback. ATCI's revised figure depicted a 50-foot building setback from the western margin of the identified fault zone.

Subsequently, in an attempt to better define the location of the identified fault trace and reduce the 50-foot building setback, ATCI excavated and logged two additional trenches (Trenches 3 and 4) on the subject property. The locations of the trenches are shown on Figure 8, and the logs of the trenches are provided in Appendix C.

According to their report, ATCI encountered a fault trace within the eastern portion of Trench 3, and unfaulted Santa Clara formation bedrock in Trench 4. ATCI noted that the bedrock strikes to the northwest and dips approximately 30 degrees to the northeast, back into the hillside, in a favorable bedding orientation. Based on their subsurface investigation, ATCI modified the configuration of the landslides mapped previously by FLA.

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ATCI described and mapped an extremely weathered claystone unit that extends across the central portion of the site in a northwesterly direction, that is approximately 25 feet thick and pinches out to the northwest. ATCI concluded that this claystone unit was forming a groundwater barrier.

ATCI concluded that the fault trace observed in Trench 3 was consistent with the traces observed in FLA's Trenches, and noted that no evidence of faulting was observed to the west of the western-most trace observed in all of the trenches. They also noted that the location of the fault trace depicted on their site geologic map was based on accurate surveying by a Licensed Land Surveyor. Because of the well defined location of the fault and the lack of ground disturbance to the west of it, ATCI concluded that a 30-foot building setback was reasonable rather than the 50-foot setback recommended in their 21 March 2001 letter.

4.4. Upp Geotechnology, Inc., 2005

We performed a geotechnical study for a prior owner of the property, and submitted the results of that study in a report dated 28 March 2005. During that study we logged six test borings and nine exploration pits. The locations of the borings and pits are provided on Figure 8. Laboratory testing was performed on selected samples retained from the borings and pits. The results of the laboratory testing and the logs of the borings and pits are provided in Appendix D.

Our study revealed that a moderately large, shallow, dormant landslide exists across the central portion of the site. The landslide debris consists of highly to critically expansive clayey soil (colluvium) and is underlain by siltstone and claystone bedrock that dips into the slope to the northeast. Because of the presence of landsliding on the site, we performed slope stability analyses that revealed factors of safety below 1.0 under pseudo-static conditions. We recommended reducing the risk for landsliding by constructing buttress fills for the proposed homes. We also concluded, based upon our subsurface exploration and review of prior reports, that a trace of the Hayward fault crosses the eastern portion of the site. Because of the lack of fault related deformation west of the observed fault trace, we agreed with ATCI's recommendation of a 30-foot building setback from the observed fault trace. We understand that the reviewing geologist had approved this setback and development, however it was never constructed.

4.5. URS, 2007

We reviewed a report prepared by URS dated 5 April 2007 for the widening of a north DWR undercrossing beneath a bridge on Interstate 680, about 1,600 feet southeast of the central portion of the subject site. The study involved evaluating existing bridge foundations; reviewing reports of prior geotechnical studies that involved drilling six borings in the areas of the bridge abutments; drilling an additional boring to a depth of about 100 feet; performing laboratory testing; and developing recommendations for new foundation elements and approach embankments. The boring and laboratory testing were performed by Robert Y. Chew Geotechnical, Inc (RYC), a subcontractor to URS. The laboratory testing included performing unconfined compression tests on samples retrieved from various elevations between 6 and 93 feet.

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5. SITE CHARACTERIZATION

5.1. Regional Setting

We reviewed the aerial photographs and topographic maps for the site and vicinity. The irregularly shaped, approximately 6.8-acre site is situated on a predominantly west-facing slope at the base of the foothills of the Diablo Mountain Range. The site is elongated with its long axis oriented in the northwest-southeast direction. The subject property is bounded to the northeast by Interstate 680, to the northwest by East Warren Avenue, and by a residential neighborhood to the southwest and south.

5.2. Site Description

Our principal engineers and geologists, project geologist, and staff geologists visited the site numerous times between 28 May 2014 and 1 July 2016 to perform site reconnaissances, geologic mapping, and to explore the subsurface conditions on the property. We developed a site plan and slope profiles using tape and compass mapping techniques along with a topographic survey provided to us during our field exploration and a later preliminary grading and drainage plan by Carlson, Barbee & Gibson, Inc. dated 25 September 2017 (see Figure 8, Site Plan and Engineering Geologic Map and Figures 9 through 12, Geologic Cross-Sections A-A' and D-D'. The site plan and profiles are only as accurate as implied by the mapping techniques used. The following is a summary of the surficial site characteristics.

The lower, western portion of the site is adjacent to a developed residential neighborhood that was constructed on the valley floor at an elevation of approximately 105 feet (mean sea level). The subject property slopes up to the east from the rear yards of the adjoining properties to an elevation of approximately 155 feet. A broad, flat bench is located along the eastern property boundary. This bench apparently was cut for the construction of highway 680.

The topography of the slope in the central portion of the property between the upper bench and valley floor is slightly irregular. This slope has gradients that range from approximately 2½:1 (horizontal to vertical) in the upper portion of the slope to approximately 4½:1 in the central and lower portions of the slope (see Figures 9 through 12). Irregularities in the site topography generally correspond to localized shallow landslides as mapped on Figure 8.

Drainage across the site is characterized as uncontrolled sheet flow to the west. A deep concrete v-ditch is located in the southern portion of the subject property along the western property line. Most surface runoff crossing the site is collected in this ditch and conveyed to the City storm drain system. An unnamed creek flowing out of the hills to the east flows into a channel that crosses the northern portion of the property. To the east, the upgradient end of the creek has been filled by the construction of Highway 680 and the creek flows through a buried culvert. Surface runoff in the northern portion of the site flows south into the creek. At the property's western boundary, the creek enters a culvert that extends under the adjacent housing development.

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The site is vegetated primarily with grass and weeds. Several trees are located within the area of the creek in the northern and southern portion of the property. At the time of our fieldwork, the grass and brush were relatively dry and brown.

5.3. Subsurface

Our engineers and geologists visited the site on numerous occasions between 13 October 2015 and 1 July 2016 to explore the subsurface conditions at discrete locations on the property. Between 13 and 15 October 2015 our geologists logged 2 fault exploration trenches (Exploration Trenches 1 and 2) and four test pits (Exploration Pits 1 through 4). Between 19 and 21 April 2016, our engineers and geologists returned to the site and logged three additional fault exploration trenches (Exploration Trenches 3 through 5). The trenches were excavated with a track-mounted excavator equipped with a 30-inch wide bucket.

On 30 June 2016 our principal engineer and staff geologist logged a continuously cored boring drilled in the western central portion of the site (Boring 1), and on 1 July 2016 our staff geologist logged four additional borings drilled on the property (Borings 2 through 5). The borings were cored and drilled with a track-mounted CME-55 drill rig equipped with hollow-stem augers and an automatic hammer.

The locations of the exploration trenches, pits, and borings are shown on Figure 8. We determined the trench, pit, and boring locations by measuring distance and bearing from known points on the supplied topographic survey and field landmarks, these locations are only as accurate as implied by the mapping technique used.

Our engineers and geologists logged the trenches, pits, and borings in general accordance with the Unified Soil Classification System and our Rock Classification System described on Figures 13 and 14, Key to Logs and Rock Classification System, respectively. A Summary of Field Sampling Procedures for the borings is presented on Figure 15. The logs of the trenches are presented on Figures 16 through 20, Logs of Exploration Trenchs 1 through 5. The logs of the test pits are presented on Figures 21 through 24, Logs of Exploration Pits 1 through 4. The log of the continuously cored boring (Boring 1) is presented on Figures 25 and 26, Log of Boring 1, and photographic records of the cores are provided on Figures 27 through 29, Core Photographs of Boring 1. The logs of Borings 2 through 5 are presented on Figures 30 through 34. The logs show our interpretation of the subsurface conditions at the locations and on the dates indicated and we do not warrant that they are representative of the subsurface conditions at other locations and times.

Exploration Trenches 1 and 2, excavated in the eastern portions of the site, both encountered a trace of the Hayward fault. The fault trace consisted of a shear surface or thin layer of subparallel shear surfaces with gouge in between. In Exploration Trench 1, the fault was observed to vertically offset layers of claystone and sandstone layers within the bedrock by about 1 foot. The upper portion of the fault was displaced towards the west, following the basal shear of the shallow landslide in that area of the site. In Exploration Trench 2, the fault shears extended into the lower portion of the topsoil, but did not project all the way to the ground surface. Based upon

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the narrow zone of deformation, and relatively limited amount of observed offset, we judge this fault trace to be a subsidiary or secondary fault trace, and not the main trace of the Hayward Fault.

Exploration Trench 1 also crossed through a shallow (about 10 feet deep or less) landslide deposit; the approximate limits of this landslide are shown on Figure 8. The landslide shear surface was noted as shearing through the upper portion of the bedrock. The lowest portion of a different shallow landslide was also noted within the colluvium exposed in Exploration Pit 2. Other trenches or test pits did not reveal evidence of landsliding.

Boring 1 was drilled and continuously cored to a depth of about 80 feet in the central western (lowest) portion of the site. The objective of this boring was to evaluate the presence or absence of deep-seated landsliding beneath the site. The boring exposed about 12 feet of very dark clay stiff colluvium overlying about 4½ feet of brown, silty clay alluvium. The alluvium was underlain by layered siltstone, sandstone, claystone members of the Irvington Gravels formation to the depth explored. No evidence of deep-seated landsliding was noted in the core.

The remaining trenches, borings, and pits revealed relatively consistent subsurface conditions consisting of topsoil and colluvium over Irvington Gravels formation claystone, siltstone, and sandstone bedrock. The thickness of the colluvium and soil in the upper and central portions of the site is relatively thin, generally about 5 to 6 feet thick or less. Along the lower, western portion of the site, and in the northern portion of the property on the north side of the drainage that crosses the site (not in the area of the proposed improvements), the colluvium thickens significantly. Additionally, Exploration Trench 4 encountered about 1 to 5 feet of tilled, non-engineered fill that had been scattered across the southern-most portion of the site atop the colluvium.

Detailed descriptions of the subsurface materials encountered in the trenches, pits, and borings are presented on the logs. Our interpretations of subsurface conditions across the site in the areas of the proposed improvements are depicted on Figures 9 through 12.

5.4. Groundwater

We did not encounter groundwater in any of the borings, pits, or trenches of this study or during our 2003-2005 study. However, FLA and ATCI both documented high groundwater conditions during the course of their studies. In general, groundwater was noted by FLA and ATCI at shallower depths in the upper (eastern) portion of the site than in the lower western portion of the site. ATCI concluded that localized claystone beds within the bedrock acted as groundwater barriers resulting in localized areas having perched groundwater conditions.

Our geologists measured groundwater within the piezometers installed by FLA on 22 September 2015 and 1 July 2016. We noted no groundwater in borings MW-1, MW-3, MW-5, MW-6, and MW-7. The other borings had consistent depths to perched groundwater in 2015 between about 17 and 20 feet below ground surface and in 2016 between about 17 and 24 feet below ground surface.

It should be noted that fluctuations in the level of subsurface water could occur due to variations in rainfall, temperature, and other factors not evident at the time our observations were made.

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5.5. Laboratory Testing

We developed our laboratory testing program to supplement laboratory testing performed during previous studies. We retained soil samples from the pits, trenches, and borings for laboratory classification and testing. The results of moisture content and dry density tests are presented on the logs. The results of plasticity tests performed on samples of the colluvium and claystone bedrock revealed these materials are critically expansive, with plasticity indexes of 46 and 73, respectively (see Figure 35, Plasticity Chart).

6. SLOPE STABILITY ANALYSES

6.1. Overview

The following paragraphs describe the methodology and results of a quantitative slope stability analyses that we performed to evaluate the relative risk of future landslide movement at the subject property. We performed the analyses using the computer program Slide 5.0 by Rocscience, Inc., utilizing Spencer's method to calculate the factor of safety against sliding. The analyses were performed in general accordance with the guidelines presented in the Special Publication 117A by the California Geological Survey (2008).

You should note that computer-aided slope stability analyses are mathematical models of the slopes and soil and they contain many assumptions. Slope stability analyses and the generated factors of safety only indicate general slope stability trends. In general, factors of safety below 1.00 indicate a potential failure. However, a slope with a factor of safety of less than 1.00 will not necessarily fail, but the probability of failure will be greater than that for a slope with a higher factor of safety. Conversely, a slope with a factor of safety greater than 1.00 may fail but the probability of stability is higher than that for a slope with a lower factor of safety.

6.2. Slope Geometry

We performed the slope stability analyses utilizing the surface profiles depicted on Figures 9 through 12. We generated these profiles utilizing topographic maps provided to us of the current site configurations, modified to show the proposed residential building pads, driveways, and roadway. These configurations are based upon the existing shallow landslides being either removed or being rebuilt as engineered buttress fills in accordance with the recommendations presented in this report.

6.3. Soil Strength Parameters

We obtained soil and rock strength parameters for the colluvium and Irvington Gravels formation materials based upon the results of direct shear tests performed by ESC. We also performed a comparative analysis between the bedrock direct shear strength envelope and the results of unconfined compression testing performed by URS/RYC and deemed the direct shear strength values to be more conservative.

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We derived soil strength parameters for the alluvium beneath the colluvium in the lowest (western) portion of the site using the mean cohesion and recommended phi angle values provided in the Seismic Hazard Zone Report for the Milpitas 7½-Minute Quadrangle, Alameda and Santa Clara County, California (California Geologic Survey, 2001).

For the proposed imported engineered fill material, we utilized the recommended phi angle from the Seismic Hazard Zone Report for the Milpitas 7½-Minute Quadrangle, Alameda and Santa Clara County, California (California Geologic Survey, 2001) along with a nominal cohesion.

We assigned wet unit weights for the subsurface materials based upon laboratory data and our experience in the area. A table of the soil parameters is presented below.

Unit	Phi Angle (degrees)	Cohesion (psf)	Wet Unit Weight (pcf)
Fill	21	100	120
Colluvium	18	525	125
Alluvium	21	830	125
Irvington Gravels Fm.	25	800	130

Soil and Rock Properties

6.4. Groundwater Conditions

Based upon the highest recorded perched groundwater elevations, we conservatively performed our analysis using an assigned permanent water table at a depth of about 17 feet beneath current grades across the entire slope.

6.5. Seismic Coefficient

A static (non-seismic) analysis was initially performed using no seismic coefficient. In accordance with California Geological Survey Note 48 (2013), based on peak ground acceleration of 0.845 computed using the USGS Seismic Design Maps tool with the 2010 ASCE 7 design code reference (with March 2013 errata) and information included in Special Publication 117A, we derived a seismic coefficient of 0.22 for the site and utilized it in our pseudo-static analyses.

6.6. Slope Stability Analysis Results

We performed both static and seismic analyses for each of the four cross-sections A-A' through D-D'. Each analysis that we ran searched thousands of potential failure planes initiating anywhere on the subject slopes to evaluate the potential for localized shallow landsliding and deep-seated landsliding. The lowest factors of safety for each analysis is presented in the following table and graphical illustrations of potential failure surfaces are shown on Figures 36 through 43, Slope Stability Analysis No. 1 through 8).

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Analysis No.	Slope	Seismic	Factor of Safety
1	Cross-Section A-A'	Static	3.64
2	Cross-Section A-A'	0.22	1.61
3	Cross-Section B-B'	Static	2.65
4	Cross-Section B-B'	0.22	1.36
5	Cross-Section C-C'	Static	2.20
6	Cross-Section C-C'	0.22	1.25
7	Cross-Section D-D'	Static	2.45
8	Cross-Section D-D'	0.22	1.42

Slope Stability Analyses and Results

7. FINDINGS

Based upon the results of our study, it is our opinion that, from geologic and geotechnical engineering perspectives, the subject property may be developed as planned, provided that the recommendations presented in this report are incorporated into the design and construction of the proposed improvements. In our opinion, the primary constraints to the proposed development include:

- The non-supportive soil and colluvium mantling the supportive underlying Irvington Gravels formation and the potential for future soil creep or landsliding;
- the potential for differential movement from the critically expansive colluvium and/or claystone bedrock;
- the presence of existing shallow dormant landslides on the slopes in the areas of the proposed residences; and
- the site's proximity to the Hayward fault.

7.1. Proposed Building Area

Our subsurface study showed that the area of the proposed building sites are underlain at depth by materials of the Irvington Gravels formation. Within the building areas, the bedrock is mantled by non-supportive topsoil, colluvium and shallow dormant landslide deposits. The proposed grading, to create the residential building pads, will remove the majority of the existing landslides. In areas beyond the grading for the residential building pads, generally uphill of the proposed terraced walls and/or uphill of the residential (garage) retaining walls, we anticipate that remaining landslide deposits will be excavated and replaced as engineered buttress fills.

Plasticity Index testing on the colluvium and claystone members within the Irvington Gravels formation indicate these materials are critically expansive. In our opinion, Irvington Gravels materials should provide adequate support for the foundations of the proposed residences and

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associated improvements, provided they are designed and constructed in accordance with the recommendations below, which include measures to mitigate distress from shrinking and swelling of the expansive claystone and colluvium.

7.2. Slope Stability

As discussed above, several shallow, dormant landslides mantle the bedrock on the west-facing slope within the site. These landslides are generally confined to the upper surficial soil and colluvium. The landslides will be removed and/or excavated and replaced with engineered buttress fills. Based on the results of our slope stability analyses, we judge the potential for landsliding within the areas of the proposed residences will be low once site grading and site retaining wall construction is completed.

It should be noted that, because of the moderately steep slope and thin veneer of soil and colluvium mantling the bedrock on the site, the occurrence of a new shallow landslide within the property but outside of the limits of the proposed grading and construction cannot be excluded. A new shallow landslide (approximately less than 10 feet deep) in areas beyond the proposed site grading and construction could be triggered by excessive precipitation or strong ground shaking associated with an earthquake. In our opinion, a landslide of this nature should not constitute an immediate threat to the integrity of the proposed residence and associated improvements, provided that they are designed and constructed in accordance with the recommendations of this report.

Based upon our observations of the subsurface conditions and geologic setting of the site vicinity, it is our opinion that the potential for deep-seated landsliding to affect the proposed improvements is low.

The long-term stability of many hillside areas is difficult to predict. A hillside will remain stable only as long as the existing slope equilibrium is not disturbed by natural processes or by the acts of Man. Landslides can be activated by a number of natural processes, such as the loss of support at the bottom of a slope by stream erosion or the reduction of soil strength by an increase in groundwater level from excessive precipitation. Artificial processes caused by Man include improper grading activities, the introduction of excess water through excessive irrigation, improperly designed or constructed leachfields, and poorly controlled surface runoff.

Although our knowledge of the causes and mechanisms of landslides has greatly increased in recent years, it is not yet possible to predict with certainty exactly when and where all landslides will occur. At some time over the span of thousands of years, most hillsides will experience landslide movement as mountains are reduced to plains. Therefore, a small but unknown level of risk is always present to structures located in hilly terrain. Owners of property located in these areas must be aware of, and willing to accept, this unknown level of risk.

7.3. Seismicity

Based upon our subsurface exploration (current and previous) and our review of prior studies by ESC, FLA, and ATCI, we conclude that a subsidiary trace of the Hayward fault crosses the

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eastern portion of the property, near the top of the slope. ATCI previously recommended a 30-foot building setback from the western margin of the fault. In our opinion, this is a reasonable setback given the lack of fault-related deformation to the west of the observed trace and the mapped mapped location of the main trace east of the site beneath Interstate 680 (Lienkaemper, 1992). In our opinion it is unlikely that surface fault rupture will occur through the proposed home sites provided they are constructed within the area shaded green on Figure 8 (beyond a 30-foot setback on the west side of the subsidiary trace).

However, it is reasonable to assume that the site will be subjected to very strong ground shaking from a major earthquake on at least one of the nearby active faults during the design life of future improvements (Association of Bay Area Governments, 2012). Improvements designed and constructed in accordance with the following recommendations and current building standards should maintain their structural integrity during the design level earthquake.

8. RECOMMENDATIONS

Because the proposed project is still in a relatively early phase of development, it is conceivable that changes and additions will be made to the proposed development concept following submission of this report. We recommend that as various changes and additions are made, you contact us to evaluate the geotechnical aspects of these modifications.

As currently planned, seventeen single-family residences will be constructed into the lower, western portion of the lot. The residences will be three stories tall, with the lowest level consisting of a garage set into the slope that daylights towards the front of each residential lot. Driveways will lead to the garages from a new shared roadway that will boarder the western margin of the property and connect with Omaha Way, near the west central portion of the development. Backyard terraces will be constructed behind the homes, at elevations generally corresponding with each home's second story floor elevation. Tiered concrete retaining walls will be constructed behind the backyards for the northern fourteen lots. The slope behind three southern lots will be re-graded as a cut slope with a 2:1 gradient. We also anticipate that low landscape retaining walls and/or cut slopes may be constructed between the proposed residences to accommodate differences in pad elevations between the front and backyard areas.

As described above, portions of the site have experienced shallow landsliding. The proposed grading to create the residential building pads will remove the majority of the landslides. In areas beyond the grading for the residential building pads, generally uphill of the terraced walls and/or uphill of the residential (garage) retaining walls, we recommend that the landslide materials be excavated and replaced as engineered buttress fills.

The following recommendations must be incorporated into all aspects of future development.

8.1. Location of Proposed Improvements

The proposed improvements must be confined to the approximate building areas shown on Figure 8. Do not construct improvements outside of this generalized area without written approval from C2. If other structures are planned in the future, we must evaluate their location to provide appropriate geotechnical engineering design criteria.

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8.2. Seismic Design Criteria

We recommend that the project structural design engineer provide appropriate seismic design criteria for proposed foundations and associated improvements. The following information is intended to aid the project structural design engineer to this end and is based on criteria set forth in the 2016 California Building Code (CBC). The mapped spectral accelerations and site coefficients were computed using the USGS Seismic Design Maps tool with the 2010 ASCE 7 design code reference (updated 2013).

The mapped spectral accelerations and site coefficients were computed using the Beta version of the USGS Seismic Design Maps application with the 2015 NEHRP Recommended Seismic Provision, which are being incorporated into the 2016 ASCE 7 Standard.

Design Parameters

Latitude = 37.488º
Longitude = -121.918º
Site Class = D
S_s = 2.199g
S_1 = 0.909g
F_a = 1.0
F_v = 1.5

Experience has shown that earthquake-related distress to structures can be substantially mitigated by quality construction. We recommend that a qualified and reputable contractor and skilled craftsmen build the associated improvements. We also recommend that the project structural design engineer and project architect monitor the construction to make sure that their designs and recommendations are properly interpreted and constructed.

8.3. Earthwork

At the time of this study, the full extent of any proposed earthwork had not been finalized. We anticipate that a significant amount of grading will be required to construct the proposed improvements. We recommend that the shallow landslides on the site in the area of the proposed improvements be excavated, and that proposed pads and slopes be restored to desired grades with engineered fill. Any proposed earthwork should be performed in accordance with the recommendations provided below.

8.3.1. Clearing and Site Preparation

- Clear all obstructions, including brush, trees not designated to remain, and debris on any areas to be graded.
- Clear and backfill any holes or depressions resulting from the removal of underground obstructions below proposed finished subgrade levels with suitable material compacted to the requirements for engineered fill given below.

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- After clearing, strip the site to a sufficient depth to remove all surface vegetation and organic-laden topsoil. At the time of our field study, we estimated that a stripping depth of approximately 3 inches would be required on natural slope areas. This material must not be used as engineered fill; however, it may be used for landscaping purposes.

8.3.2. Fill Material

- Based on our study, the expansive on-site materials may be used to construct engineered buttress fills in landslide area or used in landscaping areas. Engineered fill beneath flatwork or structures must be comprised of imported materials.
- Imported materials to be used for engineered fill must meet the following requirements:
  1) Have an organic content less than 3% by volume;
  2) no rocks or lumps greater than 6 inches in maximum dimension, and
  3) no more than 15% of the fill may be greater than 2½ inches in maximum dimension.
  4) Have a plasticity index (PI) of 15% or less.
- **Contact C2 with samples of proposed fill materials at least four days prior to fill placement for laboratory testing and evaluation.**

8.3.3. Keyways and Benches

- Fill placed on slopes in excess of 5:1 must be benched into the underlying supportive bedrock to provide a firm, stable surface for support of the fill.
- Where the toe of fill slopes are not retained by site retaining walls, a keyway must be excavated a minimum of 3 feet into the supportive bedrock, as measured on the downhill side of the keyway.
- Benches and keyways generally must be a minimum of 8 feet wide and must be excavated entirely into the supportive material.
- Temporary back slopes may be vertically excavated provided they are constructed in the dry season and meet Cal OSHA requirements.
- Both the keyway and any required benches must be excavated near level in the direction parallel to the natural slope and must be provided with an approximately 2% gradient sloping into the hillside to provide resistance to lateral movement and to facilitate proper subdrainage.
- **Contact C2 to evaluate the actual location, size, and depth of the required keyway and benches at the time of construction**.

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8.3.4. Subdrains

- C2 must determine the need for subdrains at the time of construction.
- In general, fill exceeding 5 feet deep should be provided with subdrains.
- Subdrains must consist of a 4-inch diameter, rigid, heavy-duty, perforated pipe (Schedule 40, SDR 17, or equivalent), approved by C2, embedded in drainrock (crushed rock or gravel).
- Flexible corrugated pipe must not be used.
- The pipe must be placed with the perforations down on a 2- to 3-inch bed of drainrock. The drainrock must be separated from the fill and the native material by a geotextile filter fabric, approved by C2 (see Figure 44, Conceptual Engineered Fill Subdrain Diagram).
- Subdrain pipes must be provided with clean-out risers at their up-gradient ends and at all sharp changes in direction.
- Changes in pipe direction must be made with "sweep" elbows to facilitate future inspection and clean-out.
- Subdrain systems must be provided with a minimum 1% gradient and must discharge onto an energy dissipater at an appropriate downhill location approved by C2.

8.3.5. Compaction Procedures

- Prior to fill placement, scarify the surface to receive the fill to a depth of 6 inches.
- Moisture condition the imported fill to the materials' approximate optimum moisture content. Moisture condition expansive on-site materials to approximately 3% above the material's optimum moisture content.
- Spread and compact the fill in lifts not exceeding 8 inches in loose thickness.
- Compact imported fill to at least 90% relative compaction by the Modified Proctor Test method, in general accordance with the ASTM Test Designation D1557 (latest revision). Compact on-site expansive material to 85 to 88% relative compaction.
- **Contact C2 to observe the placement and test the compaction of engineered fill.** Provide at least two working days notice prior to placing fill.

8.3.6. Permanent Slopes

- Construct the gradients of permanent cut or fill slopes no steeper than 2:1.
- Construct drainage benches on graded slopes at elevation intervals no greater than 30 feet where those slopes exceed 30 feet tall.

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- Re-vegetate all graded surfaces or areas of disturbed ground prior to the onset of the rainy season following construction to control soil erosion.
- Install other erosion control provisions if vegetation is not established by the rainy season.
- Maintain ground cover vegetation once it is established to provide long-term erosion control.

8.3.7. Trench Backfill

- Backfill all utility trenches with compacted engineered fill.
- Place imported engineered fill into the trenches in lifts not exceeding 8 inches in uncompacted thickness, and compact it to at least 90% relative compaction by mechanical means only.
- If imported sand is used, compact it to at least 90% relative compaction. Do not use water jetting to obtain the minimum degree of compaction in imported sand backfill. If the trench is greater than 50 feet long, located on sloping ground greater than 5:1 (horizontal to vertical), and is backfilled with sand, check dams should be installed to reduce the potential of the sand washing out.
- Compact the upper 6 inches of trench backfill to at least 95% relative compaction in all pavement areas.
- **Contact C2 to observe and test compaction of the fill.**

8.3.8. Daylighting Excavations

- Excavate the basement using shoring or an OSHA approved benching or sloping cut configuration selected by an OSHA "Competent Person". The Competent Person must be capable of identifying hazards during construction, such as slope instability, and take prompt corrective measures to mitigate any potential hazard.
- The contractor is solely responsible for means and methods of construction and should designate appropriate personnel to act as the Competent Person.
- To aid the Competent Person in their selection of construction means and methods, consider the on-site soil to be an OSHA Soil Type B. The Competent Person must evaluate the excavation during construction and confirm the suggested OSHA soil classification type.
- **Contact C2 to observe the subsurface conditions** encountered within the basement excavation are consistent with expected subsurface conditions.

8.4. Foundations

Because of the potential for non-supportive soils (fill and colluvium) to exist beneath areas of building pads, the critically expansive nature of the underlying bedrock, and the site's seismic

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setting, we recommend that the proposed residences and garages be structurally supported on drilled, cast-in-place, straight-shaft concrete friction piers gaining support in the bedrock. We also recommend that the foundation be isolated from the critically expansive bedrock using void forms. Site retaining walls may be supported on either drilled pier foundations or designed and constructed as segmented block retaining walls.

We recommend that your engineer design and your contractor construct the proposed foundation elements in accordance with the following recommendations.

8.4.1. Drilled Piers

- Drill piers with a minimum diameter of 16 inches and embed them a minimum of 8 feet or the depth of overburden (which ever is greater) into the underlying bedrock.
- Design and construct drilled piers no closer than 3 pier diameters apart (measured center of pier to center of pier)
- Total pier depth will vary across the building sites depending on the depth of the non-supportive soil and the extent of prior grading.
- Design the portion of the piers in the supportive bedrock using a skin friction value of 400 psf for dead plus live loads, with a 1/3 increase for transient loads, including wind and seismic.
- Neglect any portion of the piers in fill and colluvium and any point-bearing resistance for support.
- Figure active loads on the upper portion of the piers in the fill and colluvium on the basis of an equivalent fluid weight of 55 pcf taken over **2 times** the pier diameter. The depth of the active loads will vary across the building site depending on the depth of prior grading. Where the fill and surficial soil is removed by grading, active loads will be negligible. To facilitate construction, it may be appropriate for the structural engineer to prepare a table that provides pier depths and design based on various wall heights and an active zone that could vary from 0 to 10 feet.
- Design for resistance to lateral loads using a passive pressure equal to an equivalent fluid weight of 350 pcf to a maximum of 4,000 psf taken over **1½ times** the pier diameter for the length of the piers in the bedrock (see Figure 45, Conceptual Pier Pressure Diagram).
- Anticipate differential and total settlement for piers founded in supportive material to be less than 1 inch.
- Clear the bottoms of the pier excavations of loose cuttings and soil fall-in prior to the installation of the reinforcing steel and the placement of concrete.

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- Remove any accumulated water in the excavations prior to the placement of the steel and concrete.
- Because the surficial and bedrock soil is expansive, keep the pier holes moist prior to pouring concrete to prevent the development of shrinkage cracks.
- Use sono tubes in the tops of the hole to prevent overpour (mushrooming) of the concrete.
- Reinforce the piers with a full-length cage containing a minimum of four No. 5 steel reinforcing bars.
- The structural engineer must determine the actual number, size, location, depth, spacing, and reinforcement of the piers, based on the anticipated building loads and the soil engineering design parameters provided above.
- **Contact C2 to observe the piers as they are being drilled** to assess whether the piers are founded in material of sufficient supporting capacity.

8.4.2. Support Beam (Grade Beams) and Void Forms

- Design any grade beam retaining more than 2 feet of soil for an active pressure of 55 pcf.
- Reinforce grade beams with top and bottom reinforcement to provide structural continuity and to permit the spanning between piers. The structural design engineer must determine the actual size and reinforcement of the grade beams.
- Provide good structural continuity between the grade beam and the piers.
- Create a separation or void between the bottoms of foundation elements and the expansive soil (see Figure 46, Conceptual Grade Beam and Void Form Diagram).
- Establish a void by using a degradable cardboard void forms prior to pouring the grade beams or excavate after the beams have been poured. The effective void height should be at least 4 inches.
- Maintain the separation space using galvanized flashing on both sides of the excavation or void form.
- Remove any concrete overpour before the concrete has achieved its design strength.
- **C2 must observe the void creation method prior to placing concrete and also following concrete placement** to evaluate the integrity and size of the void.

8.4.3. Retaining Walls

We anticipate that structural concrete retaining walls will be used behind the backyard areas on the proposed sites, and also incorporated within the building foundation around

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the lower level garages. The following recommendations are for cantilever type walls. Contact us to provide appropriate recommendations if you consider other types of walls.

- Support structural residential and site retaining walls on drilled pier foundations designed in accordance with the recommendations given above for the support of the proposed residence.
- Design retaining walls to resist both lateral earth pressures and any additional lateral loads caused by surcharge loads on the adjoining ground surface.
- Deflection of cantilever retaining walls will occur in response to lateral loading. Anticipate horizontal deflections at the top of the wall to be 2 percent of the wall height or less.
- Design unrestrained (active condition) walls with level backfill to resist an equivalent fluid pressure of 55 pcf. Design walls that are restrained from movement at the top or sides (at-rest condition) with level backfill to resist an equivalent fluid pressure of 77 pcf (see Figure 47, Conceptual Retaining Wall Pressure Diagram).
- Add an additional equivalent fluid pressure increment to the active and at-rest condition for sloping backfill, in accordance with the following:

  +5 pcf for slopes up to 4:1 (horizontal to vertical)

  +8 pcf for slopes between 3:1 and 4:1

  +12 pcf for slopes between 2:1 and 3:1
- Design for seismic-loading as the structural engineer deems appropriate. In our opinion, the requirements for seismic design of retaining walls are not clearly defined. If the structural engineer considers seismic loading, based upon the procedures presented by Sitar, et. al. (2012), design unrestrained (active condition) residential retaining walls to resist an additional earthquake equivalent fluid pressure (seismic increment) of 30 pcf.
- If seismic loading is considered, design basement retaining walls to resist the most critical loading: either the at-rest condition if the walls are restrained, or the active condition plus the seismic increment if the walls are unrestrained.
- Site walls shorter than 6 feet are not typically subject to additional earthquake loading requirements.
- Wherever the walls will be subjected to surcharge loads, they must be designed for an additional uniform lateral pressure equal to 1/2 or 1/3 the anticipated surcharge load for restrained or unrestrained walls, respectively.
- The preceding pressures require that sufficient drainage be provided behind the walls to prevent the buildup of hydrostatic pressures from surface or subsurface water infiltration.

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- Provide a backdrain system consisting of an approximately 1-foot thick curtain of drainrock (crushed rock or gravel) placed behind the wall.
- Separate the drainrock from the backfill by a geotextile filter fabric, such as Mirafi 140 or an alternative, approved by C2. A 4-inch diameter heavy-duty rigid perforated subdrain pipe (Schedule 40, SDR 17 or equivalent), approved by C2, must be placed with the perforations down on a 2- to 3-inch layer of drainrock at the base of the drain. **Do not use flexible corrugated pipe.**
- As an alternative, back drainage may consist of an approved drainage mat placed directly against the wall. The bottom of the drainage mat must be in contact with the rigid 4-inch perforated drainpipe embedded in gravel. The mat's filter fabric must be placed around the drainpipe and between the pipe and the soil.
- The backdrains should extend up the height of the back of the retaining walls to within 1-foot of the height of the retained soil, and then be covered with a compacted clay soil cap.
- Details of backdrain options are presented on Figure 48, Conceptual Retaining Wall Backdrain Diagram.
- Perforated retaining wall subdrain pipes must be dedicated pipes and must not connect to the surface drain system. Install the subdrain pipes with a positive gradient of at least 1% and provide them with clean-out risers at their up-gradient ends and at all sharp changes in direction. Changes in pipe direction must be made with "sweep" elbows to facilitate future inspection and clean-out. The perforated pipes must be connected to buried solid pipes to convey collected runoff to discharge onto an energy dissipater at an appropriate downhill location or into the local stormwater system, as approved by C2.
- Compact the backfill placed behind the walls comprised of imported materials to at least 90% relative compaction, and backfill comprised of on-site expansive materials to 85-88% relative compaction, using light compaction equipment, in accordance with the compaction procedures given above. If heavy compaction equipment is used, the walls should be appropriately temporarily braced, as the situation requires. If backfill consists entirely of drainrock, it should be placed in approximately 2-foot lifts and must be compacted with several passes of a vibratory plate compactor.
- Perform annual maintenance of retaining wall backdrain systems, which must include inspection and flushing to make sure that subdrain pipes are free of debris and are in good working order. This maintenance must also include inspection of subdrain outfall locations to verify that introduced water flows freely through the discharge pipes and that no excessive erosion has occurred.
- If erosion is detected, C2 must be contacted to evaluate its extent and to provide mitigation recommendations, if needed.

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- Damp proof retaining walls that are adjacet to living spaces and/or site walls with decorative facing. We are not qualified to recommend specific damp proofing materials or their applications. Any damp proofing product must be applied in **strict** compliance with the manufacturer's and/or architect's specifications.
- If you select an alternative retaining wall type, you should contact C2 to provide additional recommendations.

8.4.4. Segmented Block Retaining Walls

We anticipate that landscaping retaining walls may be used to support slopes between the backyard and front yard areas between the proposed houses. As an alternative to pier supported walls, landscape retaining walls may be constructed using flexible segmented block retaining walls (SRW) founded within within the underlying bedrock or engineered fill. These walls will be subject to minor deformation and cosmetic damage related to soil creep and expansive soil processes, however their flexible nature allows them to accommodate differential movements and be periodically maintained and repaired as needed. The following recommendations are for typical SRWs. Contact us to provide appropriate recommendations if you consider other types of walls.

- We recommend that the SRWs be designed and constructed in general accordance with the manufacturer's recommendations, including being provided with geogrid reinforcement, if necessary.
- The following material parameters may be used for the SRW design. For the underlying bedrock or engineered fill (foundation materials) and for engineered backfill derived from on-site materials, use a unit weight of 120 pcf, an internal angle of friction of 21 degrees, and 100 psf cohesion with an allowable bearing capacity of 1,000 psf.
- Consider seismic-loading as the design engineer deems appropriate. In our opinion, site walls less than 6 feet tall are not subject to additional earthquake loading requirements.
- Construct the SRWs so that a minimum of one layer of blocks is keyed into the underlying bedrock or engineered fill at least 12 inches below the lowest adjacent ground surface.
- Apply appropriate surcharge loading for sloping ground at the top of the retaining wall in accordance with the manufacturer's recommendations.
- **Contact C2 to observe the excavation prior to placement of the SRW blocks** to evaluate if the blocks are founded in material of sufficient supporting capacity.
- Contact C2 to observe the placement of geogrid and test the compaction of backfill.

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- Provide drainage provisions to prevent the build up of hydrostatic pressure in accordance with the manufacturer's recommendations and the recommendations presented in the preceding section for basement retaining walls

8.4.5. Flatwork

We anticipate that flexible pavement (asphalt) will be used for the new shared roadway, and concrete slabs-on-grade may be used for the driveway, patios, and walkways. Where located expansive colluvium or bedrock, the overlaying flatwork will be subject to differential movement.

To mitigate the risk of differential movement for the asphalt roadway, we recommend the following minimum requirements:

- Remove the upper 24 inches of subgrade materials beneath areas of pavement and replace it with baserock.
- Scarify and recompact the upper of 6 inches of the sub-base to receive baserock to the requirements for engineered fill given above.
- Use a minimum pavement section of 2 inches of asphalt over 24 inches of virgin CalTrans Class II baserock compacted to at least 95% relative compaction in accordance with the requirements for engineered fill given above.
- **Contact C2 to observe and test compaction of the sub-base recompaction and baserock compaction.**

To mitigate the risk of differential movement of residential flatwork (patios, walkways, garage slabs, and driveways), we recommend the following options:

- Option 1: Construct the flatwork using a flexible pavement system that can accommodate differential movement, such as pavers.
- Option 2: Remove and replace the upper 24 inches of the subgrade materials with virgin CalTrans Class II baserock compacted to at least 95% relative compaction in accordance with the requirements for engineered fill given above.

For concrete flexible pavers we recommend the following minimum requirements:

- Support pavers on a minimum of 12 inches of non-expansive fill compacted to the requirements for compacted fill given above.
- Proof-roll the surface of the non-expansive fill to provide a smooth, firm surface, then place pavers on a leveling course per manufacturer's recommendations.
- Periodically repair cracked pavers or re-level pavers that experience differential movement.

For concrete slabs-on-grade we recommend the following minimum requirements:

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- Support concrete slabs-on-grade on a minimum of 24 inches of non-expansive fill compacted to the requirements for compacted fill given above.
- Proof-roll the surface of the non-expansive fill to provide a smooth, firm surface for slab support prior to placement of reinforcing steel.
- Design slab reinforcement in accordance with anticipated use and loading, but at a minimum, reinforce slabs with No. 3 rebar on 18-inch centers each way, placed mid-height in the slab.
- Support the reinforcing from below on concrete blocks (or similar) during concrete pouring to make sure that it remains mid-height in the slab.
- Place grooves in the concrete slabs at 10-foot intervals or in accordance with the structural design engineer's recommendations to help control cracking.

Where floor wetness is undesirable:

- The building designer or qualified waterproofing consultant must provide moisture barrier requirements.
- The following recommendations are typical moisture barrier standards. We do not guarantee that these measures will prevent all future moisture intrusion. If necessary, you should consult a qualified waterproofing consultant to provide waterproofing design.
- Traditionally, designers have specified the following: place 4 inches of free-draining gravel beneath the floor slab to serve as a capillary barrier between the subgrade soil and the slab. Following gravel placement, place a heavy-duty membrane over the gravel in order to minimize vapor transmission and then place 2 inches of sand over the membrane to protect it during construction. Just prior to placing concrete, lightly moisten the sand.
- More recent standards suggest using a puncture resistant, heavy-duty membrane (such as a minimum of 15 mil Stego Wrap, or equivalent) in direct contact with the floor slab and underlain by 6 inches of free-draining gravel.
- The structural designer must evaluate moisture conditions related to concrete slab curing and performance. The builder must provide appropriate drying time as determined by the designer.
- Use the gravel, heavy-duty membrane, and/or sand (if specified) in lieu of the upper 6 inches of recommended non-expansive fill.

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8.5. Drainage

Control of surface drainage is critical to the successful performance of the proposed improvements. The results of improperly controlled runoff may include: foundation heave and/or settlement, erosion, gullying, ponding, and potential slope instability. To mitigate the risks associated with improperly controlled runoff, we recommend that you implement the following:

- Prevent surface water from ponding in areas adjacent to the foundation of the proposed residences and associated improvements by grading adjacent areas to create proper drainage by sloping them away from the structures.
- As an alternative, install area drains to collect surface runoff.
- Provide roof gutters with downspouts on the structures. Provide downspouts with slip-joint connectors or clean-outs, where they are connected to buried pipes, to facilitate maintenance (see Figure 49, Conceptual Downspout Clean-Out Diagram).
- Do not allow water collected in the gutters to discharge freely onto the ground surface adjacent to the foundation.
- Convey water from downspouts and/or area drains away from the residence via buried, closed conduits or lined surfaces. Use buried conduits consisting of rigid, smooth-walled pipes (PVC). **Do not use flex-pipes.**
- Discharge collected water onto an energy dissipater or into the local storm water system at an appropriate location approved by C2. Energy dissipaters may consist of a bubbler system or a short "T" fitting placed in a shallow trench and covered with a mound of cobbles (see Figure 50, Conceptual Energy Dissipater Diagram). The discharge must not be located where runoff will adversely impact adjacent parcels.
- Perform annual maintenance of the surface drainage systems, including:
  1) Inspecting and testing roof gutters and downspouts to make sure that they are in good working order and do not leak;
  2) inspecting and flushing area drains to make sure that they are free of debris and are in good working order; and
  3) inspecting surface drainage outfall locations to verify that introduced water flows freely through the discharge pipes and that no excessive erosion has occurred.
- Contact C2 if erosion is detected so that we may evaluate its extent and provide mitigation recommendations, if needed.

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9. PLAN REVIEW AND CONSTRUCTION OBSERVATION

We must be retained to review the final grading, foundation, and drainage control plans in order to assess whether that our recommendations have been properly incorporated into the proposed project. **WE MUST BE GIVEN AT LEAST ONE WEEK TO REVIEW THE PLANS AND PREPARE A PLAN REVIEW LETTER.**

We must also be retained to observe the grading and the installation of foundations and drainage systems in order to:

- assess whether the actual soil conditions are similar to those encountered in our study;
- provide us with the opportunity to modify the foundation design, if variations in conditions are encountered; and
- observe whether the recommendations of our report are followed during construction.

Sufficient notification prior to the start of construction is essential, in order to allow for the scheduling of personnel to insure proper monitoring.

WE MUST BE NOTIFIED AT LEAST TWO WEEKS PRIOR TO THE ANTICIPATED START-UP DATE. IN ADDITION, WE MUST BE GIVEN AT LEAST TWO WORKING DAYS NOTICE PRIOR TO THE START OF ANY ASPECTS OF CONSTRUCTION THAT WE MUST OBSERVE.

The phases of construction that we must observe include, but are not necessarily limited to, the following.

1. **EARTHWORK:** During construction to observe keyway and bench excavations, evaluate the need for subdrainage, and to test compaction of engineered fill
2. **DRILLED PIER EXCAVATION:** During drilling to evaluate depth to supportive material and final pier depths
3. **VOID FORMS:** Prior to placing concrete and following removal of forms to substantiate the creation of the void
4. **RETAINING WALL BACKDRAIN:** During installation
5. **RETAINING WALL BACKFILL:** During backfill to observe and test compaction
6. **SEGMENTED BLOCK RETAINING RETAINING WALL:** Prior to placement of the blocks to evaluate if the blocks are founded in material of sufficient supporting capacity and during placement of geogrid and/or fill
7. **SLABS-ON-GRADE:** Prior to and during placement of non-expansive fill to observe the subgrade preparation and to test compaction of non-expansive fill
8. **SURFACE DRAINAGE SYSTEMS:** Near completion to evaluate installation and discharge locations

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A Bibliography, a List of Aerial Photographs, and the following Figures and Table are attached and complete this report.

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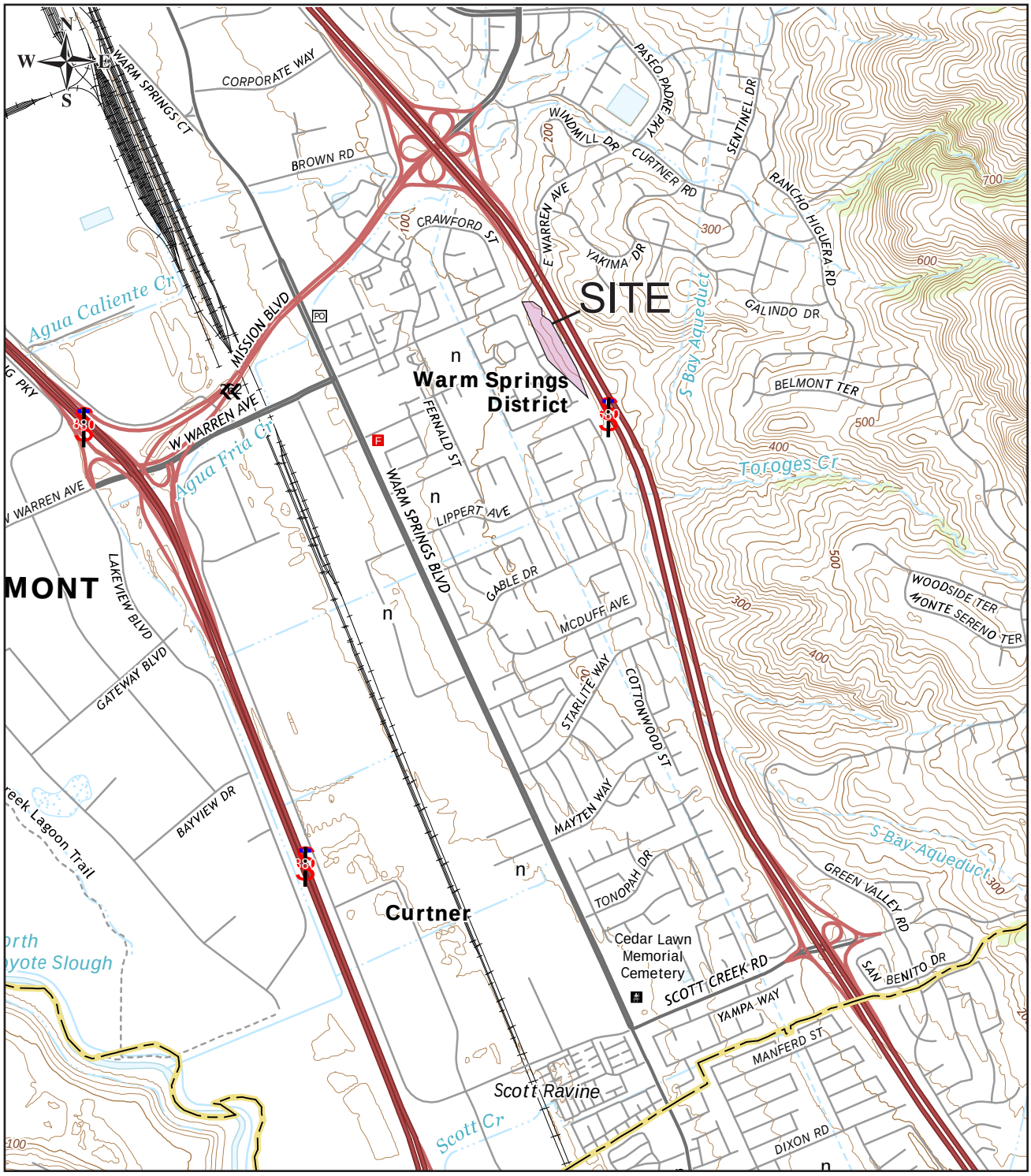

BASE: The National Map US Topo; UNITED STATES GEOLOGICAL SURVEY; 2015

SITE LOCATION MAP

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TIFFANY PARK ESTATE PROPERTY
East Warren Avenue
Fremont, California

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RW/CH	1" = 2,000'	14042C-02R1	January 2018	Figure 1

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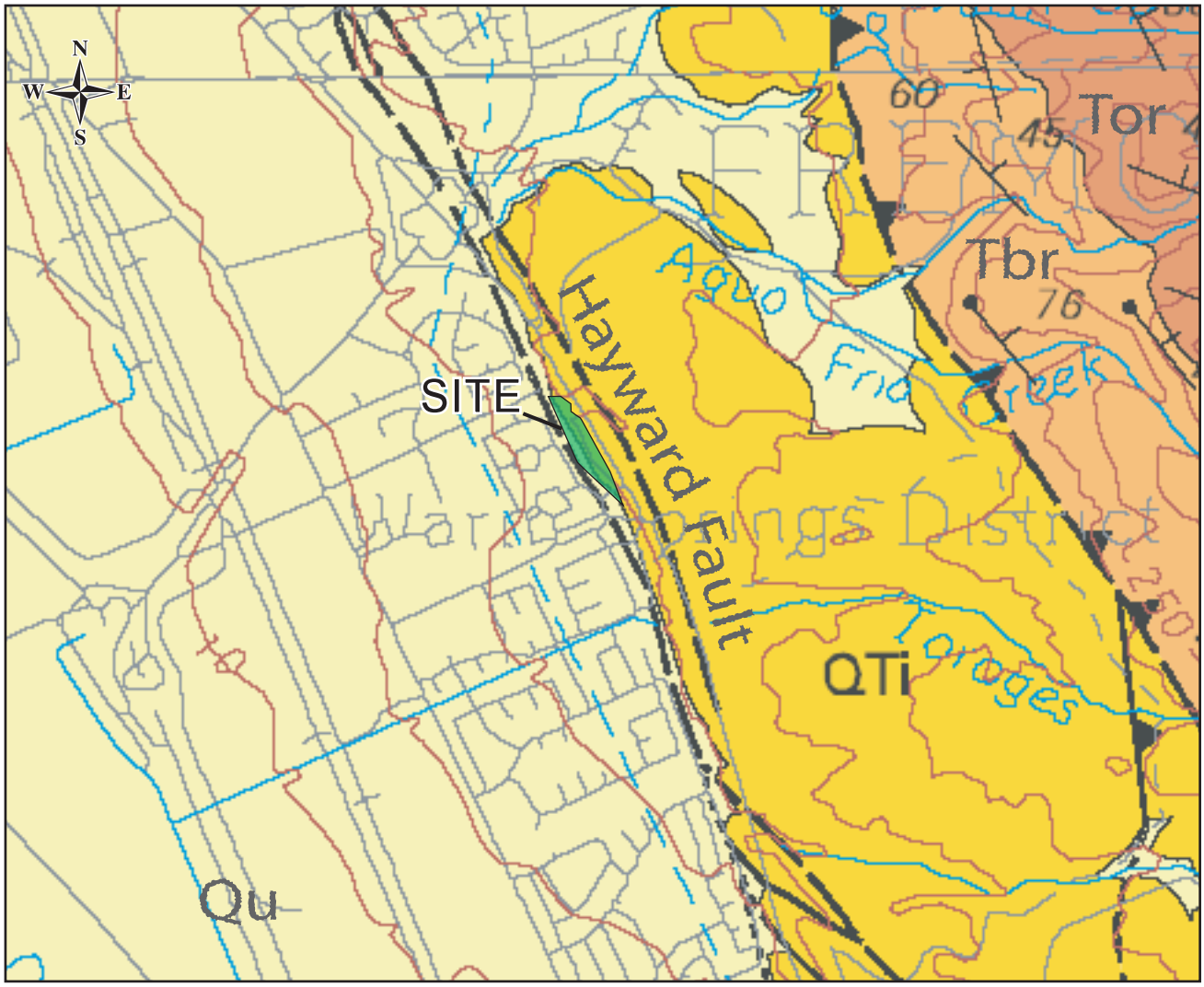

EXPLANATION

Qu - Undivided surficial deposits

QTi - Irvington gravels

Tor - Orinda Formation

Tbr - Briones Formation

15 Strike and dip

24 Strike and dip; top direction unknown

Geologic contact
dashed where approximate and dotted where concealed

Fault
dashed where approximate and dotted where concealed

Thrust fault
dashed where approximate and dotted where concealed

BASE: Sheet 1: Preliminary Gepologic Map Emphasizing Bedrock Formations in Alameda County, California; GRAYMER, ET AL.; 1996

REGIONAL GEOLOGIC MAP

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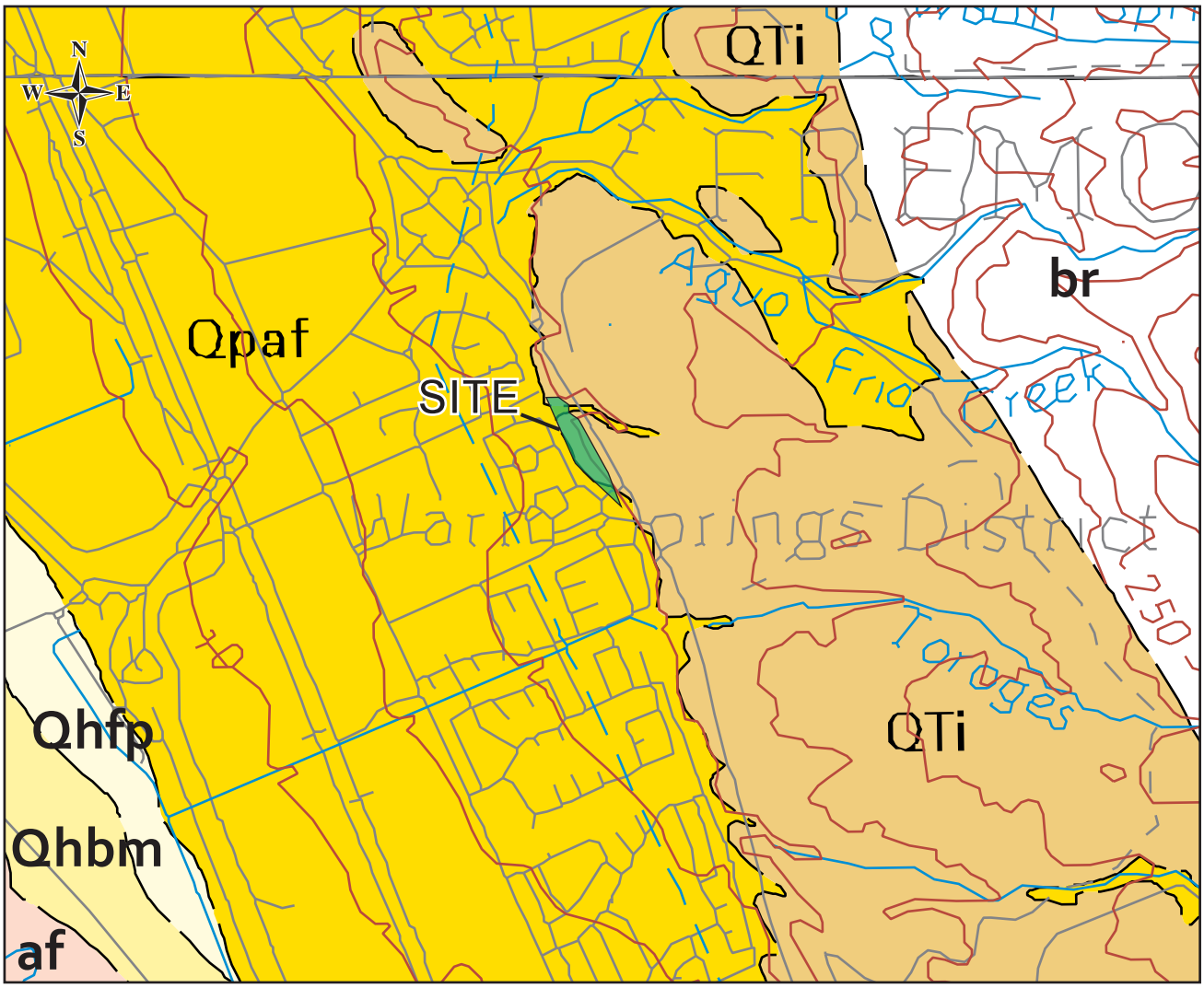

EXPLANATION

af	- Artificial fill
Qhbm	- Bay Mud deposits
Qhfp	- Floodplain deposits
Qpaf	- Alluvial fan deposits
QTi	- Irvington gravels
br	- Undifferentiated bedrock

Geologic Contact
dashed where approximate

BASE: Sheet 1 of 2: Quaternary Geology of Alameda County and Surrounding Areas, California: Derived from the Digital Database Open-file 97-97; HELLEY and GRAYMER; 1997

REGIONAL QUATERNARY GEOLOGIC MAP

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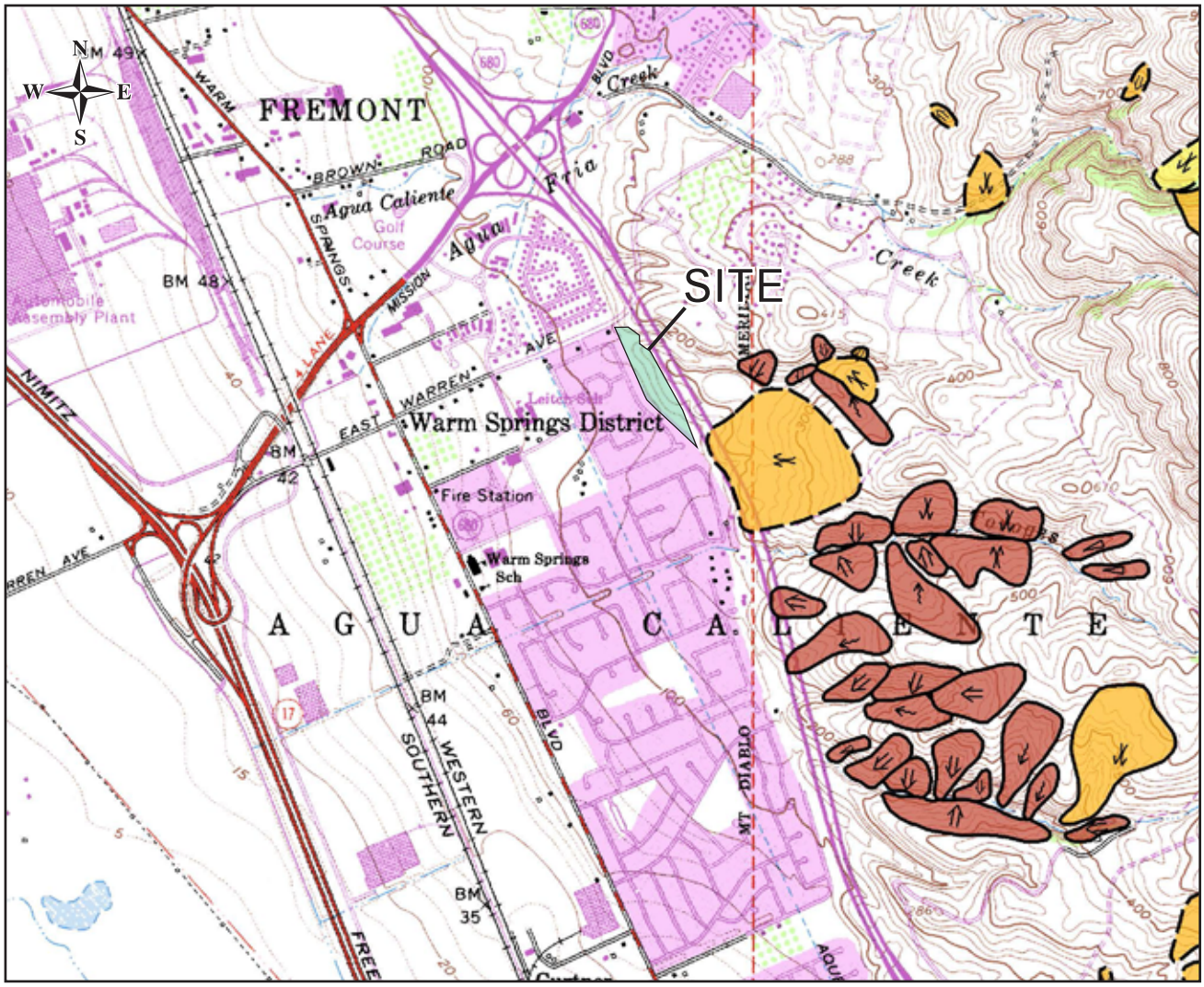

EXPLANATION

Landslide Activity	Landslide Types	Interpretation
- Active or Historic	- Rock Slide	—— - Definite
- Dormant, Young	- Soil Slide	– – – - Probable
- Dormant, Mature		····· - Questionable
- Dormant, Old		

BASE: Landslide Inventory Map of the Milpitas Quadrangle Alameda and Santa Clara Counties, California Geological Survey; June 2011

REGIONAL LANDSLIDE INVENTORY MAP

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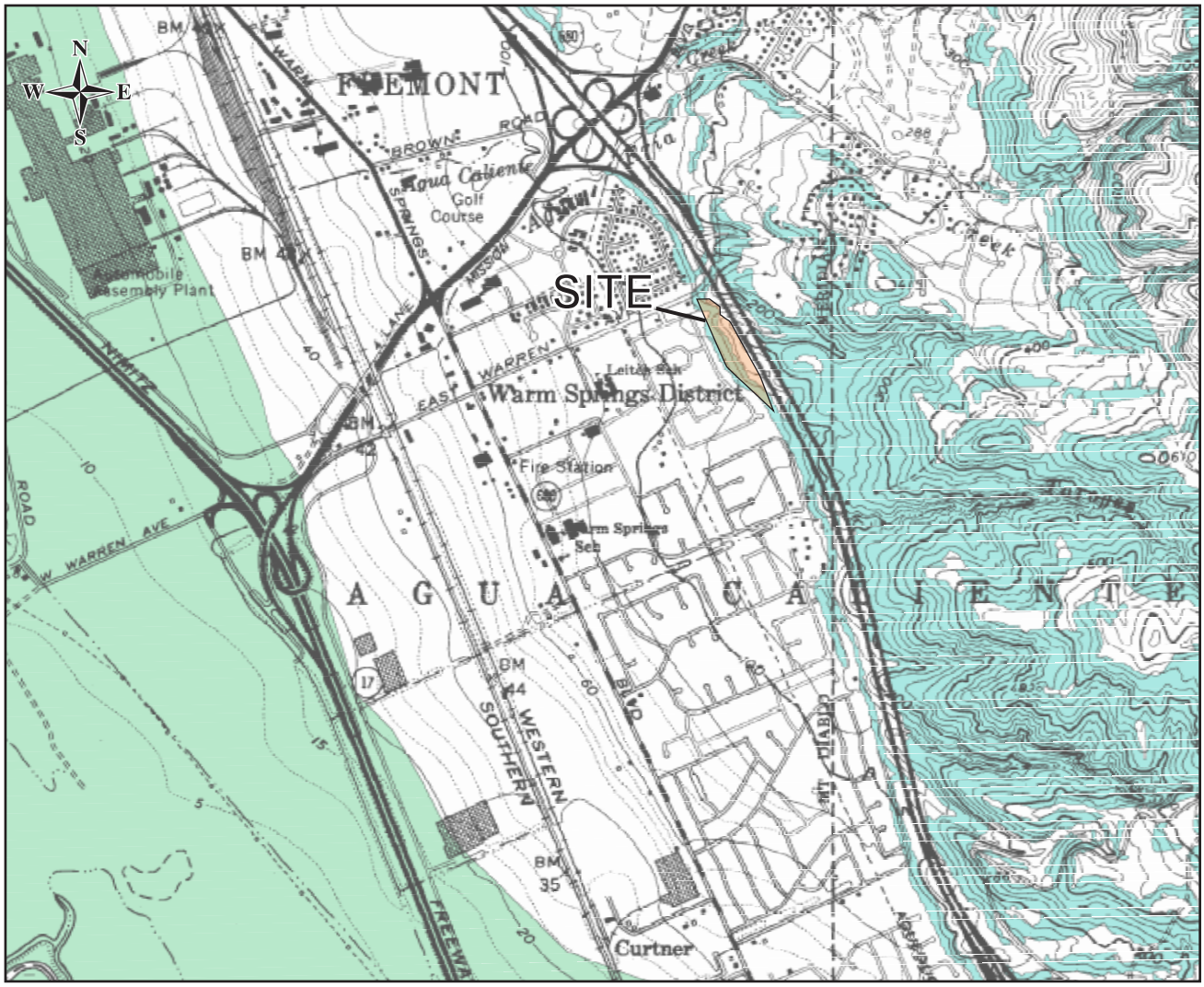

EXPLANATION

- **Earthquake-Induced Landslides;** Areas where previous occurence of landslide movement, or local topographic, geological, geotechnical, and subsurface water conditions indicate a potential for permanent ground displacements.

- **Liquefaction;** Areas where historic occurence of liquefaction, or local topographic, geological, geotechnical, and subsurface water conditions indicate a potential for permanent ground displacements.

BASE: Seismic Hazard Zones, Milpitas Quadrangle; California Geological Survey; 19 October 2004

REGIONAL SEISMIC HAZARD ZONES MAP

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RW/CH	1" = 2,000'	14042C-02R1	January 2018	Figure 5

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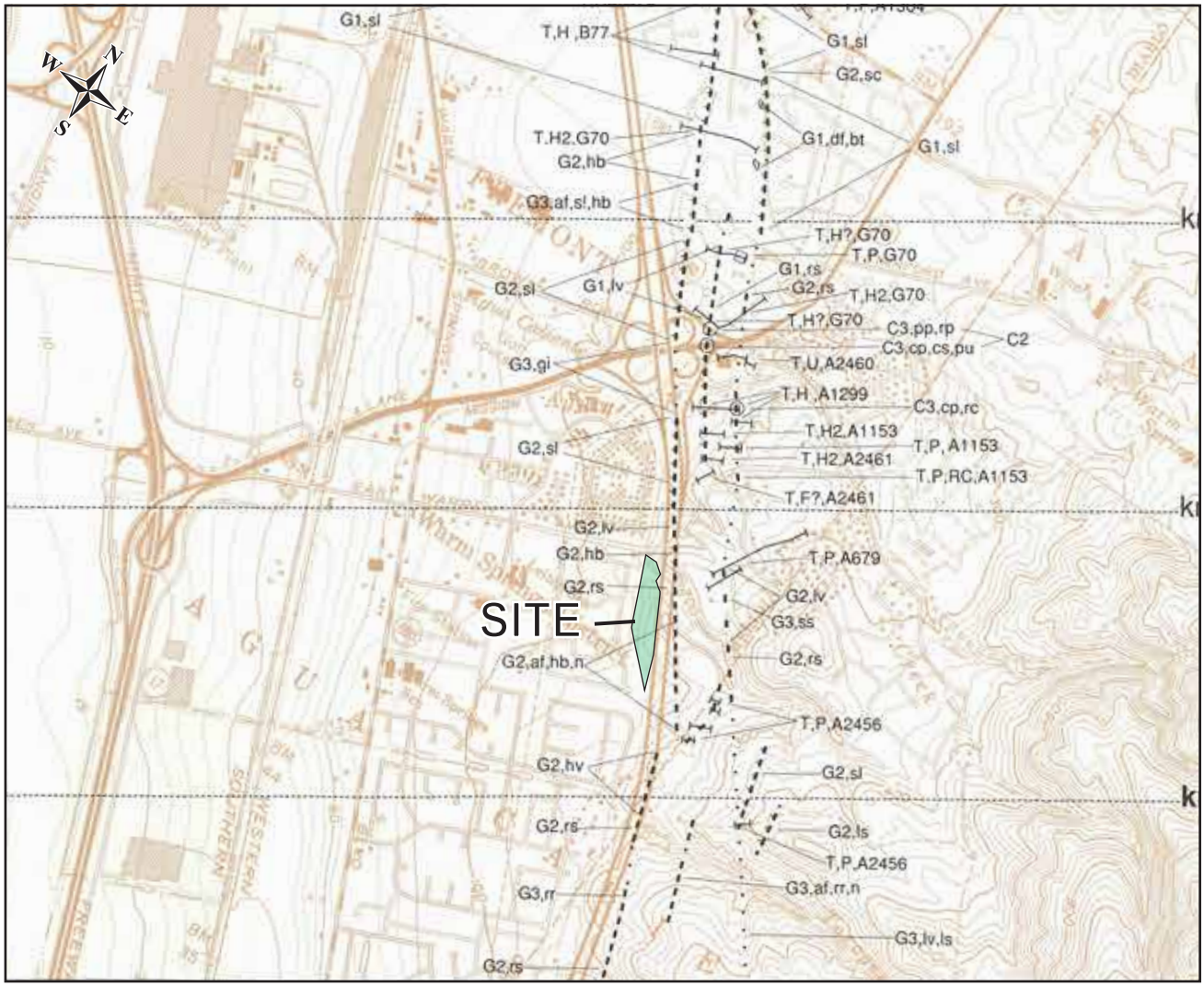

EXPLANATION

G - Geomorphic Features
- 2 - Distinct Feature
- 3 - Weakly Pronounced Feature
  - af - alignment of multiple features as listed
  - hb - linear hillside bench
  - hv - linear hillside valley
  - lv - linear valley or trough
  - n - notch
  - rs - right laterally offset stream or gully

- - - - - - Approximate Fault Location

|———| Trench Location

BASE: Map of Recently Active Traces of the Hayward Fault, Alameda and Contra Costa Counties; LIENKAEMPER, JAMES J.; 1992

REGIONAL FAULT MAP

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JB/CH	1" = 2,000'	14042C-02R1	January 2018	Figure 6

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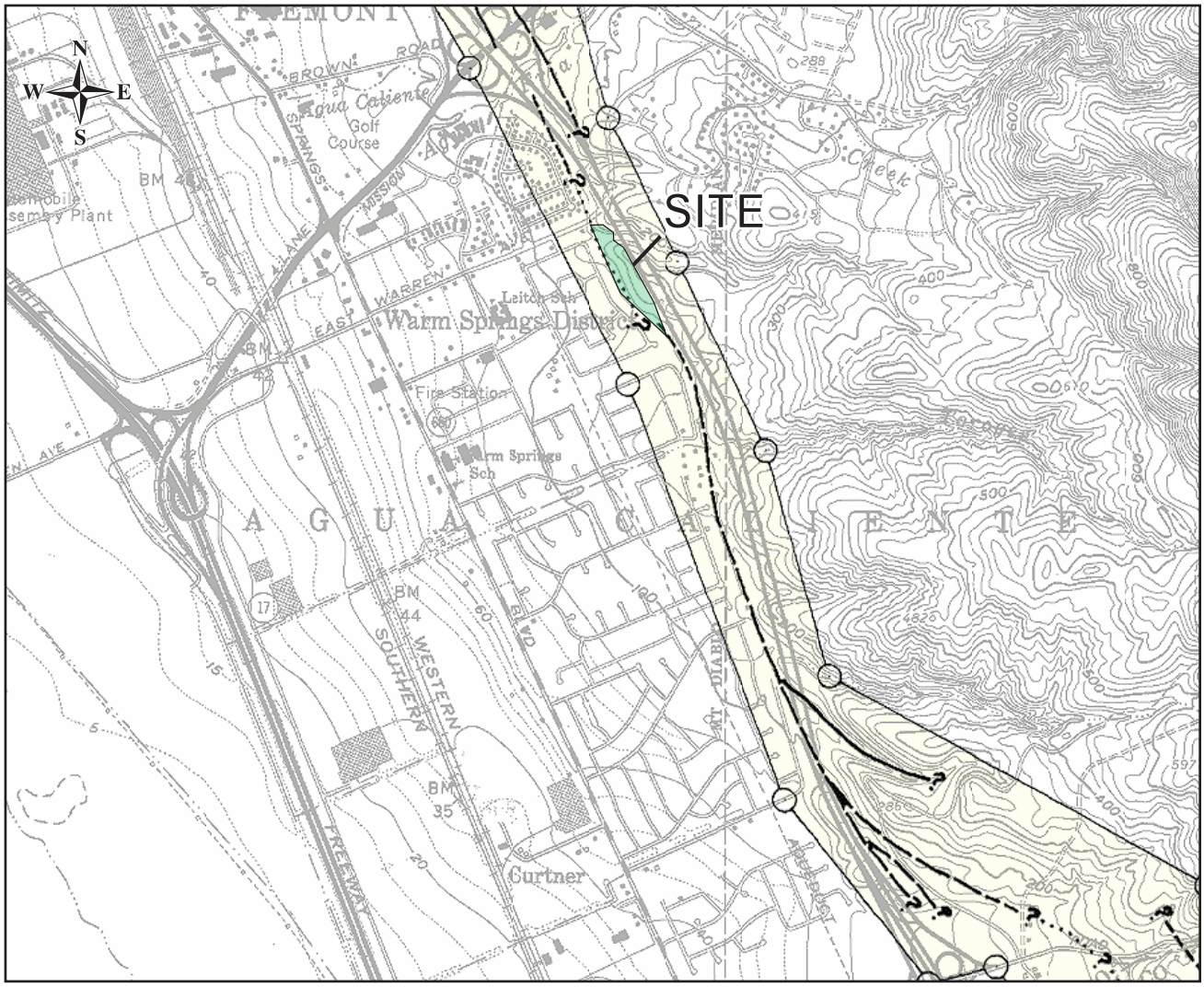

EXPLANATION

Potentially Active Faults

1906 C — Faults considered to have been active during Holocene time and to have relatively high potential for surface rupture; Solid line where accurately located, long dash where approximately located, short dash where inferred, dotted where concealed; query (?) indicates additional uncertainty. Evidence of historic offset indicated by year of earthquake-associated event or C for displacement caused by creep or possible creep.

Special Studies Zone Boundaries

These are delineated as straight-line segments that connect encircled points so as to define special studies zone segments.

Seaward projection of zone boundary

BASE: State of California Special Studies Zones; Milpitas Quadrangle; California Division of Mines and Geology; 1 January 1982

REGIONAL SPECIAL STUDIES ZONES MAP

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RW/CH	1" = 2,000'	14042C-02R1	January 2018	Figure 7

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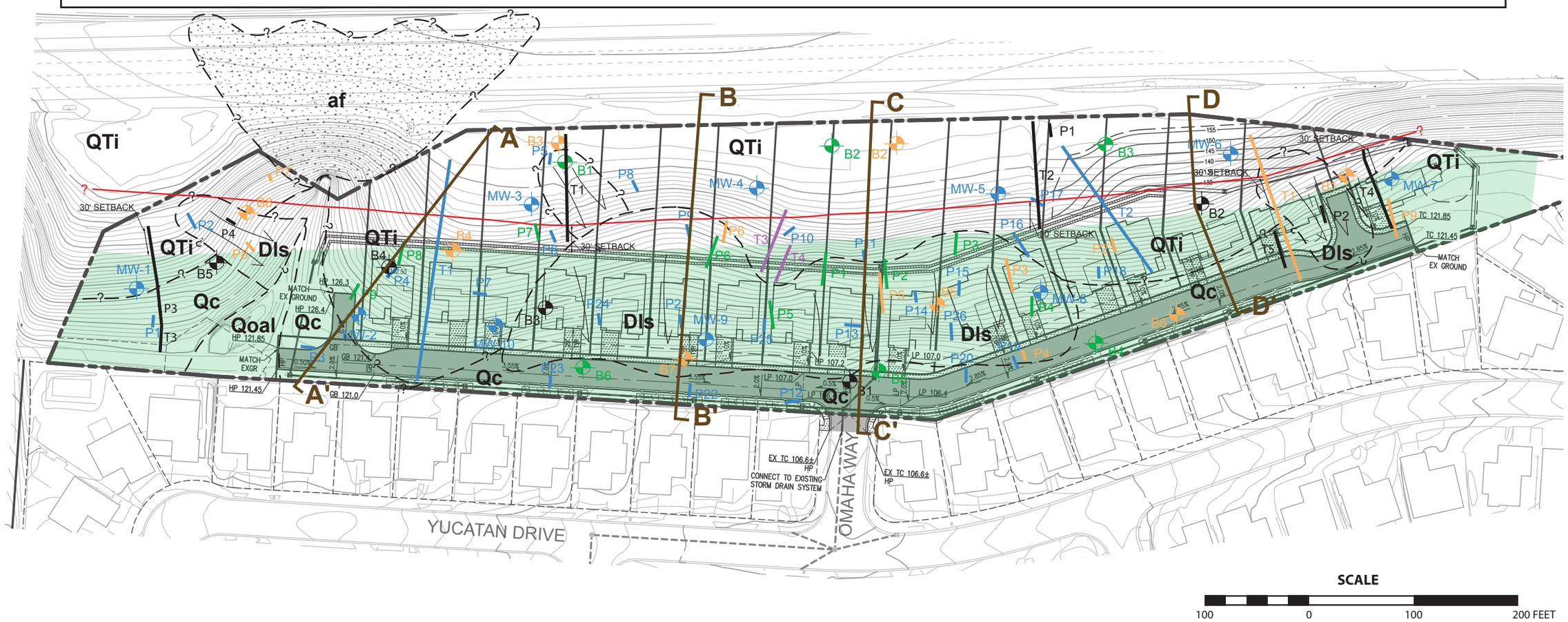
EXPLANATION

- af - Artificial Fill
- Dls - Dormant Landslide
- Qc - Colluvium (where greater than 5 ft. thick)
- Qoal - Old Alluvium
- QTi - Irvington Gravels Formation
- Geologic Contact
- Landslide Deposit (*Upp Geotechnology, 2015*)
- Approximate Location of Fault
- Area Cleared by Fault Trenches
- Approximate Property Line
- A A' - Geologic Cross-Section Location
- B1 P1 T1 - Test Boring, Test Pit and Exploration Trench Location and Number (*Upp Geotechnology, 2015 and 2016*)
- B1 P1 - Test Boring and Test Pit Location and Number (*Upp Geotechnology, 2005*)
- T3 - Exploration Trench Location and Number (*ATCI, 2001*)
- B1 P1 T1 - Test Boring, Test Pit, and Exploration Trench Location and Number (*ESC, 1987*)
- MW-1 P1 T1 - Monitoring Well, Test Pit, and Exploration Trench Location and Number (*FLA, 1998*)



SCALE

100 0 100 200 FEET

BASE: Sheet 1; Omaha Way Option A- Preliminary Grading and Drainage Plans; CALSON, BARBEE AND GIBSON INC.; 25 September 2017

SITE PLAN AND ENGINEERING GEOLOGIC MAP

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LR/CH	As Shown	14042C-02R1	January 2018	Figure 8

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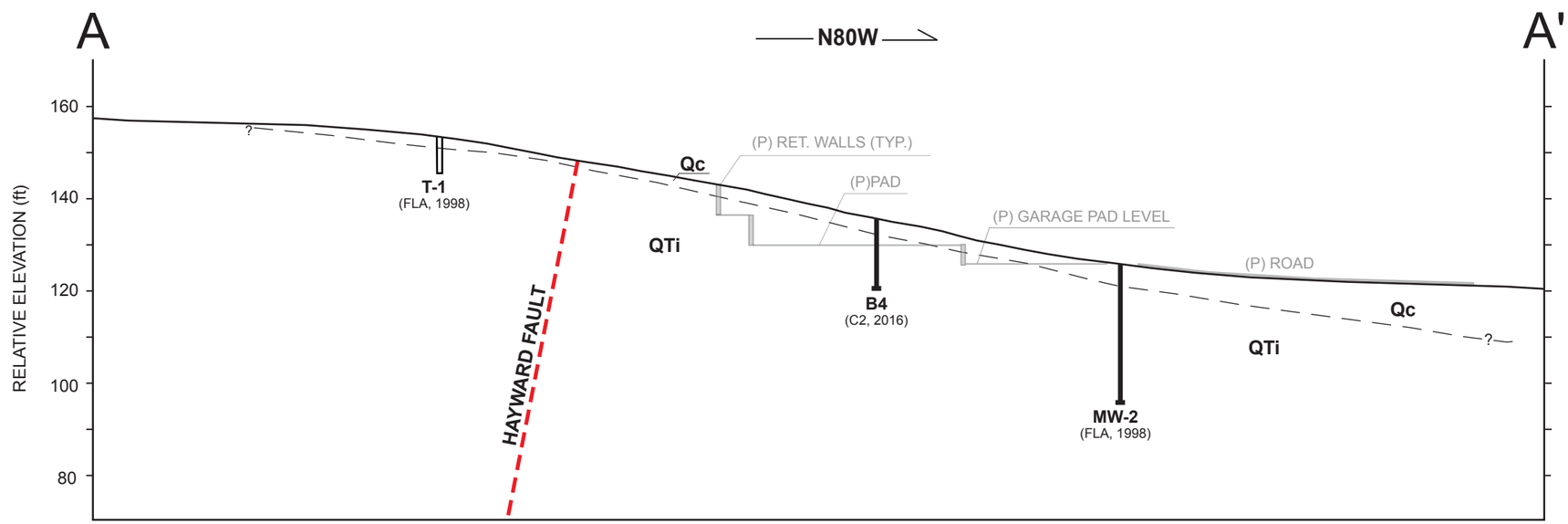

NOTE: This cross-section is a conceptual illustration of general subsurface and geologic relationships and should not be used for any other purpose.

BASE: Sheet 1; Omaha Way Option A- Preliminary Grading and Drainage Plans; CALSON, BARBEE AND GIBSON INC.; 25 September 2017

GEOLOGIC CROSS-SECTION A-A'

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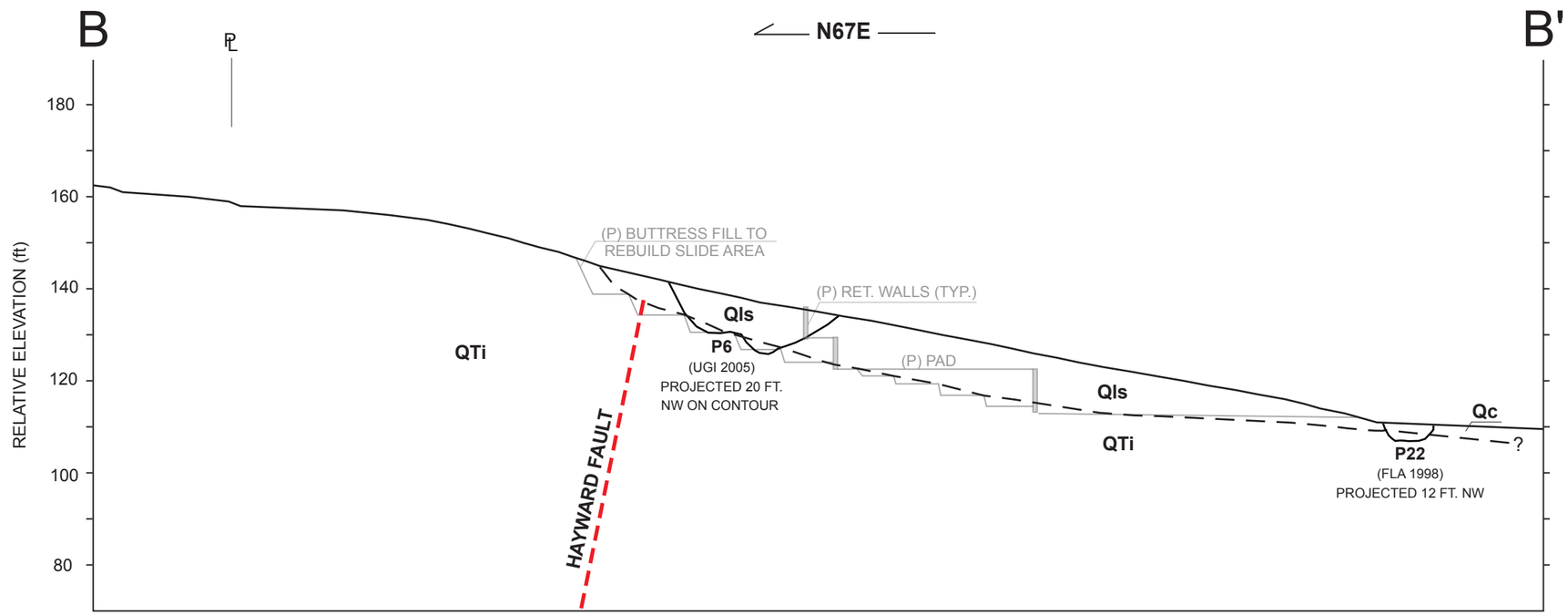

NOTE: This cross-section is a conceptual illustration of general subsurface and geologic relationships and should not be used for any other purpose.

BASE: Sheet 1; Omaha Way Option A- Preliminary Grading and Drainage Plans; CALSON, BARBEE AND GIBSON INC.; 25 September 2017

GEOLOGIC CROSS-SECTION B-B'

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LR/CH	1"= 30'	14042C-02R1	January 2018	Figure 10

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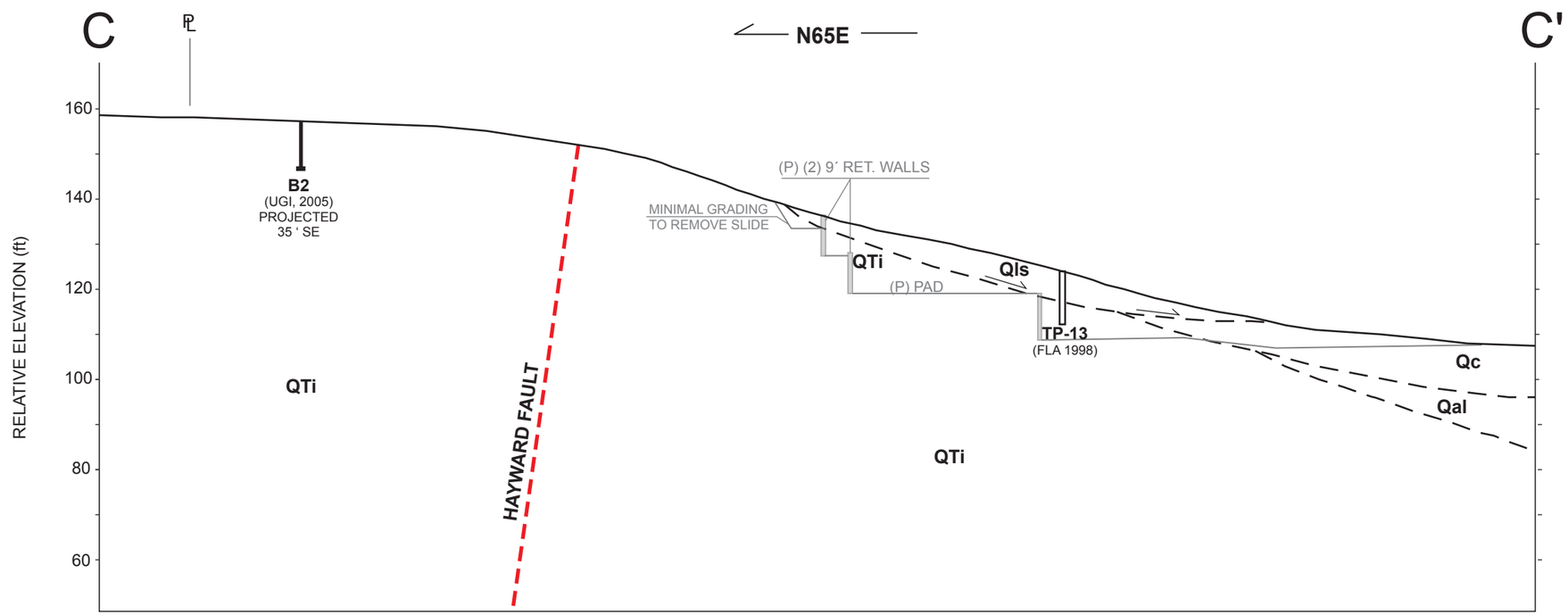

NOTE: This cross-section is a conceptual illustration of general geologic relationships and should not be used for any other purpose.

BASE: Omaha Way Option A- Preliminary Grading and Drainage Plans; CALSON, BARBEE AND GIBSON INC.; 25 September 2017

GEOLOGIC CROSS-SECTION C-C'

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KK/CH	1"= 30'	14042C-02R1	January 2018	Figure 11

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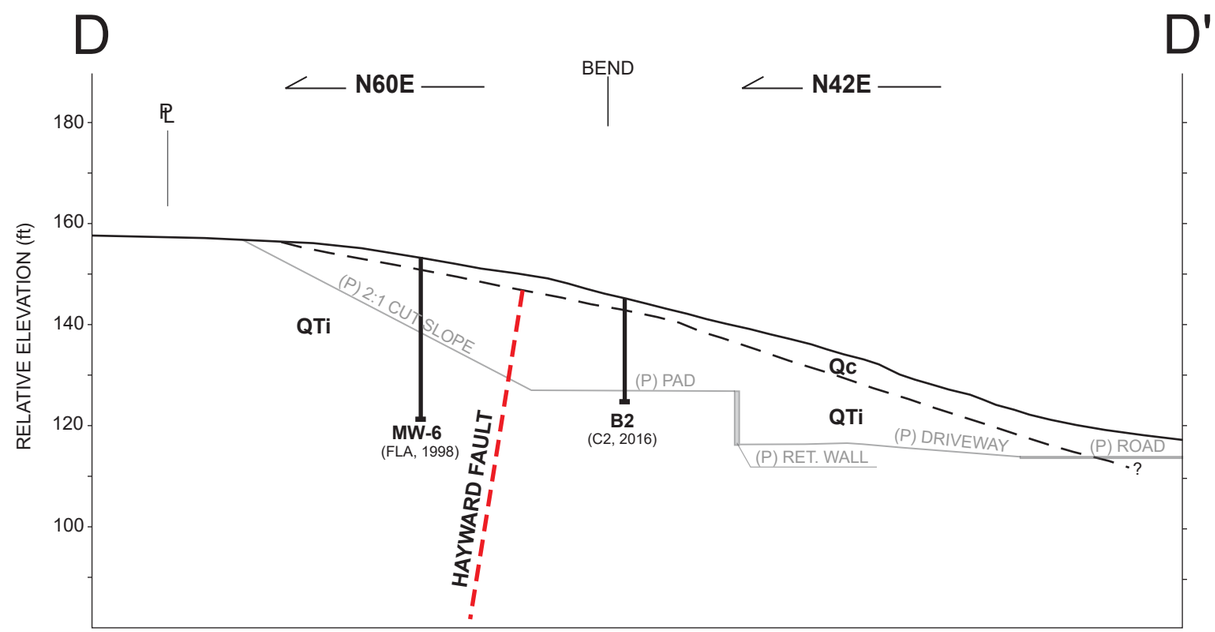

NOTE: This cross-section is a conceptual illustration of general geologic relationships and should not be used for any other purpose.

BASE: Omaha Way Option A- Preliminary Grading and Drainage Plans; CALSON, BARBEE AND GIBSON INC.; 25 September 2017

GEOLOGIC CROSS-SECTION D-D'

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KK/CH	1"= 30'	14042C-02R1	January 2018	Figure 12

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UNIFIED SOIL CLASSIFICATION SYSTEM

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	GW	Well graded gravels; gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures, non-plastic fines.
			SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 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 AND CLAYS LIQUID LIMIT IS GREATER THAN 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

GRAIN SIZES

U.S. STANDARD SERIES SIEVE	200	40	10	4	¾″	3″	12″ SIEVE OPENINGS

SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

CONSISTENCY AND RELATIVE DENSITY

CONSISTENCY

SILTS AND CLAYS	STRENGTH[2]	BLOWS/FOOT[1]
VERY SOFT	0 - ¼	0 - 2
SOFT	¼ - ½	2 - 4
FIRM	½ - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	OVER 4	OVER 32

RELATIVE DENSITY

SANDS AND GRAVELS	BLOWS/FOOT[1]
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

[1] Number of blows of 140-pound hammer falling 30 inches to drive a 2-inch O.D (1 3/8-inch I.D) split spoon

[2] Unconfined compressive strength in tons/sq. ft. as determined by laboratory testing or approximated in general conformance with the standard penetration test (ASTM D-1586), pocket penetrometer, torvane, or visual observation

KEY TO LOGS

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FRACTURING

INTENSITY	SIZE OF PIECES (FEET)
VERY LITTLE FRACTURED	Greater than 4.0
OCCASIONALLY FRACTURED	1 - 4
MODERATELY FRACTURED	0.5 - 1
CLOSELY FRACTURED	0.1 - 0.5
INTENSELY FRACTURED	0.05 - 0.1
CRUSHED	Less than 0.05

HARDNESS

SOFT	Reserved for plastic material alone
LOW	Can be gouged deeply or carved easily with a knife blade
MODERATELY	Can be readily scratched by a knife blade; scratch leaves a heavy trace of dust and is readily visible after the powder has been blown away.
HARD	Can be scratched with difficulty; scratch produced a little powder and is often faintly visible.
VERY HARD	Cannot be scratched with knife blade; leaves a metallic streak.

STRENGTH

LOW	Plastic or very low strength.
FRIABLE	Crumbles easily by rubbing with fingers.
WEAK	An unfractured specimen of such material will crumble under light hammer blows.
MODERATELY	Specimen will withstand a few heavy hammer blows before breaking.
STRONG	Specimen will withstand a few heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments.
VERY STRONG	Specimen will resist heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments.

WEATHERING[1]

DEEP	Moderate to complete mineral decomposition; extensive disintegration; deep and thorough discoloration; many fractures, all extensively coated or filled with oxides, carbonates and/or clay or silt.
MODERATE	Slight change or partial decomposition of minerals; little disintegration; cementation little to unaffected. Moderate to occasionally intense discoloration. Moderately coated fractures.
SLIGHT	No megascopic decomposition of minerals; little of no effect on normal cementation. Slight and intermittent, or localized discoloration. Few stains on fracture Surface.
FRESH	Unaffected by weathering agents. No disintegration of discoloration. Fractures usually less numerous than joints.

[1] The physical and chemical disintegration and decomposition of rocks and minerals by natural processes such as oxidation, reduction, hydration, solution, carbonation, and freezing and thawing.

BEDDING OF SEDIMENTARY ROCKS

SPLITTING PROPERTY	THICKNESS (FEET)
MASSIVE	Greater than 4.0
BLOCKY	2.0 - 4.0
SLABBY	0.2 - 2.0
FLAGGY	0.05 - 0.2
SHALY OR PLATY	0.01 - 0.05
PAPERY	Less than 0.01

STRATIFICATION	THICKNESS (FEET)
VERY THICK-BEDDED	Greater than 4.0
THICK-BEDDED	2.0 - 4.0
THIN-BEDDED	0.2 - 2.0
VERY THIN-BEDDED	0.05 - 0.2
LAMINATED	0.01 - 0.05
THINLY LAMINATED	Less than 0.01

ROCK CLASSIFICATION SYSTEM

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The standard penetration resistance (SPT) blow counts are obtained in general accordance with ASTM Test Designation D1586. The drive weight assembly consists of a 140-pound hammer dropped through a 30-inch free fall. A blow count is defined as the number of hammer blows per six inches of penetration, or 50 blows for 6 inches or less of penetration. The driving of samplers was discontinued if the observed blow count was 50 for 6 inches or less of penetration.

SPT samples are collected in a standard, 2-inch outer diameter, split-barrel sampler without liners (see Figure A below). Samplers holding 2-inch diameter liners (see Figure B below) and 2½-inch diameter liners (see Figure C below) are used to obtain "undisturbed" samples. Occasionally a portable power driven sampler holding 1-inch diameter liners is used for field sampling (see Figure D below). Resistance is measured in seconds per foot and does not correlate with the ASTM SPT. Undisturbed samples may also be collected using a Pitcher Barrel sampler (see Figure E below). Material recovered over the length of the sampler is shaded. A measure of resistance is not collected with this technique.

Blow counts are converted to SPT counts which are shown on the boring logs by the following relation:

$$B = \frac{N\,W\,H}{(140)(30)} \left(\frac{D_{o\,SPT}^{2} - D_{i\,SPT}^{2}}{D_o^{2} - D_i^{2}} \right)$$

B = Equivalent number of blows per foot with a SPT
N = Number of blows per foot actually recorded
W = Weight of hammer (lb)
H = Height of hammer drop (in)
D_o = Outside Diameter (in)
D_i = Inside Diameter (in)

The blow counts used for these conversions were taken over the last two sample intervals if the sampler was driven 12 inches or more. If the sampler is driven less than 12 inches, the blow counts of the last sample were converted to SPT counts of 50 blows over an equivalent SPT run length.

SPT Figure A | 2" Liner Figure B | 2.5" Liner Figure C | 1" Liner Figure D | Pitcher Barrel Figure E

■ = Undisturbed Sample ☒ = Disturbed Sample

Where obtained, the shear strength of the soil samples is shown on the boring logs in far right-hand column.

SUMMARY OF FIELD SAMPLING PROCEDURES

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14042C-02R1	January 2018	Figure 15

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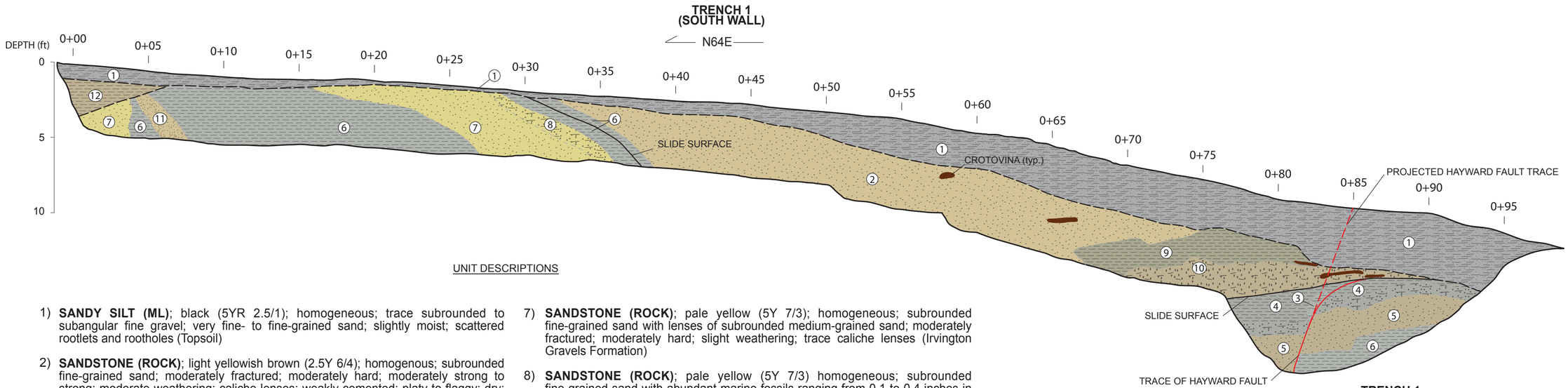

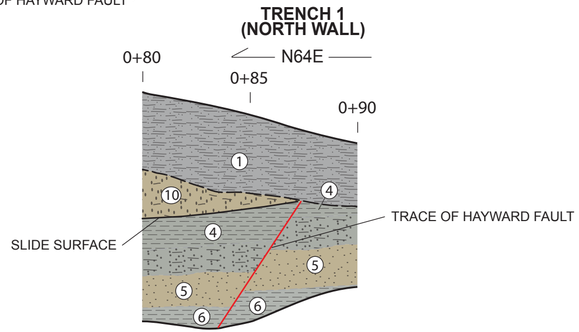

UNIT DESCRIPTIONS

1) **SANDY SILT (ML)**; black (5YR 2.5/1); homogeneous; trace subrounded to subangular fine gravel; very fine- to fine-grained sand; slightly moist; scattered rootlets and rootholes (Topsoil)

2) **SANDSTONE (ROCK)**; light yellowish brown (2.5Y 6/4); homogenous; subrounded fine-grained sand; moderately fractured; moderately hard; moderately strong to strong; moderate weathering; caliche lenses; weakly cemented; platy to flaggy; dry; trace rootholes (Landslide Deposit)

3) **CLAYSTONE (ROCK)**; olive gray (5Y 5/2); heterogeneous; closely fractured; soft hardness; weak strength; moderate weathering; caliche lenses along upper contact (Irvington Gravels Formation)

4) **CLAYSTONE (ROCK)**; olive gray (5Y 5/2) to reddish brown (5YR 4/4) mottling; heterogeneous; closely to intensely fractured; weak strength; moderate weathering; moist (Irvington Gravels Formation)

5) **SANDSTONE (ROCK)**; light olive brown (2.5Y 5/4); homogenous; subrounded fine-grained sand; closely to intensely fractured; low hardness; low to friable strength; slight weathering; moist; trace rootlets adn rootholes (Irvington Gravels Formation)

6) **CLAYSTONE (ROCK)**; olive gray (5Y 4/2) to dark reddish brown (5YR 3/4); heterogeneous; closely to intensely fractured; soft to low hardness; weak strength; moderate weathing; oxidation staining on fracture surfaces; moist; scattered shells less than 0.4 inches (Landslide Deposit and Irvington Gravels Formation)

7) **SANDSTONE (ROCK)**; pale yellow (5Y 7/3); homogeneous; subrounded fine-grained sand with lenses of subrounded medium-grained sand; moderately fractured; moderately hard; slight weathering; trace caliche lenses (Irvington Gravels Formation)

8) **SANDSTONE (ROCK)**; pale yellow (5Y 7/3) homogeneous; subrounded fine-grained sand with abundant marine fossils ranging from 0.1 to 0.4 inches in size; trace charcoal gravels; moist; (Irvington Gravels Formation)

9) **CLAYSTONE (ROCK)**; light olive brown (2.5Y 5/6); intensely fractured; soft to low hardness; moderate strength; moderate weathering; abundant caliche lenses; flaggy; moist (Landslide Deposit)

10) **SILTY SANDSTONE (ROCK)**; olive yellow (2.5Y 6/6); subrounded fine-grained sand with trace subrounded fine gravel; low to soft hardness; friable strength; slight weathering; platy; moist (Landslide Depsoit)

11) **CONGLOMERITIC SANDSTONE (ROCK)**; light yellowish brown (2.5Y 6/4); fine-grained sand matrix; matrix supported; subrounded coarse-grained sand to fine gravel chert clasts; weakly cemented; slightly moist (Irvington Gravels Formation)

12) **CLAYSTONE (ROCK)**; olive brown (2.5Y 4/3); moderately fractured; soft to low hardness; moderate strength; slight weathering; oxidation staining; small lenses of caliche; moist; trace rootlets and rootholes (Irvington Gravels Formation)

BASE: Logged by C. Hundemer, C. Reid, J. Buckley, R. Hohn; C2EARTH, INC.; 13, 14, and 15 October 2015

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LOG OF EXPLORATION TRENCH 1

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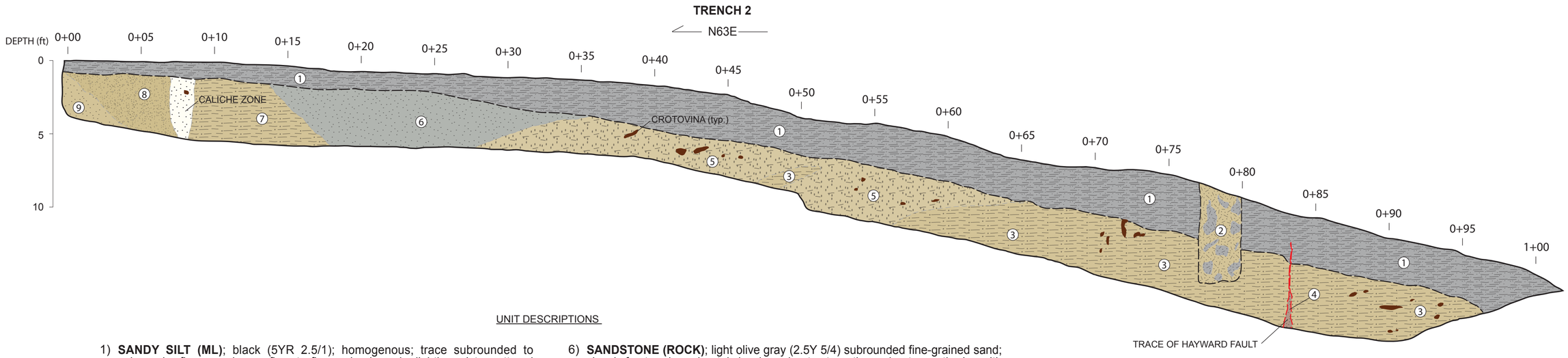
EB/CH	1″ = 5′	14042C-02R1	January 2018	Figure 16



UNIT DESCRIPTIONS

1) **SANDY SILT (ML)**; black (5YR 2.5/1); homogenous; trace subrounded to subangular fine gravel; very fine- to fine-grained sand; slightly moist; scattered rootlets and rootholes (Topsoil)

2) **SANDY SILT (ML)**; black 5YR 2.5/1) to yellowish brown (10YR 5/6); heterogenous; subrounded fine-grained sand; trace subrounded to subangular gravels; slightly moist (Trench Backfill)

3) **CLAYEY SANDSTONE (ROCK)**; yellowish brown (10YR 5/4) homogenous; subrounded fine-grained sand with abundant caliche staining throughout unit; low hardness; moderate strength; moderate weathering; flaggy; moist; crotovina present; trace rootlets (Irvington Gravels Formation)

4) **CLAYEY SILT (ML)**; brown (10YR 5/3); oxidation staining on fracture surfaces; caliche staining; (Clayey Gouge)

5) **SILTY SANDSTONE (ROCK)**; yellowish brown (10YR 5/4) heterogenous; subrounded to subangular fine- medium-grained sand; trace subrounded to subangular fine gravel comprised of black chert; low to moderately hard; moderate strength; moderate weathering with oxidation staining; slightly moist (Irvington Gravels Formation)

6) **SANDSTONE (ROCK)**; light olive gray (2.5Y 5/4) subrounded fine-grained sand; closely fractured; moderately hard; moderate strength; moderate weathering with oxidation staining; slightly moist; trace rootlets (Irvington Gravels Formation)

7) **CLAYEY SANDSTONE (ROCK)**; yellowish brown (10YR 5/4) heterogenous; subrounded fine-grained sand; trace coarse-grained sand to fine gravel; closely fractured; moderate hardness; moderate strength; moderate weathering with oxidation staining; slightly moist; trace rootlets (Irvington Gravels Formation)

8) **CONGLOMERATIC SANDSTONE (ROCK)**; light yellowish brown (2.5Y 6/4) fine-grained sand matrix; matrix supported; subrounded coarse gravel clasts; scattered caliche; closely fractured; moderate hardness; weak strength; weakly cemented; thin-bedded; deep weathering of clasts with oxidation staining throughout; slightly moist (Irvington Gravels Formation)

9) **SANDSTONE (ROCK)**; yellowish brown (10YR 5/4) heterogenous; subrounded fine-grained sand; trace subrounded coarse-grained sand and fine gravel; trace caliche nodules up to 0.5 inch in diamter; moderate hardness; moderate strength; moderate weathering with some oxidation staining; moist; trace rootlets (Irvington Gravels Formation)

BASE: Logged by C. Hundemer, C. Reid, J. Buckley, R. Hohn; C2EARTH, INC.; 13, 14, and 15 October 2015

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LOG OF EXPLORATION TRENCH 2

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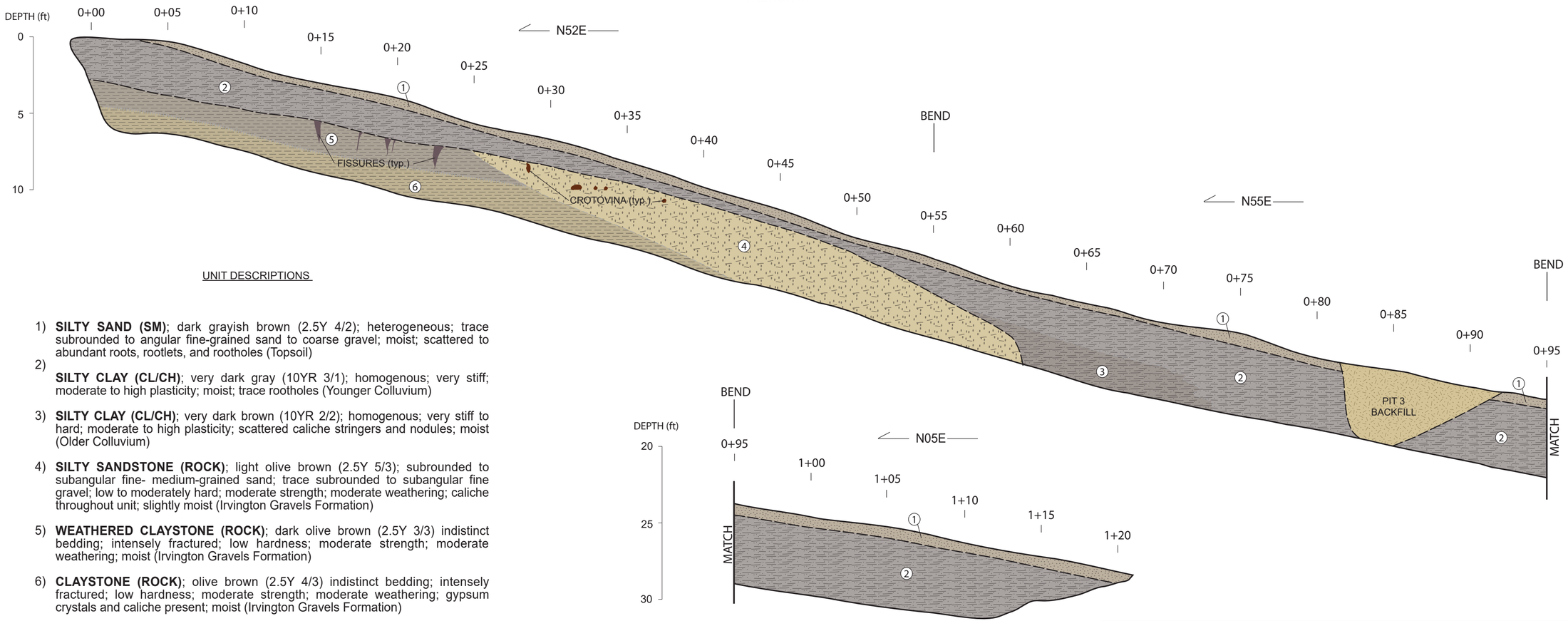
EB/CH	1" = 5'	14042C-02R1	January 2018	Figure 17

TRENCH 3



UNIT DESCRIPTIONS

1) **SILTY SAND (SM)**; dark grayish brown (2.5Y 4/2); heterogeneous; trace subrounded to angular fine-grained sand to coarse gravel; moist; scattered to abundant roots, rootlets, and rootholes (Topsoil)

2) **SILTY CLAY (CL/CH)**; very dark gray (10YR 3/1); homogenous; very stiff; moderate to high plasticity; moist; trace rootholes (Younger Colluvium)

3) **SILTY CLAY (CL/CH)**; very dark brown (10YR 2/2); homogenous; very stiff to hard; moderate to high plasticity; scattered caliche stringers and nodules; moist (Older Colluvium)

4) **SILTY SANDSTONE (ROCK)**; light olive brown (2.5Y 5/3); subrounded to subangular fine- medium-grained sand; trace subrounded to subangular fine gravel; low to moderately hard; moderate strength; moderate weathering; caliche throughout unit; slightly moist (Irvington Gravels Formation)

5) **WEATHERED CLAYSTONE (ROCK)**; dark olive brown (2.5Y 3/3) indistinct bedding; intensely fractured; low hardness; moderate strength; moderate weathering; moist (Irvington Gravels Formation)

6) **CLAYSTONE (ROCK)**; olive brown (2.5Y 4/3) indistinct bedding; intensely fractured; low hardness; moderate strength; moderate weathering; gypsum crystals and caliche present; moist (Irvington Gravels Formation)

BASE: Logged by C. Hundemer, C. Reid, J. Buckley, E. Brown; C2EARTH, INC.; 19 and 20 April 2016

LOG OF EXPLORATION TRENCH 3				
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JB/CH	1" = 5'	14042C-02R1	January 2018	Figure 18

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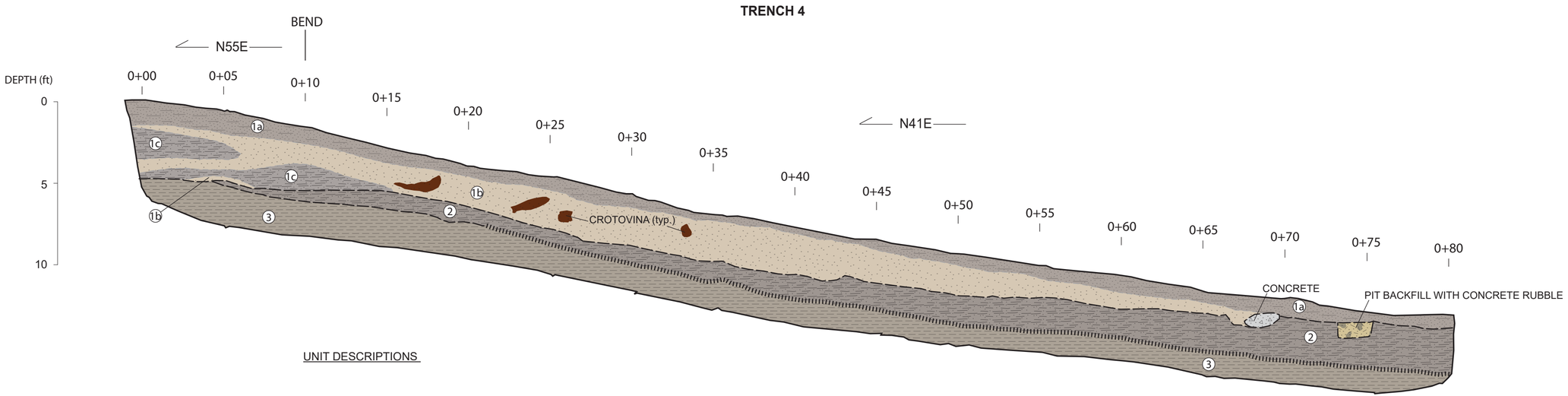

UNIT DESCRIPTIONS

1a) **SILTY SAND (SM)**; very dark grayish brown (10YR 3/2); heterogeneous; very loose, scattered, subrounded medium- to coarse-grained sand; moist; scattered roots, rootholes and rootlets (Fill)

1b) **SAND (SP)**; light yellowish brown (2.5Y 6/4); heterogeneous; loose to medium dense; scattered, rounded to sub angular, fine- to coarse- gravels; moderately graded; gravels are on imbricated; moist; trace rootlets; cobbles of asphalt; construction debris (Fill)

1c) **CLAYEY SILT (ML)**; very dark gray (10YR 3/1); heterogeneous; stiff to very stiff; scattered subangular, fine- to medium-grained sand; moist; trace rootlets (Fill)

2) **SILTY CLAY (CH)**; very dark brown (10YR 2/2) to very dark grayish brown (10YR 2/2) homogeneous; stiff to very stiff; moderate to high plasticity; moist; trace rootlets (Colluvium)

3) **CLAYSTONE (ROCK)**; dark olive brown (2.5Y 3/3); indistinct intensely fractures; low hardness; weak; moderate weathering; greasy to wacky luster on fracture surfaces; massive structure; slabby; (Irvington Gravels Formation)

BASE: Logged by C. Hundemer, J. Buckley, E. Brown; C2EARTH, INC.; 21, 20, and 19 April 2016

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LOG OF EXPLORATION TRENCH 4				
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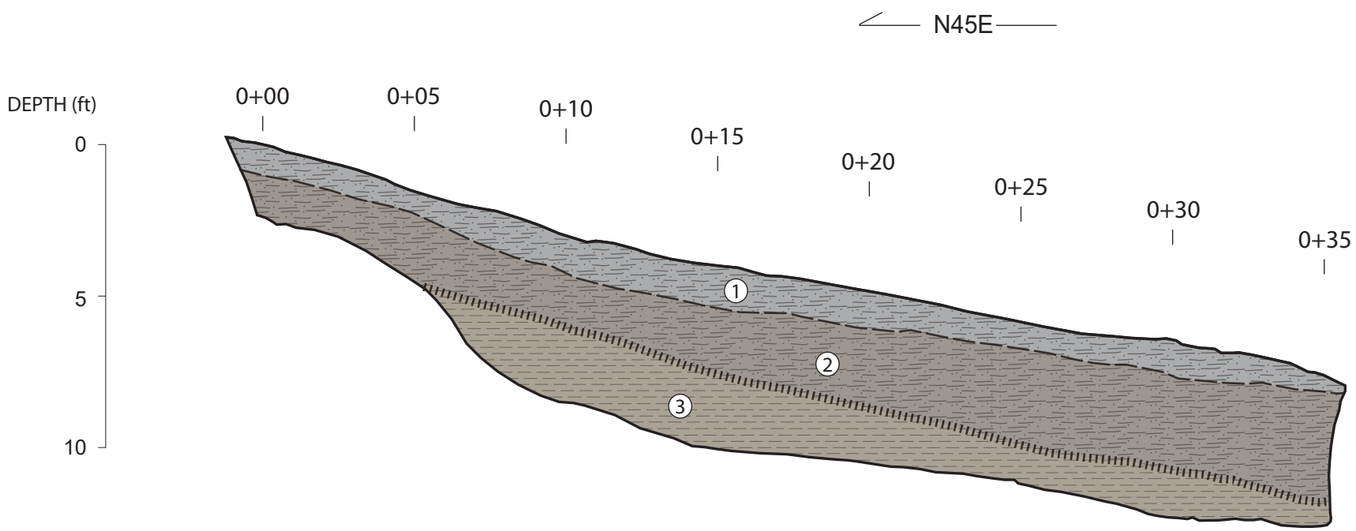
LR/CH	1" = 5'	14042C-02R1	January 2018	Figure 19

TRENCH 5



UNIT DESCRIPTIONS

1) **SILTY SAND (SM)**; dark grayish brown (2.5Y 4/2); heterogeneous; trace subrounded to angular fine-grained sand to coarse gravel; moist; scattered to abundant roots, rootlets, and rootholes (Topsoil)

2) **SILTY CLAY (CH)**; very dark brown (10YR 2/2) to very dark grayish brown (10YR 2/2) homogeneous; stiff to very stiff; moderate to high plasticity; moist; trace rootlets (Colluvium)

3) **CLAYSTONE (ROCK)**; dark olive brown (2.5Y 3/3); indistinct intensely fractures; low hardness; weak; moderate weathering; greasy to waxy luster on fracture surfaces; massive structure; slabby; (Irvington Gravels Formation)

BASE: Logged by C. Hundemer, J. Buckley, E. Brown; C2EARTH, INC.; 21, 20, and 19 April 2016

LOG OF EXPLORATION TRENCH 5				
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LR/CH	1" = 5'	14042C-02R1	January 2018	Figure 20

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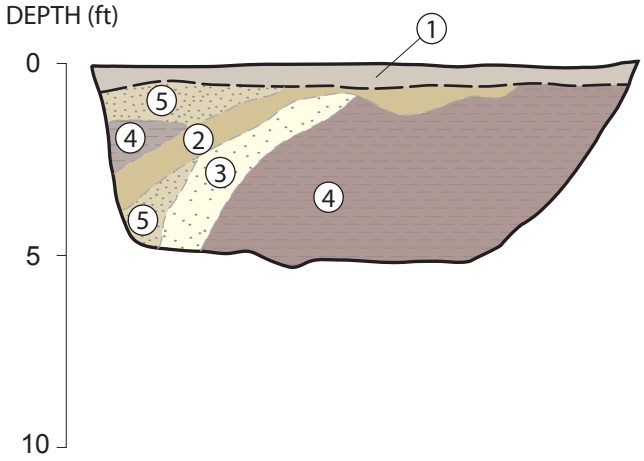
PIT 1

N54E



UNIT DESCRIPTIONS

1) **SILTY SAND (SM)**; grayish brown (10YR 5/2); heterogeneous; subrounded fine- to medium-grained sand; scattered rounded fine gravel; well graded; abundant root holes; dry; abdunant roots and rootlets (Topsoil)

2) **SILTY SANDSTONE (ROCK)**; brown (10YR 5/3) to light yellowish brown (2.5Y 6/3); heterogeneous; subrounded fine- to medium-grained sand; trace subrounded fine gravel; moderately graded; low hardness; moderate strength; moderate weathering; flaggy; moist; crotovina present; trace rootlets (Irvington Gravels Formation)

3) **SILTY SAND (SM)**; light gray (2.5Y 7/2) to white (2.5Y 8/1); heterogeneous; subrounded fine-grained sand and silt; abundant root holes; extensive caliche despoits throughout; dry; trace rootlets (Irvington Gravels Formation)

4) **SANDY SILTSTONE (ROCK)**; brown (10YR 5/3); homogeneous; fine-grained sand and silt; trace subrounded fine gravel; poorly graded; closely fractured; moderate hardness; moderate strength; moderate weathering; moist; trace rootlets (Irvington Gravels Formation)

5) **SANDSTONE (ROCK)**; light yellowish brown (2.5Y 6/4); homogeneous; subrounded fine-grained sand; scattered subangular medium-grained sand; well sorted; moderate hardness; moderate strength; moderate weathering; moist; trace rootlets (Irvington Gravels Formation)

BASE: Logged by E. Brown and C. Hundemer; C2EARTH, INC.; 15 October 2015

LOG OF EXPLORATION PIT 1

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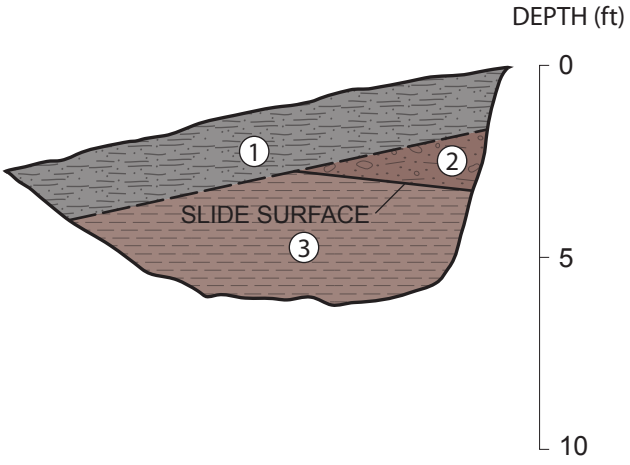
PIT 2

N46E



UNIT DESCRIPTIONS

1) **SILTY SAND (SM)**; black (2.5Y 2.5/1); heterogeneous; subrounded fine-grained sand and silt; scattered subangular coarse-grained sand and fine gravel; well graded; trace root holes; dry; abundant rootlets (Topsoil)

2) **SILTY SAND (SM)**; very dark grayish brown (2.5Y 3/2) to dark yellowish brown (10YR 3/4); heterogeneous; subangular fine- to coarse-grained sand; scattered subangular fine gravel; well graded; moist; scattered rootlets (Landslide Deposit)

3) **SANDY SILT (ML)**; very dark grayish brown (2.5Y 3/2); homogeneous; fine-grained sand and silt; trace subrounded medium-grained sand; poorly graded; scattered root holes; moist; trace rootlets (Colluvium)

BASE: Logged by E. Brown and C. Hundemer; C2EARTH, INC.; 15 October 2015

LOG OF EXPLORATION PIT 2

UPP GEOTECHNOLOGY
a division of C2EARTH, INC.

TIFFANY PARK ESTATE PROPERTY
East Warren Avenue
Fremont, California

DRAFTED/REVIEWED	SCALE	DOCUMENT ID.	DATE	
EB/CH	1" = 5'	14042C-02R1	January 2018	Figure 22

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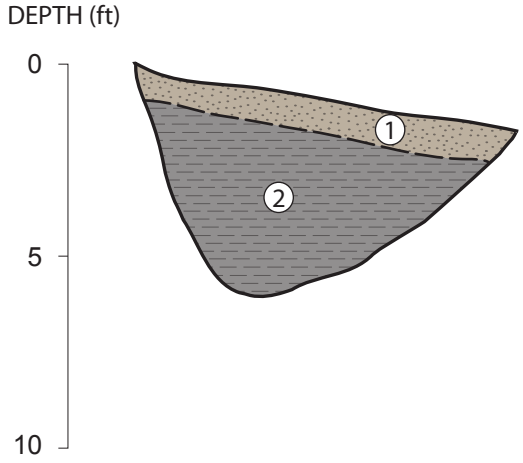
PIT 3

N54E



UNIT DESCRIPTIONS

1) **SILTY SAND (SM)**; dark grayish brown (2.5Y 4/2); heterogeneous; subrounded to angular fine-grained sand to coarse gravel; very well graded; abundant root holes; dry; abundant roots and rootlets (Topsoil)

2) **SILTY CLAY (CL/CH)**; very dark gray (10YR 3/1); homogenous; very stiff; moderate to high plasticity; moist; trace rootlets and rootholes (Colluvium)

BASE: Logged by E. Brown and C. Hundemer; C2EARTH, INC.; 15 October 2015

LOG OF EXPLORATION PIT 3

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TIFFANY PARK ESTATE PROPERTY
East Warren Avenue
Fremont, California

DRAFTED/REVIEWED	SCALE	DOCUMENT ID.	DATE	
EB/CH	1" = 5'	14042C-02R1	January 2018	Figure 23

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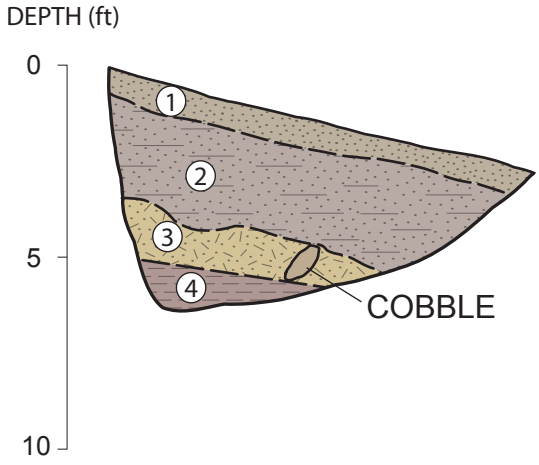
PIT 4

N06E



UNIT DESCRIPTIONS

1) **SILTY SAND (SM)**; very dark graish brown (2.5Y 3/2); heterogeneous; subangular to subrounded fine- to medium-grained sand with silt; moderately graded; trace root holes; dry; abundant rootlets (Landslide Deposit)

2) **SILTY SANDSTONE (ROCK)**; dark grayish brown (2.5Y 4/2); hetereogeneous; subrounded to angular fine-grained sand to fine-gravel with silt; well graded; intesnely fractured to crushed; low hardness; friable; moderately weathered; dry; scattered rootlets (Landslide Deposit)

3) **SILTY SANDSTONE (ROCK)**; olive brown (2.5Y 4/6); heterogeneous; subrounded to angular fine- to medium-grained sand with silt; trace subangular fine gravel; trace large well rounded cobbles; well graded; intensely fractured; low hardness; weak strength; moderately to deeply weathered; trace caliche nodules; dry (Landslide Deposit)

4) **CLAYSTONE (ROCK)**; dark grayish brown (2.5Y 4/2); homogeneous; clayey silt; very poorly graded; sheared; closely to intensely fractured; low hardness; weak strength; moderate weathering; moist (Irvington Gravels Formation)

BASE: Logged by E. Brown and C. Hundemer; C2EARTH, INC.; 15 October 2015

LOG OF EXPLORATION PIT 4

UPP GEOTECHNOLOGY
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TIFFANY PARK ESTATE PROPERTY
East Warren Avenue
Fremont, California

DRAFTED/REVIEWED	SCALE	DOCUMENT ID.	DATE	
EB/CH	1" = 5'	14042C-02R1	January 2018	Figure 24

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EQUIPMENT	Crawler-Mounted CME 55	RELATIVE ELEVATION	112 feet	LOGGED BY	T. Barrett
DEPTH TO GROUNDWATER	Not Encountered	DEPTH TO BEDROCK	16½ feet	DATE DRILLED	6/30/16

DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS	GRAPHICAL LOG	DEPTH (FEET)	BLOW COUNT OR CORE RECOVERY (%)	NOTES
SILTY CLAY; black (10YR 2/1); homogeneous; stiff; moderate plasticity; caliche; moist (Colluvium)		2	C1 86	
CLAY; very dark gray (10YR 3/1); homogeneous; scattered gravel; stiff; high plasticity; moist (Colluvium)		4, 6, 8, 10	C2 100	Water Content: 7%
SILTY CLAY; brown (10YR 4/3); homogeneous; trace oxidation staining; moderate to high plasticity; moist (Alluvium)		12, 14, 16	C3 100	Horizontal Fracture Horizontal Fracture
SILTSTONE; light olive brown (2.5Y 5/6); occasionally fractured; soft to low hardness; low strength; moderate weathering; massive to blocky; trace oxidized rootlets; moist (Irvington Gravels Formation)		18, 20	C4 100	Crushed Zone Vertical Fracture
		22, 24	C5 100	
		26		Vertical fractures with slickensides dipping 60˚ Crushed Zone
SANDSTONE; yellowish brown (10YR 5/6); fine-grained sand; poorly indurated; low hardness; friable; moderate weathering; caliche; moist (Irvington Gravels Formation)		28, 30	C6 100	Crushed Zone
SANDY CLAYSTONE; olive brown (2.5Y 4/4); fine-grained sand; low hardness; friable; high plasticity; moderate weathering; moist (Irvington Gravels Formation)		32, 34	C7 100	Horizontal Fracture
SANDSTONE (as described above) **SANDY CLAYSTONE (as described above)**		36, 38, 40	C8 100	

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LOG OF BORING 1

TIFFANY PARK ESTATE PROPERTY
Fremont, California

PROJECT NO.	DATE	
14042C-02R1	January 2018	Figure 25

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EQUIPMENT	Crawler-Mounted CME 55	RELATIVE ELEVATION	112 feet	LOGGED BY	T. Barrett
DEPTH TO GROUNDWATER	Not Encountered	DEPTH TO BEDROCK	16½ feet	DATE DRILLED	6/30/16

DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS	GRAPHICAL LOG	DEPTH (FEET)	BLOW COUNT OR CORE RECOVERY (%)	NOTES
SANDSTONE; yellowish brown (10YR 5/6); fine-grained sand; poorly indurated; low hardness; friable; moderate weathering; caliche; moist (Irvington Gravels Formation)		42	C9 100	Crushed Zone
SANDY CLAYSTONE; olive brown (2.5Y 4/4); fine-grained sand; low hardness; friable; moderate weathering; moist (Irvington Gravels Formation)		44		Crushed Zone Fractured at 45 Degrees
		46		
		48	C10 100	
		50		
		52	C11 100	
		54		
		56		
		58	C12 100	
		60		Horizontal Fracture
		62	C13 100	
		64		
		66		
		68	C14 100	
		70		
CLAYSTONE; olive brown (2.5Y 4/6); low hardness; friable; moderate weathering; moist (Irvington Gravels Formation)		72	C15 100	
		74		
		76		Horizontal Fracture
		78	C16 100	
Bottom of Boring = 80 feet		80		

LOG OF BORING 1 (continued)

TIFFANY PARK ESTATE PROPERTY
Fremont, California

UPP GEOTECHNOLOGY
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PROJECT NO.	DATE	
14042C-02R1	January 2018	Figure 26

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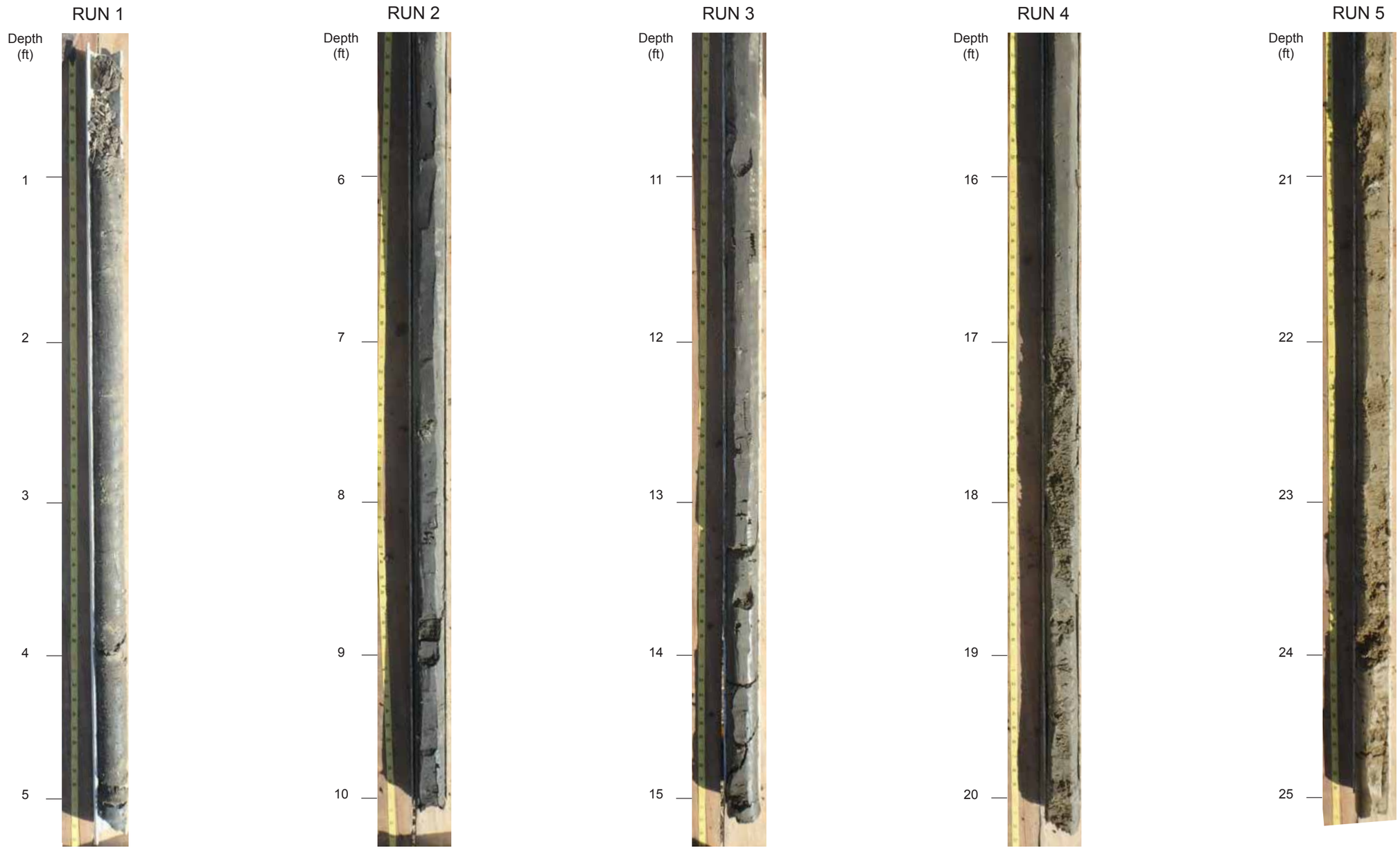

CORE PHOTOGRAPHS OF BORING 1 - RUNS 1-5

UPP GEOTECHNOLOGY a division of C2EARTH, INC.		TIFFANY PARK ESTATE PROPERTY East Warren Avenue Fremont, California		
DRAFTED/REVIEWED	SCALE	DOCUMENT ID.	DATE	
RW/CH	As Shown	14042C-02R1	January 2018	Figure 27

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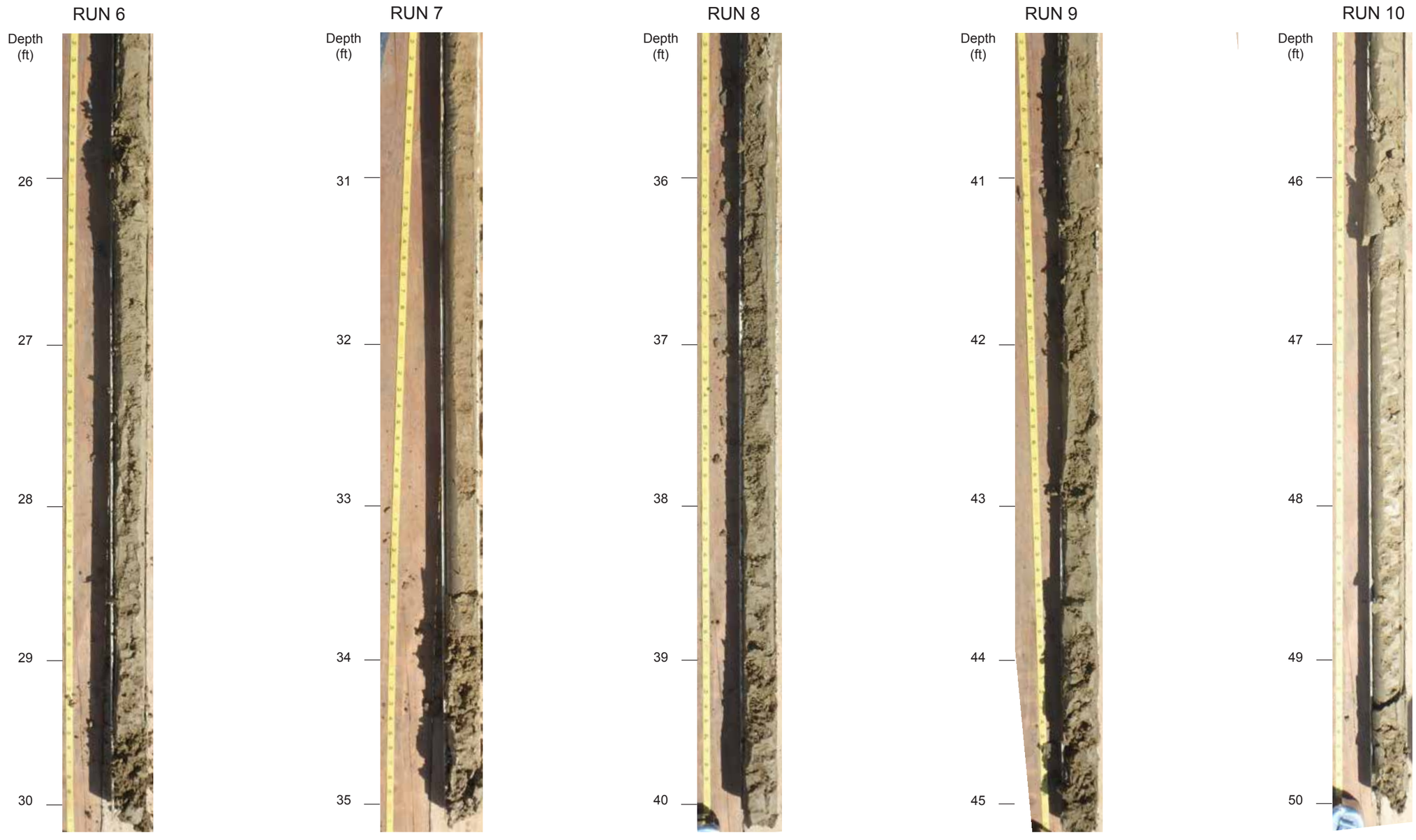

CORE PHOTOGRAPHS OF BORING 1 - RUNS 6-10

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TIFFANY PARK ESTATE PROPERTY
East Warren Avenue
Fremont, California

DRAFTED/REVIEWED	SCALE	DOCUMENT ID.	DATE	
RW/CH	As Shown	14042C-02R1	January 2018	Figure 28

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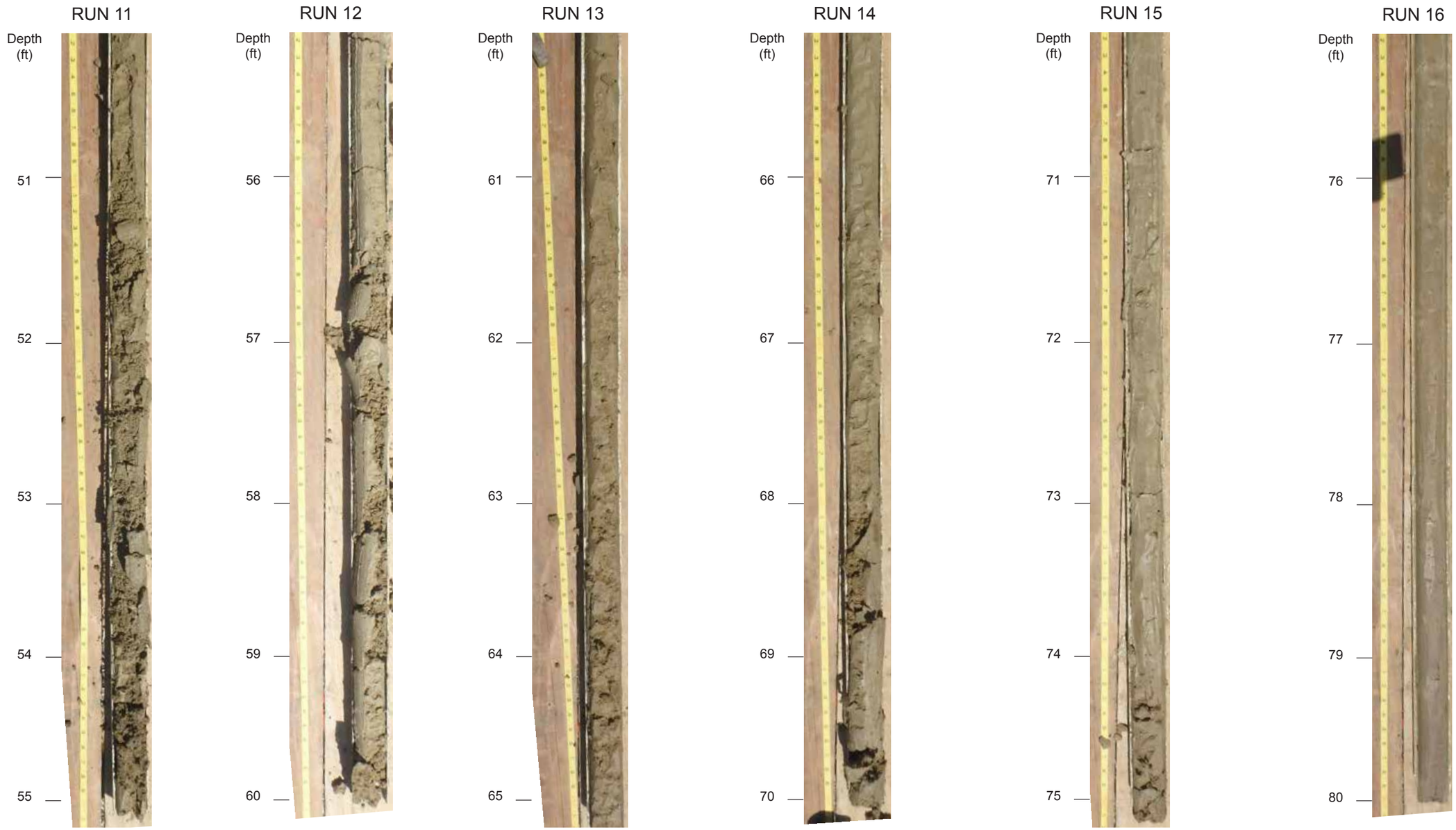

CORE PHOTOGRAPHS OF BORING 1 - RUNS 11-16

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TIFFANY PARK ESTATE PROPERTY
East Warren Avenue
Fremont, California

DRAFTED/REVIEWED	SCALE	DOCUMENT ID.	DATE	
RW/CH	As Shown	14042C-02R1	January 2018	Figure 29

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EQUIPMENT	Crawler-Mounted CME 55	RELATIVE ELEVATION	145 feet	LOGGED BY	T. Barrett
DEPTH TO GROUNDWATER	Not Encountered	DEPTH TO BEDROCK	2 feet	DATE DRILLED	7-1-16

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLE	PENETRATION RESISTANCE (BLOWS / FT.)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
SILTY CLAY; black (10YR 2/1); homogenous; moderate plasticity; moist (Colluvium)	Stiff	CL/CH	1					
CLAYSTONE; olive brown (2.5Y 4/6) and light olive brown (2.5YR 5/6); very little fracturing; soft; low strength; high plasticity; deep weathering; abundant oxidation staining and oxidized organics; moist (Irvington Gravels Formation)		(ROCK)	2					
			3					
			4		10			
			5					
			6					
			7					
			8					
			9					
			10		7	39	81	
			11					
			12					
			13					
			14					
			15		11	39	82	
			16					
			17					
			18					
			19					
Bottom of Boring = 20 feet			20		14			

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LOG OF BORING 2

TIFFANY PARK ESTATE PROPERTY
Fremont, California

DOCUMENT ID.	DATE	FIGURE NO.
14042C-02R1	January 2018	30

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EQUIPMENT	Crawler-Mounted CME 55	RELATIVE ELEVATION	129 feet	LOGGED BY	T. Barrett
DEPTH TO GROUNDWATER	Not Encountered	DEPTH TO BEDROCK	6 feet	DATE DRILLED	7-1-16

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLE	PENETRATION RESISTANCE (BLOWS / FT.)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
SILTY CLAY; black (10YR 2/1); homogeneous; moderate plasticity; moist (Colluvium)	Stiff	CL/CH	1, 2, 3		9	21	98	
CLAY; dark yellowish brown (10YR 4/5); homogenous; moderate to high plasticity; caliche; moist (Alluvium)	Stiff	CL	4, 5		15	25	96	
CLAYSTONE; olive brown (2.5Y 4/6); moderate to high plasticity; very little fracturing; soft; low strength; moist (Irvington Gravels Formation)		(ROCK)	6, 7, 8, 9, 10, 11, 12, 13, 14, 15		14	22	101	
					12			
Bottom of Boring = 15 feet			16, 17, 18, 19, 20					

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LOG OF BORING 3

TIFFANY PARK ESTATE PROPERTY
Fremont, California

DOCUMENT ID.	DATE	FIGURE NO.
14042C-02R1	January 2018	31

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EQUIPMENT	Crawler-Mounted CME 55	RELATIVE ELEVATION	136 feet	LOGGED BY	T. Barrett
DEPTH TO GROUNDWATER	Not Encountered	DEPTH TO BEDROCK	4 feet	DATE DRILLED	7-1-16

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLE	PENETRATION RESISTANCE (BLOWS / FT.)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
SILTY CLAY; black (10YR 2/1); homogenous; moderate plasticity; slightly mottled; moist (Colluvium)	Stiff	CL/CH	1, 2, 3		14			
CLAYSTONE; black (2.5Y 2.5/1) to olive (5Y 5/6); heterogeneous; moderate plasticity; slightly mottled; moist; trace rootlets (Irvington Gravels Formation)		(ROCK)	5, 6		16	23	101	
			9, 10		12			
			14, 15		10	39	83	
Bottom of Boring = 15 feet			16, 17, 18, 19, 20					

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LOG OF BORING 4

TIFFANY PARK ESTATE PROPERTY
Fremont, California

DOCUMENT ID.	DATE	FIGURE NO.
14042C-02R1	January 2018	32

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EQUIPMENT	Crawler-Mounted CME 55	RELATIVE ELEVATION	135 feet	LOGGED BY	T. Barrett
DEPTH TO GROUNDWATER	Not Encountered	DEPTH TO BEDROCK	18 feet	DATE DRILLED	7-1-16

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLE	PENETRATION RESISTANCE (BLOWS / FT.)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
CLAY; very dark gray (10YR 3/1); homogeneous; trace subangular coarse sand; moderate to high plasticity; moist; trace carbonized organics; trace rootlets in upper five feet (Colluvium)	Very Stiff to Hard	CL/CH	1					
			2					
			3					
			4					
			5		17			
			6					
			7					
			8					
			9					
			10		19	19	101	
			11					
			12					
			13					
			14					
			15		35			
			16					
			17					
			18					
CLAYSTONE; olive brown (2.5Y 4/4); low hardness; weak; slight weathering; trace subrounded medium-grained sand; trace carbonized rootlets (Irvington Gravels Formation)		(ROCK)	19					
			20		29	18	109	

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LOG OF BORING 5

TIFFANY PARK ESTATE PROPERTY
Fremont, California

DOCUMENT ID.	DATE	FIGURE NO.
14042C-02R1	January 2018	33

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EQUIPMENT Crawler-Mounted CME 55	RELATIVE ELEVATION 135 feet	LOGGED BY T. Barrett
DEPTH TO GROUNDWATER Not Encountered	DEPTH TO BEDROCK 18 feet	DATE DRILLED 7-1-16

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLE	PENETRATION RESISTANCE (BLOWS / FT.)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
CLAYSTONE (continued from above)		(ROCK)	- 21 - 22 - 23 - 24 - 25		27	20	109	
Bottom of Boring = 25 feet			- 26 - 27 - 28 - 29 - 30 - 31 - 32 - 33 - 34 - 35 - 36 - 37 - 38 - 39 - 40 -					

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LOG OF BORING 5 (CONTINUED)

TIFFANY PARK ESTATE PROPERTY
Fremont, California

DOCUMENT ID.	DATE	FIGURE NO.
14042C-02R1	January 2018	34

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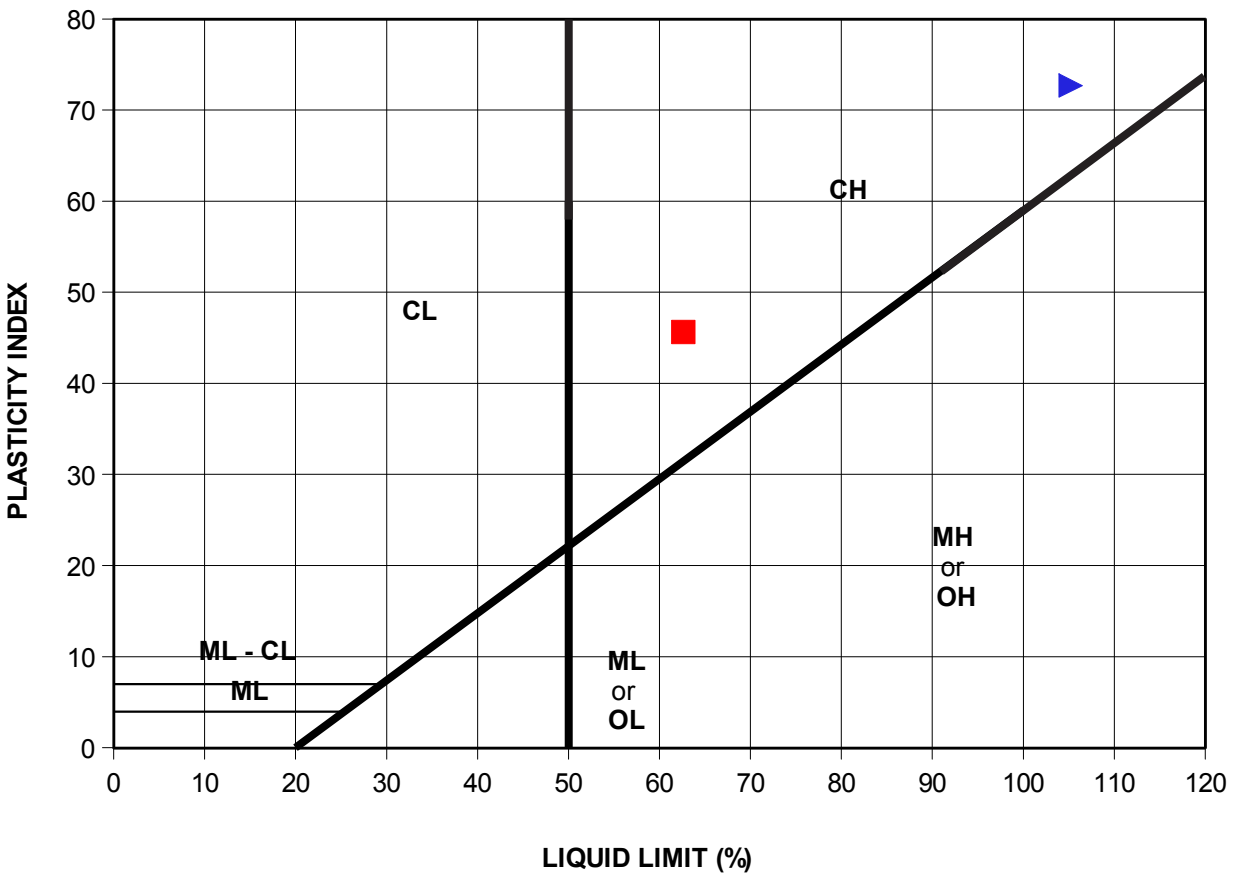

KEY	SAMPLE NUMBER	SAMPLE DEPTH (ft)	WATER CONTENT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX	PLASTIC LIMIT (%)	PASSING No. 200 SIEVE (%)	LIQUIDITY INDEX	UNIFIED SOIL CLASSIFICATION SYMBOL
■	B1	7	7	63	46	17	80	- 0.2	CH
▶	B2-2	10	39	105	73	32	97	0.1	CH

PLASTICITY CHART

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TIFFANY PARK ESTATE PROPERTY
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DRAFTED/REVIEWED	SCALE	DOCUMENT ID.	DATE	
LR/CH	Not Applicable	14042C-02R1	January 2018	Figure 35

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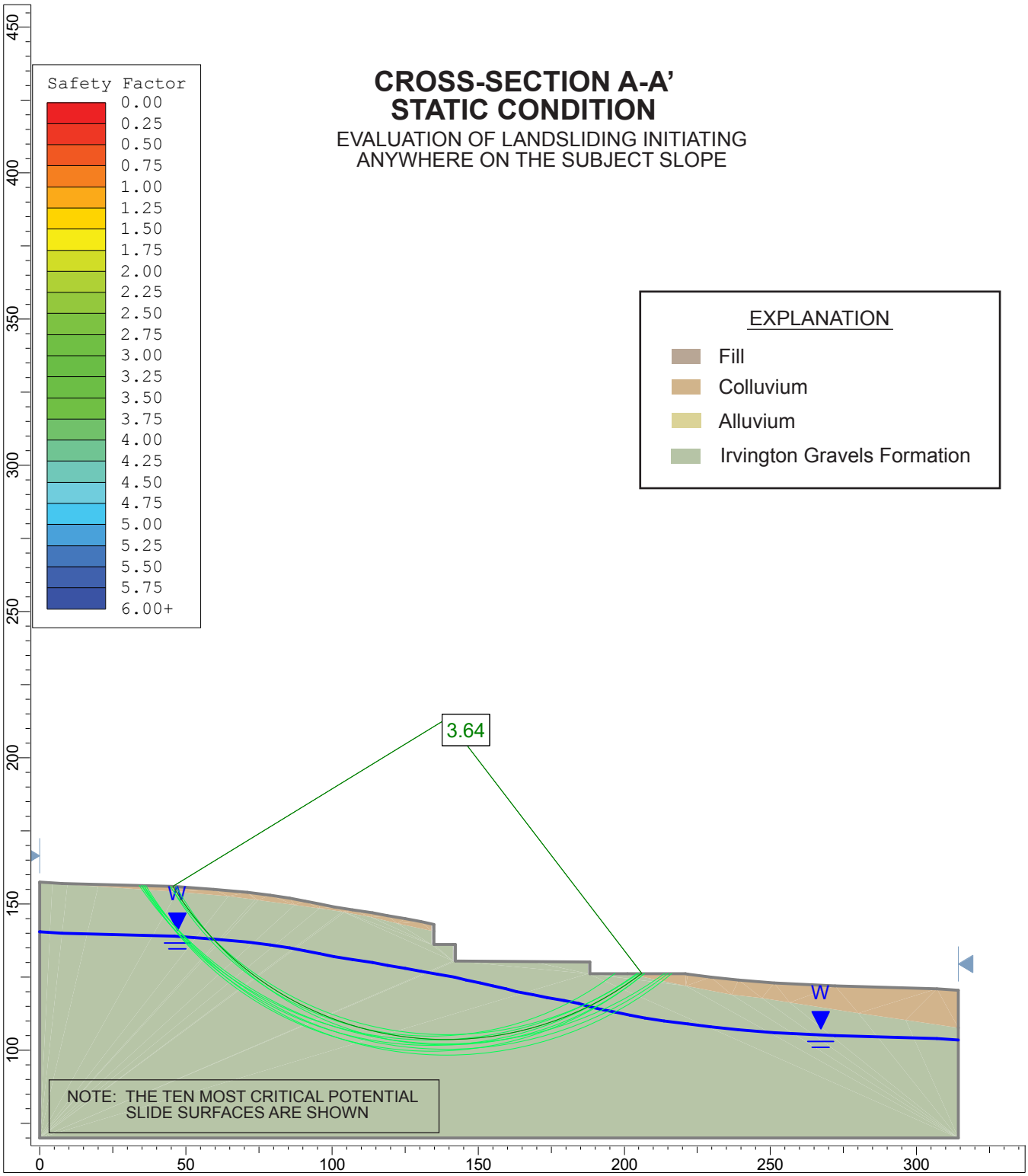

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SLOPE STABILITY ANALYSIS NO. 1

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TIFFANY PARK ESTATE PROPERTY
East Warren Avenue
Fremont, California

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LR/CH	As Shown	14042C-02R1	January 2018	Figure 36

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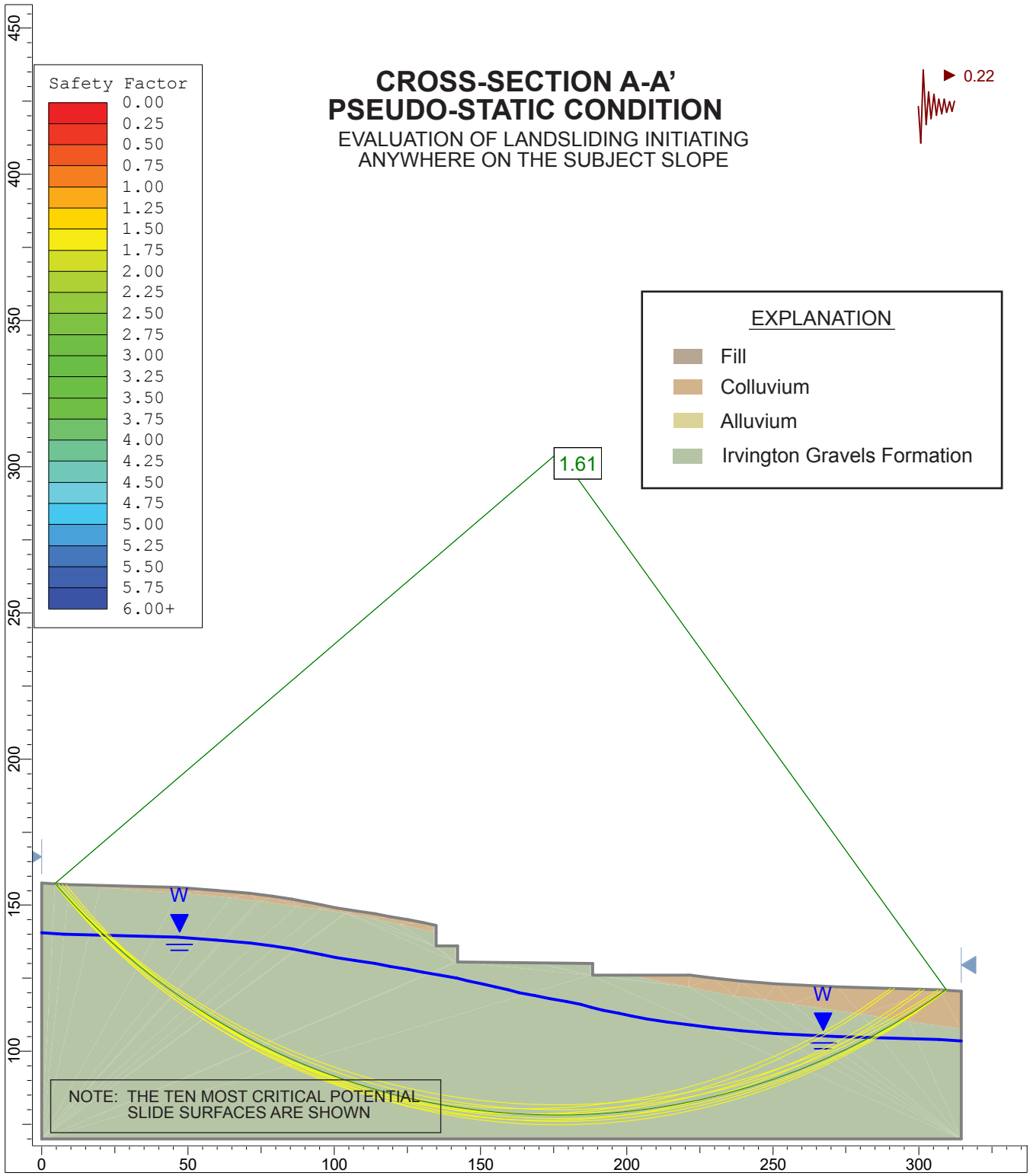

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SLOPE STABILITY ANALYSIS NO. 2

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TIFFANY PARK ESTATE PROPERTY
East Warren Avenue
Fremont, California

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LR/CH	As Shown	14042C-02R1	January 2018	Figure 37

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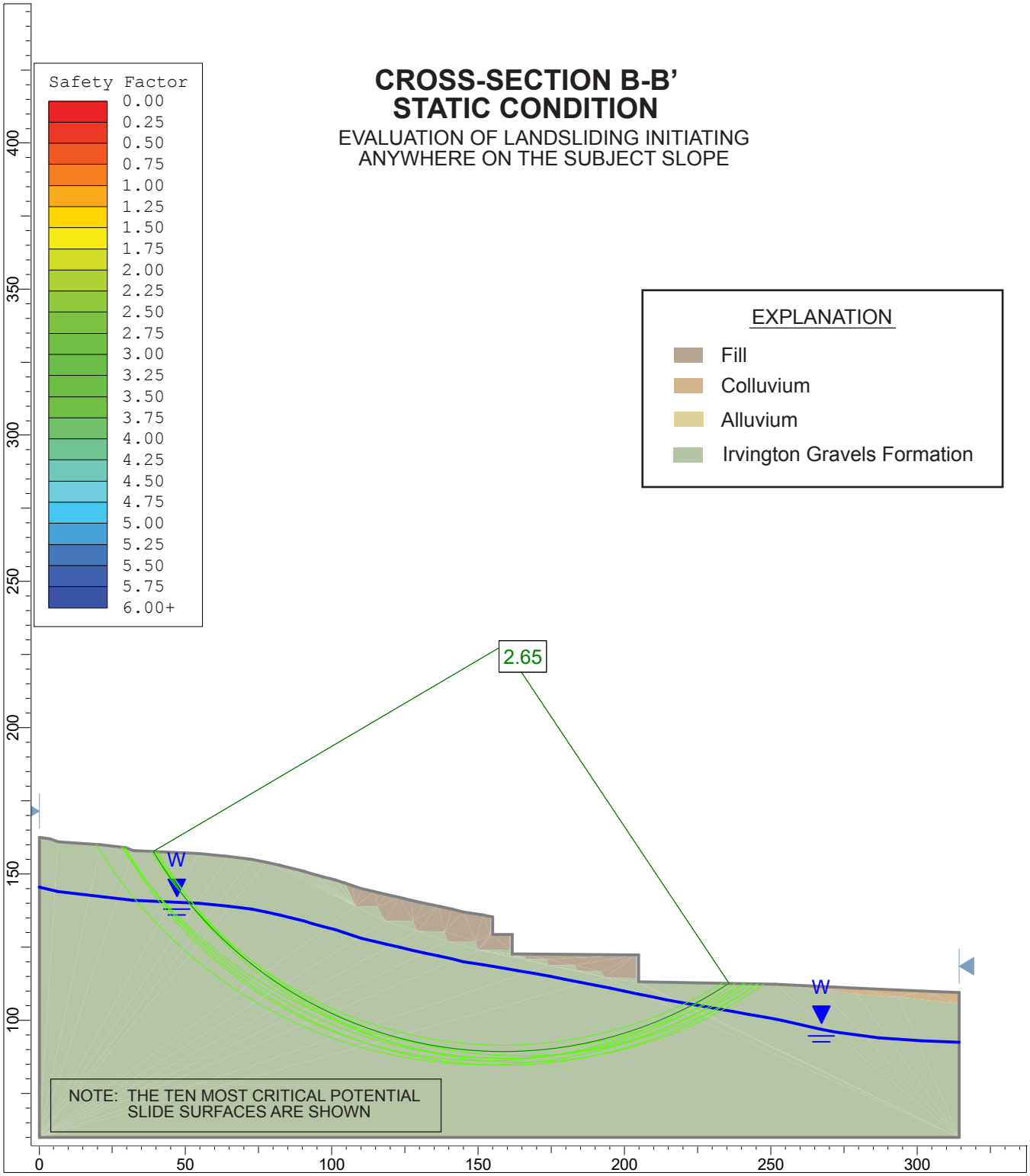

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SLOPE STABILITY ANALYSIS NO. 3

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TIFFANY PARK ESTATE PROPERTY
East Warren Avenue
Fremont, California

DRAFTED/REVIEWED	SCALE	DOCUMENT ID.	DATE	
LR/CH	As Shown	14042C-02R1	January 2018	Figure 38

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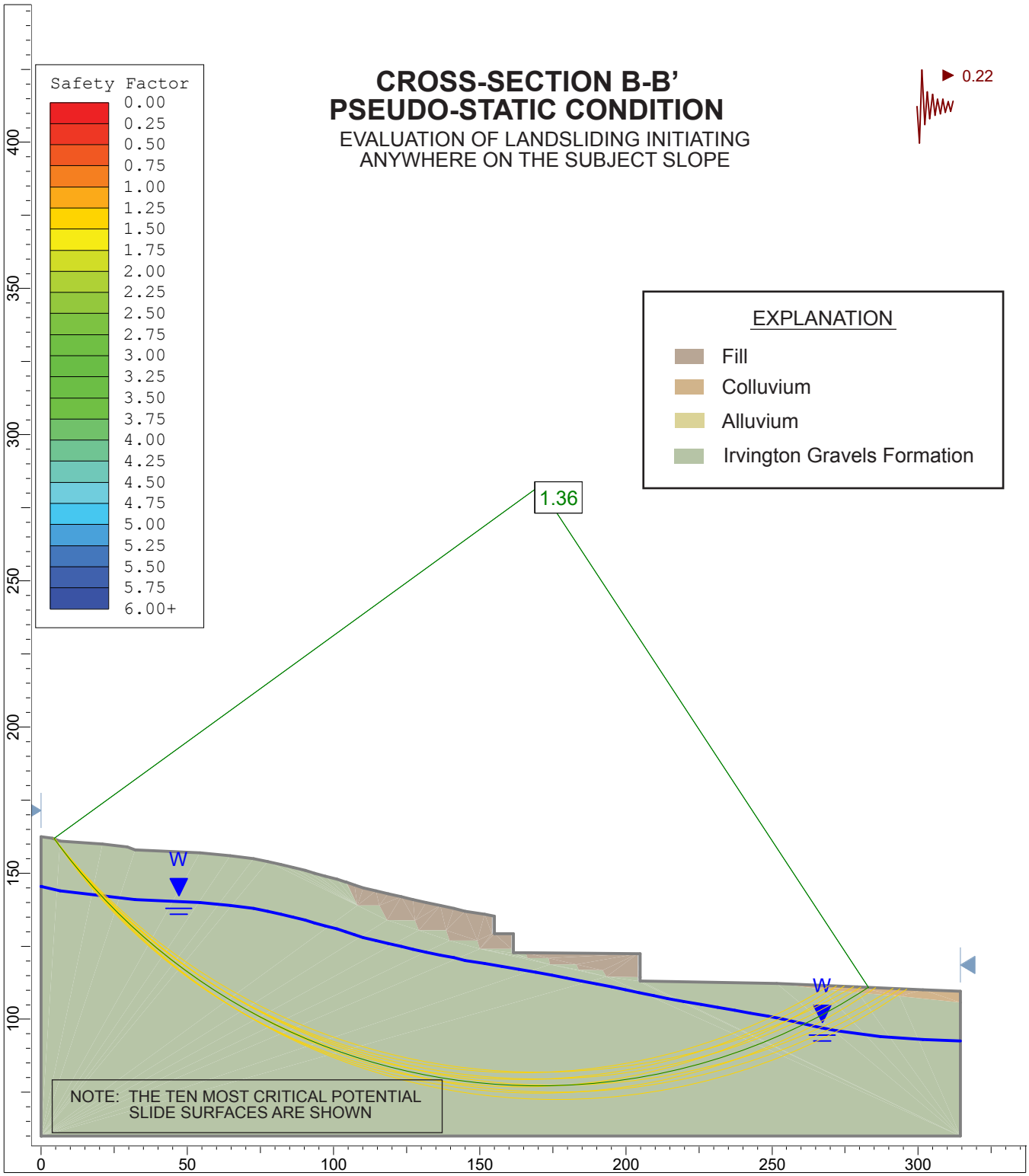

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SLOPE STABILITY ANALYSIS NO. 4

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TIFFANY PARK ESTATE PROPERTY
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DRAFTED/REVIEWED	SCALE	DOCUMENT ID.	DATE	
LR/CH	As Shown	14042C-02R1	January 2018	Figure 39

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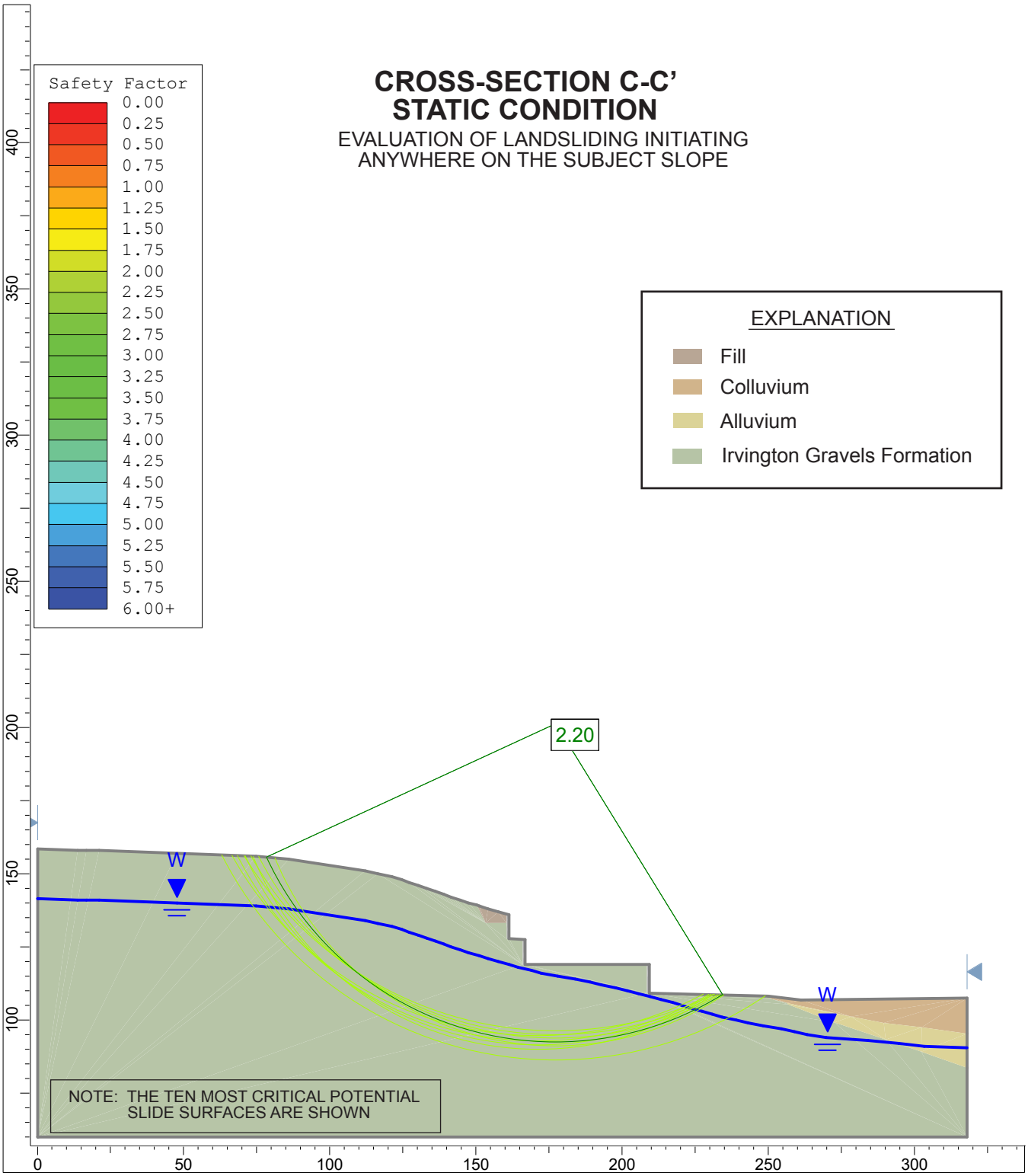

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SLOPE STABILITY ANALYSIS NO. 5

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TIFFANY PARK ESTATE PROPERTY
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LR/CH	As Shown	14042C-02R1	January 2018	Figure 40

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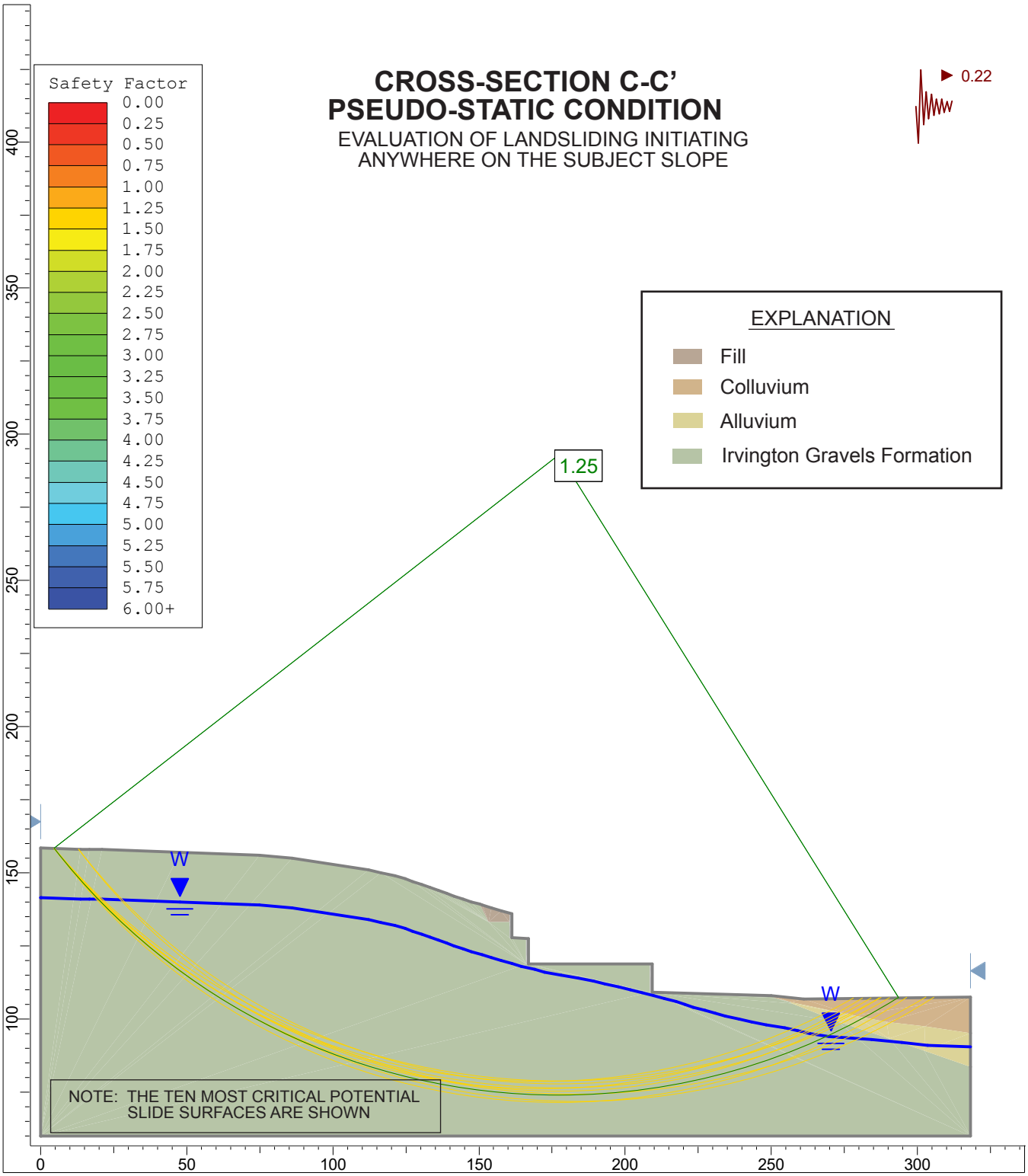

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SLOPE STABILITY ANALYSIS NO. 6

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LR/CH	As Shown	14042C-02R1	January 2018	Figure 41

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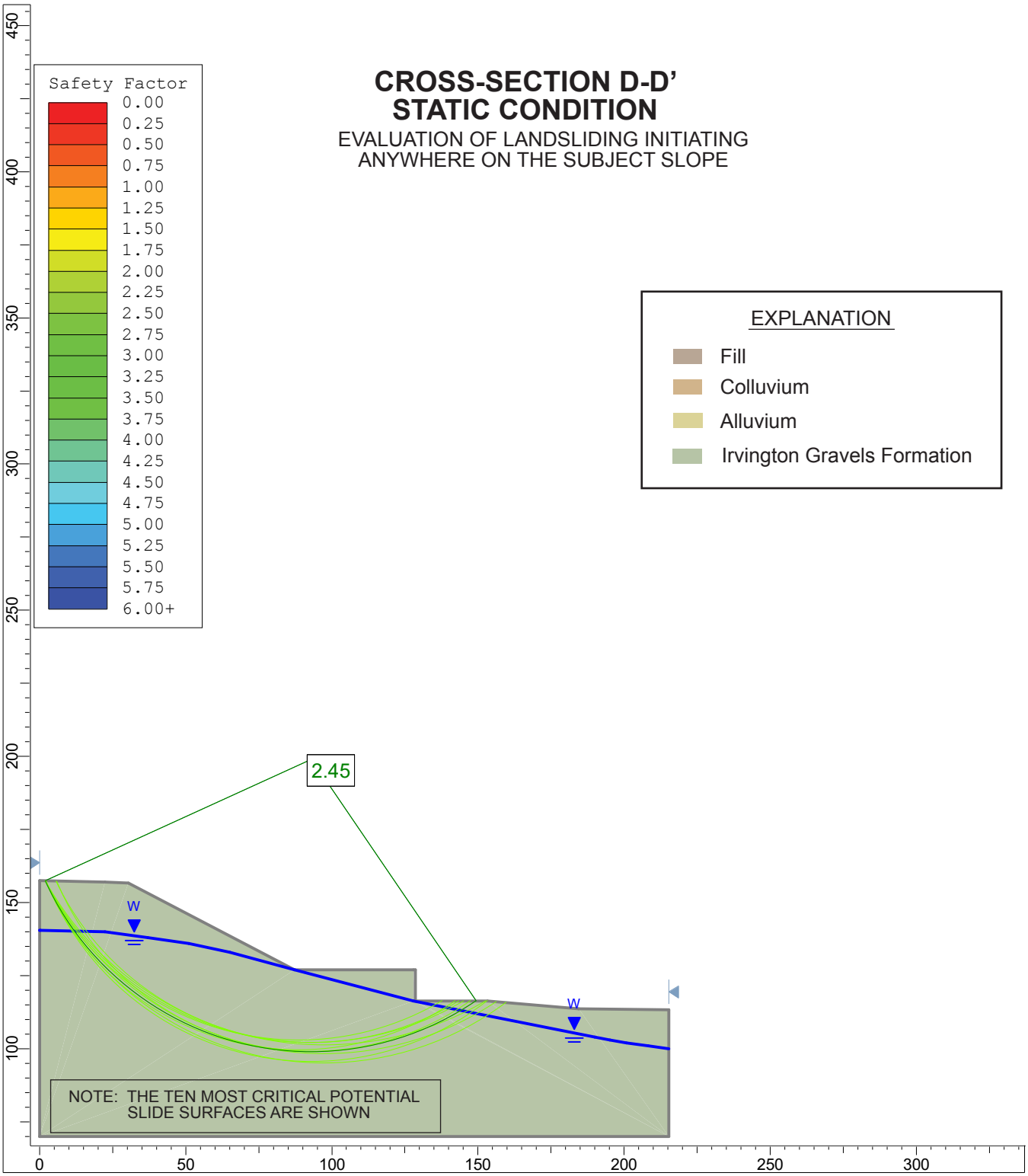

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SLOPE STABILITY ANALYSIS NO. 7

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DRAFTED/REVIEWED	SCALE	DOCUMENT ID.	DATE	
LR/CH	As Shown	14042C-02R1	January 2018	Figure 42

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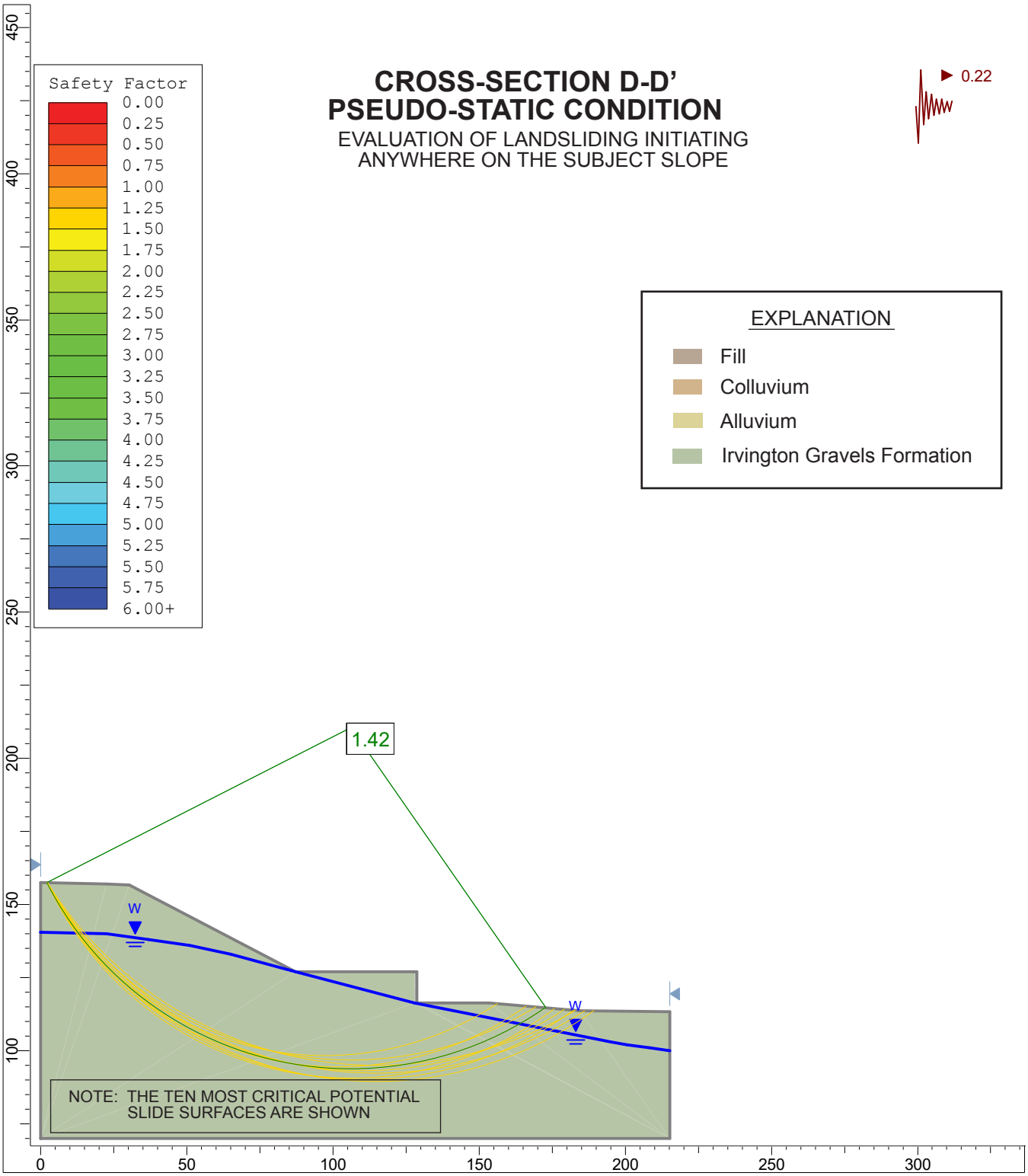

BASE: Slide 5.0; ROCSCIENCE INC.; Version 5.041; Build 7-8-2009

SLOPE STABILITY ANALYSIS NO. 8

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TIFFANY PARK ESTATE PROPERTY
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LR/CH	As Shown	14042C-02R1	January 2018	Figure 43

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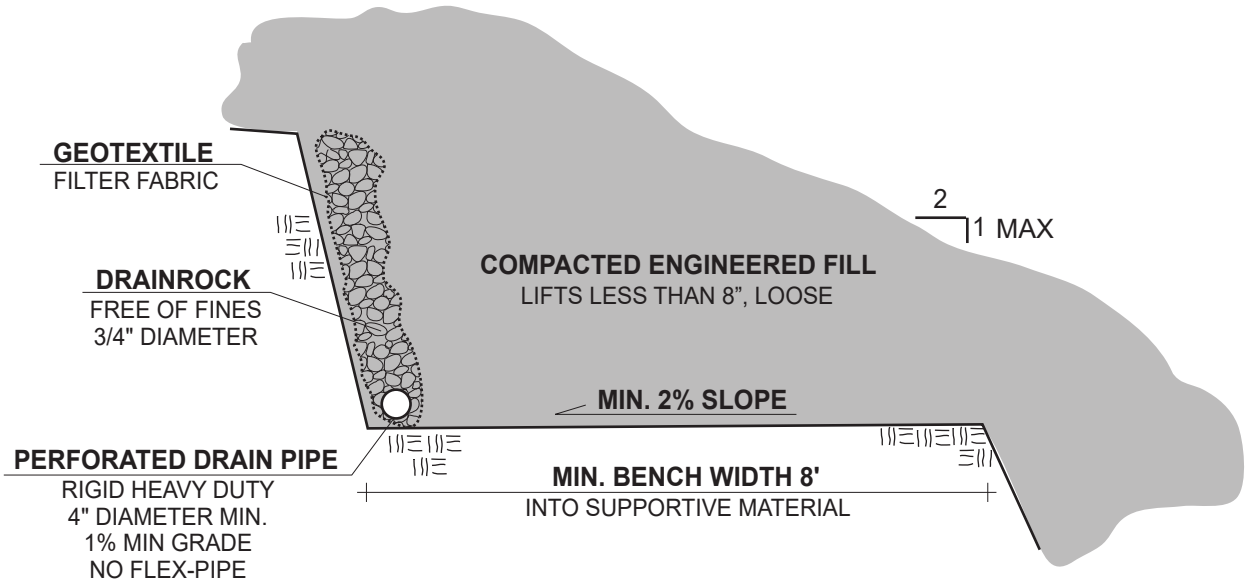
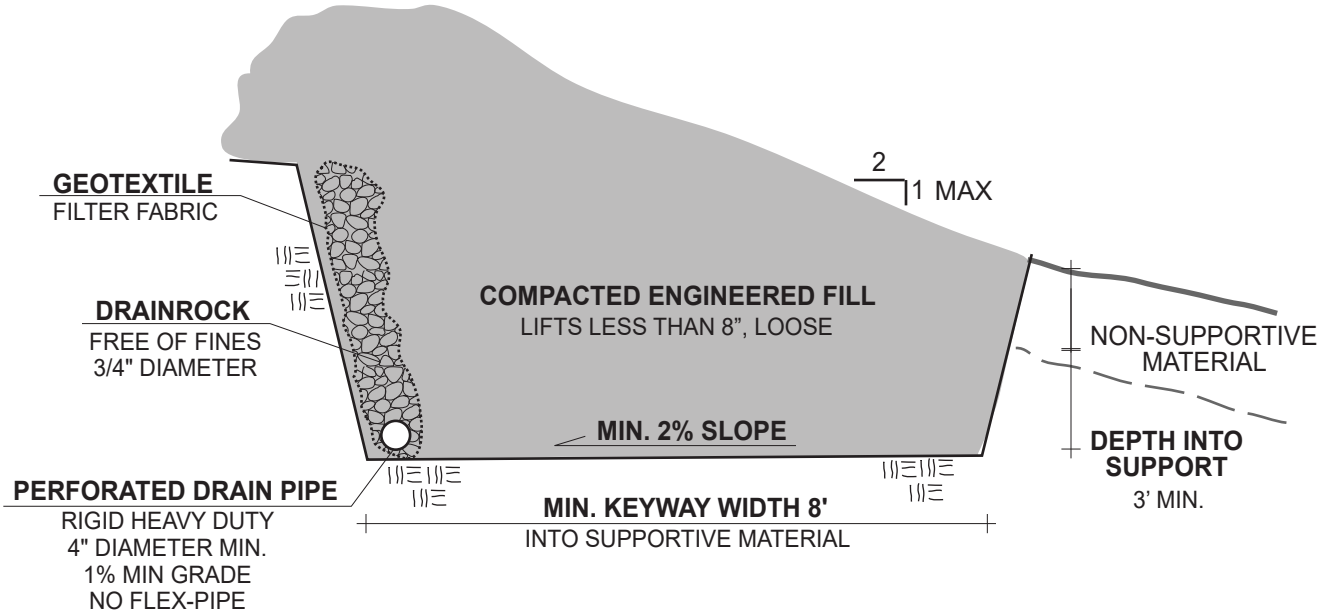
BENCH DIAGRAM



KEYWAY DIAGRAM



CONCEPTUAL ENGINEERED FILL AND SUBDRAIN DIAGRAM

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TIFFANY PARK ESTATE PROPERTY
East Warren Avenue
Fremont, California

DRAFTED/REVIEWED	SCALE	DOCUMENT ID.	DATE	
JB/CH	Not Applicable	14042C-02R1	January 2018	Figure 44

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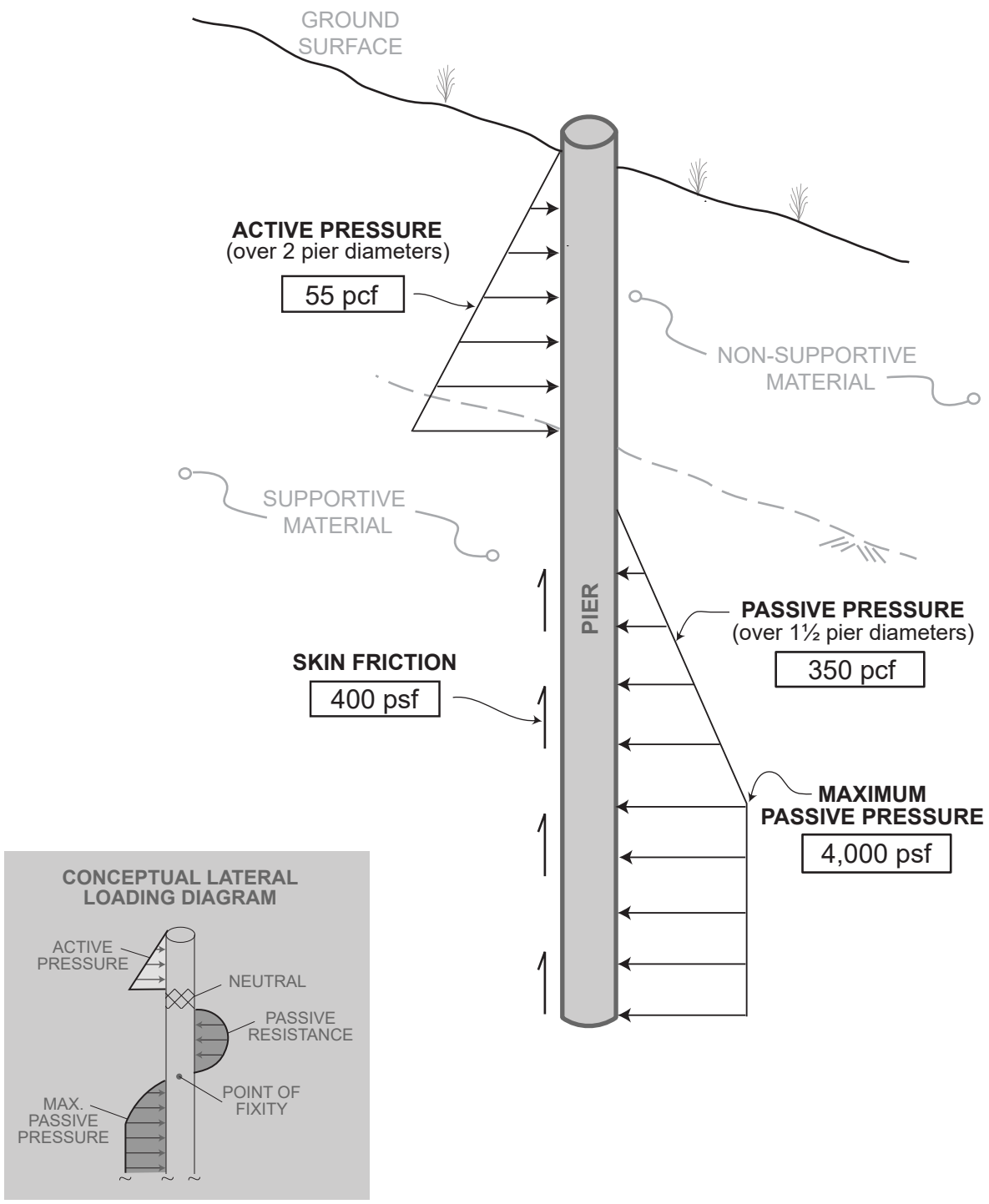

CONCEPTUAL PIER PRESSURE DIAGRAM

UPP GEOTECHNOLOGY a division of C2EARTH, INC.		TIFFANY PARK ESTATE PROPERTY East Warren Avenue Fremont, California		
DRAFTED/REVIEWED	SCALE	DOCUMENT ID.	DATE	
JB/CH	Not Applicable	14042C-02R1	January 2018	Figure 45

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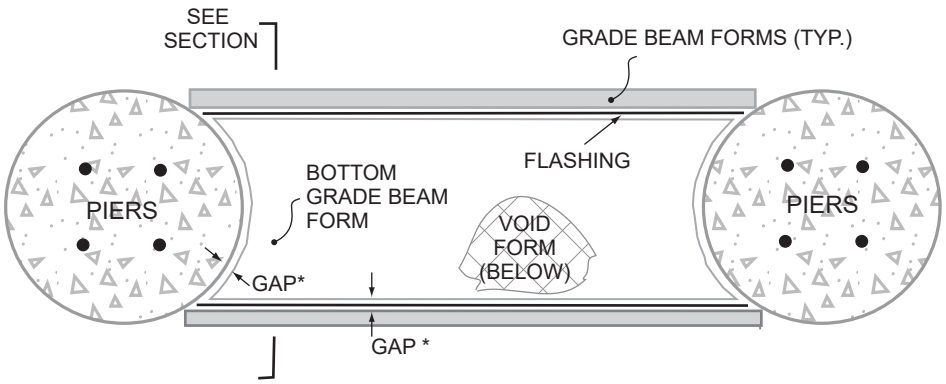
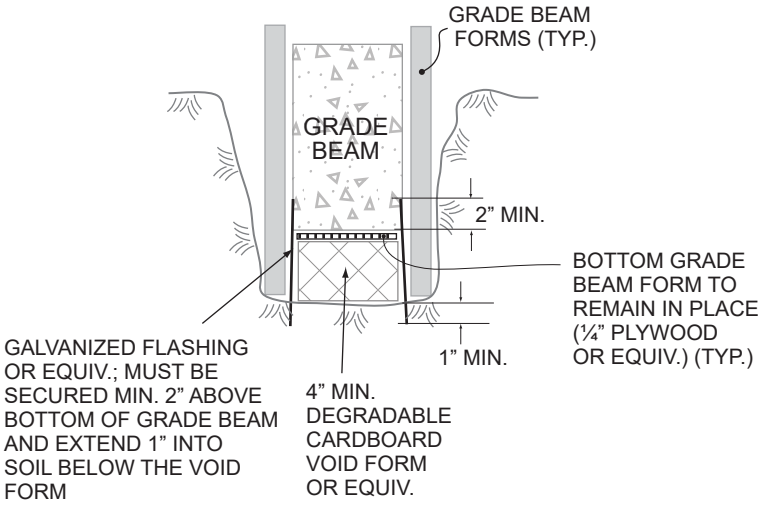
PLAN VIEW:



* GAPS MUST NOT EXCEED ½ INCH

SECTION VIEW:

GRADE BEAM DETAIL



NOTE:

THE PURPOSE OF VOID FORMS IS TO MINIMIZE THE POTENTIAL OF EXPANSIVE SOIL COMING INTO CONTACT WITH THE BOTTOM OF THE FOUNDATION ELEMENTS AND EXERTING AN UPLIFT PRESSURE.

A 4" VOID MUST BE CREATED BELOW ALL GRADE BEAMS WHERE EXPANSIVE SOIL IS ENCOUNTERED.

CONCEPTUAL GRADE BEAM VOID FORM DIAGRAM

UPP GEOTECHNOLOGY
a division of C2EARTH, INC.

TIFFANY PARK ESTATE PROPERTY
East Warren Avenue
Fremont, California

DRAFTED/REVIEWED	SCALE	DOCUMENT ID.	DATE	
JB/CH	Not Applicable	14042C-02R1	January 2018	Figure 46

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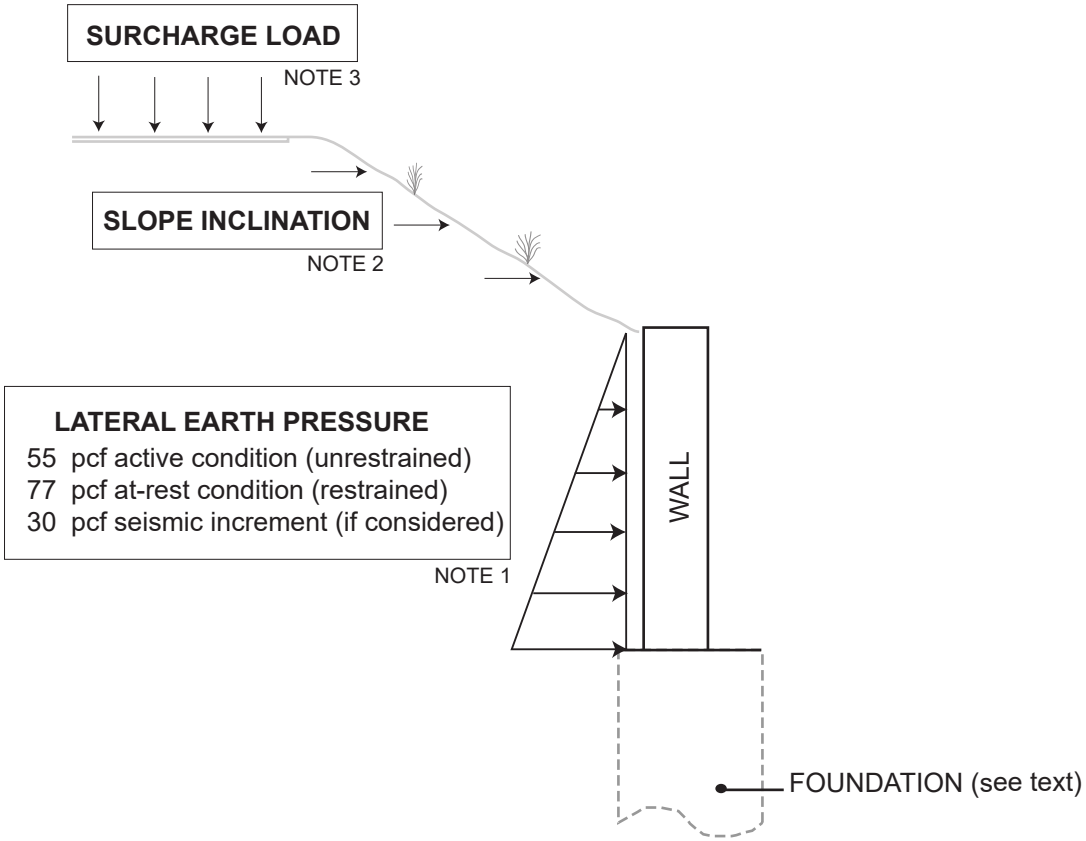

Note 1: Lateral earth pressures are shown for drained retaining walls. Contact us to provide additional recommendations if undrained walls are planned.

Note 2: Add an additional equivalent fluid pressure increment to the active and at-rest condition for sloping backfill above the wall:

+5 pcf for slope inclinations up to 4:1 (horizontal to vertical)
+8 pcf for slope inclinations between 3:1 and 4:1
+12 pcf for slope inclinations between 2:1 and 3:1

Note 3: Additional lateral load equal to 1/3 (unrestrained) or 1/2 (restrained) the anticipated surcharge load.

CONCEPTUAL RETAINING WALL PRESSURE DIAGRAM

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TIFFANY PARK ESTATE PROPERTY
East Warren Avenue
Fremont, California

DRAFTED/REVIEWED	SCALE	DOCUMENT ID.	DATE	
JB/CH	Not Applicable	14042C-02R1	January 2018	Figure 47

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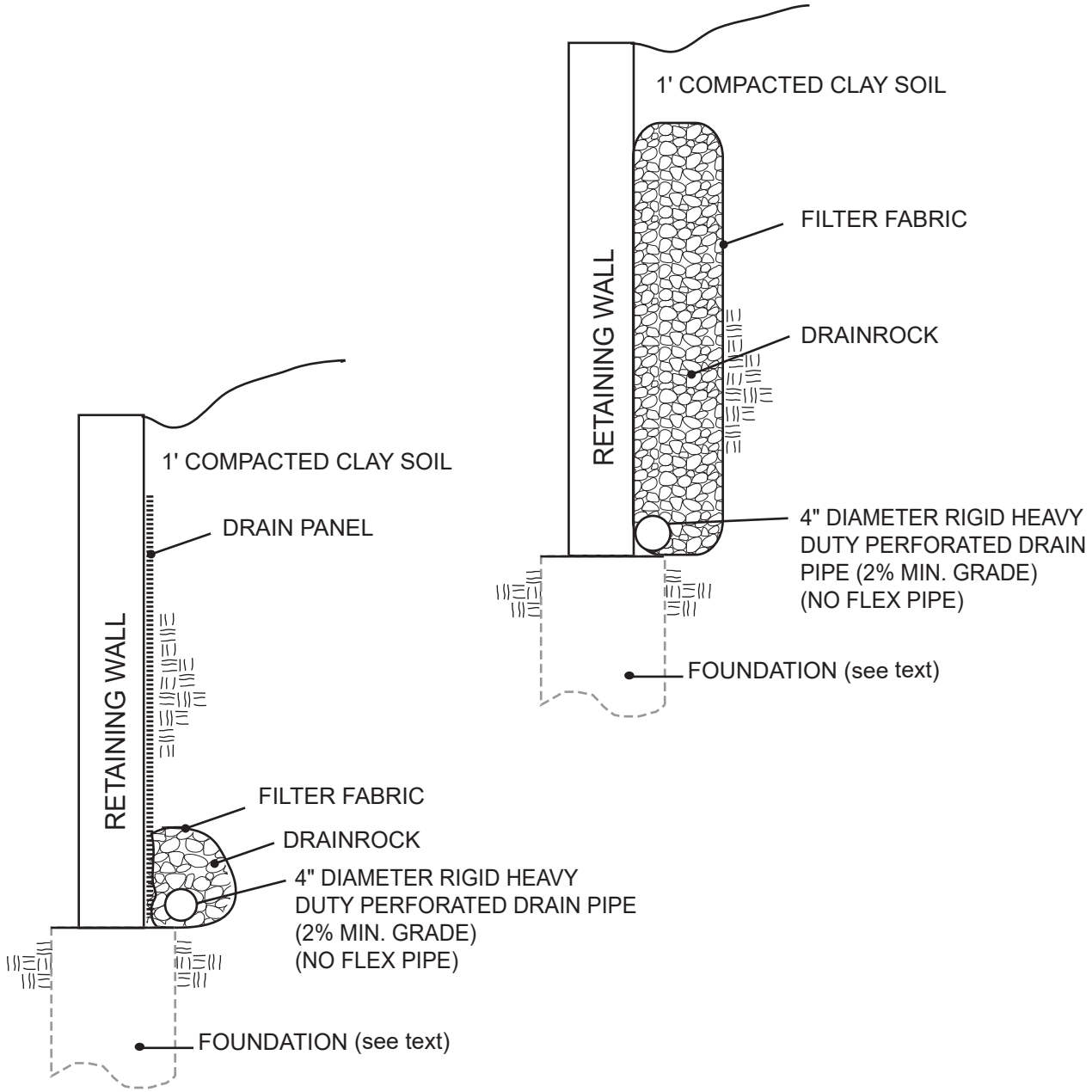

CONCEPTUAL RETAINING WALL BACKDRAIN DIAGRAM

UPP GEOTECHNOLOGY
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TIFFANY PARK ESTATE PROPERTY
East Warren Avenue
Fremont, California

DRAFTED/REVIEWED	SCALE	DOCUMENT ID.	DATE	
JB/CH	Not Applicable	14042C-02R1	January 2018	Figure 48

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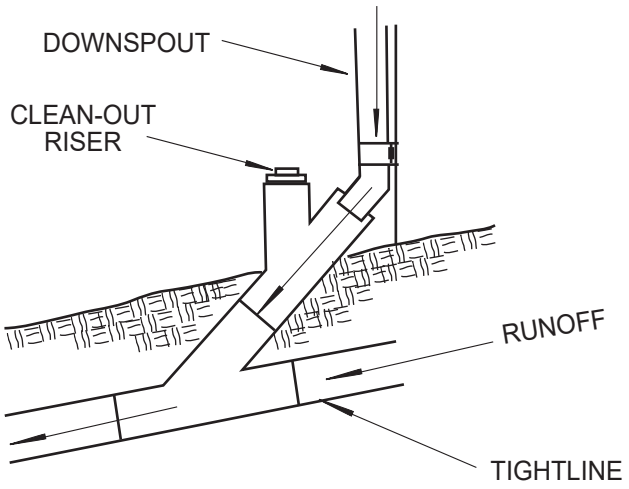

CONCEPTUAL DOWNSPOUT CLEAN-OUT DIAGRAM

UPP GEOTECHNOLOGY
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TIFFANY PARK ESTATE PROPERTY
East Warren Avenue
Fremont, California

DRAFTED/REVIEWED	SCALE	DOCUMENT ID.	DATE	
JB/CH	Not Applicable	14042C-02R1	January 2018	Figure 49

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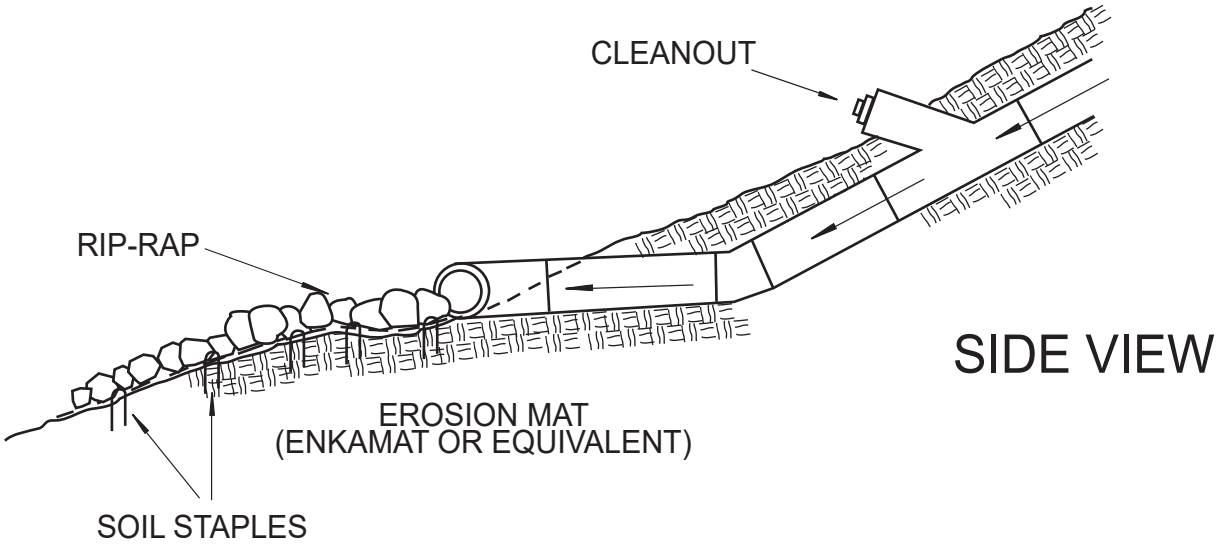

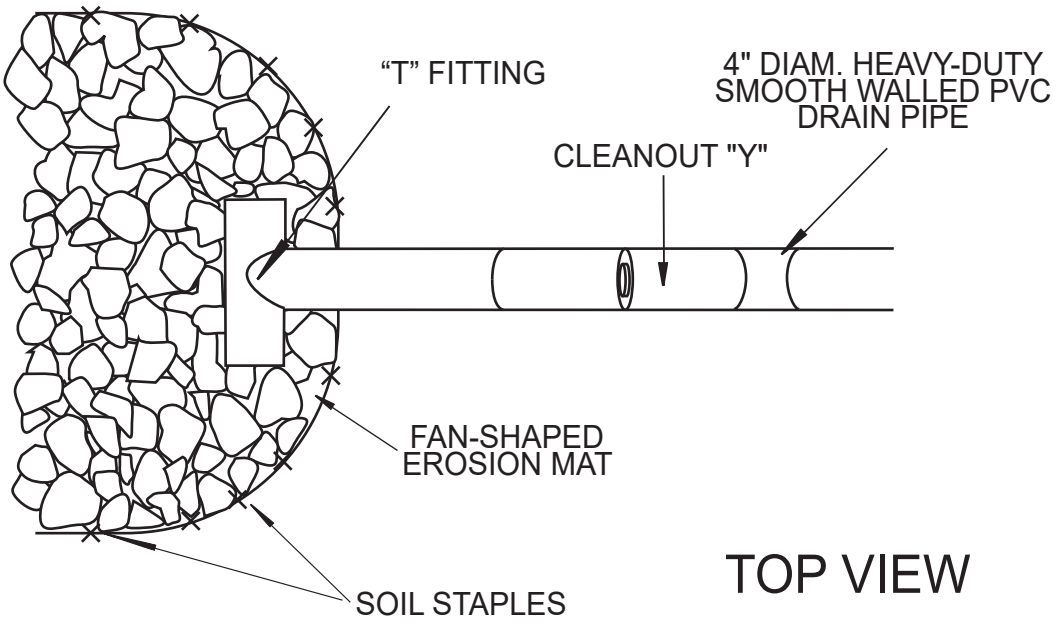

CONCEPTUAL ENERGY DISSIPATER DIAGRAM

UPP GEOTECHNOLOGY
a division of C2EARTH, INC.

TIFFANY PARK ESTATE PROPERTY
East Warren Avenue
Fremont, California

DRAFTED/REVIEWED	SCALE	DOCUMENT ID.	DATE	
JB/CH	Not Applicable	14042C-02R1	January 2018	Figure 50

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TABLE I

MODIFIED MERCALLI SCALE OF EARTHQUAKE INTENSITIES

I. Not felt by people, except under especially favorable circumstances.

II. Felt only by persons at rest on the upper floors of buildings. Some suspended objects may swing.

III. Felt by some people who are indoors, but it may not be recognized as an earthquake. The vibration is similar to that caused by the passing of light trucks. Hanging objects swing.

IV. Felt by many people who are indoors, by a few outdoors. At night some people are awakenad. Dishes, windows and doors are disturbad: walls make creaking sounds; stationary cars rock noticeably. The sensation is like a heavy object striking a building; the vibration is similar to that caused by the passing of heavy trucks.

V. Felt indoors by practically everyone, outdoors by most people. The direction and duration of the shock can be estimated by people outdoors. At night, sleepers are awakened and some run out of buildings. Liquids are disturbed and sometimes spilled. Small, unstable objects and some furnishings are shifted or upset. Doors close or open.

VI. Felt by everyone, and many people are frightened and run outdoors. Walking is difficult. Small church and school bells ring. Windows, dishes, and glassware are broken; liquids spill; books and other standing objects fall; pictures are knocked from walls; furniture is moved or overturned. Poorly built buildings may be damaged, and weak plaster will crack.

VII. Causes general alarm. Standing upright is very difficult. Persons driving cars also notice the shaking. Damage is negligible in buildings of very good design and construction, slight to moderate in well-built ordinary structures, considerable in poorly built or designed structures. Some chimneys are broken; interiors and furnishings experience considerable damage; architectural ornaments fall. Small slides occur along sand or gravel banks of water channels; concrete irrigation ditches are damaged. Waves form in the water and it becomes muddied.

VIII. General fright and near panic. The steering of cars is difficult. Damage is slight in specially designed earthquake-resistant structures, considerable in well-built ordinary buildings. Poorly built or designed buildings experience partial collapses. Numerous chimneys fall; the walls of frame buildings are damaged; interiors experience heavy damage. Frame houses that are not properly bolted down may move on their foundations. Decayed pilings are broken off. Tress are damaged. Cracks appear in wet ground and on steep slopes. Changes in the flow or temperature of springs and wells are noted.

IX. Panic is general. Interior damage is considerable in specially designed earthquake-resistant structures. Well-built ordinary buildings suffer severe damage, with partial collapses; frame structures thrown out of plumb or shifted off of their foundations. Unreinforced masonry buildings collapse. The ground cracks conspicuously and some underground pipes are broken. Reservoirs are damaged seriously.

X. Most masonry and many frame structures are destroyed. Specially designed earthquake-resistant structures may suffer serious damage. Some well-built bridges are destroyed, and dams, dikes and embankments are seriously damaged. Large landslides are triggered by the shock. Water is thrown onto the banks of canals, rivers and lakes. Sand and mud are shifted horizontally on beaches and flat land. Rails are bent slightly. Many buried pipes and conduits are broken.

XI. Few, if any, masonry structures remain standing. Other structures are severely damaged. Broad fissures, slumps and slides develop in soft or wet soils. Underground pipe lines and conduits are put completely out of service. Rails are severely bent.

XII. Damage is total, with practically all works of construction severely damaged or destroyed. Waves are observed on ground surfaces, and all soft or wet soils are greatly disturbed. Heavy objects are thrown into the air, and large rock masses are displaced.

YANEV,P.,1974, Peace of Mind in Earthquake Country, Chronicle Books, San Francisco, California.

APPENDIX A

LOGS OF BORINGS, PITS, AND TRENCHES
AND LABORATORY TEST DATA

EARTH SYSTEMS CONSULTANTS (1987)

File No. C6-2453-C1
December 24, 1987

Date Drilled: 11/4/87	Logged by: SML	Ground Elevation: 132	**BORING NO. 1**

Depth (in feet)	Symbol	Pen. Resist. (blows/ft.)	Pocket Pen. (t.s.f.)	FIELD DESCRIPTION AND CLASSIFICATION					Dry Density (pcf)	Moisture Content (%)
				Color	DESCRIPTION AND REMARKS	Moist. Cond.	Consist	Soil Type		
0		40	4.5+	Dark Grey-Brown	Silty CLAY, trace roots (TOPSOIL)	Damp	Hard	CH		
				Mottled Light Brown	Silty CLAY, trace fine claystone fragments				106.5	12.0
5		43	4.5+	Yellow-brown	Silty CLAY, trace fine sand, limonite and carbonate streaks	Damp	Hard	CH	108.6	18.0
					-easier drilling at 7-1/2 ' depth					
10		28	4.0	Yellow-brown	Silty CLAY, trace fine sandstone fragments	Moist	Very Stiff	CH	110.0	19.1
15		28	4.0	Light brown & light tan mottled	Silty CLAY, trace fine sand, slickensided	Very Moist	Very Stiff	CH	89.4	33.0
20		22	3.5-4.0	Light brown & light tan mottled	Silty CLAY, trace fine sand, slickensided	Very Moist	Very stiff	CH	88.4	32.7
25					Total Depth 20 feet. No groundwater encountered during drilling. KEY TO BORING LOGS 3" O.D. Modified Calif. Sampler					

File No. C6-2453-C1
December 24, 1987

Date Drilled: 11/4/87	Logged by: SML	Ground Elevation: 150	BORING NO. 2

Depth (in feet)	Symbol	Pen. Resist. (blows/ft.)	Pocket Pen. (t.s.f.)	FIELD DESCRIPTION AND CLASSIFICATION: Color	DESCRIPTION AND REMARKS	Moist. Cond.	Consist	Soil Type	Dry Density (pcf)	Moisture Content (%)
0		36	4.5+	Light pink & grey-brown mottled	Silty CLAY, little fine sand -becomes sandy at 3-1/2' depth	Damp	Hard	CH	118.9	12.4
5		21	-	Light brown & tan	Silty fine grained SAND, trace sandstone fragments -becomes clayey at 8-1/2' depth	Damp	Dense	SM	115.0	10.8
				Multi-colored	Sandy CLAY to clayey SAND with sandstone, quartz, shale fragments	Damp	Med. Dense	SC		
10		28		Brown	Fine to medium grained silty SAND, trace fine gravel	Damp	Med. Dense	SM	113.6	6.4
15		56	4.5+	Brown	Silty CLAY, trace fine grained sand	damp	hard	CH	111.1	19.0
20		50	4.5+	Brown and tan	Silty and sandy CLAY, interbedded	damp	hard	CH	113.4	16.8
					Total Depth 21-1/2 feet. No groundwater encountered during drilling.					
25										

File No. C6-2453-C1
December 24, 1987

Date Drilled: 11/4/87	Logged by: SML	Ground Elevation: 155	BORING NO. 3

Depth (in feet)	Symbol	Pen. Resist. (blows/ft.)	Pocket Pen. (t.s.f.)	FIELD DESCRIPTION AND CLASSIFICATION					Dry Density (pcf)	Moisture Content (%)
				Color	DESCRIPTION AND REMARKS	Moist. Cond.	Consist	Soil Type		
0		39	4.5+	Light olive-grey & orange mottled	Sandy CLAY, trace coarse sand -trace fine gravel	Damp	Hard	CH	120.7	7.6
5		62	4.5+	Light brown	Fine grained silty SAND	Damp	Dense	SM	123.0	9.9
10		80	4.5+	Light olive-grey to orange-brown	Sandy CLAY	Damp	Hard	CH	120.2	13.5
15		56	4.5	Brown	Sandy to silty CLAY, trace fine gravel	Damp	Hard	CH	108.6	19.7
20		66	4.5+	Brown	Silty CLAY	Damp	Hard	CH	108.5	18.4
25					Total Depth 20 feet. No groundwater encountered during drilling.					

File No. C6-2453-C1
December 24, 1987

Date Drilled: 11/4/87	Logged by: SML	Ground Elevation: 143	BORING NO. 4

Depth (in feet)	Symbol	Pen. Resist. (blows/ft.)	Pocket Pen. (t.s.f.)	FIELD DESCRIPTION AND CLASSIFICATION					Dry Density (pcf)	Moisture Content (%)
				Color	DESCRIPTION AND REMARKS	Moist. Cond.	Consist	Soil Type		
0		35	4.5+	Dk. grey brown	Silty CLAY (TOPSOIL)	Damp	Hard	CH		
				Olive-grey	Silty CLAY	Damp	Hard	CH	116.5	12.0
5		47	4.5+	Olive-grey & orange mottled	Silty CLAY	Damp	Hard	CH	106.8	20.5
10		27	4.5	Olive-grey & orange mottled	Silty CLAY	Moist	Hard	CH	84.4	36.5
15		30	4.5	Olive-grey & orange mottled	Silty CLAY	Moist	Hard	CH	87.4	34.1
20					Total Depth 15 feet. No groundwater encountered during drilling.					
25										

File No. C6-2453-C1
December 24, 1987

Date Drilled: 11/4/87	Logged by: SML	Ground Elevation: 125	**BORING NO. 5**

Depth (in feet)	Symbol	Pen. Resist. (blows/ft.)	Pocket Pen. (t.s.f.)	FIELD DESCRIPTION AND CLASSIFICATION: Color	DESCRIPTION AND REMARKS	Moist. Cond.	Consist	Soil Type	Dry Density (pcf)	Moisture Content (%)
0				Dk. grey brown	Silty CLAY (TOPSOIL)	Damp	Hard	CH		
		26	4.5+	Olive-grey	Silty CLAY, trace wood fragments (FILL?)	Damp	Hard	CH	96.6	9.3
5		18	4.5	Olive-grey & orange-red-brn mottled	Silty CLAY	Moist	Hard	CH	99.6	23.7
10		22	4.5	Yellow-Brown, Grey-brown at tip	Silty CLAY, slickensided	Moist	Hard	CH	96.6	9.3
15		24	4.5	Yellow-grey brown	- Some gypsum crystals				96.6	9.3
20					Total Depth 15 feet. No groundwater encountered during drilling.					
25										

File No. C6-2453-C1
December 24, 1987

Date Drilled: 11/4/87	Logged by: SML	Ground Elevation: 125	BORING NO. 6

Depth (in feet)	Symbol	Pen. Resist. (blows/ft.)	Pocket Pen. (t.s.f.)	FIELD DESCRIPTION AND CLASSIFICATION					Dry Density (pcf)	Moisture Content (%)
				Color	DESCRIPTION AND REMARKS	Moist. Cond.	Consist	Soil Type		
0		44	4.5+	Dk. grey brown	Silty CLAY, few roots, little fine gravel	Damp	Hard	CH	91.1	12.2
5		40	4.5+	Dark grey-brown	Silty CLAY, little carbonate streaks	Damp	Hard	CH	110.9	17.4
10		38	4.0	Dark grey-brown	Silty CLAY, little carbonate streaks	Moist	Hard	CH	99.4	23.4
15		34	4.0	Dark brown	Silty CLAY	Moist	Hard	CH	97.4	24.3
					Total Depth 15 feet. No groundwater encountered during drilling.					
20										
25										

File No. C6-2453-C1
December 24, 1987

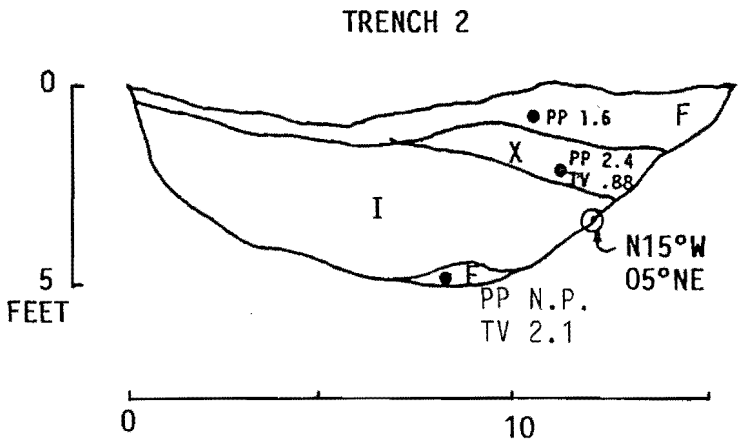
Date Drilled: 11/4/87	Logged by: SML	Ground Elevation: 108	BORING NO. 7

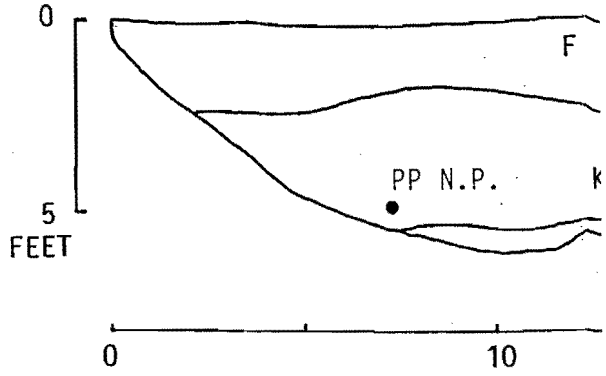
Depth (in feet)	Symbol	Pen. Resist. (blows/ft.)	Pocket Pen. (t.s.f.)	FIELD DESCRIPTION AND CLASSIFICATION					Dry Density (pcf)	Moisture Content (%)
				Color	DESCRIPTION AND REMARKS	Moist. Cond.	Consist	Soil Type		
0				Dk. grey brown	Silty CLAY	Damp	Hard	CH	--	--
5		52	4.5+	Dark grey-brown	Silty CLAY, little carbonate	Damp	Hard	CH	110.0	18.0
10		48	4.5	Grey-brown & tan mottled	Silty CLAY	Damp	Hard	CH	100.8	19.9
15		43	4.5+	Yellow-brown	Silty CLAY, carbonate streaks, trace fine sand	Damp	Hard	CH	104.2	21.1
20					Total Depth 15 feet. No groundwater encountered during drilling.					
25										

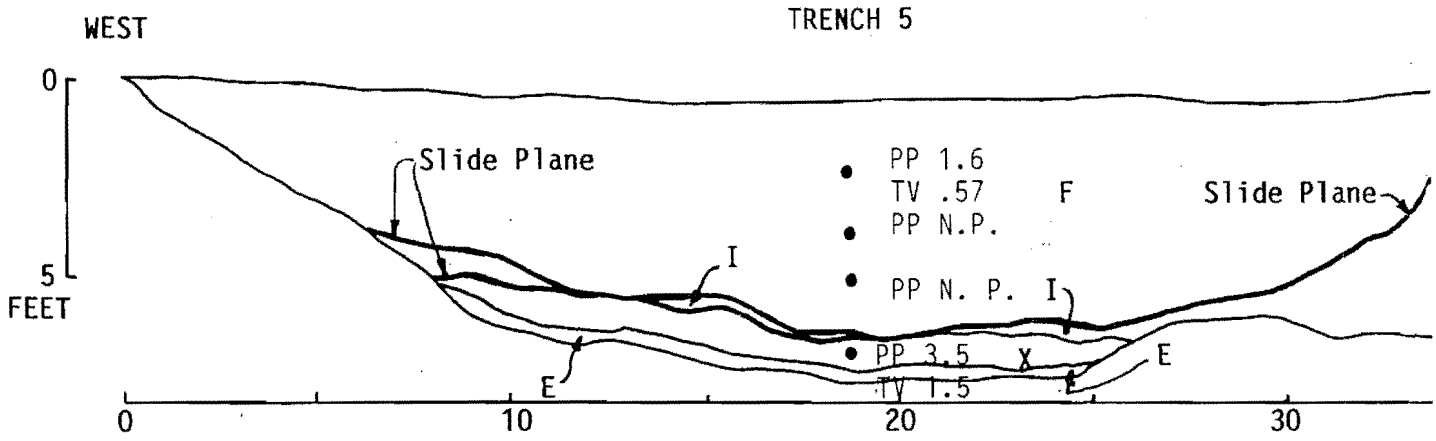
File No. C6-2453-C1
December 24, 1987

Date Drilled: 11/4/87	Logged by: SML	Ground Elevation:	BORING NO. 8

Depth (in feet)	Symbol	Pen. Resist. (blows/ft.)	Pocket Pen. (t.s.f.)	FIELD DESCRIPTION AND CLASSIFICATION					Dry Density (pcf)	Moisture Content (%)
				Color	DESCRIPTION AND REMARKS	Moist. Cond.	Consist	Soil Type		
0				Dk. grey brown	Silty CLAY	Damp	Hard	CH		
5		50	4.5+	Dark grey-brown	Silty CLAY, trace fine sand	Damp	Hard	CH	113.0	15.9
				Lt. olive grey	Sandy CLAY	Damp	Hard	CH		
10		39	4.5+	Lt. olive grey & orange-brown mottled	Silty CLAY, little fine sand	Moist	Hard	CH	101.3	22.1
15		26	3.5	Lt. olive grey & orange-brown mottled	Sandy CLAY	Moist	Very Stiff	CH	103.4	22.5
20					Total Depth 15 feet. No groundwater encountered during drilling.					
25										


TRENCH 2
0
5
FEET
PP 1.6
F
X
PP 2.4
TV .88
I
N15°W
05°NE
E
PP N.P.
TV 2.1
0
10


0
5
FEET
F
PP N.P.
0
10


WEST
TRENCH 5
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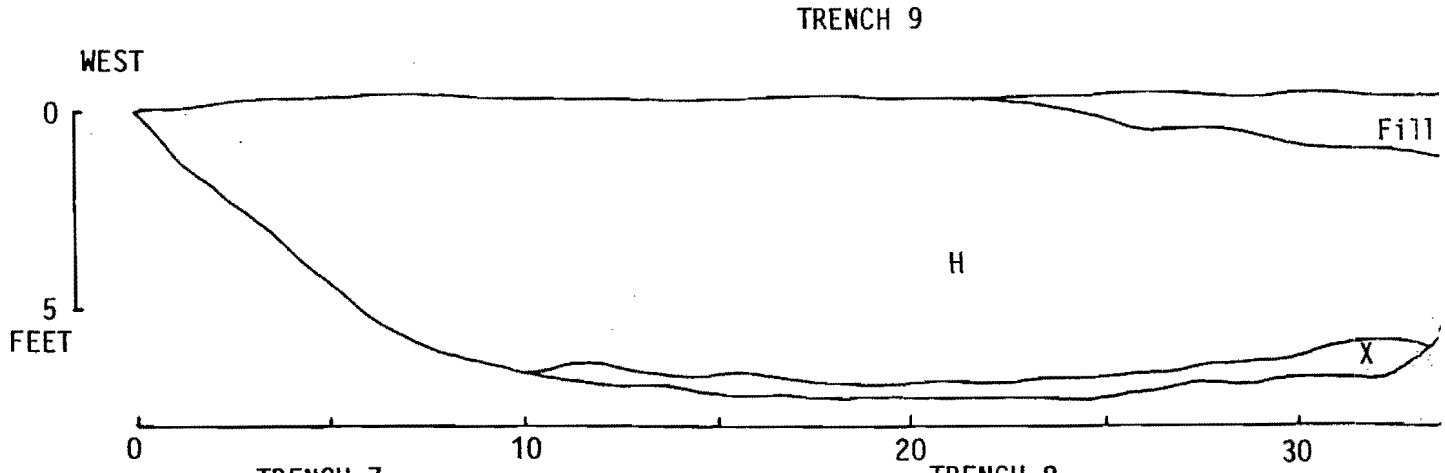
5
FEET
Slide Plane
PP 1.6
TV .57
F
PP N.P.
Slide Plane
I
PP N. P.
I
PP 3.5
X
E
TV 1.5
E
0
10
20
30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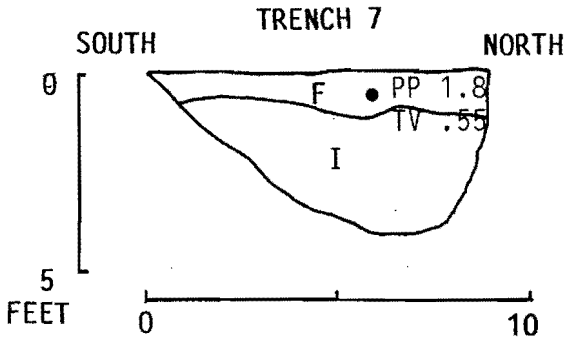
0
5
FEET
Fill
H
X
0
10
20
30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NORTH
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FEET
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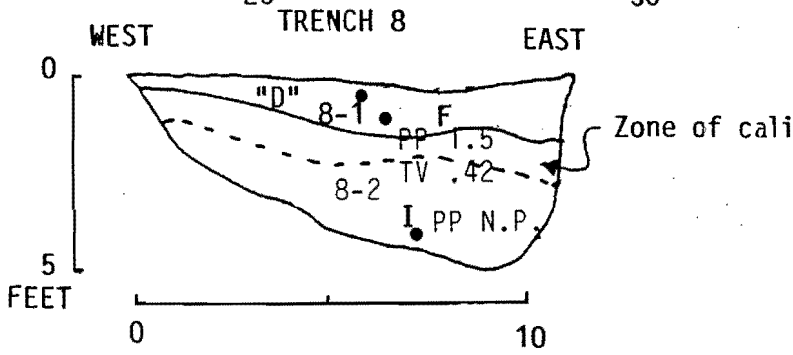
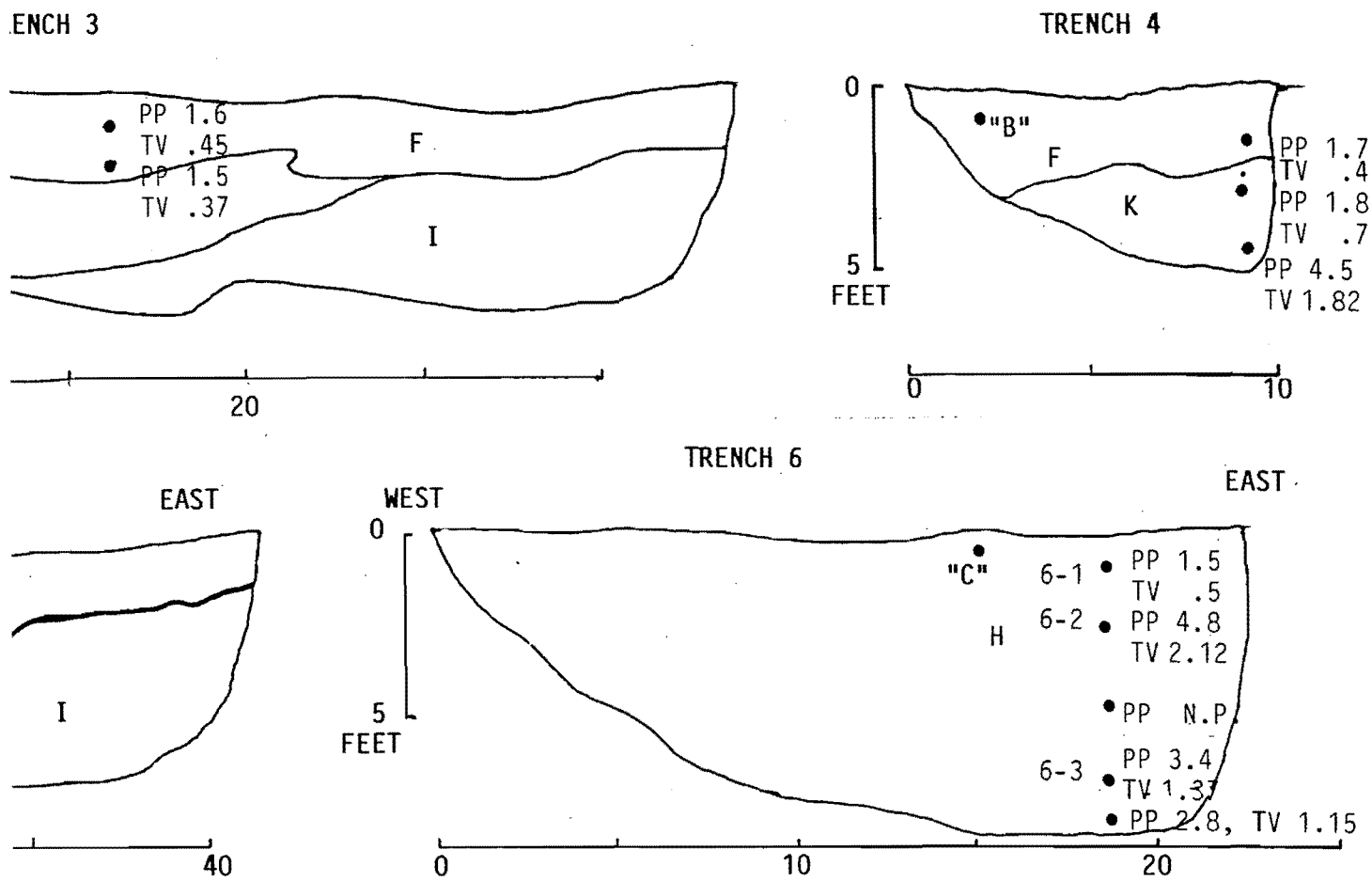

TRENCH 8
WEST
EAST
0
5
FEET
"D"
8-1
F
PP 1.5
TV .42
8-2
I
PP N.P.
Zone of cali
0
10



A Fill
F Topsoil
H Topsoil
X Weathered Claystone
E Claystone
I Sandstone
K Sandy Clay

Geologic Contact

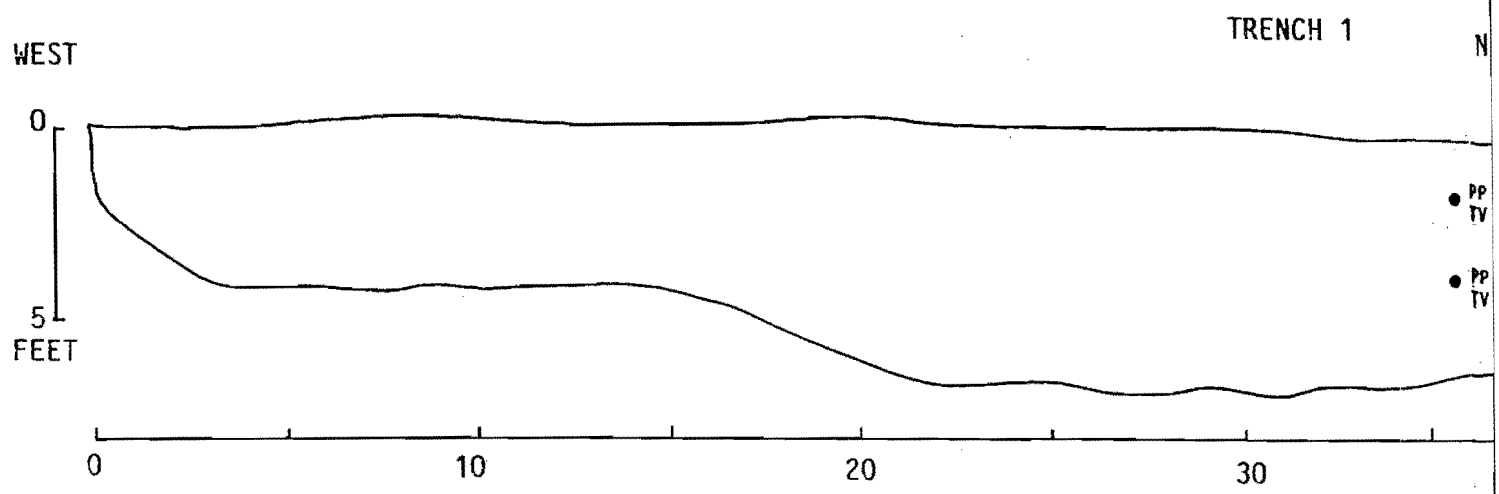
Slide Plane

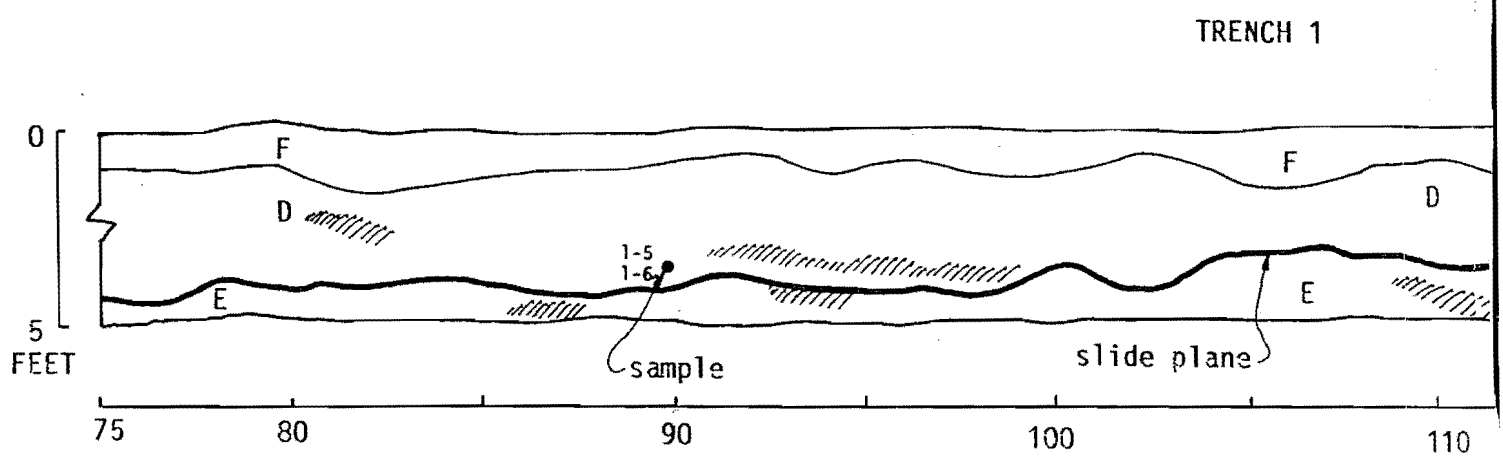
Strike and Dip

PP Pocket Penetrometer - T.S.C.
TV Torvane - T.S.F.
N.P. No Penetration
8-1 Undisturbed Sample No.
"C" Disturbed Sample

LOGS OF TRENCHES 2 THROUGH 9

East Warren Avenue Site
Fremont, California





A Fill
B Fill
C Topsoil
F Topsoil
H Topsoil

D Slide Debris
E Claystone

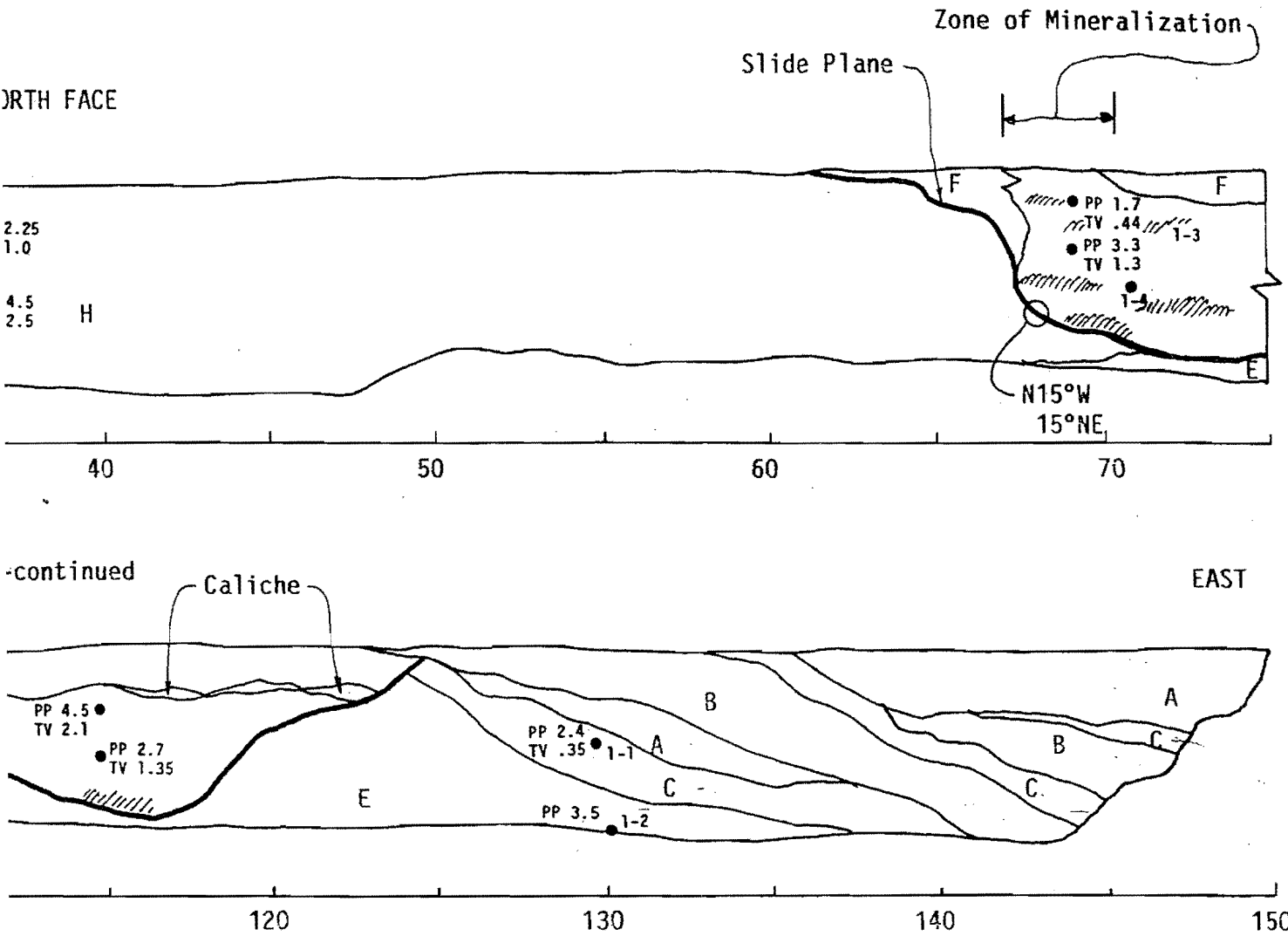
Zone of Iron Oxide Stain

Geologic Contact

Slide Plane

Strike & Dip

Sample



LOG OF TRENCH 1

East Warren Avenue Site
Fremont, California

File No. C6-2453-C1
December 24, 1987

Table A-I

Summary of Moisture, Density, Swell and Direct Shear Testing

		In-Place Conditions		Swell Tests			Direct Shear Testing	
Sample Number	Depth (Ft.)	Dry Density pcf	Moisture Content % Dry Wt	Swell Index (A)	% Swell	Moisture Increase % (B)	Angle of Internal Friction Degrees	Unit Cohesion psf
1-1	1	106.5	12.0	Swell Pressure = 11,500 psf				
1-2	4 1/2	108.6	18.0					
1-3	9 1/2	110.0	19.1					
1-4	14 1/2	89.2	33.0	1.2	10.4	8.3	10	500
1-5	19 1/2	88.4	32.7					
2-1	2	118.9	12.4					
2-2	6	115.0	10.8					
2-3	11	113.6	6.4					
2-4	16	111.1	19.0					
2-5	21	113.4	16.8					
3-1	1	120.7	7.6					
3-2	4 1/2	123.0	9.9					
3-3	9 1/2	120.2	13.5					
3-4	14 1/2	108.6	19.7					
3-5	19 1/2	108.5	18.4					
4-1	1	116.5	12.0					
4-2	4	106.8	20.5	1.5	18.7	12.7	18	525
4-3	9	84.4	36.5					
4-4	14	87.4	34.1					

Table A-I

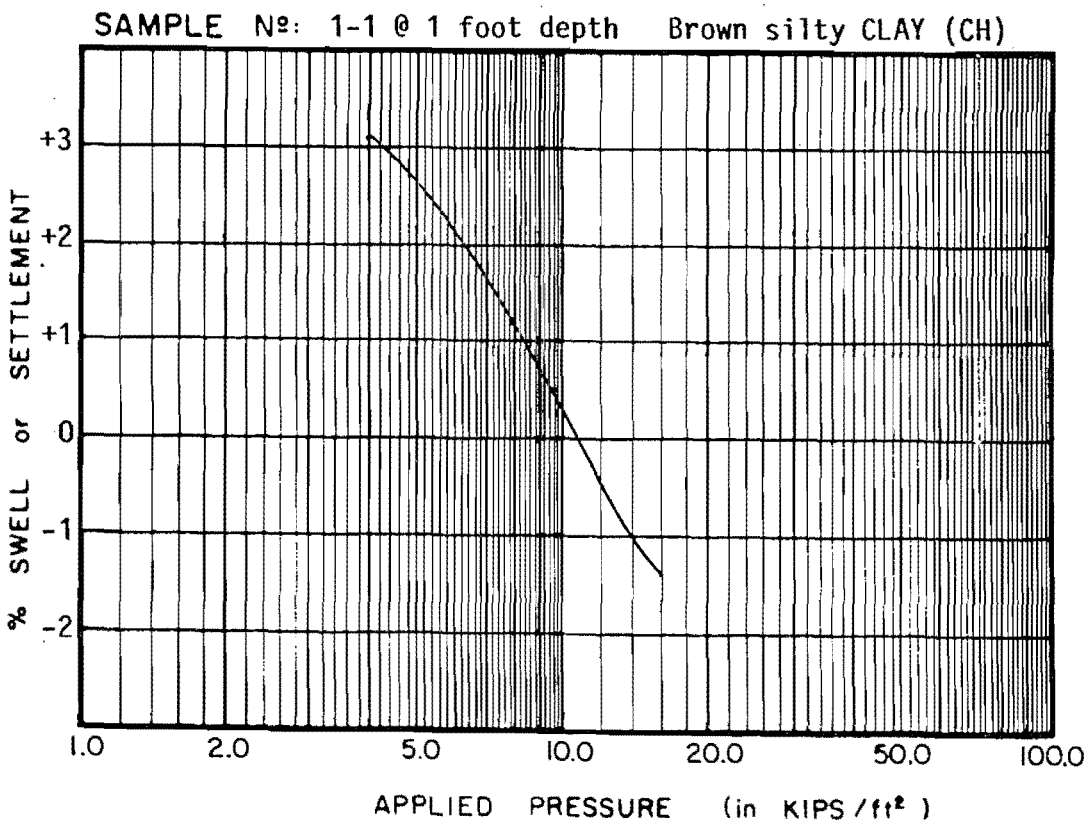
Summary of Moisture, Density, Swell and Direct Shear Testing

		In-Place Conditions		Swell Tests			Direct Shear Testing	
Sample Number	Depth (Ft.)	Dry Density pcf	Moisture Content % Dry Wt	Swell Index (A)	% Swell	Moisture Increase % (B)	Angle of Internal Friction Degrees	Unit Cohesion psf
5-1	1	96.6	9.3					
5-2	4 1/2	99.6	23.7					
5-3	9 1/2	86.3	34.7	1.2	8.5	7.2	18	500
5-4	14 1/2	97.0	28.0					
6-1	1	91.1	12.2					
6-2	4 1/2	110.9	17.4	Atterberg Limits				
6-3	9 1/2	99.4	23.4					
6-4	14 1/2	97.4	24.3					
7-1	4 1/2	110.0	18.0	Swell Pressure > 16,000 psf				
7-2	9 1/2	100.8	19.9					
7-3	14 1/2	104.2	21.1					
8-1	4 1/2	113.0	15.9	1.4	12.3	8.7	25	800
8-2	9 1/2	101.3	22.1					
8-3	14 1/2	103.4	22.5					

NOTES: (A) - Swell Index equals percent swell divided by percent moisture increase.

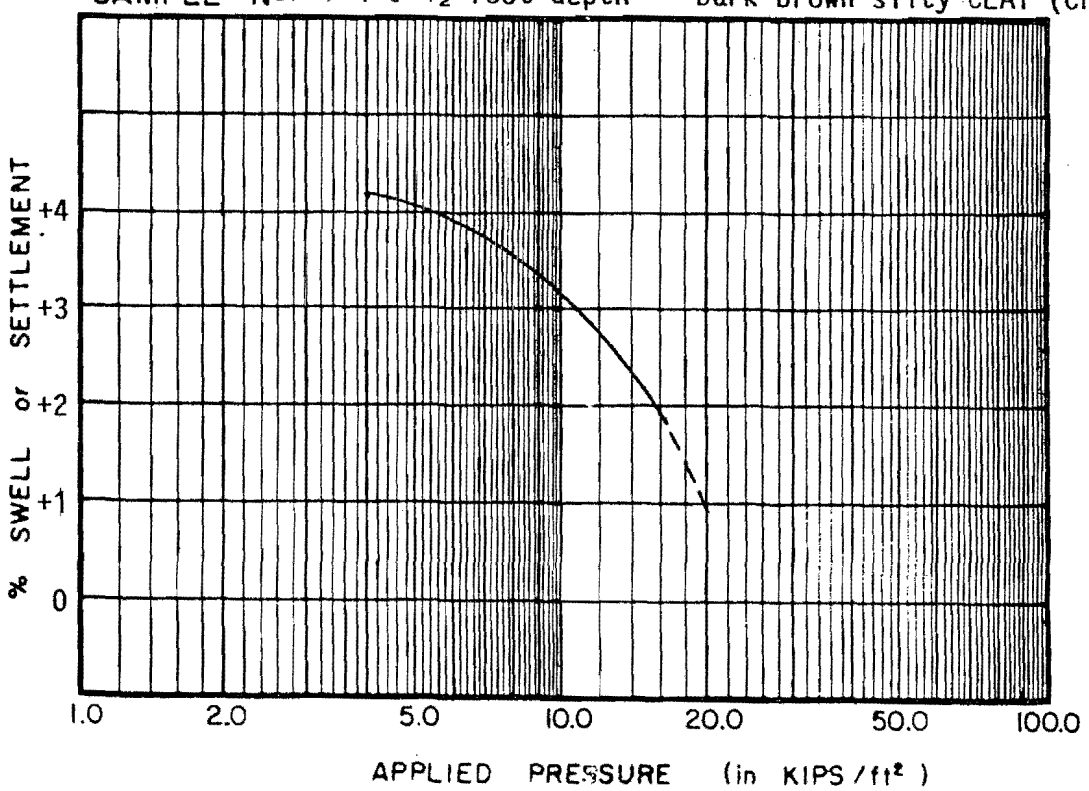
(B) - Moisture Increase following at least 24 hours of soaking prior to testing.

SWELL TEST

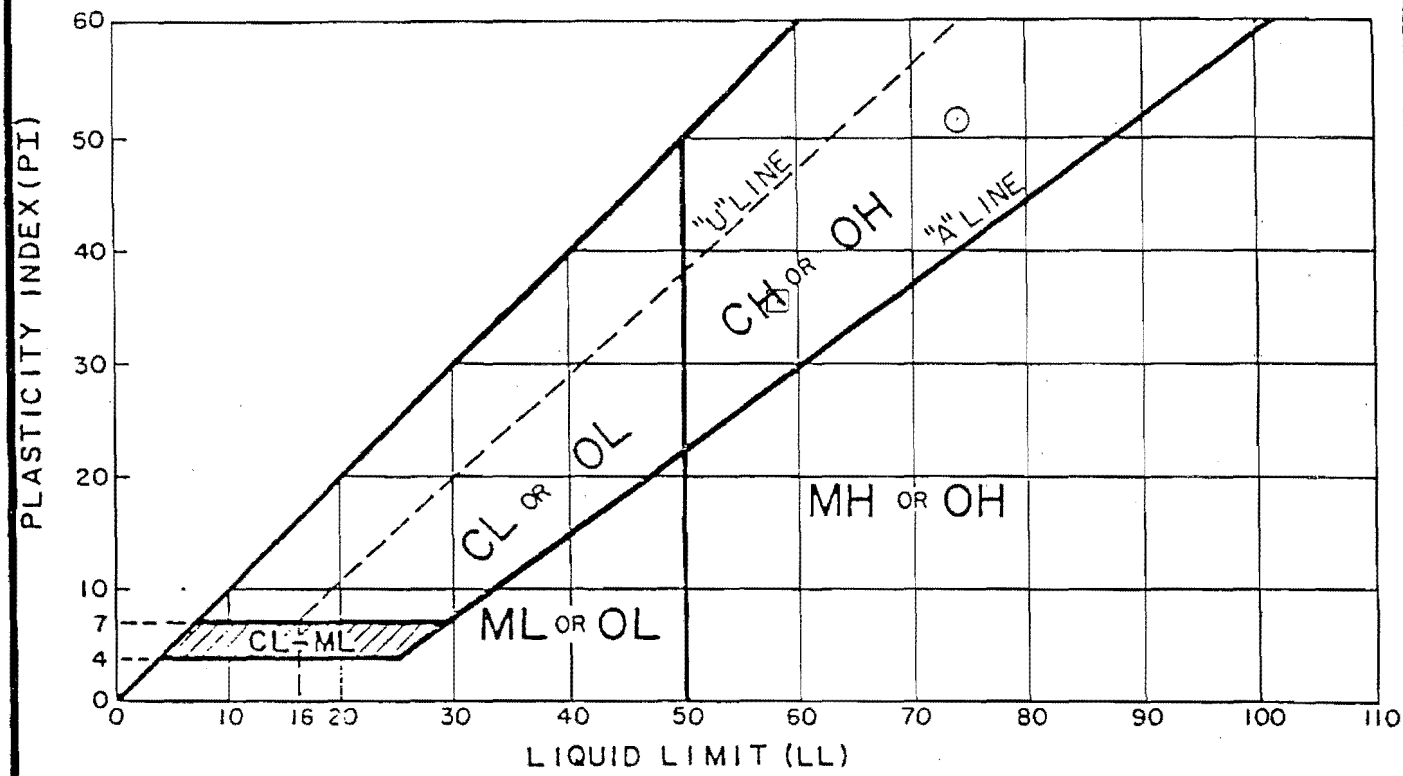

SAMPLE Nº: 1-1 @ 1 foot depth Brown silty CLAY (CH)
% SWELL or SETTLEMENT
+3
+2
+1
0
-1
-2
1.0
2.0
5.0
10.0
20.0
50.0
100.0
APPLIED PRESSURE (in KIPS/ft²)

SWELL TEST

SAMPLE Nº: 7-1 @ 4½ foot depth Dark brown silty CLAY (CH)



PLASTICITY CHART



Sample Number	Depth (ft.)	Description	Atterberg Limits: Liquid Limit %	Atterberg Limits: Plasticity Index
○ 4-2	4½	Olive-gray silty CLAY	74	52
□ 6-2	4½	Gray-brown silty CLAY	58	36

APPENDIX B

LOGS OF BORINGS, PITS, AND TRENCHES
AND LABORATORY TEST DATA

FRANK LEE & ASSOCIATES (1998)

File No: 157011

LOG OF MONITORING WELL MW-1

Client: Versatile Construction
Site: E. Warren Avenue, Fremont
Drillers: PC Drilling
Drill Rig: Puntel
Auger Type/Size: 8-inch hollow stem/140# hammer
Top of Casing Elevation: See Table 1

Logged By: TG/GH
Approved By:
Date Completed: 05/12/98
Casing Diameter: 2"
Screen Size: 0.010
Filter pack: #3 Sand

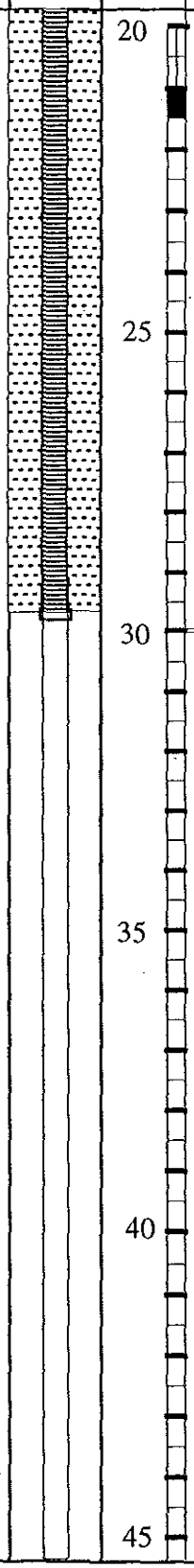
Symbols used explained on "Key to Boring Logs"

Sample Number	Sampler	U.S. C.S.	Well Data	Depth in feet	Blows per 6 in.	Surface Condition: Tall grass-covered slope.
1-1	CM			0	5 9 16	**Silty clay**, dark bluish gray, moist to very moist, medium to high plasticity, very stiff; little fine- to medium-grained sand; organics common (topsoil/fill?). Increase in clay content; increase in plasticity to high.
1-2	CM			5	7 18 25	**Sand**, fine-grained, light grayish brown, slightly moist,dense; little clay (highly weathered Santa Clara Formation bedrock?).
1-3	CM			10	14 18 25	
1-4	CM			15	7 12 26	**Clayey sand**, increase in clay. Increase in moisture and plasticity (highly weathered Santa Clara Formation bedrock?). Hard.
				20		**Sandy silty clay**, dark brown, moist to very moist, high plasticity, stiff; fine- to medium-grained sand (weathered Santa Clara Formation bedrock?).

File No: 157011

LOG OF MONITORING WELL MW-1 (Continued)

Sample Number	Sampler	U.S. C.S.	Well Data	Depth in feet	Blows per 6 in.	
1-5	CM			20	4 7 14	
				25		Increase in fine-grained sand; decrease in silt.
						Color change to medium brown; some medium-grained sand; increase in stiffness.
				30		Bottom of hole at 30 feet. No free groundwater encountered. Temporary casing installed as shown.
				35		
				40		
				45		



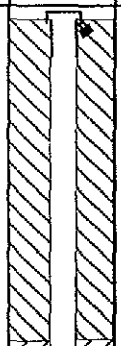
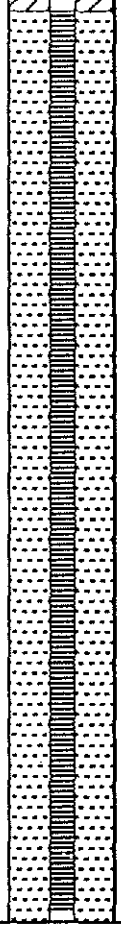
File No: 157011

LOG OF MONITORING WELL MW-2

Client: Versatile Construction
Site: E. Warren Avenue, Fremont
Drillers: PC Drilling
Drill Rig: Puntel
Auger Type/Size: 8-inch hollow stem/140# hammer
Top of Casing Elevation: See Table 1

Logged By: TG/GH
Approved By:
Date Completed: 05/12/98
Casing Diameter: 2"
Screen Size: 0.010
Filter pack: #3 Sand

Symbols used explained on "Key to Boring Logs"

Sample Number	Sampler	U.S. C.S.	Well Data	Depth in feet	Blows per 6 in.	Surface Condition: High grass; gently sloping topography.
2-1	CM			0	9 17 20	**Silty clay**, dark gray, moist, medium to high plasticity, hard; trace fine- to medium-grained sand; organics common (topsoil/fill?)
2-2	CM			5	5 10 14	**Sandy silty clay**, gray to medium brown, very moist, high plasticity, very stiff; fine- to coarse-grained sand; increase in organics; few clasts to fine gravel (highly weathered Santa Clara Formation bedrock?).
2-3	CM			10	9 9 14	**Clayey sand**, fine- to coarse-grained, light brown, slightly moist to moist, medium dense (highly weathered Santa Clara Formation bedrock?).
2-4	CM			15	4 7 11	**Sand**, fine- to coarse-grained, light yellowish brown, moist, medium dense; little clay; few small clasts (highly weathered Santa Clara Formation bedrock?).
				20		

File No: 157011

LOG OF MONITORING WELL MW-2 (Continued)

Sample Number	Sampler	U.S. C.S.	Well Data	Depth in feet	Blows per 6 in.	
				20		
MW2-5	CM				4 10 9	**Silty clay**, greenish brown and blue-green mottled, moist to very moist, high plasticity, very stiff; little sand (weathered Santa Clara Formation bedrock?).
				25		Increase in fine sand. Very moist.
				30		Bottom of hole at 30 feet. No free groundwater encountered. Temporary casing installed as shown.
				35		
				40		
				45		

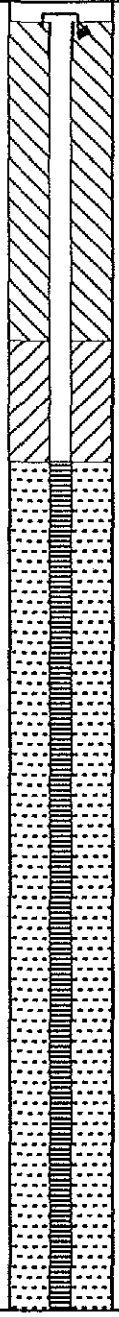
File No: 157011

LOG OF MONITORING WELL MW-3

Client: Versatile Construction
Site: E. Warren Avenue, Fremont
Drillers: PC Drilling
Drill Rig: Puntel
Auger Type/Size: 8-inch hollow stem/140# hammer
Top of Casing Elevation: See Table 1

Logged By: TG/GH
Approved By:
Date Completed: 05/13/98
Casing Diameter: 2"
Screen Size: 0.010
Filter pack: #3 Sand

Symbols used explained on "Key to Boring Logs"

Sample Number	Sampler	U.S. C.S.	Well Data	Depth in feet	Blows per 6 in.	Surface Condition: High grass; gently sloping topography.
3-1	CM			0	5 16 20	**Silty Clay**, gray to dark brown, moist, medium to high plasticity, hard; fine- to medium-grained sand; subangular clasts up to 3/8 inch across (topsoil/fill?).
3-2	CM			5 10	6 6 7	**Sandy silty clay**, dark to medium brown and gray, moist, high plasticity, stiff; clasts up to 1/2 inch across; some organics present (highly weathered Santa Clara Formation bedrock?).
3-3	CM				6 21 36	**Silty clay**, brown to gray, moist, high plasticity, hard; few medium to coarse sand grains (highly weathered Santa Clara Formation bedrock?).
3-4	CM			15 20	▽ 5 6 16 23 6 18 20	**Sand**, fine- to medium-grained, brown, very moist to wet, dense (highly weathered Santa Clara Formation bedrock?). Sand catcher used.

File No: 157011

LOG OF MONITORING WELL MW- 3 (Continued)

Sample Number	Sampler	U.S. C.S.	Well Data	Depth in feet	Blows per 6 in.	
				20		
	CM			25	3 4 5	Sand catcher used.
3-5	CM				5 12 40	
						Sandy clay, brown to light yellowish brown, wet to very moist, very dense; medium-grained sand (weathered Santa Clara Formation bedrock?).
				30		Bottom of hole at 29 feet. Free groundwater encountered at 14 feet. Temporary casing installed as shown.
				35		
				40		
				45		

File No: 157011

LOG OF MONITORING WELL MW-4

Client:	Versatile Construction	Logged By:	TG/GH
Site:	E. Warren Avenue, Fremont	Approved By:	
Drillers:	PC Drilling	Date Completed:	5/14/98
Drill Rig:	Puntel	Casing Diameter:	2"
Auger Type/Size:	8-inch hollow stem/140# hammer	Screen Size:	0.010
Top of Casing Elevation:	See Table 1	Filter pack:	#3 Sand

Symbols used explained on "Key to Boring Logs"

Sample Number	Sampler	U.S. C.S.	Well Data	Depth in feet	Blows per 6 in.	Surface Condition: Tall grass, thistle, and mustard.
				0		**Silty clay**, dark brown to black, moist, high plasticity, stiff; few small clasts (topsoil/fill?).
4-1	CM				8 13 16	
				5		
4-2	CM				8 9 10	**Sand**, fine- to coarse-grained, light grayish brown, moist to very moist, medium dense (highly weathered Santa Clara Formation bedrock?).
				10		**Silty clay**, brown to gray, high plasticity, moist, very stiff; some smoothed small clasts (highly weathered Santa Clara Formation bedrock?).
4-3	CM				5 8 10	**Sand**, light yellowish brown, fine- to coarse-grained, moist, medium dense (highly weathered Santa Clara Formation bedrock?).
						Increase in grain size to coarse; increase in moisture to wet.
				15		
4-4	CM				5 ▽ 7 11	Decrease in grain size to fine to medium; decrease in moisture to very moist; some coarse to small subangular clasts.
				20		

LOG OF MONITORING WELL MW-4 (Continued)

Sample Number	Sampler	U.S. C.S.	Well Data	Depth in feet	Blows per 6 in.	
				20	11 22 22	Added sandcatcher.
	CM					
					8 12 30	
	CM					
				25	6	
4-5	CM				11 30	**Clay,** light brown and green mottled, very moist, high plasticity, very stiff; black streaks; smooth (weathered Santa Clara Formation bedrock?).
				30	3 13	
4-6	CM				20	
						Bottom of hole at 31-1/2 feet. Free groundwater encountered at 15-1/2 feet.
				35		
				40		
				45		

File No: 157011

LOG OF MONITORING WELL MW-5

Client:	Versatile Construction	Logged By:	TG/GH
Site:	E. Warren Avenue, Fremont	Approved By:	
Drillers:	PC Drilling	Date Completed:	5/14/98
Drill Rig:	Puntel	Casing Diameter:	2"
Auger Type/Size:	8-inch hollow stem/140# hammer	Screen Size:	0.010
Top of Casing Elevation:	See Table 1	Filter pack:	#3 Sand

Symbols used explained on "Key to Boring Logs"

Sample Number	Sampler	U.S. C.S.	Well Data	Depth in feet	Blows per 6 in.	Surface Condition: Long, tall grass and mustard.
				0		**Silty clay,** dark bluish gray, moist to very moist, medium to high plasticity, very stiff; little fine- to medium-grained sand; organics common (topsoil/fill?).
5-1	CM				6 16 25	**Sandy silty clay,** dark brown to gray, medium plasticity, moist, hard; few organics; few small clasts (highly weathered Santa Clara Formation bedrock?).
				5	7 11 20	**Sand,** fine-grained, light grayish brown, slightly moist, dense; subangular clasts up to 3/8 inch across (highly weathered Santa Clara Formation bedrock?).
5-2	CM					**Sandy clay,** light brown with white clasts, mottled with light yellow, medium plasticity, moist, very stiff (highly weathered Santa Clara Formation bedrock?). Harder drilling.
5-3	CM			10	7 7 13	**Sandy silty clay,** dark brown to gray, medium plasticity, moist, hard; few organics; few small clasts (highly weathered Santa Clara Formation bedrock?).
						Sandy clay, reddish brown and gray, medium plasticity, moist, very stiff; trace of fine-grained sand (highly weathered Santa Clara Formation bedrock?).
				15	3 ▽ 6 15	**Sand,** light yellowish brown, fine- to coarse-grained, wet, medium dense (highly weathered Santa Clara Formation bedrock?).
5-4	CM					**Sandy clay,** reddish to light brown, high plasticity, moist, very stiff (highly weathered Santa Clara Formation bedrock?). Color change to red.
				20		

LOG OF MONITORING WELL MW-5 (Continued)

Sample Number	Sampler	U.S. C.S.	Well Data	Depth in feet	Blows per 6 in.	
				20		**Sand,** light yellowish brown, fine- to coarse-grained, wet, medium dense (weathered Santa Clara Formation bedrock?).
5-5	CM					**Clayey sand,** medium- to coarse-grained light yellow to light red,very moist to wet, dense; white lime-like lenses (weathered Santa Clara Formation bedrock?).
				25		**Sand,** light yellowish brown, medium-to-coarse-grained, moist, medium dense (weathered Santa Clara Formation bedrock?).
5-6	CM					**Silty sand,** medium-grained, light brown to light red, moist, dense; few subangular clasts; some whitish fine-grained sand (weathered Santa Clara Formation bedrock?).
				30		Increase in moisture to very moist.
5-7	CM					
				35		Bottom of hole at 31-1/2 feet. Free groundwater encountered at 15-1/2 feet.
				40		
				45		

File No: 157011

LOG OF MONITORING WELL MW-6

Client: Versatile Construction
Site: E. Warren Avenue, Fremont
Drillers: PC Drilling
Drill Rig: Puntel
Auger Type/Size: 8-inch hollow stem/140# hammer
Top of Casing Elevation: See Table 1

Logged By: TG/GH
Approved By:
Date Completed: 5/14/98
Casing Diameter: 2"
Screen Size: 0.010
Filter pack: #3 Sand

Symbols used explained on "Key to Boring Logs"

Sample Number	Sampler	U.S. C.S.	Well Data	Depth in feet	Blows per 6 in.	Surface Condition: Tall grass, mustard, sweet peas.
				0		**Sandy silty clay**, dark brownish gray, high plasticity, moist, stiff; few organics; few small clasts (topsoil/fill?).
6-1	CM				5 7 9	**Silty clay**, brown and orange, high plasticity, moist, stiff (highly weathered Santa Clara Formation bedrock?).
				5		**Sandy silty clay**, light brown, high plasticity, moist, very stiff; clasts from 1/4 in. to 3/4 in. across with fine- to medium-grained sand (highly weathered Santa Clara Formation bedrock?).
6-2	CM				4 9 15	
				10		
6-3	CM				7 13 15	Color change to dark brown and gray; organics present.
						Silty clay, light brown mottled, high plasticity, very moist, very stiff (highly weathered Santa Clara Formation bedrock?).
				15		
6-4	CM				5 7 15	**Clay**, light brown and green mottled, high plasticity, very moist, very stiff; black streaks; smooth texture (weathered Santa Clara Formation bedrock?).
				20		

File No: 157011

LOG OF MONITORING WELL MW-6 (Continued)

Sample Number	Sampler	U.S. C.S.	Well Data	Depth in feet	Blows per 6 in.	
				20		
6-5	CM				4 6 14	**Clay**, light brown and green mottled, high plasticity, very moist, very stiff; black streaks; smooth (weathered Santa Clara Formation bedrock?).
				25		
6-6	CM				4 4 14	
				30		
6-7	CM				3 8 10	
						Bottom of hole at 31-1/2 feet. No free groundwater encountered.
				35		
				40		
				45		

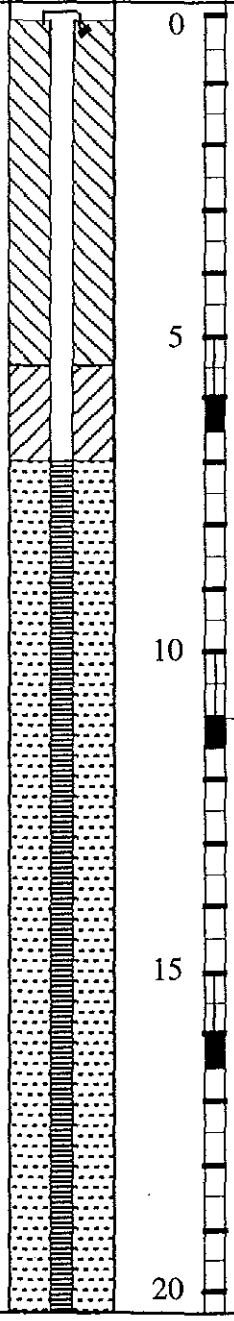
File No: 157011

LOG OF MONITORING WELL MW-7

Client:	Versatile Construction	Logged By:	TG/GH
Site:	E. Warren Avenue, Fremont	Approved By:	
Drillers:	PC Drilling	Date Completed:	5/15/98
Drill Rig:	Puntel	Casing Diameter:	2"
Auger Type/Size:	8-inch hollow stem/140# hammer	Screen Size:	0.010
Top of Casing Elevation:	See Table 1	Filter pack:	#3 Sand

Symbols used explained on "Key to Boring Logs"

Sample Number	Sampler	U.S. C.S.	Well Data	Depth in feet	Blows per 6 in.	Surface Condition: Long grasses and weeds.
				0		**Sandy clay**, dark brownish gray, moist, medium plasticity; some organics (very highly weathered Santa Clara Formation bedrock?). Some gravels between 1/2 inch and 3/4 inch across. No gravels present.
				5		
7-1	CM				7 16 18	Hard.
				10		
7-2	CM				8 14 17	**Sandy clay**, dark brown to brownish gray, moist to very moist, medium plasticity, very stiff; organics; few bark pieces (highly weathered Santa Clara Formation bedrock?).
				15		
7-3	CM				6 13 20	Decrease in organics; increase in plasticity to high; hard.
				20		



File No: 157011

LOG OF MONITORING WELL MW-7 (Continued)

Sample Number	Sampler	U.S. C.S.	Well Data	Depth in feet	Blows per 6 in.	
	7-4	CM		20		**Sandy clay**, dark brown to brownish gray, moist to very moist, high plasticity, very stiff; no organics.
				25		Harder drilling.
	7-5	CM				**Sandy silty clay**, light gray to light brown, medium plasticity, moist, hard; medium to coarse sand grains.
				30		
	7-6	CM				**Silty clay**, light gray to light brown, medium plasticity, moist, very stiff; fine- to medium-grained sand; some small, subrounded to subangular clasts (weathered Santa Clara Formation bedrock?).
						Bottom of hole at 31-1/2 feet. No free groundwater encountered.
				35		
				40		
				45		

File No: 157011

LOG OF MONITORING WELL MW-8

Client:	Versatile Construction	Logged By:	TG/GH
Site:	E. Warren Avenue, Fremont	Approved By:	
Drillers:	PC Drilling	Date Completed:	5/15/98
Drill Rig:	Puntel	Casing Diameter:	2"
Auger Type/Size:	8-inch hollow stem/140# hammer	Screen Size:	0.010
Top of Casing Elevation:	See Table 1	Filter pack:	#3 Sand

Symbols used explained on "Key to Boring Logs"

Sample Number	Sampler	U.S. C.S.	Well Data	Depth in feet	Blows per 6 in.	Surface Condition: Long grasses and weeds.
				0		**Silty clay**, dark brownish gray, moist, high plasticity, very stiff; organics.
				5		
8-1	CM				6 16 15	
				10		
8-2	CM				6 18 30	Traces of medium- to coarse-grained sand; decrease in organics; hard.
				15		Change in color to grayish brown; no organics; decrease in moisture to slightly moist; decrease in plasticity to medium; few small clasts up to 1/4 inch across.
8-3	CM				4 12 20	**Clay**, greenish gray and yellowish-orange and red mottled, moist, high plasticity, very stiff to hard; weathered; biotite present; smooth (weathered Santa Clara Formation bedrock?). Harder drilling at 17 feet.
				20		

File No: 157011

LOG OF MONITORING WELL MW-8 (Continued)

Sample Number	Sampler	U.S. C.S.	Well Data	Depth in feet	Blows per 6 in.	
				20		
8-4	CM				9 6 16	
				25		
8-5	CM				8 13 28	
				30		
8-6	CM				7 11 12	
						Bottom of hole at 31-1/2 feet. No free groundwater encountered.
				35		
				40		
				45		

File No: 157011

LOG OF MONITORING WELL MW-9

Client:	Versatile Construction	Logged By:	TG/GH
Site:	E. Warren Avenue, Fremont	Approved By:	
Drillers:	PC Drilling	Date Completed:	5/14/98
Drill Rig:	Puntel	Casing Diameter:	2"
Auger Type/Size:	8-inch hollow stem/140# hammer	Screen Size:	0.010
Top of Casing Elevation:	See Table 1	Filter pack:	#3 Sand

Symbols used explained on "Key to Boring Logs"

Sample Number	Sampler	U.S. C.S.	Well Data	Depth in feet	Blows per 6 in.	Surface Condition: Long grasses and weeds.
				0		**Silty clay,** dark brown to black, moist, high plasticity, very stiff.
				5	4 8 12	
9-1	CM					
						Clay, greenish gray and yellowish orange mottled, moist, high plasticity, hard (weathered Santa Clara Formation bedrock?).
				10	4 15 24	
9-2	CM					
				15	3 13 31	
9-3	CM					
				20		

File No: 157011

LOG OF MONITORING WELL MW-9 (Continued)

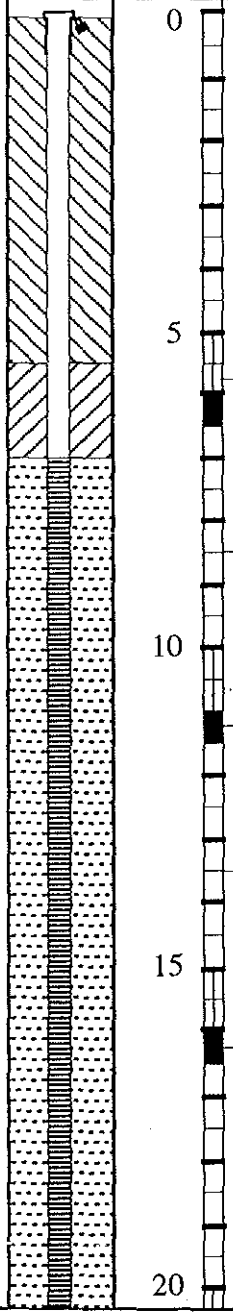
Sample Number	Sampler	U.S. C.S.	Well Data	Depth in feet	Blows per 6 in.	
				20		
9-4	CM				7 22 30	
						Sandy silty clay, light yellowish brown, moist, medium plasticity, hard; small clast; medium-grained sand (weathered Santa Clara Formation bedrock?).
				25		
9-5	CM				8 31 30	
						Cable broke. Unable to obtain final sample; however, drill tailings suggest the same material was present at the bottom of the hole.
				30		
						Bottom of hole at 30 feet. No gree groundwater encountered.
				35		
				40		
				45		

File No: 157011

LOG OF MONITORING WELL MW-10

Client:	Versatile Construction	Logged By:	TG/GH
Site:	E. Warren Avenue, Fremont	Approved By:	
Drillers:	PC Drilling	Date Completed:	5/15/98
Drill Rig:	Puntel	Casing Diameter:	2"
Auger Type/Size:	8-inch hollow stem/140# hammer	Screen Size:	0.010
Top of Casing Elevation:	See Table 1	Filter pack:	#3 Sand

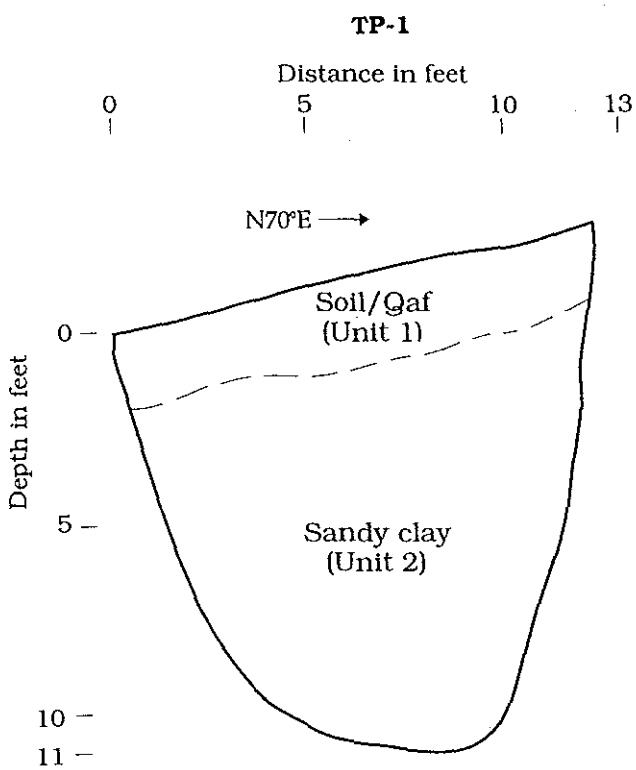
Symbols used explained on "Key to Boring Logs"

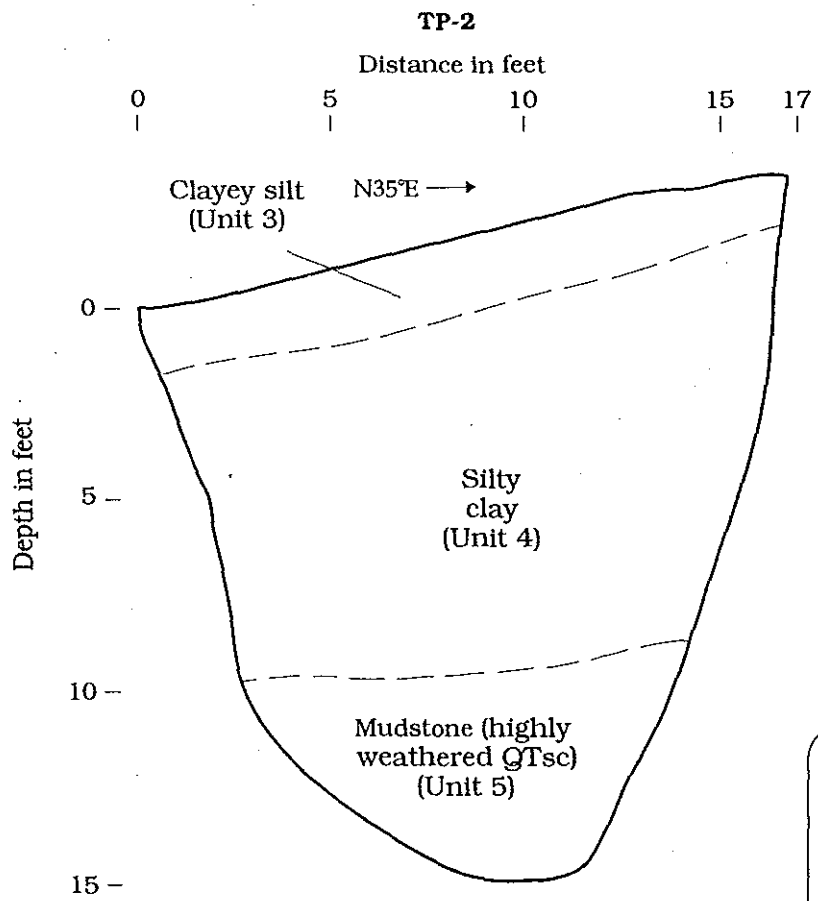
Sample Number	Sampler	U.S. C.S.	Well Data	Depth in feet	Blows per 6 in.	Surface Condition: Long grass; weeds; swampy.
				0		**Silty clay**, dark brown to dark gray, very moist, high plasticity, stiff; abundant organics, worms.
				5	12	
10-1	CM				15 21	**Silty sand**, fine-grained, light yellow to light brown, moist, dense; abundant fine- to coarse-grained clasts (highly weathered Santa Clara Formation bedrock?).
						Silty clay, dark brown to brown and yellowish orange, very moist, high plasticity, stiff; some clasts (highly weathered Santa Clara Formation bedrock?).
				10	4	
10-2	CM				10 13	**Clay**, brown, yellow, and orange mottled, moist, high plasticity, very stiff (highly weathered Santa Clara Formation bedrock?).
						Silty sand, fine-grained, light yellow to light brown, very moist; medium dense (highly weathered Santa Clara Formation bedrock?).
				15	7	
10-3	CM				12 18	**Sandy clay**, yellowish orange and brown, moist, high plasticity, very stiff; biotite present (weathered Santa Clara Formation bedrock?).
				20		

File No: 157011

LOG OF MONITORING WELL MW-10 (Continued)

Sample Number	Sampler	U.S. C.S.	Well Data	Depth in feet	Blows per 6 in.	
				20	5 16 25	
10-4	CM					**Silty clay**, light brown and orangish-yellow, moist, high plasticity, hard; traces of small clasts, biotite (weathered Santa Clara Formation bedrock?).
				25	5 10 25	
10-5	CM					
				30	7 13 33	
10-6	CM					
						Bottom of hole at 31-1/2 feet. No free groundwater encountered.
				35		
				40		
				45		

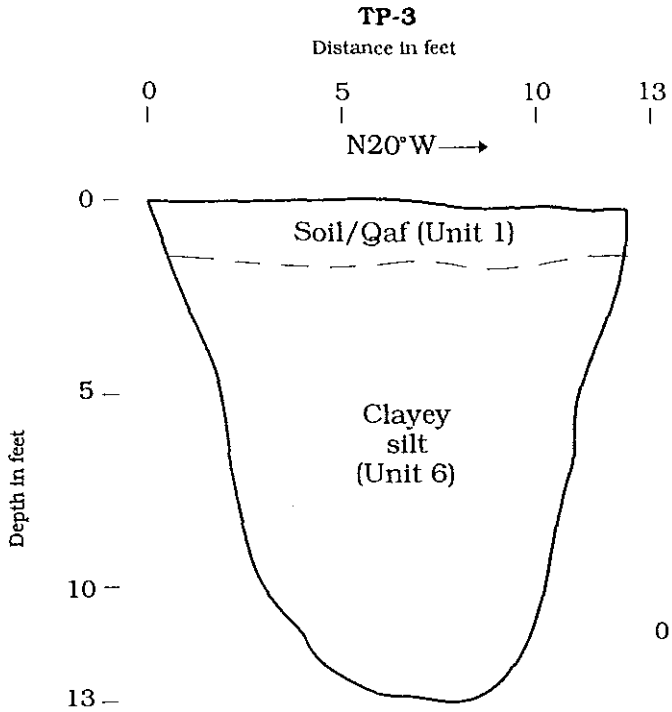


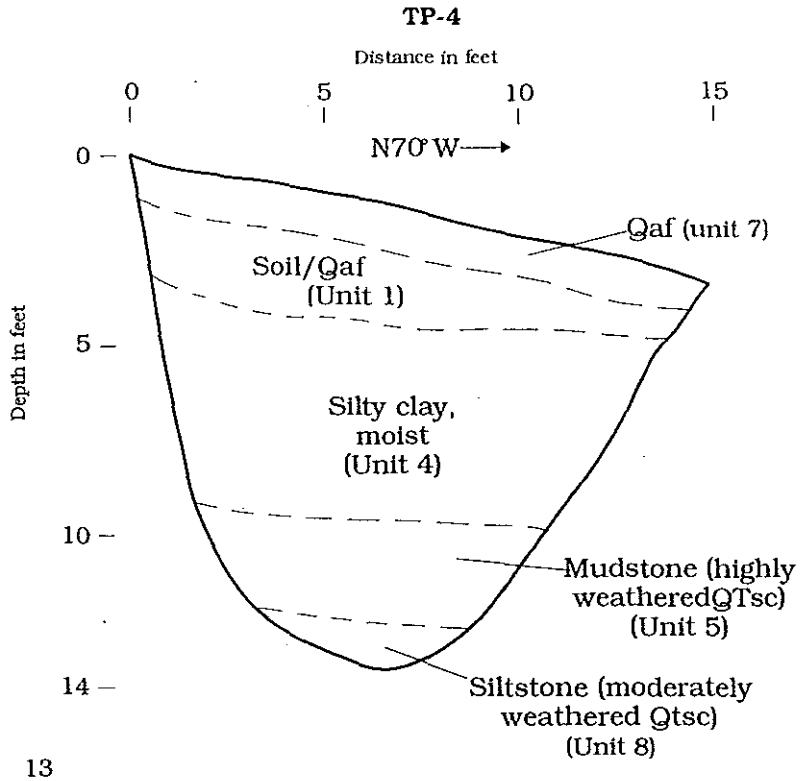


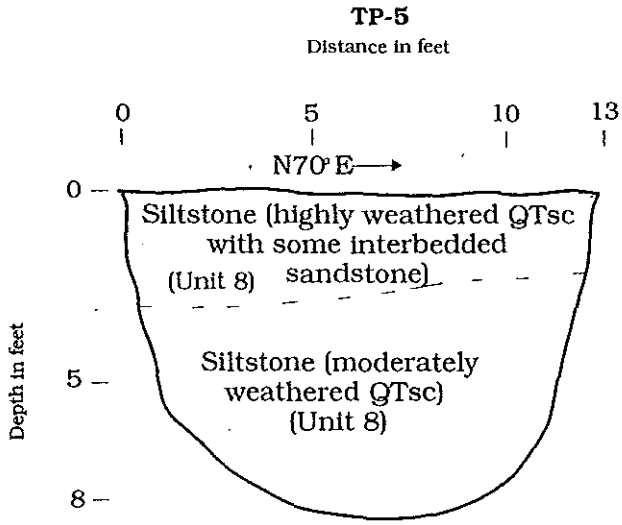
For EXPLANATION See Plate 27

Scale: 1" = 5'
H=V

LOGS OF TEST PITS
TP-1 AND TP-2
Tiffany Park
East Warren Avenue
Fremont, California



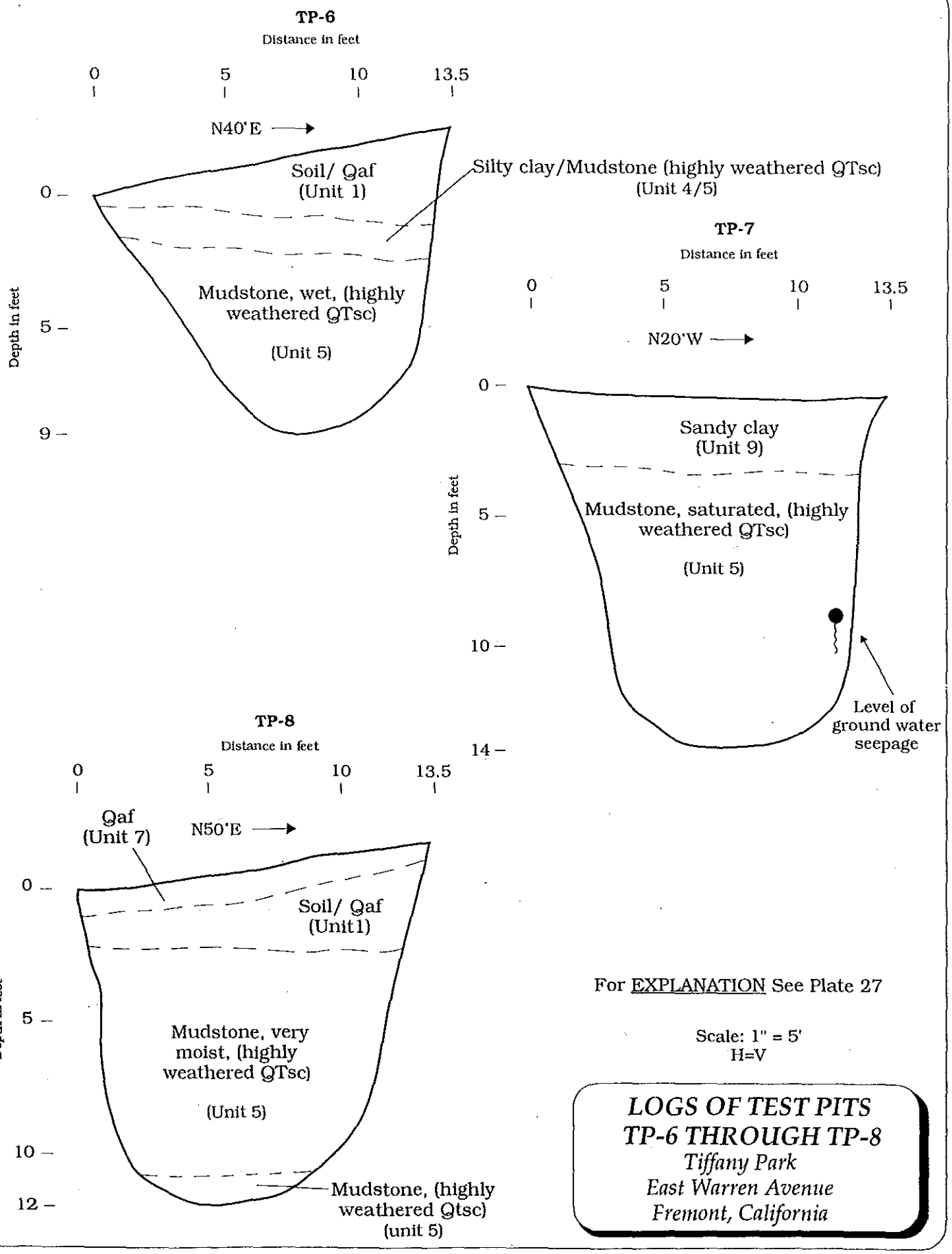




For EXPLANATION See Plate 27

Scale: 1" = 5'
H=V

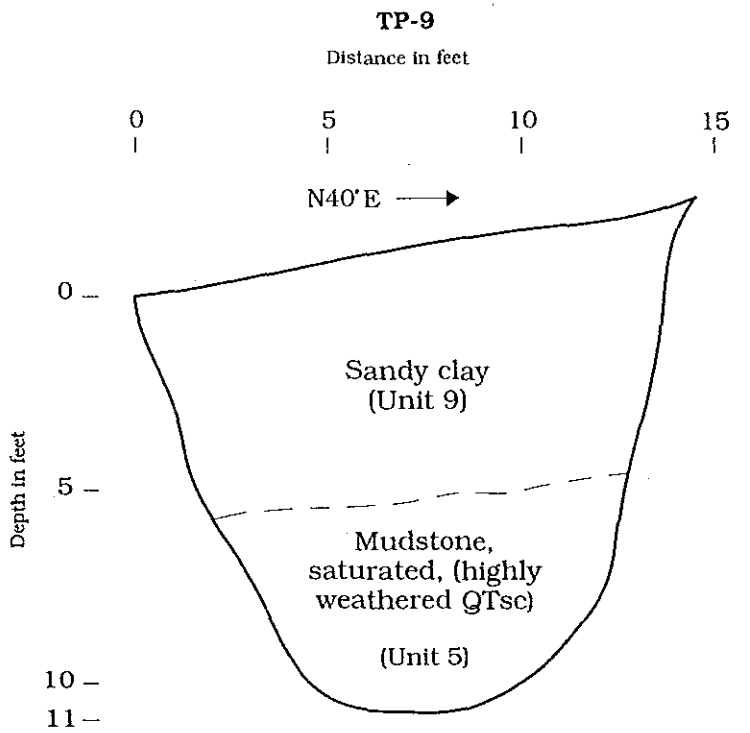
LOGS OF TEST PITS TP-3 THROUGH TP-5
Tiffany Park
East Warren Avenue
Fremont, California

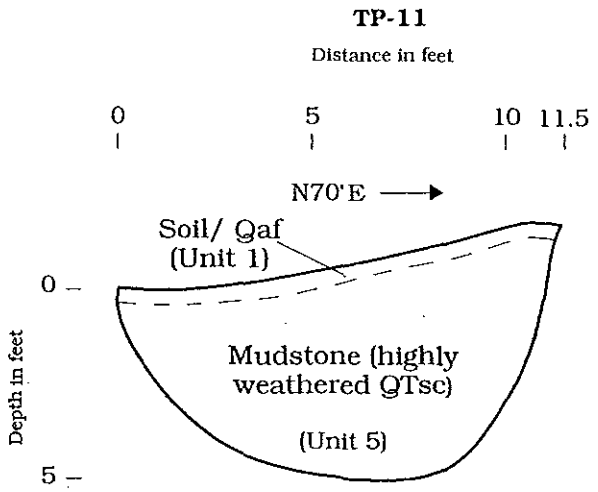


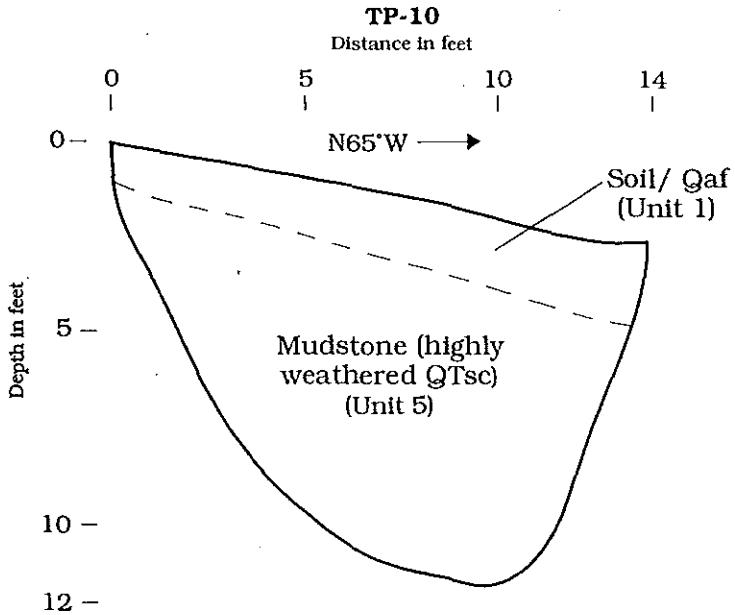
For EXPLANATION See Plate 27

Scale: 1" = 5'
H=V

LOGS OF TEST PITS
TP-6 THROUGH TP-8
Tiffany Park
East Warren Avenue
Fremont, California



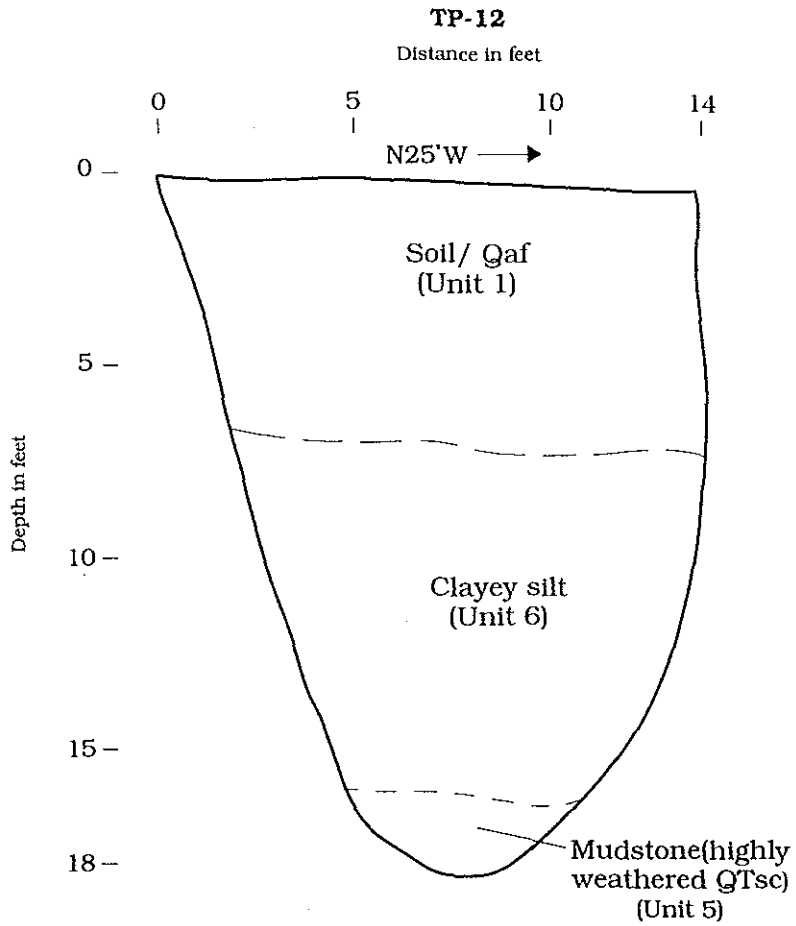


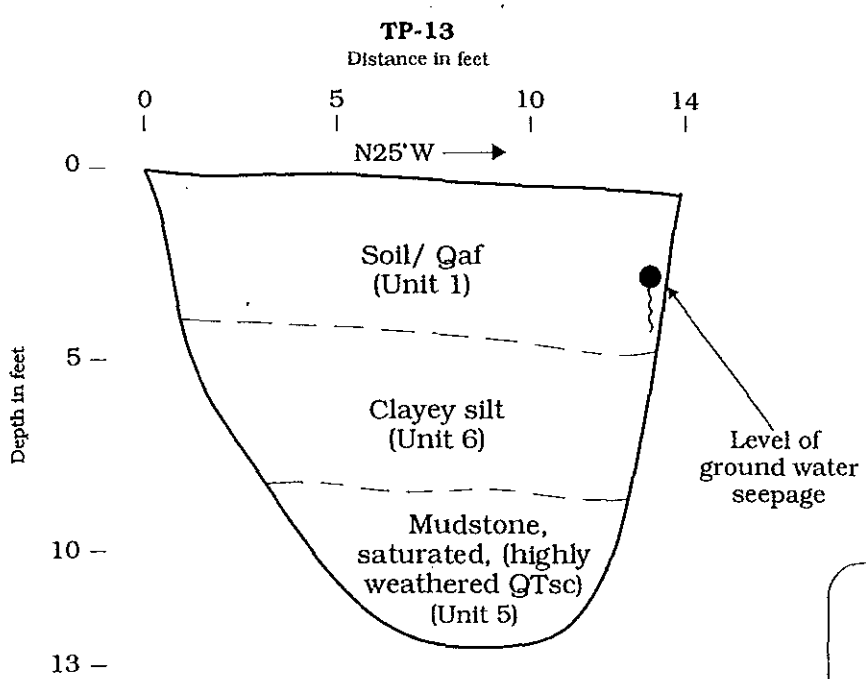


For EXPLANATION See Plate 27

Scale: 1" = 5'
H=V

LOGS OF TEST PITS TP-9 THROUGH TP-11
Tiffany Park
East Warren Avenue
Fremont, California

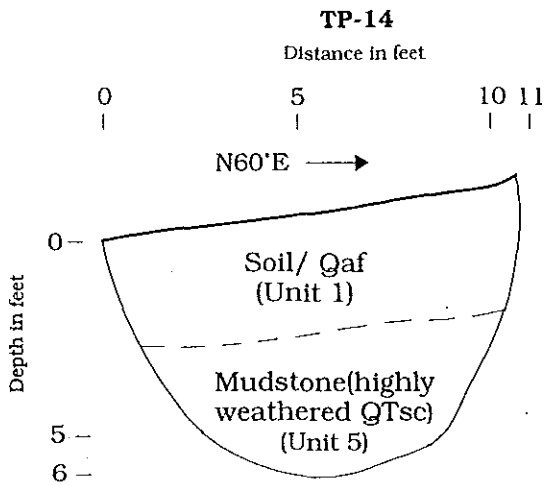


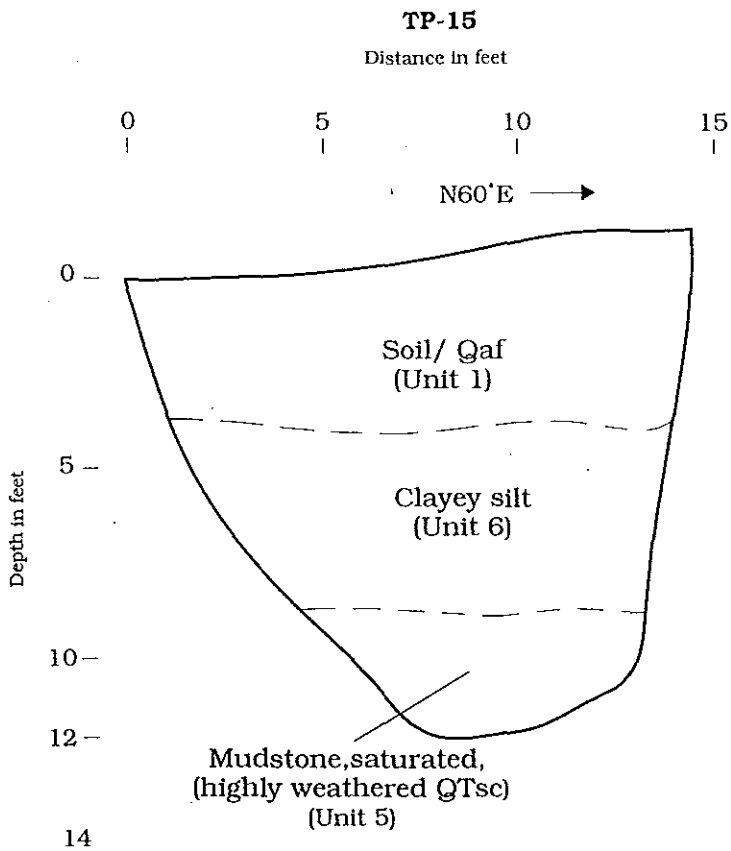


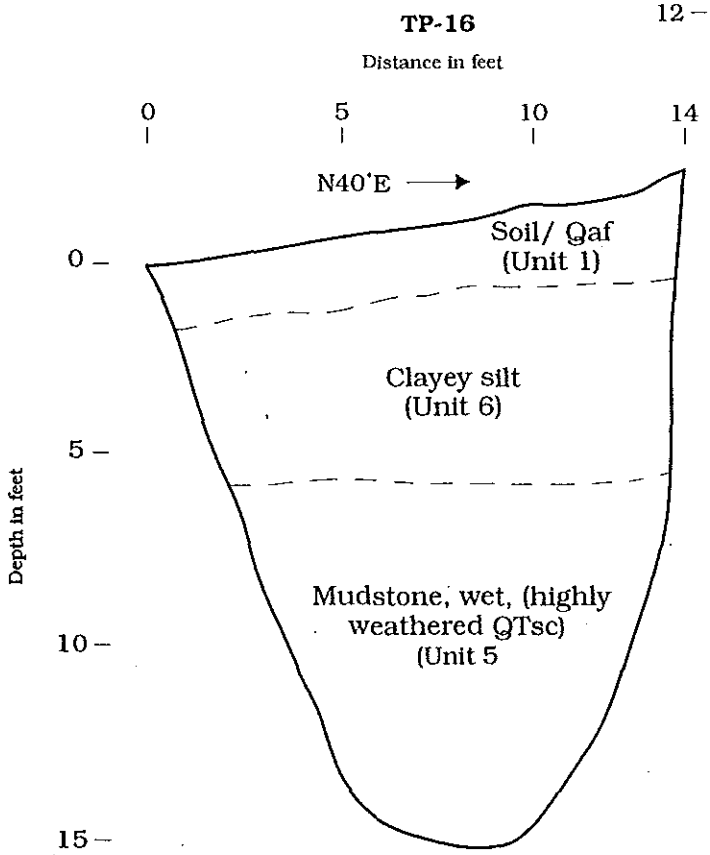
For EXPLANATION See Plate 27

Scale: 1" = 5'
H=V

LOGS OF TEST PITS
TP-12 AND TP-13
Tiffany Park
East Warren Avenue
Fremont, California



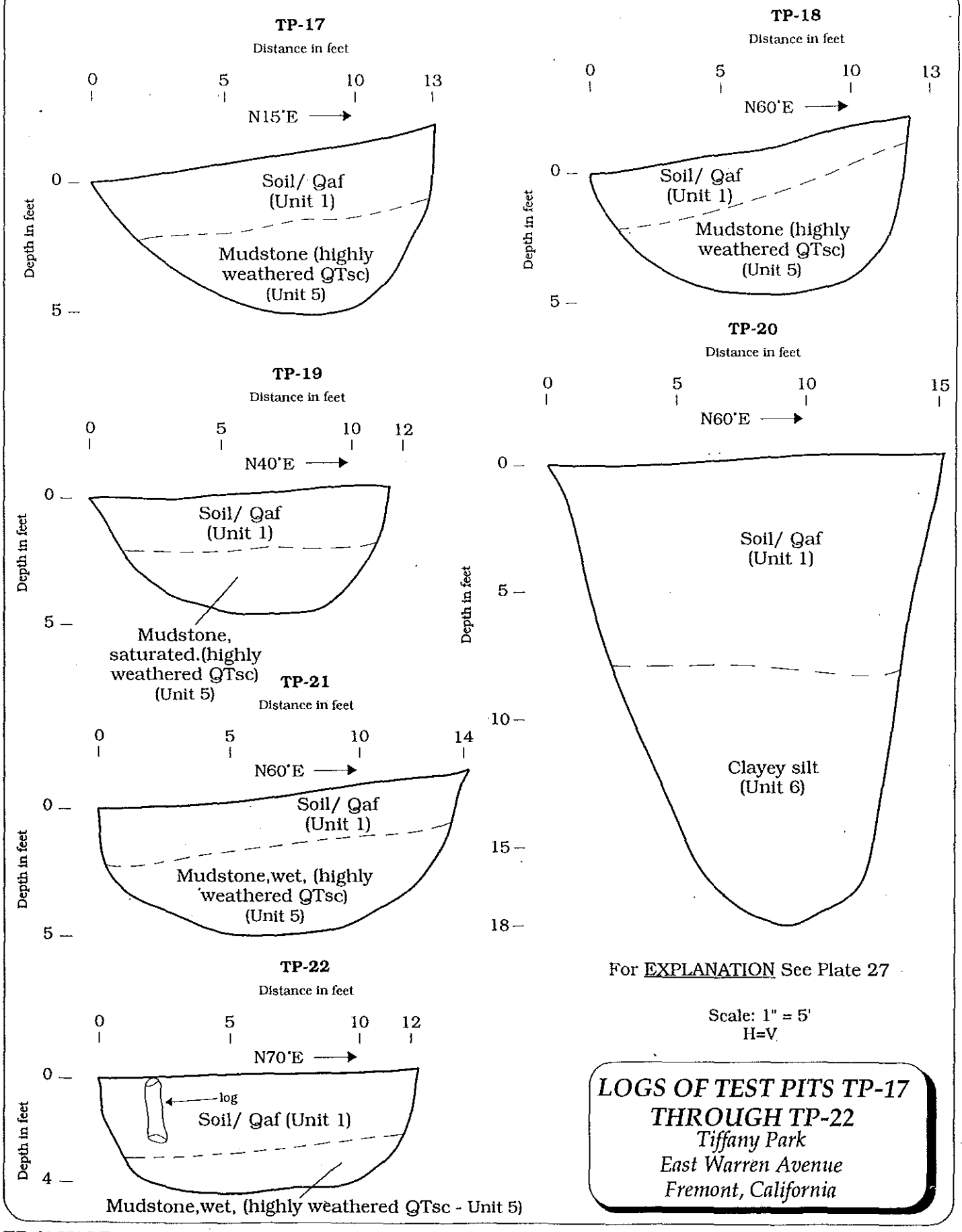




For EXPLANATION See Plate 27

Scale: 1" = 5'
H=V

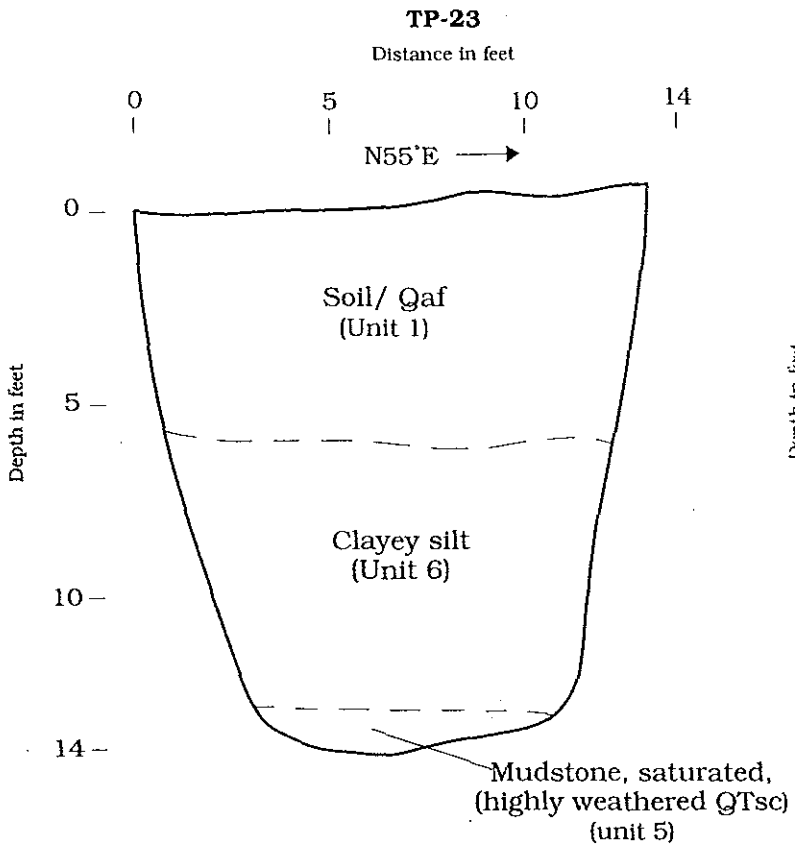
LOGS OF TEST PITS TP-14 THROUGH TP-16
Tiffany Park
East Warren Avenue
Fremont, California

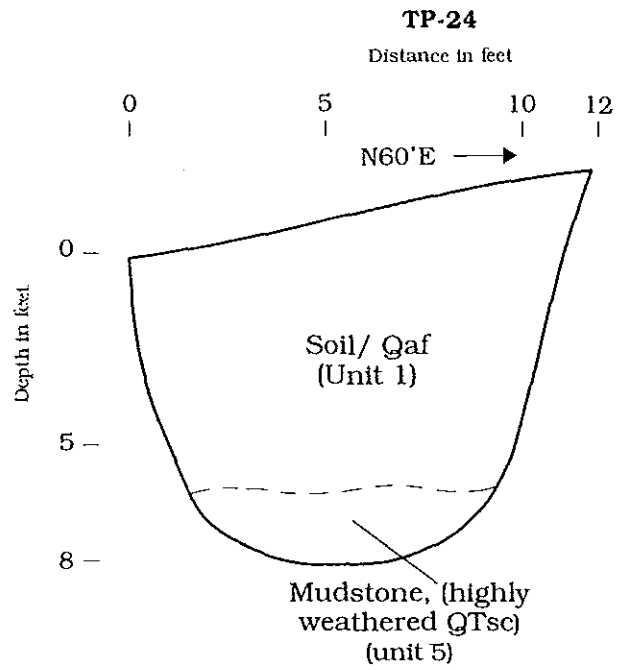


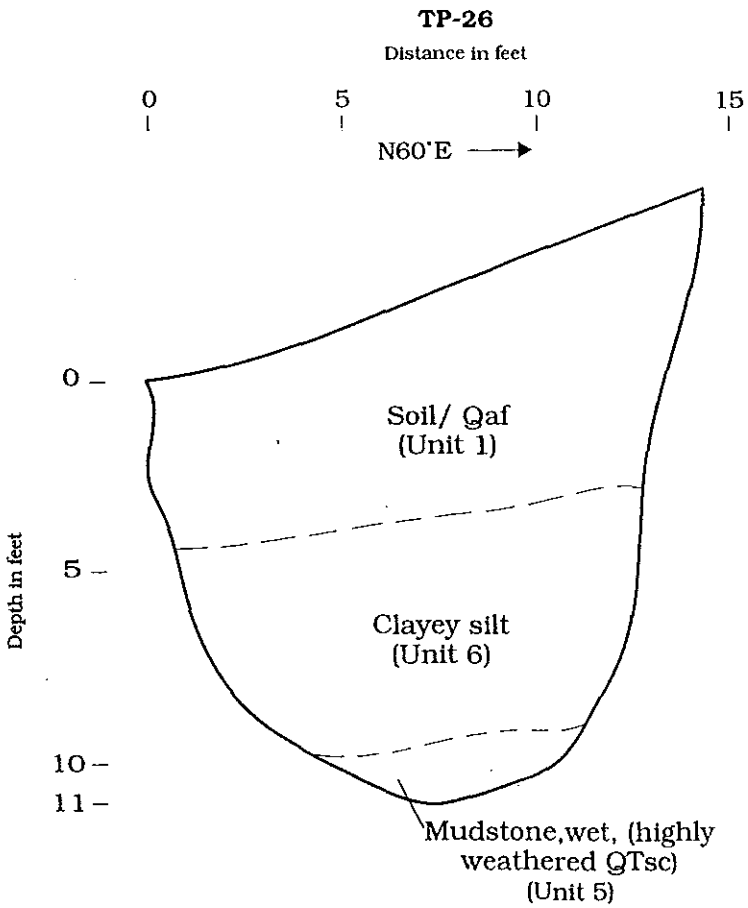
For EXPLANATION See Plate 27

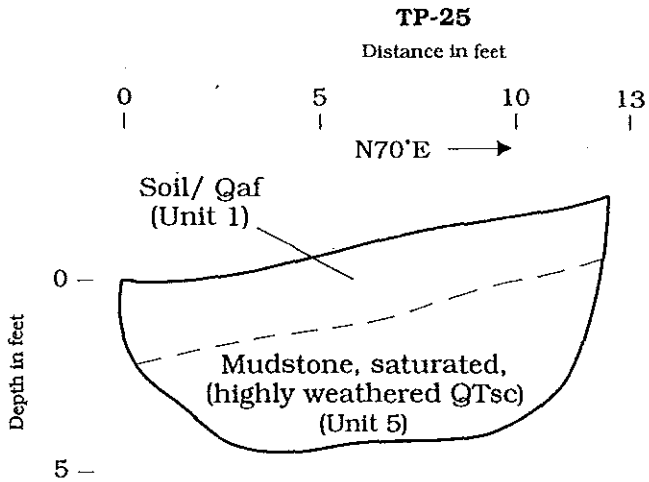
Scale: 1" = 5'
H=V

LOGS OF TEST PITS TP-17 THROUGH TP-22
Tiffany Park
East Warren Avenue
Fremont, California









For EXPLANATION See Plate 27

Scale: 1" = 5'
H=V

LOGS OF TEST PITS TP-23 THROUGH TP-26
Tiffany Park
East Warren Avenue
Fremont, California

EXPLANATION

UNIT 1: **Silty clay,** black, slightly moist to moist, moderately plastic, stiff to very stiff; some sand, moderately sticky (soil/Qaf).

UNIT 2: **Sandy clay,** dark brownish-gray, moist, moderately plastic; trace meduim-grained sand and silt, moderately sticky.

UNIT 3: **Clayey silt,** brown and dark gray mottled, slightly moist; some fine- to medium-grained sand; pockets of fine white powder (caliche) common, hard, some organics (topsoil?).

UNIT 4: **Silty clay,** yellowish-brown, moist, very plastic, stiff to very stiff; some fine- to medium-grained sand, thin layers of fine white powder (caliche) common, very sticky.

UNIT 5: **Mudstone**, with the consistency of clayey silt to silty clay, medium greenish-gray with reddish-brown fracture surfaces, moist, very stiff to hard, layers of fine white powder (caliche) common, some coarse-grained sand and pebbles, blocky fracture pattern (highly weathered Santa Clara Formation bedrock).

UNIT 6: **Clayey silt,** medium to dark gray with some brown mottling, slightly moist, some fine- to medium-grained sand, pockets of fine white powder (caliche) common, hard.

UNIT 7: **Silty sand,** fine- to medium-grained, light gray and brown mottled, damp to dry; some clay, stiff, moderately crumbly, some organics (Qaf).

UNIT 8: **Siltstone,** orangish-brown and gray mottled, reddish-brown fracture surfaces, slightly moist, dense, moderately well-indurated; some silt and medium -to coarse-grained sand, few pebbles, (moderately weathered Santa Clara formation bedrock).

UNIT 9: **Sandy clay,** dark gray to black, very wet to saturated, little medium- to coarse-grained sand, organic rich, some peat.

UNIT 10: **Silty sand,** fine-grained, orangish-brown and greenish-grey mottled, damp, some pebbles and medium -to coarse-grained gravel, little medium -to coarse-grained sand and trace clay (weathered bedrock?).

UNIT 10a: **Silty sand,** fine-grained, greenish-grey, damp to dry, some medium -to coarse-grained sand (weathered bedrock?).

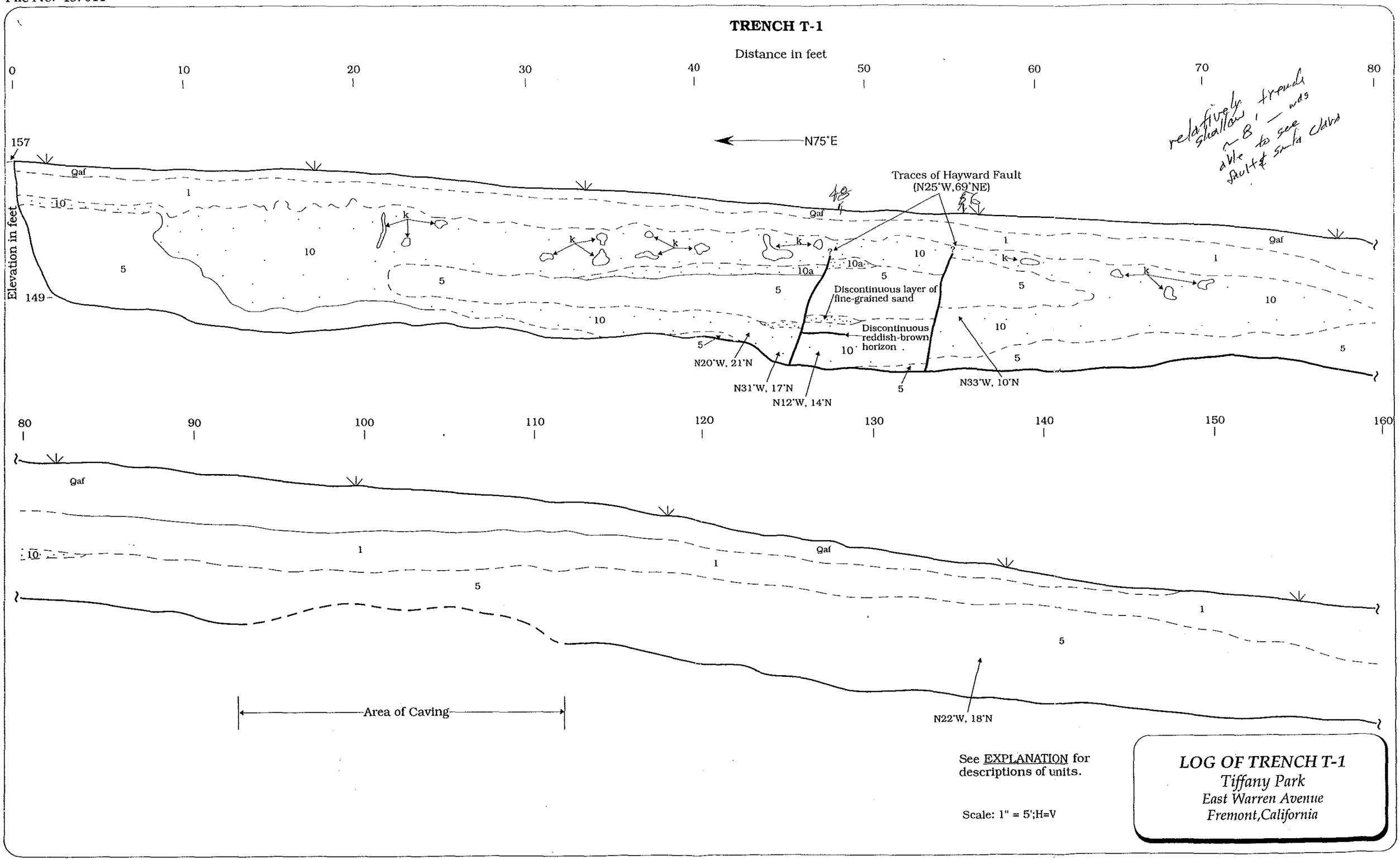
UNIT 11: **Gravelly sand,** slightly moist, loose, gravel is fine -to coarse-grained, cobbles and boulders up to 1-1/2 feet in diameter common (channel deposit?)

k: Krotovina (filled-in animal burrow).

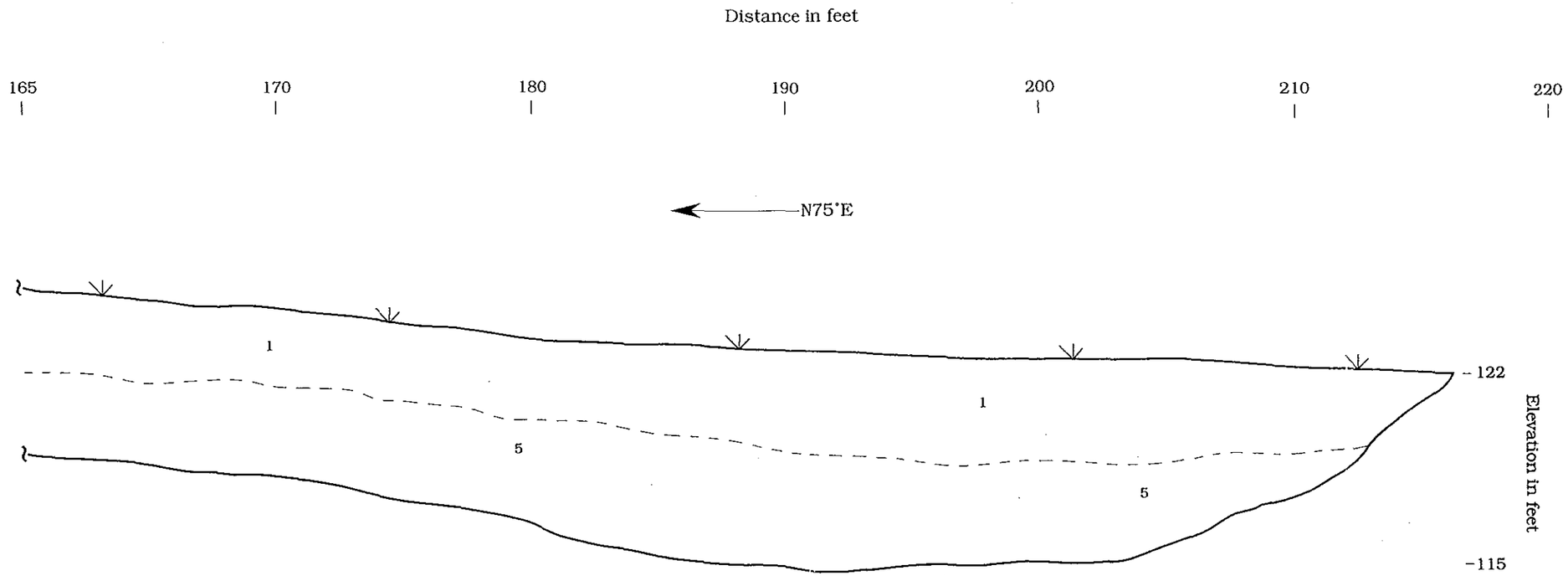
:Vegetation

EXPLANATION FOR
TEST PITS AND TRENCHES
Tiffany Park
East Warren Avenue
Fremont, California

File No: 157011



TRENCH T-1 (CONTINUED)

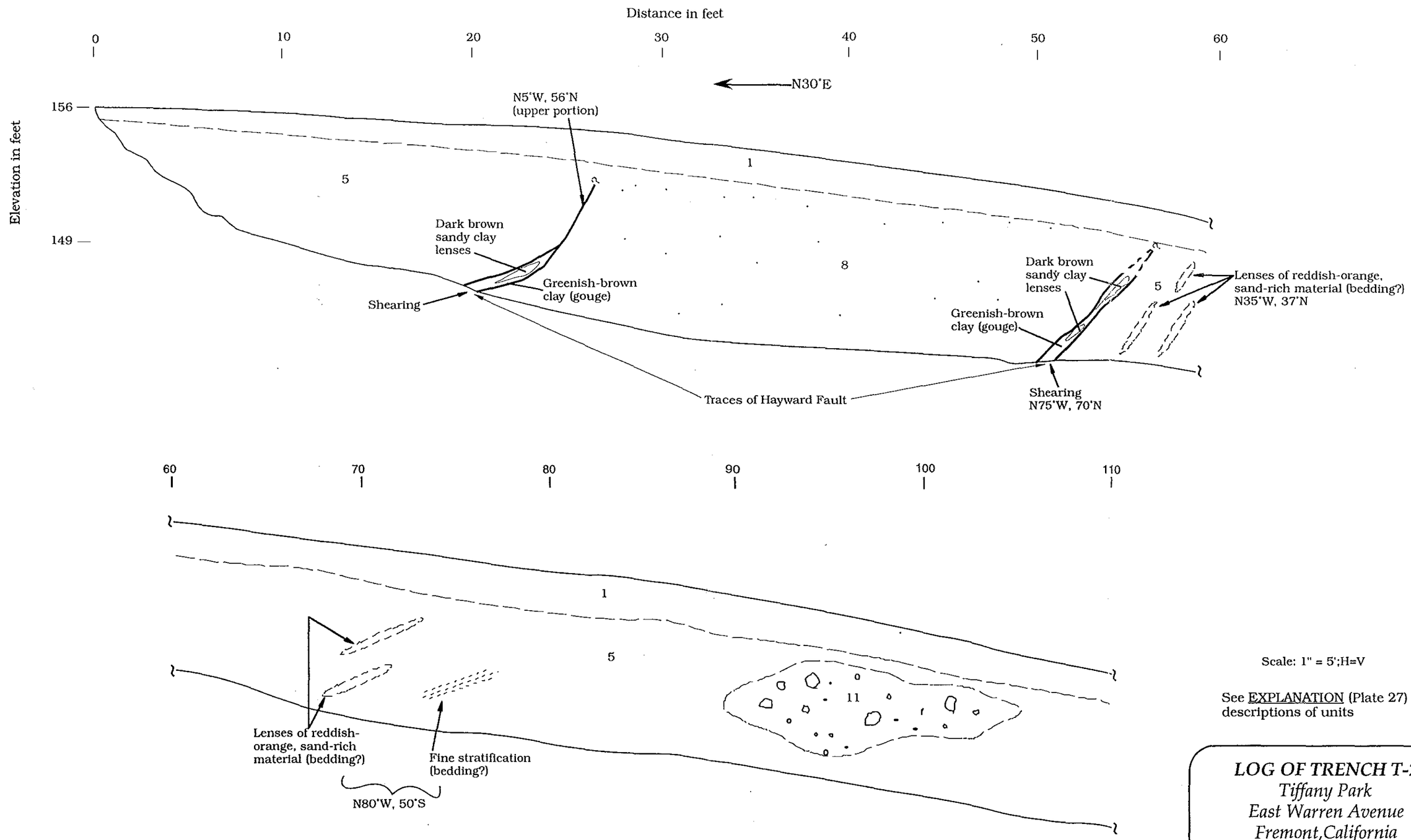


Scale: 1" = 5';H=V

See EXPLANATION (Plate 27)
for description of units

LOG OF TRENCH T-1
(CONTINUED)
Tiffany Park
East Warren Avenue
Fremont,California

TRENCH T-2

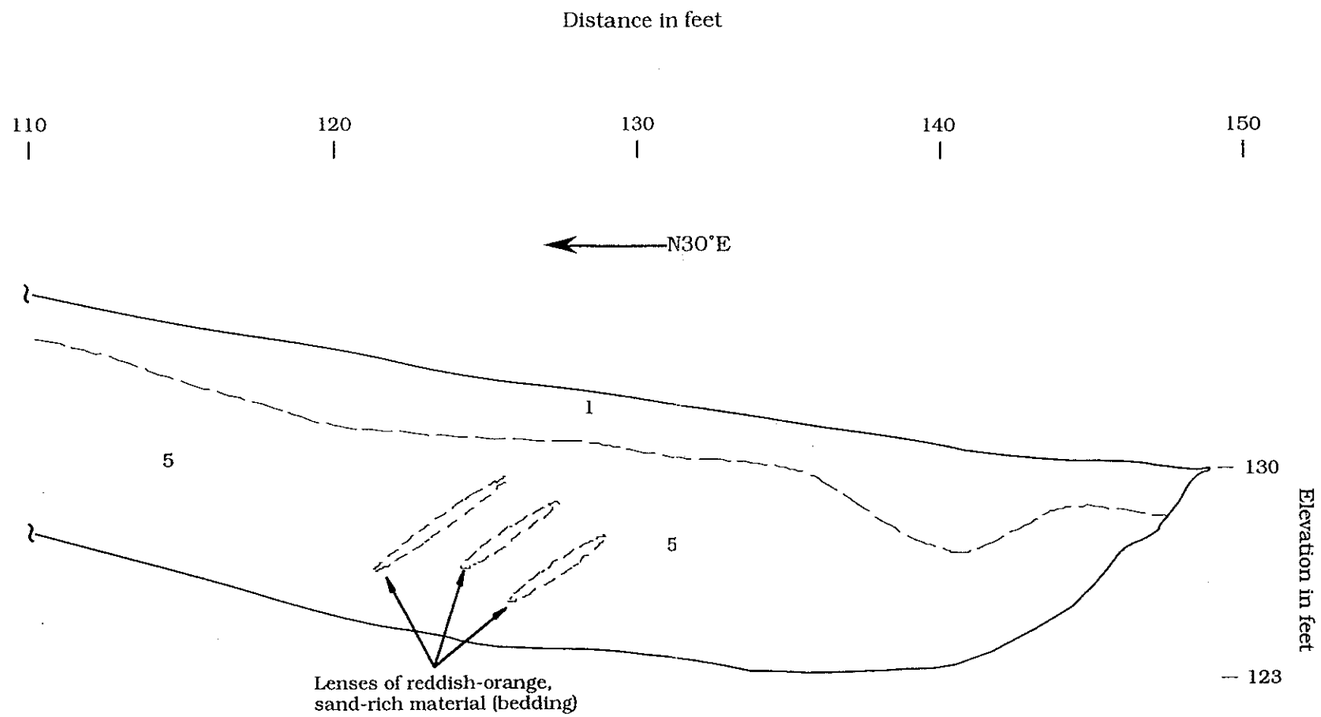


Scale: 1" = 5';H=V

See EXPLANATION (Plate 27) for descriptions of units

LOG OF TRENCH T-2
Tiffany Park
East Warren Avenue
Fremont, California

TRENCH T-2 (CONTINUED)



Scale: 1" = 5';H=V

See EXPLANATION (Plate 27) for descriptions of units

LOG OF TRENCH T-2
(CONTINUED)
Tiffany Park
East Warren Avenue
Fremont, California

Testing Results

Direct shear

				Moisture	dry density
B-8-1 @ 6½-7	$\phi = 10.9°$	$c = 537$ PSF		28.9%	93.1 PCF
B-9-1 @ 6-6½	$\phi = 19.0°$	$c = 209$ PSF		28.1%	87.5 PCF

Unconfined compressive

B-8-4	4.645 KSF		31.7%	90.2 PCF
B-9-2	2.758 KSF		35.6%	84.6 PCF

APPENDIX C

LOGS OF TRENCHES

ASSOCIATED TERRA CONSULTANTS (2001)

EXPLANATION FOR TRENCHES T-3 AND T-4

A - Silty clay, very dark gray to brownish black, dry to slightly damp, soft to firm, high plasticity, vertisol with minor inclusions to 1/2" to 1" across.

B - Sandy clay, with subangular fragments of underlying bedrock, gray, soft to firm, high plasticity.

C - Sandstone, fine-grained, orangish brown, slightly damp, medium dense, friable.

D - Conglomerate, predominately grayish white with reddish brown clasts, medium dense, friable, subangular clasts to 1" across in a medium-grained sand and caliche matrix.

E - Sandstone, fine-grained, orangish brown, slightly damp, medium dense, friable.

F - Conglomerate, predominately grayish white with reddish brown clasts, medium dense, friable, subangular clasts to 1" across in a medium-grained sand and caliche matrix.

G - Sandstone, fine-grained, orangish brown, slightly damp, medium dense, friable.

H - Claystone, medium reddish brown, damp, medium dense, with coarse-grained sand and caliche.

I - Sandstone, fine-grained, orangish brown, slightly damp, medium dense, friable.

J - Sandy clay, medium reddish brown, damp, firm to stiff, with coarse-grained sand and caliche.

K - Conglomerate, predominately grayish white with reddish brown clasts, medium dense, friable, subangular clasts to 1" across in a medium-grained sand and caliche matrix.

L - Mudstone, medium gray with reddish brown fracture surfaces, damp, very stiff to hard, high plasticity, with the consistancy of a silty clay to clayey silt towards the top.

M - Sandstone, fine-grained, orangish brown, slightly damp, medium dense, friable.

N - Sandstone, medium to coarse-grained, yellowish brown, damp, medium dense, with pockets of caliche.

EXPLANATION FOR TRENCHES T-3 AND T-4 (Continued)

O - Sandstone, fine-grained, orangish brown, slightly damp, medium dense, friable.

P - Sandstone, medium to coarse-grained, yellowish brown, damp, medium dense, with pockets of caliche.

Q - Claystone, medium gray, slightly damp, medium dense.

R - Conglomerate, predominately grayish white with reddish brown clasts, medium dense, friable, subangular clasts to 1" across in a medium-grained sand and caliche matrix.

S - Sandstone, fine-grained, orangish brown, slightly damp, medium dense, friable, normally graded, top up.

T - Mudstone, medium gray with reddish brown fracture surfaces, damp, very stiff to hard, high plasticity, with the consistancy of a silty clay to clayey silt towards the top.

U - Sandstone, fine-grained, orangish brown, slightly damp, medium dense, friable.

V - Claystone, medium gray, slightly damp, medium dense.

W - Sandstone, fine-grained, orangish brown, slightly damp, medium dense, friable.

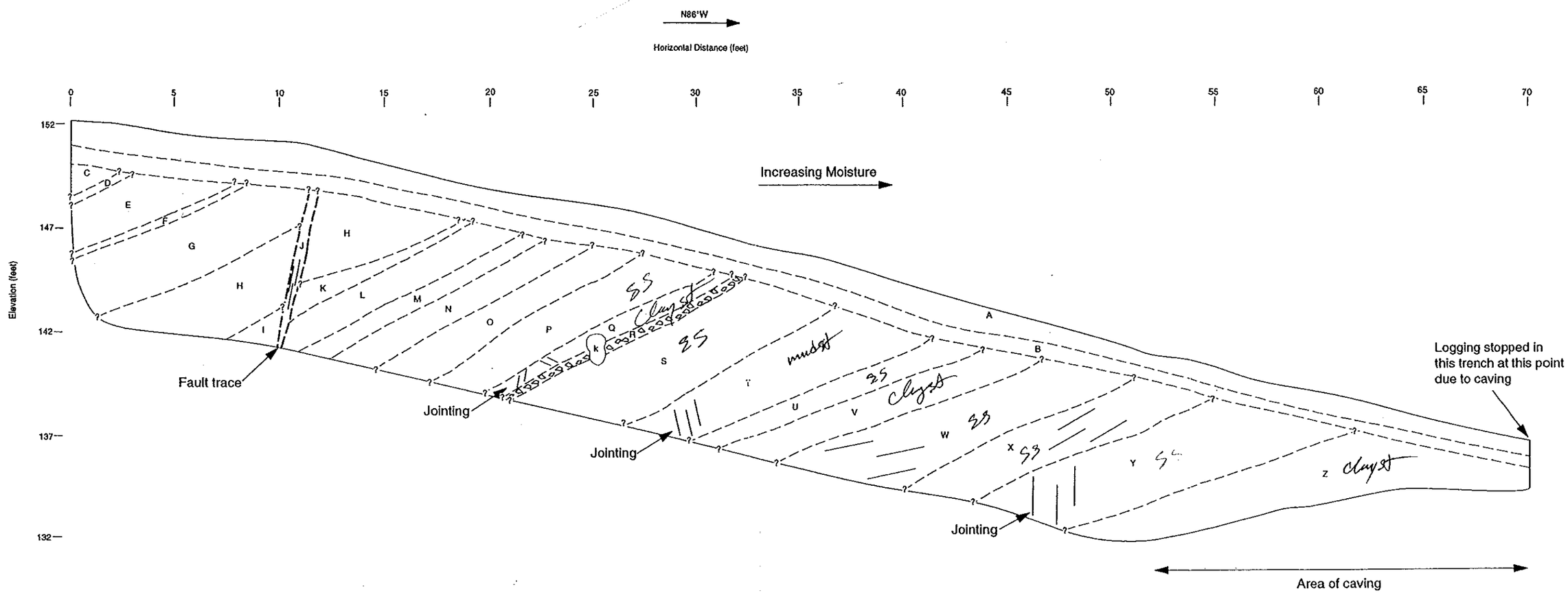
X - Claystone, medium gray, slightly damp, medium dense.

Y - Sandstone, fine-grained, orangish brown, slightly damp, medium dense, friable.

Z - Claystone, dark gray to black with orange stain on fractures, damp, medium dense, very fractured, randomly oriented slickensides; with thin shelled pelcypods to 3" across.

AA - Conglomerate, predominately grayish white with reddish brown clasts, medium dense, friable, subangular clasts to 1" across in a medium-grained sand and caliche matrix.

k - Krotovina (filled-in animal burrow)

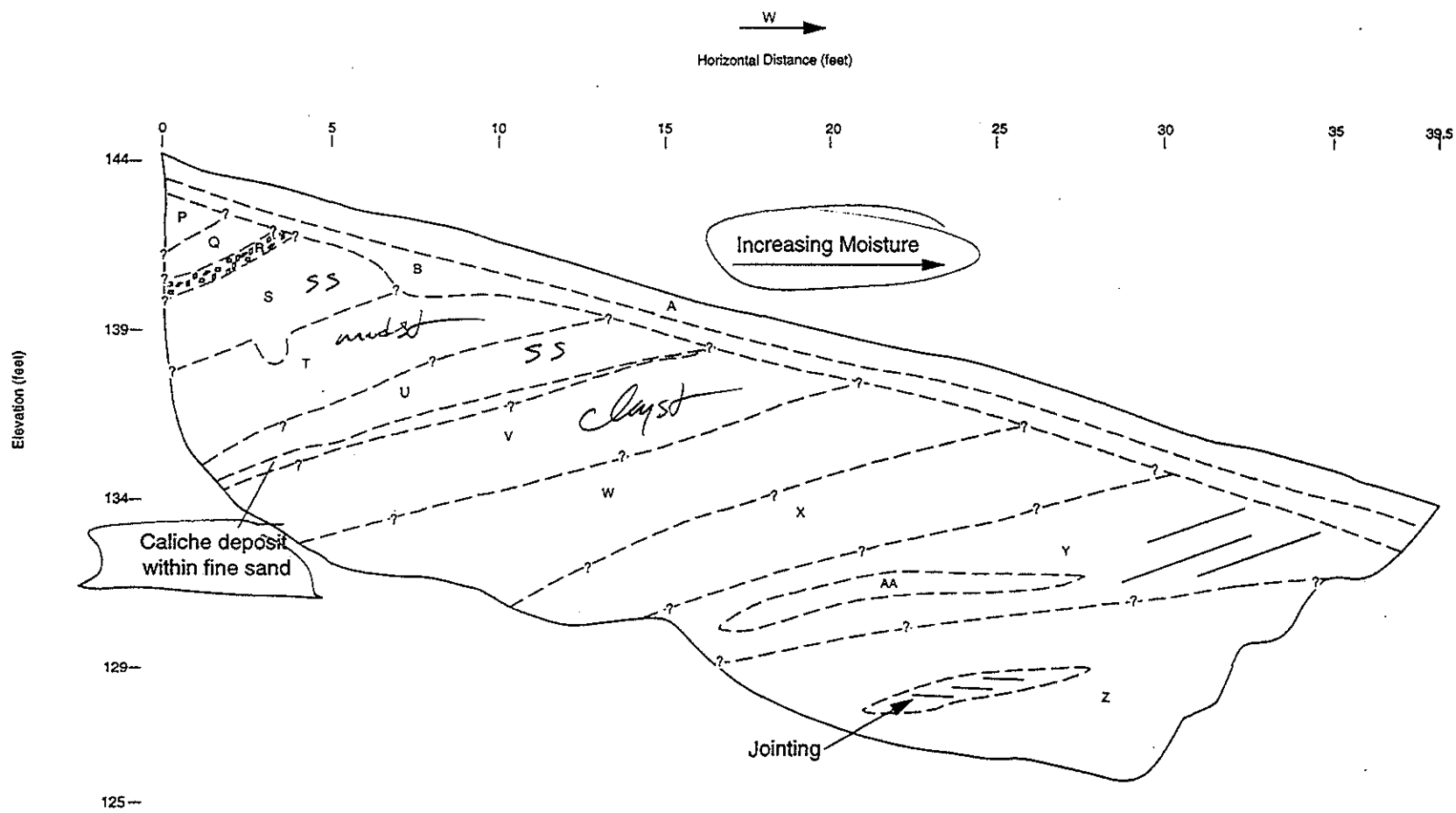


Scale: 1 inch = 5 feet

LOG OF TRENCH T-3
Tiffany Park
East Warren Avenue
Fremont, California

See EXPLANATION FOR TRENCHES T-3 AND T-4.

File No.: 157015



Scale: 1 inch = 5 feet

LOG OF TRENCH T-4
Tiffany Park
East Warren Avenue
Fremont, California

See EXPLANATION FOR TRENCHES T-3 AND T-4

APPENDIX D

LOGS OF BORINGS AND PITS
AND LABORATORY TEST DATA

UPP GEOTECHNOLOGY (2005)

EQUIPMENT	CME 75	RELATIVE ELEVATION	157'	LOGGED BY	L. Stupi
DEPTH TO GROUNDWATER	Not Encountered	DEPTH TO BEDROCK	0'	DATE DRILLED	10-20-03

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLE	PENETRATION RESISTANCE (BLOWS / FT.)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
SANDSTONE; pale yellow (5Y 7/3); fine to coarse-grained; trace angular coarse sand; caliche; slightly moist; moderately weathered (Bedrock)	(Medium Dense)	rock	1		20	12	110	
			2					
			3		23	16		
			4		17	5		
CLAYSTONE; gray (10YR 5/1); trace, subangular, coarse-grained sand; moist; highly weathered (Bedrock)	(Very Stiff to Hard)	rock	5					
			6		20	26	96	1.5*
			7					
			8					
			9					
* = Unconfined compression test			10		33	18		
Bottom of Boring = 10.0'			11					
			12					
			13					
			14					
			15					
			16					
			17					
			18					
			19					
			20					

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Engineering Geology • Geotechnical Engineering

LOG OF BORING 1

TIFFANY PARK ESTATE
Fremont, California

PROJECT NO.	DATE	FIGURE NO.
2576.2R1	March 2005	10

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EQUIPMENT	CME 75	RELATIVE ELEVATION	157.5'	LOGGED BY	L. Stupi
DEPTH TO GROUNDWATER	Not Encountered	DEPTH TO BEDROCK	0'	DATE DRILLED	10-20-03

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLE	PENETRATION RESISTANCE (BLOWS / FT.)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
SANDY SILTSTONE; pale yellow (5Y 7/3) to grayish brown (2.5Y 5/2); fine to medium-grained; caliche; oxidation staining; moist; weathered (Bedrock)	(Medium Dense)	rock	1		14	18	101	
			3		14	11	113	
			4		14	14		
			6		20	17	111	2.5*
* = Unconfined compression test			10		20			
Bottom of Boring = 10.0'								

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LOG OF BORING 2

TIFFANY PARK ESTATE
Fremont, California

PROJECT NO.	DATE	FIGURE NO.
2576.2R1	March 2005	11

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EQUIPMENT	CME 75	RELATIVE ELEVATION	156.5'	LOGGED BY	L. Stupi
DEPTH TO GROUNDWATER	Not Encountered	DEPTH TO BEDROCK	3.0'	DATE DRILLED	10-20-03

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLE	PENETRATION RESISTANCE (BLOWS / FT.)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
SILTY CLAY; very dark grayish brown (2.5Y 3/2); trace fine to coarse-grained sand; sub-angular rock fragments up to 0.5" diameter; moist (Topsoil)	Stiff	CL	1		10	19		
SILTY CLAY; light yellowish brown (2.5Y 6/3); trace rounded coarse-grained sand; homogeneous; moist; (Colluvium)	Very Stiff	ML	3		20	17	117	3.9*
SILTSTONE; light yellowish brown (2.5Y 3/2) to light olive brown (2.5Y 5/3); scattered, fine- to coarse-grained, angular sand, gravels, and pebbles; highly weathered (Bedrock)	(Very Stiff to Hard)	rock	4		31	14		
			6		47	16	117	4.5*
* = Unconfined compression test			10		25			
Bottom of Boring = 10.0'								

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LOG OF BORING 3

TIFFANY PARK ESTATE
Fremont, California

PROJECT NO.	DATE	FIGURE NO.
2576.2R1	March 2005	12

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EQUIPMENT	CME 75	RELATIVE ELEVATION	116'	LOGGED BY	L. Stupi
DEPTH TO GROUNDWATER	Not Encountered	DEPTH TO BEDROCK	18.0'	DATE DRILLED	10-21-03

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLE	PENETRATION RESISTANCE (BLOWS / FT.)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
SILTY CLAY; very dark gray (2.5Y N3/); trace fine to coarse-grained sand; sub-rounded rock fragments up to 0.5" diameter; moist (Dls / Colluvium / Older Alluvium)	Very Stiff	ML	1, 2, 3, 4, 5, 6		18	24	102	
grades to very dark grayish brown (2.5Y 3/2)			10, 11		18	26	92	
			15, 16		14	25	94	
CLAYEY SILTSONE; light yellowish brown 10YR 5/6); trace coarse-grained sand; homogeneous; moist; very highly weathered (Bedrock)	(Stiff to Very Stiff)	rock	18, 19, 20					

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LOG OF BORING 4

TIFFANY PARK ESTATE
Fremont, California

PROJECT NO.	DATE	FIGURE NO.
2576.2R1	March 2005	13

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EQUIPMENT	CME 75	RELATIVE ELEVATION	116'	LOGGED BY	L. Stupi
DEPTH TO GROUNDWATER	Not Encountered	DEPTH TO BEDROCK	18.0'	DATE DRILLED	10-21-03

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLE	PENETRATION RESISTANCE (BLOWS / FT.)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
CLAYEY SILTSTONE (continued from previous page)			21		19	22	104	
			22					
			23					
			24					
			25					
			26		14	23		
			27					
			28					
			29					
			30					
			31		14	23		
			32					
			33					
			34					
			35					
			36		15	23		
			37					
			38					
			39					
Bottom of Boring = 40.0'			40		16	22		

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LOG OF BORING 4 (continued)

TIFFANY PARK ESTATE
Fremont, California

PROJECT NO.	DATE	FIGURE NO.
2576.2R1	March 2005	14

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EQUIPMENT	CME 75	RELATIVE ELEVATION	113'	LOGGED BY	L. Stupi
DEPTH TO GROUNDWATER	Not Encountered	DEPTH TO BEDROCK	18.0'	DATE DRILLED	10-21-03

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLE	PENETRATION RESISTANCE (BLOWS / FT.)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
SILTY CLAY; very dark gray (2.5Y N3/); trace fine to coarse-grained sand; sub-rounded rock fragments up to 0.5" diameter; moist (Dls / Colluvium / Older Alluvium)	Stiff to Very Stiff	ML	1, 2, 3, 4, 5, 6, 7, 8, 9, 10					
			6		10	25	96	
grades to very dark grayish brown (2.5Y 3/2)			11, 12, 13, 14, 15, 16, 17, 18, 19, 20					
			11		14	24	96	
			16		20	23	101	
CLAYEY SILTSONE; light yellowish brown (10YR 5/6); trace coarse-grained sand; homogeneous; moist; very highly weathered (Bedrock)	(Very Stiff)	rock						

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LOG OF BORING 5

TIFFANY PARK ESTATE
Fremont, California

PROJECT NO.	DATE	FIGURE NO.
2576.2R1	March 2005	15

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EQUIPMENT	CME 75	RELATIVE ELEVATION	113'	LOGGED BY	L. Stupi
DEPTH TO GROUNDWATER	Not Encountered	DEPTH TO BEDROCK	18.0'	DATE DRILLED	10-21-03

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLE	PENETRATION RESISTANCE (BLOWS / FT.)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
CLAYEY SILTSTONE (continued from previous page)	(Very Stiff)	rock	21		22	21	104	
			22					
			23					
			24					
			25					
			26		22	21	108	
			27					
			28					
			29					
			30					
			31		18	20		
Bottom of Boring = 31.5'			32					
			33					
			34					
			35					
			36					
			37					
			38					
			39					
			40					

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LOG OF BORING 5 (continued)

TIFFANY PARK ESTATE
Fremont, California

PROJECT NO.	DATE	FIGURE NO.
2576.2R1	March 2005	16

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EQUIPMENT	CME 75	RELATIVE ELEVATION	116'	LOGGED BY	L. Stupi
DEPTH TO GROUNDWATER	Not Encountered	DEPTH TO BEDROCK	13.0'	DATE DRILLED	10-21-03

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLE	PENETRATION RESISTANCE (BLOWS / FT.)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
CLAY; very dark gray (10YR 3/1); trace sub-rounded coarse-grained sand, pebbles, and rock fragments up to 1" diameter; homogeneous; moist (Dls / Colluvium / Older Alluvium)	Very Stiff	CL	1, 2, 3, 4, 5, 6, 7, 8, 9					
			6		16	22	102	
grades to dark grayish brown (2.5Y 3/2)			10, 11, 12					
			11		20	17	107	
SILTSTONE; light yellowish brown (10YR 5/6); abundant caliche stringers; moist; highly weathered (Bedrock)	(Hard)	rock	13, 14, 15, 16, 17, 18					
			16		42	14	121	
SANDSTONE (see following page)	(Dense)	rock	19, 20					

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LOG OF BORING 6

TIFFANY PARK ESTATE
Fremont, California

PROJECT NO.	DATE	FIGURE NO.
2576.2R1	March 2005	17

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EQUIPMENT	CME 75	RELATIVE ELEVATION	116'	LOGGED BY	L. Stupi
DEPTH TO GROUNDWATER	Not Encountered	DEPTH TO BEDROCK	13.0'	DATE DRILLED	10-21-03

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLE	PENETRATION RESISTANCE (BLOWS / FT.)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
SANDSTONE; light yellowish brown (2.5Y 6/4); fine-grained sand; trace sub-angular pebbles and coarse-grained sand; moist; highly weathered (Bedrock)	(Dense)	rock	21		33	13	121	
CLAYSTONE; pale olive (5Y 6/3); scattered oxidation staining; moist; highly weathered (Bedrock)	(Stiff)	rock	26		12	32		
			31		13	36		
Bottom of Boring = 31.5'								

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LOG OF BORING 6 (continued)

TIFFANY PARK ESTATE
Fremont, California

PROJECT NO.	DATE	FIGURE NO.
2576.2R1	March 2005	18

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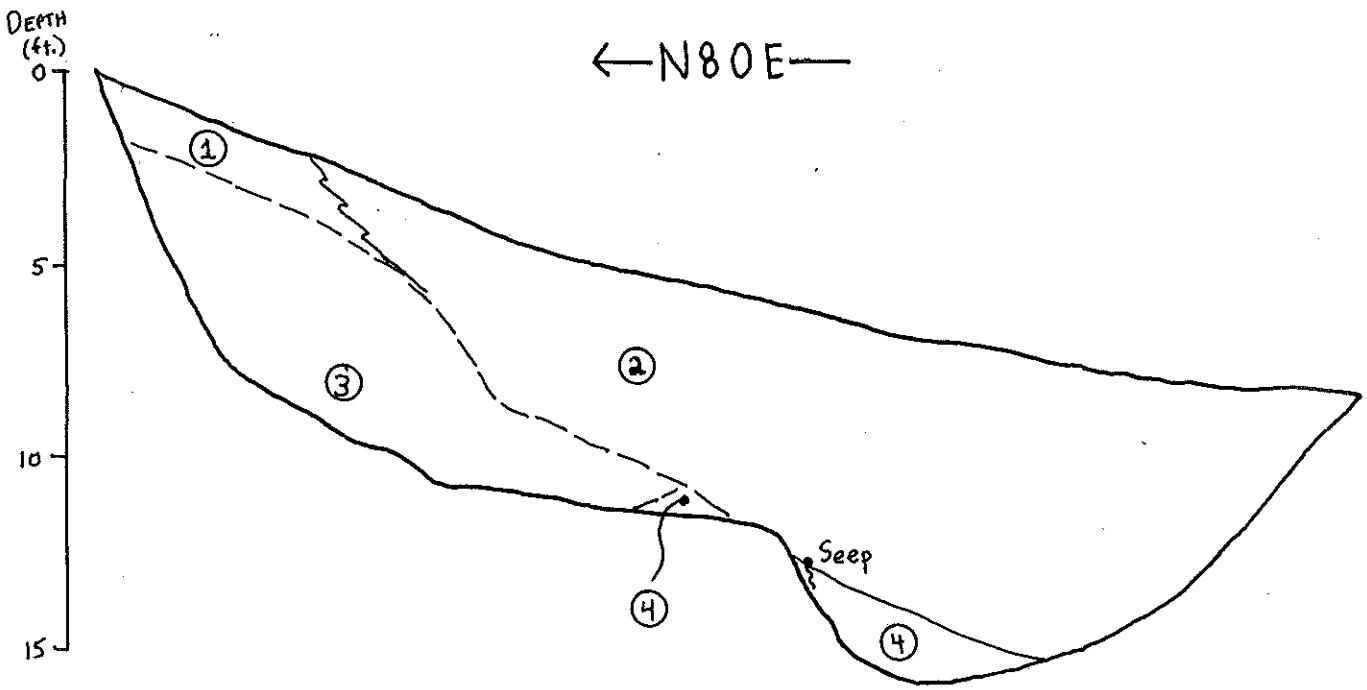

1. **SILTY CLAY**; very dark gray; scattered sub-rounded gravel; homogeneous; dry to slightly moist; (Topsoil)

2. **SILTY CLAY**; very dark gray mixed with light yellowish brown; heterogeneous; moist to very moist; rusted pipe and decaying lumber in uphill portion of unit; smooth, polished slide plane in downhill portion of unit between Unit 2 and Unit 4 below; (Dormant Landslide Debris Mixed With Fill)

3. **SANDSTONE**; pale yellow; fine- to medium-grained; poorly cemented; scattered oxidation staining; highly weathered; (Bedrock)

4. **CLAYSTONE**; gray to light olive brown; scattered oxidation staining; moist to wet with a seep at 6½ feet; highly weathered; contact between Unit 4 and sandstone (Unit 3) strikes N40W and dips 24 degrees to the northeast; (Bedrock)

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LOG OF EXPLORATION PIT 1

UPP GEOTECHNOLOGY, INC.
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TIFFANY PARK ESTATE
East Warren Avenue
Fremont, California

APPROVED BY	SCALE	PROJECT NO.	DATE	
C.H.	1" = 5'	2576.2R1	March 2005	Figure 19

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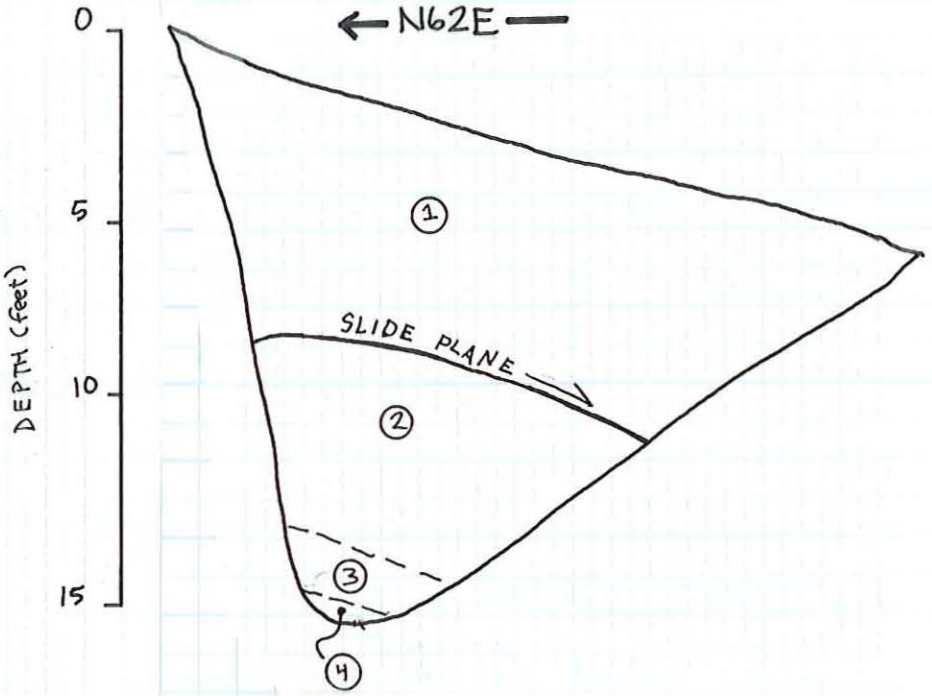

1. **SILTY CLAY**; very dark gray mixed with light yellowish brown; heterogeneous; moist to very moist; smooth, polished slide plane at base of unit; (Dormant Landslide Debris)

2. **SILTY CLAY**; light yellowish brown; scattered sub-rounded pebbles; scattered caliche stringers and nodules; relatively homogeneous; moist; (Colluvium)

3. **SANDSTONE**; pale yellow; fine- to medium-grained; poorly cemented; scattered oxidation staining; highly weathered; (Bedrock)

4. **CLAYSTONE**; gray to light olive brown; scattered oxidation staining; moist; highly weathered (Bedrock)

LOGGED BY: M. Baumann and L. Stupi; UPP GEOTECHNOLOGY, INC.; 9-25-03

LOG OF EXPLORATION PIT 4

UPP GEOTECHNOLOGY, INC. Engineering Geology • Geotechnical Engineering		TIFFANY PARK ESTATE East Warren Avenue Fremont, California		
APPROVED BY	SCALE	PROJECT NO.	DATE	
	1" = 5'	2576.2R1	March 2005	Figure 20

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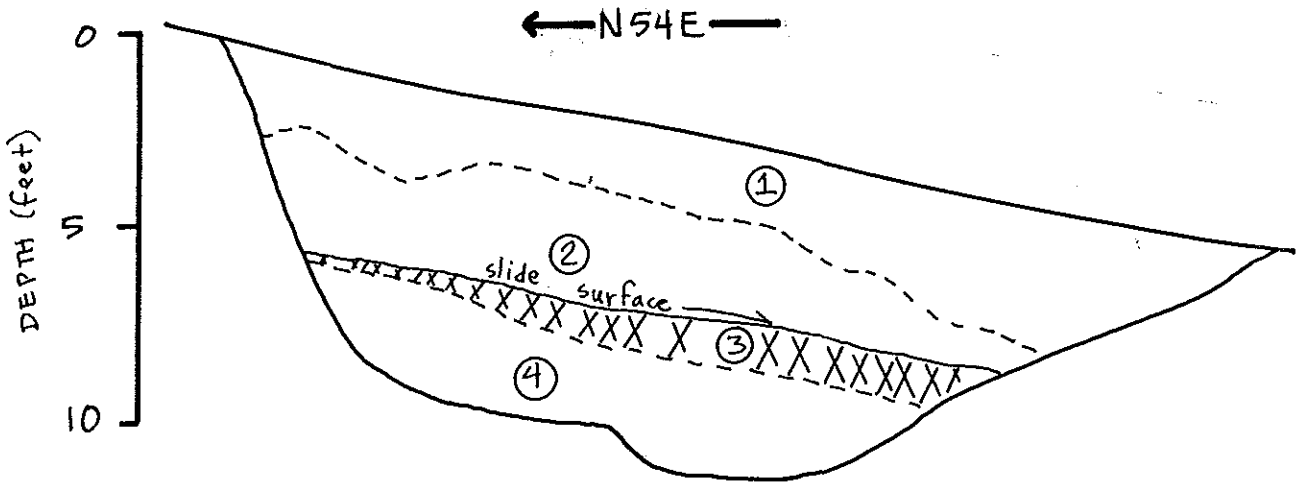

1. **SILTY CLAY**; very dark gray; scattered sub-rounded gravel; homogeneous; dry to slightly moist; (Dormant Landslide Debris)

2. **SANDY SILT**; light yellowish brown; scattered sub-rounded pebbles; relatively homogeneous; moist; smooth; polished slide plane at base of unit; (Dormant Landslide Debris)

3. **CLAYSTONE**; gray to light olive brown; scattered oxidation staining; moist to wet; highly weathered; highly disturbed (Bedrock)

4. **CLAYSTONE**; gray to light olive brown; scattered oxidation staining; moist to wet; highly weathered; (Bedrock)

LOGGED BY: M. Baumann and L. Stupi; UPP GEOTECHNOLOGY, INC.; 9-25-03

LOG OF EXPLORATION PIT 5

UPP GEOTECHNOLOGY, INC.
Engineering Geology • Geotechnical Engineering

TIFFANY PARK ESTATE
East Warren Avenue
Fremont, California

APPROVED BY	SCALE	PROJECT NO.	DATE	
C.M.	1" = 5'	2576.2R1	March 2005	Figure 21

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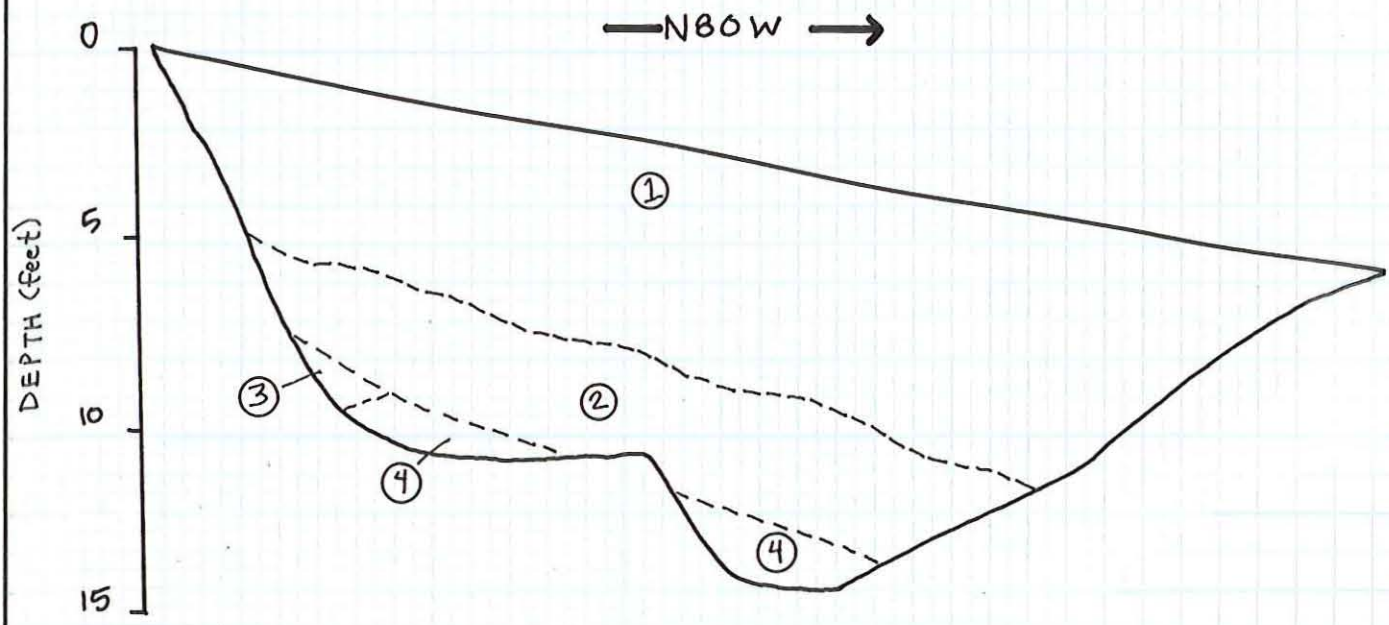

1. **SILTY CLAY**; very dark gray mixed with light yellowish brown; heterogeneous; moist to very moist; (Dormant Landslide Debris)

2. **CLAYEY SILT**; olive brown; scattered sub-rounded pebbles; relatively homogeneous; moist (Dormant Landslide Debris)

3. **SANDSTONE**; pale yellow; fine- to medium-grained; poorly cemented; scattered oxidation staining; highly weathered; (Bedrock)

4. **CLAYSTONE**; gray to light olive brown; scattered oxidation staining; moist to wet; highly weathered; (Bedrock)

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LOG OF EXPLORATION PIT 6

UPP GEOTECHNOLOGY, INC.
Engineering Geology • Geotechnical Engineering

TIFFANY PARK ESTATE
East Warren Avenue
Fremont, California

APPROVED BY	SCALE	PROJECT NO.	DATE	
CAH	1" = 5'	2576.2R1	March 2005	Figure 22

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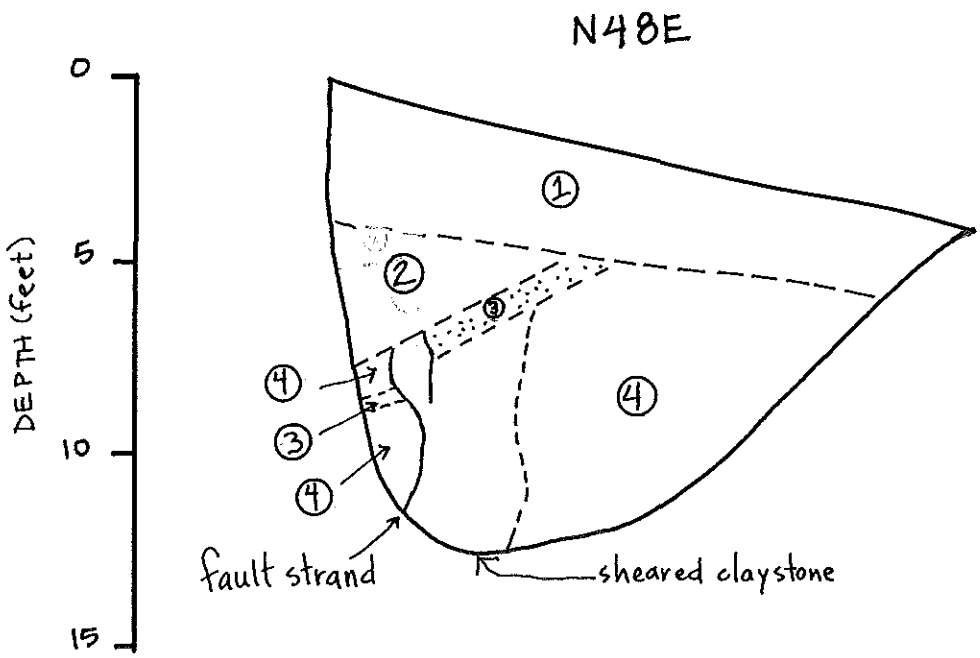

1. **SILTY CLAY**; very dark gray; scattered sub-rounded gravel; homogeneous; dry to slightly moist; (Topsoil)

2. **SILTY CLAY**; olive gray; trace sand and sub-rounded pebbles; relatively homogeneous; very moist; (Completely Weathered Claystone)

3. **SANDSTONE**; light olive brown; fine- to medium-grained; poorly cemented; scattered oxidation staining; highly weathered (Bedrock)

4. **CLAYSTONE**; light olive brown; scattered oxidation staining; moist; very highly weathered in upper 3 feet; highly weathered below (Bedrock)

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LOG OF EXPLORATION PIT 7

UPP GEOTECHNOLOGY, INC. Engineering Geology • Geotechnical Engineering		TIFFANY PARK ESTATE East Warren Avenue Fremont, California		
APPROVED BY	SCALE	PROJECT NO.	DATE	
CH	1" = 5'	2576.2R1	March 2005	Figure 23

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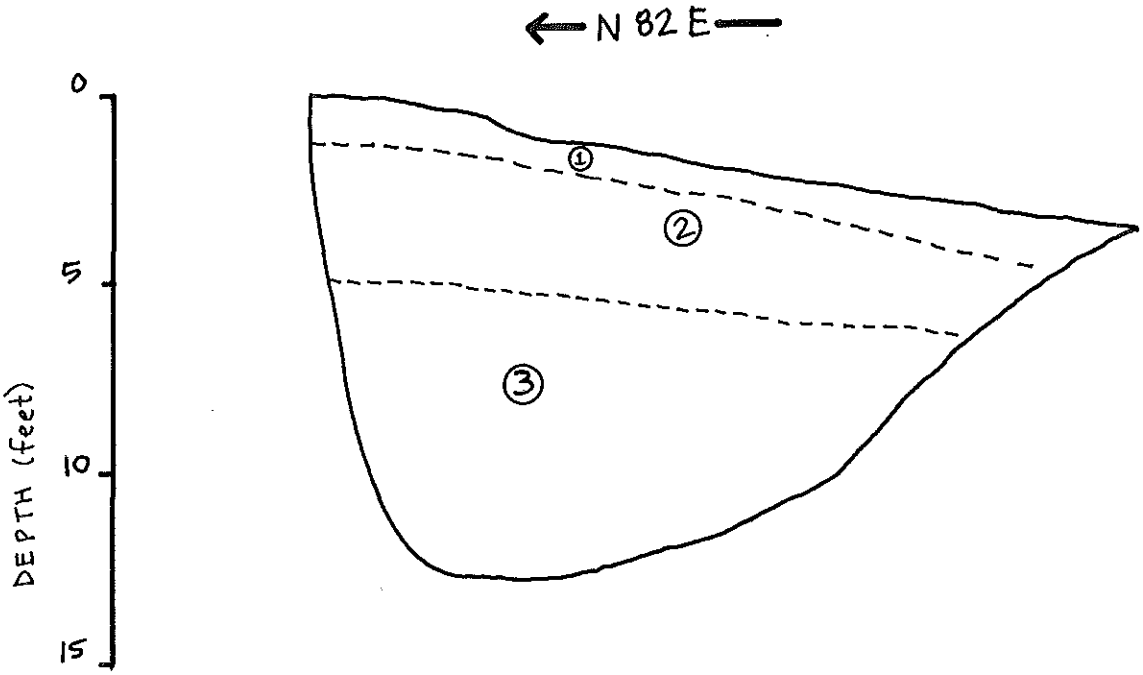

1. **SILTY CLAY**; very dark gray; scattered sub-rounded gravel; homogeneous; dry to slightly moist; (Topsoil)

2. **SILTY CLAY**; light yellowish brown; scattered sub-rounded gravel; relatively homogeneous; ; scattered caliche stringers and nodules; dry to slightly moist; (Colluvium)

3. **SILTSTONE**; olive gray to olive yellow; relatively homogeneous; moderately weathered; moist; (Bedrock)

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LOG OF EXPLORATION PIT 8

UPP GEOTECHNOLOGY, INC. Engineering Geology • Geotechnical Engineering		TIFFANY PARK ESTATE East Warren Avenue Fremont, California		
APPROVED BY	SCALE	PROJECT NO.	DATE	
CH	1" = 5'	2576.2R1	March 2005	Figure 24

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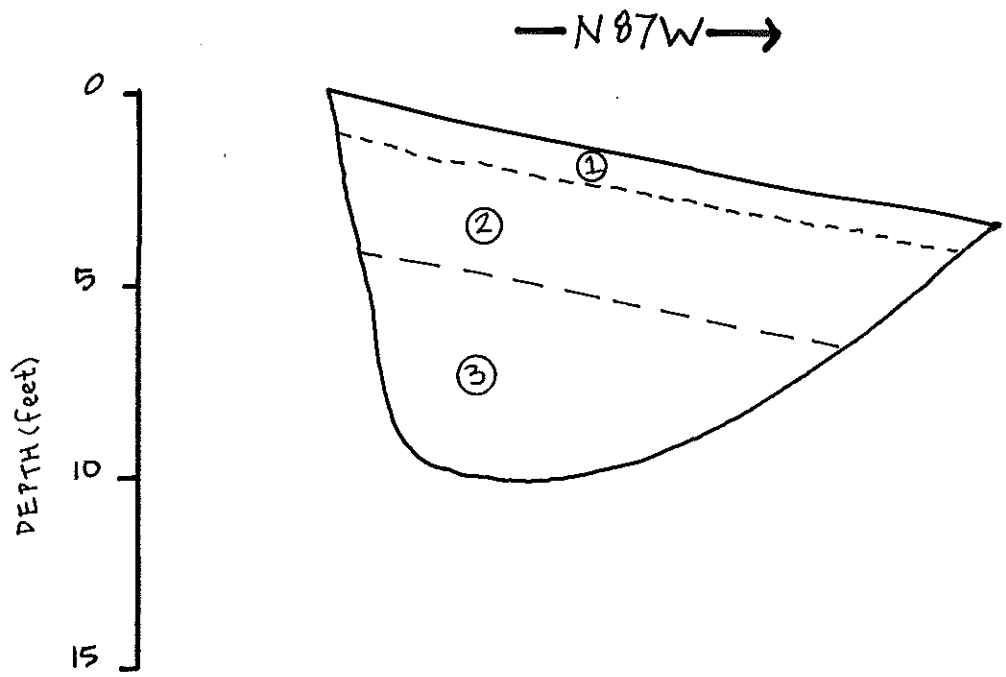

1. **SILTY CLAY**; very dark gray; scattered sub-rounded gravel; homogeneous; dry to slightly moist; (Topsoil)

2. **SILTY CLAY**; light yellowish brown; scattered sub-rounded pebbles; scattered caliche stringers and nodules; relatively homogeneous; moist; (Colluvium)

3. **CLAYSTONE**; olive brown; scattered oxidation staining; moist; highly weathered; (Bedrock)

LOGGED BY: M. Baumann and L. Stupi; UPP GEOTECHNOLOGY, INC.; 9-26-03

LOG OF EXPLORATION PIT 9

UPP GEOTECHNOLOGY, INC. Engineering Geology • Geotechnical Engineering		TIFFANY PARK ESTATE East Warren Avenue Fremont, California		
APPROVED BY	SCALE	PROJECT NO.	DATE	
C.H.	1" = 5'	2576.2R1	March 2005	Figure 25

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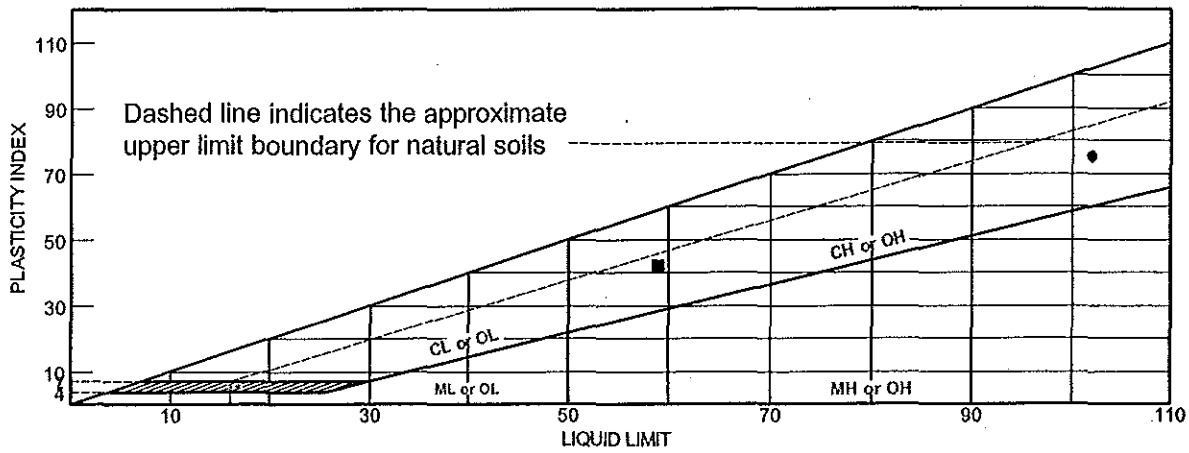
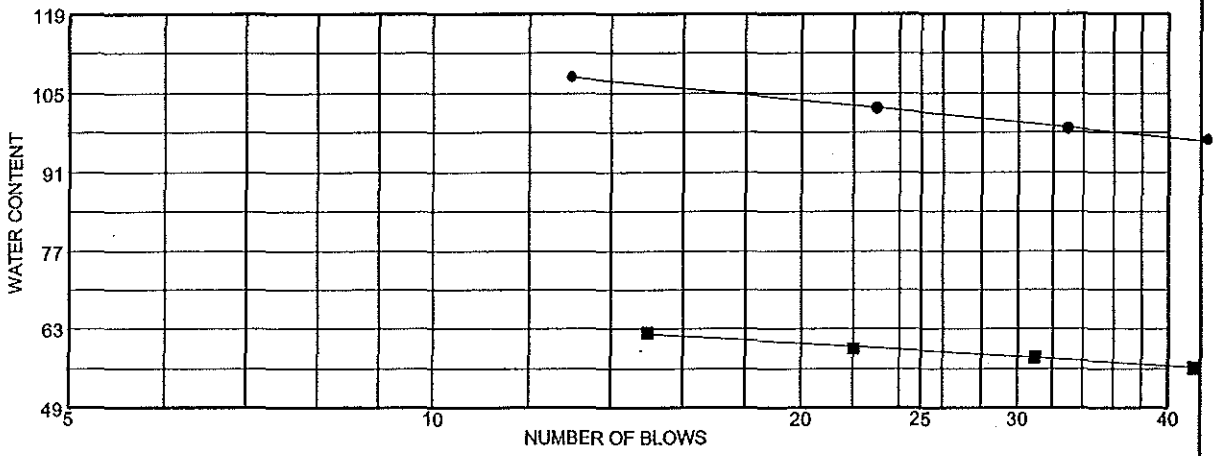
LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Olive Gray fat CLAY	102	27	75			
■	Dark Brown fat CLAY w/ Sand & CaCO3	59	17	42			

Project No. 128-182 **Client:** Upp Geotechnology

Project: Hwu - 2576.2

● **Source:** P1 **Sample No.:** 2 **Elev./Depth:** 9

■ **Source:** P3 **Sample No.:** 1 **Elev./Depth:** 2.5

Remarks:

●

■

LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT

UPP GEOTECHNOLOGY, INC.

Engineering Geology • Geotechnical Engineering

TIFFANY PARK ESTATE
East Warren Avenue
Fremont, California

APPROVED BY	SCALE	PROJECT NO.	DATE	
CH	not applicable	2576.2R1	March 2005	Figure 26

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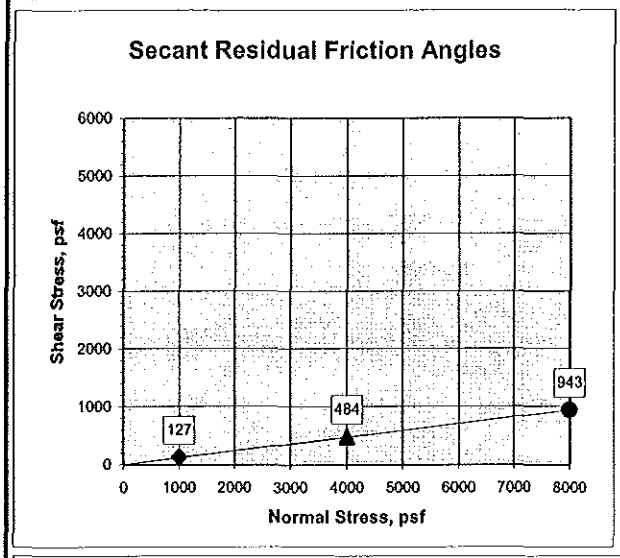
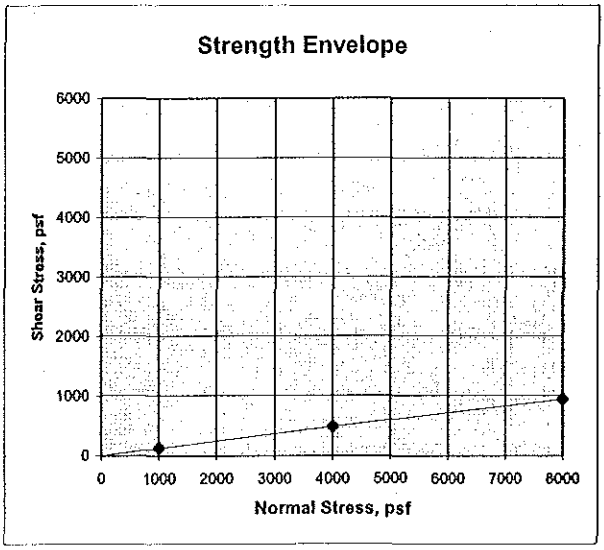
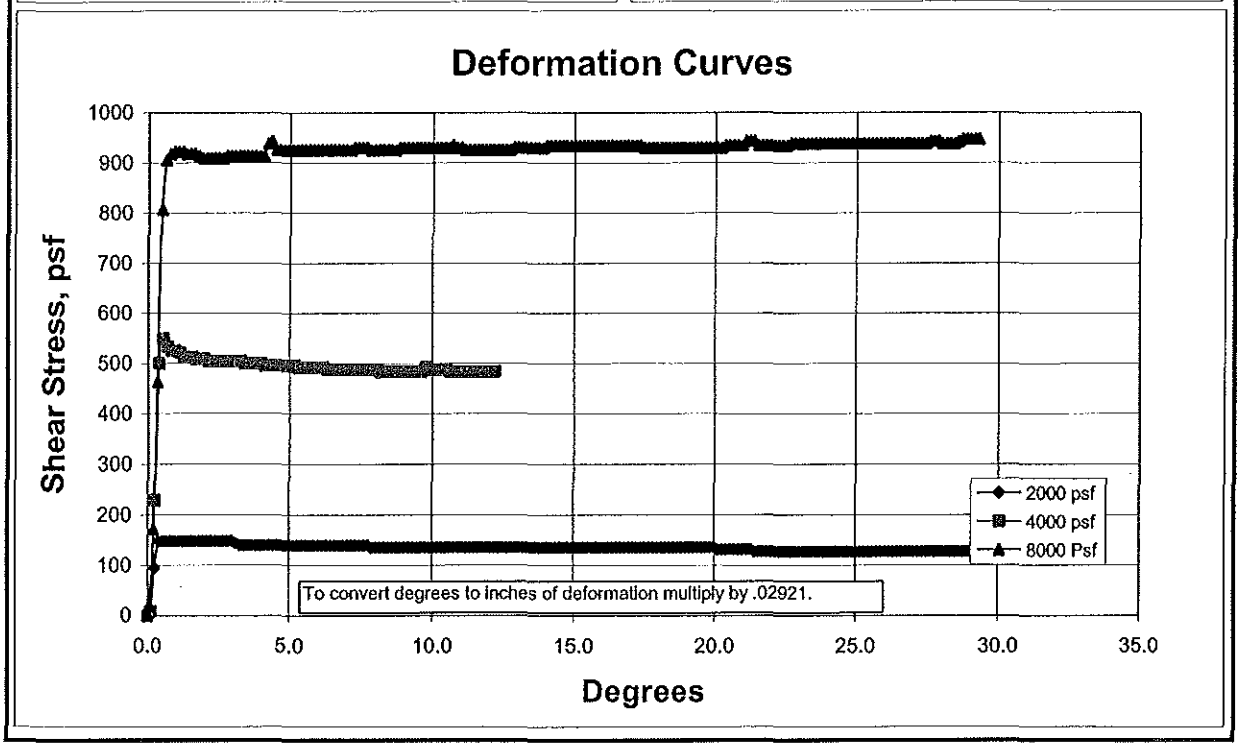
Drained, Residual Torsional Ring Shear Test ASTM D 6467

Job No.:	128-182A	Boring:	P1	Date:	11/17/03	Undisturbed:	
Client:	Upp Geotechnology	Sample:	2	By:	PJ	Peak:	
Project:	Hwu - 2576.2	Depth:	9	Checked:	DC	Residual:	
Soil Type:	Olive Gray fat CLAY			Clay, %:		Fully Softened:	X
Remarks:				LL:	102	Peak:	
Normal Stress, psf	1000	4000	8000	PL:	27	Residual:	X
Secant Phi, deg.	7	7	7				







DRAINED TORSIONAL SHEAR STRENGTH ENVELOPE

UPP GEOTECHNOLOGY, INC.
Engineering Geology • Geotechnical Engineering

TIFFANY PARK ESTATE
East Warren Avenue
Fremont, California

APPROVED BY	SCALE	PROJECT NO.	DATE	
CJ	not applicable	2576.2R1	March 2005	Figure 27

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UPDATED GEOTECHNICAL AND GEOLOGIC STUDY
PROPOSED SITE DEVELOPMENT

TIFFANY PARK ESTATE PROPERTY
EAST WARREN AVENUE
FREMONT, CALIFORNIA

Document Id. 14042C-02R1
Dated 18 January 2018

TO: Upp Geotechnology
a division of C2Earth, Inc.
750 Camden Avenue, Suite A
Campbell, CA 95008

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