PRELIMINARY
GEOTECHNICAL INVESTIGATION

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

PARDEE HOMES
SAN DIEGO, CALIFORNIA

MARCH 28, 2019
PROJECT NO. 06847-42-03

Project No. 06847-42-03
March 28, 2019

Pardee Homes
13400 Sabre Springs Parkway, Suite 200
San Diego, California 92128

Attention: Mr. Allen Kashani

Subject: PRELIMINARY GEOTECHNICAL INVESTIGATION
SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

References:
1. *Geotechnical Feasibility Study, South Otay Mesa Property, San Diego, California,* prepared by Geocon Incorporated, dated October 4, 2002 (Project No. 06847-42-01).
2. *Geotechnical Investigation, Beyer Boulevard Extension, Otay Mesa Community Plan Amendment, San Diego, California,* prepared by Geocon Incorporated, dated May 10, 2006 (Project No. 07254-42-02).
3. *Update to Geotechnical Feasibility Study, Pipitone Lot Split – Parcel 2, South Otay Mesa Property, San Diego, California,* prepared by Geocon Incorporated, dated July 17, 2013 (Project No. 06847-42-02).

Dear Mr. Kashani:

In accordance with your request, we have prepared this preliminary geotechnical investigation for the proposed Vesting Tentative Map for the subject property. We utilized the information in the referenced reports in preparing this report. Based on the results of our study, it is our opinion that the site can be developed as planned provided the recommendations contained in this report are followed.

Several conditions exist such as expansive soils, difficult excavation characteristics, landslides, and a landslide setback along the west side of the project, which will require special consideration during site development. The accompanying report presents the results of our study and preliminary conclusions and recommendations regarding the geotechnical aspects of site development.

Should you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

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PRELIMINARY GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the findings of our preliminary geotechnical investigation for Southwest Village project located south of Old Otay Mesa Road and Highway 905 in San Diego, California (see Vicinity Map, Figure No. 1). The purpose of this study is to provide information relative to the site soil and geologic conditions and to identify geotechnical constraints, if any, that may impact proposed development. This project is a compilation of information from References 1 through 3.

Previous information reviewed as part of the referenced geotechnical feasibility study included stereoscopic aerial photographs, readily available published and unpublished geologic literature, and previous geotechnical reports prepared by Geocon Incorporated (see *List of References*)

Field investigations, laboratory testing and engineering analyses was previously performed for Geocon's 2002 geotechnical feasibility study and 2006 study for Beyer Boulevard Extension. The field investigations consisted of a site reconnaissance by an engineering geologist, geologic mapping, drilling large-diameter borings and excavating backhoe trenches. The large diameter borings were excavated to examine the soil and geologic conditions immediately adjacent to the headscarp of a large landslide complex (the San Ysidro Landslide) that is located along the extreme western and southern edges of the overall South Otay Mesa property. Exploratory trenches were scattered across the higher-elevation site-interior to further define the extent and thickness of surficial terrace deposit clays that typically cap Otay Mesa. Details of the field investigation as well as boring and trench logs are presented in Appendix A and B. Logs of borings performed for Geocon's May 21, 2001, report for Intermodal Transportation Center (Reference No. 9) are included in Appendix C.

Laboratory tests were performed on selected soil samples obtained during the field investigation to evaluate pertinent physical properties. Details of the laboratory testing and a summary of the test results are presented in Appendix C.

The base map used to depict the site soil and geologic conditions for this study consists of an CAD file of the plan titled *Grading & Drainage Plan, Vesting Tentative Map, Southwest Village,* prepared by Rick Engineering Company, undated (see Figures 2 through 6, map pocket). The Geologic Map depicts proposed development, existing topography, mapped geologic features, and the approximate locations of exploratory excavations.

2. SITE AND PROJECT DESCRIPTION

The overall South Otay Mesa property consists of approximately 300 acres of undeveloped, formerly cultivated farm land located in the Otay Mesa area east of San Ysidro and south of U.S. Highway 905 and east of Interstate 805. The area covered in this report is located within the western portion of the overall South Otay Mesa property and has an area of approximately 106 acres. The site is surrounded by undeveloped properties or designated open-space.

The property is located adjacent to the San Ysidro Landslide complex which is one of the largest landslide features in San Diego County. Although the base of the landslide has only been identified southwest of the site, geomorphic and geologic interpretation, and our experience with similar mass movements suggest that the landslide is on the order of 400-feet-thick within the limits of the South Otay Mesa property.

Characteristic landslide morphology of steep back-scarps and bulging, hummocky topography, as well as deflected drainages is evident within the hillside area west of the property. Robust topography in portions of the slide area suggests that portions of the slide may be incipient and consist of a large block-glide type movements. Other slide areas express a more subdued/relaxed topography suggestive of earthflow movement. The subdivision area covered by the Vesting Tentative Map is east of the slide on the mesa top and is underlain by Terrace Deposits and the San Diego and Otay Formations.

Topographically, the proposed subdivision area is characterized by a large mesa with nearly flat to gently inclined ground surfaces in the south and western portions, with a canyon tributary drainage in the northern portion of the property. Ground surfaces over the mesa top are smooth and essentially featureless because of cultivation and off-road vehicle disturbance over the years. Site elevations vary from approximately 510 feet Mean Sea Level (MSL) in the northeast corner of the site to approximately 382 feet MSL in canyon drainage in the northern portion of the property. Within the Byer Boulevard extension area west of the subdivisions, exiting elevations range from near 230 feet MSL at the west end to near 490 feet MSL where the roadway connects to the mesa top.

Vegetation types consist mostly of annual grassland, disturbed by numerous unimproved dirt roads used by local residents, off-road recreational vehicles, and the U.S. Border Patrol. Localized areas of native vegetation such as coastal scrub has been mapped in the area. Review of 1953 air photographs indicates the site was previously stripped of vegetation and has been seasonally cultivated. Structures and dwellings are present in some portions of the property.

The VTM indicates the site will be graded to construct 301 single-family residential lots and 84 multi-family buildings with interior streets and retaining walls in two large parcels (referred to as the

north and south parcel areas). Beyer Boulevard roadway will be extended approximately 6,000 feet from the current eastern terminus crossing steep-walled Moody Canyon to the top of the mesa where it connects to the proposed residential community. Beyer Boulevard will connect into the future Caliente Avenue roadway extension.

Cuts from existing grade up between a few feet to approximately 20 feet are planned within the western and southern portion of the south area. The remainder of the site will receive fills varying from a few feet to approximately 90 feet thick. Fill slopes will be constructed along property margins, within the canyon drainages and within the Beyer Boulevard extension west of the subdivision lots. Fill slopes vary in height from approximately 5 feet to 100 feet. Cut slopes up to a height of approximately 100 feet will be graded to construct the extension of Beyer Boulevard. Cut and fill slopes will be constructed at a 2:1 (horizontal:vertical) gradient. Retaining walls with maximum heights up to 6 feet are planned within the subdivision area. Walls up to approximately 23 feet are planned within the drainages on the west side of the subdivision property.

The above locations and descriptions are based on our site reconnaissance, review of published geologic literature and the above referenced studies. If planned development changes from those described or shown on the VTM, Geocon Incorporated should be contacted for review of plans and possible revisions to this report.

2.1 Beyer Boulevard Alignment Selection

Previous selection of the roadway alignment was determined based on detailed geologic mapping, review of published geologic literature, and potential impacts to biological habitat. Given the western end of the roadway required connection to an existing street (existing easterly terminus of Beyer Boulevard), our evaluation was to result in a location that would best fit the complex geologic conditions and maintain minimal disturbance to biological habitat. Selection of the alignment began with detailed field mapping based on topography provided by the Civil Engineer to identify locations of landslides. The information was then provided to the Civil Engineer to best fit an alignment that would enable construction of the roadway and minimize encountering adverse geologic conditions or create significant offsite grading to enable a stable roadway configuration. Based on the initial alignment, we then initiated our field investigation to define geologic conditions with subsurface exploration. Our second phase of field work was conducted to provide additional structural geology along portions of the alignment to better characterize our slope stability analyses. This was done in response to previous cursory review comments by City of San Diego LDR Geology.

3. SOIL AND GEOLOGIC CONDITIONS

Soil and geologic conditions at the site were identified by a review of published and unpublished geologic literature for the general area, soil exposures noted during geologic mapping and observations within the subsurface explorations. Surficial soils and geologic units mapped or encountered during the previous field investigation in and near the subdivision area include undocumented fill, alluvium, colluvium, topsoil, landslide debris, Pleistocene-age Terrace Deposits, and the Tertiary-age San Diego and Otay Formations. Each of these units is described below and their approximate limits are depicted on the Geologic Map (Figures 2 through 6). Geologic cross sections are depicted on Figures 7 through 13 (Map Pocket). The locations of the borings and trenches are presented on the geologic maps. Some borings may not be shown as they are outside the area covered by this study. The locations of borings outside the covered area are shown on geologic maps presented in the referenced feasibility studies for the overall South Otay Mesa property.

To prepare this report we have combined geologic maps, borings, and trenches from several previous geotechnical reports. Some of the nomenclature with respect to geologic units is different between the reports. To maintain consistency with the boring logs and trenches, we did not modify the nomenclature.

3.1 Undocumented Fill (Qudf)

Undocumented fills exist mainly as elongate prisms of end-dump materials following the rims of canyons. The fills are expected to be relatively thin (on the order of 5 feet or less) along the edges of the canyons but appear to be much thicker where small tributary canyons or gullies have been filled. In some areas the fill appears to be on the order of 20 feet thick. The fills generally consist of loose, porous, clayey-sandy soil with abundant oversize concrete, asphalt, organic debris and trash. The undocumented fill in its present condition is not suitable for support of structural loading, fill and/or surface improvements. Undocumented fills within planned areas of grading will require complete removal and/or recompaction. Spreading the material and separating (picking) unsuitable materials will be required prior to placing as compacted fill.

3.2 Colluvium (Qcols)

Shallow surficial soil encountered in Trench T-14A consisting of soft to loose, damp, medium to dark brown, gravelly clay to a clayey silt is considered to be colluvium, or slope-creep accumulations on the north-facing slopes of Moody Canyon. These soils rest upon horizontally bedded Otay Formation siltstone. Further downslope, this unit transitions into a thicker layer interpreted as a shallow landslide. Due to the loose, unconsolidated condition of the colluvium, complete removal and recompaction will be required in areas of proposed grading.

3.3 Alluvium (Qal)

Alluvium exists in the bottom of the major drainages of Moody Canyon, and is anticipated to extend into smaller canyon tributaries. Exploratory trench excavations T-11, T-12 and T-13 and exploratory Boring LB-1A in the portion of Beyer Boulevard alignment crossing Moody Canyon encountered loose alluvial soils varying in thickness from 4 feet to greater than 10 feet. The alluvium generally consists of loose, porous light to dark brown very gravelly sands.

Although no exploratory excavations have been conducted in the drainages within the subdivision area, previous investigations in the Otay Mesa area indicate that alluvial deposits in tributary canyons can be on the order of 15 to 20 feet thick. Alluvial soils are porous and compressible, and will require removal and recompaction.

3.4 Topsoil (unmapped)

A relatively thin layer of topsoil (typically on the order of 1 to 2 feet in thickness) blankets the natural mesa surface and is generally comprised of stiff, humid to damp, dark brown sandy clay or silty sand. The topsoil is compressible in its present condition and will require removal and recompaction within areas of planned development.

3.5 Landslide Debris (Older with symbol Qls1 and Younger with symbol Qls2)

A deep-seated landslide complex (Qls1) has been identified along the western and southern mesa rim by Tan (1995), the City of San Diego Seismic Safety Element (2008, Sheets 2 and 3) and by this study (see Geologic Map, Figures No. 2 through 6). This landslide complex, also known as the *San Ysidro Landslide*, is located west of the property and partially extends across the proposed Beyer Boulevard alignment. Large-diameter exploratory borings were performed along the mesa rim during previous field investigations to establish the position of the landslide headscarp. Two of these borings are located within or adjacent to the Vesting Tentative Map area. A third boring is located adjacent to the northwest corner. Additional borings were performed outside of the VTM covered by this study.

After down-hole logging of each boring by an engineering geologist, all borings, without exception, were found to have encountered an intact, approximately horizontal succession of sedimentary strata. In general, the borings encountered Pleistocene-age Terrace Deposits underlain by Tertiary-age San Diego Formation and Otay Formation. This stratigraphic sequence and structure is very similar in elevation and location to that described in the same area by Kennedy and Tan (1977) and Tan (1995). Boring locations and the headscarp of the landslide were field surveyed to determine the precise

location of the landslide with respect to the proposed development setback limit line. The surveyed location of the landslide headscarp is shown on the Geologic Map (Figure 2, Map Pocket).

Down-hole logging indicated massive to horizontal, or approximately horizontal bedding within the sedimentary units. Bedding plane shears, clayseams, adversely oriented fractures, continuous jointing or fracturing were not encountered in any of the borings.

In our opinion, landslides or landslide-related geologic structures should not adversely impact the proposed subdivision east of the headscarp of the San Ysidro landslide. However, due to the relatively steep headscarp, a 50-foot development setback is recommended to provide a buffer zone in the event that surficial sloughages occur.

With respect to Beyer Boulevard extension, additional borings were performed along the roadway extension alignment to verify the position of the primary landslide backscarp of the San Ysidro Landslide (Older, with symbol Qls1) and to outline other secondary landslides (Younger, with symbol Qls2), scarps, or any slide-related shear zones that could impact proposed cut slopes (see Geologic Map, Figures 2 and 3 and Geologic Cross-sections on Figures 7 through 10). After down-hole logging of each large-diameter boring and logging of exploratory trenches by an engineering geologist, Borings LB-1A, LB-3A through LB-10A, Trenches T-3A through T25A, and Trench T-27A were found to have encountered landslide debris (see Geologic Map and Geologic Cross-sections A-A' through I-I').

Exploratory Trenches T-4A, T-10A, and T-20A and possibly large-diameter Borings LB-4A and LB-9A encountered the principal (or primary) backscarp fissure and/or basal slip-surfaces of the San Ysidro Landslide complex (see trench and boring-logs in Appendix B). The backscarp fissure encountered in the trenches strikes approximately N40W and dips from 50 to 70 degrees to the southwest, separating undisturbed Pleistocene-age and Tertiary-age formations on the east from fractured and rotated formational blocks of landslide-debris on the west (see Geologic Map and Geologic Cross-sections A-A' and C-C', map pocket). The backscarp fissure is very irregular in width, varying from approximately 12 inches in Trench T-4A to 30 inches in Trench T-10A and has been in-filled mostly by pebbles and cobbles. There is also a pronounced darker (secondary) reddish-brown iron oxide staining (epigenetic cementation) in the fissure immediately east (up-section) in undisturbed Pleistocene terrace deposits. Since there is no shearing or displacement of the oxide coatings in the footwall (or hanging wall) of the fissure, which suggests little or no recent movement of the San Ysidro Landslide; this is because it takes a very long time for such epigenetic oxide rinds to form in arid climates (over 10,000 years according to Birkeland, 1984). This is also suggested by Geocon, in a previous investigation where horizontally-bedded fluvial terrace deposits and the Bay Point Formation were deposited against tilted blocks of the San Ysidro Landslide (Geocon, 2001).

Additional borings (second field investigation phase for Beyer Boulevard performed in January 2006) drilled through landslide remnants and basal slip-surfaces within Beyer Boulevard were of significant help in understanding regional stratigraphy of the bentonitic zones that provided the failure-surfaces at the base of the San Ysidro landslide complex. Elevations of the top of the lowest bentonite zone taken from 4 different borings (this included two borings on other projects thousands of feet offsite to the south) that bracket the central portion of the landslide, were used to calculate strike and dip. Possible 3-point problem combinations indicated strike that varied from approximately N85 degrees E to N63 degrees W; dips varied from approximately 3 degrees to 5 degrees dip in either a southeastern or southwestern direction. Average strike was calculated at N80W with a dip of 4 degrees southwest. The main channel of the Tijuana River nearly parallels the strike and likely undercut the bentonite (adversely dipping southward out of the channel slope) 5,000 to 10,000 years ago, or older, during the last major sea level fluctuations (K. R. Lajoie, J.P. Kern, *et al.*, 1979, in item No. 2, *List of References*).

Some geologic studies within the Otay Mesa area have interpreted the backscarp of the San Ysidro Landslide as a possible fault. There is no evidence of compression or extensive shearing due to tectonic faulting, or any definite correlatable strata indicating total displacement. However, in Trench T-4A that extends across the backscarp, the western landslide-block has a cap of gravelly clay juxtaposed against the scarp-fissure and the approximately horizontal Terrace Deposit Gravel (Lindavista Formation). If the clayey layer represents the bottom of the thick Terrace Deposit Clay (also equivalent to the Lindavista Formation) typically capping the Otay Mesa not far to the east, the vertical slide-displacement could exceed 50 feet). Subsequent to Kennedy and Tan (1977), after physical testing via trenching (where Trenches T-4A and T-10A define the character and linearity of the backscarp fissure) and still other geological investigations such as those of Michael J. Hart (1977, after the Kennedy-Tan mapping), whose study and paper, *Landsliding, And Alternative to Faulitng in San Ysidro, California*, in item No. 10, *List of References*). provide confirmation of this opinion. There may be local occurrences of ancient inactive or potentially active faults that strike northwest-to southeast within the Pliocene-age Otay Formation, but there is no direct evidence of coincidence of these ruptures with the scarps within the landslide debris.

Linear strike-measurements of the primary backscarp fissure of the San Ysidro Landslide encountered in exploratory Trenches T-4A and T-10A compares closely to the proximity and trend of the nearby linear bluff along the west edge of Otay Mesa, as well as linear trends in the same area observed in aerial stereo-photographs and the City of San Diego Seismic Safety Study maps. Extension of the strike-direction of the backscarp-fissure crosses the proposed Beyer Boulevard alignment between Stations 21+00 and 23+00. The proposed 80- to 100-foot-high cuts will likely expose highly fractured and weathered landslide debris in the areas of the alignment to the west of Station 25+00. This condition will require remedial grading in the form of stability fills and

associated keyways westward to approximately Station 13+00 (see Geologic Cross-Sections A-A', B-B', C-C' and D-D'). Based on information obtained from our second phase of field investigation, the roadway in the vicinity of Cross-Section A-A' was shifted northward to enable the entire roadway being beyond the mapped backscarp of the San Ysidro landslide. Based on the northward roadway shift and construction of the stability fills, the proposed roadway alignment in the area of the backscarp should be stable.

The mapped location of the San Ysidro Landslides (mapped as Qls1, designating older landslide debris) is shown on the Geologic Maps (Figures 2 and 3). Geologic cross sections (A-A' through J-J', Figures 7 through 10) depict geologic profiles based on interpretation of subsurface data.

Relatively shallow secondary landslides along the alignment will require remedial measures in the form of removal and recompaction. Because of the typically complex structure of the landslide debris, final design and/or modification of as-graded remedial excavations would depend on the observations of our engineering geologist during grading. A summary of remedial slope recommendations is presented in the *Conclusions and Recommendations* section of this report.

It is known that late in Pleistocene time, approximately 200,000 years ago, Sea Level began to lower, dropping 100 feet or more, below present Sea Level by about 150,000 years ago (K. R. Lajoie and J. P. Kern, 1979). This would have caused the ancient Tijuana River drainage to incise through a widespread coastal pediment (pre-Otay Mesa), and undercut weak bentonite layers in the Pliocene-age Otay Formation siltstones. This was an unusually large Sea Level fluctuation that could have initiated the failure of the main body of the San Ysidro landslide (Qls1, undercutting exposed out of slope dipping weak bentonite zones). After this, there was an equally rapid rise in Sea Level over about 50,000 years that allowed deposition of Quaternary-age fluvial and shallow marine deposits of the Bay Point Formation against the toe of the main landslide blocks. In addition, a whole succession (up to about 9) of terrace deposits may have been incised into the rotated blocks of Qls1 (K. R. Lajoie and J. P. Kern, *et al.*, 1979). Later still, after a Holocene Sea Level drop, Moody Canyon was incised through the previously eroded Qls1 and a zone of thin, interbedded bentonite beds in the Otay Formation siltstone member. The erosion of Moody Canyon undercut both the remnant Qls1 and at least two bentonitic layers, causing the secondary landslide movements. Erosion, however, has removed most of the landslide debris (both Qls1 and Qls2) on the south side of Moody Canyon (see Geologic Cross Sections B-B', D-D', G-G', H-H', I-I', and J-J'). Wedges of Qls1 that dip away from the proposed Beyer Boulevard cuts to the south can be mitigated with stability fills above and/or buttressing. Based on all this information, it is the opinion of Geocon Incorporated that the primary mechanism for failure of the landslides is associated with Sea Level changes (and base-levels) resulting in canyon erosion that undercut bentonite layers in the Otay Formation.

3.6 Old Paralic Deposits (Qop)

Upper Pleistocene-age Old Parlic Deposits (Qop), formally known as Bay Point Formation, is overlain by undocumented fill and alluvium a short distance just east of the terminus of existing Beyer Boulevard. Exploratory Trench T-12A (Appendix B) encountered medium-dense to dense, very moist, reddish to yellowish brown, clayey, fine-to-coarse cobble gravel conglomerate. Horizontal bedding is indicated by the approximately horizontally-imbricated cobble layers. This formation, in either a natural or properly compacted condition, possesses high shear strength characteristics and good foundation engineering properties.

3.7 Terrace Deposits (Qtc and Qtg)

Terrace deposits cap the entire mesa These deposits are also known as Very Old Paralic Deposits (Qvop). To avoid confusion, we have left the mapped contacts as Qtc and Qtg for consistency between the boring and trench logs from previous geotechnical studies and geologic maps.

The terrace deposits were encountered in all of the exploratory borings and trenches and are divided on the geologic map into two members. The upper Terrace Deposit member consists of a highly expansive clay deposit designated as Qtc. A very dense, granular cobble conglomerate member (Qtg) underlies the clay. Each member is described below.

Terrace Deposit Clay (Qtc) was encountered in the majority of the exploratory trenches across the site. The clay encountered varied from 3 to 11 feet in thickness and consisted of stiff, moist, dark brown to olive clay. Expansion testing indicates the clay possesses highly expansive characteristics. The clay will require remedial grading in the form of removal and replacement with *low* expansive materials. The expansive clays should be buried in deeper fill areas and away from slope faces.

Terrace Deposit Gravel (Qtg) was encountered in all borings and trenches and consists of dense to very dense interbedded reddish brown sandy coarse gravel and gravelly sands, with some silt and clay. Large-diameter borings, with difficulty, were able to penetrate this deposit and establish thicknesses ranging between 23 feet and 72 feet. Down-hole logging of this unit revealed massive to horizontal bedding and approximately horizontal imbrication of gravel clasts and cobble layers. Interbedded horizontally laminated sand layers were also observed. Gravel clasts typically consisted of rounded to subrounded volcanic, metasedimentary and granitic rocks that varied in dimension from approximately 3 inches up to 2 feet. Differences in thickness of this unit are interpreted as ground surface variations and very irregular, disconformable, basal deposition scour-contacts with the underlying Tertiary-age formations.

Excavation of the Terrace Deposit Gravel required a very heavy effort with the drill rig during drilling and in some zones required the use of a rock core bucket to penetrate the deposit. Cobbles and boulders within the deposit generally increased in size with depth. In general, the upper 10 to 15 feet consisted of gravels less than 12 inches in dimension and contained zones with a relatively low percentage of cobble. This upper zone should provide good capping material. Deeper materials contained a much higher percentage of cobble and larger boulders. Excavation of this deposit will require a very heavy effort with conventional heavy-duty earth moving equipment. Larger than normal excavators may be required to excavate deeper utility trenches. Larger cobble and rock may require screening if placed near finish grade elevations.

3.8 San Diego Formation (Tsd)

Dense, light yellowish brown to gray-brown silty, fine micaceous sandstone with some thin interbedded conglomerate layers of the Pliocene-age San Diego Formation were encountered in borings immediately below the Pleistocene-age Terrace Deposit Gravel (Qtg) unit described above. Down-hole logging of the Qtg/Tsd contact indicated an irregularly horizontal depositional contact scoured into the generally finer-grained horizontally bedded sandstone of the San Diego Formation. The elevation of this disconformable contact varies between approximately 430 feet MSL in boring LB-5 (Appendix A) to approximately 457 feet MSL in boring LB-7 (Appendix A), with the average contact elevation at 442 feet MSL. In some of the borings beyond the limits of the Vesting Tentative Map area (borings LB-3, LB-4, and LB-5) the presence of interbedded, coarse subrounded volcanic conglomerate layers is suggestive of reported nonmarine facies of the San Diego Formation (Wagner, H. M., 2001). The San Diego Formation is suitable for support of structural fill and/or loading in its present condition.

3.9 Otay Formation (To)

Dense to hard, light olive to gray-brown, horizontally interbedded clayey siltstones, silty claystones and fine-grained sandstone of the Oligocene-age Otay Formation sandstone-mudstone member were encountered in some of the borings immediately below the Pliocene-age San Diego Formation. Down-hole logging of the contact with the San Diego Formation indicated a sharp, but irregular, depositional contact scoured into the generally finer-grained massive to horizontal beds of the Otay Formation. Remolded clayseams or adverse bedding plane features were not observed in any of the borings. Claystones observed in borings LB-3 and LB-6 (Appendix A) were very hard and massive with significant silt. Laboratory shear strength testing indicated high strength values (see Appendix D). Some discontinuous, steep to vertical joints were encountered in borings LB-3 and LB-4 (Appendix A). The potential for slope instability within the Otay Formation in areas of planned development is negligible due to the absence of adverse bedding plane parallel clayseams. The Otay sandstone-mudstone member as encountered is very dense and is suitable for support of structural

loads and/or fills in its present condition. The sandstone portions typically possess low expansion and good shear strength properties.

3.10 Otay Formation Siltstone Member (Tos)

Dense to hard, light olive to light gray-brown, subhorizontally interbedded clayey siltstones, silty claystones and fine-grained sandstone of the Oligocene-age Otay Formation Siltstone member were encountered in Borings LB-1A, LB-2A, LB-4A, LB-8A, LB-9A and LB-10A (Appendix B). Otay Siltstone was also encountered in exploratory Trenches T-13A, T-14A, and T-15A (Appendix B). Some thin, discontinuous bentonitic siltstone lenses and clay seams occur in the siltstone member, but with the exception of Boring LB-4A, occur at elevations well below proposed grade. Again, with the exception of a lenticular bentonitic zone, remolded clay seams or adverse bedding plane features were not observed in any of the borings. Remolded and direct shear tests yield high strength values. Potential adverse conditions for slope stability in the granular portions of the Otay Formation within planned development are negligible in the absence of shallow adverse bedding plane parallel shears or clay seams. The Otay Formation Siltstone member as encountered is dense and is suitable for support of structural loads and/or fills in its present condition. Both the siltstone and sandstone portions of this member typically possess low expansion and good shear strength properties.

3.11 Otay Formation Bentonitic Member (Tob)

Dense to hard, moist, light gray to pinkish-brown bentonitic very clayey siltstone to silty claystone was encountered in exploratory Boring LB-4A and in exploratory Trenches T-7A, T-9A, T22A, and T23A (Appendix B). Other previous geotechnical consultants' Borings B-7, B-11, and KB-15 (Appendix B) also indicated the presence of bentonitic strata, but without establishing stratigraphic correlation. Consequently, Geocon approximately interpreted an irregular bentonitic zone that was estimated to be approximately 50 feet thick. In Geocon's January 2006 borings adjacent to Moody Canyon and proposed Beyer Boulevard alignment, Borings LB-9A and LB-10A (Appendix B) encountered a deeper (elevations 270 to 280) bentonitic bed that was more consistent with landslide configuration and regional stratigraphy (see Geologic Cross-Sections D-D', I-I', and J-J'). Earlier Boring LB-4A encountered thin, lenticular bentonite-rich clay layers in a higher stratigraphic interval (elevations 310 to 320 feet MSL). This boring exhibited variable undulating bedding attitudes and "flame" structures that suggested "lateral spread features." This may represent inactive, ancient submarine mudflows and landslides that are stable in-place, but can cause slope-instability when exposed in cut excavations. The proposed cut excavations along the Beyer Boulevard alignment are likely to expose this suspected bentonitic zone at some locations (see Geologic Cross-Sections B-B', G-G', I-I', and J-J).

Because of the unpredictable bedding-plane structures and attitudes within this unit, and the possible instability of the landslide debris resting upon the bentonitic zone at higher elevations, mitigation of potential instability will require stability-fill placement as recommended hereinafter.

3.12 Otay Formation Gritstone Member (Tog, non mapped)

Dense to very dense, damp, light yellowish-brown, silty, fine to coarse-grained sandstone of the lower-Oligocene-age Otay Formation Gritstone was encountered in Borings LB-1A and LB-8A, at approximate elevations between 200 and 210 feet MSL, respectively. This unit is not mapped because of its burial, but is shown stratigraphically on Geologic Cross-Sections C-C' and D-D'. The gritstone member is capped by a layer of alluvium and a relatively thin layer of Otay Formation Siltstone. Otay Formation Gritstone, as encountered, is dense and suitable for support of structural loads and/or fills in its present condition. It also possesses low expansion and good shear-strength properties.

4. GROUNDWATER

No seeps, springs or groundwater conditions were observed or encountered during our site reconnaissance or during our field investigation. Dependent on the time of year, water may accumulate in Moody Canyon and tributary drainages. Groundwater is not anticipated to adversely impact development of the property. It is not uncommon for groundwater or seepage conditions to develop where none previously existed. Proper surface drainage of irrigation and rainwater will be critical to future performance of the project.

5. GEOLOGIC STRUCTURE

Bedding and formational contact attitudes observed and/or measured during the investigation are mostly horizontal, exceptions being localized undulations and cross-laminations within a horizontally bedded unit. The coarse conglomeratic portions of the Terrace Deposit Gravel (Qtg) are typically massive with few discernible attitudes, other than approximately horizontal imbrication of conglomerate clasts. Adverse geologic structures, based on observations of the exploratory excavations, do not present a significant hazard to development. However, during grading, cut slopes should be evaluated by an engineering geologist to confirm the presence or absence of adverse bedding plane shears.

6. GEOLOGIC HAZARDS

6.1 Geologic Hazard Category

Review of the City of San Diego, Seismic Safety Study, Geologic Hazards and Faults, 2008 edition indicates the majority of the subdivision area is designated in Geologic Hazard Category 53. Category 53 is described as Other Terrain, "level or sloping terrain, unfavorable geologic structure, low to moderate risk". Geologic Hazard Category 27 is mapped in the canyon drainages. Category 27 is described in Slide-Prone Formations as "Otay, Sweetwater, and others". Hazard categories 21 and 22 are mapped on the west end of the project within the Beyer Boulevard Extension and along the west and south sides of the property. Hazard Category 21 is described under Landslides as "Confirmed, known, or highly suspected". Hazard Category 22 is described under Landslides as "Possible or conjectured".

6.2 Ground Rupture

No evidence of faulting was observed during our investigation. The USGS (2016) and City of San Diego (2008) shows that there are no mapped Quaternary faults crossing the subdivision area. The site is not located within a currently established Alquist-Priolo Earthquake Fault Zone. No active faults are known to exist at the site. The nearest active fault, the Newport Inglewood/Rose Canyon Fault Zone, lies approximately seven miles west of the site. The risk associated with ground rupture hazard is low.

A southern strand of the potentially active La Nacion fault is mapped approximately 1 mile west of the subdivision lots on the City of San Diego Seismic Safety Study and approximately 150 feet west of the current eastern terminus of Beyer Boulevard. Projection of the strike of this fault does not cross the property. Earlier mapping by Kennedy and Tan (1977) showed conjectural northwestern-striking splinter faults extending southeastward from the La Nacion Fault and buried beneath the San Ysidro landslide complex. These also do not extend onto the site and may represent secondary headscarps of the landslide complex.

6.3 Seismicity

We performed a deterministic seismic hazard analysis using Risk Engineering (2015). Six known active faults are located within a search radius of 50 miles from the property. We used the 2008 USGS fault database that provides several models and combinations of fault data to evaluate the fault information. Based on this database, the Newport-Inglewood/Rose Canyon and Rose Canyon Fault Zones, located approximately 7 miles west of the site, are the nearest known active faults and are the dominant source of potential ground motion. Earthquakes that might occur on the Newport-

Inglewood/Rose Canyon and Rose Canyon Fault Zones or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated maximum earthquake magnitude and peak ground acceleration for the Newport-Inglewood/Rose Canyon Fault are 7.5 and 0.33g, respectively. Table 6.3.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for the most dominant faults in relation to the site location. We calculated peak ground acceleration (PGA) using Boore-Atkinson (2008) NGA USGS2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2008) NGA acceleration-attenuation relationships.

TABLE 6.3.1
DETERMINISTIC SPECTRA SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2008 (g)
Newport-Inglewood/Rose Canyon	7	7.5	0.30	0.26	0.33
Rose Canyon	7	6.9	0.26	0.24	0.27
Coronado Bank	14	7.4	0.22	0.17	0.21
Palos Verdes	14	7.7	0.24	0.18	0.24
Elsinore	45	7.85	0.13	0.09	0.11
Earthquake Valley	49	6.8	0.07	0.05	0.04

In the event of a major earthquake on the referenced faults or other significant faults in the southern California and northern Baja California area, the site could be subjected to moderate to severe ground shaking. With respect to this hazard, the site is considered comparable to others in the general vicinity.

We performed a site-specific probabilistic seismic hazard analysis using the computer program *EZ-FRISK*. Geologic parameters not addressed in the deterministic analysis are included in this analysis. The program operates under the assumption that the occurrence rate of earthquakes on each mapped Quaternary fault is proportional to the faults slip rate. The program accounts for earthquake magnitude as a function of fault rupture length, and site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized

acceleration-attenuation relationships suggested by Boore-Atkinson (2008), Campbell-Bozorgnia (2008) and Chiou-Youngs (2008) in the analysis. Table 6.3.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 6.3.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson, 2008 (g)	Campbell-Bozorgnia, 2008 (g)	Chiou-Youngs, 2008 (g)
2% in a 50 Year Period	0.44	0.37	0.43
5% in a 50 Year Period	0.32	0.28	0.31
10% in a 50 Year Period	0.24	0.21	0.22

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site. Seismic design of the structures should be performed in accordance with the 2016 California Building Code (CBC) guidelines currently adopted by the City of San Diego.

6.4 Landslides

As previously discussed, a landslide complex exists west and south of the subdivision property limits. No evidence of landsliding was encountered within the subdivision footprint during our previous geotechnical studies. Landslides do exist within the Beyer Boulevard roadway extension. Recommendations for landslide mitigation for Beyer Boulevard extension are provided in this report.

In our opinion, landslides or landslide-related geologic structures should not adversely impact the proposed development. However, due to the relatively steep headscarp, a 50-foot setback between the landslide hearscarp and the subdivision development limits is recommended to provide a buffer zone in the event that surficial sloughages of the headscarp occur.

6.5 Liquefaction

Liquefaction is limited to granular soil deposits located below the groundwater table which are in a relatively loose, unconsolidated condition that are subjected to ground accelerations from a large earthquake. Due to the dense nature of the on-site soil and bedrock units, the risk associated with liquefaction potential is considered very low.

7. EARTHWORK GRADING FACTORS

Estimates of embankment shrink or swell (bulk/shrink) factors are presented in Table 7. A discussion of these factors, and the level of accuracy associated with these estimates, is warranted. Bulk/shrink factors are based on comparing existing soil or rock conditions with expected final fill conditions. Numerous uncertainties are inherent with the analysis and its potential effect on site development costs should be considered when preparing budgets. Variations in natural soil density, as well as in compacted fill, render shrinkage and bulking value estimates very approximate.

For the existing conditions, the density (and moisture content) can vary by 10 to 20 percent. The geometry of differing soil deposits can vary significantly over relatively short distances. The depth and variability of the gravel, cobble, and rock content can also vary abruptly over short distances. Due to these inherit inaccuracies in estimating bulk/shrink volumes, it is recommended that a site balance area be provided where grades can be adjusted to accommodate these uncertainties.

For fill areas, the degree of compaction that is achieved by the grading contractor may be significantly greater than the minimum required. As an example, the contractor can compact fills to any relative compaction of 90 percent or higher of the laboratory maximum dry density. Thus, the contractor has at least a 10 percent range of control over the fill volume. Overexcavation of the gravel-sand soils to generate capping material often occurs to facilitate the grading contractor's operation. The grading contractor can also undercut/overexcavate areas for *convenience yardage.*

Estimated ranges for percentage of shrinkage or bulking are presented in Table 7. For use in earthwork balancing, the midpoint (average) of these ranges is typically used in determining shrinkage and bulking amounts, and in balancing cut and fill volumes on the site. However, in addition to the use of the average shrinkage/bulking for balancing purposes, it is recommended that the upper and lower bounds of the earthwork factor ranges be used to *bracket* the range of estimated earthwork shrinkage and bulking. By using the upper and lower bounds, an estimate of the maximum deviation of earthwork quantities may be established. The resulting maximum deviation is for inherent errors relating to the variability in earthwork factors and does not include an allowance for variables that occur during construction such as site grading errors, or the other factors discussed above. In this regard, it is suggested that maximum and minimum values also be assigned to other quantity estimates to permit a *worst case* and *best case* evaluation of balance site development costs. In addition, a *balance area* should be implemented as part of the grading plan to adjust final grades based on the final shrinkage/bulking factors.

TABLE 7
BULKING AND SHRINKAGE FACTORS

Soil Unit	Shrink/Bulk Factor
Surficial Deposits (undocumented fill, topsoil, colluvium, alluvium)	10 to 15 percent shrink
Landslide Deposits	0 bulk and shrink
Terrace Deposits	0 to 3 percent bulk
Otay Formation	3 to 5 percent bulk

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 General

8.1.1 No soil or geologic conditions were encountered during our field investigation, or noted in our geologic review, that would preclude the development of property. Preliminary recommendations for grading and remediation of geotechnical constraints are provided herein.

8.1.2 It is recommended that additional geotechnical studies be performed as development plans progress. The additional studies can better define depths of remedial grading and provide more soil and geologic information specific to the proposed development.

8.1.3 Our field investigations indicate that the site is underlain by a Terrace Deposits underlain by the San Diego Formation and Otay Formation. Topsoil blankets the mesa surface. Alluvium and colluvium are present in Moody Canyon drainage and tributary drainages. Undocumented fill is mapped in some portions of the property. The undocumented fill, alluvium, colluvium, topsoil, and the Terrace Deposit clay is not suitable for support of settlement-sensitive structures and will require removal and recompaction in areas of development.

8.1.4 Groundwater and/or seepage-related problems are not anticipated provided that surface drainage is directed into properly designed drainage structures and away from pavement edges, buildings, and other moisture-sensitive improvements.

8.1.5 Based on our research, no active, potentially active, or activity unknown faults are mapped crossing the site or are trending toward the site.

8.1.6 The risk associated with geologic hazards due to liquefaction, ground rupture and landslides is low.

8.1.7 Several conditions were encountered that will require special consideration during grading. These conditions are considered important from either a soil and geologic perspective or economic considerations (i.e., increased grading costs). The special considerations identified from this study are highly expansive Terrace Deposit clays, difficult excavation characteristics of Terrace Deposit gravels and the landslide complex along the west rim of the mesa. Each condition is discussed below.

8.2 Special Considerations

8.2.1 *Highly Expansive Terrace Clay (Qtc) Deposits*. Highly expansive clays of the upper portion of the Terrace Deposit exist across the site. Trench excavations indicate that the clay varies in thickness from approximately 3 feet to 11 feet. The clay thickness generally tends to increase from north to south. Laboratory expansion index (EI) testing yielded results varying from 91 to 120. We recommend the expansive clay soils be placed at least 5 feet below finish grade. If there is not sufficient area to bury the clays, mining of the underlying sandy portion of the terrace deposit and mixing the clay with the sand and gravel can be considered to provide an acceptable finish grade expansion condition. Mixing of the underlying Terrace Gravels at an approximate 50/50 ratio resulted in expansion index values varying from 28 to 87. This will require a substantial amount of remedial grading and should be accounted for when establishing a site grading budget.

8.2.2 *Difficult Excavation of Terrace Gravel (Qtg)*. Terrace gravel deposits that underlie the clay consist of dense to very dense, cobble conglomerate with the percentage of gravel and size of cobbles and boulders increasing with depth. Excavations that extend into the larger cobble and higher percentage gravel and cobble zones will require a very heavy excavation effort (based on difficulty encountered during drilling and trenching). Deep utility excavations may require the use of a larger excavator (such as a Caterpillar 375) to efficiently dig the deposit. Mine areas to generate low expansive soils, if extended to the large cobble zones will require deep ripping with a large bulldozer (D9 or larger). In addition, larger cobbles and boulders (greater than 12 inches) should not be placed within 3 feet of finish grade.

8.2.3 *Landslide Complex*. The margin of a known landslide complex is located along the entire west and south rim of the overall South Otay Mesa property and adjacent to the west side of the subdivision area and within the proposed Beyer Boulevard roadway extension area. One of the primary purposes of previous geotechnical studies performed by Geocon Incorporated was to define the headscarp of the landslide for purposes of establishing the maximum amount of developable area on the mesa. Borings were situated as close as possible to proposed development limits line based on previous mapping. The borings were advanced to demonstrate that beyond the landslide headscarp, intact sedimentary bedrock units exist (i.e. stable conditions). In addition, during the field investigation, the headscarp was mapped in detail and surveyed to establish an accurate location. The mapped and surveyed landslide headscarp location, along with the locations of borings are shown on the Geologic Map.

8.2.4 The primary geotechnical constraint for the proposed Beyer Boulevard roadway extension is the presence of the San Ysidro Landslide that crosses a portion of the roadway. Numerous secondary landslides also exist that will require remedial grading. In addition, the presence of a bentonitic zone in the Otay Formation that will be exposed in slope cuts or impact slope stability will require stabilization. Recommendations are provided herein for removal and recompaction of loose surficial soils and construction of drained stability fills and/or buttresses within the roadway alignment.

8.3 Soil and Excavation Characteristics

8.3.1 It is anticipated that the surficial deposits (undocumented fill, topsoil, alluvium) and the Terrace Deposit clay can be excavated with a light to moderate effort with conventional heavy-duty grading equipment. Heavy to very heavy effort is anticipated to efficiently excavate the deeper Terrace Deposit gravels, landslide debris, and the San Diego and Otay formations.

8.3.2 We expect on-site soils to be both "expansive" and "non-expansive" (expansion index [EI] of greater than 20 and less than 20) as defined by 2016 California Building Code (CBC) Section 1803.5.3. Table 8.3.1 presents soil classifications based on the expansion index. The on-site soils are expected to possess a "low" to "high" expansion potential based on previous laboratory testing.

TABLE 8.3.1
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	Expansion Classification	2016 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

8.3.3 We performed laboratory tests on samples of the site materials to evaluate the percentage of water-soluble sulfate content. Results from the laboratory water-soluble sulfate content tests are presented in Appendix B and indicate that the on-site materials at the locations tested possess "Not Applicable" (S0 sulfate exposure), "Moderate" (S1 sulfate exposure) and "Severe" (S2 sulfate exposure) to concrete structures as defined by 2016 CBC Section 1904 and ACI 318-08 Sections 4.2 and 4.3. Table 8.3.2 presents a summary of concrete

requirements set forth by 2016 CBC Section 1904 and ACI 318 which should be followed in determining the type of concrete to be used for the project. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration.

TABLE 8.3.2
REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS

Sulfate Exposure	Exposure Class	Water-Soluble Sulfate Percent by Weight	Cement Type	Maximum Water to Cement Ratio by Weight	Minimum Compressive Strength (psi)
Not Applicable	S0	0.00-0.10	--	--	2,500
Moderate	S1	0.10-0.20	II	0.50	4,000
Severe	S2	0.20-2.00	V	0.45	4,500
Very Severe	S3	> 2.00	V+Pozzolan or Slag	0.45	4,500

8.3.4 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, further evaluation by a corrosion engineer may be performed if improvements that could be susceptible to corrosion are planned.

8.4 Grading

8.4.1 All grading should be performed in accordance with the *Recommended Grading Specifications* contained in Appendix F. Where the recommendations of this section conflict with those of Appendix F; **the recommendations of this section take precedence**.

8.4.2 Prior to commencing grading, a preconstruction conference should be held at the site with the owner and/or developer, grading contractor, civil engineer and geotechnical engineer in attendance. Special soil handling and/or the grading plans can be discussed at that time.

8.4.3 Site preparation should begin with the removal of all deleterious material and vegetation. The depth of removal should be such that material exposed in cut areas or soils to be used as fill are relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

8.4.4 Undocumented fill, topsoil, alluvium and the Terrace Deposit clay within the limits of development should be removed to expose firm sandy soil of the terrace gravel, the San Diego Formation, or Otay Formation. Deeper than normal benching and/or stripping operations for sloping ground surfaces will be required for removal of thicker topsoil and colluvium.

8.4.5 Where not restricted by property line or protected open space, removal of compressible surficial soils should extend beyond the toe of fill slopes a horizontal distance equal to the depth of the remedial removal (see Figure 14 for general information). The actual extent of remedial grading should be determined in the field by the geotechnical engineer or engineering geologist.

8.4.6 Stabilization of cut slopes will be required on the south side of the proposed Beyer Boulevard roadway alignment and to mitigate younger landslides (Qls2) on the north side (See Geologic Cross-Sections B-B', D-D', G-G', H-H', I-I', and J-J'). Planned cuts creating slopes up to 80 feet are anticipated and construction of drained stability fills will be required. A buttress or shear key to remove Qls2 debris and the bentonite layer of the Otay Formation within the roadway alignment is also recommended to provide stable slopes. Details pertaining to stability fills and buttresses are shown on the Geologic Cross Sections. Construction of recommended stabilization fills and buttresses will require extensive grading and some stockpiling of high strength materials for use in the stabilization areas. Minimum shear strength parameters for buttress fills to produce a factor of safety in excess of 1.5 are a friction angle of 34 degrees and an cohesion of 500 psf. This will require select grading and may require a relative compaction of 95 percent or greater.

8.4.7 We recommend grading be performed so that soil within 5 feet of finish grade is composed of granular *low* expansive soil (Expansion Index of 50 or less). The expansive clays should be placed in deeper fill areas. We expect the canyon drainage area at the north end of the property will provide sufficient area for clay burial. However, if there is not sufficient area for clay placement, consideration should be given to mining the Terrace Deposit sand and gravel to enable clay burial. Alternatively, the Terrace Deposit sand and gravel can be mixed with the clay. Previous laboratory expansion index testing on samples of mixed soil resulted in a *medium* expansion potential. Mixing would require less mining; however, we expect mixing would generate medium expansive soils near finish grade, which would result in Category II foundations.

8.4.8 After removal of unsuitable materials as described above is performed, the site should then be brought to final subgrade elevations with structural fill compacted in layers. In general, soils native to the site are suitable for re-use as fill if free from vegetation, debris and other deleterious matter. Layers of fill should be no thicker than will allow for adequate bonding and compaction. All fill, including backfill and scarified ground surfaces, should be compacted to at least 90 percent of laboratory maximum dry density as determined by ASTM Test Procedure D-1557; at or slightly above optimum moisture content. Fills greater than 50-feet-thick should be compacted to at least 93 percent of the laboratory maximum dry density at or above optimum moisture content. Fill areas with in-place density test results indicating moisture contents less that specified will require additional moisture conditioning prior to placing additional fill.

8.4.9 Oversize material (defined as material greater than 12 inches in nominal dimension) may be generated during excavation of the Terrace Gravel deposit. Placement of the oversize cobble and boulders should be performed in accordance with the recommendations in Appendix F. For fill areas it is recommended that oversize materials not be placed within 5 feet of proposed finish grade elevation for building pads and 3 feet below the deepest utility within streets.

8.4.10 Where grading results in cut to fill transitions across lots, the cut portion of the transition should be over-excavated (undercut) at least 3 feet below proposed finish grade and replaced with properly compacted “very low” to “low” expansive fill soils. Overexcavations should be cut at a gradient of one percent toward the street or the deeper fill area to provide drainage for moisture migration along the contact between the native soil and compacted fill.

8.4.11 Consideration should be given to undercutting cut pads that expose large cobble or boulders within the Terrace Deposit at least 3 feet below pad grade to facilitate excavation of foundations and shallow utilities.

8.4.12 Cut pads that expose expansive clay should be undercut to a depth of at least 5 feet. After the overexcavations have been performed, the area should be brought back to design subgrade elevations with properly compacted *low* expansive granular soils.

8.4.13 It is recommended that the cut portion of cut-fill transition pads be undercut to a depth of at least 3 feet below pad grade and replaced with properly compacted *low* expansive fill soils.

8.4.14 Imported fill should consist of granular soil with a *low* expansion potential (EI of 50 or less) that is free of deleterious material or stones larger than 3 inches and should be compacted as recommended above. Geocon Incorporated should be notified of the import soil source and should perform laboratory testing prior to its arrival at the site to evaluate its suitability as fill material.

8.5 Subdrains

8.5.1 Subdrains are recommended at the base of stability fills and buttresses. Chimney drains are also recommended. This is intended to intercept landscape irrigation that migrates through the stability fills and divert it to prevent a source for water migrating into the landslide debris left in-place.

8.5.2 The subdrain should consist of a 6-inch-diameter perforated PVC pipeline placed at the base of the stability fill/buttress backcut. The pipe should be covered by crushed gravel (approximately 6 cubic feet of gravel per lineal foot of pipe) surrounded by a filter fabric. The pipes should drain at a minimum gradient of 1 percent and outlet to a suitable location (storm drain system). A typical buttress drain detail is provided on Figure 15 and shown on Geologic Cross Sections A-A', B-B', and D-D'.

8.5.3 Subdrains should be constructed in tributary canyons to be filled. The subdrain should extend up the canyons to approximately 15 feet below proposed ultimate finish grade elevations and at least 2 feet below any proposed utilities. Typical subdrain construction details are presented on Figures 16 and 17. The recommended location of the subdrain is shown on Figures 3 through 5.

8.5.4 The final 20-foot segment of a subdrain should consist of non-perforated drainpipe. At the non-perforated/perforated interface, a seepage cutoff wall should be constructed on the downslope side of the junction in accordance with Figure 18. Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure in accordance with Figure 18.

8.5.5 After construction of the subdrains, the project civil engineer should survey the locations and prepare accurate as-built plans of the subdrain locations. The project soils engineer should verify the as-built subdrain outlet. The contractor should ensure that an adequate drainage gradient is maintained throughout the system, and that the subdrain outlet is free of obstructions.

8.6 Settlement Monitoring

8.6.1 The maximum fill thickness occurs within canyon drainages. We estimate a fill thickness of approximately 70 to 100 feet (fill plus remedial removals). We recommend settlement monuments be placed in areas where the fill thickness exceeds 50 feet. The locations of monuments will be determined once 40-scale grading plans are available.

8.6.2 Figure 19 shows a typical settlement monument detail. We recommend surface settlement monuments be installed and monitored until the readings indicate settlement, as a result of fill placement, is essentially complete. Settlement monuments should be surveyed on a weekly basis for the first month and every other week thereafter until the readings indicate primary settlement is essentially complete. We estimate a settlement period of 3 months. The surveyed results should be provided to Geocon Incorporated to evaluate when settlement has essentially ceased.

8.7 Slope Stability

8.7.1 Slope stability analysis for the Beyer Boulevard extension are provided in Appendix E. A discussion of slope stability for subdivision slopes and adjacent areas are provided below.

8.7.2 Cross Section K-K′ was prepared to perform a global stability analysis of the proposed subdivision development area and adjacent landslide complex. The basal landslide elevation was projected from boring and stability analysis information associated with the Intermodal Transportation Facility southwest of the site. The cross section from the Intermodal Transportation Facility was extended onto the mesa rim to encompass the entire width of the landslide. Our stability analysis was performed for both an assumed flat basal slip surface (BSS) and a 3-degree dipping BSS. Our analysis indicates for the overall landslide, a factor of safety of 1.5 for both a flat and a 3-degree dipping shear zone (see Figures 20 and 21). Based on these results, and previous hypothetical analysis in the general landslide area, global movement of the entire slide mass is unlikely to impact the site. In our opinion subdivision property, in its current condition, has a global factor of safety of 1.5. However, due to the very steep headscarp at the mesa rim, we recommend a 50-foot development setback from the surveyed location of the headscarp be established to provide a buffer zone in the event of surficial instability of the headscarp.

8.7.3 General slope stability analyses were performed for proposed cut and fill slopes using shear strength parameters based upon laboratory test results from previous investigations and experience with similar soil and geologic conditions. The results of the analysis indicate that cut and fill slopes have a factor-of-safety of at least 1.5 against deep seated

and surficial instability for heights up to 50 foot (cut) and 100 feet (fill). The results of the analyses are presented on Figures 22 through 24.

8.7.4 We recommend that cut slopes be observed during grading by an engineering geologist to check that the soil and geologic conditions do not differ significantly from those anticipated and to check if adverse bedding, sheared claystones, fractures or joints exist. Remedial grading procedures (i.e., buttresses, stability fills) may be recommended should adverse geologic conditions be observed.

8.7.5 The outer 15 feet (or a distance equal to the height of the slope, whichever is less) of fill slopes should be composed of properly compacted granular "soil" fill to reduce the potential for slope creep and surficial sloughing. This width may be increased for slope stability considerations based on future studies. In general, soil with an EI$\leq$50 should be used within the outer slope zone.

8.7.6 All fill slopes should be overbuilt at least 3 feet horizontally and cut back to the design finish grade. As an alternative, fill slopes may be compacted by back-rolling at vertical intervals not to exceed 4 feet and then track-walking with a D-8 dozer, or equivalent, upon completion such that the fill soils are uniformly compacted to at least 90 percent relative compaction to the face of the finished slope.

8.7.7 Slopes should be landscaped with drought-tolerant vegetation having variable root depths and requiring minimal landscape irrigation. Slopes should also be properly maintained to reduce erosion.

8.8 Seismic Design Criteria

8.8.1 We used the computer program *U.S. Seismic Design Maps*, provided by the USGS. Table 8.8.1 summarize site-specific design criteria obtained from the 2016 California Building Code (CBC; Based on the 2012 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. The site should be designed for Site Class D. We evaluated the Site Class based our experience for the site sub surface soils and exploratory boring information in accordance with Section 1613.3.2 of the 2016 CBC, and Table 20.3-1 of ASCE 7-10. The values presented in Table 8.8.1 are for the risk-targeted maximum considered earthquake (MCE_R).

TABLE 8.8.1
2016 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2016 CBC Reference
Site Class	D	Table 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	0.886g	Figure 1613.3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.335g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.146	Table 1613.3.3(1)
Site Coefficient, F_V	1.731	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	1.015g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration – (1 sec), S_{M1}	0.579g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.677g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.386g	Section 1613.3.4 (Eqn 16-40)

8.8.2 Table 8.8.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 8.8.2
2016 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	ASCE 7-10 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.360g	Figure 22-7
Site Coefficient, F_{PGA}	1.140	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.411g	Section 11.8.3 (Eqn 11.8-1)

8.8.3 Conformance to the criteria in Table 8.8.1 and 8.8.2 does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

8.9 Foundations

8.9.1 The foundation recommendations herein are for proposed one- to three-story residential structures. The foundation recommendations have been separated into three categories dependent on the thickness and geometry of the underlying fill soils as well as the expansion index of the prevailing subgrade soils of a particular building pad (or lot). The foundation category criteria are presented in Table 8.9.1. Final foundation categories for each building or lot will be provided after completion of grading (finish pad grades have been achieved) and laboratory expansion testing of the finish grade soils is complete.

TABLE 8.9.1
FOUNDATION CATEGORY CRITERIA

Foundation Category	Maximum Fill Thickness, T (feet)	Differential Fill Thickness, D (feet)	Expansion Index (EI)
I	$T<20$	--	$EI \leq 50$
II	$20 \leq T<50$	$10 \leq D<20$	$50<EI \leq 90$
III	$T \geq 50$	$D \geq 20$	$90<EI \leq 130$

8.9.2 Table 8.9.2 presents minimum foundation and interior concrete slab design criteria for conventional foundation systems.

TABLE 8.9.2
CONVENTIONAL FOUNDATION RECOMMENDATIONS BY CATEGORY

Foundation Category	Minimum Footing Embedment Depth (inches)	Continuous Footing Reinforcement	Interior Slab Reinforcement
I	12	Two No. 4 bars, one top and one bottom	6 x 6 - 10/10 welded wire mesh at slab mid-point
II	18	Four No. 4 bars, two top and two bottom	No. 3 bars at 24 inches on center, both directions
III	24	Four No. 5 bars, two top and two bottom	No. 3 bars at 18 inches on center, both directions

8.9.3 The embedment depths presented in Table 8.9.2 should be measured from the lowest adjacent pad grade for both interior and exterior footings. The conventional foundations should have a minimum width of 12 inches and 24 inches for continuous and isolated footings, respectively. A wall/column footing dimension detail is presented on Figure 25.

8.9.4 The concrete slab-on-grade should be a minimum of 4 inches thick for Foundation Categories I and II and 5 inches thick for Foundation Category III.

8.9.5 A vapor retarder should underlie slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). In addition, the membrane should be installed in accordance with manufacturer's recommendations and ASTM requirements and installed in a manner that prevents puncture. The project architect or developer should specify the type of vapor retarder used based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

8.9.6 The project foundation engineer, architect, and/or developer should determine the thickness of bedding sand below the slab. In general, 3 to 4 inches of sand bedding is typically used. Geocon should be contacted to provide recommendations if the bedding sand is thicker than 6 inches.

8.9.7 The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plan. It is critical that the foundation contractor understands and follows the specifications presented on the foundation plan.

8.9.8 As an alternative to the conventional foundation recommendations, consideration should be given to the use of post-tensioned concrete slab and foundation systems for the support of the proposed structures. The post-tensioned systems should be designed by a structural engineer experienced in post-tensioned slab design and design criteria of the Post-Tensioning Institute (PTI), Third Edition, as required by the 2016 California Building Code (CBC Section 1808.6). Although this procedure was developed for expansive soil conditions, it can also be used to reduce the potential for foundation distress due to differential fill settlement. The post-tensioned design should incorporate the geotechnical parameters presented on Table 8.9.3 for the particular Foundation Category designated. The parameters presented in Table 8.9.3 are based on the guidelines presented in the PTI, Third Edition design manual.

TABLE 8.9.3
POST-TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS

Post-Tensioning Institute (PTI), Third Edition Design Parameters	Foundation Category		
	I	II	III
Thornthwaite Index	-20	-20	-20
Equilibrium Suction	3.9	3.9	3.9
Edge Lift Moisture Variation Distance, e_M (feet)	5.3	5.1	4.9
Edge Lift, y_M (inches)	0.61	1.10	1.58
Center Lift Moisture Variation Distance, e_M (feet)	9.0	9.0	9.0
Center Lift, y_M (inches)	0.30	0.47	0.66

8.9.9 The foundations for the post-tensioned slabs should be embedded in accordance with the recommendations of the structural engineer. If a post-tensioned mat foundation system is planned, the slab should possess a thickened edge with a minimum width of 12 inches and extend at least 6 inches below the clean sand or crushed rock layer.

8.9.10 If the structural engineer proposes a post-tensioned foundation design method other than PTI, Third Edition:

- The deflection criteria presented in Table 8.9.3 are still applicable.
- Interior stiffener beams should be used for Foundation Categories II and III.
- The width of the perimeter foundations should be at least 12 inches.
- The perimeter footing embedment depths should be at least 12 inches, 18 inches and 24 inches for foundation categories I, II, and III, respectively. The embedment depths should be measured from the lowest adjacent pad grade.

8.9.11 Our experience indicates post-tensioned slabs are susceptible to excessive edge lift, regardless of the underlying soil conditions. Placing reinforcing steel at the bottom of the perimeter footings and the interior stiffener beams may mitigate this potential. The placement of the reinforcing tendons in the top of the slab and the resulting eccentricity after tensioning could reduce the ability of the system to mitigate edge lift. The structural engineer should design the foundation system to reduce the potential of edge lift occurring for the proposed structures.

8.9.12 During the construction of the post-tension foundation system, the concrete should be placed monolithically. Under no circumstances should cold joints form between the footings/grade beams and the slab during the construction of the post-tension foundation system.

8.9.13 Category I, II, or III foundations may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot (psf) (dead plus live load). This bearing pressure may be increased by one-third for transient loads due to wind or seismic forces. The estimated maximum total and differential settlement for the planned structures due to foundation loads is 1 inch and ½ inch, respectively. Differential settlement is estimated to occur over a span of 40 feet.

8.9.14 Additional settlement as a result of hydro-compression could occur as the compacted fills become wet. We estimate an additional settlement of 0.2 to 0.3 percent of the total fill thickness due to hydro-compression after the completion of primary settlement. We expect hydro-compression to occur over a 20 year or more duration. The estimated fill thickness and total settlement as a result of hydro-compression for each foundation category is presented below. We estimate differential settlement as a result of hydro-compression to be approximately one-half of the total settlement listed on Table 8.9.4. An estimate of total and differential fill thickness and final foundation categories for each building or lot will be provided in an as-graded reports once grading is complete.

TABLE 8.9.4
ESTIMATED TOTAL SETTLEMENT
AS A RESULT OF HYDRO-COMPRESSION

Foundation Category	Estimated Maximum Fill Thickness (after grading) (feet)	Estimated Total Fill Settlement (inches)
I	0 to 20 feet	0 to 0.5
II	20 to 50 feet	0.5 to 1.5
III	50 to 70 feet	1.5 to 2

8.9.15 Foundations will need to be designed to accommodate estimated total and differential fill settlement from both building loading and hydro-compression.

8.9.16 Isolated footings outside of the slab area, if present, should have the minimum embedment depth and width recommended for conventional foundations for a particular foundation category. The use of isolated footings, which are located beyond the perimeter of the building and support structural elements connected to the building, are not recommended for Category III. Where this condition cannot be avoided, the isolated footings should be connected to the building foundation system with grade beams.

8.9.17 For Foundation Category III, consideration should be given to using interior stiffening beams and connecting isolated footings and/or increasing the slab thickness. In addition,

consideration should be given to connecting patio slabs, which exceed 5 feet in width, to the building foundation to reduce the potential for future separation to occur.

8.9.18 Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisture conditioned, as necessary, to maintain a moist condition as would be expected in any such concrete placement.

8.9.19 Where buildings or other improvements are planned near the top of a slope steeper than 3:1 (horizontal:vertical), special foundations and/or design considerations are recommended due to the tendency for lateral soil movement to occur.

- For fill slopes less than 20 feet high or cut slopes regardless of height, building footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.

- When located next to a descending 3:1 (horizontal:vertical) fill slope or steeper, the foundations should be extended to a depth where the minimum horizontal distance is equal to H/3 (where H equals the vertical distance from the top of the fill slope to the base of the fill soil) with a minimum of 7 feet but need not exceed 40 feet. The horizontal distance is measured from the outer, deepest edge of the footing to the face of the slope. A post-tensioned slab and foundation system or mat foundation system can be used to help reduce potential foundation distress associated with slope creep and lateral fill extension. Specific design parameters or recommendations for either of these alternatives can be provided if desired.

- If swimming pools are planned, Geocon Incorporated should be contacted for a review of specific site conditions.

- Swimming pools located within 7 feet of the top of cut or fill slopes are not recommended. Where such a condition cannot be avoided, the portion of the swimming pool wall within 7 feet of the slope face be designed assuming that the adjacent soil provides no lateral support. This recommendation applies to fill slopes up to 30 feet in height, and cut slopes regardless of height. For swimming pools located near the top of fill slopes greater than 30 feet in height, additional recommendations may be required and Geocon Incorporated should be contacted for a review of specific site conditions.

- Although other improvements, which are relatively rigid or brittle, such as concrete flatwork or masonry walls, may experience some distress if located near the top of a slope, it is generally not economical to mitigate this potential. It may be possible, however, to incorporate design measures which would permit some lateral soil movement without causing extensive distress. Geocon Incorporated should be consulted for specific recommendations.

8.9.20 The exterior flatwork recommendations provided herein assumes that grading is performed as recommended above and that the near surface soils are very low to medium expansive (EI≤90). Exterior slabs not subjected to vehicular traffic should be a minimum of four inches thick and reinforced with 6 x 6-6/6 welded wire mesh. The mesh should be placed in the middle of the slab. Proper mesh positioning is critical to future performance of the slabs. The contractor should take extra measures to provide proper mesh placement. Prior to construction of slabs, the upper 12 inches of subgrade soils should be moisture conditioned one to three percent above optimum moisture content and compacted to at least 90 percent of the laboratory maximum dry density per ASTM 1557.

8.9.21 To control the location and spread of concrete shrinkage and/or expansion cracks, it is recommended that crack-control joints be included in the design of concrete slabs. Crack-control joint spacing should not exceed, in feet, twice the recommended slab thickness in inches (e.g., 10 feet by 10 feet for a 5-inch-thick slab). Crack-control joints should be created while the concrete is still fresh using a grooving tool or shortly thereafter using saw cuts. The structural engineer should take criteria of the American Concrete Institute into consideration when establishing crack-control spacing patterns.

8.9.22 The recommendations of this report are intended to reduce the potential for cracking of slabs due to expansive soil (if present), differential settlement of existing soil or soil with varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

8.9.23 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

8.10 Retaining Walls and Lateral Loads

8.10.1 Retaining walls that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall) at the top of the wall and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 35 pcf. Where the backfill will be inclined at 2:1 (horizontal:vertical), an active soil pressure of 50 pcf is recommended. Expansive soil should not be used as backfill

material behind retaining walls. Soil placed for retaining wall backfill should have an Expansion Index less than 50.

8.10.2 Where walls are restrained from movement at the top, an additional uniform pressure of 8H psf (where H equals the height of the retaining wall portion of the wall in feet) should be added to the active soil pressure where the wall possesses a height of 8 feet or less and 12H where the wall is greater than 8 feet. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to two feet of fill soil should be added.

8.10.3 Soil to be used as backfill should be stockpiled and samples obtained for laboratory testing to evaluate its suitability for use as wall backfill. Modified lateral earth pressures will be required if backfill soils do not meet the required expansion index. City standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. On-site soils might not meet the design values used for City standard wall design. Geocon Incorporated should be consulted if City standard wall designs will be used to assess the suitability of on-site soil for use as wall backfill.

8.10.4 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The wall designer should provide appropriate lateral deflection quantities for planned retaining walls structures, if applicable. These lateral values should be considered when planning types of improvements above retaining wall structures.

8.10.5 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and should be waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The above recommendations assume a properly compacted granular (EI of less than 50) free-draining backfill material with no hydrostatic forces or imposed surcharge load. A typical retaining wall drainage detail is presented on Figure 26. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

8.10.6 In general, wall foundations having a minimum depth and width of 1 foot may be designed for an allowable soil bearing pressure of 2,000 psf, provided the soil within 3 feet below the base of the wall has an Expansion Index of less than 90. The recommended allowable soil bearing pressures may be increased by 300 psf and 500 psf for each additional foot of

foundation width and depth, respectively, up to a maximum allowable soil bearing pressure of 4,000 psf. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, Geocon Incorporated should be consulted where such a condition is expected.

8.10.7 The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the CBC. If the project possesses a seismic design category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 18.3.5.12 of the 2013 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall. A seismic load of 20H should be used for design. We used the peak ground acceleration adjusted for Site Class effects, PGA_M, of 0.411 g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.33.

8.10.8 For resistance to lateral loads, an allowable passive earth pressure equivalent to a fluid density of 300 pcf is recommended for footings or shear keys poured neat against properly compacted granular fill soils or undisturbed formation materials. The allowable passive pressure assumes a horizontal surface extending away from the base of the wall at least 5 feet or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material not protected by floor slabs or pavement should not be included in the design for lateral resistance. Where walls are planned adjacent to and/or on descending slopes, a passive pressure of 150 pcf should be used in design.

8.10.9 An allowable friction coefficient of 0.35 may be used for resistance to sliding between soil and concrete. This friction coefficient may be combined with the allowable passive earth pressure when determining resistance to lateral loads.

8.10.10 The recommendations presented above are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of eight feet. In the event that walls higher than eight feet or other types of walls (i.e., soil nail) are planned, Geocon Incorporated should be consulted for additional recommendations. We understand MSE walls up to approximately 23 feet may be utilized for the walls in the canyon drainage. Preliminary recommendations for MSE walls are provided in Section 7.11 of this report.

8.11 MSE Retaining Walls

8.11.1 We recommend the geotechnical parameters in Table 8.1.1 be used for design of MSE retaining walls with grid reinforced backfill.

TABLE 8.1.1
GEOTECHNICAL PARAMETERS FOR GEOSYNTHETIC REINFORCED WALLS

Parameter	Reinforced Zone	Retained Zone	Foundation Zone
Angle of Internal Friction	30 degrees	30 degrees	30 degrees
Cohesion	100 psf	100 psf	100 psf
Wet Unit Weight	130 pcf	130 pcf	130 pcf

8.11.2 The above soil parameters are based on preliminary direct shear strength test results and represent some of the on-site materials. As such, once backfill soils have been identified, sufficient shear tests should be conducted on samples of the proposed backfill soils to verify they conform to actual design values. Results should be provided to the designer to re-evaluate stability of the walls. Dependent upon test results, the designer may require modifications to the original wall design (e.g., longer geogrid embedment lengths).

8.11.3 Retaining walls that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall in feet) at the top of the wall and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid having a density of 35 pounds per cubic foot (pcf). Where the backfill will be inclined at no steeper than 2:1 (horizontal:vertical), an active soil pressure of 50 pcf is recommended. These soil pressures assume that the backfill materials within an area bounded by the wall and a 1:1 plane extending upward from the base of the wall are sandy soils with suitable shear characteristics and an EI of 50 or less. Laboratory tests should be performed on soils to be used as wall backfill to assess their suitability for use.

8.11.4 For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill should be added to the wall design.

8.11.5 An allowable soil bearing pressure of 2,000 pounds per square foot (psf) can be used for foundation design and calculations for wall bearing. This bearing pressure assumes a minimum foundation width and depth of 12 inches. The allowable soil bearing pressure may be increased by 300 psf and 500 psf for each additional foot of foundation width and

depth, respectively, up to a maximum allowable soil-bearing pressure of 4,000 psf. Walls that are built on sloping ground surfaces should be at least 7 feet horizontally from the slope face to the wall. This may require deeper foundation embedment to achieve the 7-foot distance.

8.11.6 The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the CBC. If the project possesses a seismic design category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 18.3.5.12 of the 2013 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall. A seismic load of 20H should be used for design. We used the peak ground acceleration adjusted for Site Class effects, PGA_M, of 0.411 g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.33.

8.11.7 To resist lateral loads, a passive pressure equivalent to the pressure exerted by a fluid density of 300 pcf should be used for design of footings or shear keys poured neat against properly compacted granular fill soils. The passive pressure assumes that a horizontal ground surface extends away from the base of the wall at least five feet or three times the depth of the surface generating the passive pressure, whichever is greater. For 2:1 (H:V) descending sloping conditions adjacent to foundation elements where the assumption for passive pressure discussed above is not met, a passive earth pressure of 150 pcf is recommended. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

8.11.8 If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.35 should be used for design. Both passive and friction can be combined to resist sliding.

8.11.9 The wall should be provided with drainage system sufficient enough to prevent excessive seepage through the wall and water at the base of the wall to prevent hydrostatic pressures behind the wall.

8.11.10 Backfill materials within the reinforced zone should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to or slightly above optimum moisture content in accordance with ASTM D 1557. This is applicable to the entire embedment length of the geogrid reinforcement. Typically, wall designers specify that

heavy compaction equipment be excluded from within 3 feet of the face of the wall; however, smaller equipment (e.g., walk-behind, self-driven compactors or hand whackers) should be used to compact the materials without causing deformation of the wall. If the designer specifies no compactive effort for this zone, the materials are essentially not properly compacted and the geogrid within the uncompacted zone should not be relied upon for reinforcement and overall embedment lengths should be increased to account for the difference.

8.11.11 Geosynthetic reinforcement must elongate to develop full tensile resistance. This elongation generally results in movement at the top of the wall. The amount of movement is dependent upon the height of the wall (e.g., higher walls rotate more), construction, and the type of geosynthetic used. In addition, over time reinforced-earth retaining walls have been known to exhibit creep and can undergo additional movement. Given this condition, the owner should be aware that structures and pavement placed within the reinforced and retained zones of the wall may undergo movement and should be designed to accommodate this movement.

8.12. Slope Maintenance

8.12.1 Slopes that are steeper than 3:1 (horizontal:vertical) may, under conditions which are both difficult to prevent and predict, be susceptible to near surface (surficial) slope instability. The instability is typically limited to the outer three feet of a portion of the slope and usually does not directly impact the improvements on the pad areas above or below the slope. The occurrence of surficial instability is more prevalent on fill slopes and is generally preceded by a period of heavy rainfall, excessive irrigation, or the migration of subsurface seepage. The disturbance and/or loosening of the surficial soils, as might result from root growth, soil expansion, or excavation for irrigation lines and slope planting, may also be a significant contributing factor to surficial instability. It is, therefore, recommended that, to the maximum extent practical: (a) disturbed/loosened surficial soils be either removed or properly recompacted, (b) irrigation systems be periodically inspected and maintained to eliminate leaks and excessive irrigation, and (c) surface drains on and adjacent to slopes be periodically maintained to preclude ponding or erosion. It should be noted that although the incorporation of the above recommendations should reduce the potential for surficial slope instability, it will not eliminate the possibility, and, therefore, it may be necessary to rebuild or repair a portion of the project's slopes in the future.

8.13 Storm Water Management

8.13.1 If storm water management devices are not properly designed and constructed, there is a risk for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water being detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeological study at the site. If infiltration of storm water runoff into the subsurface occurs, downstream improvements may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of water infiltration.

8.13.2 Storm water management recommendations are provided under separate cover.

8.14 Site Drainage and Moisture Protection

8.14.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2010 CBC 1804.3 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

8.14.2 In the case of basement walls or building walls retaining landscaping areas, a water-proofing system should be used on the wall and joints, and a Miradrain drainage panel (or similar) should be placed over the waterproofing. The project architect or civil engineer should provide detailed specifications on the plans for all waterproofing and drainage.

8.14.3 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

8.14.4 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. We recommend the use of drains to collect excess irrigation water and transmit it to drainage structures, or impervious above-grade planter boxes. In addition, where landscaping is

planned adjacent to the pavement, we recommend construction of a cutoff wall along the edge of the pavement that extends at least six inches below the bottom of the base material.

8.15 Grading and Foundation Plan Review

8.15.1 Geocon Incorporated should review the grading and foundation plans for the project prior to final design submittal to determine if additional analysis and/or recommendations are required.

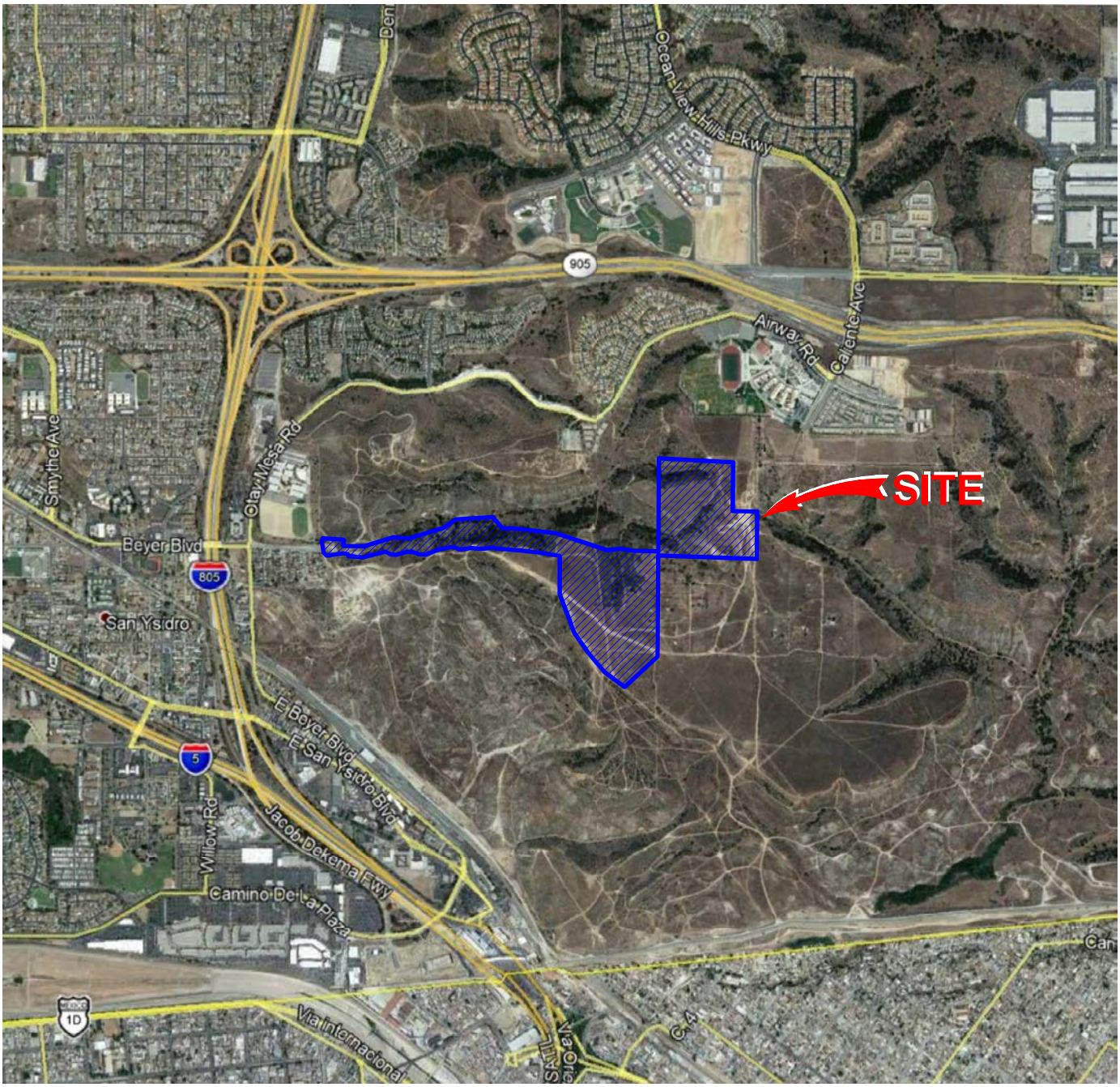
LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.

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

4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.



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N

NO SCALE

VICINITY MAP

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
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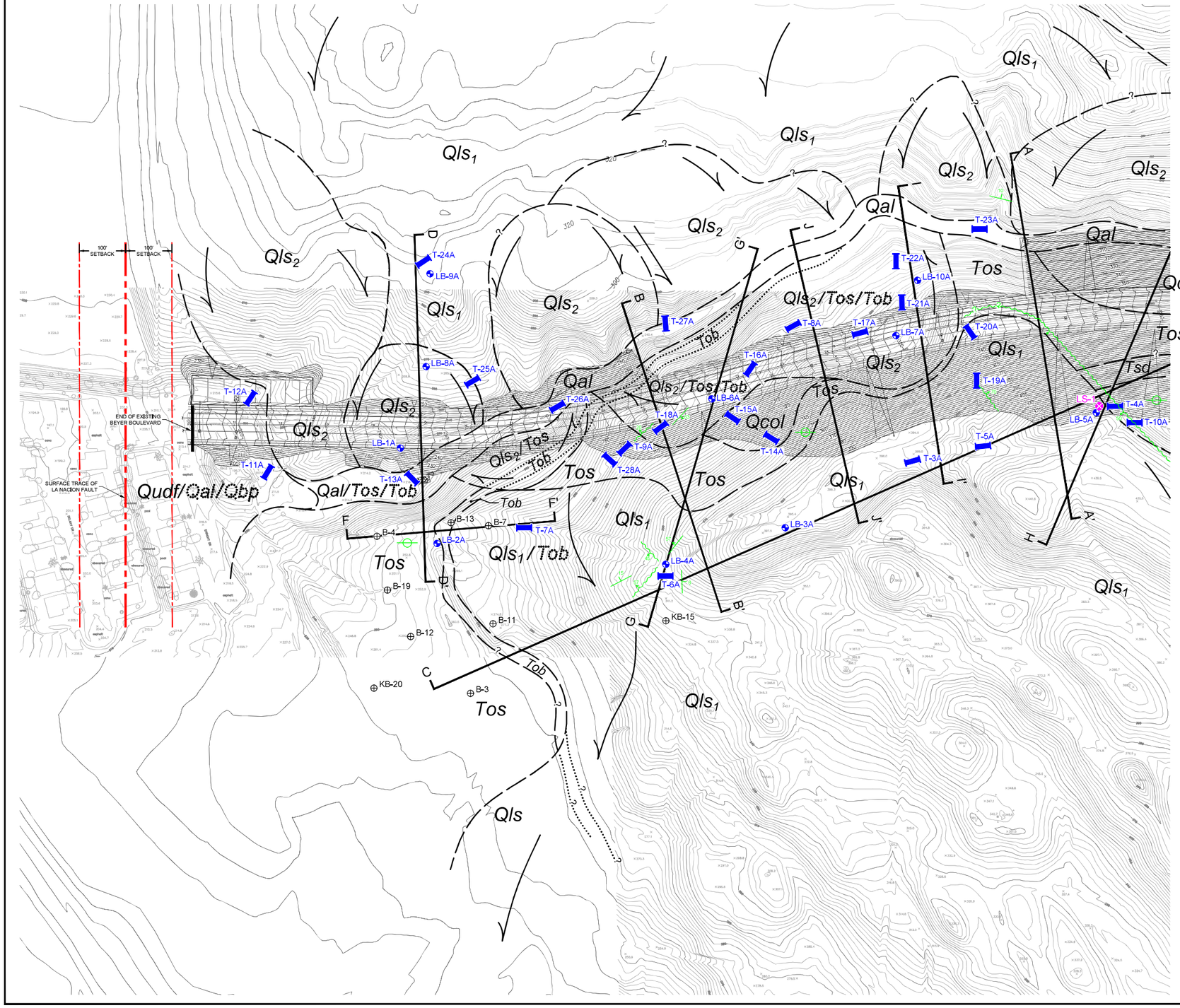
SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

RM / AML		DSK/GTYPD

DATE 03 - 28 - 2019	PROJECT NO. 06847 - 42 - 03	FIG. 1

Plotted:03/28/2019 10:23AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 2019)\DETAILS\07847-42-03 Vic Map.dwg



GRAPHIC SCALE
0' 50' 100' 150' 200' 300' 400'
SCALE 1"=100' (on 36x24)

GEOCON LEGEND

- Qudf ..... UNDOCUMENTED FILL
- Qls_1 ..... LANDSLIDE DEBRIS (OLDER); RELATED TO SAN YSIDRO LANDSLIDE
- Qls_2 ..... LANDSLIDE DEBRIS (YOUNGER); RELATED TO SECONDARY LANDSLIDE GENERATED BY THE EROSION OF MOODY CANYON INTO THE OLDER SAN YSIDRO LANDSLIDE
- Qal ..... ALLUVIUM (Dotted Where Buried)
- Qcol ..... COLLUVIUM
- Qtc ..... TERRACE DEPOSIT CLAY; CORRELATES TO THE UPPER PORTION OF THE LINDAVISTA FORMATION (The "Normal Heights Mudstone" OF Reed, 1990)
- Qtg ..... TERRACE DEPOSIT GRAVEL; CORRELATES TO THE LOWER CONGLOMERATE PORTIONS OF LINDAVISTA FORMATION
- Qbp ..... BAY POINT FORMATION (Dotted Where Buried)
- Tsd ..... SAN DIEGO FORMATION
- Tos ..... OTAY FORMATION - SILTSTONE (Dotted Where Buried)
- Tob ..... OTAY FORMATION BENTONITIC MEMBER (Dotted Where Buried)
- Tog ..... OTAY FORMATION - GRITSTONE MEMBER (Not Mapped, Shown on Geologic Cross Sections and Dotted Where Buried)
- ..... APPROX. LOCATION OF GEOLOGIC CONTACT (Dotted Where Buried, Queried Where Uncertain)
- ..... LA NACION FAULT (CITY OF SAN DIEGO SEISMIC SAFETY MAP, SHEET 2, 1995)
- LB-7 ..... APPROX. LOCATION OF LARGE-DIAMETER EXPLORATORY BORING (Geocon Report Dated 07-17-2013)
- LB-10A ..... APPROX. LOCATION OF LARGE DIAMETER BORING (Geocon Report Dated 05-10-2006)
- LB-6 ..... APPROX. LOCATION OF LARGE DIAMETER BORING (Geocon Report Dated 10/04/2002)
- ..... APPROX. LOCATION OF LARGE DIAMETER BORING (Geotechnics Report Dated 06/08/1988 and 05/04/2004)
- T-28 ..... APPROX. LOCATION OF EXPLORATORY BACKHOE TRENCH (Geocon Report Dated 07-17-2013)
- T-23A ..... APPROX. LOCATION OF EXPLORATORY BACKHOE TRENCH (Geocon Report Dated 05-10-2006)
- T-13 ..... APPROX. LOCATION OF EXPLORATORY BACKHOE TRENCH (Geocon Report Dated 10/04/2002)
- (2) ..... Thickness of Terrace Deposit Clay in Feet
- ..... APPROX. STRIKE AND DIP OF LANDSLIDE SHEAR FAILURE
- ..... APPROX. STRIKE AND DIP OF BEDDING, DIPPING, AND HORIZONTAL ATTITUDES
- P P' ..... APPROX. LOCATION OF GEOLOGIC CROSS SECTION
- LS-25 ..... SURVEYED LOCATION OF LANDSLIDE HEADSCARP

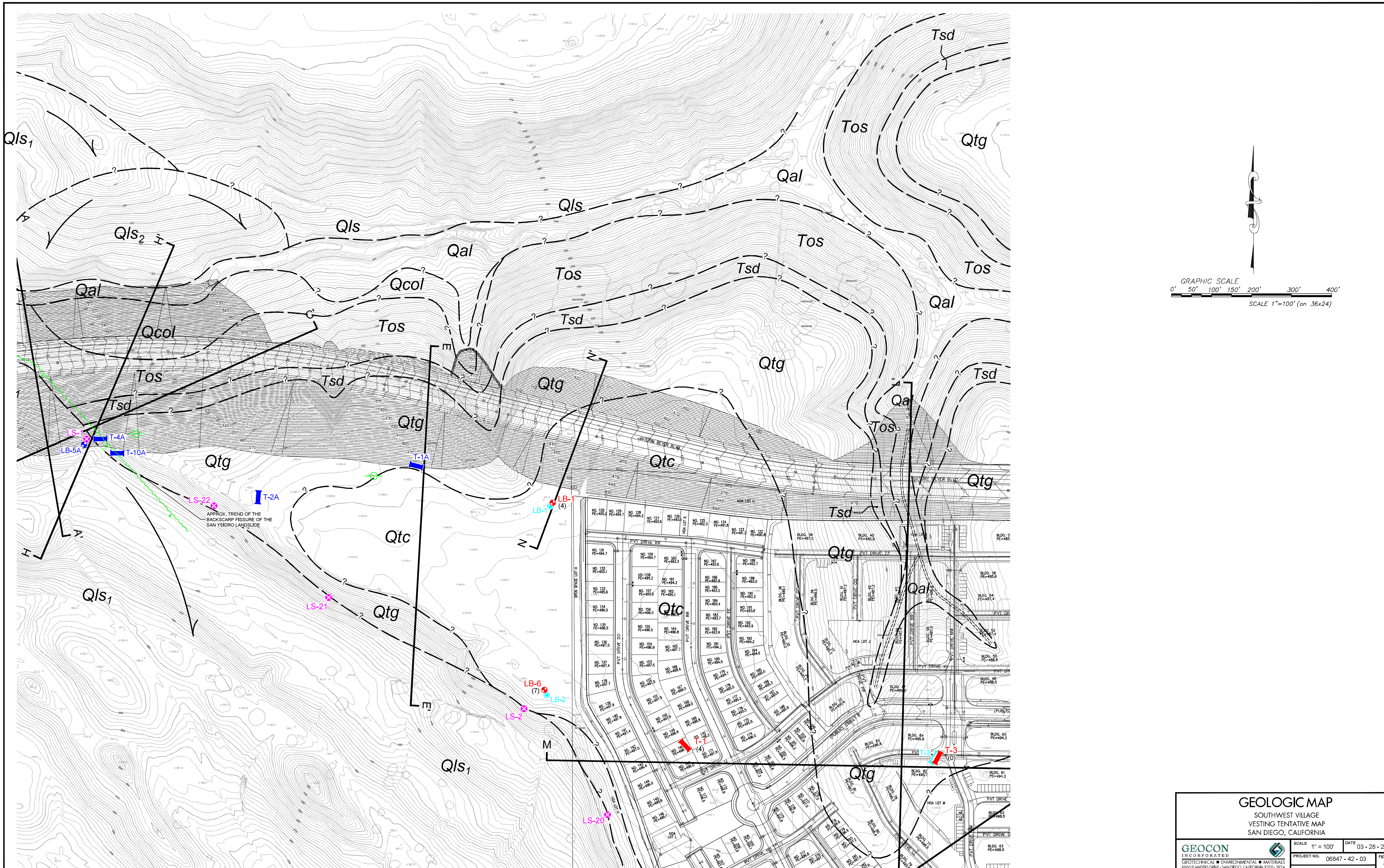
GEOLOGIC MAP

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE	1" = 100'
DATE	03 - 28 - 2019
PROJECT NO.	06847 - 42 - 03
FIGURE	2
SHEET	1 OF 5

Plotted: 03/27/2019 4:43PM | By: ALVIN LADRILLONO | File Location: Y:\PROJECTS\06847-42-03 (South Otay Mesa - 2019)\SHEETS\06847-42-03 Geo Map (VTM).dwg



GEOLOGIC MAP

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE 1" = 100'	DATE 03 - 28 - 2019	FIGURE 3
PROJECT NO. 06847 - 42 - 03		
SHEET 2 OF 5		

Plotted:03/27/2019 4:52PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 2019)\SHEETS\06847-42-03 Geo Map (VTM).dwg

GRAPHIC SCALE
0' 50' 100' 150' 200' 300' 400'
SCALE 1"=100' (on 36x24)

GEOLOGIC MAP

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

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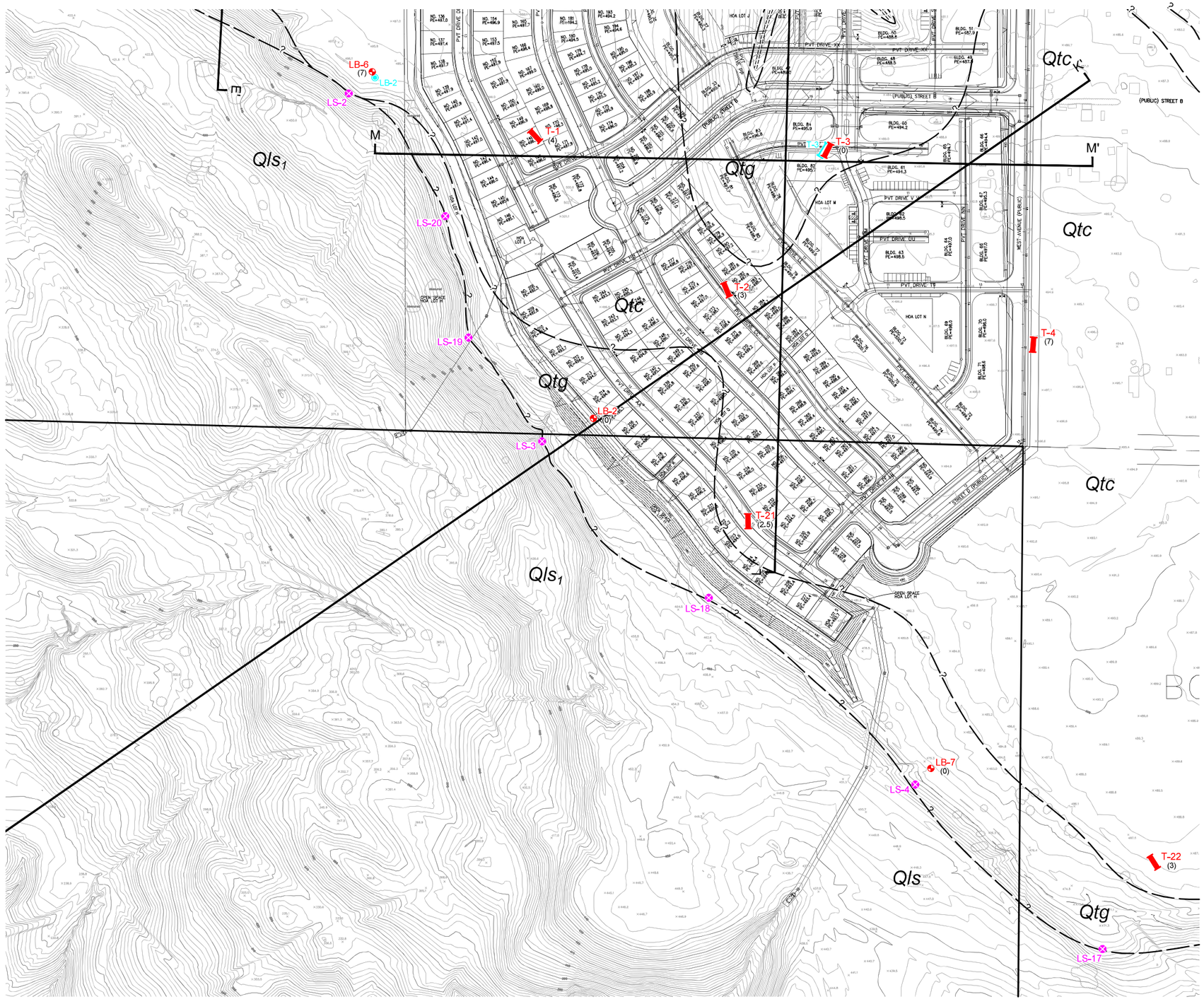
PHONE 858 558-6900 - FAX 858 558-6159

SCALE	1" = 100'
DATE	03 - 28 - 2019
PROJECT NO.	06847 - 42 - 03
FIGURE	4
SHEET	3 OF 5

Plotted:03/27/2019 4:53PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 2019)\SHEETS\06847-42-03 Geo Map (VTM).dwg



GRAPHIC SCALE
0' 50' 100' 150' 200' 300' 400'
SCALE 1"=100' (on 36x24)

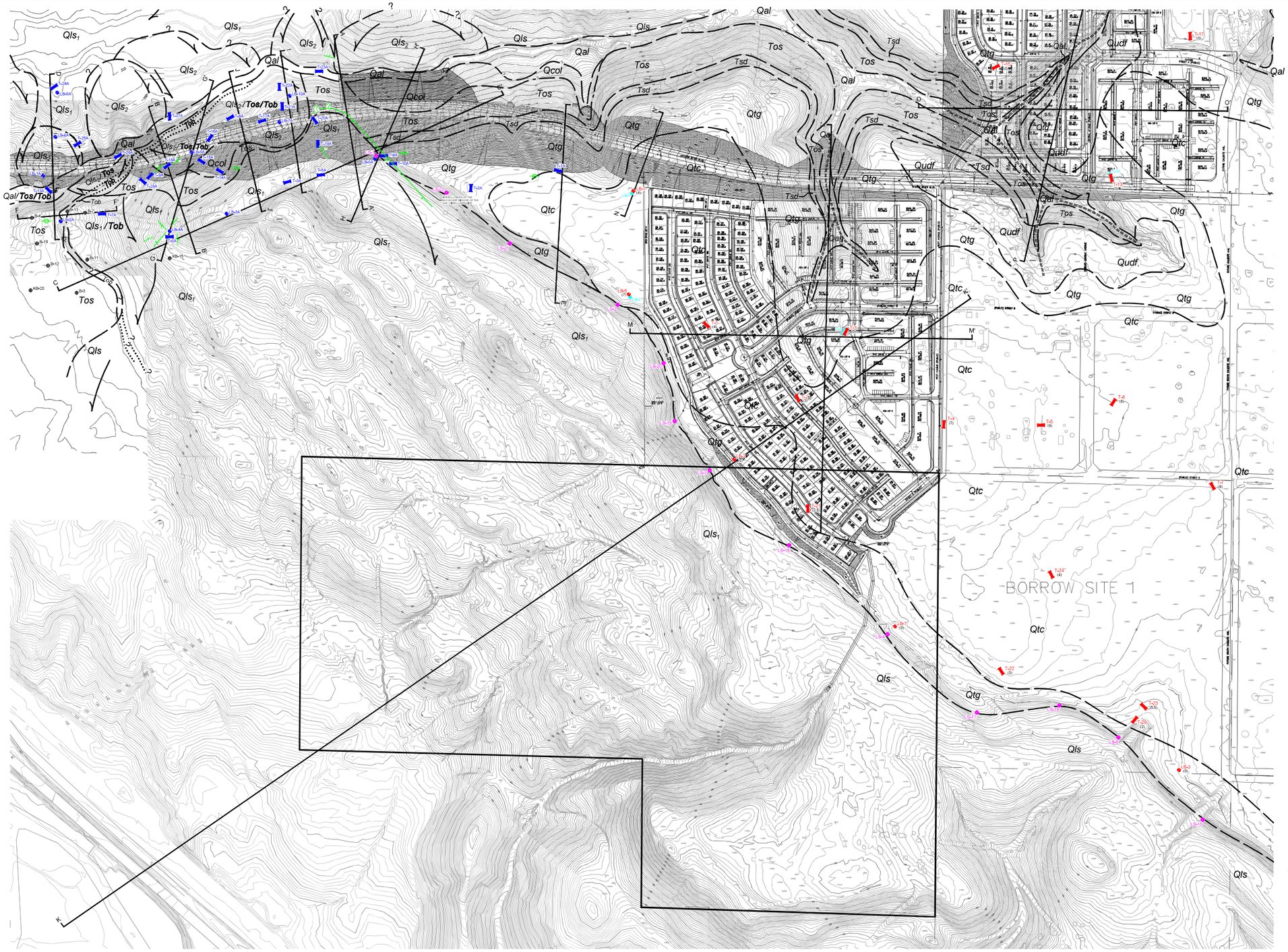
GEOLOGIC MAP

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE	1" = 100'
DATE	03 - 28 - 2019
PROJECT NO.	06847 - 42 - 03
FIGURE	5
SHEET	4 OF 5

Plotted:03/27/2019 4:55PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 201935)\SHEETS\06847-42-03 Geo Map (-VTM).dwg



GEOLOGIC MAP

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
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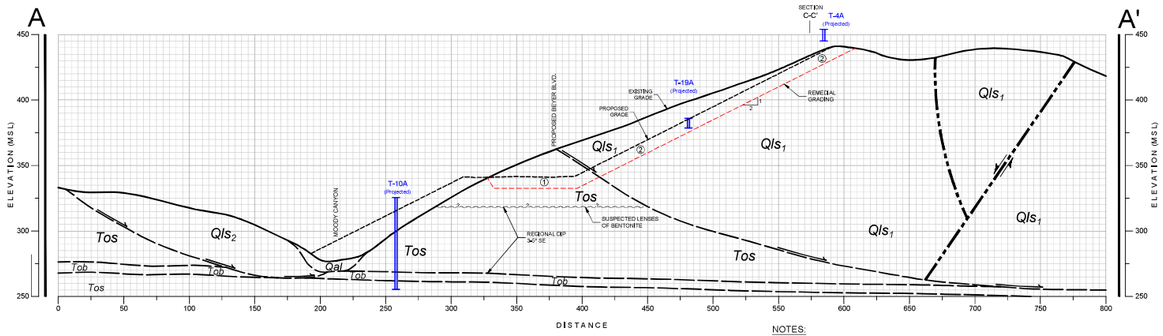
SCALE	1" = 200'
DATE	03 - 28 - 2019
PROJECT NO.	06847 - 42 - 03
FIGURE	6
SHEET	5 OF 5

Plotted:03/27/2019 3:01PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 201853)\SHEETS\06847-42-03 Geo Map (VTM).dwg



GEOLOGIC CROSS-SECTION A-A'

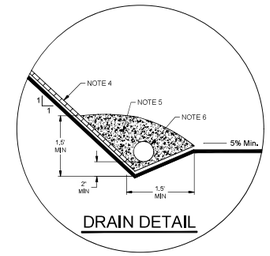
SCALE: 1" = 50' (Vert. = Horiz.)

NOTES:

1.....OVEREXCAVATE 10' BENEATH ROADWAY & REPLACE WITH PROPERLY COMPACTED FILL.

2.....CONSTRUCT 20' STABILITY FILL.

3.....REMOVE AND PROPERLY RECOMPACT ALLUVIUM



DRAIN DETAIL

NOTES:

1.....EXCAVATE BACKCUT AT 1:1 INCLINATION

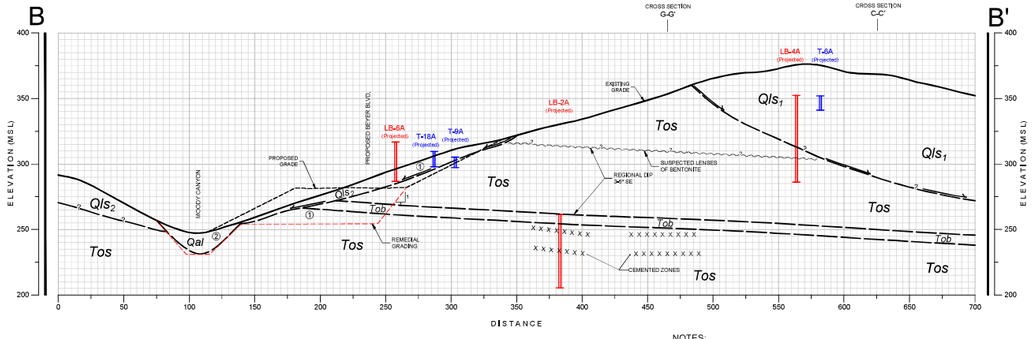
2.....BASE OF BUTTRESS TO BE 3 FEET INTO DENSE, OTAY FORMATION SANDSTONE SOIL SLOPING A MINIMUM 2% INTO SLOPE, KEYWAY DEPTH MAY BE INCREASED DDEPENDING ON ACTUAL GEOLOGIC CONDITIONS OBSERVED DURING GRADING.

3.....BUTTRESS FILL TO BE COMPOSED OF PROPERLY COMPACTED, GRANULAR SOIL WITH MINIMUM SHEAR STRENGTH OF ϕ = 34° C' = 500 psf.

4.....CHIMNEY DRAINS TO BE APPROVED, PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN, TENSAR, OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER OR 12-INCH BY 24-INCH SLOTS FILLED WITH FILTER MATERIAL (SEE NOTES). CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED, CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC.

6.....COLLECTOR PIPE TO BE 6-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.



GEOLOGIC CROSS-SECTION B-B'

SCALE: 1" = 50' (Vert. = Horiz.)

NOTES:

1.....REMOVE AND PROPERLY RECOMPACT LANDSLIDE AND **Tob** BENEATH ROADWAY.

2.....REMOVE AND PROPERLY RECOMPACT ALLUVIUM

GEOCON LEGEND

Qudf.....UNDOCUMENTED FILL

Qls_1.....LANDSLIDE DEBRIS (OLDER); RELATED TO SAN YSIDRO LANDSLIDE

Qls_2.....LANDSLIDE DEBRIS (YOUNGER); RELATED TO SECONDARY LANDSLIDE GENERATED BY THE EROSION OF MOODY CANYON INTO THE OLDER SAN YSIDRO LANDSLIDE

Qal.....ALLUVIUM

Qcol.....COLLUVIUM

Qtc.....TERRACE DEPOSIT CLAY; CORRELATES TO THE UPPER PORTION OF THE LINDAVISTA FORMATION (The "Normal Heights Mudstone" Of Reed, 1990)

Qtg.....TERRACE DEPOSIT GRAVEL; CORRELATES TO THE LOWER CONGLOMERATE PORTIONS OF LINDAVISTA FORMATION

Qbp.....BAY POINT FORMATION

Tsd.....OTAY FORMATION

To.....SAN DIEGO FORMATION

Tos.....OTAY FORMATION - SILTSTONE

Tob.....OTAY FORMATION BENTONITIC MEMBER (Dotted Where Buried)

Tog.....OTAY FORMATION - GRITSTONE MEMBER

.....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

.....LA NACION FAULT (CITY OF SAN DIEGO SEISMIC SAFETY MAP, SHEET 2, 1995)

LB-2.....APPROX. LOCATION OF LARGE-DIAMETER EXPLORATORY BORING (Geocon Report Dated 07-17-2013)

LB-10A.....APPROX. LOCATION OF LARGE DIAMETER BORING (Geocon Report Dated 05/10/2006)

LB-5.....APPROX. LOCATION OF LARGE DIAMETER BORING (Geocon Report Dated 10/04/2002)

B-7.....APPROX. LOCATION OF LARGE DIAMETER BORING (Geotechnica Report Dated 06/08/1988 and 05/04/2004)

T-18A.....APPROX. LOCATION OF EXPLORATORY BACKHOE TRENCH (Geocon Report Dated 05/10/2006)

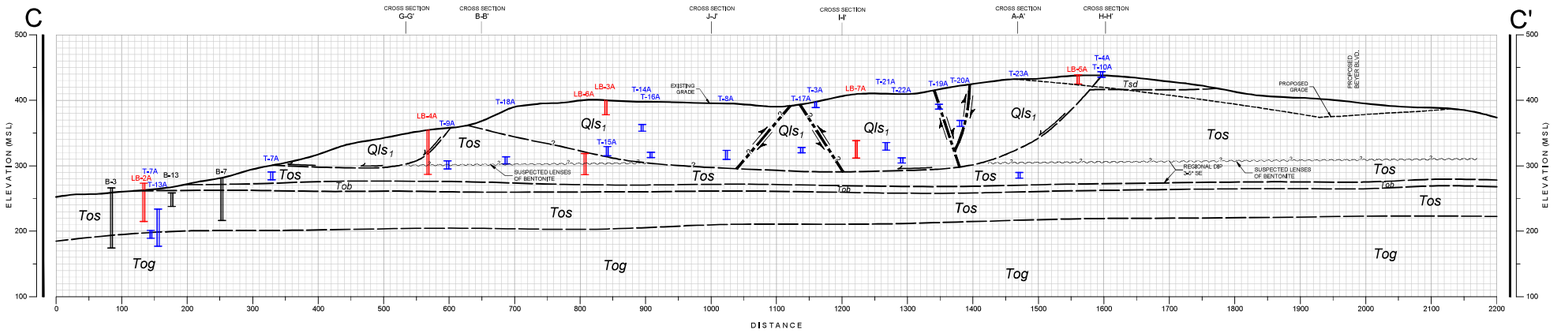
GEOLOGIC CROSS SECTION

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

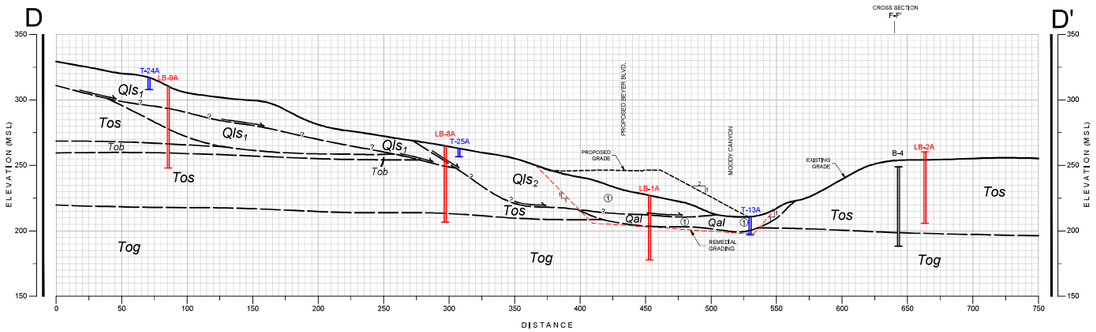
SCALE	1" = 50'
DATE	03 - 28 - 2019
PROJECT NO.	06847 - 42 - 03
FIGURE	7
SHEET	1 OF 7

Plotted:03/28/2019 1:44PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 2019)\SHEETS\06847-42-03 XSection (A-A').dwg



GEOLOGIC CROSS-SECTION C-C'

SCALE: 1" = 100' (Vert. = Horiz.)

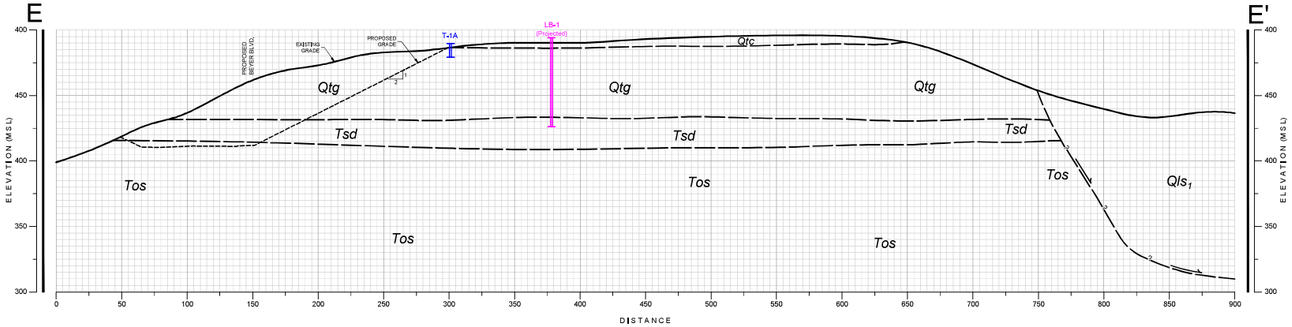


GEOLOGIC CROSS-SECTION D-D'

SCALE: 1" = 50' (Vert. = Horiz.)

NOTE:

1. ...OVEREXCAVATE ALLUVIUM AND LANDSLIDE TOE AND REPLACE WITH PROPERLY COMPACTED FILL.



GEOLOGIC CROSS-SECTION E-E'

SCALE: 1" = 50' (Vert. = Horiz.)

GEOLOGIC CROSS SECTION

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

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6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
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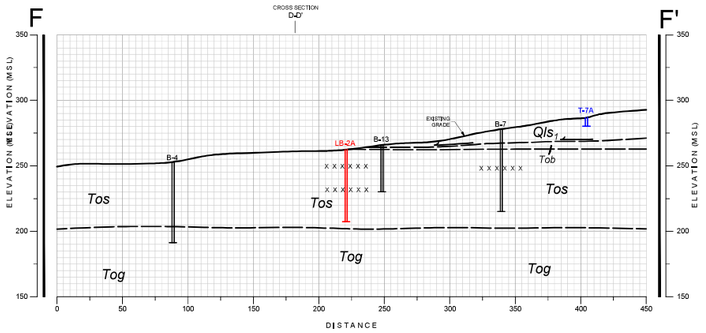
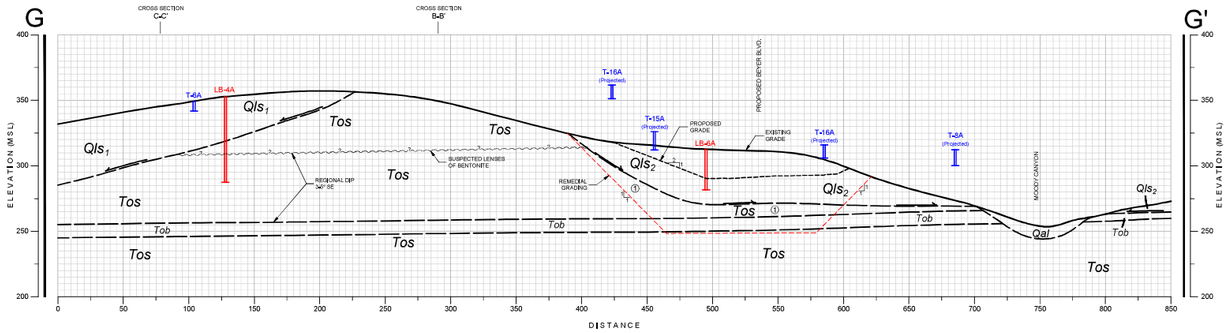
SCALE	DATE
VARIES	03 - 28 - 2019
PROJECT NO. 06847 - 42 - 03	FIGURE 8
SHEET 2 OF 7	

Plotted:03/27/2019 8:08PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03\South Otay Mesa - 2019\SHEETS\06847-42-03 XSection (A-A').dwg



GEOLOGIC CROSS-SECTION F-F'

SCALE: 1" = 50' (Vert. = Horiz.)

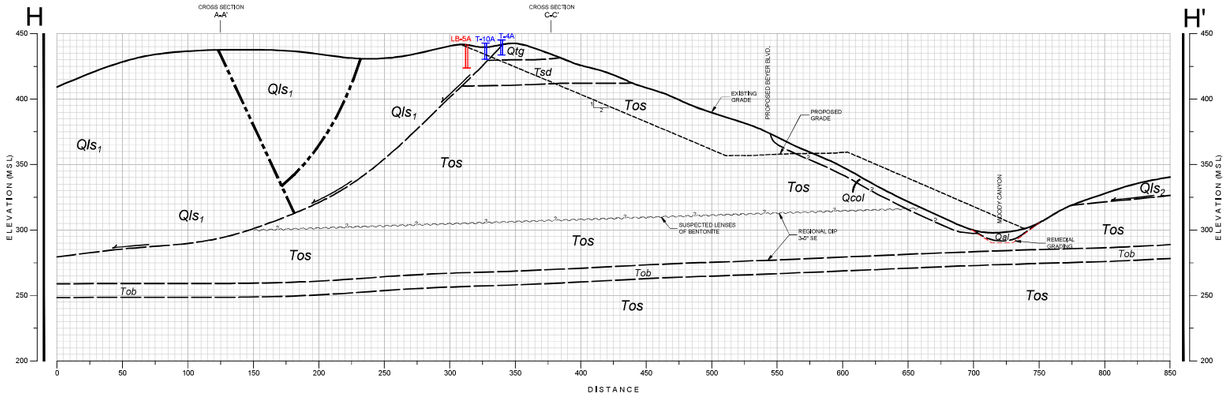


GEOLOGIC CROSS-SECTION G-G'

SCALE: 1" = 50' (Vert. = Horiz.)

NOTE:

1.....CONSTRUCT BUTTRESS



GEOLOGIC CROSS-SECTION H-H'

SCALE: 1" = 50' (Vert. = Horiz.)

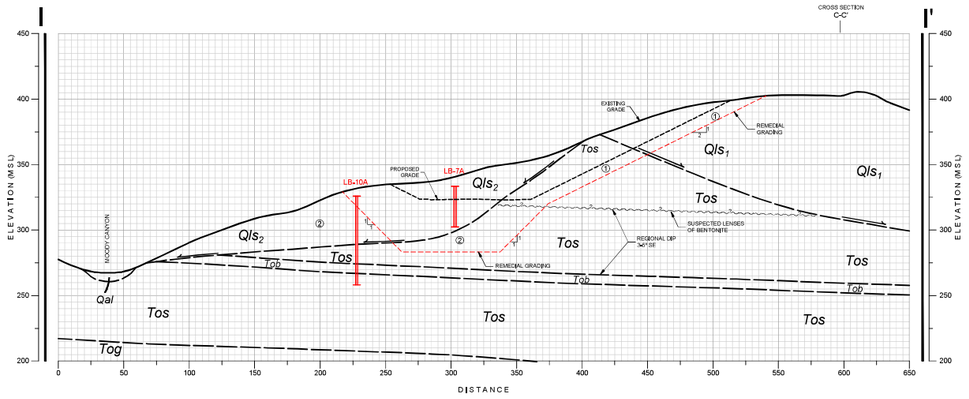
GEOLOGIC CROSS SECTION

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE	1" = 50'
DATE	03 - 28 - 2019
PROJECT NO.	06847 - 42 - 03
FIGURE	9
SHEET	3 OF 7

Plotted:03/28/2019 10:36AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 201B)\SHEETS\06847-42-03 XSection (H-H').dwg



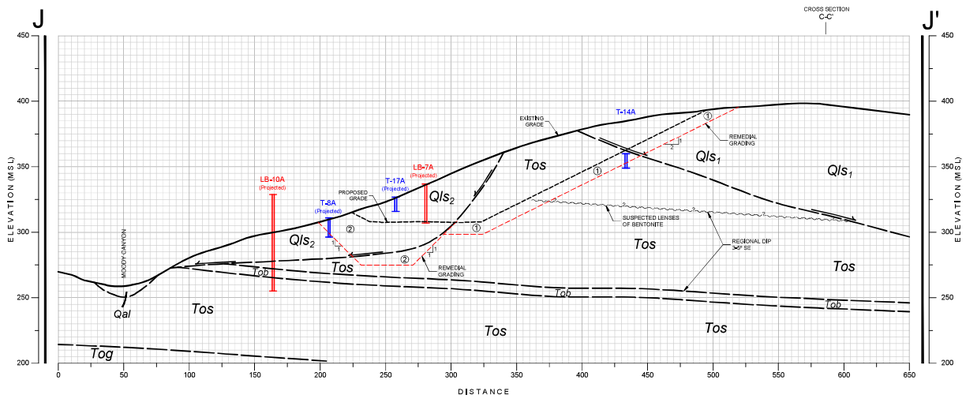
GEOLOGIC CROSS-SECTION I-I'

SCALE: 1" = 50' (Vert. = Horiz.)

NOTES:

1.....CONSTRUCT 20' STABILITY FILL.

2.....CONSTRUCT BUTTRESS.



GEOLOGIC CROSS-SECTION J-J'

SCALE: 1" = 50' (Vert. = Horiz.)

NOTES:

1.....CONSTRUCT 20' STABILITY FILL.

2.....REMOVE AND RECOMPACT LANDSLIDE BENEATH ROADWAY.

GEOLOGIC CROSS SECTION

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

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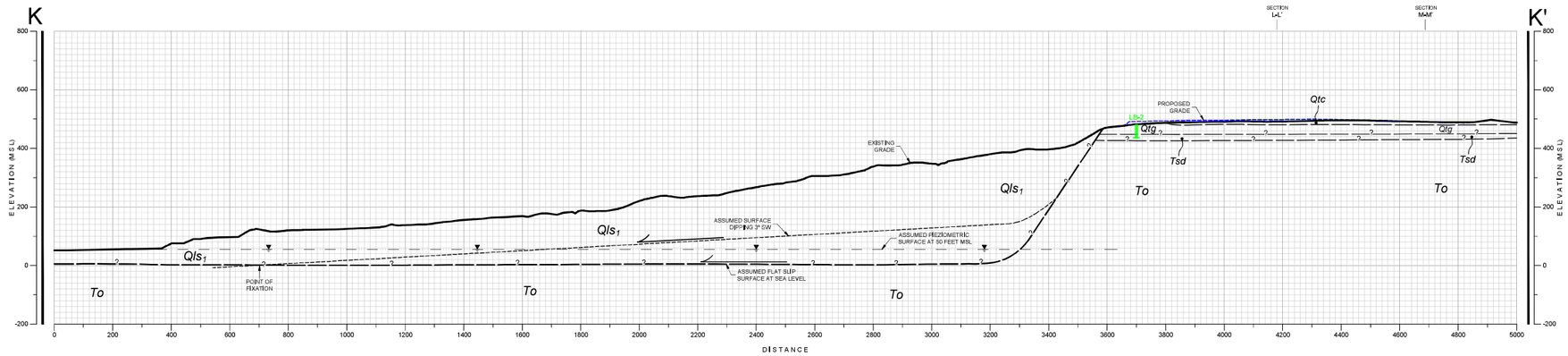
PHONE 858 558-6900 - FAX 858 558-6159

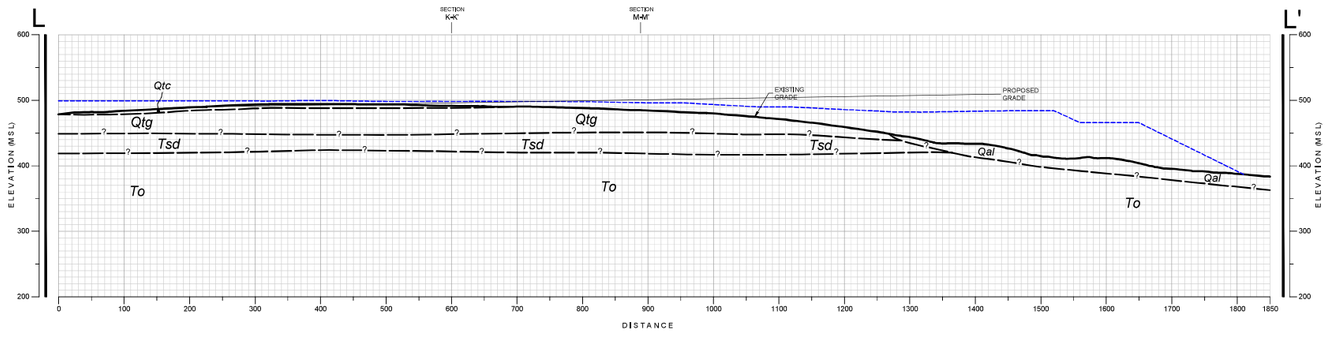
SCALE	DATE
1" = 50'	03 - 28 - 2019
PROJECT NO. 06847 - 42 - 03	FIGURE 10
SHEET 4 OF 7	

Plotted:03/28/2019 1:48PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 2019)\SHEETS\06847-42-03 XSection (A-J).dwg



GEOLOGIC CROSS-SECTION K-K'

SCALE: 1" = 200' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION L-L'

SCALE: 1" = 100' (Vert. = Horiz.)

GEOLOGIC CROSS SECTION

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

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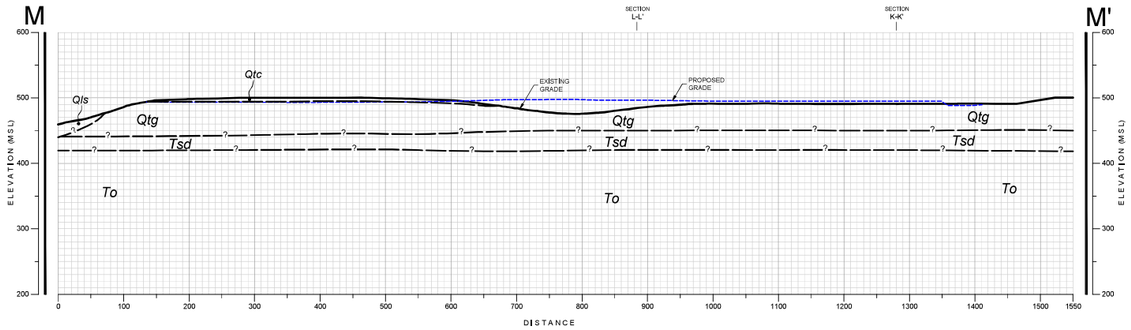
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

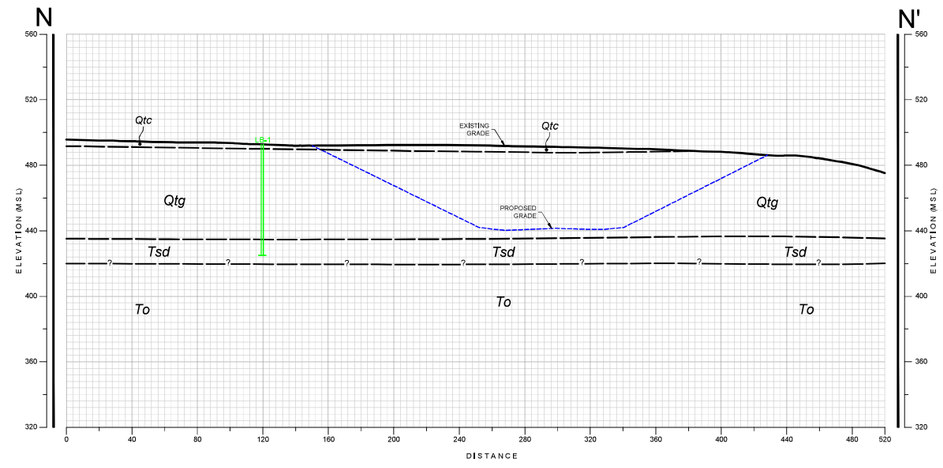
SCALE	VARIES	DATE	03 - 28 - 2019
PROJECT NO.	06847 - 42 - 03	FIGURE	11
SHEET	5 OF 7		

Plotted:03/28/2019 1:47PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 2019)\SHEETS\06847-42-03 XSection (K-K'L-L').dwg



GEOLOGIC CROSS-SECTION M-M'

SCALE: 1" = 100' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION N-N'

SCALE: 1" = 40' (Vert. = Horiz.)

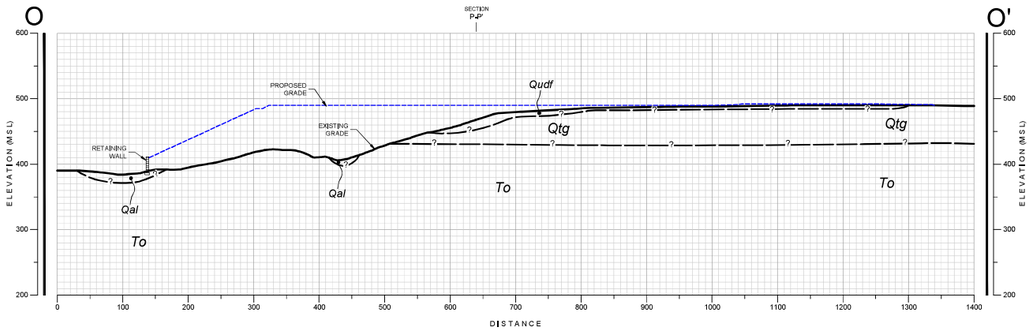
GEOLOGIC CROSS SECTION

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

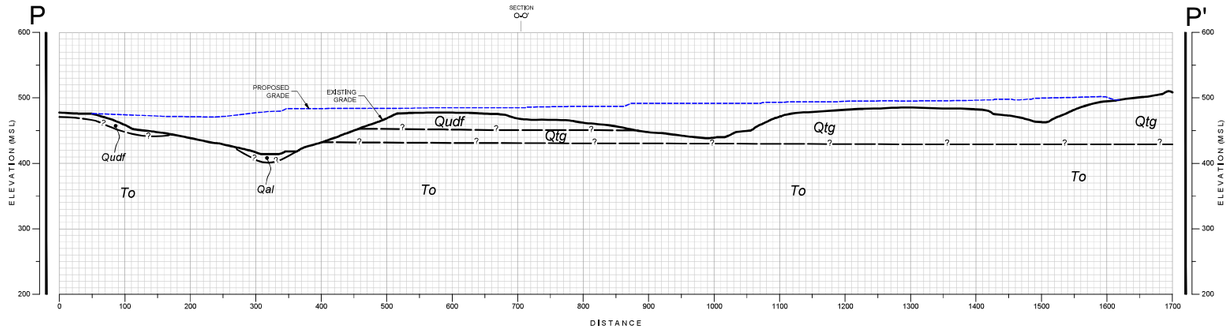
SCALE	VARIES
DATE	03 - 28 - 2019
PROJECT NO.	06847 - 42 - 03
FIGURE	12
SHEET	6 OF 7

Plotted:03/28/2019 10:48AM | By:ALVIN LACHELLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 2019)\SHEETS\06847-42-03 XSection (N-N').dwg



GEOLOGIC CROSS-SECTION O-O'

SCALE: 1" = 100' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION P-P'

SCALE: 1" = 100' (Vert. = Horiz.)

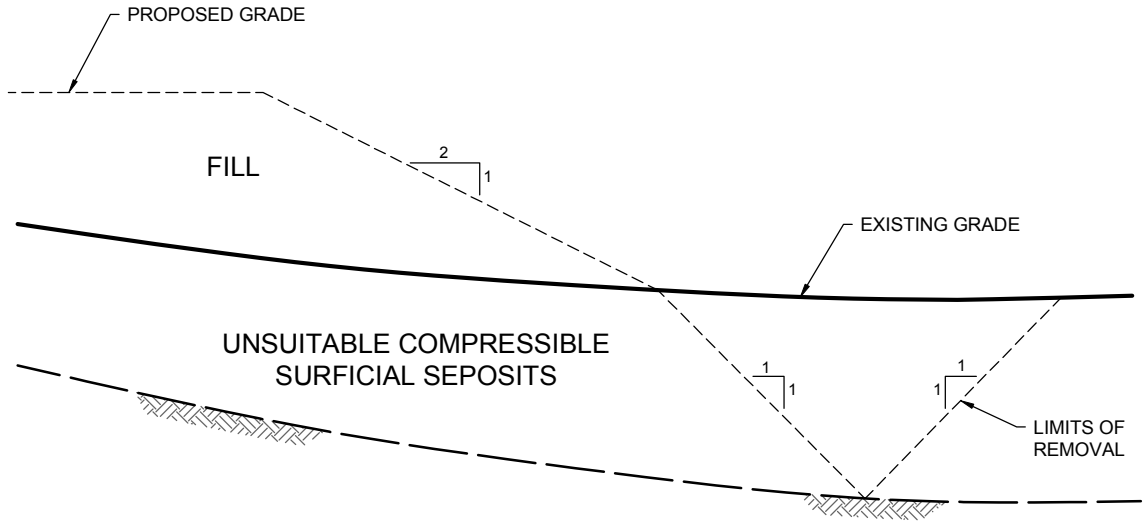
GEOLOGIC CROSS SECTION

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE	1" = 100'
DATE	03 - 28 - 2019
PROJECT NO.	06847 - 42 - 03
FIGURE	13
SHEET	7 OF 7

Plotted:03/28/2019 10:47AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 2015)\SHEETS\06847-42-03 XSection (4-L).dwg



FORMATIONAL MATERIAL

NOT TO SCALE

NOTE:

SLOPE OF BACKCUT MAY BE STEEPENED WITH THE APPROVAL OF THE PROJECT ENGINEER/GEOLOGIST WHERE BOUNDARY CONSTRAINTS LIMIT EXTENT OF REMOVALS

NO SCALE

CONSTRUCTION DETAIL FOR LATERAL EXTENT OF REMOVAL

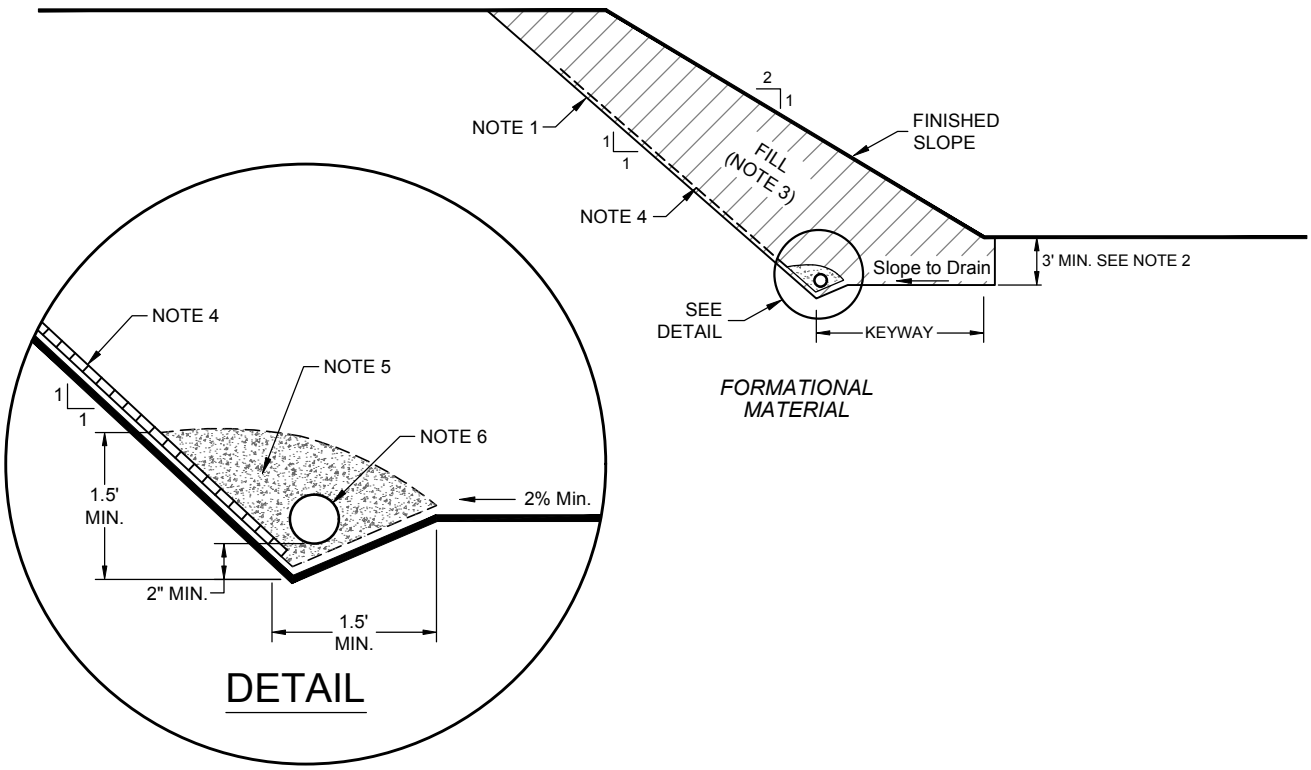
GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

RM / AML		DSK/GTYPD

DATE 03 - 28 - 2019	PROJECT NO. 06847 - 42 - 03	FIG. 14

Plotted:03/28/2019 10:21AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 2019)\DETAILS\Lateral Extent of Removal.dwg



NOTES:

1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2.....BASE OF EXCAVATION TO BE 3 FEET INTO COMPETENT MATERIAL, SLOPING A MINIMUM 2% INTO SLOPE.

3.....SLOPE FILL TO BE COMPOSED OF PROPERLY COMPACTED SOIL.

4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 5 FEET AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6.....COLLECTOR PIPE TO BE 6-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

TYPICAL BUTTRESS/STABILITY FILL DETAIL

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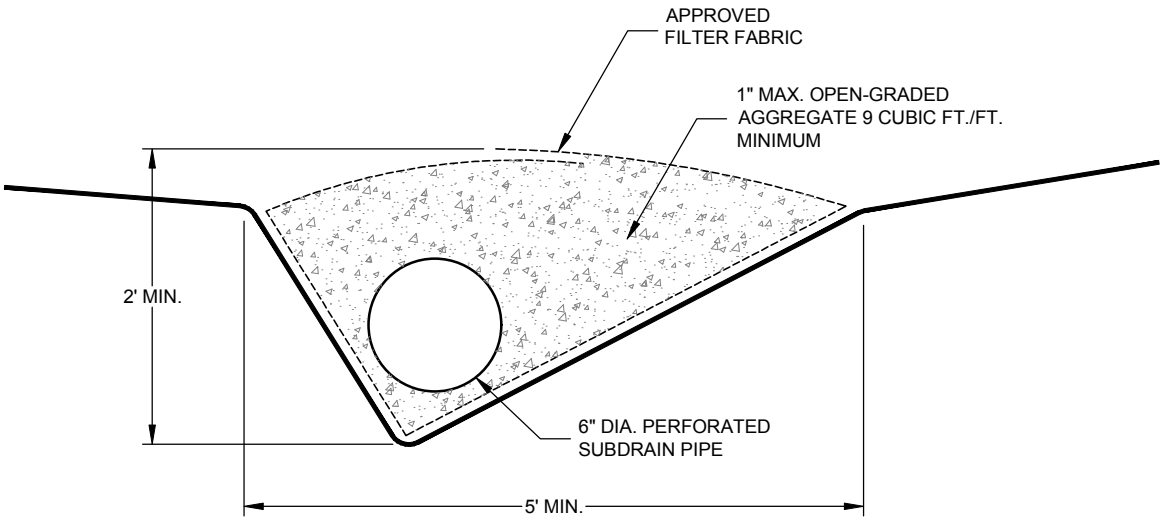
SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

RM / AML		DSK/GTYPD

DATE 03 - 28 - 2019	PROJECT NO. 06847 - 42 - 03	FIG. 15

Plotted:03/28/2019 1:35PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 2019)\DETAILS\Typical Slope Fill.dwg



NOTES:

1.....SUBDRAIN PIPE SHOULD BE 6-INCH MINIMUM DIAMETER, PERFORATED, THICK WALLED SCHEDULED 40 PVC, SLOPED TO DRAIN AT 1 PERCENT MINIMUM AND CONNECTED TO STORM DRAIN SYSTEM OR APPROVED OUTLET.

2.....WHERE SUBDRAIN PIPE EXCEEDS 1,000 FEET IN LENGTH, THE DOWNSTREAM (LOWEST PORTION) 1,000 FEET SHOULD BE INCREASED TO 8 INCHES DIAMETER PVC.

3.....FILTER FABRIC TO BE MIRAFI 140N OR EQUIVALENT.

TYPICAL SUBDRAIN DETAIL

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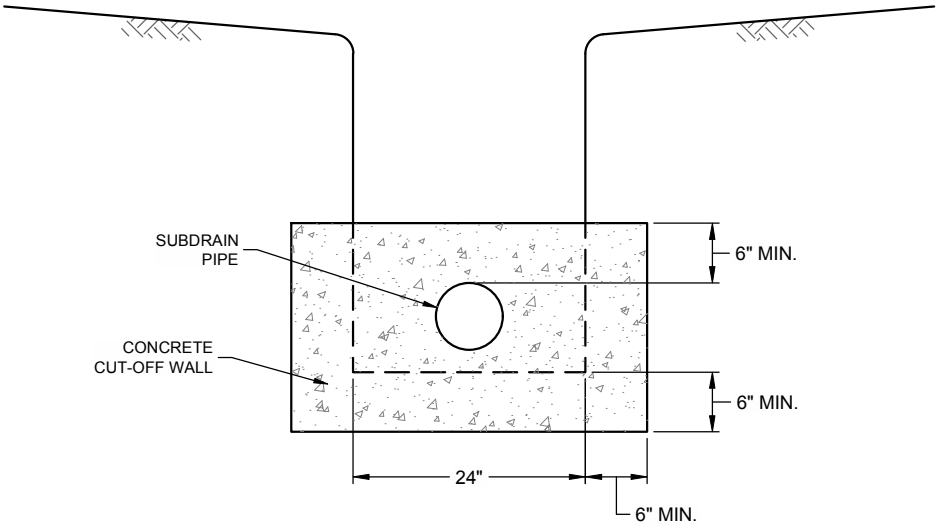
SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

RM / AML		DSK/GTYPD	DATE 03 - 28 - 2019	PROJECT NO. 06847 - 42 - 03	FIG. 16

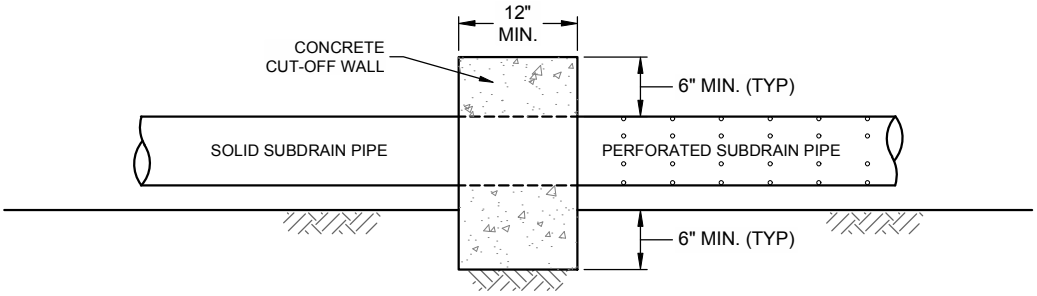
Plotted:03/28/2019 10:20AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 2019)\DETAILS\Typical Subdrain Detail.dwg

FRONT VIEW



NO SCALE

SIDE VIEW



NO SCALE

RECOMMENDED SUBDRAIN CUT-OFF WALL DETAIL

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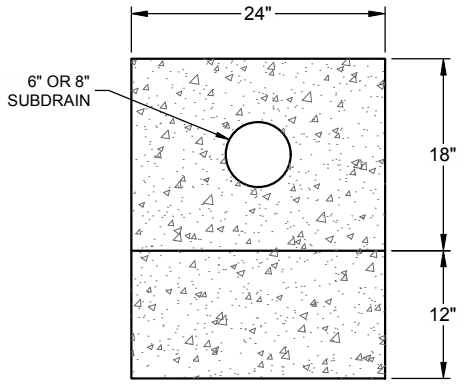
SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

RM / AML		DSK/GTYPD	DATE 03 - 28 - 2019	PROJECT NO. 06847 - 42 - 03	FIG. 17

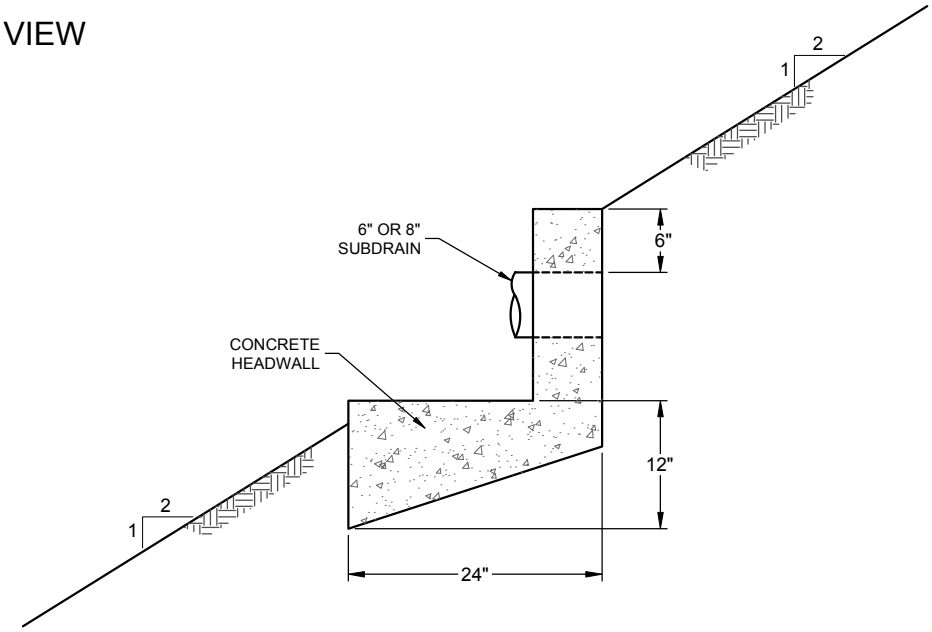
Plotted:03/28/2019 10:20AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 2019)\DETAILS\Subdrain Cut-Off Wall Detail (RSCOW).dwg

FRONT VIEW



NO SCALE

SIDE VIEW



NO SCALE

NOTES:

1. HEADWALL SHOULD OUTLET AT TOE OF FILL SLOPE OR INTO CONTROLLED SURFACE DRAINAGE

2. TO BE APPROVED BY PROJECT CIVIL ENGINEER

SUBDRAIN OUTLET HEADWALL DETAIL

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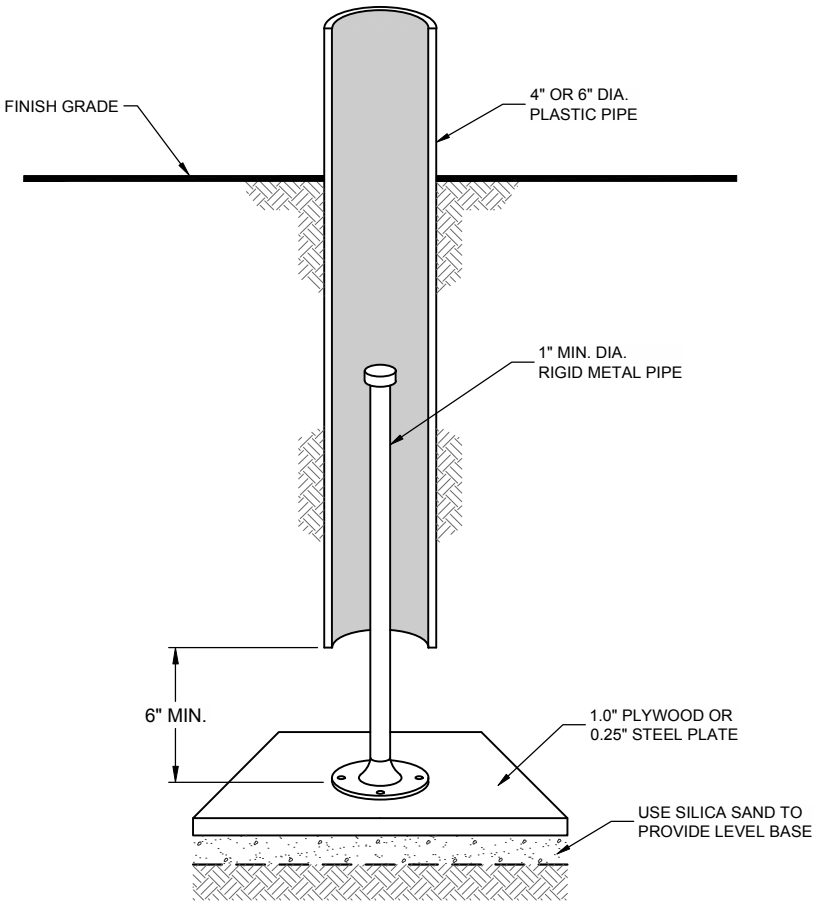
SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

RM / AML		DSK/GTYPD	DATE 03 - 28 - 2019	PROJECT NO. 06847 - 42 - 03	FIG. 18

Plotted:03/28/2019 10:17AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 2019)\DETAILS\Subdrain Headwall Detail (SOHD).dwg



NO SCALE

NOTES:

1.....LOCATION OF SETTLEMENT PLATES SHALL BE CLEARLY MARKED AND READILY VISIBLE (RED FLAG) TO EQUIPMENT OPERATORS.

2.....CONTRACTOR SHALL MAINTAIN 10-FOOT HORIZONTAL CLEARANCE.

4.....IN THE EVENT OF DAMAGE TO SETTLEMENT PLATE, IMMEDIATELY NOTIFY THE SOIL ENGINEER

NO SCALE

SETTLEMENT MONUMENT

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SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

RM / AML		DSK/GTYPD

DATE 03 - 28 - 2019	PROJECT NO. 06847 - 42 - 03	FIG. 19

Plotted:03/28/2019 10:16AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 2019)\DETAILS\Settlement Monument Detail.dwg

Project Name: Southwest Village
Project No.: 06847-42-03
Cross Section: K-K'
Name: A-A1 (Figure 20).gsz
Date: 6/12/2018
Name: Qcf , Cohesion: 300 psf, Phi: 30 °, Unit Weight: 130 pcf
Name: Qls, Cohesion: 300 psf, Phi: 30 °, Unit Weight: 125 pcf
Name: Shear Zone, Cohesion: 50 psf, Phi: 9 °, Unit Weight: 120 pcf
Name: Qt, Cohesion: 100 psf, Phi: 33 °, Unit Weight: 120 pcf
Name: Tsd, Cohesion: 450 psf, Phi: 34 °, Unit Weight: 125 pcf
Name: To, Cohesion: 450 psf, Phi: 34 °, Unit Weight: 125 pcf

FAILURE ALONG ASSUMED FLAT SLIP SURFACE

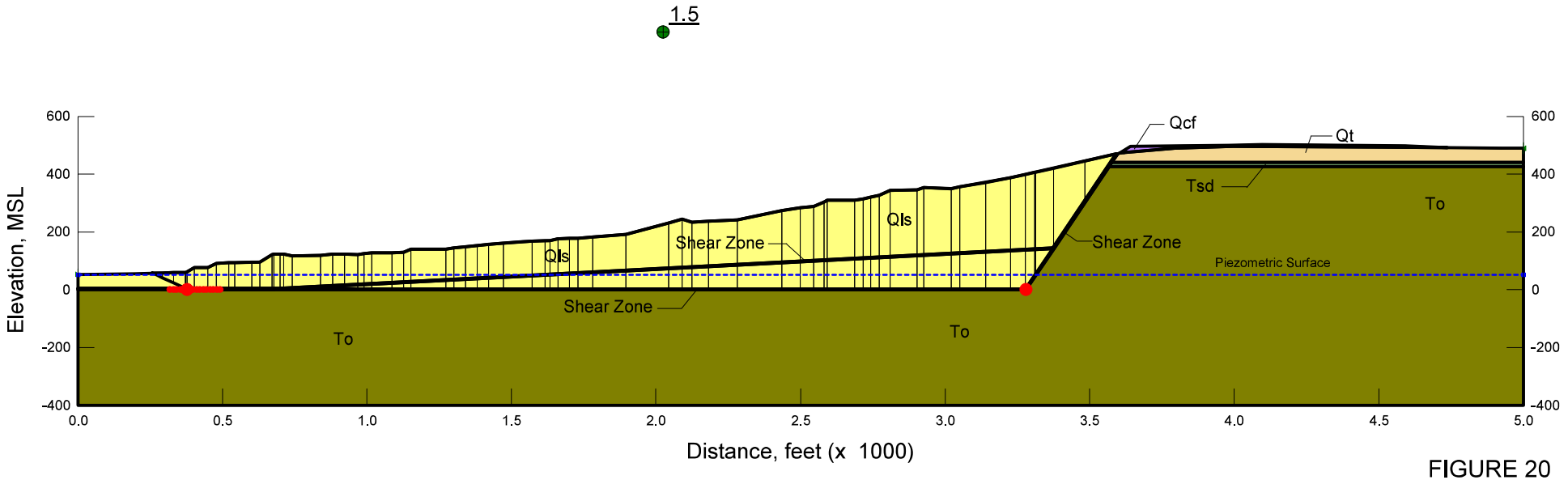

FIGURE 20

Project Name: Southwest Village
Project No.: 06847-42-03
Cross Section: K-K'
Name: A-A1 (Figure 21).gsz
Date: 6/12/2018
Name: Qls, Cohesion: 300 psf, Phi: 30 °, Unit Weight: 125 pcf
Name: Shear Zone, Cohesion: 50 psf, Phi: 9 °, Unit Weight: 120 pcf
Name: Qcf , Cohesion: 300 psf, Phi: 30 °, Unit Weight: 130 pcf
Name: Qt, Cohesion: 100 psf, Phi: 33 deg, Unit Weight: 120 pcf
Name: Tsd, Cohesion: 450 psf, Phi 34 deg, Unit Weight 125 pcf
Name: To, Cohesion: 450 psf, Phi: 34 deg, Unit Weight 125 pcf

FAILURE ALONG 3 DEG INCLINED SLIP SURFACE

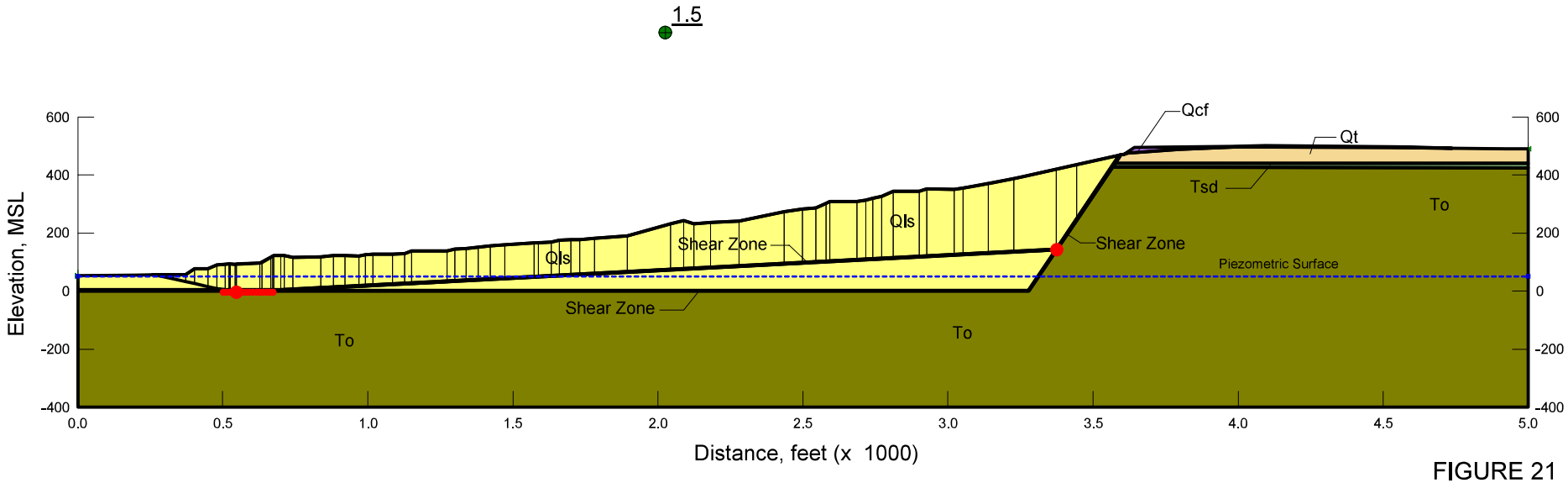

FIGURE 21

ASSUMED CONDITIONS :

SLOPE HEIGHT	H	=	100 feet
SLOPE INCLINATION	2 : 1	(Horizontal : Vertical)	
TOTAL UNIT WEIGHT OF SOIL	γ_t	=	130 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	=	34 degrees
APPARENT COHESION	C	=	450 pounds per square foot
NO SEEPAGE FORCES			

ANALYSIS :

$\gamma_{c\phi}$	=	$\frac{\gamma_t H \tan\phi}{C}$	EQUATION (3-3), REFERENCE 1
FS	=	$\frac{NcfC}{\gamma_t H}$	EQUATION (3-2), REFERENCE 1
$\gamma_{c\phi}$	=	19.5	CALCULATED USING EQ. (3-3)
Ncf	=	50	DETERMINED USING FIGURE 10, REFERENCE 2
FS	=	1.8	FACTOR OF SAFETY CALCULATED USING EQ. (3-2)

REFERENCES :

1.....Janbu, N., Stability Analysis of Slopes with Dimensionless Parameters, Harvard Soil Mechanics, Series No. 46, 1954

2.....Janbu, N., Discussion of J.M. Bell, Dimensionless Parameters for Homogeneous Earth Slopes, Journal of Soil Mechanics and Foundation Design, No. SM6, November 1967.

SLOPE STABILITY ANALYSIS - CUT SLOPES

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SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

RM / AML		DSK/GTYPD	DATE 03 - 28 - 2019	PROJECT NO. 06847 - 42 - 03	FIG. 22

Plotted:03/28/2019 10:16AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 2019)\DETAILS\Slope Stability Analyses-Cut (SSA-C).dwg

ASSUMED CONDITIONS :

SLOPE HEIGHT	H	=	100 feet
SLOPE INCLINATION	2 : 1	(Horizontal : Vertical)	
TOTAL UNIT WEIGHT OF SOIL	γ_t	=	130 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	=	30 degrees
APPARENT COHESION	C	=	300 pounds per square foot
NO SEEPAGE FORCES			

ANALYSIS :

$\gamma_{c\phi}$	=	$\frac{\gamma_t H \tan\phi}{C}$	EQUATION (3-3), REFERENCE 1
FS	=	$\frac{NcfC}{\gamma_t H}$	EQUATION (3-2), REFERENCE 1
$\gamma_{c\phi}$	=	25	CALCULATED USING EQ. (3-3)
Ncf	=	6.5	DETERMINED USING FIGURE 10, REFERENCE 2
FS	=	1.5	FACTOR OF SAFETY CALCULATED USING EQ. (3-2)

REFERENCES :

1.....Janbu, N., Stability Analysis of Slopes with Dimensionless Parameters, Harvard Soil Mechanics, Series No. 46, 1954

2.....Janbu, N., Discussion of J.M. Bell, Dimensionless Parameters for Homogeneous Earth Slopes, Journal of Soil Mechanics and Foundation Design, No. SM6, November 1967.

SLOPE STABILITY ANALYSIS - FILL SLOPES

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SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

RM / AML		DSK/GTYPD	DATE 03 - 28 - 2019	PROJECT NO. 06847 - 42 - 03	FIG. 23

Plotted:03/28/2019 10:15AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 2019)\DETAILS\Slope Stability Analyses-Fill (SSA-F).dwg

ASSUMED CONDITIONS :

SLOPE HEIGHT	H	=	Infinite
DEPTH OF SATURATION	Z	=	3 feet
SLOPE INCLINATION	2 : 1		(Horizontal : Vertical)
SLOPE ANGLE	i	=	26.6 degrees
UNIT WEIGHT OF WATER	γ_w	=	62.4 pounds per cubic foot
TOTAL UNIT WEIGHT OF SOIL	γ_t	=	130 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	=	30 degrees
APPARENT COHESION	C	=	300 pounds per square foot

SLOPE SATURATED TO VERTICAL DEPTH Z BELOW SLOPE FACE

SEEPAGE FORCES PARALLEL TO SLOPE FACE

ANALYSIS :

$$FS = \frac{C + (\gamma_t - \gamma_w)\ Z\ cos^2\ i\ tan\ \phi}{\gamma_t\ Z\ sin\ i\ cos\ i} = 2.5$$

REFERENCES :

1.....Haefeli, R. *The Stability of Slopes Acted Upon by Parallel Seepage*, Proc. Second International Conference, SMFE, Rotterdam, 1948, 1, 57-62

2.....Skempton, A. W., and F.A. Delory, *Stability of Natural Slopes in London Clay*, Proc. Fourth International Conference, SMFE, London, 1957, 2, 378-81

SURFICIAL SLOPE STABILITY ANALYSIS

GEOCON INCORPORATED

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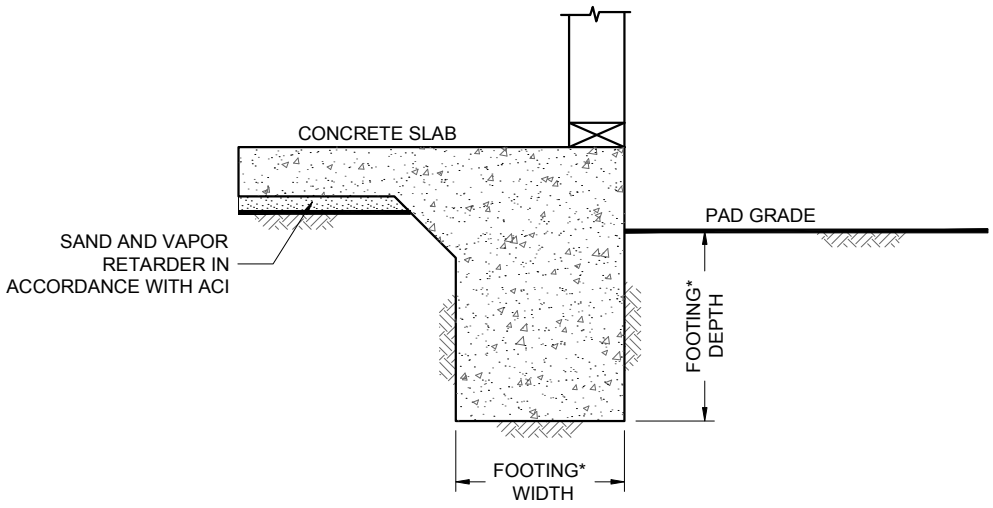
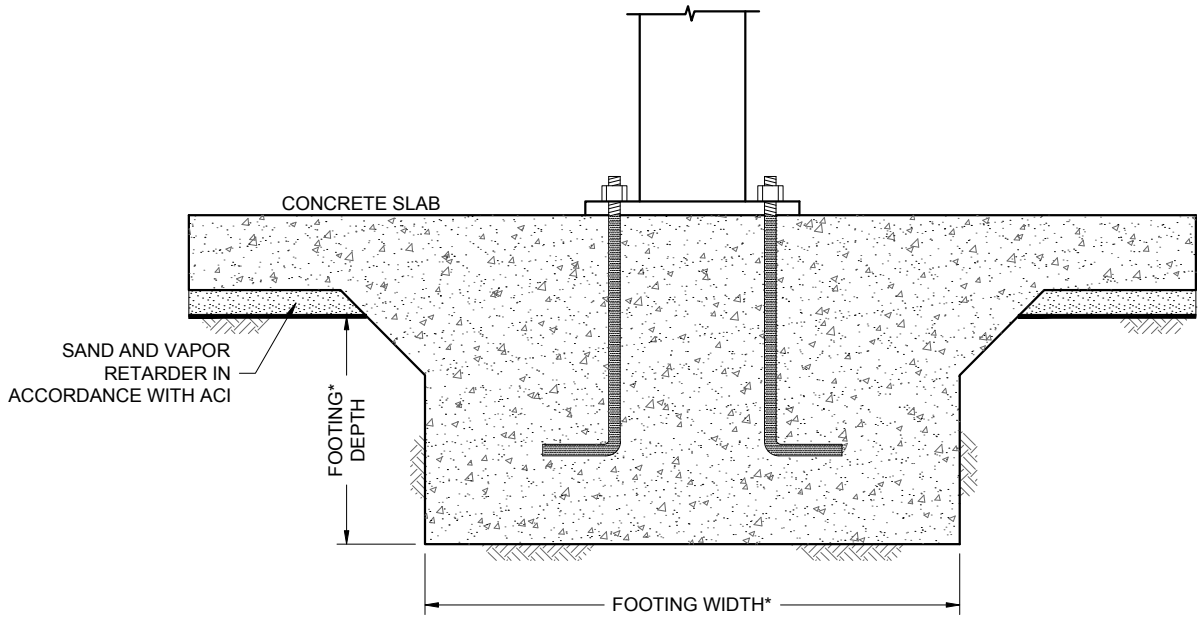
SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

RM / AML		DSK/GTYPD	DATE 03 - 28 - 2019	PROJECT NO. 06847 - 42 - 03	FIG. 24

Plotted:03/28/2019 10:14AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 2019)\DETAILS\Slope Stability Analyses-Surficial (SSSA).dwg





*....SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

NO SCALE

WALL / COLUMN FOOTING DIMENSION DETAIL

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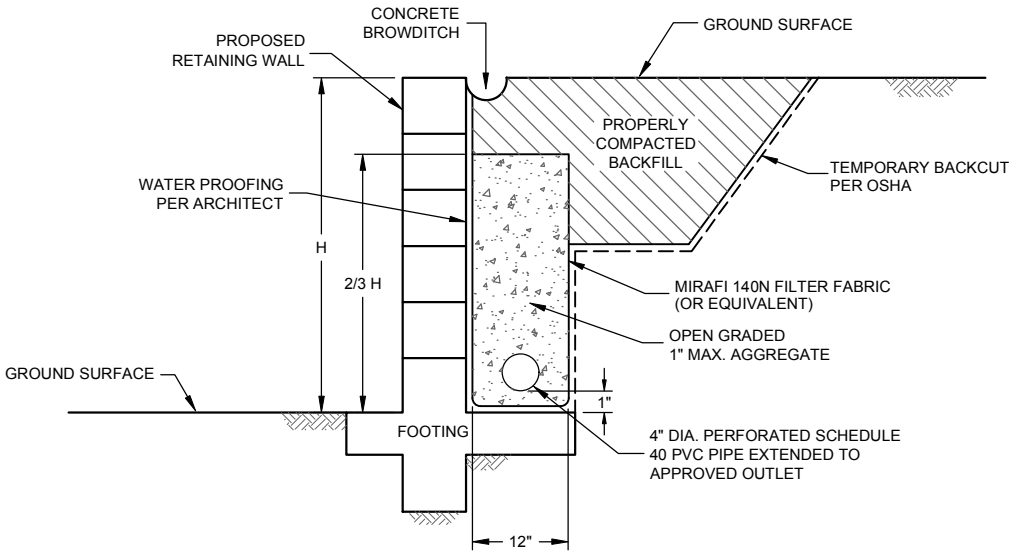
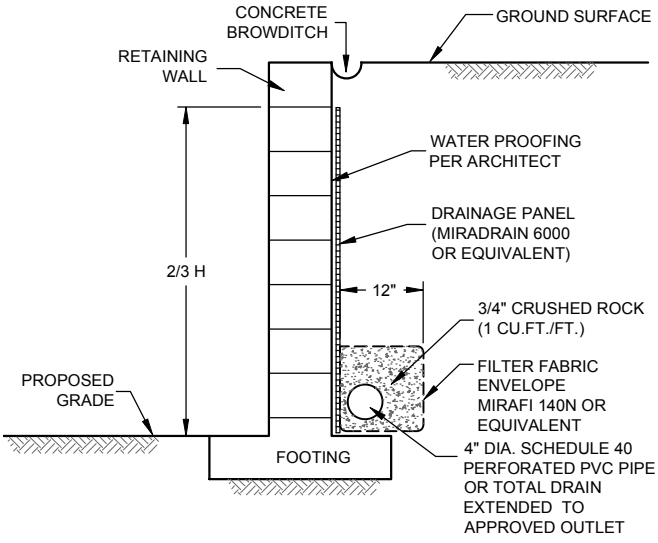
SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

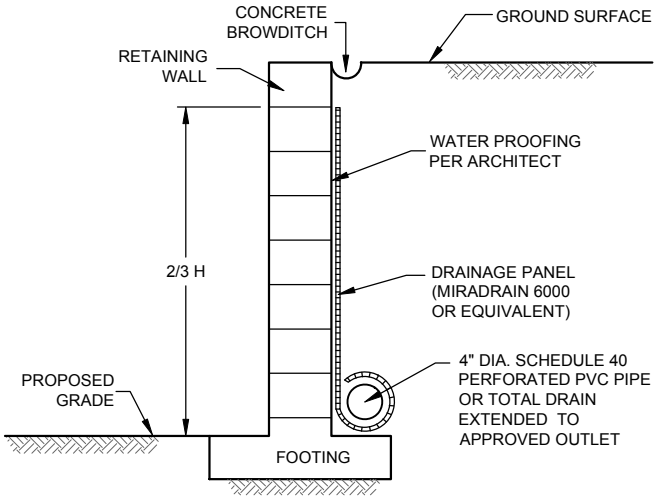
RM / AML		DSK/GTYPD

DATE 03 - 28 - 2019	PROJECT NO. 06847 - 42 - 03	FIG. 25

Plotted:03/28/2019 10:14AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 2019)\DETAILS\Wall-Column Footing Dimension Detail (COLFOOT2).dwg







NOTE :

DRAIN SHOULD BE UNIFORMLY SLOPED TO GRAVITY OUTLET OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPING

NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

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SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

RM / AML		DSK/GTYPD	DATE 03 - 28 - 2019	PROJECT NO. 06847 - 42 - 03	FIG. 26

Plotted:03/28/2019 10:13AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-03 (South Otay Mesa - 2019)\DETAILS\Typical Retaining Wall Drainage Detail (RWDD7A).dwg

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The field investigation performed for the overall South Otay Mesa property was performed during the period of August 22 through September 3, 2002, and consisted of a site reconnaissance, excavation of 7 large-diameter borings and 29 backhoe trenches. The approximate locations of the boring and trench excavations within the vicinity of the project are shown on the Geologic Maps (Figures 2 through 6, Map Pocket).

The large diameter borings were excavated to depths varying from 37 to 73 feet below existing grade using a Soilmec 108 truck mounted drill rig equipped with a 30-inch diameter auger. Relatively undisturbed samples were obtained from the borings by driving a split-tube samples 12 inches into the undisturbed soil mass with blows from a telescoping Kelly bar varying if weight from 1,700 pounds to 4,500 pounds. The sample was equipped with 1-inch by 2⅜-inch-diameter brass rings to facilitate removal and laboratory testing.

Backhoe trenches were excavated to depths varying from 6 to 16 feet using a John Deere 510 rubber tire backhoe equipped with a 24-inch wide bucket. Disturbed bulk and chunk samples were obtained at selected locations in the exploratory trenches.

The field investigation for Beyer Boulevard extension was conducted in 2 phases. The first phase was performed during the period of October 25 through November 3, 2004 and consisted of a site reconnaissance, excavation of 7 large-diameter borings and 23 backhoe trenches. The second phase occurred on January 18 and 19, 2006 and consisted of excavating an additional 3 large-diameter borings and 5 backhoe trenches. Approximate locations of the boring and trench excavations are shown on the Geologic Map Figures 2 and 3.

Large diameter borings were excavated to depths varying from 12 to 70 feet below existing grade using an Earthdrill EZ Bore 100 truck-mounted drill rig equipped with a 30-inch-diameter auger. Relatively undisturbed samples were obtained from the borings by driving a split-tube samples 12 inches into the undisturbed soil mass with blows from a telescoping Kelly bar varying if weight from 1,700 pounds to 4,500 pounds. The sampler was equipped with 1-inch-by-2⅜-inch-diameter brass rings to facilitate removal and laboratory testing.

Backhoe trenches were excavated using a John Deere 310 rubber tire backhoe and a John Deere 555 track-mounted backhoe equipped with a 24-inch-wide bucket. Disturbed bulk and chunk samples were obtained at selected locations in the exploratory trenches.

The soils encountered in the exploratory excavations were visually examined, classified and logged. Logs of borings and trenches are presented in Appendix B. The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained.

Exploratory excavations (borings and trenches) pertinent to the project from previous nearby geotechnical investigations have also been included. The logs are presented to provide additional subsurface information regarding the depths and types of materials that were encountered on the site.

PROJECT NO. 06847-42-01

BORING LB 1

ELEV. (MSL.) 492 DATE COMPLETED 8/23/02

EQUIPMENT SOILMEC 108 TRUCK MT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2				CL	**TERRACE DEPOSIT CLAY** Stiff, damp, dark brown, very Sandy CLAY			
4								
6	LB1-1			SP	**TERRACE DEPOSIT GRAVEL** Medium dense, humid to damp, light reddish brown, Gravelly, coarse SAND, trace clay, silt, slight caving			
8								
10					Medium dense, moist, reddish brown, very Gravelly, Silty SAND, with some clay, subrounded to rounded, fine to medium size (1" to 6" diameter)			
12	LB1-2							
14								
16				SM-GM				
18								
20								
22								
24								
26								
28								

Figure A-1, Log of Boring LB 1

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

BORING LB 1

ELEV. (MSL.) 492 DATE COMPLETED 8/23/02

EQUIPMENT SOILMEC 108 TRUCK MT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30								
32				SM-GM				
34								
36					Very dense, moist, light to medium red brown, Silty, Sandy, very coarse GRAVEL, 8" to 24" diameter clasts, trace clay			
38								
40	LB1-3			GM				
42					-12 inch clean sand layer; horizontal laminated bedding			
44								
46								
48	LB1-4				Dense, moist, medium reddish brown, very Silty, Sandy, medium to coarse GRAVEL			
50								
52				GM-SM				
54								
56								
58					-Sharp depositional contact at 58.5 feet N55E, 5NW with undulations dipping approximately 2 degrees to SW and NW			
				SM				

Figure A-2, Log of Boring LB 1

SOM

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◣ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB 1** ELEV. (MSL.) **492** DATE COMPLETED **8/23/02** EQUIPMENT **SOILMEC 108 TRUCK MT**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
60	LB1-5				**SAN DIEGO FORMATION** Dense, damp, light gray to yellow-brown, Silty fine SANDSTONE with some friable (cohesionless when disturbed) sand layers -Horizontal to gently undulating laminated micaceous beds (interbedded sandy siltstone and sandstone with 1" to 3" thick alternating beds			
62								
64								
66					BORING TERMINATED AT 66 FEET			

Figure A-3, Log of Boring LB 1

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◣ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

BORING LB 2

ELEV. (MSL.) 484 DATE COMPLETED 8/23/02

EQUIPMENT SOILMEC 108 TRUCK MT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2				SM	**TERRACE DEPOSIT GRAVEL** Dense, humid to damp, medium reddish brown, Gravelly, Silty, fine to medium SAND, some clay			
4								
6								
8								
10					-Horizontal, sharp depositional contact			
12				SP-GP	Dense, humid to damp, light reddish brown, very Gravelly, medium to coarse SAND -Upper part is noncohesive, (when disturbed), with ~8 foot diameter "belling" of boring between 15 and 19 feet; horizontal imbrication of cobbles with clean sand with heavy mineral (magnetite) laminations			
14								
16								
18								
20								
22					-Transitional contact			
24				GM	Very dense, moist, medium brown, Sandy, very coarse GRAVEL -Oversize boulders - cobbles 6" to 24" diameter			
26								
28								

Figure A-4, Log of Boring LB 2

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB 2** ELEV. (MSL.) **484** DATE COMPLETED **8/23/02** EQUIPMENT **SOILMEC 108 TRUCK MT**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
30								
32					-Irregular horizontal scour-contact			
34					**SAN DIEGO FORMATION** Dense, damp, light gray-brown, Silty fine SANDSTONE -Interbedded micaceous siltstone layers; undulating approximately horizontal laminated bedding (observed from 10 to 15 feet above contact and from intact chunks in spoil pile)			
36								
38				SM				
40								
42								
44								
46								
48								
					BORING TERMINATED AT 49 FEET *NOTE: Because of "belling" in noncohesive bouldery materials from 15 to 19 feet, downhole logging could not be safely performed beyond 15 feet			

Figure A-5, Log of Boring LB 2

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

BORING LB 3

ELEV. (MSL.) 472 DATE COMPLETED 8/23/02

EQUIPMENT SOILMEC 108 TRUCK MT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**TERRACE DEPOSIT GRAVEL** Medium dense to dense, damp, light to medium reddish brown, Sandy, medium to coarse GRAVEL to very Gravelly SAND, with some silt and trace clay			
2								
4								
6								
8				GM-SM				
10								
12								
14								
16					-Irregular transition 15 to 17 feet			
18					Dense, moist, medium reddish brown, Sandy, very coarse GRAVEL			
20					-Frequent occurances of 18 to 14 inch diameter, boulders of subrounded to rounded volcanic and granitic rock			
22				GM				
24								
26					-Very irregular, approximately horizontal, sharp depositional (scour) contact			
28				SM	**SAN DIEGO FORMATION** Dense, damp, light brown, Silty, fine to medium SANDSTONE			

Figure A-6, Log of Boring LB 3

SOM

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

BORING LB 3

ELEV. (MSL.) 472 DATE COMPLETED 8/23/02

EQUIPMENT SOILMEC 108 TRUCK MT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30								
32					Dense, moist, reddish brown, Sandy coarse GRAVEL, subrounded to subangular			
34				GM				
36					-Horizontal, sharp scour-contact			
38				SM	Dense, damp, light tan-brown, very Silty fine SANDSTONE, micaceous			
40								
42				GM	Very dense, moist, reddish brown, Sandy coarse GRAVEL -Sharp, horizontal scour-contact			
44	LB3-1			SM	**OTAY FORMATION** Very dense, damp, light gray-olive, Silty, very fine SANDSTONE -Joint N80W, 80N, terminated by contact below			
46					-Sharp, horizontal scour-contact			
48	LB3-2 LB3-3			CL	Very stiff to hard, moist, light brown-pink, Silty CLAYSTONE; possibly bentonitic, massive and blocky			
50								
52					BORING TERMINATED AT 52 FEET			

Figure A-7, Log of Boring LB 3

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◣ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

BORING LB 4

ELEV. (MSL.) 476 DATE COMPLETED 8/28/02

EQUIPMENT SOILMEC 108 TRUCK MT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2				CL-SC	**TERRACE DEPOSIT CLAY** Stiff, damp, dark reddish brown to brown, very Sandy CLAY; massive, with some fine gravel			
4								
6					-Irregular, approximately horizontal contact			
8				SP-GP	**TERRACE DEPOSIT GRAVEL** Dense, damp, medium to light reddish brown, very Gravelly coarse SAND -Sloughing, low cohesion, when disturbed			
10								
12								
14				GM	Dense, damp, light to medium reddish brown, Sandy, very coarse GRAVEL, with some silt, trace clay			
16								
18								
20								
22								
24								
26								
28								

Figure A-8, Log of Boring LB 4

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

BORING LB 4

ELEV. (MSL.) 476 DATE COMPLETED 8/28/02

EQUIPMENT SOILMEC 108 TRUCK MT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30					-Horizontal scour-contact			
32				SM	**SAN DIEGO FORMATION** Dense, damp, light yellow brown-tan, Silty, fine to medium SANDSTONE			
34				GP-SP	-Horizontal contact Very dense, moist, medium brown-olive, Sandy coarse GRAVEL			
36								
38				SM	Dense, damp, light yellow brown-tan, Silty, fine to medium SANDSTONE			
40				GP-SP	Very dense, moist, medium to dark brown, Sandy coarse GRAVEL, with trace clay			
42								
44								
46					-Very irregular (undulating), approximately horizontal scour-contact			
48					Medium dense, damp to humid, light to medium brown (mottled) Silty medium SAND, with angular rip-up clasts of siltstone and sandstone (intraformational breccia?), micaceous			
50								
52					-Very irregular, approximately horizontal scour-contact			
54	LB4-1			ML-CL	**OTAY FORMATION** Dense, damp to moist, light olive-gray-brown, Clayey SILTSTONE with random steep discontinuous joints, and thin (1" to 3" thick) claystone layers with horizontal laminations			
56	LB4-2				N60W, vertical joint; pinches out less than 24 inches along strike and dip, and is truncated by San Diego Formation scour-contact above, at 53.5 feet			
58				ML	Dense, damp, light olive-gray, Sandy SILTSTONE			

Figure A-9, Log of Boring LB 4

SOM

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◣ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB 4** ELEV. (MSL.) **476** DATE COMPLETED **8/28/02** EQUIPMENT **SOILMEC 108 TRUCK MT**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
60								
62					BORING TERMINATED AT 62 FEET			

Figure A-10, Log of Boring LB 4

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◣ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

BORING LB 5

ELEV. (MSL.) 477 DATE COMPLETED 8/30/02

EQUIPMENT SOILMEC 108 TRUCK MT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2				CL	**TERRACE DEPOSIT CLAY** Stiff, damp to moist, dark brown, Sandy CLAY, with some cobble			
4								
6					-Irregular, approximately horizontal contact			
8				SM-GM	**TERRACE DEPOSIT GRAVEL** Medium dense to dense, medium to dark reddish brown, very Gravelly SAND; some silt, trace clay			
10								
12								
14								
16								
18								
20				GM	Very dense, damp, medium to dark reddish brown, Sandy, very coarse GRAVEL, with 8 to 18 inches diameter cobbles; some silt			
22								
24								
26								
28								

Figure A-11, Log of Boring LB 5

SOM

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◣ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

BORING LB 5

ELEV. (MSL.) 477 DATE COMPLETED 8/30/02

EQUIPMENT SOILMEC 108 TRUCK MT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30				GM				
32								
34								
36								
38								
40								
42								
44								
46								
48					-Sharp, horizontal scour-contact at 48.5 feet			
50				SM	**SAN DIEGO FORMATION** Dense, damp, light tan-brown, Silty, fine to medium SANDSTONE; massive to cross-laminated, micaceous -6" pebble conglomerate layer, horizontally imbricated, rounded to subrounded dark volcanic rock			
52								
54								
56					-Contact transitional over 6 inches and approximately horizontal			
58				SM-ML	**OTAY FORMATION** Very dense, damp, light olive-gray-brown, very Silty, very fine SANDSTONE, with some clay lenses			

Figure A-12, Log of Boring LB 5

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB 5** ELEV. (MSL.) **477** DATE COMPLETED **8/30/02** EQUIPMENT **SOILMEC 108 TRUCK MT**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
60								
					BORING TERMINATED AT 61 FEET			

Figure A-13, Log of Boring LB 5

SOM

SAMPLE SYMBOLS
□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE ◣ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

RACE DEPOSIT CLAY

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 18

PROJECT NO. 06847-42-01

BORING LB 6

ELEV. (MSL.) 496 DATE COMPLETED 8/30/02

EQUIPMENT SOILMEC 108 TRUCK MT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 6				CL	**TERRACE DEPOSIT CLAY** Stiff, moist, dark yellow brown, Sandy CLAY, with some fine gravel, massive			
8 – 10				SM	**TERRACE DEPOSIT GRAVEL** Medium dense to dense, damp, medium reddish brown, very Gravelly, Silty, medium to coarse SAND with trace clay			
12 – 28				GP-SP	Dense, damp, medium reddish brown, very Sandy coarse GRAVEL, with cobbles 6 to 8 inches, low cohesion, (when disturbed), with some sloughing			
				SP				

Figure A-14, Log of Boring LB 6

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

BORING LB 6

ELEV. (MSL.) 496 DATE COMPLETED 8/30/02

EQUIPMENT SOILMEC 108 TRUCK MT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30								
32	LB6-1			SP	Medium dense to dense, damp, light reddish brown, Gravelly coarse SAND -Sloughing and non cohesive (when disturbed), crossbedded			
34								
36								
38				GM	Very dense, damp to moist, medium brown to reddish brown, Sandy, very coarse GRAVEL -Oversize cobbles 8 to 20 inches diameter in slightly silty coarse sand matrix, with trace clay			
40								
42								
44								
46								
48								
50								
52								
54								
56								
58								

Figure A-15, Log of Boring LB 6

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◣ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

BORING LB 6

ELEV. (MSL.) 496 DATE COMPLETED 8/30/02

EQUIPMENT SOILMEC 108 TRUCK MT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60								
62								
64				GM				
66								
68								
70					Becomes Clayey to Silty, with fine to medium rounded conglomerate layers, horizontally imbricated			
72	LB6-2 LB6-3			CL	-Approximately horizontal to undulating scour-deposition contact		72.8	40.5
					OTAY FORMATION Hard, moist, light olive-gray, Silty CLAYSTONE; massive, blocky			
					BORING TERMINATED AT 73 FEET			

Figure A-16, Log of Boring LB 6

SOM

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◣ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

BORING LB 7

ELEV. (MSL.) 475 DATE COMPLETED 9/3/33

EQUIPMENT SOILMEC 108 TRUCK MT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2				SM-GM	**TERRACE DEPOSIT GRAVEL** Medium dense to dense, dry to humid, light reddish brown, very Gravelly, Silty medium SAND -Massive to approximately horizontal bedding, with horizontally imbricated cobble layers			
4								
6								
8					-Gravel becomes coarser (6 to 8 inches diameter)			
10								
12				GM	Dense to very dense, damp, medium reddish brown, Sandy, very coarse GRAVEL, with some silt, trace clay and oversize cobbles (8 to 20 inches diameter)			
14								
16								
18								
20								
22					-Irregular scour-contact; overall approximately horizontal attitude			
24				SM	**SAN DIEGO FORMATION** Dense, damp, light brown-olive, Silty fine SANDSTONE, micaceous -Vertical discontinuous joint with 1/16" to 1/8" clay lining NE-SW strike, terminated by overlying terrace deposit contact and extends 2 to 3 feet in depth			
26								
28								
				SP	Dense, humid to damp, light tan-brown, medium to			

Figure A-17, Log of Boring LB 7

SOM

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB 7** ELEV. (MSL.) 475 DATE COMPLETED 9/3/33 EQUIPMENT SOILMEC 108 TRUCK MT MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30					coarse SANDSTONE, with thin horizontal layer of bentonitic claystone rip-up clasts at 29 feet (approximately 3" thick) -Approximately horizontal contact			
32				SM	Dense, damp, light brown-tan, very Silty fine SANDSTONE			
34					-Approximately horizontal bedding-contact			
36				SM	Dense, damp, medium red-brown, Silty, medium to coarse SANDSTONE			
					BORING TERMINATED AT 36.5 FEET			

Figure A-18, Log of Boring LB 7

SOM

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 1

ELEV. (MSL.) 501 DATE COMPLETED 8/22/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TERRACE DEPOSIT CLAY** Hard, dry, dark yellowish brown, CLAY, cracking, rootlets; topsoil zone			
2	T1-1			CH	Hard, moist to damp, dark yellowish brown, CLAY			
4				SW	**TERRACE DEPOSIT GRAVEL** Dense, dry to moist, dark yellowish orange, well graded SAND with rounded gravel, less than 10% rounded cobbles and boulders to 1 foot diameter; caving.			
6								
8								
10	T1-2							
					TRENCH TERMINATED AT 11 FEET			

Figure A-19, Log of Trench T 1

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 2

ELEV. (MSL.) **490** DATE COMPLETED **8/22/02**

EQUIPMENT **JD 510 RUBBER TIRE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TERRACE DEPOSIT CLAY** Hard, dry, dark yellowish brown, CLAY, cracking, and rootlets; topsoil zone			
2				CH	Hard, moist, dark yellowish brown, CLAY			
4				SW	**TERRACE DEPOSIT GRAVEL** Dense, dry to moist, dark yellowish orange, well graded SAND with rounded gravel. 10 to 20% rounded cobbles and boulders up to 2 foot diameter, caving			
6								
8								
10					TRENCH TERMINATED AT 10 FEET			

Figure A-20, Log of Trench T 2

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 3

ELEV. (MSL.) 490 DATE COMPLETED 8/22/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T3-1			CH	**TOPSOIL** Hard, dry, dark yellowish brown, CLAY, cracking, rootlets			
2					**TERRACE DEPOSIT GRAVEL** Dense, dry to moist, dark yellowish orange, Clayey, well graded SAND with gravel, approximately 20% rounded cobbles and boulders up to 1 foot diameter; scattered caliche			
4								
6	T3-2			SC				
8								
10					TRENCH TERMINATED AT 10 FEET			

Figure A-21, Log of Trench T 3

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 4

ELEV. (MSL.) 496 DATE COMPLETED 8/22/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TERRACE DEPOSIT CLAY** Hard, dry, dark yellowish brown, CLAY, cracking, roots; topsoil zone			
2				CH	Hard, moist, dark yellowish brown, CLAY			
4								
6								
8				SW	**TERRACE DEPOSIT GRAVEL** Dense, moist, dark yellowish orange, well graded SAND with rounded gravel; approximately 10 to 20% rounded cobbles and boulders up to 1 foot diameter			
10					TRENCH TERMINATED AT 10 FEET			

Figure A-22, Log of Trench T 4

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 5

ELEV. (MSL.) 492 DATE COMPLETED 8/22/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TERRACE DEPOSIT CLAY**			
2	T5-1 T5-2			CH	Firm to hard, damp to dry, dark yellowish brown, CLAY; topsoil zone Hard, moist, moderate yellowish brown, CLAY			
4	T5-3							
6	T5-4			SW	**TERRACE DEPOSIT GRAVEL**			
8	T5-5			SW-CH	Dense, moist, dark yellowish orange, well graded SAND with rounded gravel; approximately 10 to 20% rounded cobbles and boulders to 1 foot diameter SAND interbedded with firm, yellowish gray clay beds			
10								
12				SW	No clay interbeds			
14								
					TRENCH TERMINATED AT 15 FEET			

Figure A-23, Log of Trench T 5

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 6 ELEV. (MSL.) 489 DATE COMPLETED 8/22/02 EQUIPMENT JD 510 RUBBER TIRE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CH	**TERRACE DEPOSIT CLAY** Firm to hard, damp to dry, dark yellowish brown, CLAY, abundant soil carbonate; topsoil zone			
2					Firm to hard, moist, moderate olive brown, CLAY			
4				CH				
6					**TERRACE DEPOSIT GRAVEL** Dense, moist, dark to pale yellowish orange, well graded SAND with clay and fine and coarse gravel; scattered cobbles, less than 8 inches diameter			
8				SW-SC				
10								
12					TRENCH TERMINATED AT 12 FEET			

Figure A-24, Log of Trench T 6

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 7

ELEV. (MSL.) 481 DATE COMPLETED 8/22/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TERRACE DEPOSIT CLAY** Firm to hard, dry, dark yellowish brown, CLAY, abundant soil carbonate; topsoil zone			
2	T7-1			CH	Hard, damp to dry, dark yellowish brown, CLAY			
4	T7-2			CH	Becomes moist, moderate yellowish brown, CLAY with sand			
6	T7-3							
8	T7-4			SW	**TERRACE DEPOSIT GRAVEL** Dense, moist, moderate yellowish brown, well graded, fine to coarse SAND with rounded, fine to coarse gravel, approximately 10 to 20% rounded cobbles and boulders up to 1 foot diameter, caving			
10								
					TRENCH TERMINATED AT 11 FEET			

Figure A-25, Log of Trench T 7

SOM

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 8

ELEV. (MSL.) 476 DATE COMPLETED 8/22/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TERRACE DEPOSIT CLAY** Firm, dark yellowish brown, CLAY, abundant soil carbonate, roots; topsoil zone			
2					Firm to hard, moist, moderate olive brown, CLAY with gravel, scattered cobbles less than 8 inch diameter			
4	T8-1							
6				CH				
8								
10								
12	T8-2			SC	**TERRACE DEPOSIT GRAVEL** Dense, moist, moderate brown, Clayey SAND with rounded gravel, approximately 20% cobbles and boulders up to 18 inches diameter			
14					TRENCH TERMINATED AT 14 FEET			

Figure A-26, Log of Trench T 8

SOM

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 9

ELEV. (MSL.) 474 DATE COMPLETED 8/22/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TERRACE DEPOSIT CLAY** Hard, dry, dark yellowish brown, CLAY, cracks, roots; topsoil zone			
2					Hard, moist, dark yellowish brown, CLAY, approximately 10% rounded gravel above 3 feet. No gravel below 3 feet			
4	T9-1							
6				CH				
8								
10								
12				SC	**TERRACE DEPOSIT GRAVEL** Dense, moist, moderate brown, Clayey SAND with rounded gravel, approximately 20% cobbles and boulders up to 18 inches diameter			
					TRENCH TERMINATED AT 12 FEET (REFUSAL)			

Figure A-27, Log of Trench T 9

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◣ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 10

ELEV. (MSL.) 479 DATE COMPLETED 8/22/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TERRACE DEPOSIT CLAY** Hard, dry, dark yellowish brown, CLAY, cracks, roots, caliche; topsoil zone			
2					Firm to hard, moist, pale to dark yellowish brown, CLAY			
4	T10-1							
6	T10-2			CH				
8								
10	T10-3			SC	**TERRACE DEPOSIT GRAVEL** Dense, moist, moderate brown, Clayey SAND with gravel, approximately 10% cobbles and boulders up to 1 foot diameter			
12					TRENCH TERMINATED AT 12 FEET			

Figure A-28, Log of Trench T 10

SOM

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 11

ELEV. (MSL.) 481 DATE COMPLETED 8/22/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TERRACE DEPOSIT CLAY** Hard, dry, dark yellowish brown, CLAY, caliche and rootlets; topsoil zone			
2					Firm to hard, moist, pale yellowish brown, CLAY			
4								
6				CH				
8								
10					-1 foot boulder			
				SC	**TERRACE DEPOSIT GRAVEL** Dense, moist, moderate brown, Clayey SAND with gravel, approximately 10% rounded cobbles and boulders up to 1 foot diameter			
					TRENCH TERMINATED AT 11 FEET			

Figure A-29, Log of Trench T 11

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 12

ELEV. (MSL.) 464 DATE COMPLETED 8/22/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TERRACE DEPOSIT CLAY** Hard, dry, dark yellowish brown, CLAY, caliche and roots			
2					Firm to hard, moist, pale yellowish brown, CLAY with rounded gravel			
4				CH				
6								
8	T12-1			SC	**TERRACE DEPOSIT CLAY** Dense, moist, moderate yellowish brown, Clayey SAND			
10								
					TRENCH TERMINATED AT 11 FEET			

Figure A-30, Log of Trench T 12

SOM

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 13

ELEV. (MSL.) 478 DATE COMPLETED 8/23/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				SM	**TOPSOIL** Dense, dry, dark yellowish brown, Silty SAND, porous, soil cracking, roots			
2								
					TERRACE DEPOSIT GRAVEL Dense, moist, moderate yellowish brown, Clayey SAND, scattered rounded gravel and cobbles less than 6 inches diameter			
4	T13-1			SC				
6					TRENCH TERMINATED AT 6 FEET			

Figure A-31, Log of Trench T 13

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 14

ELEV. (MSL.) 480 DATE COMPLETED 8/23/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Dense, dry, dark yellowish brown, Silty SAND, porous, soil cracking, roots			
2	T14-1				**TERRACE DEPOSIT GRAVEL** Dense, moist, light to moderate brown, Silty fine SAND, partially cemented in places			
4	T14-2			SM	Moderate olive brown below 4 feet			
6	T14-3			CL	Hard, damp, light olive gray, CLAY			
8					Very dense, partially cemented in places, damp to moist, dusky yellow, light olive brown and moderate olive brown, fine SAND			
10	T14-4			SP				
12								
14					-1 foot thick clayey sand with rounded gravel, scattered round cobbles less than 6 inches diameter			
16	T14-5				-2 foot diameter boulder at 15 feet Predominantly light olive gray below 15 feet			
					TRENCH TERMINATED AT 16 FEET			

Figure A-32, Log of Trench T 14

SOM

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 15

ELEV. (MSL.) 473 DATE COMPLETED 8/23/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Dense, dry, dark yellowish brown, Silty SAND, porous, soil cracking, roots			
2				SC	**TERRACE DEPOSIT GRAVEL** Dense, moist, moderate yellowish brown, Clayey SAND with rounded gravel, approximately 25% rounded cobbles up to 1 foot diameter. Coarsens downward, approximately 50% cobbles and boulders up to 2 feet diameter below 6 feet			
4								
6								
8								
10					-Light olive gray below 10 feet			
					TRENCH TERMINATED AT 11 FEET			

Figure A-33, Log of Trench T 15

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 16

ELEV. (MSL.) 472 DATE COMPLETED 8/23/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TOPSOIL** Hard, dry, dark yellowish brown, CLAY			
2				SC	**TERRACE DEPOSIT GRAVEL** Dense, moist, moderate yellowish brown, Clayey SAND with rounded gravel, approximately 10 to 20% rounded cobbles, less than 8 inches diameter			
4								
6								
8					TRENCH TERMINATED AT 8 FEET			

Figure A-34, Log of Trench T 16

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 17 ELEV. (MSL.) 491 DATE COMPLETED 8/23/02 EQUIPMENT JD 510 RUBBER TIRE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0								
2				SM	**TOPSOIL** Dense, dry to damp, dark yellowish brown, Silty SAND			
4	T17-1			SC	**TERRACE DEPOSIT GRAVEL** Dense, moist, moderate yellowish brown, Clayey SAND, scattered rounded gravel and cobbles less than 6 inches diameter			
6								
8					TRENCH TERMINATED AT 8 FEET			

Figure A-35, Log of Trench T 17

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 18

ELEV. (MSL.) 508 DATE COMPLETED 8/23/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2	T18-1			CH	**TERRACE DEPOSIT CLAY** Hard, dry, dark yellowish brown, CLAY, abundant caliche, soil cracking; topsoil zone			
				CH	Hard, moist, moderate yellowish brown, CLAY with sand, abundant soil, calcium sulfate or carbonate (?)			
4								
6				SC/CH	Dense, moist, light olive brown, Clayey SAND/Sandy CLAY with gravel, approximately 20% rounded cobbles less than 6 inches diameter			
8								
10	T18-2			SC	**TERRACE DEPOSIT GRAVEL** Dense, moist, moderate yellowish brown, Clayey SAND with gravel, approximately 10% rounded and angular cobbles less than 6 inches diameter			
					TRENCH TERMINATED AT 11 FEET			

Figure A-36, Log of Trench T 18

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 19 ELEV. (MSL.) 518 DATE COMPLETED 8/23/02 EQUIPMENT JD 510 RUBBER TIRE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**TOPSOIL** Dense, dry, dark yellowish brown, Clayey SAND			
2				GP	**TERRACE DEPOSIT GRAVEL** Predominantly cobbles and rounded boulders up to 2 feet diameter			
4				SC	Dense, moist, moderate yellowish brown, Clayey SAND with approximately 10% rounded cobbles less than 8 inches diameter			
6					TRENCH TERMINATED AT 7 FEET			

Figure A-37, Log of Trench T 19

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 20

ELEV. (MSL.) 492 DATE COMPLETED 8/23/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TERRACE DEPOSIT CLAY** Hard, dry, dark yellowish brown, CLAY, soil cracks; topsoil zone			
2	T20-1			CH	Hard, moist, moderate yellowish brown, CLAY with sand			
4				MH/SM	**TERRACE DEPOSIT GRAVEL** Stiff to medium dense, moist, moderate yellowish brown, Sandy SILT/Silty fine SAND			
6	T20-2							
8								
10				SC	Dense, moist, moderate yellowish brown, Clayey SAND with approximately 10% rounded cobbles less than 8 inches diameter			
12					TRENCH TERMINATED AT 12 FEET			

Figure A-38, Log of Trench T 20

SOM

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 21 ELEV. (MSL.) 483 DATE COMPLETED 8/23/02 EQUIPMENT JD 510 RUBBER TIRE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	T21-1			CH	**TOPSOIL** Hard, dry to damp, dark yellowish brown, CLAY			
2								
4				SC	**TERRACE DEPOSIT GRAVEL** Dense, moist, moderate yellowish brown, Clayey SAND with gravel, approximately 20% rounded cobbles up to 1 foot diameter			
6					TRENCH TERMINATED AT 6 FEET			

Figure A-39, Log of Trench T 21

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 22

ELEV. (MSL.) 486 DATE COMPLETED 8/26/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TERRACE DEPOSIT CLAY** Hard, dry, moderate yellowish brown, CLAY, cracked roots			
2				CH	Hard, moist, moderate yellowish brown, CLAY			
4				SM	Dense, damp, moderate and light brown, Silty, fine to coarse SAND with rounded gravel, approximately 30% cobbles and boulders up to 1 foot diameter			
6					TRENCH TERMINATED AT 6 FEET			

Figure A-40, Log of Trench T 22

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 23

ELEV. (MSL.) 468 DATE COMPLETED 8/26/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				CH	**TERRACE DEPOSIT CLAY** Hard, moist, moderate yellowish brown, CLAY, cracked roots			
2	T23-1			CH	Firm, moist, moderate yellowish brown, CLAY			
4				CH	Firm, moist, moderate yellow brown, Sandy CLAY			
6	T23-2			SC	**TERRACE DEPOSIT GRAVEL** Becomes dense, moist, moderate yellowish brown and dark yellowish orange, Clayey SAND with gravel, approximately 25% cobbles and boulders up to 2 feet diameter			
8								
					TRENCH TERMINATED AT 9 FEET			

Figure A-41, Log of Trench T 23

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 24

ELEV. (MSL.) 485 DATE COMPLETED 8/26/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				CH	**TERRACE DEPOSIT CLAY** Hard, dry, moderate yellowish brown, CLAY, cracked roots; topsoil zone			
2				CH	Firm, moist, moderate yellowish brown, CLAY			
4								
	T24-1			SM	**TERRACE DEPOSIT GRAVEL** Dense, moist, dark yellowish orange to moderate yellowish brown, Silty fine SAND, scattered gravel and cobbles, rounded, less than 6 inches diameter			
6								
8								
10								
	T24-2			SM	Becomes moderate yellowish brown			
12								
14	T24-3			SW	Becomes dense, moist, moderate yellowish brown, well graded SAND with rounded fine gravel, approximately 20% rounded cobbles less than 1 foot diameter, caving			
16					TRENCH TERMINATED AT 16 FEET			

Figure A-42, Log of Trench T 24

SOM

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 25

ELEV. (MSL.) 484 DATE COMPLETED 8/26/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				CH	**TERRACE DEPOSIT CLAY** Hard, dry, dark yellowish brown, CLAY, cracks, roots			
2				CH	Hard, moist, dark yellowish brown, CLAY			
				SC	**TERRACE DEPOSIT GRAVEL** Dense, moist, moderate brown, Clayey SAND with rounded gravel, approximately 20% cobbles and boulders up to 1 foot diameter			
4								
6	T25-1			SC	No cobbles or boulders below 4.5 feet			
8					TRENCH TERMINATED AT 8 FEET			

Figure A-43, Log of Trench T 25

SOM

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

TRENCH T 26

ELEV. (MSL.) 478 DATE COMPLETED 8/26/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TERRACE DEPOSIT CLAY** Hard, dry, dark yellowish brown, CLAY, caliche, rootlets; topsoil zone			
2				CH	Firm to hard, moist, pale yellowish brown, CLAY			
4								
6				SC	**TERRACE DEPOSIT GRAVEL** Dense, moist, moderate brown, Clayey SAND with gravel, approximately 10% rounded cobbles and boulders up to 2 feet diameter			
8								
					TRENCH TERMINATED AT 9 FEET			

Figure A-44, Log of Trench T 26

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06847-42-01

TRENCH T 27

ELEV. (MSL.) 489 DATE COMPLETED 8/26/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				CH	**TERRACE DEPOSIT CLAY** Hard, dry, dark yellowish brown, CLAY, caliche, roots; topsoil zone			
2				CH	Firm to hard, moist, pale yellowish brown, CLAY			
4								
6				SC	**TERRACE DEPOSIT GRAVEL** Dense, moist, moderate yellowish brown, Clayey SAND with gravel, approximately 10% rounded cobbles and boulders up to 1 foot diameter			
8								
					TRENCH TERMINATED AT 9 FEET			

Figure A-45, Log of Trench T 27

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06847-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 28 ELEV. (MSL.) 487 DATE COMPLETED 8/26/02 EQUIPMENT JD 510 RUBBER TIRE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CH	**TERRACE DEPOSIT CLAY** Hard, dry, dark yellowish brown, CLAY, caliche, rootlets; topsoil zone			
2				CH	Firm to hard, moist, pale yellowish brown, CLAY, gravelly in upper 3 feet			
4								
6								
8				SC	**TERRACE DEPOSIT GRAVEL** Dense, moist, moderate yellowish brown, Clayey SAND with coarse gravel, approximately 10% rounded cobbles and boulders up to 1 foot diameter			
10					TRENCH TERMINATED AT 11 FEET			

Figure A-46, Log of Trench T 28

SOM

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06847-42-01

TRENCH T 29

ELEV. (MSL.) 465 DATE COMPLETED 8/26/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TOPSOIL** Hard, dry, dark yellowish brown, CLAY with gravel, cracking, roots			
2					**TERRACE DEPOSIT GRAVEL** Dense, moist, dusky yellow and moderate yellowish brown, Clayey, very Gravelly SAND, approximately 30% rounded cobbles and boulders up to 2.5 feet diameter			
4								
6				SC-GC				
8								
10								
12	T29-1			SM	**SAN DIEGO FORMATION** Dense, damp, dusky yellow to light olive brown, Silty fine SAND			
14					TRENCH TERMINATED AT 14 FEET			

Figure A-47, Log of Trench T 29

SOM

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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APPENDIX B

APPENDIX B

LOGS OF BORINGS FROM GEOCON'S MAY 2006 REPORT FOR BEYER BOULEVARD EXTENSION

FOR

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

PROJECT NO. 06847-42-03

PROJECT NO. 07254-42-02

BORING LB-1A

ELEV. (MSL.) 230' DATE COMPLETED 10-25-2004

EQUIPMENT EZ BORE 100 30" ROTARY BUCKET BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**LANDSLIDE DEBRIS (Younger)**			
2	LB1A-1			SC	Medium dense, moist, light gray, Clayey, fine SAND; bedding variable, dipping 30-40° southwest in disturbed block of Otay Formation and considered a younger landslide initiated by erosion of Moody Canyon through older landslide debris			
4								
6	LB1A-2					2	108.0	14.0
8				ML	Firm, damp, medium gray-brown, Clayey SILT; bedding variable, undulating, N25E, 3NW to 5SE, mottled with white calcium carbonate inclusions and thin layers of fine sand			
10	LB1A-3			SC	Medium dense, moist, dark grayish brown to olive (mottled), Clayey SAND; contorted clayseam at 10½ feet, fractured and brecciated	2	102.3	22.6
12								
14								
16								
					-Brecciated zone undulating approx. horizontal; base of slide			
18				SP-GP	**ALLUVIUM** Loose, damp, medium brown, very Sandy, coarse GRAVEL; alluvial gravel, scoured into undisturbed thin claystone layer E-W, 5N			
20					**OTAY FORMATION SILTSTONE**			
22	LB1A-4				Dense, damp, light brown, very Silty, fine SANDSTONE; bedding N30W, 10NE to horizontal, with caliche stringers, red clayey beds	6	97.9	21.3
24				SM-ML	-Becomes more sandy, with calcium carbonate cementation, some thin interbedded claystone layers			
26								
28								
					-Bedding undulating and approx. horizontal			
					OTAY FORMATION GRITSTONE MEMBER			

Figure A-1,
Log of Boring LB-1A, Page 1 of 2

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

BORING LB-1A

ELEV. (MSL.) 230' DATE COMPLETED 10-25-2004

EQUIPMENT EZ BORE 100 30" ROTARY BUCKET BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	LB1A-5				Dense to very dense, damp, light yellowish brown, Silty, fine to medium SANDSTONE	26	111.9	6.5
32	LB1A-6				-Bedding horizontal, becomes very dense			
34								
36					-2-inch thick cemented zone			
38								
40	LB1A-7			SM		30	124.1	10.6
42					-Transition to coarse grained, silty sand with subangular to subrounded fine gravel (grit), with thin cemented layers			
44								
46								
48								
50	LB1A-8					40/10"		
					BORING TERMINATED AT 51 FEET No groundwater encountered			

Figure A-1,
Log of Boring LB-1A, Page 2 of 2

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

BORING LB-2A

ELEV. (MSL.) 260' DATE COMPLETED 10-26-2004

EQUIPMENT EZ BORE 100 30" ROTARY BUCKET BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**OTAY FORMATION SILTSTONE**			
2				ML	Dense, damp, medium gray, fine, Sandy SILTSTONE; with thin interbedded silt, fine sandstone			
4	LB2A-1							
6	LB2A-2			ML-CL	Dense, damp, medium gray-brown, Clayey SILTSTONE	8	99.4	24.9
8					Very dense, damp, light gray, Silty, fine SANDSTONE; massive			
10	LB2A-3			SM		18		
12								
14					-Cemented layer 2-inches thick N65E, 11SE			
16					Hard, damp, medium brown to gray, Sandy CLAYSTONE and Clayey SILTSTONE; approx. horizontal beds			
18				CL-ML	-Very dense, Silty, very fine SANDSTONE layer approx. 2 feet thick, grading to siltstone			
20	LB2A-4				-Reddish brown coloration grading from siltstone to claystone	10	119.3	12.2
22					Very dense, damp, very light gray, slightly Silty, fine SANDSTONE; becomes friable, less cemented			
24								
26				SM				
28					-Cemented layer, N40E, 11SE 2 to 3-inches thick			

Figure A-2,
Log of Boring LB-2A, Page 1 of 2

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▨ ... DISTURBED OR BAG SAMPLE
- ◣ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

BORING LB-2A

ELEV. (MSL.) 260' DATE COMPLETED 10-26-2004

EQUIPMENT EZ BORE 100 30" ROTARY BUCKET BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	LB2A-5					17		
					Dense, damp, medium brown, Sandy SILTSTONE to Silty SANDSTONE			
32								
					-Very stiff, pinkish brown 4-inch thick bentonite layer; N20W, 8NE			
34								
				ML-SM				
36					-Claystone bed 1-inch thick N40W, 6SW			
38								
					Very hard, damp, medium brown-olive, very Clayey SILTSTONE to Silty CLAYSTONE			
40								
42	LB2A-6			ML-CL				
44								
46					-Bentonite claystone bed approx. 8-inches thick, approx. horizontal at 46½ feet			
48					Very dense, damp, light brown, very Silty, fine SANDSTONE; bedding N20E, 5SE			
50				SM				
52					-Transition to bentonitic clayey sandstone at 52½ feet			
54								
					BORING TERMINATED AT 55 FEET No groundwater encountered			

Figure A-2,
Log of Boring LB-2A, Page 2 of 2

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB-3A** ELEV. (MSL.) **392'** DATE COMPLETED **11-01-2004** EQUIPMENT **EZ BORE 100 30" ROTARY BUCKET** BY: **G. COPENHAVER** MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2					**LANDSLIDE DEBRIS (Older)** Dense, damp, reddish brown, Sandy, coarse GRAVEL; some silt			
4								
6				GM				
8					-Boulder size (8 to 20-inch diameter) cobble			
10								
12	LB3A-1				Dense, damp, reddish brown, very Gravelly, Silty, medium coarse SAND			
14				SM-GP				
16					BORING TERMINATED AT 16 FEET (Refusal on large cobble-boulders) No groundwater encountered			

Figure A-3,
Log of Boring LB-3A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

BORING LB-4A

ELEV. (MSL.) 350' DATE COMPLETED 11-02-2004

EQUIPMENT EZ BORE 100 30" ROTARY BUCKET BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		SM	**LANDSLIDE DEBRIS (Older)** Dense, dry to humid, dark brown, Silty, fine SAND; numerous white calcium carbonate (caliche) lined fractures			
2			Medium dense, damp, light gray, fine, Sandy SILT; (mottled with white caliche)			
4	LB4A-1					
6	LB4A-2	ML	-Becomes medium gray-brown	3	96.5	13.8
8						
10	LB4A-3		Dense, damp, reddish brown, Gravelly to Clayey SAND; sandy bedding parting surfaces at N25E, 10NW	10		
12	LB4A-4	SC				
14						
16	LB4A-5		Becomes Sandy, coarse GRAVEL with some Silt	10		
18						
20	LB4A-6	GM		12		
22						
24						
26			-Approx. imbrication layers of gravel at N-S, 30E, likely to be block slide-rotated bedding of the Terrace Deposit Gravel. This may represent a large landslide - block within the San Ysidro Landslide complex that is older than those in Moody Canyon			
28						

07254-42-02(RECENT).GPJ

Figure A-4,
Log of Boring LB-4A, Page 1 of 3

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

BORING LB-4A

ELEV. (MSL.) 350' DATE COMPLETED 11-02-2004

EQUIPMENT EZ BORE 100 30" ROTARY BUCKET BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30								
32				GM				
34					-Remolded (shear) clayseam approx. 2-inches thick with pink bentonite N45W, 45SW at 35 feet (landslide failure surface)			
36	LB4A-9 LB4A-10 LB4A-7 LB4A-8			CL-ML	**OTAY FORMATION** Hard, moist, light gray to pinkish brown, very Silty CLAYSTONE to dense, Clayey SILTSTONE (this lenticular zone exhibits features of "lateral spread" ancient submarine landslides and is considered inactive when undisturbed	15	109.7	17.5
38								
40					Bedding with localized discontinuous polished surfaces N85W, 26N shear on bentonitic clay layer N30E, 70SE. Bedding E-W, 25N along 4-6" cemented layer			
42					Open fractures 1/8-inch wide N70W, 67NE with striated surfaces (striations parallel to dip)			
44					Possible "flame" structures, with sharp variations in bedding. Bedding N70E, 20NW			
46					Discontinuous steep open fractures in various directions with voids, sheared laminated siltstone bedding N70E, 15NW is sheared at N40E, 57NW, transitioning into dense, massive siltstone			
48								
50					-Gradual transition into massive subhorizontal beds			
52					**OTAY FORMATION SILTSTONE** Dense, damp, light gray-olive, Clayey SILTSTONE; massive to approx. horizontal bedding			
54								
56				ML				
58								

Figure A-4,
Log of Boring LB-4A, Page 2 of 3

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07254-42-02

BORING LB-4A

ELEV. (MSL.) 350' DATE COMPLETED 11-02-2004

EQUIPMENT EZ BORE 100 30" ROTARY BUCKET BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	LB4A-11					35	106.9	17.9
	LB4A-12			ML				
62								
64								
					BORING TERMINATED AT 65 FEET No groundwater encountered			

Figure A-4,
Log of Boring LB-4A, Page 3 of 3

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

BORING LB-5A

ELEV. (MSL.) 390' DATE COMPLETED 11-03-2004

EQUIPMENT EZ BORE 100 30" ROTARY BUCKET BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**LANDSLIDE DEBRIS (Older)** Stiff, moist, dark olive to yellow brown, Sandy to Gravelly CLAY; derived from Terrace Deposit Clay (older landslide debris)			
2								
4				SM-GM	Dense, damp, medium to light reddish brown, very Gravelly, coarse SAND; derived from Terrace Deposit Gravel			
6								
8				GM	Dense, damp, medium to light reddish brown, Sandy, very coarse GRAVEL; slight dip to E of the cobbles, imbrication, suggesting slide-block rotation			
10					-10 to 12-inch diameter cobbles			
					BORING TERMINATED AT 11½ FEET (Near refusal) No groundwater encountered			

Figure A-5,
Log of Boring LB-5A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07254-42-02

BORING LB-6A

ELEV. (MSL.) 315' DATE COMPLETED 11-03-2004

EQUIPMENT EZ BORE 100 30" ROTARY BUCKET BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		CL	**LANDSLIDE DEBRIS (Younger)** Soft to stiff, very moist, dark brown, Sandy to Gravelly CLAY; scattered caliche; younger landslide			
6		CL-GC	Stiff to hard, moist, olive-brown to light brown (mottled), Gravelly CLAY -Abundant caliche At 6 feet - 2-inch zone highly sheared S: N60E, 20NW At 10 feet - becoming cobbly (conglomeratic) At 12 feet - horizontal imbrication			
10	LB6A-1			16	111.9	13.1
12	LB6A-2					
14		GC	Medium dense, damp, light to medium reddish brown, Clayey, Sandy GRAVEL; some silt -More cemented at 15 feet			
20	LB6A-3			11		
22		GC	Dense, humid to damp, medium reddish brown, Clayey to Sandy, coarse Gravel; some silt, some cementation (used coring tool) -One foot thick layer of fat clay, soft to firm, internally sheared, approx. horizontal			
28			-Cemented zone (may represent a large block of debris from Older Landslide)			

Figure A-6,
Log of Boring LB-6A, Page 1 of 2

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB-6A** ELEV. (MSL.) **315'** DATE COMPLETED **11-03-2004** EQUIPMENT **EZ BORE 100 30" ROTARY BUCKET** BY: **G. COPENHAVER**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
					BORING TERMINATED AT 29 FEET - Refusal No groundwater encountered			

Figure A-6,
Log of Boring LB-6A, Page 2 of 2

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◥ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

BORING LB-7A

ELEV. (MSL.) 335' DATE COMPLETED 11-04-2004

EQUIPMENT EZ BORE 100 30" ROTARY BUCKET BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**LANDSLIDE DEBRIS (Younger)**			
2					Soft to stiff, moist, dark gray-brown, Gravelly CLAY; porous			
4								
6	LB7A-1 LB7A-2			CL		6		
8								
10					-Remolded clay seam 1 to 2-inch thick; N70W, 40NE			
12					Medium dense, humid, light to medium brown, very Gravelly, Silty, medium SAND			
14								
16				SM-GM				
18								
20								
22					Loose, damp, light reddish brown, very Gravelly, Silty, medium SAND			
24								
26				GM	-Becomes oversize boulder gravel; possible block of Older Landslide Debris, reworked into younger debris			
28								

Figure A-7,
Log of Boring LB-7A, Page 1 of 2

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB-7A** ELEV. (MSL.) **355'** DATE COMPLETED **11-04-2004** EQUIPMENT **EZ BORE 100 30" ROTARY BUCKET** BY: **G. COPENHAVER**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
					BORING TERMINATED AT 30 FEET (Near refusal on oversize boulder-cobble) No groundwater encountered			

Figure A-7,
Log of Boring LB-7A, Page 2 of 2

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

BORING LB-8A

ELEV. (MSL.) 265' DATE COMPLETED 01-18-2006

EQUIPMENT _____ BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC-CL	**LANDSLIDE DEBRIS (Younger)** Loose, moist, dark to light brown (mottled), very Clayey, very fine SAND; represents secondary landslide (symbol Qls2 on map)			
2								
4								
6	LB8A-1 LB8A-2				-Loose, damp, light tan to olive, silty, fine sand with blocks of very silty claystone and sandstone 2 to 24 inch diameter and porous, with open cracks 1/8 to 1/2 inch wide	1		
8								
10	LB8A-3			SM	-Shear N40W, 47SW, 1/4 to 1/2 inch, with brown silt gouge	3		
12								
14								
16					-Shear N60E, 36SE; 2 to 3 inch thick remolded clay at 16 feet			
18				CH-CL	Soft to stiff, moist, pink to white gray (mottled) bentonitic CLAY; very fractured and disturbed shear zone N75W, 10SW; basal landslide shear (brecciated bentonite fragments are not in-place)			
20	LB8A-4			ML-CL	Loose to medium dense, moist, dark to medium brown (mottled), very Clayey SILT to very fine SAND; possible paleosol developed on top of undisturbed Otay Formation -Transitional contact into weathered formation	1		
22	LB8A-5			SM	**OTAY FORMATION** Dense, moist, light brown to reddish brown, very very Silty, very fine SANDSTONE; massive to subhorizontal			
24					-Subhorizontal calcium carbonate (caliche) layers near contact			
26				ML	Dense, moist, medium olive brown, very Clayey SILTSTONE; massive			
28				ML	Dense, damp, light olive brown, fine Sandy SILTSTONE; massive, with some discontinuous steep joints, trace clay			

Figure A-8,
Log of Boring LB-8A, Page 1 of 3

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

BORING LB-8A

ELEV. (MSL.) 265' DATE COMPLETED 01-18-2006

EQUIPMENT _____ BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	LB8A-6					6/8"		
					-Sharp deposition contact N62W, 5SW (bedding)			
32				SM	Dense, damp, light brown, Silty, fine SANDSTONE			
34								
36				CL-ML	Hard, moist, medium olive brown, very Silty CLAYSTONE; massive			
38								
40	LB8A-7					10		
					-Thin 1 to inch bentonite layer N55W, 3NE; not remolded and with sharp depositional contact at 41.5 feet			
42								
44								
46								
48								
50	LB8A-8					10/8"		
52					-Approximately horizontal, with undulations			
				SM	**OTAY GRITSTONE**			
54					Very dense, humid to damp, light yellow brown, Silty, medium to very coarse grained SANDSTONE; with subangular grit-size sand (up to 1/4 inch diameter)			
56								
58								

Figure A-8,
Log of Boring LB-8A, Page 2 of 3

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB-8A** ELEV. (MSL.) **265'** DATE COMPLETED **01-18-2006** EQUIPMENT _____ BY: **G. COPENHAVER** MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	LB8A-9				BORING TERMINATED AT 60.2 FEET No groundwater encountered	5/2"		

Figure A-8,
Log of Boring LB-8A, Page 3 of 3

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◥ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

BORING LB-9A

ELEV. (MSL.) **320'** DATE COMPLETED **01-19-2006**

EQUIPMENT _____ BY: **G. COPENHAVER**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML-CL	**LANDSLIDE DEBRIS** Stiff, damp, light olive brown to gray, very Clayey SILT to CLAY; bedding N5W, 60NE (slide-rotated block of Otay Formation); very fractured, with voids, breccia clasts; represents primary landslide (Qls1 on map); collar of boring is located less than 30 feet east of exploratory trench T-24A that exposed landslide-rotated contact between pleistocene-age LindaVista Formation			
10	LB9A-1					2		
12					-Becomes more clayey (with some bentonite clay)			
14					-Disconuous, steep fractures, with 1/4 inch wide voids; fractures spacing is 1 to 3 inch apart			
18					-Cemented bed (calcium carbonate) N83E, 22NW (slide-rotated)			
20	LB9A-2					4		
24					-Brown bentonite clay layer: N84W, 24NE approximately 10 inch thick; is not remolded -Sharp contact same attitude same as above			
26				SM	Dense, damp, light brown, Silty, fine SAND (fractured, with minor breccia clasts)			
28								

Figure A-9,
Log of Boring LB-9A, Page 1 of 3

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

BORING LB-9A

ELEV. (MSL.) **320'** DATE COMPLETED **01-19-2006**

EQUIPMENT _____ BY: **G. COPENHAVER**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	LB9A-3				-Landslide basal shear, N30E, 36SE, approx. 1/2 inch remolded clay-gouge with striae parallel to dip	6		
32				CL	**OTAY FORMATION** Stiff to hard, moist, brown olive, very Silty CLAY; irregular subhorizontal contact above and below is displaced against sandstone by shear above			
34								
36				SP	Loose to medium dense, humid, light brown, Silty, fine SAND; less cohesive			
38				SP	Very dense, dry to humid, light brown to gray, cemented SANDSTONE; very fractured N65W, 6SW bedding			
40	LB9A-4			SM	Dense, humid, light brown, Silty, fine SANDSTONE; massive	6		
42					-8 inch thick claystone at 41.2 feet with undulating bedding at N62E, 7SE and 1/8 inch thick bedding plane shear at base			
44								
46				CL-CH	**BENTONITE ZONE** Stiff, moist, light brown white to pink (mottled), Silty CLAYSTONE with some silt			
48	LB9A-5 LB9A-5A			CL-ML	-Numerous Bedding Plane shear remolded seams within bentonitic zone overall strike N67E, 7SE; (major Bedding plane shear is at 48 feet, is 2 to 3 inch thick N70E, 3 to 4SE (undulating)	2		
50	LB9A-6				Hard, moist, light to medium brown olive, very Silty CLAYSTONE with some bentonite	10/10"		
52				ML-SM	**OTAY FORMATION** Dense, damp to moist, medium brown to olive, very fine Sandy SILTSTONE interbedded with Silty, very fine SANDSTONE; massive or subhorizontal			
54								
56								
58								

Figure A-9,
Log of Boring LB-9A, Page 2 of 3

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB-9A** ELEV. (MSL.) **320'** DATE COMPLETED **01-19-2006** EQUIPMENT _____ BY: **G. COPENHAVER**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
60	LB9A-7					12/8"		
					BORING TERMINATED AT 60.7 FEET No groundwater encountered			

Figure A-9,
Log of Boring LB-9A, Page 3 of 3

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING LB-10A ELEV. (MSL.) 325' DATE COMPLETED 01-19-2006 EQUIPMENT BY: G. COPENHAVER MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML-CL	**LANDSLIDE DEBRIS** Loose to medium dense, humid to damp, medium brown olive, very Clayey SILT; very fractured and rotated blocks of Otay Formation, siltstone and claystone with voids up to 1/2 inch wide along fractures			
10	LB10A-1					2		
20	LB10A-2					2		
26					-Throughgoing shear 1/8 inch wide with hematite lining E-W, 67S			

Figure A-10,
Log of Boring LB-10A, Page 1 of 3

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

BORING LB-10A

ELEV. (MSL.) 325' DATE COMPLETED 01-19-2006

EQUIPMENT _____ BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30								
32					-Shear at 32 feet N-S 42W approximately 1 inch remolded clay-gouge, with some calcium carbonate staining on footwall			
34								
36								
38				SM	N12E, 50NW shear, with 1/2 inch dark olive clay slicked gouge-fill. Wedge-shape block or "slice" between two shears that represent a landslide backscarp			
40					-N-S, 45W shear, with 1/8 to 1/4 inch dark olive clay gouge-fill (slicked)			
42				SM	**OTAY FORMATION** Dense, humid to damp, light brown olive, Silty, fine SANDSTONE			
44								
46					-Lamination (bedding) N75E, 10SE			
48								
50								
52					-N35E, 6Se (cemented lense, bedding), lenticular (approx. 2 inch thick)			
54				CL	**BENTONITE ZONE** Hard, moist, medium brown olive, Silty CLAY with some bentonite; massive			
56	LB10A-3					10		
58	LB10A-4				-Becomes mostly light brown to reddish brown bentonite claystone -N22E, 6SE; 1/2 inch bedding plane shear remolded light pink bentonite -N22E, 6SE; 2 inch bedding plane shear remolded pink bentonite			

Figure A-10,
Log of Boring LB-10A, Page 2 of 3

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB-10A** ELEV. (MSL.) **325'** DATE COMPLETED **01-19-2006** EQUIPMENT _____ BY: **G. COPENHAVER**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
60	LB10A-5			ML	-White massive bentonite at 60.5 feet -Sharp depositional contact with bentonite zone Dense, moist, olive brown, Sandy SILTSTONE; massive to subhorizontal beds with some thin (3 to 6 inch thick) interbedded sandstone and claystone	6		
62								
64								
66								
68								
70					BORING TERMINATED AT 70 FEET No groundwater encountered			

Figure A-10,
Log of Boring LB-10A, Page 3 of 3

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

TRENCH T- 1A

ELEV. (MSL.) 486' DATE COMPLETED 10-12-2004

EQUIPMENT JD 310 24" BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
	T1-1			CL	**TOPSOIL** Stiff, firm, moist, medium to dark gray-brown, Sandy CLAY; porous with shrinkage cracks, roots			
2								
				SM-GM	**TERRACE DEPOSIT GRAVEL** Dense, moist, light reddish brown, very Gravelly, Silty SAND; approx. horizontal bedding and imbrication of gravel clasts (equivalent to Lindavista formation)			
4								
6	T1-2							
				SM	Medium dense, moist, pale yellowish brown, slightly Silty, coarse SAND; friable			
8	T1-3							
					TRENCH TERMINATED AT 8½ FEET			

Figure A-11,
Log of Trench T- 1A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ▨ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◥ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T- 2A ELEV. (MSL.) 482' DATE COMPLETED 10-12-2004 EQUIPMENT JD 310 24" BY: G. COPENHAVER MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Stiff, firm, moist, medium to dark gray-brown, Sandy CLAY; porous with shrinkage cracks, roots			
2				SC	**TERRACE DEPOSIT GRAVEL** Medium dense, damp, light to medium reddish brown, Clayey SAND; some gravel -Irregular, approx. horizontal contact			
4								
6				SM	Medium dense, damp, light to medium reddish brown, Silty, medium to coarse SAND; some undulating, approx. horizontal thin clay layers, indicates probable translocated clay			
8					TRENCH TERMINATED AT 8 FEET			

Figure A-12,
Log of Trench T- 2A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T- 3A ELEV. (MSL.) 395' DATE COMPLETED 10-12-2004 EQUIPMENT JD 310 24" BY: G. COPENHAVER	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL-SC	**LANDSLIDE DEBRIS (Older)** Stiff, humid, medium to dark brown, very, Sandy CLAY; porous, with shrinkage cracks and surficial soil			
2				SC	Loose, moist, medium reddish brown, Gravelly to Clayey, fine SAND; porous, root voids			
4								
6				GC-SC	Medium dense, moist, medium reddish brown, Clayey to Sandy GRAVEL and Gravelly SAND; landslide - rotated bedding is N76W, 15N			
					TRENCH TERMINATED AT 6½ FEET			

Figure A-13,
Log of Trench T- 3A, Page 1 of 1

07254-42-02(RECENT).GPJ

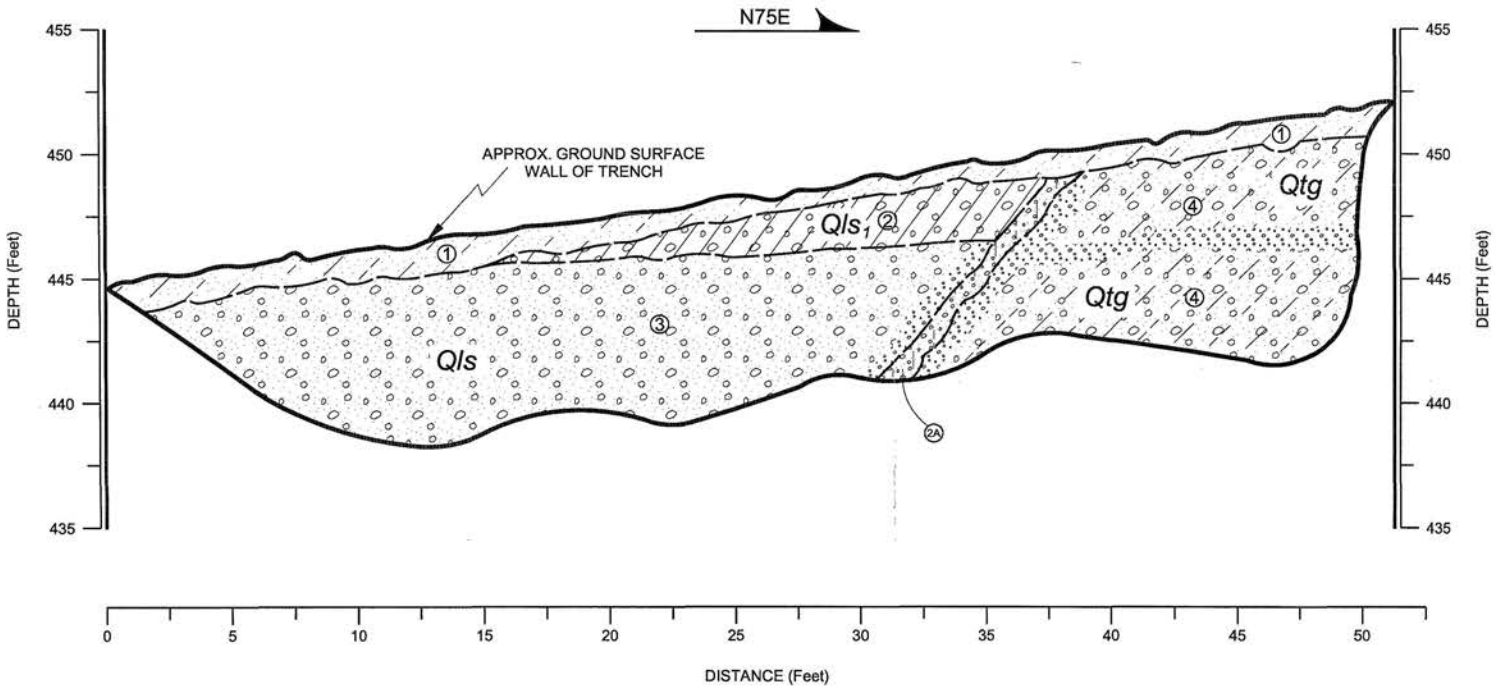
SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◣ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

OTAY MESA COMMUNITY PLAN AMENDMENT
BEYER BOULEVARD EXTENSION
SAN DIEGO, CALIFORNIA



GEOCON LEGEND

① TOPSOIL / FILL UNDIFFERENTIATED

② LANDSLIDE DEBRIS (Older) - (Qls_1)
Stiff, moist, dark brown, gravely CLAY derived from the upper Terrace Deposit Clay member; estimated apparent downward displacement of 40 feet (See Geocon report, 10-04-02)

②A BACKSCARP FISSURE
Loose, dry, light brown, Silty to Sandy, fine to medium PEBBLE-GRAVEL; in filling of linear fissure approx. 12-inches wide; no evidence of shearing or gouge in matrix or walls. Attitude N40W, 50SW

③ LANDSLIDE DEBRIS (Older) - (Qls_1)
Loose to medium dense, light to dark reddish brown (mottled), very Gravely SAND of theTerrace Deposit Gravel member; with random steep joints and fractures

④ TERRACE DEPOSIT GRAVEL - (Qtc, Qtg)
Medium dense to dense, moist, light reddish brown, Clayey to Sandy, coarse GRAVEL; grades to boulder size conglomerate with depth, ripup clasts of sandstone of the San Diego Formation, suggest nearness to the underlying contact with that unit.

TRENCH LOG T-4A

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PROJECT NO. 07254 - 42 - 02
FIGURE A-14
DATE 10-12-2004

X:/07254-42-02/DJ/FIG_A-14_XSECTION.DWG

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T- 5A ELEV. (MSL.) 420' DATE COMPLETED 10-12-2004 EQUIPMENT JD 310 24" BY: G. COPENHAVER MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**LANDSLIDE DEBRIS (Older)**			
2				SC-GC	Medium dense, moist, medium reddish brown, Gravelly to Clayey, fine SAND; gravel clasts randomly oriented			
4								
6				SM	-Transitional approx. horizontal contact Medium dense, damp, light to medium reddish brown, Silty, medium to coarse SAND; friable, noncohesive when disturbed			
					TRENCH TERMINATED AT 7 FEET			

Figure A-15,
Log of Trench T- 5A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07254-42-02

TRENCH T- 6A

ELEV. (MSL.) 350' DATE COMPLETED 10-12-2004

EQUIPMENT JD 310 24" BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				CL	**LANDSLIDE DEBRIS (Older)** Soft, humid, dark gray-olive, Gravelly, Silty CLAY; porous, irregular transition			
2								
					Medium dense, damp, medium reddish brown, Sandy, coarse GRAVEL; disturbed conglomerate of the pleistocene Lindavista Formation, with imbricated cobbles inclined (rotated) approx. 5° E			
4				GM				
6								
8					TRENCH TERMINATED AT 8 FEET			

Figure A-16,
Log of Trench T- 6A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T- 7A ELEV. (MSL.) 228' DATE COMPLETED 10-12-2004 EQUIPMENT JD 310 24" BY: G. COPENHAVER MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**LANDSLIDE DEBRIS (Older)** Stiff, humid, dark olive-brown, Sandy CLAY; weathered soil mantle			
2					Dense, damp, light gray-olive, Silty, fine SAND; fractured, rotated block of Otay Formation E to W, 40°N in Clayey SILTSTONE layer			
4				SM				
6								
8					TRENCH TERMINATED AT 8 FEET			

Figure A-17,
Log of Trench T- 7A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07254-42-02

TRENCH T- 8A

ELEV. (MSL.) 310' DATE COMPLETED 10-15-2004

EQUIPMENT JD 310 24" BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**LANDSLIDE DEBRIS (Younger)** Stiff, dry, light to dark brown (mottled), Clayey SAND			
2					Loose to medium dense, humid, dark brown, very Clayey, fine SAND; some gravel			
4				SC-CL				
6								
8								
10	T8-1			SC-CL	Very stiff to medium dense, moist, medium brown, very Clayey SAND; polished fracture surfaces -2 to 3" remolded bedding plane parallel shear, E to W, 2°N at 10 feet			
12								
					TRENCH TERMINATED AT 13½ FEET			

Figure A-18,
Log of Trench T- 8A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07254-42-02

TRENCH T- 9A

ELEV. (MSL.) 303' DATE COMPLETED 10-12-2004

EQUIPMENT JD 310 24" BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**LANDSLIDE DEBRIS (Older)** Loose, dry to humid, light gray-brown, Silty, fine SAND; porous			
2								
4				SM	Medium dense, humid, light gray, Silty, fine SAND			
					Medium dense, damp, medium gray, Silty, fine SAND			
6				SM	-Approx. 1-inch thick bentonite layer at 5 feet; N50E, 20NW, dense, damp, moist, medium gray silt; internally sheared older, landslide			
					TRENCH TERMINATED AT 7 FEET			

Figure A-19,
Log of Trench T- 9A, Page 1 of 1

07254-42-02(RECENT).GPJ

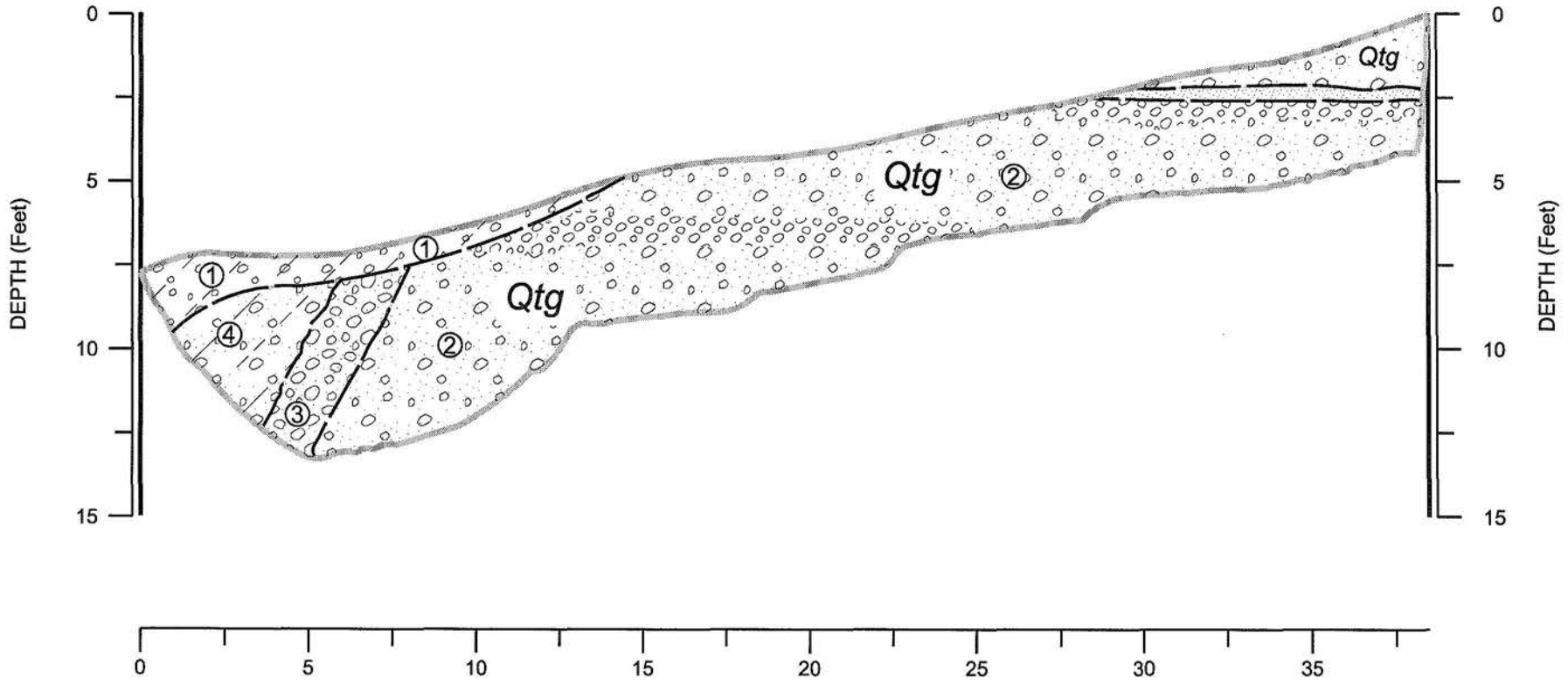
SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

OTAY MESA COMMUNITY PLAN AMENDMENT
BEYER BOULEVARD EXTENSION
SAN DIEGO, CALIFORNIA



GEOCON LEGEND

① TOPSOIL
Medium dense, humid, medium brown, very Clayey GRAVEL

② TERRACE DEPOSIT GRAVEL - (Qtg)
Very dense, damp to moist, light brown, Sandy CONGLOMERATE; abundant gravel, some boulders, sandy, silty matrix, well graded, local sand beds and cobble/gravel imbrication, sub horizontal

③ BACKSCARP FISSURE INFILLING
Loose, dry, dark reddish brown, Sandy GRAVEL; some cobbes, abundant roots to base of excavation, roots penetrate the backscarp, gravel/cobbles in random orientations, with some slight imbrications subparallel to dip of fissure, N40W, 60-70SW

④ LANDSLIDE DEBRIS (Older) - (Qls_1)
Dense, locally loose to medium dense, reddish brown, Clayey SAND; trace roots, occasional gravel, occasional light yellow sandstone; possibly derived from Terrace Deposit Clay

TRENCH LOG T-10A

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PROJECT NO. 07254 - 42 - 02
FIGURE A-20
DATE 10-12-2004

X:\07254-42-02\DJ\FIG_A-20_XSECTION.DWG

PROJECT NO. 07254-42-02

TRENCH T-11A

ELEV. (MSL.) _____ DATE COMPLETED **10-15-2004**

EQUIPMENT **JD 310 24"** BY: **G. COPENHAVER**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2				SM	**UNDOCUMENTED FILL** Loose, damp, light tan to brown, Silty, fine SAND; little or no compaction, evident, porous			
4								
6								
8								
10				SM	**ALLUVIUM** Loose, moist, medium brown to reddish brown, Gravelly to Silty, fine SAND; porous			
12	T11-1							
14								
16				SM-GM	Loose, moist, medium brown, very Gravelly, Silty, fine to medium SAND; with lenses of silt			
18					-Becomes coarse, with 12 to 18-inch cobble-boulders			
					TRENCH TERMINATED AT 18½ FEET			

Figure A-21,
Log of Trench T-11A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07254-42-02

TRENCH T-12A

ELEV. (MSL.) _____ DATE COMPLETED **10-15-2004**

EQUIPMENT **JD 310 24"** BY: **G. COPENHAVER**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2				SC	**UNDOCUMENTED FILL** Loose, damp, medium to light brown (mottled), very Gravelly, Clayey, fine SAND			
4								
6								
8				SC-GC	**ALLUVIUM** Loose to stiff, moist, dark brown, very Gravelly, Clayey, fine to medium SAND; porous, with pinhole voids			
10								
12				GC	**BAY POINT FORMATION** Medium dense to dense, very moist, reddish brown, Clayey to Sandy, fine to coarse CONGLOMERATE; massive, little or no porosity, with horizontally imbricated rounded cobbles			
14	T12-1 T12-2							
16								
					TRENCH TERMINATED AT 17 FEET			

Figure A-22,
Log of Trench T-12A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T-13A ELEV. (MSL.) 216' DATE COMPLETED 10-15-2004 EQUIPMENT JD 310 24" BY: G. COPENHAVER MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Loose, dry to humid, light brown to tan, very Sandy, coarse GRAVEL; friable, poorly graded, noncohesive sand matrix, with caving			
2								
4				SP-GP				
6								
8								
10				SM	**OTAY FORMATION SILTSTONE** Dense, damp, light gray to tan, very Silty, fine SANDSTONE; horizontally laminated TRENCH TERMINATED AT 10½ FEET (Caving)			

Figure A-23,
Log of Trench T-13A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T-14A ELEV. (MSL.) 360' DATE COMPLETED 11-03-2004 EQUIPMENT JD 310 24" BY: G. COPENHAVER	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**COLLUVIUM/SLOPECREEP** Soft, moist, dark gray-brown, Silty to Gravelly CLAY; porous, roots; transitions to shallow landslide debris further downslope			
2								
4				ML-CL	Loose, damp, light gray to white to olive, Clayey SILT: with burrows, irregular basal contact			
6					-Very irregular contact			
8				ML	**OTAY FORMATION SILTSTONE** Dense, damp, light olive-brown, Clayey SILTSTONE; horizontally bedded			
					TRENCH TERMINATED AT 9 FEET			

Figure A-24,
Log of Trench T-14A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07254-42-02

TRENCH T-15A

ELEV. (MSL.) 325' DATE COMPLETED 11-03-2004

EQUIPMENT JD 310 24" BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				CL	**LANDSLIDE DEBRIS (Younger)** Stiff, damp, dark to light brown (mottled), Sandy CLAY: transitions to colluvium / slopecreep upslope			
2								
4								
6				CL-ML	Stiff, damp, medium to light brown (mottled), very Silty CLAY			
8					-Very irregular transition inclined approx. 30° N			
10				CL-ML	**OTAY FORMATION** Very stiff to hard, damp to moist, light gray-olive, very Silty CLAYSTONE; massive			
12					TRENCH TERMINATED AT 12 FEET			

Figure A-25,
Log of Trench T-15A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T-16A ELEV. (MSL.) 315' DATE COMPLETED 11-03-2004 EQUIPMENT JD 310 24" BY: G. COPENHAVER MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**LANDSLIDE DEBRIS (Younger)**			
2					Stiff, moist, medium to red-brown, very Clayey to Sandy GRAVEL; massive, disturbed appearing matrix, rotated cobbles			
4				GC				
6								
8					TRENCH TERMINATED AT 8 FEET			

Figure A-26,
Log of Trench T-16A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T-17A ELEV. (MSL.) 325' DATE COMPLETED 11-03-2004 EQUIPMENT JD 310 24" BY: G. COPENHAVER	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**LANDSLIDE DEBRIS (Younger)** Loose, moist, dark brown, Clayey, Gravelly, medium SAND: porous, roots			
2				GP	Very dense, damp, medium reddish brown, Sandy, coarse GRAVEL; cemented, horizontal imbricated cobbles (possible large block of older landslide debris)			
4								
6								
8					TRENCH TERMINATED AT 8 FEET			

Figure A-27,
Log of Trench T-17A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07254-42-02

TRENCH T-18A

ELEV. (MSL.) 310' DATE COMPLETED 11-03-2004

EQUIPMENT JD 310 24" BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**LANDSLIDE DEBRIS (Older)** Soft, moist, dark brown, Silty CLAY; topsoil layer			
2					Medium dense, damp, light olive-brown, Clayey SILT; "lateral spread" of Otay Formation with internal shears, rotated bedding attitude is N72E, 33NW; hairline shear at 4 feet attitude is N50E, 65SE, displaces a 4-inch thick sand bed over 2 feet			
4				ML				
6					TRENCH TERMINATED AT 7½ FEET			

Figure A-28,
Log of Trench T-18A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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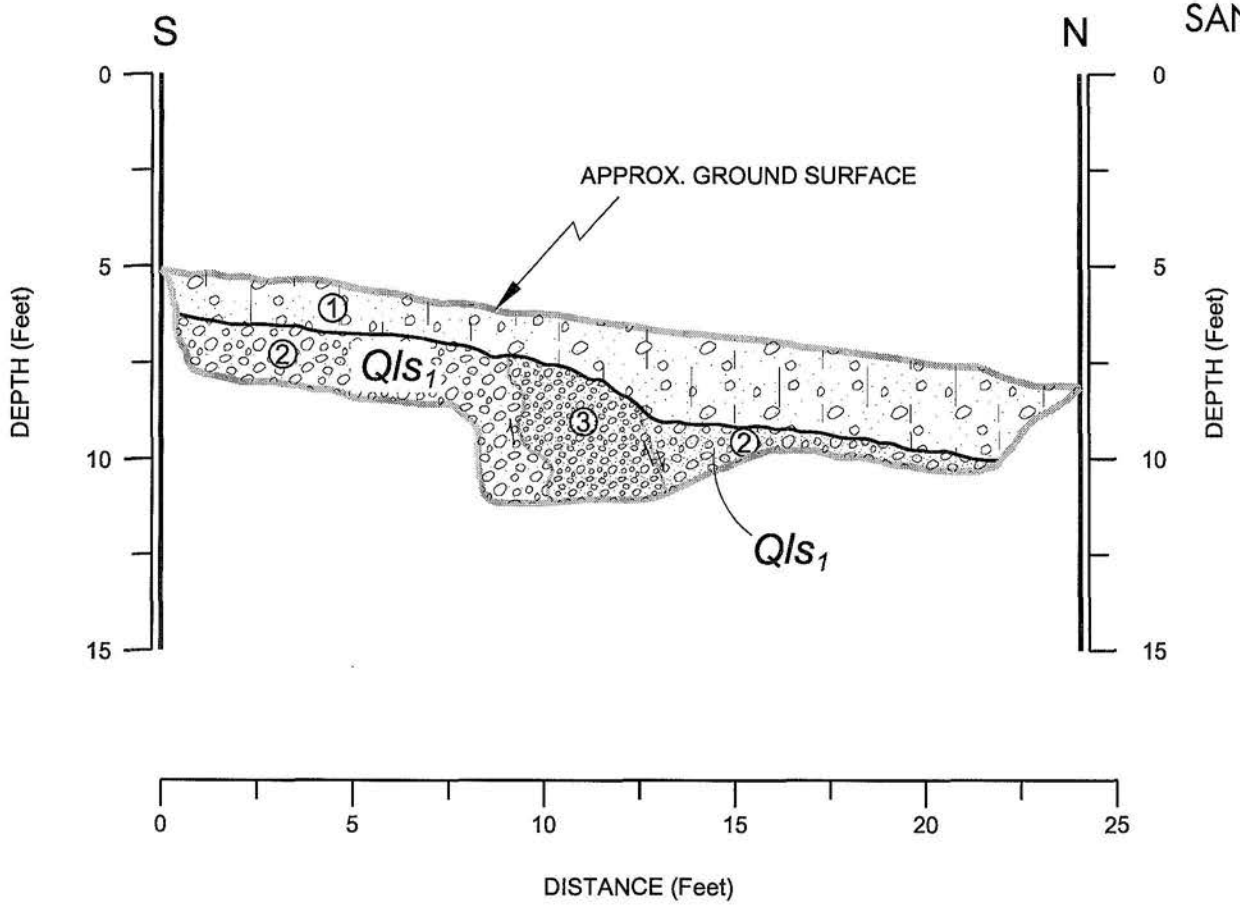
GEOCON

OTAY MESA COMMUNITY PLAN AMENDMENT
BEYER BOULEVARD EXTENSION
SAN DIEGO, CALIFORNIA



GEOCON LEGEND

① TOPSOIL
Loose, damp, dark brown, Gravely, Silty, fine SAND

② LANDSLIDE DEBRIS (Older) - (Qls_1)
Very dense, humid to dry, light reddish brown, cemented, Sandy, fine to medium GRAVEL

③ Internal Slide Fissure approx. 2 to 3 feet wide, filled with loose, very moist, grayish olive-brown, fine to medium (pebble), Sandy GRAVEL with some silt; clasts are disoriented, fissure trends approx. N40W, 70NE (very irregular walls) and separated two landslide (older) blocks

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GEOTECHNICAL CONSULTANTS
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PHONE 858 558-6900 - FAX 858 558-6159

PROJECT NO. 07254 - 42 - 02
FIGURE A-29
DATE 11-03 2004

TRENCH LOG T-19A

X:\07254-42-02\DJ\FIG_A-29_XSECTION.DWG

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T-20A ELEV. (MSL.) 365' DATE COMPLETED 11-04-2004 EQUIPMENT JD 310 24" BY: G. COPENHAVER MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2				SM-ML	**LANDSLIDE DEBRIS (Older)** Dense, damp, light gray-brown, very Silty, very fine SANDSTONE; with fine biotite, massive to contorted; possible "lateral spread" disconformity contact between a block of Sand Diego Formation and :flame structures" of bentonitic zone			
4								
6				CH	Very stiff, very moist, gray-olive, bentonitic CLAYSTONE; horizontal remolded clay seams			
8								
					TRENCH TERMINATED AT 8½ FEET			

Figure A-30,
Log of Trench T-20A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T-21A ELEV. (MSL.) 330' DATE COMPLETED 11-04-2004 EQUIPMENT JD 310 24" BY: G. COPENHAVER MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC-CL	**LANDSLIDE DEBRIS (Younger)** Stiff, moist, dark brown, very Sandy CLAY; porous			
2					Loose, moist, dark medium brown (mottled), Clayey to Sandy GRAVEL; cobbles with slightly inclined imbrication			
4				GC				
6					-Becomes reddish brown			
8					TRENCH TERMINATED AT 8 FEET (Refusal on boulder-cobbles)			

Figure A-31,
Log of Trench T-21A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T-22A ELEV. (MSL.) 310' DATE COMPLETED 11-04-2004 EQUIPMENT JD 310 24" BY: G. COPENHAVER	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				GC-CL	**LANDSLIDE DEBRIS (Younger)** Loose, damp, dark to medium brown (mottled), very Gravelly CLAY			
2				ML-CL	Medium dense, moist, medium to light olive-gray-brown, very Clayey SILT; bedding E to W, 23S and very weathered, fractured; possible rotated block of Older Landslide Debris			
4								
6					TRENCH TERMINATED AT 6 FEET			

Figure A-32,
Log of Trench T-22A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T-23A ELEV. (MSL.) 285' DATE COMPLETED 11-04-2004 EQUIPMENT JD 310 24" BY: G. COPENHAVER MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SP-GP	**LANDSLIDE DEBRIS (Older)** Loose, moist, light tan, Gravelly, coarse SAND; friable			
2				SC	Loose, moist, light brown to medium brown (mottled), Clayey, fine SAND			
4								
6				SM	Dense, moist, light gray-olive, Silty, fine SAND; mottled, fractured			
8					TRENCH TERMINATED AT 8½ FEET			

Figure A-33,
Log of Trench T-23A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T-24A ELEV. (MSL.) 320' DATE COMPLETED 01-19-2006 EQUIPMENT BY: G. COPENHAVER MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GM	**LANDSLIDE DEBRIS** Loose to medium dense, humid, medium reddish brown, Silty, Sandy, coarse GRAVEL; fractured weathered and landslide rotated block of Terrace Deposit Gravel (equivalent to LindaVista Formation)			
2								
4				ML-CL				
6								
8					-Contact N45E, 40SE (landslide-rotated) Stiff to medium dense, moist, medium olive brown, Clayey SILT to Silty CLAY; very fractured, weathered and porous with voids along fractures landslide-rotated block of Otay Formation			
10					TRENCH TERMINATED AT 10 FEET			

Figure A-34,
Log of Trench T-24A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◣ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T-25A ELEV. (MSL.) 260' DATE COMPLETED 01-19-2006 EQUIPMENT BY: G. COPENHAVER	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				GC	**LANDSLIDE DEBRIS** Loose, damp, dark olive brown, Clayey COBBLE with some silt, gravel; porous; represents secondary landslide (symbol Qls2 on map)			
2								
4				CL	Stiff, moist, medium dark brown, very Gravelly, Sandy CLAY; porous, with roots, burrows			
6								
8				CL	Soft to stiff, moist, medium reddish brown olive, Gravelly CLAY; may be weathered, fractured, disturbed claystone of Otay Formation (?)			
10					TRENCH TERMINATED AT 10 FEET			

Figure A-35,
Log of Trench T-25A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T-26A ELEV. (MSL.) 235' DATE COMPLETED 01-19-2006 EQUIPMENT _____ BY: G. COPENHAVER	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM-GM	**ALLUVIUM** Loose, damp, medium light brown, very Gravelly, Silty, coarse SAND; porous			
2								
4				ML	**OTAY FORMATION** Dense, damp to moist, medium light olive, Clayey SILTSTONE			
6					-Bedding N35W, 3NE (laminated, with calcium carbonate inclusions)			
8								
					TRENCH TERMINATED AT 9 FEET			

Figure A-36,
Log of Trench T-26A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T-27A ELEV. (MSL.) 250' DATE COMPLETED 01-19-2006 EQUIPMENT _____ BY: G. COPENHAVER MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GC	**LANDSLIDE DEBRIS** Soft to stiff, very moist, medium			
2								
4								
6					-Rotated gravelly, clay sand layer (incline approx. 25N); approximately 8 inch thick			
8								
10								
12								
14								
16								
18					-Undulating approximately S.-inclined bentonitic shear dipping approximately 5S approximately 2 inch thick (bentonite is not in-place)			
20				ML	**OTAY FORMATION** Dense, damp, light olive brown, Sandy SILTSTONE; massive to subhorizontal TRENCH TERMINATED AT 20 FEET			

Figure A-37,
Log of Trench T-27A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

TRENCH T-28A

ELEV. (MSL.) 310' DATE COMPLETED 01-19-2006

EQUIPMENT _____ BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
0				GP	**COLLUVIUM** Stiff, moist, dark brown, Gravelly			
2								
4								
6				SM	**OTAY FORMATION** Dense, damp, light brown to tan, very Silty, very fine SANDSTONE			
8	T28a-1							
10								
					TRENCH TERMINATED AT 11 FEET			

Figure A-38,
Log of Trench T-28A, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

BORING LB-1

ELEV. (MSL.) 492' DATE COMPLETED 08-23-2002

EQUIPMENT SOILMEC 108 TRUCK MT BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TERRACE DEPOSIT CLAY** Stiff, damp, dark brown, very Sandy CLAY			
4				SP	**TERRACE DEPOSIT GRAVEL** Medium dense, humid to damp, light reddish brown, Gravelly, coarse SAND, trace clay, silt, slight caving			
6	LB1-1							
10				SM-GM	Medium dense, moist, reddish brown, very Gravelly, Silty SAND, with some clay, subrounded to rounded, fine to medium size (1 inch to 6 inch diameter)			
12	LB1-2							

Figure A-39,
Log of Boring LB-1, Page 1 of 3

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

BORING LB-1

ELEV. (MSL.) 492' DATE COMPLETED 08-23-2002

EQUIPMENT SOILMEC 108 TRUCK MT BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30								
32								
34								
36				GM	Very dense, moist, light to medium red brown, Silty, Sandy, very coarse GRAVEL, 8 inch to 24 inch diameter clasts, trace clay			
38								
40	LB1-3				-12 inch clean sand layer; horizontal laminated bedding			
42								
44								
46								
48	LB1-4			GM-SM	Dense, moist, medium reddish brown, very Silty, Sandy, medium to coarse GRAVEL			
50								
52								
54								
56								
58								
				SM	-Sharp depositional contact at 58.5 feet N55E, 5NW with undulations dipping approximately 2 degrees to SW and NW **SAN DIEGO FORMATION**			

07254-42-02(RECENT).GPJ

Figure A-39,
Log of Boring LB-1, Page 2 of 3

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB-1** ELEV. (MSL.) **492'** DATE COMPLETED **08-23-2002** EQUIPMENT **SOILMEC 108 TRUCK MT** BY: **G. COPENHAVER**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
60	LB1-5				Dense, damp, light gray to yellow-brown, Silty, fine SANDSTONE with some friable (cohesionless when disturbed) sand layers -Horizontal to gently undulating laminated micaceous beds (interbedded sandy siltstone and sandstone with 1 inch to 3 inch thick alternating beds)			
62								
64								
66					BORING TERMINATED AT 66 FEET			

Figure A-39,
Log of Boring LB-1, Page 3 of 3

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

BORING LB-6

ELEV. (MSL.) 496' DATE COMPLETED 08-30-2002

EQUIPMENT SOILMEC 108 TRUCK MT BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TERRACE DEPOSIT CLAY** Stiff, moist, dark yellow brown, Sandy CLAY, with some fine gravel, massive			
8				SM	**TERRACE DEPOSIT GRAVEL** Medium dense to dense, damp, medium reddish brown, very Gravelly, Silty, medium to coarse SAND with trace clay			
12				GP-SP	Dense, damp, medium reddish brown, very Sandy coarse GRAVEL, with cobbles 6 to 8 inches, low cohesion (when disturbed), with some sloughing			
28				SP	Medium dense to dense, damp, light reddish brown, Gravelly coarse SAND			

Figure A-40,
Log of Boring LB-6, Page 1 of 3

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 07254-42-02

BORING LB-6

ELEV. (MSL.) 496' DATE COMPLETED 08-30-2002

EQUIPMENT SOILMEC 108 TRUCK MT BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30								
32					-Sloughing and non cohesive (when disturbed), crossbedded			
34	LB6-1							
36								
38				GM	Very dense, damp to moist, medium brown to reddish brown, Sandy, very coarse GRAVEL -Oversize cobbles 8 to 20 inches diameter in slightly silty coarse sand matrix, with trace clay			
40								
42								
44								
46								
48								
50								
52								
54								
56								
58								

Figure A-40,
Log of Boring LB-6, Page 2 of 3

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

BORING LB-6

ELEV. (MSL.) 496' DATE COMPLETED 08-30-2002

EQUIPMENT SOILMEC 108 TRUCK MT BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60								
62								
64								
66								
68								
70					Becomes Clayey to Silty, with fine to medium rounded conglomerate layers, horizontally imbricated -Approximately horizontal to undulating scour-deposition contact			
72	LB6-2 LB6-3			CL	**OTAY FORMATION** Hard, moist, light olive-gray, Silty CLAYSTONE; massive, blocky BORING TERMINATED AT 73 FEET		72.8	40.5

Figure A-40,
Log of Boring LB-6, Page 3 of 3

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07254-42-02

TRENCH T 3

ELEV. (MSL.) 490' DATE COMPLETED 08-22-2002

EQUIPMENT JD 510 RUBBER TIRE BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T3-1			CH	**TOPSOIL** Hard, dry, dark yellowish brown, CLAY, cracking, rootlets			
2				SC	**TERRACE DEPOSIT GRAVEL** Dense, dry to moist, dark yellowish orange, Clayey, well graded SAND with gravel, approximately 20% rounded cobbles and boulders up to 1 foot diameter; scattered caliche			
4								
6	T3-2							
8								
10					TRENCH TERMINATED AT 10 FEET			

Figure A-41,
Log of Trench T 3, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07254-42-02

TRENCH T 13

ELEV. (MSL.) 478' DATE COMPLETED 08-23-2002

EQUIPMENT JD 510 RUBBER TIRE BY: G. COPENHAVER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				SM	**TOPSOIL** Dense, dry, dark yellowish brown, Silty SAND, porous, soil cracking, roots			
2				SC	**TERRACE DEPOSIT GRAVEL** Dense, moist, moderate yellowish brown, Clayey SAND, scattered rounded gravel and cobbles less than 6 inches diameter			
4	T13-1							
6					TRENCH TERMINATED AT 6 FEET			

Figure A-42,
Log of Trench T 13, Page 1 of 1

07254-42-02(RECENT).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

DATE OBSERVED: 11-19-86 METHOD OF DRILLING: 30" Bucket Auger

LOGGED BY: RS GROUND ELEVATION: 249± LOCATION: See Geotechnical Map

BORING NO. 4

KELLY WEIGHT (lbs.) 4113

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	SOIL TEST
0	SM						OTAY FM (To): Light gray silty fine SANDSTONE, moist, dense, massive, slight caliche Contact: N55W/9E	
	CL						Red brown silty CLAYSTONE, moist, very stiff, massive, moderately fractured (½" spacing), slight green mottling, some caliche blebs, no slicks.	
5							@ 4' grades to green, less fractured (6" spacing), hard, no caliche	
	SM						@ 5'-6' silty fine sandstone bed, gradational contacts	
							@ 6½', 5" mottled red zone, moderately fractured, no slicks. Contact: gradational to interfingering	
10	ML	4					Light gray to brown silty fine SANDSTONE, moist, dense, massive with occasional faint, indistinct bedding, roughly horizontal. Contact: undulating, approximately N76E/0-5N	Expansion Index
15							Mottled red brown to green clayey SILTSTONE, moist, hard, somewhat fractured (1"-2" spacing) near contact, less fractured below, no slicks.	
							@ 11'-12' silty fine sandstone bed, gradational contacts	
							@ 12' moderately fractured (½"-2" spacing), cemented caliche nodules to 2", very stiff.	
20	ML	9					@ 15½' fault: slightly remolded, large slicks on surface oriented with dip N30W/55SW. Continues to 19'. 2' silty fine sand bed is offset approximately 1½' in this area, down to SW	Particle Size Analysis Atterberg Limits Remolded Direct Shear
	SM/ML						Contact: 1/8" remolded clay seam, approximately horizontal	
25							Light gray brown silty fine SANDSTONE/fine sandy SILTSTONE, moist, very dense, massive	@ 25' Kelly Weight becomes 2981 lbs.
							@ 22½', 2" brown clayey zone, gradational contacts, roughly horizontal	
30		10			18.8	108.6	@ 25', 2"-4" brown claystone bed, horizontal, some caliche @ 26' becomes light gray fine sandy SILTSTONE, bedding: undulating, roughly N68W/7S	
							@ 30½', 1" claystone bed, horizontal, hard	
35							@ 33' Bedding: horizontal, 1"-3" claystone, occasionally bentonitic, occasional slick surfaces, discontinuous. @ 33' becomes light gray brown silty fine SANDSTONE.	
							@ 35½', 4" brown claystone bed, gradational contacts, approximately horizontal	
40							@ 40' grades to medium gray fine sandy SILTSTONE	

JOB NO.: 05-6738-001-00-00

LOG OF BORING

FIGURE: B-8

DATE OBSERVED: 11-19-86 METHOD OF DRILLING: 30" Bucket Auger

LOGGED BY: RS GROUND ELEVATION: 249± LOCATION: See Geotechnical Map

BORING NO. 4

KELLY WEIGHT (lbs.) 2981

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	SOIL TEST
40	ML	12	◿		23.2	97.3	OTAY FM. (To): Medium gray fine sandy SILTSTONE, moist, hard, massive @ 42'-43' silty fine sandstone, horizontal @ 45' discontinuous cemented sandstone, 1"-2" thick	Particle Size Analysis Atterberg Limits Undisturbed Direct Shear
45	SM						Below 45' becomes light gray brown to yellow brown silty fine to medium SANDSTONE, very dense, massive, occasional cemented lenses, occasional dark angular grains - may be grading into Sweetwater Formation (Tsw).	@ 47' Kelly Weight becomes 2168 lbs.
50								
55								
60		20	◿		5.0	111.0		
							TOTAL DEPTH: 61' No Water No Caving Geologically Logged to 59' Backfilled 11-19-86	
65								
70								
75								
80								

JOB NO.: 05-6738-001-00-00

LOG OF BORING

FIGURE: B-9

DATE OBSERVED: 11-12-86 METHOD OF DRILLING: 30" Bucket Auger

LOGGED BY: RS GROUND ELEVATION: 276± LOCATION: See Geotechnical Map

BORING NO. 7

KELLY WEIGHT (lbs.) 4113

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	SOIL TEST
0	SM						OTAY FM: (To): Light gray silty fine SANDSTONE, moist, dense, massive	
5							@ 4'-6½' fault: N5E/78E, 18" thick roughly horizontal (gradational, undulating) clay bed is offset 12", down to E, clay is very stiff to hard, highly to slightly fractured.	
							@ 6½'-10', 1/16" to 1/4" clay filled fractures in sandstone, at 1' spacing around hole. Undulating, steeply dipping, N60E/75NW, N48E/77SE, N5E/Vertical. May be continuation of fault above.	
10	CH	4	⊠	⊠	32.6	89.4	@ 10', 6"-12" clay bed N10W/13W, offset 8" by fracture N35E/70SE, down to SE. Olive brown clay, moist, stiff, with abundant slicks, caliche blebs, somewhat remolded	Expansion Index Particle Size Analysis Atterberg Limits
				⊠			@ 10'-13' shear zone, intermixed sandstone lenses (to 12" thick) and slightly remolded, highly fractured, slicked, claystone stringers to 3" thick: N15W/50E, N10W/57E, N35W/77E	Expansion Index Atterberg Limits Remolded Direct Shear
15	ML/SM						@ 13'-13½' pink bentonitic clay, remolded at bottom contact.	
							Contact: slightly undulating, N63W/5SW	
20		7	⊠		17.4	109.5	Light gray fine sandy SILTSTONE/silty SANDSTONE, damp, very dense, massive	Sulfate, pH
							@ 16½', 1" clayey siltstone bed, hard, unfractured, N7W/7E	
25							@ 21½', 6" brown claystone bed, hard, unfractured, horizontal	@ 25' Kelly Weight becomes 2981 lbs.
30		10/11"	⊠		11.8	118.3	@ 30', 6" clayey siltstone bed, hard to cemented, N-S/5E.	
							@ 33' grades to silty fine SANDSTONE	
35								
40								

JOB NO.: 05-6738-001-00-00

LOG OF BORING

FIGURE: B-14

DATE OBSERVED: 11-21-86 METHOD OF DRILLING: 30" Bucket Auger

LOGGED BY: RS GROUND ELEVATION: 276± LOCATION: See Geotechnical Map

BORING NO. 7

KELLY WEIGHT (lbs.) 2981

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	SOIL TEST
40	SM	15/10"	◿		5.0	105.1	OTAY FM. (Ts): Light gray silty fine SANDSTONE, damp, very dense, massive	
45							Contact: Gradational	
	ML						Medium gray brown clayey SILTSTONE, damp, hard, massive, unfractured	@ 47' Kelly Weight becomes 2168 lbs.
50		20/10"	◿				Contact: Gradational	
	SM						Light gray brown silty fine SANDSTONE, damp, very dense, massive	
55							Contact: Undulating, approximately horizontal	
	ML						Medium gray brown clayey SILTSTONE, damp, hard, massive unfractured.	
60				☒				
							TOTAL DEPTH: 61'	
							No Water	
							No Caving	
65							Geologically logged to 60'	
							Backfilled 11-21-86	
70								
75								
80								

JOB NO.: 05-6738-001-00-00

LOG OF BORING

FIGURE: B-15

DATE OBSERVED: 1-2-87 METHOD OF DRILLING: 30" Bucket Auger

LOGGED BY: RS GROUND ELEVATION: 253 ± LOCATION: See Geotechnical Map

BORING NO. 12

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	SOIL TEST
0	ML						OTAY FM. (to): Light gray brown fine sandy SILTSTONE, damp, hard, massive. @ 2' brown clayey siltstone, 3" thick, N27W/5W @ 2.5' brown clayey siltstone lens, approximately horizontal	
5							@ 5.5' grades to gray brown SILTSTONE, with slight clay, hard, massive, some micaceous grains	
							@ 8' red stain 1/8"-1/2" thick, approximately horizontal, occasional slicked surfaces just above this @ 8'-8.5' slight red mottling	
10	SM						Gradational contact Light gray brown silty fine SANDSTONE, damp, very dense, massive.	
							@ 11', 1" claystone bed, hard, unfractured, N70E/6S	
15							@ 14', 6" claystone bed, hard, unfractured, top contact: N45W/8SW. Bottom contact: E-W/8S	
							@ 16.5', 6" siltstone bed, N30W/0-2W	
20								
25								
30							Contact: horizontal	
	ML						Gray brown clayey SILTSONE, damp, hard, massive.	
35							Contact: approximately horizontal, offset 3" by fault/fracture N50W/62 SW, down to SW	
	SM						Light gray brown silty fine SANDSTONE, damp, very dense, massive	
40							@ 37.5', 2" siltstone bed, approximately horizontal, offset 3" by same fault/fracture as above - N50W/62SW, down to SW	

JOB NO.: 05-6738-001-00-00

LOG OF BORING

FIGURE: B-23

DATE OBSERVED: 1-2-87 METHOD OF DRILLING: 30" Bucket Auger

LOGGED BY: RS GROUND ELEVATION: 253 ± LOCATION: See Geotechnical Map

BORING NO. 12

DESCRIPTION

KELLY WEIGHT (lbs.) _____

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	SOIL TEST
40	SM						OTAY FM. (To): Light gray brown silty fine SANDSTONE, damp, very dense, massive @ 41', 3" claystone bed, hard, unfractured, horizontal Gradational contact	
	ML						Gray brown clayey SILTSTONE, damp, hard, massive @ 47', 1/8'-1/2' clay bed, hard, horizontal 2" clay bed @ contact, horizontal, slightly bentonitic, hard, unfractured.	
45								
50	SM						Light gray brown silty fine SANDSTONE, damp, very dense, massive @ 51.5'-52.5', siltstone bed, hard, horizontal	
55								
60							TOTAL DEPTH: 57' No Water No Caving Geologically logged to 55' Backfilled 1-2-87	
65								
70								
75								
80								

JOB NO.: 05-6738-001-00-00

LOG OF BORING

FIGURE: B-24

DATE OBSERVED: 1-2-87 METHOD OF DRILLING: 30" Bucket Auger

LOGGED BY: RS GROUND ELEVATION: 264 ± LOCATION: See Geotechnical Map

BORING NO. 13

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION KELLY WEIGHT (lbs.) _____	SOIL TEST
0	SM						OTAY FM. (To): Light gray brown silty fine SANDSTONE, damp, dense, massive @ 0'-3' caliche filled fracture, 1/2' thick, N28E/70NW. Irregular contact, partly offset by fracture/fault above.	
	ML						Gray brown fine sandy SILTSTONE, damp, hard, massive, occasionally fractured @ 6"-12" spacing, some clay @ 6', 1" claystone bed, hard, unfractured, horizontal @ 7'-8' claystone, hard, somewhat fractured (6" spacing) horizontal Undulating contact	
10	SM						Light gray brown silty fine SANDSTONE, damp, very dense, massive.	
20							TOTAL DEPTH: 19' No Water No Caving Geologically logged to 17' Backfilled 1-2-86	
25								
30								
35								
40								

JOB NO.: 05-6738-001-00-00

LOG OF BORING

FIGURE: B-25

BORING SUMMARY SHEET

Boring No 19 Elevation ___

DEPTH IN FEET	SAMPLE NO		DRY DENSITY lbs/cu ft	IN PLACE MOISTURE, % of dry weight	SHEAR RESISTANCE kips/sq ft	DRIVE ENERGY ft kips/ft	% settlement(-) % swell (+)
0		Hard, damp, brown & red-brown, siltstone & claystone (ML-CL)					
5							
10		Dense, damp, light green-brown, fine sand (SP)					
15							
20							
25		Dense, damp, pink-gray, fine sand (SP) Slip plane in bentonite-N45W,4°S					
		Hard, damp, green, very sandy claystone (CL)					
30		Dense, damp, light green-gray, clayey sandstone (SC)					
35							
40		Dense, damp, green-brown, sandstone (SW) Bottom of Hole					

LEGEND

(1) Undisturbed Sample

(◎) Disturbed Sample

Water Table

(SM) Unified Soil Classification

Job No. 74-4180
Figure No. III

BORING SUMMARY SHEET

Boring No 20 Elevation —

DEPTH IN FEET	SAMPLE NO.		DRY DENSITY lbs/cu ft	IN PLACE MOISTURE, % of dry weight	SHEAR RESISTANCE kips/sq ft	DRIVE ENERGY ft kips/ft	% settlement(-) % swell (+)
		Very hard, damp, dark brown, claystone (CL)					
5							
10		Dense, damp, green-brown, silty fine sand (SP)					
15							
20							
25		Hard, damp, brown, claystone (CL)					
30							
35		Very dense, damp, green-brown, fine sand (SP)					
40							
45							
50		Dense, damp, light brown; silty fine sand (SP)					
55							
		← Slip Plane- 6" shear zone N65E,13S					
60							
65		Dense, damp, green-brown, sandy claystone (CL)					
70							
75							
80		Dense, damp, light brown, silty fine sand (SP)					
		← Shear Zone-2' thick -- remolded clay					

LEGEND

(1) Undisturbed Sample

(◎) Disturbed Sample

Water Table

(SM) Unified Soil Classification

Job No. 74-4180
Figure No. V

APPENDIX C

APPENDIX C

LOGS OF BORINGS FROM GEOCON'S MAY 2001 REPORT FOR INTERMODAL TRANSPORTATION CENTER

FOR

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

PROJECT NO. 06847-42-03

PROJECT NO. 06637-32-01

BORING LB 1

ELEV. (MSL.) ~85 DATE COMPLETED 2/6/01

EQUIPMENT ROTARY BUCKET 30"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					A.C. PAVEMENT (1.5 to 2 inch thick)			
2	LB1-1			SC	**FILL** Loose, damp, dark gray-brown, Clayey medium SAND			
4				SC	**TERRACE DEPOSIT (UNDISTURBED)** Medium dense, moist, reddish to yellow-brown, Gravelly, Clayey, medium to coarse SAND with slight Ca films -Angular to subangular gravel with mudflow texture			
6								
8				CL	Soft to stiff, very moist, brown, Gravelly, Sandy CLAY -More Ca films			
10								
12					-More light brown, laminate (mixed) -Basal fine gravel, with Ca films, charcoal specks; irregularly horizontal (depositional contact)			
14				SM	**LANDSLIDE DEBRIS (DISPLACED OTAY FORMATION)** Loose, damp, light (mottled) brown to light olive, Silty fine SAND, some clay			
16	LB1-2							
18					-Irregular Silty bentonitic clay layer 6" to 8" thick (flame structure?) at 18.5 feet			
20				ML	-Irregular, weathered transition inclined 20 degrees to S. (disturbed and brecciated texture) with scattered fine gravel with Ca films			
22	LB1-3				1" thick breccia zone at 19 feet Medium dense, damp to moist, medium olive-brown, Sandy SILT -Disturbed, with angular hard chunks (of Otay Formation) -Remolded slickensided layer N5E, 20E (with slicks striking N60E) -N10E, 30-35 SE (rotated bedding contact)			
24					Medium dense, damp to moist, light brown, Silty fine SAND			
26	LB1-4			SM	-Multiple intersecting fractures 1" to 2" apart with 1/16" to 1/8" voids			
28					-Joints N20W, 75SW, 6" to 12" apart with 1/4" to 1/2" voids, (2" to 3" voids where intersecting) -Cemented layer (4" to 5") very irregular, disturbed			

Figure A-1, Log of Boring-LB 1

ITC

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06637-32-01

BORING LB 1

ELEV. (MSL.) ~85 DATE COMPLETED 2/6/01

EQUIPMENT ROTARY BUCKET 30"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30					-Irregular tension crx. N60E, 75-80NW; 1/4" to 1/2" wide voids -Fractures 6" to 12" apart, N25W, 75SW, with 1/16" to 1/8" voids			
32				SM	Very dense, damp to moist, medium brown to light brown, Sandy SILTSTONE -Chunky, massive			
34	LB1-5				-Fracture N25W, 75SW (1/32" to 1/16" wide voids) -Fracture N67E, 87SW (seepage)			
36					-Bedding N60E, 5SE			
	LB1-6		▼		Hard, moist, light brown to pink, bentonitic clay layers 1/2" to 1" thick			
38				CL-CH	Very dense, damp, medium to light olive-brown, Sandy SILTSTONE -Trace clay, massive			
40				ML	-Fracture, N60W, 85SE with seepage; fractures appear to be recent, tenional, with voids			
42								
44					-Groundwater rose 5' in <1/2 hour -Very strong seepage from tension - fractures with streams of water to center of boring, difficult drilling			
46								
48								
50					BORING TERMINATED AT 50 FEET (PRACTICAL REFUSAL) GROUNDWATER AT 37.5 FEET			

Figure A-2, Log of Boring-LB 1

ITC

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06637-32-01

BORING SB 1

ELEV. (MSL.) ~89 DATE COMPLETED 2/12/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC-CL	Approximately 2 inches A.C. pavement			
2					**FILL** Loose, moist, dark brown, very Clayey medium SAND			
4				CL-GC	**TERRACE DEPOSIT (UNDISTURBED)** Soft to stiff, very moist, yellow to reddish-brown, Gravelly CLAY/Clayey GRAVEL			
6					Stiff, very moist, yellow to reddish-brown, Sandy CLAY, with scattered, fine gravel			
8				CL				
10								
12								
14					Medium dense, damp, light to medium reddish-brown, Silty, fine to medium SAND, with trace clay, fine gravel			
16								
18				SM	-With Ca sulfate nodules (white), veinlets			
20					-Fine (1" to 2") gravel layer (approximately horizontal?); massive, no fractures or clayseams			
22					Cemented (or cobble) layer at approximately 21 to 22 feet			
24				SM	**LANDSLIDE DEBRIS (DISPLACED OTAY FORMATION)** Medium dense, damp, light brown, Silty fine SAND, chunky			
26					Medium dense, damp, reddish-brown, Silty fine SAND			
28				SM	-Cemented (or cobble) layers at 27 to 29 feet+-, (no sample recovery)			

Figure A-3, Log of Boring-SB 1

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06637-32-01

BORING SB 1

ELEV. (MSL.) ~89 DATE COMPLETED 2/12/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30					-Cemented layer(s), no sample recovery; disturbed, fractured mixture of cemented SAN DIEGO FORMATION and Silty fine SANDS			
32				SM				
34								
36					-3" bentonitic Silty CLAYSTONE (dipping S at 35-45 degrees) at 36 feet			
38					Becomes very moist and brown, Silty fine SAND at 36.3 feet -Very fractured, disturbed Otay Formation -Bedding is dipping 25-35 degrees S.			
40								
42				SM	Becomes light olive-brown and mottled at 42 feet -Disturbed, very fractured otay ss.			
44								
46					-Bedding dipping WSW at 20 to 25 degrees at 47 feet Hard, very moist, light olive, Clayey SILT/Silty CLAY (Disturbed Otay Formation siltstone)			
48				ML-CL				
50					-Shear, approximately, N-S, 70-80 degrees E, slickensides, etc. with loose, saturated light olive, Silty fine SAND			
52					Medium dense, wet to saturated, light gray-brown, Silty fine SAND -Massive and ~horizontal bedding			
54			▼	SM				
56					-8" very Clayey silt layer (approx. horizontal) at 56 feet			
58				SM-ML	-Becomes saturated at 54 feet --~E-W, 60-70 degrees S. fracture (with voids) - massive and horizontal bedding			

Figure A-4, Log of Boring-SB 1

ITC

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06637-32-01

BORING SB 1

ELEV. (MSL.) ~89 DATE COMPLETED 2/12/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60								
				ML-CL	Loose, wet, medium to light olive, Clayey SILT; brecciated texture			
62				CL	Stiff to hard, very moist olive-brown, Silty CLAY; disturbed Otay Formation			
64					-Laminations dip 20-30 degrees N.			
				CL-SC	Loose, wet, olive-brown, Silty CLAY, becoming Clayey fine SAND			
					-Brecciated texture			
66					Dense, wet, olive-brown, Clayey SILT; near horizontal laminations to massive, some fractures;			
68								
				ML				
70								
					-6" layer of bentonitic silt, not remolded			
72					-Fracture dips approximately 70 degrees N.			
74					-Bedding dip 60-70 degrees N. (disturbed)			
				SM	Medium dense, saturated, gray-olive, Silty fine SAND; massive, fractured			
76								
				ML-CL	-6" layer of hard, very moist, light red-brown, Clayey bentonitic SILT; dipping 10-20 degrees W.			
78				SM	Medium dense, saturated, gray-olive, Silty fine SAND; massive to horizontal			
80								
82								
84					-Irregular, low-angle contact			
86					**BASAL SHEAR ZONE** Stiff, very moist to wet, light brown-pink (mottled) bentonitic CLAY, with some silt			
				CL-CH	-Remolded zone ~2-6" thick at 87.5 feet, varying from horizontal to 20 degrees S., are raging 5-10 degrees S.			
88					-Bedding dips from 10-20 degrees W.			
					-Bedding ~10-20 degrees W.			

Figure A-5, Log of Boring-SB 1

ITC

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06637-32-01

BORING SB 1

ELEV. (MSL.) ~89 DATE COMPLETED 2/12/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
90								
				ML-CL	-Very fractured, no recovery			
92					Very stiff, very moist, olive to brown (mottled) laminated Silty CLAY; bentonitic			
94	SB1-1				-Bedding in bentonitic clay is dipping 20-25 degrees S. (disturbed and rotated)			
	SB1-2			CH	-3" remolded zone, approximately horizontal at 94.7-94.9 feet; bentonitic, with minor seams dipping 5-10 degrees S.			
96					**OTAY FORMATION**			
				CL-ML	Hard, very moist, dark olive-brown, Silty CLAYSTONE; horizontally laminated			
98								
100					BORING TERMINATED AT 100 FEET GROUNDWATER AT 54 FEET			

Figure A-6, Log of Boring-SB 1

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06637-32-01

BORING SB 2

ELEV. (MSL.) ~78 DATE COMPLETED 2/13/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
					FILL Loose, moist, dark brown, Clayey medium SAND			
2					**TERRACE DEPOSIT (UNDISTURBED)** Medium dense, moist, yellow-red brown, Gravelly, Sandy CLAY -Massive; approximately horizontally shingled gravel layers			
4								
6				CL-GC				
8								
10								
12								
14								
16				SM	Medium dense, damp, light brown to reddish-brown, Silty fine SAND			
					-2-3" clean coarse SAND			
18				SP	-Horizontal thin layers			
20					-Large cobbles (sample lost)			
22					**LANDSLIDE DEBRIS (DISPLACED OTAY FORMATION)** Medium dense, moist to very moist, light brown-olive, Silty, very fine SAND -Fractured, disturbed, otay formation			
24								
26				SM-ML	-Joint/fracture, 68-70 degrees S.			
28					-Bedding approximately horizontal			

Figure A-7, Log of Boring-SB 2

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06637-32-01

BORING SB 2

ELEV. (MSL.) ~78 DATE COMPLETED 2/13/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30				ML	-Becomes Sandy SILT, micaceous laminations			
32								
34					-Bedding dipping 20 degrees+- NW			
36				ML-CH	Very stiff to hard, very moist, brown to light red-brown, bentonitic SILT, fractured, disturbed, no remolded seams			
38								
40				SM	Dense, moist, light olive-brown, Silty fine SAND; massive to horizontal layers, some clayey zones			
42								
44					-CaCO3 moderately cemented layer			
46								
48			▼		-Becomes more fractured, saturated 3-4" thick			
50								
52					-Contact dips 20-30 degrees N. (rotated bedding)			
				CL	Very stiff to hard, very moist, reddish-brown to brown, bentonitic Silty CLAYSTONE			
54				SM	Dense, very moist, light gray-brown (olive), Silty, very fine SAND; massive			
56								
58					-Shear dipping ~45-55 degrees NW; 1/4" brown clay gouge; cuts another shear dipping steeply S.			

Figure A-8, Log of Boring-SB 2

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06637-32-01

BORING SB 2

ELEV. (MSL.) ~78 DATE COMPLETED 2/13/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60								
62								
64				SM				
66								
68					-Intense, innumerable hairline fractures (N+S+W+E dipping) 1/8'-6" apart over zone between 67-70 feet			
70					-Fractures become low-angle (<20 degrees)			
72				CH	**BASAL SHEAR ZONE** -1-2"remolded bentonitic clayseam dipping 15-20 degrees SE; irregular, very disturbed sheared contact with possible flame structure and undulating surfaces			
74				SC	Stiff, very moist, olive to brown, bentonitic CLAY -1"-3" remolded bentonitic clayseam dipping 5-20 at 72.5 feet			
76				CH	Clayey Silty SAND layer (disturbed, fractured) Stiff, very moist, chocolate brown mottled with pink brecciated bentonite CLAY Remolded clayseam (1/4-1/2") dipping 40-45 degrees S. at 77 feet			
78				CH	Stiff, very moist, brown to light brown (mottled), intensely micro-sheared Silty bentonite CLAY; melange structure -Remolded clayseams approximately 1" thick dipping ~5-10 degrees N. (undulating) -Remolded clayseam ~1/2" thick dipping ~40 degrees W.			
80								
82				CL-ML	**OTAY FORMATION** -Fracture dipping 50-60 degrees SW with slickens, hairline clay -Fracture dipping 50-60 degrees NE (in horizontally bedded claystone)			
84				ML	Very hard, very moist, olive-brown, very Silty CLAYSTONE -Horizontally laminated, undisturbed appearance			
					Very dense, damp, light brown with white mottling, Clayey SILTSTONE; moderate calcium cementation			
					BORING TERMINATED AT 85 FEET			

Figure A-9, Log of Boring-SB 2

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06637-32-01

BORING SB 3

ELEV. (MSL.) ~98 DATE COMPLETED 3/13/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**FILL** Loose, very moist, dark brown, very Sandy, Gravelly CLAY; porous			
2								
4				GC	**ALLUVIUM** Loose to medium dense, very moist, dark brown, Clayey coarse GRAVEL			
6					-Becomes very gravelly (>8" diameter boulders)			
8								
10					-Irregular transition 10-12 feet			
12				GC-SC	**LANDSLIDE DEBRIS (DISPLACED TERRACE DEPOSITS)** Medium dense, very moist, dark reddish-brown, very Gravelly to Sandy CLAY			
14								
16					-Irregular transition 16-18 feet			
18				CL	**LANDSLIDE DEBRIS (DISPLACED OTAY FORMATION)** Stiff to moist, medium olive-gray, very Silty CLAY -Weathered zone			
20								
22								
24				CL-SC	Medium dense, moist, light to medium olive-gray, very fine Sandy CLAY, fine clay, sand -With some silt; derived from Otay Formation			
26								
28								

Figure A-10, Log of Boring-SB 3

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06637-32-01

BORING SB 3

ELEV. (MSL.) ~98 DATE COMPLETED 3/13/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30				SM	Medium dense, moist, light to medium olive-gray, Silty fine SAND			
32					-6 inch layer of bentonitic Silty CLAY contacts dipping 30 degrees S at 33.5 feet; very fractured			
34								
36								
38				CL	Hard, moist, olive-brown, Silty CLAY;			
40					-Laminated bedding is horizontal or low-dipping (<5 degrees)			
42					Remolded clayseam approximately 1.5" to 1" thick at 40.1 feet; undulating-horizontal-hard, moist, chocolate brown, bentonitic Silty CLAY			
44				CL-CH	Dense, very moist, light gray-olive, laminated, Silty fine SAND -Lamination area nearly horizontal, W/5 - 10 degrees S. variable dips			
46			▼		-Lost core (fracturing?) -Groundwater?			
48					-Thin, approximately horizontal clay stringers over 6" thick zone -Becomes saturated, very fine Silty SAND			
50					-Bedding is approximately horizontal, with some layers dipping E. approximately 5-10 degrees			
52				ML	Hard, very moist, olive-brown, Clayey SILT -Laminated approximately horizontal to 5-10 degrees E.			
54					-Steep N and S dipping fractures (50-60 degrees)			
56				ML-GL	-Becomes more clayey; approximately horizontal laminae			
58								
				SM				

Figure A-11, Log of Boring-SB 3

ITC

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06637-32-01

BORING SB 3

ELEV. (MSL.) ~98 DATE COMPLETED 3/13/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60				SM	Dense, wet, light olive-gray, Silty fine SAND -Lost sample (clean sand, or fractures?) Loose, saturated, medium olive-gray, Silty fine SAND -With undulating (flame structure?) thin, soft clay layers			
62								
64				ML	Hard, damp, light to medium olive, Sandy SILT			
66				SM	-Lost sample (clean sand?; fractures?) loose to medium dense, wet, light olive, Silty to fine SAND; vaguely laminated, dipping 40-50 degrees N.			
68								
70				SC-CH	Soft to loose, wet to saturated, light olive, very Clayey fine SAND; bentonitic			
72				SM-ML	Medium dense, wet, light olive, very Silty, very fine SAND			
74					-Approximately horizontal contact (undulating)			
76				ML-CL	**BASAL SHEAR ZONE** Medium dense, damp, brown (mottled with olive) brecciated Clayey SILT -Angular chunks of claystone in clayey matrix			
78				SC-CL	Loose, wet, olive-gray, very fractured ("melange") zone of clayey fine sand; with multi-fracture intersections with steep and low-angle dips -1-2" remolded clayseam; approximately horizontal (undulatory)			
80				CH	Stiff, very moist, brown-olive (mottled) remolded zone (mostly horizontal or low-angle undulatory) Soft to stiff, very moist, brown mottled with olive, brecciated bentonitic CLAY -Angular chunks of bentonite claystone in clay matrix, with innumerable intersecting steep to low-angle fractures			
82								
84					-1" remolded clayseam; undulatory, dipping ~10 degrees N. at 84.6 feet			
86				CH	1/4-1/2" remolded clayseam; dipping 5-10 degrees SE at 86.3 feet Soft, very moist, chocolate brown mottled with olive, brecciated bentonitic CLAY; 1/2-1" remolded clayseam dipping 10-50 degrees S. (flame structure? or undulation)			
88				ML	Medium dense, wet, light olive to brown, Sandy SILT with laminae dipping steeply S.			
				CL-CH				

Figure A-12, Log of Boring-SB 3

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◪ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06637-32-01

BORING SB 3

ELEV. (MSL.) ~98 DATE COMPLETED 3/13/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
90					-Irregular N. dipping contact			
				CL	Soft, very moist to wet, olive-brown (mottled), brecciated CLAYSTONE			
92					Hard, moist, olive-gray, Clayey SILT			
94				CL-ML	Loose, very moist, brown, olive (mottled) brecciated CLAYSTONE -Remolded clayseam/shear ~2" thick, dipping ~45 degrees N-NW at 92 feet -Thin bedding-plane shears, horizontal at 92.5 feet			
96					**OTAY FORMATION** Hard, moist, medium to dark olive-brown, very Silty CLAYSTONE			
98				ML	Dense, damp to moist, light to medium olive-brown, SILTSTONE -Horizontally laminated, some very fine sand -Very dense cemented siltstone layer ~2" thick, horizontal			
100					Dense to very dense, moist, medium dark olive-brown, SILTSTONE; with some clay; horizontally laminated			
102				ML				
104								
					BORING TERMINATED AT 105 FEET			

Figure A-13, Log of Boring-SB 3

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◪ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06637-32-01

BORING SB 4

ELEV. (MSL.) ~101 DATE COMPLETED 3/14/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2				SC	**ALLUVIUM** Loose, moist, dark brown, very Gravelly, Clayey fine SAND; porous			
4								
6					**LANDSLIDE DEBRIS (DISPLACED TERRACE DEPOSITS)** Medium dense, moist, yellow-brown, very Clayey, fine to medium SAND, with some scattered fine gravel			
8								
10								
12				SC				
14								
16								
18								
20								
22					Dense, moist, medium yellow-brown, Clayey to Sandy coarse GRAVEL			
24								
26				GC				
28								

Figure A-14, Log of Boring-SB 4

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06637-32-01

BORING SB 4

ELEV. (MSL.) ~101 DATE COMPLETED 3/14/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30				GC				
32								
34								
36					-Irregular transition 36-37			
38				SM	Medium dense, moist, light brown Silty fine SAND			
40				SP	Loose to medium dense, moist, light reddish-yellow brown, medium to coarse SAND -Friable, non cohesive, trace silt			
42								
44								
46				GM	Dense, moist, medium red-brown, Sandy, Clayey coarse GRAVEL -Clasts >8 inches			
48								
50				SC-CL	Medium dense, wet to saturated, reddish-brown, very Gravelly, Clayey fine SAND			
52			▼		-Groundwater (after 14 hrs.)			
54								
56				SC-CL	**LANDSLIDE DEBRIS (DISPLACED OTAY FORMATION)** Soft to stiff, wet, light olive (mottled) Clayey, very fine SAND to Silty CLAY -Derived from Otay Formation			
58								

Figure A-15, Log of Boring-SB 4

ITC

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◪ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06637-32-01

BORING SB 4

ELEV. (MSL.) ~101 DATE COMPLETED 3/14/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60								
62								
64								
66				SC-CL				
68								
					-Hard layer of bentonitic CLAY at 69 feet dipping ENE 5-15 degrees			
70					Medium dense, very moist, light brown-olive, Silty, very fine SAND			
72								
74				SM	-Clayseam dipping 70-80 degrees WSW			
76								
78								
80					-Bedding dipping E. 10 degrees+-			
82				SP	Loose, saturated, light brown, olive, fine SAND			
84				SM	-2" cemented SILTSTONE layer (fractured) Medium dense, wet, light brown, Silty fine SAND -Bedding is approximately horizontal			
86				SP	Loose, saturated, light brown-olive, fine SAND -Massive, cohesionless			
88								

Figure A-16, Log of Boring-SB 4

ITC

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◣ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06637-32-01

BORING SB 4

ELEV. (MSL.) ~101 DATE COMPLETED 3/14/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
90				CH	Stiff, wet, medium dense, olive-brown, Silty CLAY; bentonitic?, with angular chunks of ss (breccia); approximately horizontal			
				SP	Loose, saturated, olive brown, fine SAND; cohesionless			
92				CL-CH	Horizontal clayseam 1/4" thick at 90.3 feet			
					-2" very dense, brown, cemented SILT			
94					Very stiff, wet, brown (chocolate) bentonitic CLAY; very fractured -Shear remolded layer dipping ENE 30 degrees+- at base of clay			
				SM-ML	-Shear, remolded layer 1/4-1/2" thick dipping WSW 45-50 degrees -Shear-remolded layer 1" thick dipping approximately 5-10 degrees N.			
96				SP	Medium dense, wet, light brown, Silty, very fine SAND			
98					Loose, saturated, fine SAND			
				SM	Medium dense, wet, light brown, Silty, very fine SAND			
100				SP	Loose, saturated, fine SAND			
102					Medium dense, wet, light brown, slightly Silty, very fine SAND -Horizontally laminated			
104								
				SM				
106								
108								
110					-1-2" cemented ss. layer with horizontal laminae			
				SM	**BASAL SHEAR ZONE**			
112				CL	Loose to medium dense, very moist, Silty fine SAND, gray-brown-olive (mottled), fractured, (brecciated)			
					Stiff, very moist, medium gray-olive, very Silty CLAY (micaceous) with numerous hairline crx			
114				CL-CH	-Remolded thin clayseams (~1" zone) dipping 5-10 degrees S. at 113 feet			
				CL	Very stiff, very moist, brown, mottled, breccia-CLAY with angular ss. clasts			
116					Stiff, very moist to wet, olive to gray-brown, contorted and sheared ("melange") structure; typically low-angle to horizontal shearing			
118				CH	-Bentonite top is dipping 20-30 degrees S. irregularly low-angle to horizontal shearing			
				CL				

Figure A-17, Log of Boring-SB 4

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06637-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING SB 4** ELEV. (MSL.) ~101 DATE COMPLETED 3/14/01 EQUIPMENT CME 55 8"	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
120					-Bentonite-base is horizontal Stiff, wet, light pink-white, brecciated bentonite CLAY **OTAY FORMATION** Very hard, very moist, dark brown-olive, Silty CLAYSTONE, with interbedded cemented siltstone layers; horizontally bedded BORING TERMINATED AT 120.2 FEET			

Figure A-18, Log of Boring-SB 4

ITC

SAMPLE SYMBOLS: ☐ ... SAMPLING UNSUCCESSFUL; ◧ ... STANDARD PENETRATION TEST; ■ ... DRIVE SAMPLE (UNDISTURBED); ▨ ... DISTURBED OR BAG SAMPLE; ◣ ... CHUNK SAMPLE; ⏚ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06637-32-01

BORING SB 5

ELEV. (MSL.) 108 DATE COMPLETED 3/22/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**LANDSLIDE DEBRIS (DISPLACED TERRACE DEPOSIT)** Medium to dense, moist, dark red-brown, Clayey, Sandy coarse GRAVEL, with some silt			
2								
4								
6				GC				
8								
10					Medium dense, moist, reddish-brown, very Gravelly to Clayey fine SAND			
12				SC				
14								
16					Dense, moist, reddish-brown, Clayey to Sandy coarse GRAVEL			
18				GC	-Refusal on large rock (offset approx. 5' SE with no success)			
					BORING TERMINATED AT 19 FEET			

Figure A-19, Log of Boring-SB 5

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06637-32-01

BORING SB 6

ELEV. (MSL.) 99 DATE COMPLETED 3/22/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2				SC	**FILL** Loose, moist, light olive-brown (mottled), Clayey fine SAND			
4					-Gravelly layer			
6								
8					**LANDSLIDE DEBRIS (DISPLACED OTAY FORMATION)** Medium dense, moist, gray-olive, Silty fine SAND, with some clay			
10								
12				SM				
14								
16								
18								
20								
22								
24					-Thin bentonitic clay layer (hard, fractured), approx. horizontal			
26				SM	Medium dense, moist, light brown, Silty fine SAND; horizontal laminated			
28								

Figure A-20, Log of Boring-SB 6

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06637-32-01

BORING SB 6

ELEV. (MSL.) 99 DATE COMPLETED 3/22/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30				SM	-Horizontal laminae			
32								
34								
36								
38				CL	Joint-fracture dips approx. 60 degrees to W. Hard, very moist, olive to brown, Silty CLAY			
40				SM	Medium dense, saturated, gray-brown, very Silty, very fine SAND -Abundant biotite mica horizontal laminae			
42				ML	Dense, moist, olive-brown, Clayey SILT -Horizontal laminae			
44								
46					Moderate dense, wet, gray-brown, Silty fine SAND			
48			▼		Dense, very moist, olive, very Clayey SILT -Horizontal bedding			
50				SM	Medium dense, wet, gray-olive, Silty, very fine SAND; massive			
52								
54								
56								
58								

Figure A-21, Log of Boring-SB 6

ITC

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06637-32-01

BORING SB 6

ELEV. (MSL.) 99 DATE COMPLETED 3/22/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60								
62				ML	Dense, moist, olive, very Sandy SILT			
				CL/CH	Hard, very moist, olive-brown, bentonitic CLAY			
64					Medium dense, wet, medium olive, very Silty fine SAND -Fractured, with low-angle (30-35 degrees) dip to N.			
66				SM				
68				ML	Very hard, damp, mottled olive-red-brown white, breccia-SILT, with angular claystone clasts			
70				SM	Medium dense, wet, gray-olive, Silty fine SAND			
72					-Clayseam-fracture, dipping ~60 degrees SE (1mm wide, throughgoing)			
74								
76					-Bedding is horizontally laminated			
78								
80					-Very dense, humid, light gray-white, cemented Silty fine SAND at 79 feet -Horizontal with 1/2 to 1" of hard, bentonitic clay at base			
				CH	Hard, very moist chocolate brown-olive bentonitic clay - horizontal 1" - 2" thick			
82					-Fracture (joint) 60-70 degrees S., no shear			
				CL	Hard, moist, olive-brown, Silty CLAY			
84				CH	Soft, saturated, chocolate brown, plastic (bentonitic?) CLAY at 84.5-85 feet - approx. horizontal			
86				ML	Hard, very moist, medium-olive-brown, laminated, SILT with very Silty CLAY -With cross-laminations dipping S. and abundant fine biotite mica			
88								

Figure A-22, Log of Boring-SB 6

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06637-32-01

BORING SB 6

ELEV. (MSL.) 99 DATE COMPLETED 3/22/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
90				CL	-Bedding laminations dip mostly NE 10 degrees+			
92					-Remolded clayseam approx. 1" thick dipping approx. 10-15 degrees NE.			
					Hard, very moist, brown-olive Silty CLAY; horizontal beds; very fractured			
94				SM	Dense, very moist, gray-olive, Silty fine SAND			
				CL	Hard, very moist, brown-olive, Silty CLAY			
96					-Horizontal bedding			
98				SM	Dense, very moist, greenish-brown to olive, Silty fine SAND			
100				ML-CL	Hard, very moist, olive-brown, very Clayey SILT			
102					-Becomes more sandy			
104					-Very dense, humid, light gray, cemented fine SAND at 104.5-105 feet			
106				SM	Medium dense, very moist, wet, light gray-brown, Silty fine SAND; massive			
108								
110					-Loose sand layer(s) 110-111 feet (lost sample)			
112								
114					-Contact approx 5-10 degrees dip to NW, to horizontal			
				MH	**BASAL SHEAR ZONE**			
116				SM	Medium dense, moist to very moist, light to medium dark olive (mottled) remolded Clayey SILT with approx. horizontal sheeted, anastomosed layers			
118				ML	Medium dense, wet to saturated, gray-brown Silty fine SAND; very fractured			
				CH	Medium to dense, very moist, medium to light gray-brown, Clayey			

Figure A-23, Log of Boring-SB 6

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06637-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING SB 6** ELEV. (MSL.) 99 DATE COMPLETED 3/22/01 EQUIPMENT CME 55 8"	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
120					SILT; intensely fractured with innumerable hairline clayseams (melange)			
122					Soft, very moist, chocolate brown, remolded Silty bentonitic CLAY; -Approx horizontal undulatory layering 1mm-5mm apart -Becomes more massive, but with potential clayseams throughout			
124								
					BORING TERMINATED AT 125 FEET			

Figure A-24, Log of Boring-SB 6

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06637-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING SB 7** ELEV. (MSL.) ~101 DATE COMPLETED 3/26/01 EQUIPMENT CME 55 8"	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					**ALLUVIUM** Loose to medium dense, moist, medium dark yellow-brown, Sandy coarse GRAVEL, with some clay			
2								
4				GM				
6								
8					**LANDSLIDE DEBRIS (DISPLACED TERRACE DEPOSITS)** Stiff to very stiff, dark yellow-brown, Sandy CLAY, with sporadic gravel layers			
10				CL-GC				
12								
14								
16								
18								
20								
22								
24								
26								
28								

Figure A-25, Log of Boring-SB 7

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06637-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING SB 7** ELEV. (MSL.) ~101 DATE COMPLETED 3/26/01 EQUIPMENT CME 55 8"	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
30					-1.5-2' coarse gravel layer			
32								
34				SC	Dense, moist, medium reddish-brown, very Clayey medium SAND			
36					-Sporadic gravelly layers			
38								
40	SB7-1					52		
42								
44								
46								
48								
50								
52								
54			▼		Medium dense, wet to saturated, dark yellow-reddish brown, Clayey,			
56				SC	very coarse SAND, with fine gravel			
58				GM	Dense, wet to saturated, yellow-brown, Sandy coarse GRAVEL			
				SC				

Figure A-26, Log of Boring-SB 7

ITC

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06637-32-01

BORING SB 7

ELEV. (MSL.) ~101 DATE COMPLETED 3/26/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60					Medium dense, saturated, yellow, brown-olive, Clayey medium SAND			
62								
64					-Transitional contact			
66					**LANDSLIDE DEBRIS (DISPLACED OTAY FORMATION)** Medium dense, very moist to wet, light grayish-olive, very Silty, very fine SAND			
68				SM-ML	-Horizontally laminated			
70					-Thin (1.5-2") clayseam, horizontal			
72								
74								
76					-Thin (1.5-2") horizontal laminae, 2mm-5mm apart			
78								
80								
82								
84				CL	Medium dense, very moist, gray-olive (mottled) very Clayey fine SAND, with laminated thin clayseams; horizontal			
86				SM				
88				CL	Hard, moist, light olive, Silty CLAY; horizontal laminae			
				SM				

Figure A-27, Log of Boring-SB 7

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06637-32-01

BORING SB 7

ELEV. (MSL.) ~101 DATE COMPLETED 3/26/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
90								
92					-Fractures, shears, 60-70 degrees W, with clayseam-linings 1-2 mm thick			
94					-Hairline fractures, >45 degrees W-SW, with micaceous laminations, bedding horizontal			
96					-Cemented (CaCo3) fine sand layer 1"-2" thick			
98				ML	Very stiff, very moist, medium olive, very Clayey SILT, with abundant fine biotite mica; horizontally laminated			
100				SM	Medium dense, wet, medium to light gray-olive, very Silty, very fine SAND -Thin cemented silt-sand (1-2")			
102				ML-CL	Stiff, very moist, olive, very Clayey SILT			
104				SM	Medium dense, wet, light gray-olive, Silty, very fine SAND -Very fractured from 105-106 feet			
106					-Clayseam 10-15 degrees S., 1/8" thick			
				CL-CH	**BASAL SHEAR ZONE**			
108				ML	Loose, wet, brown/olive mottled brecciated CLAY, with angular chunks of bentonitic claystone			
				CH	Soft, stiff, wet, chocolate brown, remolded bentonitic CLAY; top dips 60-70 degrees S., bottom dips ~10 degrees S.			
110				ML	Loose, wet, brown/olive mottled breccia (with angular chunks of claystone)			
112				ML-CL	Fracture with clay lining 1/8" dipping ~45 degrees SE. Stiff, very moist, olive-brown, very Clayey SILT; with numerous BPS", clayseams			
114				CH	Remolded clayseam 1-2" thick dipping 15-20 degrees S.; soft to stiff, wet, undulating			
116				SM-ML	Medium dense, very wet to saturated, gray-olive, Silty, very fine SAND -Becomes loose, saturated, and intensely fractured with clay linings in a "melange" of crackled structure with spacings of less than one inch between fractures			
118								

Figure A-28, Log of Boring-SB 7

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◪ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06637-32-01

BORING SB 7

ELEV. (MSL.) ~101 DATE COMPLETED 3/26/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
120				CH	-Remolded clayseams, low-angle to horizontal			
				CL-CH	1-2" remolded clayseam dipping 35-40 degrees S, (undulating), plastic bentonitic			
122				CH	Very stiff, very moist mottled brown brecciated bentonitic CLAY			
				CL-ML	Very stiff, very moist mottled pink-brown, remolded and brecciated bentonite CLAY; undulating to horizontal			
124				ML	**OTAY FORMATION** Hard, very moist, dark olive-brown, very Silty CLAYSTONE; horizontally laminated			
					Dense, moist, medium olive-brown, Sandy SILTSTONE, with some clay, massive			
					BORING TERMINATED AT 125 FEET			

Figure A-29, Log of Boring-SB 7

ITC

SAMPLE SYMBOLS: ☐ ... SAMPLING UNSUCCESSFUL; ◧ ... STANDARD PENETRATION TEST; ■ ... DRIVE SAMPLE (UNDISTURBED); ⊠ ... DISTURBED OR BAG SAMPLE; ◥ ... CHUNK SAMPLE; ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06637-32-01

BORING SB 8

ELEV. (MSL.) ~87 DATE COMPLETED 3/27/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					A.C. pavement 2-3 inches			
2				CL	**ARTIFICIAL FILL** Soft to stiff, moist, dark brown, very Sandy CLAY			
4					**TERRACE DEPOSIT (UNDISTURBED)** Soft to stiff, moist, dark yellowish-brown, very Sandy CLAY, with scattered gravel			
6				CL				
8								
10					-More gravelly layers, very stiff			
12								
14								
16								
18								
20								
22								
24					-Becomes very gravelly			
26								
28								

Figure A-30, Log of Boring-SB 8

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06637-32-01

BORING SB 8

ELEV. (MSL.) ~87 DATE COMPLETED 3/27/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30								
32								
34								
36				SM	Loose to medium dense, damp, light yellow to reddish-brown, Silty fine SAND, with some scattered fine gravel			
38								
40								
42								
44								
46				CL	**LANDSLIDE DEBRIS (DISPLACED OTAY FORMATION)** Stiff, very moist to wet, olive-brown (mottled), brecciated CLAY (with angular claystone chunks)			
48				CL	Hard, very moist, olive, Silty CLAY; very fractured			
50					-1"-2" clayseam, low-angle to horizontal, wet, plastic, brown			
52					-1/4" clayseam, dipping 10-20 degrees E.			
54				ML/CL	Medium dense, moist, gray-olive, very Clayey SILT, massive, but with numerous hairline clayseams along fractures			
56								
58					-Fracture with calcium carbonate fracture- filling and cemented walls			

Figure A-31, Log of Boring-SB 8

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06637-32-01

BORING SB 8

ELEV. (MSL.) ~87 DATE COMPLETED 3/27/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60					dips 50-60 degrees S.			
					-Clayseams, low-angle to horizontal			
62				CL-ML	Stiff, very moist, olive-brown mottled, brecciated CLAY, SILT			
					Remolded clayseam, 1/4" thick dipping approximately 15-20 degrees N.;undulating			
				SM				
64			▼		Loose, saturated, brown, Silty, medium to coarse micaceous SAND, with some clean noncohesive sands			
					-"flowing sand", lost sample			
66					**OLDER ALLUVIUM**			
					Loose, saturated, medium olive-brown, micaceous, coarse SAND			
68					-Non cohesive; appears to be river-alluvium			
				SP				
70					-Scattered fine gravel			
72								
74					-Fine gravel layer (1/4"-1" diameter pebbles)			
76								
78					-Approximate contact, or transition			
					OTAY FORMATION			
80					Dense and hard, gray-olive interbedded Clayey SILTSTONE + Silty CLAYSTONE			
82				ML-CL	-Horizontally laminated, minor fracturing or clayseams			
84								
86								
88								

Figure A-32, Log of Boring-SB 8

ITC

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06637-32-01

BORING SB 8

ELEV. (MSL.) ~87 DATE COMPLETED 3/27/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
90								
92								
94								
96								
98					-Joint fractures (hairline) dipping 45-60 degrees S. with thin CaCO3 linings			
100					-Cemented siltstone layer 2-3" thick			
102				CL	Hard, very moist, brown-olive Silty CLAYSTONE -Horizontally laminated			
104				ML	Very dense, moist, medium brown-olive, Sandy SILTSTONE, with some clay, horizontal			
106					-4"-6" cemented horizontal laminated, very Silty, very fine sandstone layer			
108				CL-ML	Hard, very moist, olive and brown, Silty CLAYSTONE to Clayey SILTSTONE, with interbedded very fine sand, horizontally laminated			
110								
112								
114								
116								
118				SM	Dense, very moist, gray-olive, very Sandy SILTSTONE to Silty, very fine SANDSTONE -Horizontal bedding to massive			
					BORING TERMINATED AT 120 FEET			

Figure A-33, Log of Boring-SB 8

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06637-32-01

BORING SB 9

ELEV. (MSL.) 99 DATE COMPLETED 3/29/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GC	**ARTIFICIAL FILL** Medium dense to dense, moist, dark brown, Clayey GRAVEL; with railroad ballast of angular base coarse			
2					**LANDSLIDE DEBRIS (DISPLACED OTAY FORMATION)** Medium dense, damp, light gray-olive, very Silty fine SAND to Sandy SILT -Some clay			
4								
6								
8				SM-ML				
10								
12								
14								
16								
18								
20								
22								
24								
26								
28								

Figure A-34, Log of Boring-SB 9

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06637-32-01

BORING SB 9

ELEV. (MSL.) 99 DATE COMPLETED 3/29/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30								
32				ML-CL	Medium dense to very stiff, moist, olive to brown, very interbedded Clayey SILT to Silty CLAY, with thin-grained sands			
34								
36					-Cemented fine sand layer approximately 12" thick			
38								
40								
42					-Cemented fine sand layer approximately 18" thick			
44								
46				CL				
48								
50					-Becomes a Silty CLAY; approximately horizontal to low-angle laminated bedding			
52								
54				ML-SM	Medium dense, very moist, medium light gray-brown, very Sandy SILT -Massive to low-angle dipping bedding			
56								
58								

Figure A-35, Log of Boring-SB 9

ITC

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06637-32-01

BORING SB 9

ELEV. (MSL.) 99 DATE COMPLETED 3/29/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60								
62			▼	SM	Medium dense, saturated, gray-olive, Silty fine SAND			
64				ML	Medium dense, wet to saturated, light to medium gray-olive, Clayey SILT -With laminae dipping 10-20 degrees S.			
66					-Cemented fine sand at 66.2' to 67.7'			
68				ML	Medium dense to dense, very moist, light medium olive-brown, Clayey SILT -Laminations dip 5-10 degrees SE. (cross-laminations)			
70								
72				CL	Hard, very moist, olive-brown, Silty CLAY -Laminated beds horizontal, or very low dips			
74								
76								
78				ML	Dense, very moist, light gray-olive, Sandy SILT			
80				CL	Hard, very moist, olive-brown, Silty CLAY -Cemented silt			
82								
84				SM	-Cemented sand layer 3" thick, horizontally laminated Dense, moist, light gray-olive, very Silty, very fine SAND			
				CL	-Clayseam 1/4"-1/2" thick, remolded, low-angle to horizontal			
86				SM	Medium dense, wet to saturated, light olive to gray, Silty very fine SAND -Massive, subtle sub-horizontal laminae -Fractures dipping 70-80 degrees S., hairline -Fractures dipping 60-70 degrees N., hairline			
88								

Figure A-36, Log of Boring-SB 9

ITC

SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE ◣ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06637-32-01

BORING SB 9

ELEV. (MSL.) 99 DATE COMPLETED 3/29/01

EQUIPMENT CME 55 8"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
90								
92								
94				SM	-Approximately horizontal laminated bedding			
96								
98								
100				CL	Hard, moist, brown, Silty CLAY **BASAL SHEAR ZONE** Remolded Silty CLAY, between 99.5' and 100.5';horizontal			
102					Stiff, very moist, olive-green-brown, Silty CLAY; bentonitic with possible thin clayseams - especially upper part			
104				CL				
106					-Remolded clayseam approximately 1" thick; low-angle to undulating - horizontal			
108					-Remolded clay zone between 108' and 113', with southward undulating dips from horizontal to variable, or even reversed, continuously brecciated and sheared Stiff to very stiff, very moist to wet, reddish-brown, mottled with pink, bentonitic CLAY; with admixed silt			
110								
112				CL	-Basal contact is nearly horizontal, but undulating, grooved and slickensided			
114				ML	**OTAY FORMATION** Dense, very moist, medium to dark olive, SILTSTONE; massive to horizontally laminated -Becomes very dense			
					BORING TERMINATED AT 115 FEET			

Figure A-37, Log of Boring-SB 9

ITC

SAMPLE SYMBOLS: ☐ ... SAMPLING UNSUCCESSFUL; ◧ ... STANDARD PENETRATION TEST; ■ ... DRIVE SAMPLE (UNDISTURBED); ⊠ ... DISTURBED OR BAG SAMPLE; ◣ ... CHUNK SAMPLE; ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

APPENDIX D

APPENDIX D

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected samples were tested for in-place dry density and moisture content, direct shear strength, compaction, expansion, and soluble sulfate characteristics. The results of the tests are summarized in tabular and graphical form herewith. The in-place dry density and moisture content of the samples tested are presented on the boring logs in Appendix A and B.

TABLE D-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS ASTM D 1557

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
LB1-2*	Yellowish brown, Sandy GRAVEL with little clay	136.1	6.2
LB1-5*	Dark olive-brown, Silty, vine SAND with trace rock	114.9	14.4
LB3-3*	Gray-brown, fine Sandy CLAY	104.6	18.0
T5-2*	Light yellow-brown, Silty CLAY	109.0	17.5
LB1-1**	Gray brown, fine, Sandy CLAY with little silt	119.0	13.6
LB1-6**	Olive-brown, Silty, fine SAND	123.8	10.5
LB3-1**	Reddish-brown, Clayey, fine to coarse SAND with some gravel	132.2	7.8
LB4-8**	Grayish brown, Silty CLAY with trace gravel	111.5	16.6
LB4-10**	Dark gray, fine, Sandy CLAY	112.3	16.7
LB7-2**	Dark brown, fine to coarse, Sandy CLAY with trace gravel	123.0	11.6
T8-1**	Olive-brown, fine to medium, Sandy CLAY with trace gravel	117.8	14.3
T12-2**	Olive-brown, Clayey, fine to coarse SAND with some gravel	129.9	9.2

*From Geocon October 2004
**From Geocon May 2006

TABLE D-II
SUMMARY OF DIRECT SHEAR TEST RESULTS
ASTM D 3080

Sample No.	Dry Density (pcf)	Moisture Content (%)	Angle of Shear Resistance (degrees)	Unit Cohesion (psf)
LB3-3†*	93.4	19.0	32	500
LB1-1†**	--	--	29	430
LB1-3**	101.0	25.9	31	135
LB1-5**	118.2	6.4	25	365
LB2-2**	98.9	25.0	28	140
LB4-7**	108.3	18.1	16	560
LB4-9†**	--	--	27	180
LB4-10†**	101.5	16.2	20	280
LB7-2†**	110.9	7.5	14	390
LB9A-5†**	--	--	19	100
LB10A-5A**	72.5	43.9	25	100

†Sample remolded to approximately 90 percent of relative compaction near optimum moisture content.
*From Geocon October 2004
**From Geocon May 2006

TABLE D-III
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829

Sample No.	Moisture Content		Dry Density (pcf)	Expansion Index
	Before Test (%)	After Test (%)		
LB1-2*	8.1	18.0	120.8	3
T1-1*	13.3	30.0	101.1	98
T1-2*	7.8	22.7	120.6	0
T10-2*	18.0	39.1	87.4	91
T10-3*	10.1	22.6	110.5	19
T18-1*	13.3	30.7	102.2	120
T18-2*	11.0	22.7	109.3	9
T1-mix*	9.9	22.1	115.3	28
T10-mix*	13.7	30.4	100.2	87
T18-mix*	11.7	25.1	107.4	80
LB1-1**	12.1	24.9	104.9	43
LB1-6**	9.8	18.4	111.5	0
LB3-1**	7.6	16.3	110.0	0
T8-1**	15.3	30.8	94.1	63

*From Geocon October 2004
**From Geocon May 2006

TABLE D-IV
SUMMARY OF LABORATORY SOLUBLE SULFATE TEST RESULTS
CALIFORNIA TEST NO. 417

Sample No.	Sulfate (% SO_4)	Sulfate Class
T1-1*	0.027	S0
T1-2*	0.013	S0
T10-2*	0.162	S1
T10-3*	0.036	S0
T18-1*	0.260	S2
T18-2*	0.038	S0
LB1-1**	0.051	S0
LB1-6**	0.004	S0
LB3-1**	0.032	S0
LB4-10**	0.004	S0
LB7-2**	0.036	S0

*From Geocon October 2004
**From Geocon May 2006

APPENDIX E

APPENDIX E

SLOPE STABILITY EVALUATION

General

Slope stability analyses were performed on Cross-Sections A-A', B-B', D-D', and I-I' shown on Figures 7, 8, and 10. Cross-Sections A-A', B-B' and I-I' are located in proposed cut slopes that expose landslide debris or the bentonitic member of the Otay Formation. Cross-Section D-D' is located in a proposed fill area at the toe of an existing landslide. Slope geometry, geologic structure, and calculated factors of safety for each cross section analyzed are presented on Figures E-1 through E-12.

The computer program, *Slope/W* from GeoSlope 2018, distributed by Geo-Slope International, was utilized to perform slope stability analyses. This program uses conventional slope stability equations and a two-dimensional limit-equilibrium method to calculate the factor of safety against deep-seated failure. For our analyses, Spencer's Method with circular failure and block failure mode was used. Spencer's Method satisfies both moment and force equilibrium.

The computer program searches for the most critical failure surface based on geometry and soil strength parameters. For each cross section analyzed for a circular failure mode a grid of circle midpoints and radii are specified. The computer program calculates a factor of safety for each grid point and radii. For a block failure analysis the computer program searches for the critical failure surface based on parameters inputted, including the location of the "left" and "right" sliding blocks. The critical failure surface for each analysis is shown on computer generated output (Figures E-1 through E-12) directly above the failure surface (which is shown as the hatched area on the figure).

Shear Strength Parameters

Shear strength parameters used in the analyses are based on laboratory direct shear testing performed on samples obtained from borings on the property, shear testing from previous geotechnical investigations in the area performed by others, and our experience with similar soil conditions. In most cases the shear strength values used in the analyses were average ultimate values obtained from laboratory testing. Where direct shear tests were not performed in a soil or geologic unit, assumed strength values were used. Table E-I summarizes the shear strength tests performed by Geocon Incorporated and others for each soil and geologic unit. Table E-II summarizes the average shear strength values. Table E-III summarizes the actual values used in the analyses. With respect to the Otay Formation – Bentonitic (Tob), for conservatism, we used the lowest shear value obtained from testing of in-place samples. This value was lower than the average value and produces a lower factor of safety in the slope stability analyses. The shear strength values used in the analyses are also shown on Figures E-1 through E-12.

TABLE E-I
SUMMARY OF DIRECT SHEAR TEST RESULTS

Soil/Geologic Unit	Sample No.	Angle of Shear Resistance (degrees)	Unit Cohesion (psf)
Landslide Debris (Qls)	LB1-1*	29	430
	LB1-3	31	135
	LB7-2*	14	390
Otay Formation – Bentonitic (Tob)	LB4-7	16	560
	LB4-10*	20	280
	LB9A-5*	19	100
	LB10A-5A	25	100
Otay Formation – Gritstone (Tog)	LB1-5	25	365
Otay Formation – Sandstone (Tos)	LB2-2	28	140
	Boring 4 – 40 feet**	34	20
	Boring 4 - 20 ft ** (remold)	36	80
	Boring 7 – 13 feet **	30	0
Remolded Shear Plane	LB4-9	27	180

*Sample remolded to approximately 90 percent of maximum dry density near optimum moisture content.
**From San Diego Geotechnical Consultants, June 1988.

TABLE E-II
AVERAGE DIRECT SHEAR STRENGTH TEST RESULTS

Soil Type	Angle of Internal Friction (degrees)	Cohesion (psf)
Compacted Fill (Qcf) based on remolded samples	25	300
Landslide Debris (Qls)	31	135
Otay Formation – Bentonitic (Tob)	16	560
Otay Formation – Gritstone (Tog)	25	365
Otay Formation – Sandstone (Tos)	31	50

TABLE E-III
DIRECT SHEAR STRENGTH USED IN ANALYSES

Soil Type	Angle of Internal Friction (degrees)	Cohesion (psf)
Qcf (Compacted Fill)	25	300
Qal (Alluvium)	25	200
Qls (Landslide Debris)	31	135
Tob (Otay Formation – Bentonitic)	16	560
Tos (Otay Formation – Sandstone)	31	50
Tog (Otay Formation – Gritstone)	25	360

Slope Stability — Cut Slopes Exposing Landslide Debris

Cross-Section A–A' was analyzed to evaluate cut slopes in the existing San Ysidro Landslide. As shown on Figure 7 the direction of slip for the existing landslide is into the slope. The minimum factor of safety for this cross section is 1.46 (see Figure E-1) and 2.62 (see Figure E-2). We have proposed a 20-foot-wide stability fill because of fractured and disturbed materials that are anticipated to be exposed in the slope cut. This is recommended primarily to enhance surficial stability and to provide a drained slope condition to reduce potential landscape irrigation from entering into the main landslide. The results of our stability analysis indicate a factor of safety greater than 1.5 is achieved with a 20-foot wide stability fill for the proposed graded configuration (see Figures E-3 and E-4).

Slope Stability — Cut Slopes or Natural Slopes Exposing Otay Formation (Bentonitic)

The bentonitic member of the Otay Formation underlies proposed roadway grade. Cross-Section B-B' was analyzed to evaluate the stability of proposed cut slopes where the bentonite member is closest to proposed roadway grades. To provide a stable slope configuration, a stability buttress will be required. The recommended geometry of the buttresses is shown on the geologic cross sections. Stability analyzes showing stable slopes for proposed graded configuration after remedial grading is performed is shown on Figure E-5 and E-6. Additionally, Cross-Sections A-A' and I-I' were analyzed to evaluate a suspected lenses of bentonite in the siltstone member of the Otay Formation. Stability analyzes for these sections are shown on Figures E-4, E-11 and E-12, which indicate factors of safety in excess of 1.5.

Our analyses assumed select material derived from excavations in the sandstone portions of the Otay Formation, San Diego Formation, and Terrace Deposits will be required for the buttress fill. Minimum shear strength parameters of a 34-degree angle of internal friction and cohesion of 500 pounds per square foot (psf) are required to produce a factor of safety in excess of 1.5. This may require placing the buttress fill at 95 percent relative compaction.

Slope Stability — Embankment at Toe of Existing Landslide

A stability analysis was performed for Cross-Section D-D' where proposed embankment fills will be placed at the toe of an existing landslide. Figure E-7 shows the factor of safety for the existing condition that is below 1.5. As shown on the Geologic Cross-Section D-D', the majority of alluvium will be removed to construct the roadway embankment. The embankment fill will buttress the existing landslide. Figures E-8 through E-10 show factors of safety for proposed graded conditions, which are above 1.5.

Summary of Stability Analyses

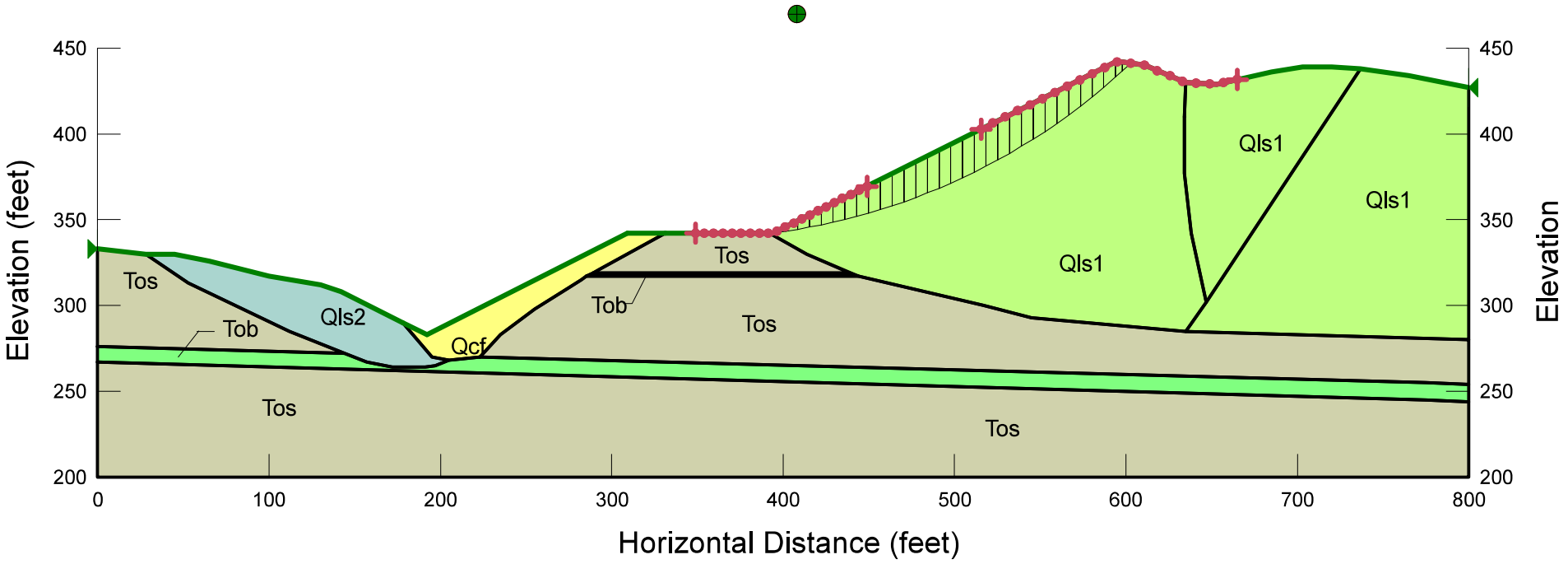
Table E-IV summarizes the stability analyses performed for this study. The calculated factor-of-safety for proposed finish grade slopes and recommended stabilization method for each cross section is included on the table.

TABLE E-IV
SUMMARY OF STABILITY ANALYSES
AND RECOMMENDED STABILIZATION METHOD

Cross Section	Proposed Graded Min. Factor-of-Safety	Stabilization Method
A-A'	1.46 (as-graded no remedial) 1.54 (as-graded with remedial)	20-foot-wide stability fill.
B-B'	2.1 (as-graded with remedial)	Stability buttress using material that has a friction angle of at least 34 degrees and a cohesion of 500 psf.
D-D'	1.17 (existing) 2.2 to 3.6 (as graded)	Embankment fill with removal of alluvium and landslide debris will buttress slope.
I-I'	1.52 to 1.55	Stability buttress using material that has a friction angel of at least 34 degrees and a cohesion of 500 psf.

Beyer Boulevard Extension
South Otay Mesa
Project No. 06847-42-03
Date: 03/28/2019
Cross Section A-A'

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Qcf	130	500	34
	Qls1	125	135	31
	Qls2	125	135	31
	Tob	130	560	16
	Tos	130	50	31



File Name: AA5b.gsz

FIGURE E-1

Beyer Boulevard Extension
South Otay Mesa
Project No. 06847-42-03
Date: 03/28/2019
Cross Section A-A'

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Qcf	130	500	34
	Qls1	125	135	31
	Qls2	125	135	31
	Tob	130	560	16
	Tos	130	50	31

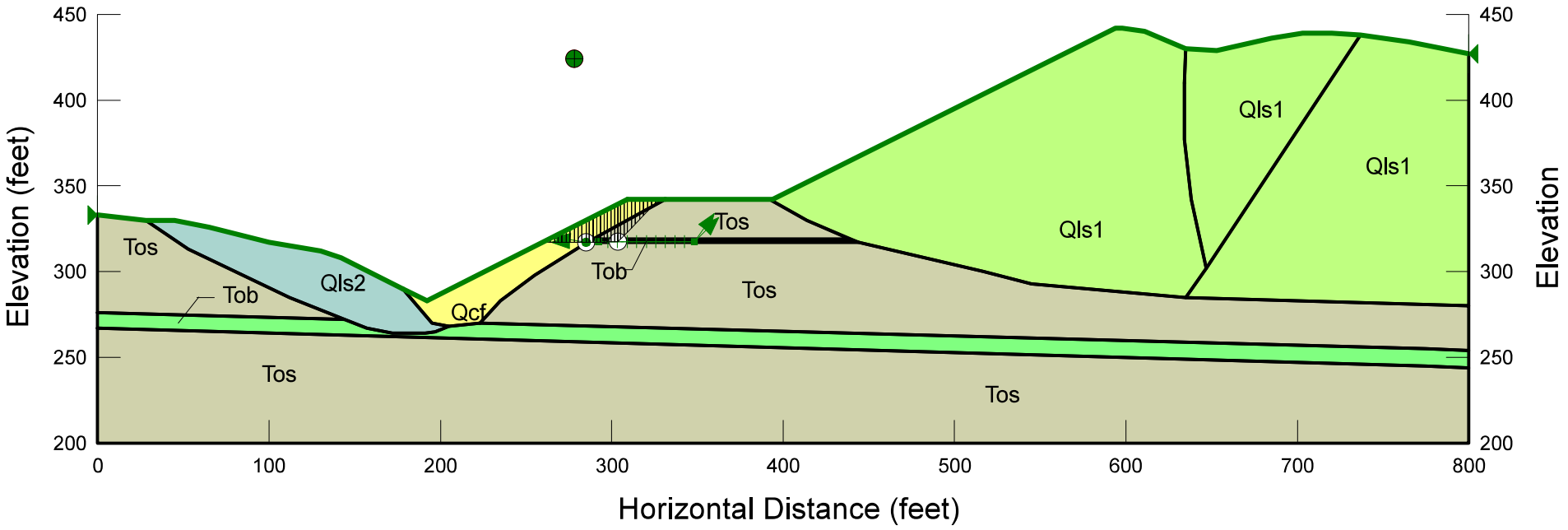


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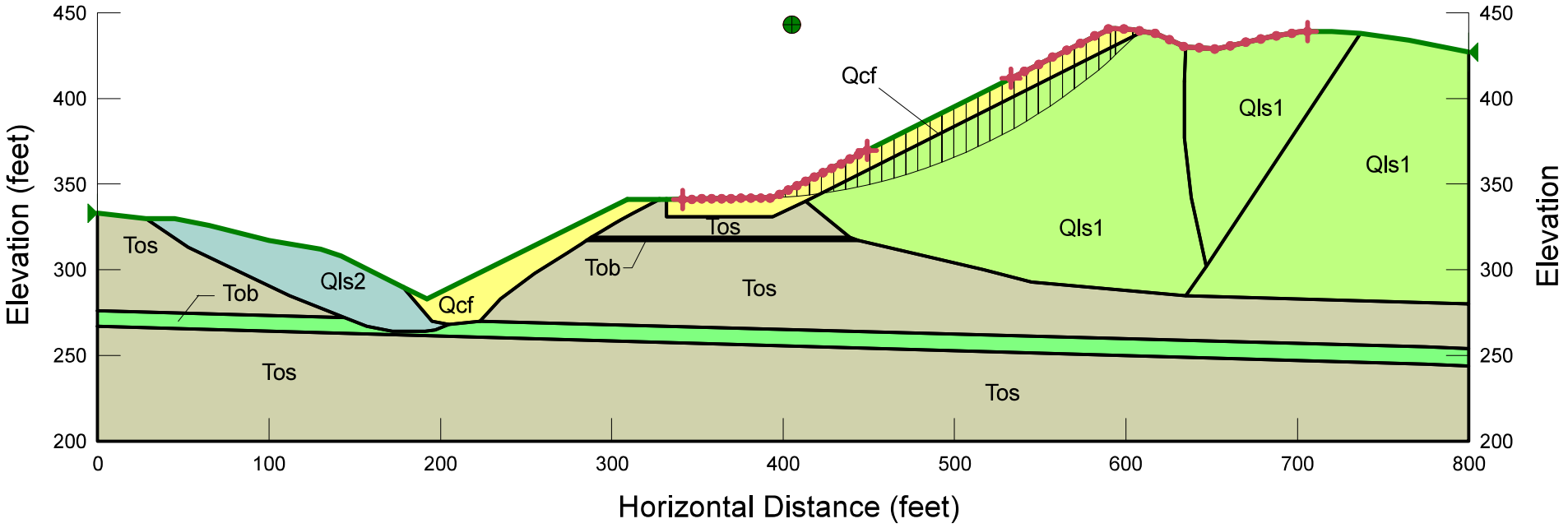
FIGURE E-2

Beyer Boulevard Extension
South Otay Mesa
Project No. 06847-42-03
Date: 03/28/2019
Cross Section A-A'

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Qcf	130	500	34
	Qls1	125	135	31
	Qls2	125	135	31
	Tob	130	560	16
	Tos	130	50	31

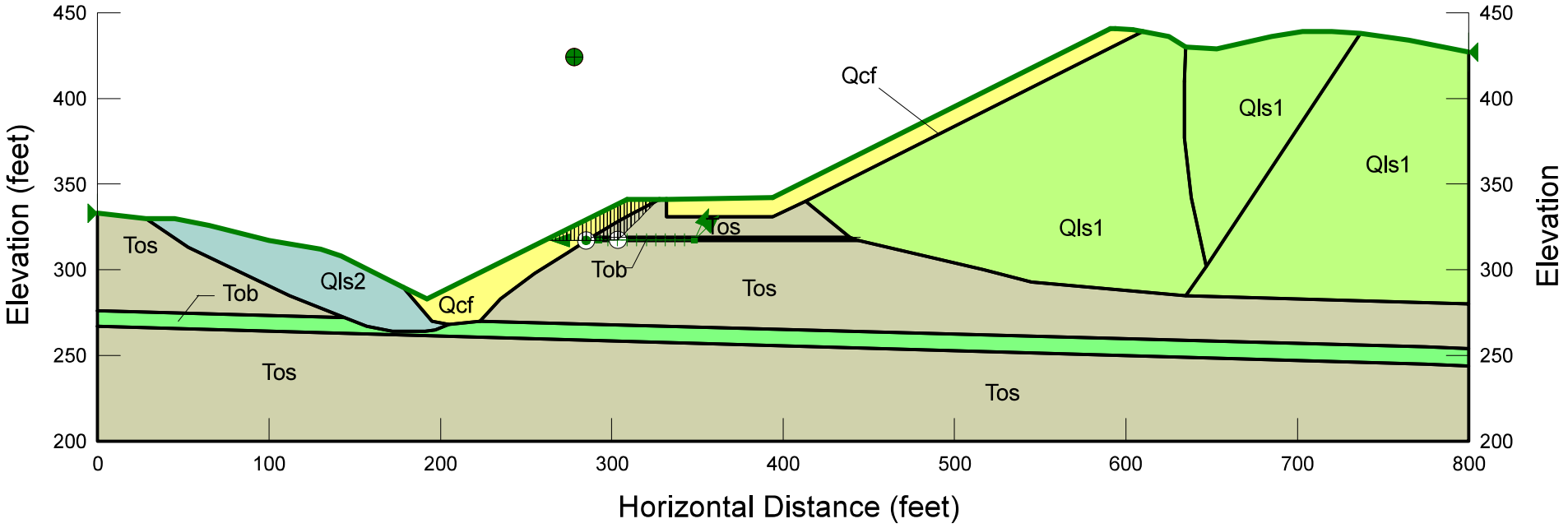


File Name: AA5r.gsz

FIGURE E-3

Beyer Boulevard Extension
South Otay Mesa
Project No. 06847-42-03
Date: 03/28/2019
Cross Section A-A'

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Qcf	130	500	34
	Qls1	125	135	31
	Qls2	125	135	31
	Tob	130	560	16
	Tos	130	50	31

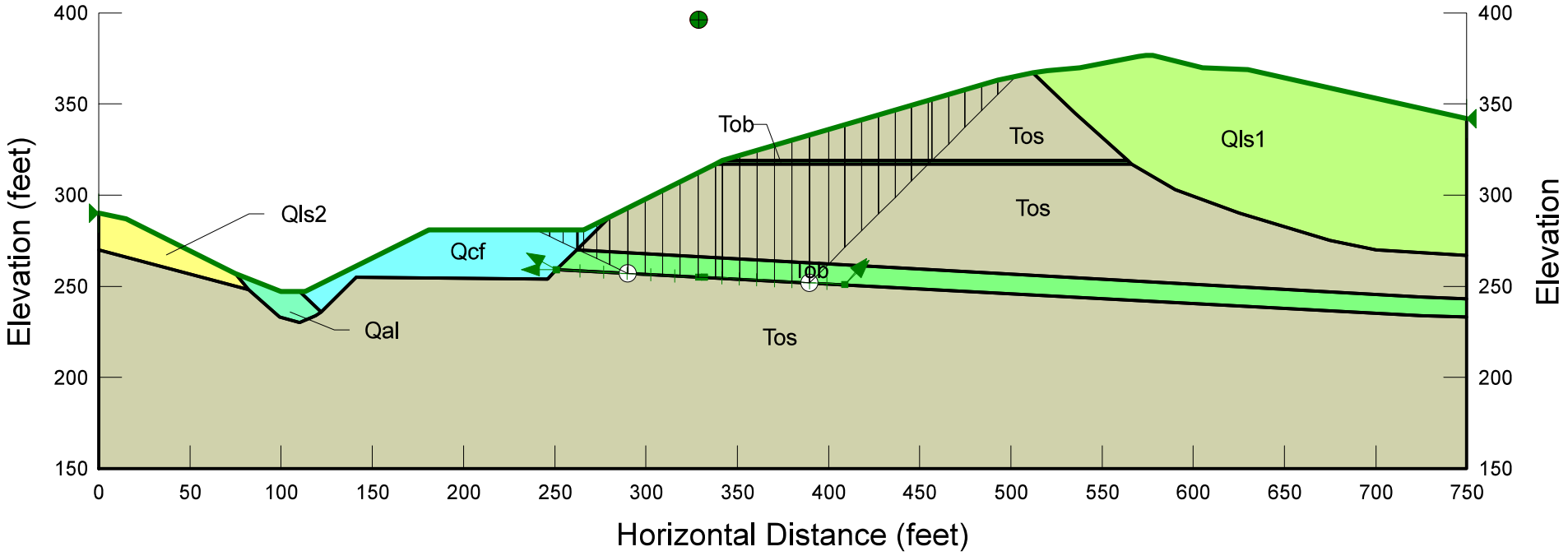


File Name: AA5r(block).gsz

FIGURE E-4

Beyer Boulevard Extension
South Otay Mesa
Project No. 06847-42-03
Date: 03/28/2019
Cross Section B-B'

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Qal	125	200	25
	Qcf	130	500	34
	Qls1	125	135	31
	Qls2	125	135	31
	Tob	130	560	16
	Tos	130	50	31



File Name: BB10a.gsz

FIGURE E-5

Beyer Boulevard Extension
South Otay Mesa
Project No. 06847-42-03
Date: 03/28/2019
Cross Section B-B'

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Qal	125	200	25
	Qcf	130	500	34
	Qls1	125	135	31
	Qls2	125	135	31
	Tob	130	560	16
	Tos	130	50	31

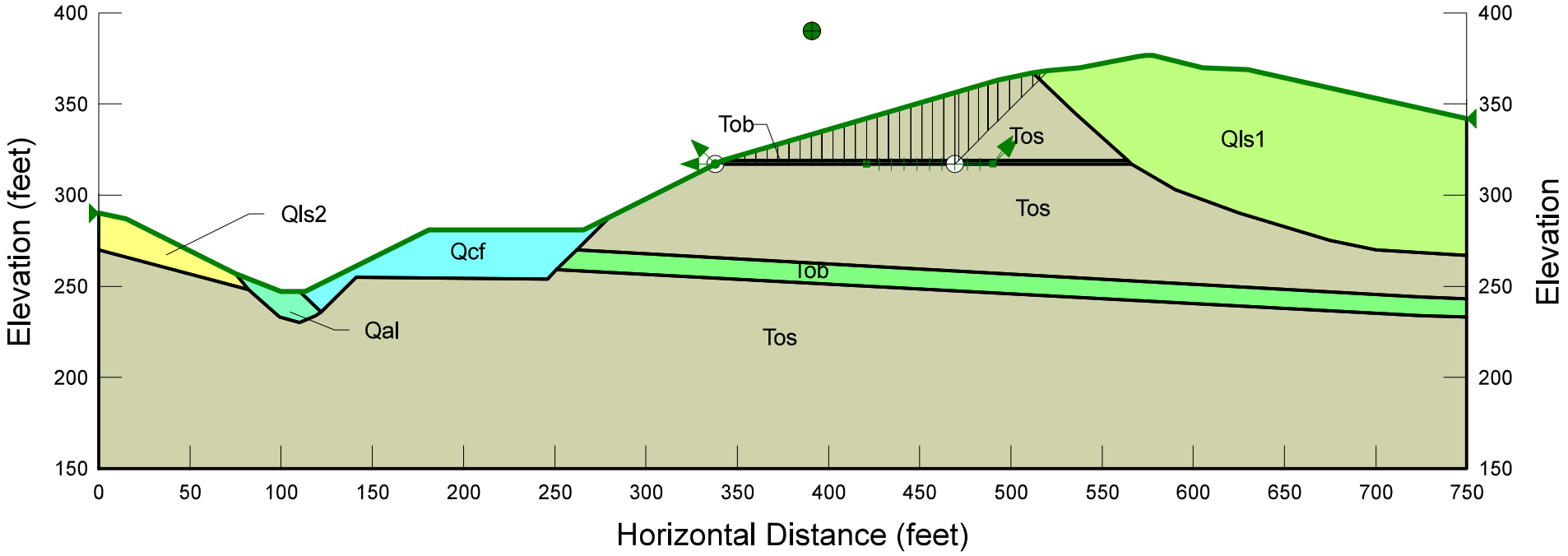


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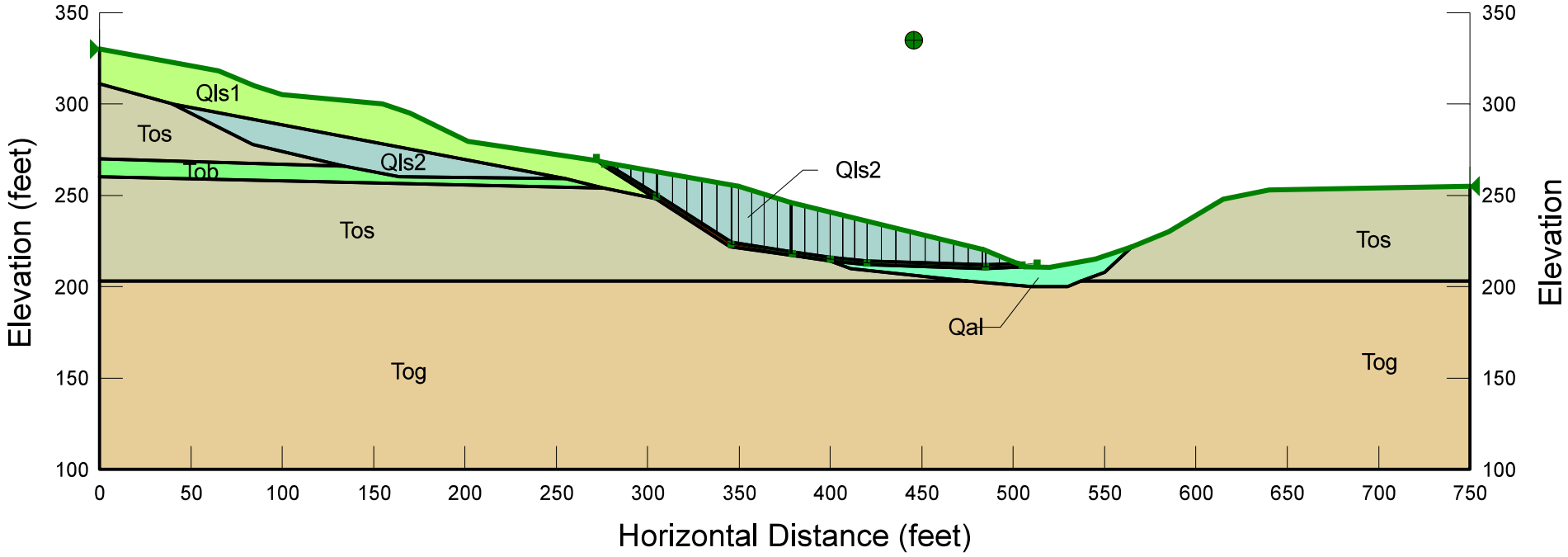
FIGURE E-6

Beyer Boulevard Extension
South Otay Mesa
Project No. 06847-42-03
Date: 03/28/2019
Cross Section D-D'

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Qal	125	200	25
	Qls1	125	135	31
	Qls2	125	135	31
	Slide Plane	120	100	12
	Tob	130	560	16
	Tog	130	360	25
	Tos	130	140	28



File Name: DD11.gsz

FIGURE E-7

Beyer Boulevard Extension
South Otay Mesa
Project No. 06847-42-03
Date: 03/28/2019
Cross Section D-D'

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Qal	125	200	25
	Qcf	130	500	34
	Qls1	125	135	31
	Qls2	125	135	31
	Slide Plane	120	100	12
	Tob	130	560	16
	Tog	130	360	25
	Tos	130	140	28

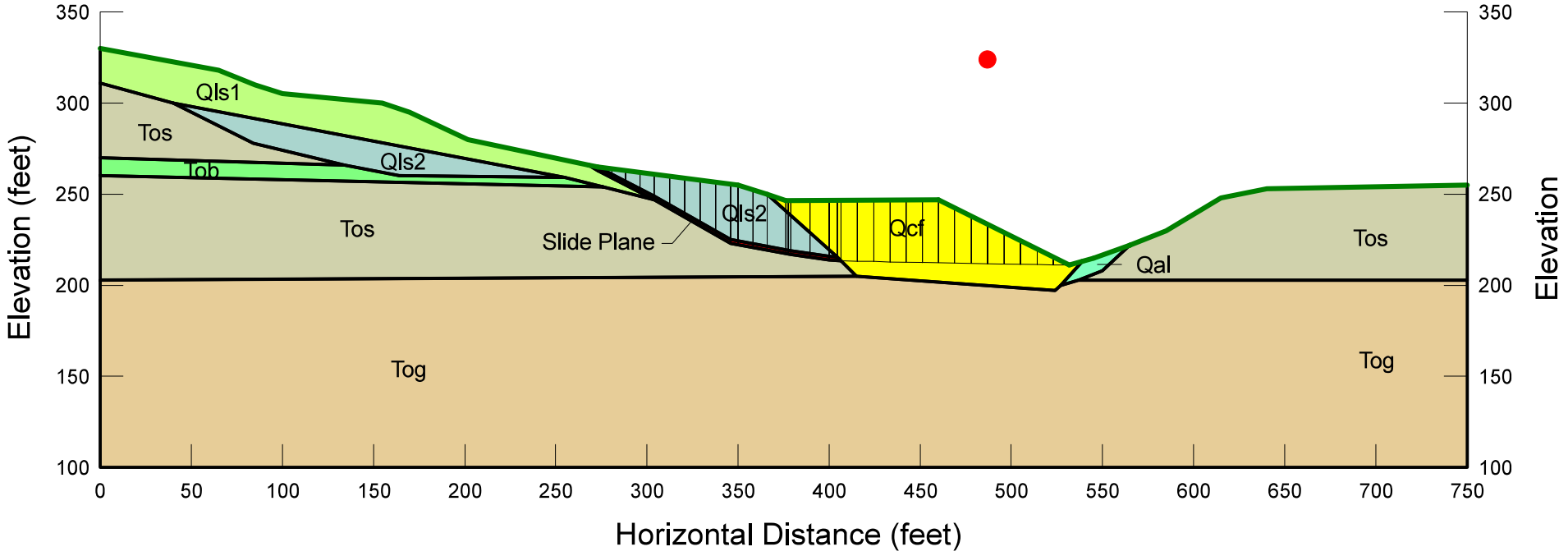


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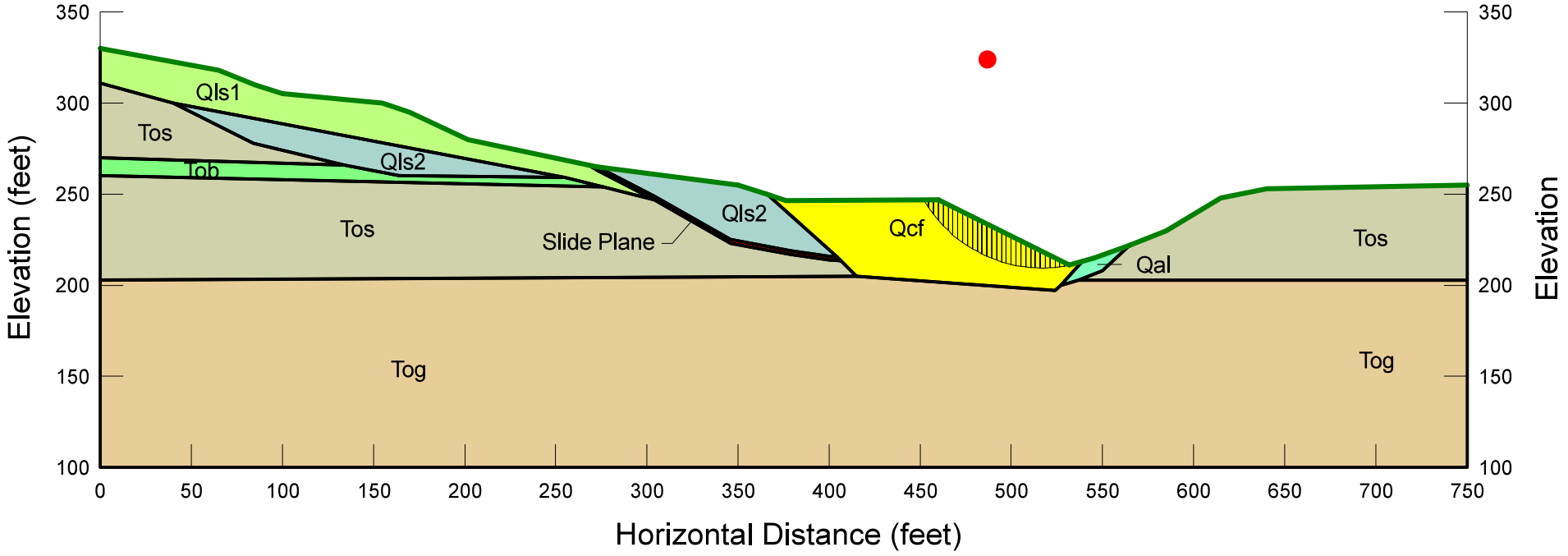
FIGURE E-8

Beyer Boulevard Extension
South Otay Mesa
Project No. 06847-42-03
Date: 03/28/2019
Cross Section D-D'

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Qal	125	200	25
	Qcf	130	500	34
	Qls1	125	135	31
	Qls2	125	135	31
	Slide Plane	120	100	12
	Tob	130	560	16
	Tog	130	360	25
	Tos	130	140	28

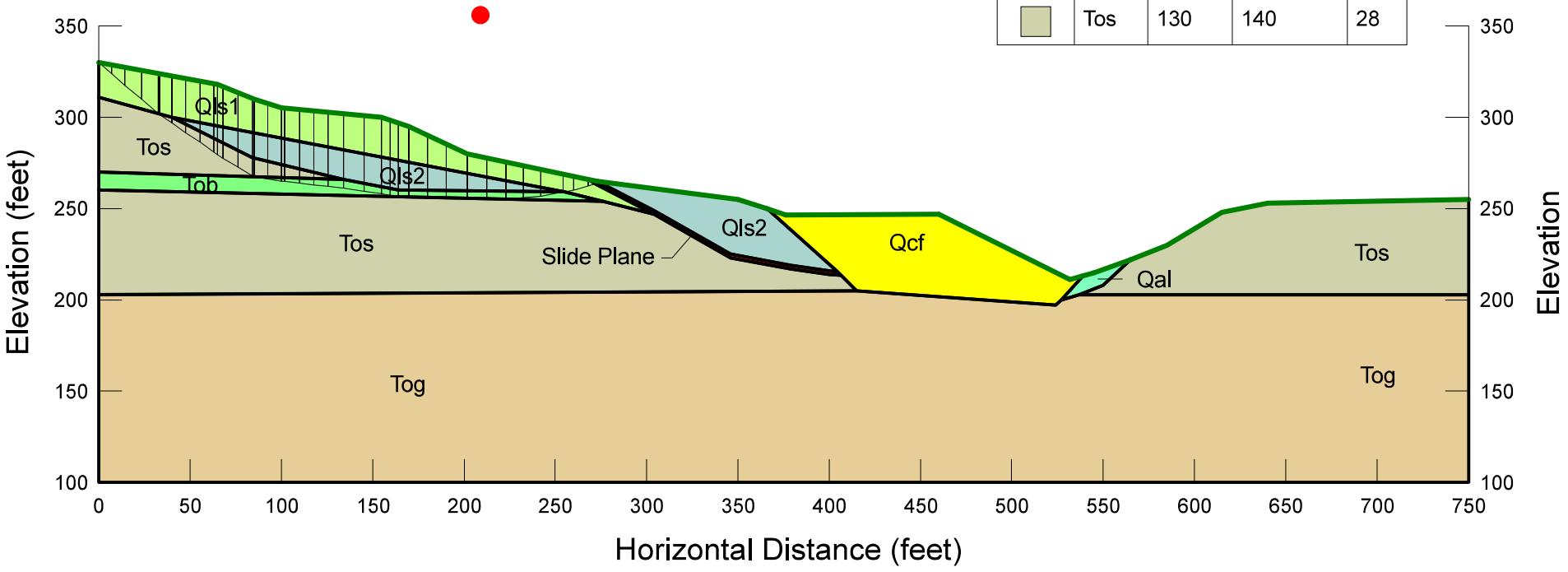


File Name: DD11r.gsz

FIGURE E-9

Beyer Boulevard Extension
South Otay Mesa
Project No. 06847-42-03
Date: 03/28/2019
Cross Section D-D'

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Qal	125	200	25
	Qcf	130	500	34
	Qls1	125	135	31
	Qls2	125	135	31
	Slide Plane	120	100	12
	Tob	130	560	16
	Tog	130	360	25
	Tos	130	140	28

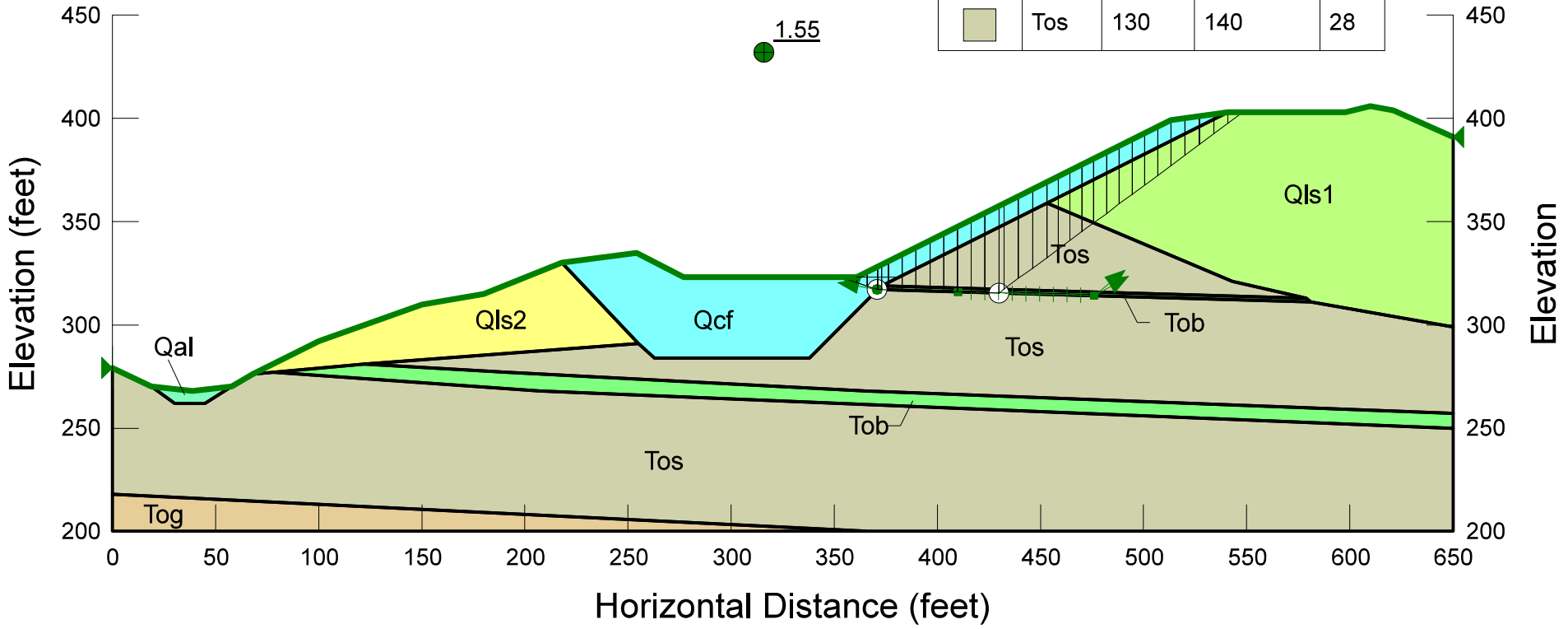


File Name: DD11r (auto).gsz

FIGURE E-10

Beyer Boulevard Extension
South Otay Mesa
Project No. 06847-42-03
Date: 03/28/2019
Cross Section I-I'

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Qal	125	200	25
	Qcf	130	500	34
	Qls1	125	135	31
	Qls2	125	135	31
	Tob	130	560	16
	Tog	130	360	25
	Tos	130	140	28

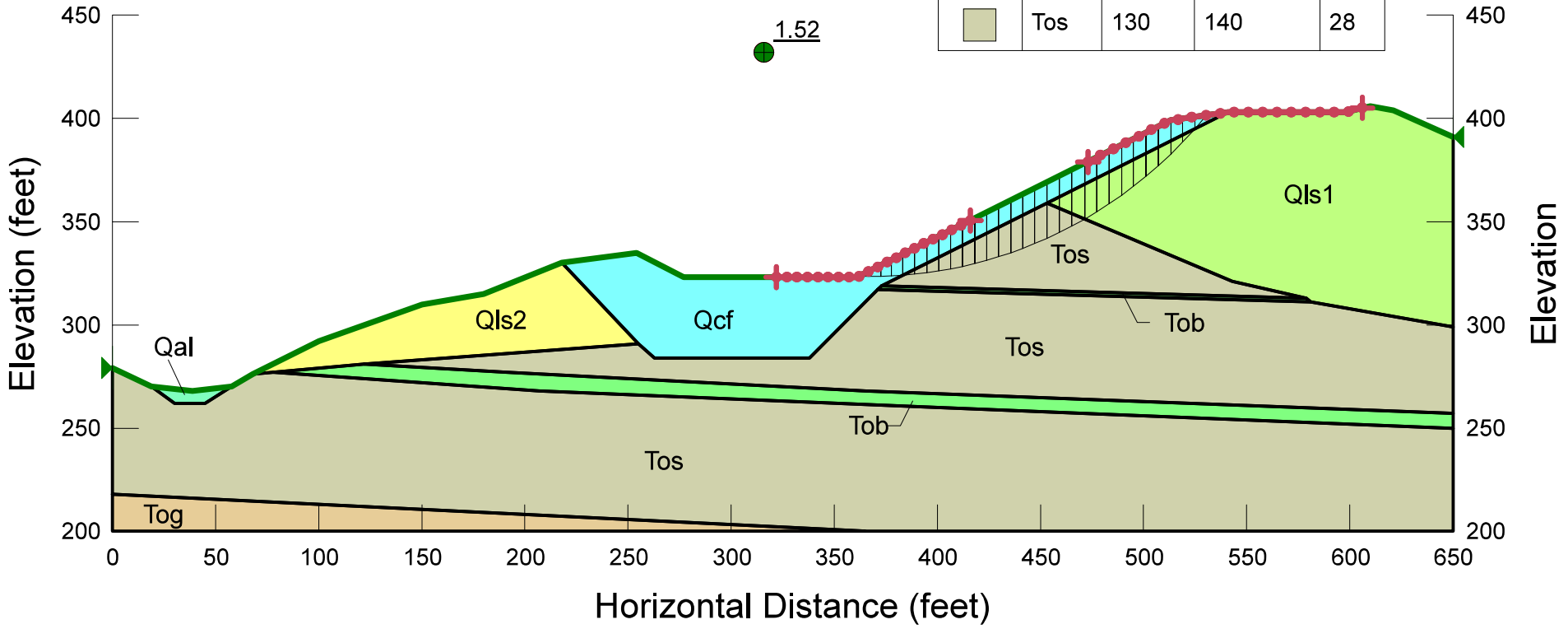


File Name: II1r(block).gsz

FIGURE E-11

Beyer Boulevard Extension
South Otay Mesa
Project No. 06847-42-03
Date: 03/28/2019
Cross Section I-I'

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Qal	125	200	25
	Qcf	130	500	34
	Qls1	125	135	31
	Qls2	125	135	31
	Tob	130	560	16
	Tog	130	360	25
	Tos	130	140	28



File Name: II1r (1).gsz

FIGURE E-12

APPENDIX F

APPENDIX F

RECOMMENDED GRADING SPECIFICATIONS

FOR

SOUTHWEST VILLAGE
VESTING TENTATIVE MAP
SAN DIEGO, CALIFORNIA

PROJECT NO. 06847-42-03

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, and/or adverse weather result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9

and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition

4. CLEARING AND PREPARING AREAS TO BE FILLED

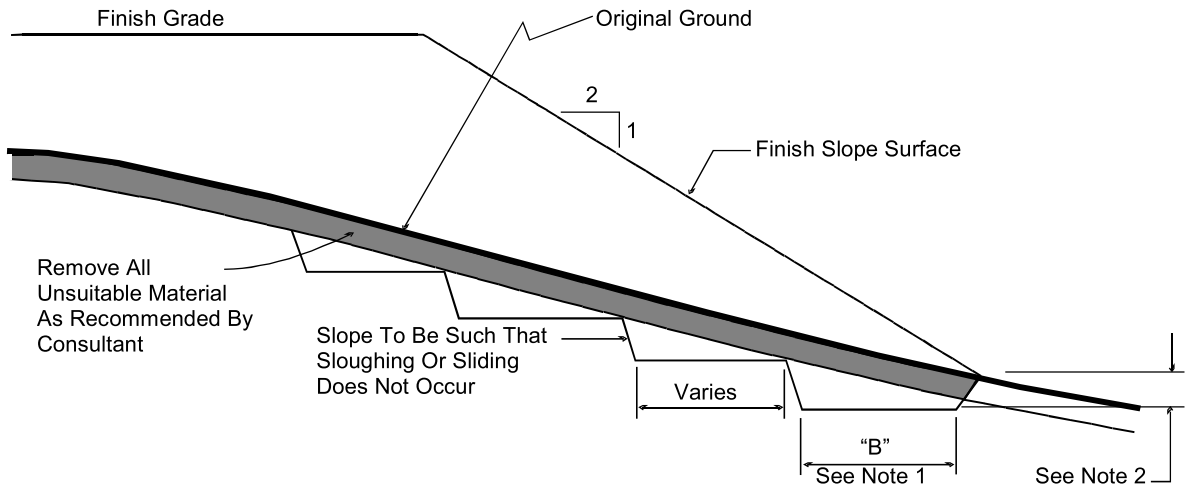
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



No Scale

DETAIL NOTES: (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection

variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

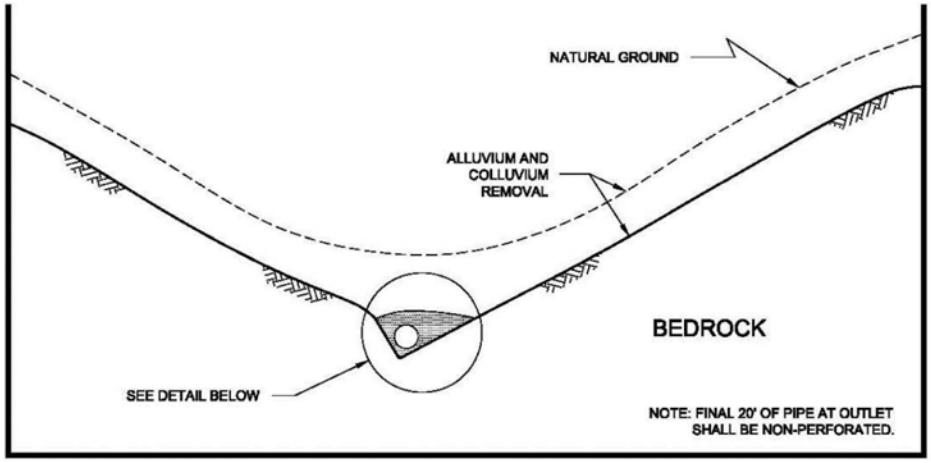
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

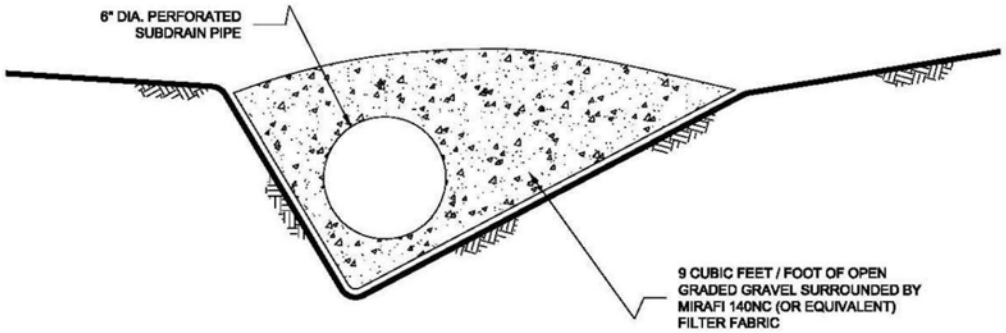
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. SUBDRAINS

7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

TYPICAL CANYON DRAIN DETAIL





NOTES:

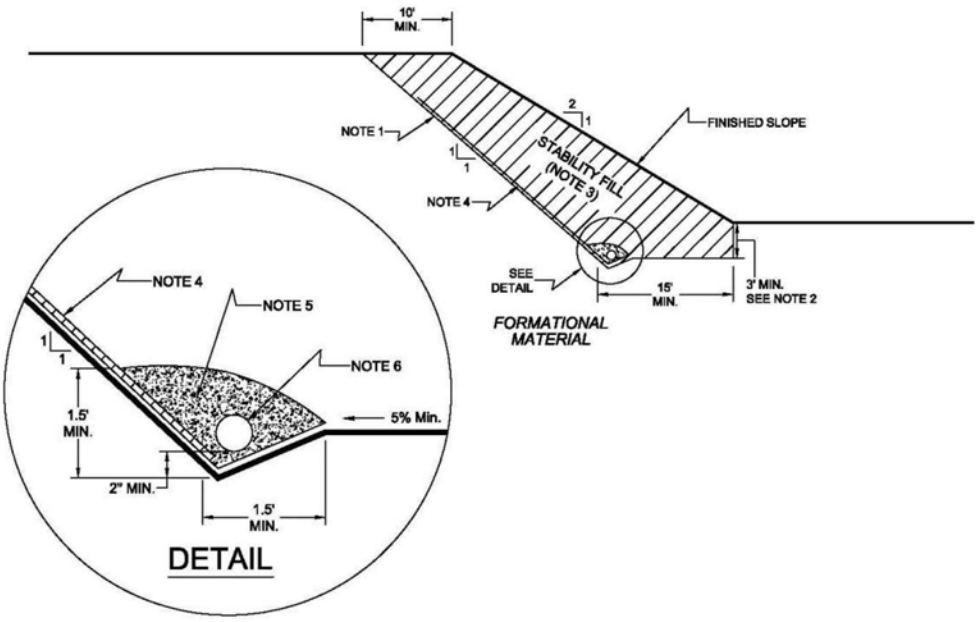
1.....6-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS
IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2.....6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS
LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or lager) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2.....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

NO SCALE

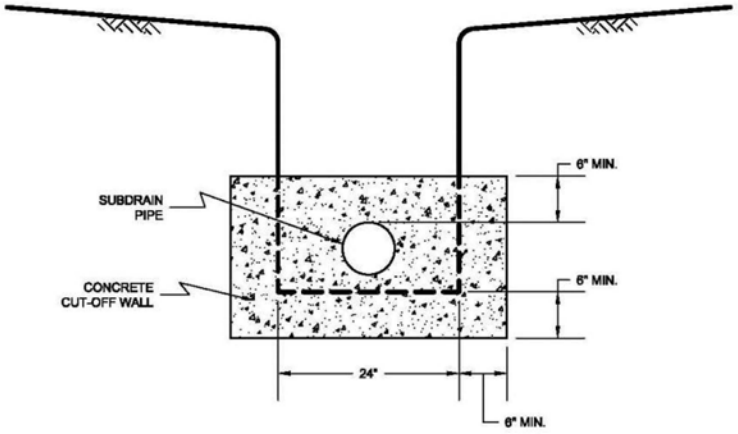
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

7.4 *Rock* fill or *soil-rock* fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock* fill drains should be constructed using the same requirements as canyon subdrains.

7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

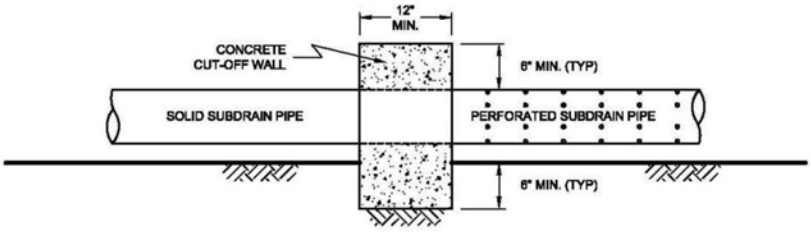
TYPICAL CUT OFF WALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW

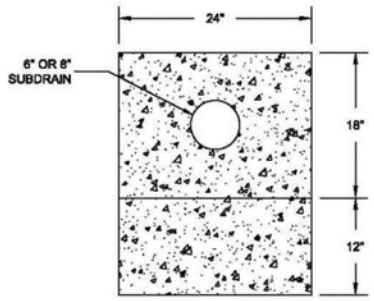


NO SCALE

7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

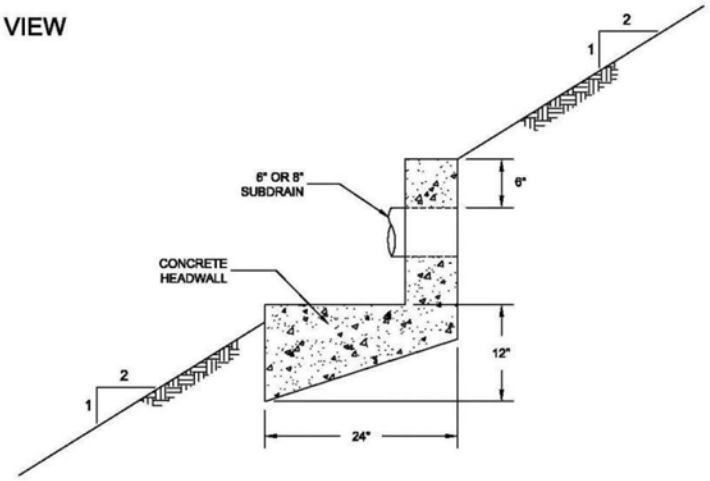
TYPICAL HEADWALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW



NOTE: HEADWALL SHOULD OUTLET AT TOE OF FILL SLOPE OR INTO CONTROLLED SURFACE DRAINAGE

NO SCALE

7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an "as-built" map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

8. OBSERVATION AND TESTING

8.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

8.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.

8.6 Testing procedures shall conform to the following Standards as appropriate:

8.6.1 Soil and Soil-Rock Fills:

8.6.1.1 Field Density Test, ASTM D 1556, *Density of Soil In-Place By the Sand-Cone Method.*

8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop.*

8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test*.

9. PROTECTION OF WORK

9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

10. CERTIFICATIONS AND FINAL REPORTS

10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

10.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

LIST OF REFERENCES

1. Abbott, P. L. and J. A. May, *Eocene Geologic History San Diego Region,* SEPM, Pacific Section, 1991.

2. --------, P. L., *Geologic Excursions in the Southern California Area,* Department of Geological Sciences, San Diego State University, San Diego, California, 1979.

3. Anderson, J. G., *Synthesis of Seismicity and Geologic Data in California,* U.S. Geologic Survey Open-File Report, 84-424, 1984, pp. 1-186.

4. *City of San Diego Seismic Safety Study, Geologic Hazards and Faults*, 2008 Edition.

5. California Geological Survey, formerly Division of Mines and Geology, *Landslide Hazards in the Southern Part of the San Diego County Metropolitan Area, San Diego County, California,* DMG Open-File Report 95-03, 1995.

6. Campbell, K. W., Y. Bozorgnia, *NGA Ground Motion Model for the Geometric Mean Horizontal Component of PGA, PGV, PGD and 5% Damped Linear Elastic Response Spectra for Periods Ranging from 0.01 to 10 s*, Preprint of version submitted for publication in the NGA Special Volume of Earthquake Spectra, Volume 24, Issue 1, pp. 139-171, February 2008.

7. California Geological Survey, *Seismic Shaking Hazards in California,* Based on the USGS/CGS Probabilistic Seismic Hazards Assessment (PSHA) Model, 2002 (revised April 2003). 10% probability of being exceeded in 50 years. http://redirect.conservation.ca.gov/cgs/rghm/pshamap/pshamain.html

8. Geocon Incorporated, *Geotechnical Investigation, Intermodal Transportation Center, San Ysidro, California*, dated May 21, 2001 (Project No. 06637-32-01).

9. Geocon Incorporated, *Geotechnical Feasibility Study, South Otay Mesa Property, San Diego, California*, dated October 4, 2002 (Project No. 06847-42-01).

10. Geocon Incorporated, *Geotechnical Investigation, Beyer Boulevard Extension, Otay Mesa Community Plan Amendment, San Diego, California,* dated May 10, 2006 (Project No. 07254-42-02).

11. Geocon Incorporated, *Update to Geotechnical Feasibility Study, Pipitone Lot Split – Parcel 2, South Otay Mesa Property, San Diego, California*, dated July 17, 2013 (Project No. 06847-42-02).

12. Geotechnics Incorporated, *Geotechnical Constraints, Beyer Boulevard Extension, Moody Canyon, San Diego, California,* dated May 4, 2004.

13. Jennings, C. W., *Fault Activity Map of California and Adjacent Areas,* California Geologic Survey, formerly Division of Mines and Geology, 1975 (revised 1987).

LIST OF REFERENCES (Concluded)

14. Kennedy, M. P., *Geology of the San Diego Metropolitan Area, California,* Bulletin 200, California Geological Survey, formerly Division of Mines and Geology, 1975.

15. Kennedy, M. P. and S. S. Tan, *Geologic Map of the San Diego 30'x60' Quadrangle, California*, USGS Regional Map Series Map No. 3, Scale 1:100,000, 2005.

16. Risk Engineering, *EZ-FRISK (version 7.65)*.

17. San Diego Association of Geologists, *Geology of Southwestern San Diego County, California and Northwestern Baja California,* edited by Gregory T. Ferrand, 1976.

18. San Diego Geotechnical Consultants, *Preliminary Geotechnical Investigation, Beyer Hill Park Apartments, San Diego, California,* dated June 8, 1988.

19. USGS (2014), *U.S. Seismic Design Maps Web Application (version 3.1.0)*, http://earthquake.usgs.gov/designmaps/us/application.php.

20. USGS (2016)*, Quaternary Fault and Fold Database of the United States:* U.S. Geological Survey website, http://earthquakes,usgs.gov/hazards/qfaults.

21. Unpublished reports, aerial photographs, and maps on file with Geocon Incorporated.

22. Wesnousky, S. G., *Earthquakes, Quaternary Faults, and Seismic Hazard in California,* Journal of Geophysical Research, Vol. 91, No. B12, 1986, pp. 12, 587, 631.