UPDATE
GEOTECHNICAL REPORT

CASTLEROCK
SAN DIEGO, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
CONSULTANTS

PREPARED FOR

PARDEE HOMES
SAN DIEGO, CALIFORNIA

MAY 5, 2006
PROJECT NO. 06696-42-01

GEOCON
INCORPORATED

GEOTECHNICAL CONSULTANTS

Project No. 06696-42-01
May 5, 2006

Pardee Homes
12626 High Bluff Drive, Suite 100
San Diego, California 92130

Attention: Mr. Allen Kashani

Subject: CASTLEROCK
SAN DIEGO, CALIFORNIA
UPDATE GEOTECHNICAL REPORT

Reference: *Geotechnical Investigation, Castlerock, San Diego, California*, prepared by Geocon Incorporated, dated July 14, 2003

Gentlemen:

In accordance with your request, we have prepared this update geotechnical report. The purpose of this report is to provide updated recommendations specific to the latest version of the 100-scale plan prepared by Latitude 33 Planning and Engineering.

Based on our review, the site is considered feasible for development as planned. As stated previously (reference), geotechnical considerations include the presence of the Friars Formation and potential landslides that are common in this formation and compressible soil deposits in the lower lying areas of the property. The accompanying report presents 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,

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UPDATE GEOTECHNICAL REPORT

1. PURPOSE AND SCOPE

This report updates the results of our previous geotechnical investigation for Castlerock, a planned residential subdivision in the East Elliott Community located north of Mast Boulevard in the eastern portion of San Diego, California (see Vicinity Map, Figure 1). The purpose of the investigation was to identify the site soil and geologic units, and any potential geologic hazards (i.e., landslides, faults, compressible soils) that could impact proposed development. This report summarizes the results of our investigation and provides recommendations for constraints identified, and general grading and development recommendations with respect to geotechnical engineering aspects of project development.

The scope of work for our geotechnical investigation included the following:

- Review published geologic literature, aerial photographs and documents for identifying site geology and potential geologic hazards.
- Surface mapping of exposed geology by an engineering geologist.
- Performing a field subsurface exploration comprised of backhoe trenches and one large diameter boring.
- Performing laboratory testing on soil samples obtained from exploratory excavations to determine pertinent soil properties of the prevailing soil conditions encountered.
- Performing engineering analyses to evaluate slope stability of proposed cut slopes and to determine preliminary foundation design criteria.
- Providing preliminary recommendations for site grading, excavation characteristics and remedial grading measures to mitigate unstable or unsuitable soil conditions.

The field investigation was conducted between April 16 and April 21, 2001 and consisted of a site reconnaissance, geologic field mapping by an engineering geologist, excavation of 64 exploratory backhoe trenches and 1 large diameter boring. Trenches were excavated to assist in defining geologic contacts, establishing the thickness of surficial soil deposits requiring remedial grading and to obtain soil samples. The large diameter boring was excavated in the vicinity of a large planned cut slope in the Friars Formation to observe soil conditions and identify zones that may impact slope stability. Details of the field investigation including trench and boring logs are presented in Appendix A. The approximate mapped limits of the on-site geologic units and locations of exploratory excavations are depicted on the Geologic Map (Figure 2, map pocket).

Laboratory tests were performed on selected representative soil samples obtained during the field investigation to determine soil physical properties. Laboratory test results were used in engineering analyses to assist in providing conclusions and recommendations for development of the property. A description of the tests performed and test results are summarized in Appendix B.

An updated geologic map has been prepared and is enclosed as Figure 2 (map pocket). The base map used to depict the soil and geologic conditions consisted of an AutoCad file of the Tentative Map prepared by Latitude 33 Planning and Engineering, provided to us on April 24, 2006. The geologic map has been copied at a scale of 1 inch equals 100 feet and depicts the configuration of the property, proposed development (grading), mapped geologic contacts, recommended subdrain locations and the approximate locations of the large diameter boring and trenches.

Conclusions and recommendations presented herein are based on an analysis of data obtained from our review of geologic literature, soil and geologic conditions encountered during the field investigation, experience with similar soil and geologic conditions on this and nearby properties and proposed grading per the planned Tentative Map.

2. SITE AND PROJECT DESCRIPTION

The site is an approximately 200-acre elongate parcel located in the southeast portion of former USMC Camp Elliott in the eastern portion of Kearny Mesa in the City of San Diego (See Vicinity Map, Figure 1). The site is bordered to the east by a residential area of Santee and Sycamore Canyon drainage, to the north by natural hills and Quail Canyon, to the west by hillsides and Little Sycamore Canyon and to the south by Mast Boulevard.

Topographically, a north-south trending promontory ridge dissected by a series of northwest-to-southeast and north-to-south draining steep-sided canyons and tributary arroyos characterize the site. All drainages are tributary to the San Diego River valley less than one-half mile to the south. Elevations vary from a high of approximately 700 feet Mean Sea Level (MSL) on the ridge top in the southwest portion of the property to a low of approximately 390 feet MSL in a drainage along the east side of the property boundary. Vegetation consists predominately of native weeds and grasses on the lower elevation more gently sloping areas and native shrubbery on the steeper hillsides.

Existing improvements include an SDG&E substation and a 100-foot-wide easement in the south-central portion of the site, a storm drain inlet structure at the base of Quail Canyon in the northeast corner and an embankment placed across Quail Canyon upstream of the storm-drain inlet and proposed development limits. Numerous dirt roads and trails traverse the property.

Review of the proposed Tentative Map indicates site development will consist of mass grading the property to construct a residential subdivision comprised of 288 single-family residential building pads. Numerous multi-family residential structures are planned in the south and western portion of the site. Primary access to the pads will be via a main loop street in the northern portion that connects to a main street with entry off Mast Boulevard. Widening of Mast Boulevard will also occur to create acceleration and deceleration lanes and right turn lanes for entry and exit to the project. Grading will generally consist of excavating a slope into the native hillside along the western edge of the property and placing the excavated materials along the eastern lower lying portions to create the pads and streets. Slopes are proposed at inclinations of 2:1 (horizontal:vertical) with maximum heights on the order of 90 feet.

The locations and descriptions of the site and proposed development are based on a site reconnaissance, review of geologic literature and our understanding of site development as shown on the Tentative Map. If project details vary significantly from those described, Geocon Incorporated should be contacted to review the changes and provide additional analyses and/or revisions to this report, if warranted.

3. SOIL AND GEOLOGIC CONDITIONS

Five surficial soil deposits and four geologic formations were encountered and/or mapped during our field investigation. Surficial soil deposits include artificial fill, colluvium/topsoil, alluvium, debris flows and landslide debris. Formational units include Quaternary-age terrace deposits, Eocene-age Stadium Conglomerate and Friars Formation. A Cretaceous-age plutonic unit known as the Cuyamaca Gabbro underlies the sedimentary units. The mapped limits of the surficial and formational units are shown on the Geologic Map (Figure 2, map pocket). Each of the surficial soil types and geologic units are described below in order of increasing age.

3.1 Artificial Fill (Qaf)

Artificial fill (presumed as undocumented) was encountered at several locations across the site. The largest deposit is an irregular-elongate fill associated with the relatively level pad at the SDG&E substation in the south-central portion of the site. This fill is approximately 20 to 30 feet thick and assumed to have been constructed as a structural fill for support of the substation. A fill embankment impounding water exists in the main canyon drainage (Quail Canyon) at the northern end of the property. Other fill accumulations present on the site and associated with numerous unimproved dirt roads that cross the site and with Mast Boulevard along the southern margin of the site. Fill materials mapped generally consist of a mixture of loose to medium dense, silty/clayey sand containing abundant gravel, cobble and boulders. The existing fills, other than the SDG&E substation pad, are considered unsuitable for support of new fill or structural loads in their present condition and will require removal and recompaction within planned grading limits.

3.2 Colluvium/Topsoil (Qcol)

Colluvial deposits are mapped in the gentle low lying slope areas near alluvial drainages primarily overlying the Friars Formation, but were noted to cap Terrace Deposits in the eastern and northeastern portion of the site. These deposits are indistinguishable from blanketing topsoil other than typically being thicker and due to similar consistency were logged as colluvium where it overlies the formational deposits as well. The colluvium/topsoil consists of soft to stiff sandy clay, and is porous, poorly consolidated and typically highly expansive. Colluvium/topsoil will require removal and recompaction within areas of planned development.

3.3 Alluvium (Qal)

Alluvium is within the main drainages and tributary channels on the site. The alluvium consists of relatively loose/soft, silty to clayey sands and sandy clays with varying amounts of cobble. Alluvium varied in thickness from approximately 4 feet to 6 feet in tributary canyons to greater than 12 feet in main drainages. The alluvium is considered compressible and will require complete removal and recompaction within areas of proposed grading.

3.4 Debris Flow Materials (Qdf)

Debris flow materials were mapped at the heads of alluvial drainages in the central portion of the site. An evaluation of site geomorphology suggests that debris flow deposits originated from the higher elevation steep slopes within Stadium Conglomerate and followed pre-existing alluvial channels radiating from the south end of a high ridge along the western margins of the site. The majority of the debris-flow materials are located within the upper parts of drainages and consist of silty/clayey sandy gravel and cobble deposits. Exploratory trenches in the debris flows indicated depths in excess of 17 feet. Debris flow materials will be encountered in a cut slope in the central portion of the site (See Geologic Cross-Section D-D' and E-E'). Construction of a stability fill will be required to stabilize the uphill portion of the debris flow in this area. Within planned grading limits, debris flow materials will require complete removal and replacement with properly compacted fill.

3.5 Landslide Debris (Qls)

Three ancient landslides were identified during this study. The presence of the landslides was determined primarily on geomorphic evaluation during the field investigation, interpretation of aerial photographs and topographic maps. Previous studies by Kennedy (1975), The City of San Diego (1995) and Tan (1995) also indicate a high susceptibility for landslides in these same mapped areas. The extent and distribution of the landslides is shown on the Geologic Map (Figure 2, map pocket). Based on our mapping, it appears that the landslide features occur near the Stadium Conglomerate/Friars Formation contact and/or on nonconformable contacts with the underlying Cuyamaca Gabbro. Two of the landslides are located directly within or above the proposed cut slope

along the western side of the property and will require stabilizing by constructing a buttress fill. The third landslide is mapped within proposed open-space beyond development limits in the northwest quadrant of the property. The apparent direction of movement of this landslide mass is not towards planned development and therefore this landslide is not considered as a risk to development.

3.6 Terrace Deposits (Qt)

Terrace deposits were encountered between approximate elevations of 420 feet MSL and 440 feet MSL in the northeastern portion of the property and typically form topographic benches. These deposits are considered to be fluvial in origin and consist of approximately horizontally bedded, dense, reddish-brown conglomeratic sandstone and clayey to sandy fine-grained cobble conglomerate. Terrace deposits are considered suitable for foundation and/or structural fill support in their present condition.

3.7 Stadium Conglomerate (Tst)

Eocene-age Stadium Conglomerate conformably overlies the Friars Formation at elevations ranging from approximately 470 feet MSL to 510 feet MSL. Geomorphically, the Stadium Conglomerate forms the characteristic resistant, dissected ridges within the upper elevations of the site. Localized, steeply eroded scars occur within this formation where debris flows originated at the head of tributary canyons. This deposit generally consists of cobble conglomerate horizontally bedded in dense to very dense, light yellowish-brown to orange-brown, sandy to clayey, coarse-grained sands with interbedded lenticular silty sandstone layers. Generally the majority of conglomerate materials possess a low expansion potential and good foundation bearing capacity characteristics and are suitable to use as capping material. However, isolated clayey portions of the soil matrix can posses a medium expansion potential.

The Stadium Conglomerate is known for requiring a moderately heavy to heavy ripping effort to efficiently excavate and also for randomly located well cemented zones. Where cemented zones are encountered a very heavy excavation effort will be required and will likely result in generating oversize materials.

3.8 Friars Formation (Tf)

The Eocene-age Friars Formation was deposited on an irregular erosion surface (nonconformity) formed on the Cuyamaca Gabbro, a plutonic crystalline basement rock of the Southern California Batholith. The Friars Formation consists of relatively flat-lying lagoonal and alluvial claystone, sandstone and conglomerate units. Interbedded dense to hard sandstone, siltstone and claystone occur at the site below approximate elevations 470 feet MSL to 510 feet MSL. Because of an irregular contact with the underlying Cuyamaca Gabbro, the Friars Formation varies in thickness from 0 feet to over 100 feet between the southwest leg of the property bordering Mast Boulevard and the eastern boundary of

the site (see Geologic Map, Figure 2). Where encountered in exploratory excavations, the Friars Formation consisted predominately of dense to very dense silty sand with interbedded layers of siltstone and claystone. Weaker claystone zones were encountered in Boring No. 1 in the vicinity of the large cut slope proposed in the southwest portion of the site.

Bedding-plane shears are relatively common within the Friars Formation and are significant in that they represent inherent planes of weakness within the formation. As the term implies, these shear zones are typically parallel to the bedding and are characterized by thin seams of very soft, wet, remolded plastic clay. In the event that bedding plane shears are encountered during site grading in cut slopes where buttressing is not anticipated, stabilization measures may be required. All cut slopes and fill slope keyway excavations within the Friars Formation should be evaluated by an engineering geologist during grading to verify the absence of bedding plane shears.

3.9 Cuyamaca Gabbro (Kc, Kcw)

Late Jurassic to early Cretaceous-age Cuyamaca Gabbro, a plutonic, granitic-textured rock of the Southern California Batholith is exposed at the surface and in road cuts on the north side of Mast Boulevard, and in the central and southwestern portions of the property. As indicated previously, the irregular contact with the Friars Formation is inclined eastward, suggesting an old erosion surface toward Sycamore Canyon and the San Diego River valley. Field classification indicates that the Gabbro can be subdivided into two units; relatively unweathered very strong gray bouldery outcrops (Kc) and deeply weathered brown decomposed weak to moderately strong material forming smooth, lower-elevation slopes (Kcw). Cut slopes excavated in gabbroic rocks should be stable if free from adversely oriented fractures and/or joints. According to Larsen (1948), the Gabbro rock is more deeply weathered than granitic rock. Experience on a nearby project in similar rock showed this to be true. The soils derived from this unit typically exhibit high shear strength characteristics and low expansion potential and should provide good foundation support in either a natural or properly compacted state.

4. GROUNDWATER

Groundwater or evidence for a permanent groundwater table at shallow depths was not encountered during our field investigation. Heavy seepage was noted in Trench 48 excavated within alluvium in the main canyon drainage at the north end of the property. Dependent upon the time of year grading occurs, subsurface seepage, perched water, and wet soil conditions may exist along any of the lower elevation drainages, especially those in the northern portions, including Quail Canyon where a breached embankment formerly retained seasonal runoff. Depending upon seasonal conditions at the time of grading, some dewatering and/or use of specialized equipment may be required to excavate the surficial soils.

Subsurface drainage systems should be installed at the base of the major drainages or other lower-elevation cleanouts to preclude the buildup of water within proposed fill areas. Groundwater is not anticipated to adversely impact the proposed grading or development.

5. GEOLOGIC STRUCTURE

Examination of 1953 aerial photography of the site (see *List of References*) and the state geologic map of this area (Kennedy, 1975) suggest near-horizontal bedding and/or a regional dip to the west of approximately 2 degrees. A limited number of outcrop exposures and geomorphic features observed during our field investigation concur with the above, suggesting an overall favorable geologic structure with respect to the generally eastward-sloping terrain.

Review of Sheet No. 33 of the City of San Diego *Seismic Safety Study, Geologic Hazards and Faults, 1995 Edition* indicates the site is situated within hazard categories 22, 23 and 53. The majority of the steeper hillsides along the west side of the property and the area along the southeast corner mapped as Cuyamaca Gabbro fall within Category 53 defined as *Level or sloping terrain, unfavorable geologic structure, Low to moderate risk.*

Several areas along the northeastern boundary are designated in category 22 defined as *Landslides, possible or conjectured.* Evidence obtained during the field investigation (trench excavations) within these areas show that these suspected landslides do not exist and that the topographic benches or topography suggestive of potential landslides is related to colluvium over fluvial Terrace Deposits and/or topography associated with nonconformable contacts between the Friars Formation and the underlying Cuyamaca Gabbro. As discussed previously, three ancient landslides were mapped, but were west of those shown on the Seismic Safety Element.

The central portion of the property is situated in Category 23, defined as *Slide Prone Formations, Friars; neutral or favorable geologic structure.*

6. GEOLOGIC HAZARDS

6.1 Faulting and Seismicity

Based upon a review of published geologic literature and observations during our site reconnaissance, it is the opinion of Geocon Incorporated that no known active faults exist on the site. Review of the *City of San Diego, Seismic Safety Study, Geologic Hazards and Faults, Sheet No. 39 (1995 Edition)* indicates no faults or fault-extensions for several miles radius of the site.

The nearest active fault to the site is the Rose Canyon Fault, located approximately 12 miles to the west-southwest. Portions of the Rose Canyon Fault are located within an Alquist-Priolo Earthquake Fault zone. This site is not situated within such a zone. Historically, the Rose Canyon fault has exhibited low seismicity with respect to earthquakes in excess of Magnitude 5.0 or greater. Major earthquakes occurring on the Rose Canyon Fault or other regional active faults could subject the site to moderate to severe ground shaking within the life span of the proposed structures.

The distance of known faults to the site was determined using EQFAULT (Blake, 1989a, updated 2000), a computer program that performs a deterministic analysis using known active fault locations that have been digitized in an earthquake catalog. A search radius of 100 miles was specified in the analysis and 38 known active faults were identified. Principle references used by EQFAULT in selecting faults to be included were Jennings (1975), Anderson (1984) and Wesnousky (1986). The program estimates maximum ground accelerations and our analysis used attenuation relationships developed by Sadigh (1997).

Results of the deterministic analysis indicate the Rose Canyon Fault zone, the Coronado Banks and the Elsinore Fault Zone are the dominant sources for potential ground motion at the site. The Rose Canyon Fault Zone is postulated as having the potential to generate a maximum earthquake Magnitude 6.9 event with a corresponding maximum peak site acceleration of 0.19g. Presented in the following table are deterministic earthquake events and calculated peak site accelerations for the faults considered most likely to subject the site to ground shaking.

TABLE 6
DETERMINISTIC SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude	Peak Site Acceleration
Rose Canyon Fault Zone	12.2	6.9	0.19
Coronado Bank	25.2	7.4	0.14
Elsinore–Julian	28.7	7.1	0.09
Newport-Inglewood	31.9	6.9	0.08
Earthquake Valley	33.6	6.5	0.05
Elsinore-Temecula	36.0	6.8	0.06

The site could be subjected to significant shaking in the event of a major earthquake on any of the faults listed above or other regional faults in the southern California or northern Baja California area. Structures should be designed in accordance with seismic design criteria of the current Uniform Building Code and/or local ordinances.

6.2 Liquefaction

The potential for liquefaction during a strong earthquake is limited to those soils that are in a relatively loose, unconsolidated condition and located below the groundwater table. Removal and recompaction of the alluvial soils within development areas and the use of subdrains within canyon fill areas is recommended to mitigate the potential for liquefaction of the alluvium. Due to the relatively high density and grain-size distribution characteristics of the formational materials at the site, along with the absence of a permanent water table within the proposed developed areas, the risk of seismically induced soil liquefaction occurring at the property is considered very low.

6.3 Landslides

Three areas of potential landslides were mapped on the property, as described previously. Of the three mapped, two are situated within or above a proposed cut slope along the west side of the property. The third landslide is located within proposed open-space area and is not considered to be an adverse impact to the development. The two landslides within proposed grading will require stabilization with drained buttress fills. Discussions pertaining to the landslides and recommendations are presented in the *Conclusions and Recommendations* Section and in Appendix C.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 No soil or geologic conditions were encountered during our investigation that would preclude the development of the property as presently planned provided the recommendations of this report are followed.

7.1.2 The surficial soils (artificial fill, colluvium/topsoil, alluvium and debris flow materials) are not considered suitable for the support of fill or structural loads in their present condition and will require removal and recompaction. The observed thickness of surficial soils varies from approximately 4 feet to greater than 17 feet.

7.1.3 Perched groundwater and/or seepage was observed in alluvium in one of the main drainages (Trench No. 48). Remedial grading of surficial deposits along the edges of drainages may encounter wet materials resulting in possible excavation and fill placement difficulties. Dependent upon the time of year grading occurs, some dewatering of alluvium may be required in order to remove compressible deposits. Overly wet materials may require spreading and drying and/or mixing with drier materials to reduce the moisture content so that compaction can be achieved.

7.1.4 Two landslides were mapped during our study that will require stabilization using drained, compacted earth buttresses. The locations of the landslides and proposed buttresses are shown on the Geologic Map (Figure 2, map pocket). In addition, stabilization fills to mitigate surficial instability due to claystone beds in the Friars Formation will be required along the southwest cut slopes. Proposed stability fills are also shown on Figure 2.

7.2 Seismic Design Criteria

7.2.1 The following table summarizes site-specific design criteria obtained from the 1997 Uniform Building Code (UBC). The values listed in Table 7.2 are for the Rose Canyon Fault (located approximately 6 miles west of the site) which is identified as a Type B fault and is more dominant that the nearest Type A fault due to its close proximity.

TABLE 7.2
SEISMIC DESIGN PARAMETERS

Parameter	Value (cut lots)	Value (fill lots)	UBC Reference
Seismic Zone Factor, Z	0.4	0.4	Table 16-I
Soil Profile Type	S_C	S_D	Table 16-J
Seismic Coefficient, C_a	0.40	0.44	Table 16-Q
Seismic Coefficient, C_v	0.56	0.64	Table 16-R
Near Source Factor, N_a	1.0	1.0	Table 16-S
Near Source Factor, N_v	1.0	1.0	Table 16-T
Seismic Source	B	B	Table 16-U

7.3 Soil and Excavation Characteristics

7.3.1 The soil conditions encountered vary from low expansive, silty sands to high-expansive clayey colluvium/topsoil, alluvium and claystones/siltstones in the Friars Formation.

7.3.2 Soluble sulfate testing was conducted on selected samples of the on-site soils encountered during the field investigation. The test results indicate very low sulfate content with a corresponding *negligible* sulfate rating as defined by UBC Table 19-A-4. Additional sulfate testing should be conducted on finish grade soil samples to determine the sulfate content of materials that will be in direct contact with concrete.

7.3.3 Excavation within the surficial deposits will require a light to moderate effort with conventional heavy-duty earthmoving equipment. Excavation of the formational units will require a moderate to heavy effort. Where cemented zones are encountered within geologic units, excavation will require heavy to very heavy ripping. Oversize concretions and cemented chunks generated during excavations will require special handling and placement in fill areas. Excavation of the proposed cut slope in weathered Cuyamaca Gabbro will require a heavy to very heavy effort and some isolated blasting.

7.3.4 Excavation of alluvium within canyon drainages may encounter very moist to saturated soil conditions dependent upon the time of year grading is performed and seasonal conditions. If saturated soils are encountered, excavations may require special equipment (i.e. excavators or swamp cats) to completely remove compressible soils. Overly wet soils generated during these excavations will require mixing with drier material to achieve suitable moisture content prior to placement and compaction.

7.4 Subdrains

7.4.1 Subdrains are recommended to mitigate the potential for adverse impacts associated with potential seepage conditions and to collect perched water that migrates along the contact between natural ground and fill surfaces. A typical canyon subdrain detail and the recommended subdrain locations are shown on the Geologic Map (Figure 2, map pocket)

7.4.2 The final segment of subdrain pipe should consist of non-perforated drainpipe. At the non-perforated/perforated connection, a seepage cutoff wall should be constructed in accordance with the typical detail shown on Figure 2. The subdrains should outlet into storm drain structures or controlled concrete drainage brow ditches. Recommended subdrain discharge points are shown on Figure 2.

7.4.3 The final grading plans should show the location of all proposed subdrains. Upon completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an "as-built" map depicting surveyed locations and elevations of the drainpipes.

7.5 Grading

7.5.1 All grading should be performed in accordance with the *Recommended Grading Specifications* contained in Appendix D. **Where the recommendations of Appendix D conflict with this section of the report, the recommendations of this section take precedence**.

7.5.2 Prior to commencing grading, a preconstruction conference should be held at the site with the owner 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.

7.5.3 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 soil to be used for fill is relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

7.5.4 Compressible surficial soils (artificial fill, colluvium/topsoil, alluvium, and debris-flow materials) within areas of planned grading should be removed to firm natural ground and properly compacted prior to placing additional fill and/or structural loads. The actual extent of unsuitable soil removals should be determined in the field by the soil engineer and/or engineering geologist. Overly wet surficial materials, where encountered, will require drying and/or mixing with drier soils to facilitate proper compaction.

7.5.5 After removal of unsuitable material, as recommended above, the base of overexcavations and natural ground surfaces to receive fill should be scarified approximately 12 inches moisture conditioned and compacted.

7.5.6 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 material. 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 maximum dry density at or slightly above optimum moisture content, as determined in accordance with ASTM Test Procedure D 1557-02. Fill areas with in-place density test results indicating moisture contents less than optimum will require additional moisture conditioning prior to placing additional fill.

7.5.7 Excavations in cemented zones of the formational units will likely result in the generation of oversize rock chunks. Oversized materials can be placed in fill areas in accordance with the recommendations contained within the *Recommended Grading Specifications* in Appendix D. Oversize materials (rocks or hard lumps in excess of 12 inches in least dimension) should be kept at least 10 feet below proposed finish grade within building pads and at least 3 feet below the deepest utility within street right of ways.

7.5.8 It is recommended that the cut portion of cut-fill residential lots be undercut to a depth of at least 3 feet below pad subgrade elevations and replaced with properly compacted *low* (Expansion Index of 50 or less) expansive fill soil. The undercut should extend back into the fill portion of the lot a sufficient distance such that at least 3 feet of fill exists on the entire pad.

7.5.9 The upper 3 feet of fill within residential building pads and 12 inches within street right-of-ways should consist of granular, low expansive soil.

7.6 Slope Stability

7.6.1 Due to the presence of the Friars Formation and weaker clay zones encountered in exploratory excavations, detailed slope stability analyses were performed to evaluate stability of the cut slope along the western side of the property. Eight geologic cross-sections were generated along the proposed slope and evaluated. Cross-sections were placed based on location of mapped landslides and debris flows as well as in the Friars Formation. A detailed discussion pertaining to and results of the analyses are presented in Appendix C.

7.6.2 Construction of fill slopes should begin with excavation of a fill slope keyway in accordance with the Fill Slope Keyway detail shown in the *Recommended Grading Specifications* in Appendix D.

7.6.3 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 surficial sloughing. In general, soil with an Expansion Index of 90 or less will be acceptable in the outer slope zone.

7.6.4 Fill slopes should be overbuilt at least 3 feet and cut back to the design finish grades. Alternatively, fill slopes can be compacted by backrolling with a loaded sheepsfoot roller at vertical intervals not to exceed 4 feet and track-walked at the completion of each slope such that the fill soils are uniformly compacted to at least 90 percent relative compaction to the face of the finished sloped.

7.6.5 All cut slopes should be observed during grading by an engineering geologist to verify that soil and geologic conditions do not differ significantly from those anticipated. Should adverse conditions be exposed, appropriate recommendations can be provided at that time.

7.6.6 Two landslides were mapped that will require construction of drained buttress earth fills to stabilize the slide mass. The recommended location of the buttresses is shown on the Geologic Map (Figure 2, map pocket). Recommended buttress dimensions and details are depicted on the Geologic Cross-Sections (Figures 3 through 5, map pockets).

7.6.7 Clay seams and weak clay zones were encountered in the Friars Formation in the area of the proposed cut slope in the southwest portion of the site. Slope stability analyses indicate factors of safety greater than 1.5 for the proposed cut slope. However, the presence of the clay in the slope face may lead to future surficial instability. Therefore, stability fills are recommended for the cut slope where the weak clays are encountered. Recommended stability fill locations are shown on the Geologic Map (Figure 2, map pocket) and dimensions are shown on the Geologic Cross-Sections (Figures 3 through 5, map pockets).

7.6.8 All slopes should be landscaped with drought-tolerant vegetation, having variable root depths and requiring minimal landscape irrigation. In addition, all slopes should be drained and properly maintained to reduce erosion. Slope planting should generally consist of drought tolerant plants having a variable root depth. Slope watering should be kept to a minimum to just support the plant growth.

7.7 Terrace Drains

7.7.1 The use of terrace drains on cut or fill slopes exceeding 30 feet in height is not considered necessary to maintain gross stability of the slopes. Based on past experience with similar projects, properly-constructed and maintained terrace drains may reduce slope erosion, particularly on fill slopes. However, improperly-maintained terrace drains can result in significant slope erosion and possible slope distress. Terrace drains which are allowed to fill with debris may concentrate surface runoff down the slope face, resulting in deep, extensive erosion gullies. It is therefore recommended that the use of terrace drains planned for cut or fill slopes on the project be kept to a minimum, consistent with the general guidelines which follow.

7.7.2 For cut or fill slopes above developed lots, a terrace drain should be provided no higher than 40 feet above the toe of slope or alternatively a lined surface drain may be located along the toe of slope.

7.7.3 For cut or fill slopes above streets or non-building areas, terrace drains are not required.

7.7.4 All terrace drains should direct the flow of water into storm drains or other suitable drainage facilities. For daylight canyon fills, down-drains should be provided at the contact between fill and natural materials, to reduce erosion along the contact.

7.7.5 The above recommendations are presented as general guidelines only; other considerations may dictate the design of slope terrace drains. All terrace drains should be sized to accommodate the maximum flow of water anticipated from the drainage area above, under the design rainfall event.

7.7.6 It is recommended that terrace drains be constructed at a drainage gradient of at least 2 percent, and steeper, where practical. In addition, a maintenance program should be devised and followed, which clearly designates the persons or agencies responsible for maintaining terrace drains within specific areas.

7.8 Foundations

7.8.1 The foundation recommendations that follow are preliminary for use by project consultants to design building foundations. The recommendations are for one- or two-story residential structures and are separated into 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 recommended minimum foundation and interior concrete slab design criteria for each category is presented on Table 7.8.1.

TABLE 7.8.1
FOUNDATION RECOMMENDATIONS BY CATEGORY

Foundation Category	Minimum Footing Depth (inches)	Continuous Footing Reinforcement	Interior Slab Reinforcement
I	12	One No. 4 bar , top and bottom	No. 3 bars at 24 inches on center, both directions
II	18	Two No. 4 bars, top and bottom	No. 3 bars at 18 inches on center, both directions
III	24	Two No. 5 bars, top and bottom	No. 3 bars at 18 inches on center, both directions

CATEGORY CRITERIA

Category I: Maximum fill thickness is less than 20 feet and Expansion Index is less than or equal to 50.

Category II: Maximum fill thickness is less than 50 feet and Expansion Index is less than or equal to 90, or variation in fill thickness is between 10 feet and 20 feet.

Category III: Fill thickness exceeds 50 feet, or variation in fill thickness exceeds 20 feet, or Expansion Index exceeds 90, but is less than 130.

Notes:

1. All footings should have a minimum width of 12 inches.
2. Footing depth is measured from lowest adjacent subgrade.
3. All interior living area concrete slabs should be at least four inches thick for Categories I and II and 5 inches thick for Category III.
4. All interior concrete slabs should be underlain by at least 4 inches (3 inches for Category III) of clean sand or crushed rock.
5. All slabs expected to receive moisture sensitive floor coverings or used to store moisture sensitive materials should be underlain by a vapor barrier covered with at least 2 inches of the clean sand recommended in No. 4 above.
6. Garage slab reinforcement to consist of 6x6-10/10 welded wire mesh for Category I and II foundations and 6x6-6/6 welded wire mesh for Category III foundations.

7.8.2 Foundations for Category I, II, or III may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot (psf) (dead plus live load). The allowable bearing pressure can be increased by one-third for transient loads such as wind or seismic forces.

7.8.3 The use of isolated footings that are located beyond the perimeter of the building and support structural elements connected to the building is 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.

7.8.4 For Foundation Category III, the structural slab design should consider 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.

7.8.5 No special subgrade presaturation is deemed necessary prior to placing concrete, however, the exposed foundation and slab subgrade soils should be sprinkled, as necessary, to maintain a moist condition as would be expected in any such concrete placement.

7.8.6 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, 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.

- Where the height of the fill slope exceeds 20 feet, the minimum horizontal distance should be increased to H/3 (where H equals the vertical distance from the top of the slope to the toe) but need not exceed 40 feet. For composite (fill over cut) slopes, H equals the vertical distance from the top of the slope to the bottom of the fill portion of the slope. An acceptable alternative to deepening the footings would be the use of a post-tensioned slab and foundation system or increased footing and slab reinforcement. Specific design parameters or recommendations for either of these alternatives can be provided once the building location and fill slope geometry have been determined.

- For cut slopes in dense formational materials, or fill slopes inclined at 3:1 (horizontal:vertical) or flatter, the bottom outside edge of building footings should be at least 7 feet horizontally from the face of the slope, regardless of slope height.

- Although other improvements that 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 that would permit some lateral soil movement without causing extensive distress. Geocon Incorporated should be consulted for specific recommendations.

7.8.7 As an alternative to the foundation recommendations for each category, 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 (UBC Chapter 18, Div. III, §1816). Although this procedure was developed for expansive soils, it is understood that 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 the following table entitled *Post-Tensioned Foundation System Design Parameters* for the particular foundation category designated.

TABLE 7.8.2
POST-TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS

Post-Tensioning Institute (PTI) Design Parameters	Foundation Category		
	I	II	III
1. Thornthwaite Index	-20	-20	-20
2. Clay Type – Montmorillonite	Yes	Yes	Yes
3. Clay Portion (Maximum)	30%	50%	70%
4. Depth to Constant Soil Suction	7.0 ft.	7.0 ft.	7.0 ft.
5. Soil Suction	3.6 ft.	3.6 ft.	3.6 ft.
6. Moisture Velocity	0.7 in./mo.	0.7 in./mo.	0.7 in./mo.
7. Edge Lift Moisture Variation Distance	2.6 ft.	2.6 ft.	2.6 ft.
8. Edge Lift	0.41 in.	0.78 in.	1.15 in.
9. Center Lift Moisture Variation Distance	5.3 ft.	5.3 ft.	5.3 ft.
10. Center Lift	2.12 in.	3.21 in.	4.74 in.

7.8.8 UBC Chapter 18, Div. III, §1816 uses interior stiffener beams in its structural design procedures. If the structural engineer proposes a post-tensioned foundation design method **other than UBC Chapter 18, Div. III, §1816**, the following recommendations apply:

- The deflection criteria presented in Table 7.8.2 are still applicable.
- Interior stiffener beams be used for Foundation Categories II and III.
- The depth of the perimeter foundation should be at least 12 inches for Foundation Category I, 18 inches for Foundation Category II, and 24 inches for Foundation Category III.

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

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

7.8.10 Our experience indicates post-tensioned slabs may be susceptible to excessive edge lift, regardless of the underlying soil conditions, unless reinforcing steel is placed at the bottom of the perimeter footings and the interior stiffener beams. Current PTI design procedures primarily address the potential center lift of slabs but, because of the placement of the reinforcing tendons in the top of the slab, the resulting eccentricity after tensioning may reduce the ability of the system to mitigate edge lift. *The foundation system should be designed to reduce the potential for edge lift to occur*.

7.8.11 The recommendations of this report are intended to reduce the potential for cracking of slabs due to expansive soils (if present) and differential settlement of deep fills or fills of 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, particularly where re-entrant slab corners occur.

7.9 Retaining Walls and Lateral Loads

7.9.1 Retaining walls not restrained at the top 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 pounds per cubic foot (pcf). Where the backfill will be inclined at no steeper than 2.0 to 1.0, 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 possess an Expansion Index of 50 or less. For those lots with finish grade soils having an Expansion Index greater than 50 and/or where backfill materials do not conform to the above criteria, Geocon Incorporated should be consulted for additional recommendations.

7.9.2 Unrestrained walls are those that are allowed to rotate more than 0.001H at the top of the wall. Where walls are restrained from movement at the top, an additional uniform pressure of 7H psf (where H equals the height of the retaining wall portion of the wall in feet) should be added to the above active soil pressure.

7.9.3 All 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, etc.) is not recommended where the seepage could be a nuisance or otherwise adversely impact the property adjacent to the base of the wall. The above recommendations assume a properly

compacted granular (Expansion Index less than 50) backfill material with no hydrostatic forces or imposed surcharge load. If conditions different than those described are anticipated, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

7.9.4 In general, wall foundations having a minimum depth and width of one 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 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 anticipated.

7.9.5 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 natural soils. The allowable passive pressure assumes a horizontal surface extending 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. An allowable friction coefficient of 0.4 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.

7.9.6 The recommendations presented above are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 8 feet. In the event that walls higher than 8 feet or other types of walls are planned, such as crib-type walls, Geocon Incorporated should be consulted for additional recommendations.

7.10 Drainage and Maintenance

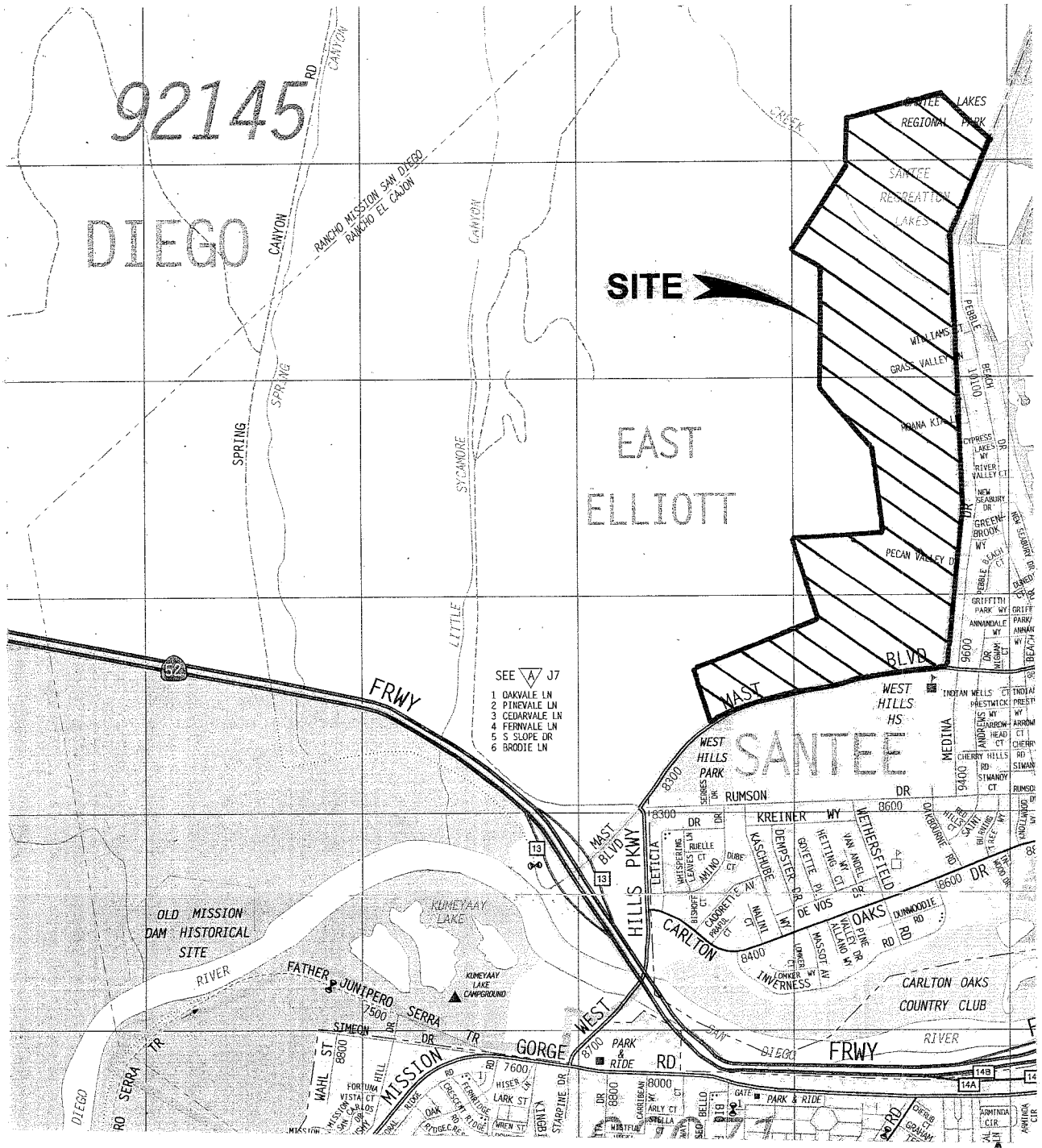
7.10.1 Good drainage is imperative to reduce the potential for differential soil movement, erosion and subsurface seepage. Positive measures should be taken to properly finish grade the building pads after the structures and other improvements are in place, so that the drainage water from the buildings, lots and adjacent properties is directed off the lots and to the street away from foundations and the top of the slopes. Experience has shown that even with these provisions, a shallow groundwater or subsurface water condition can and may develop in areas where no such water conditions existed prior to the site development; this is particularly true where a substantial increase in surface water infiltration results from an increase in landscape irrigation.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. 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.

2. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the 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.

3. 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.



SOURCE: 2003 THOMAS BROS. MAP
SAN DIEGO COUNTY, CALIFORNIA

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

JB/AML		DSK/E0000

VICINITY MAP

CASTLEROCK
SAN DIEGO, CALIFORNIA

DATE 05-05-2006	PROJECT NO. 06696 - 42 - 01	FIG. 1

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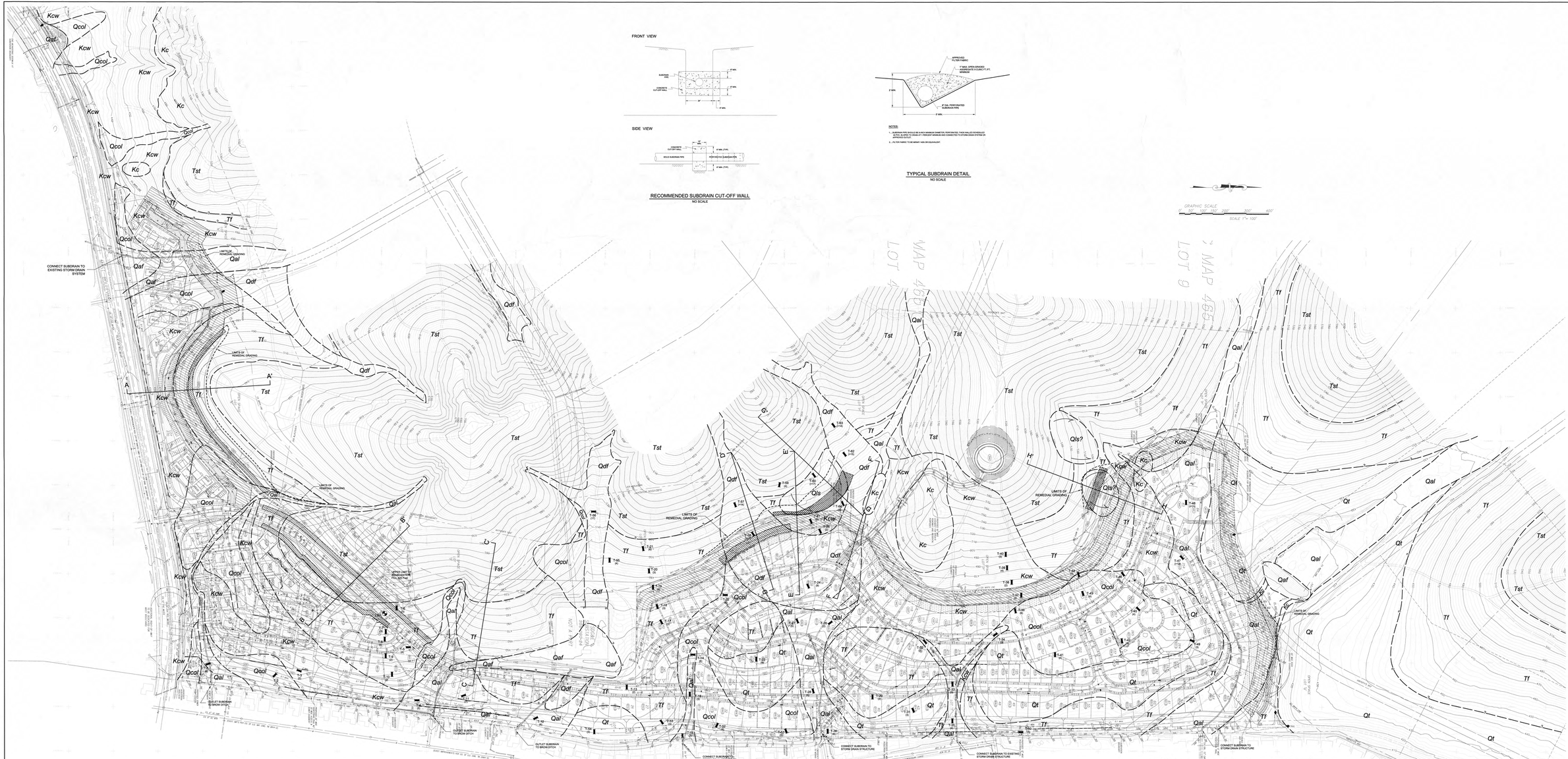
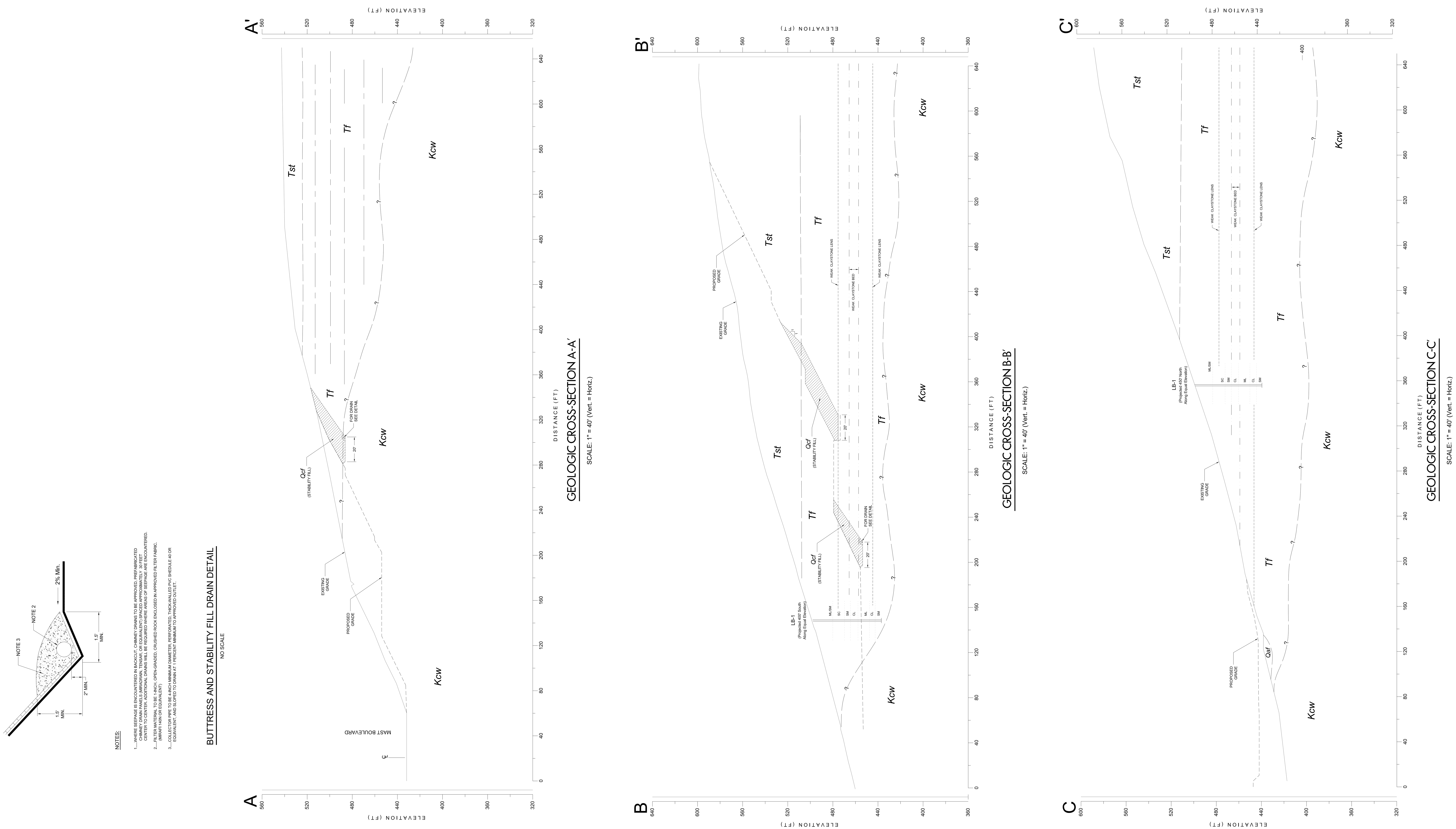

FRONT VIEW
SIDE VIEW
RECOMMENDED SUBDRAIN CUT-OFF WALL
NO SCALE
APPROVED FILTER FABRIC
6" MAX. OPEN-GRADED AGGREGATE IS CLASS 2 FILTER MATERIAL
6" DIA. PERFORATED SUBDRAIN PIPE
TYPICAL SUBDRAIN DETAIL
NO SCALE
GRAPHIC SCALE
SCALE 1" = 100'
CONNECT SUBDRAIN TO EXISTING STORM DRAIN SYSTEM
OUTLET SUBDRAIN TO BROW DITCH
CONNECT SUBDRAIN TO STORM DRAIN STRUCTURE
LIMITS OF REMEDIAL GRADING
LIMITS OF STABILITY FILL KEY
LOT 9 MAP 4653
LOT 10 MAP 4653
LEGEND
Qaf ARTIFICIAL FILL
Qal ALLUVIUM
Qcol COLLUVIUM
Qdf DEBRIS FLOW
Qls LANDSLIDE DEBRIS
Qt TERRACE DEPOSIT
Tst STADIUM CONGLOMERATE
Tf FRARS FORMATION
Kcw DEEPLY WEATHERED CUYAMACA GABBRO
Kc CUYAMACA GABBRO
APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
APPROX. LOCATION OF LARGE-DIAMETER EXPLORATORY BORING
APPROX. LOCATION OF EXPLORATORY TRENCH
(t=?) THICKNESS (Feet) OF SURFICIAL DEPOSIT
RECOMMENDED LOCATION OF SUBDRAIN
LIMITS OF STABILITY FILL KEY (For Stability Fill Dimensions See Geologic Cross Sections Figures 3 - 5)
LIMITS OF BUTTRESS KEY (For Buttress Fill Dimensions See Geologic Cross Sections Figures 3 - 5)
GEOLOGIC MAP
CASTLEROCK
SAN DIEGO, CALIFORNIA
GEOCON CONSULTANTS
SCALE 1" = 100'
DATE 09/08 - 42 - 01
SHEET 1 OF 1
FIGURE 2



GEOLOGIC CROSS-SECTIONS

A-A', B-B', C-C'

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SCALE 1" = 40'	DATE 05 - 05 - 2006		
PROJECT NO. 06696 - 42 - 01		FIGURE 3	
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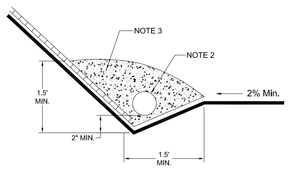
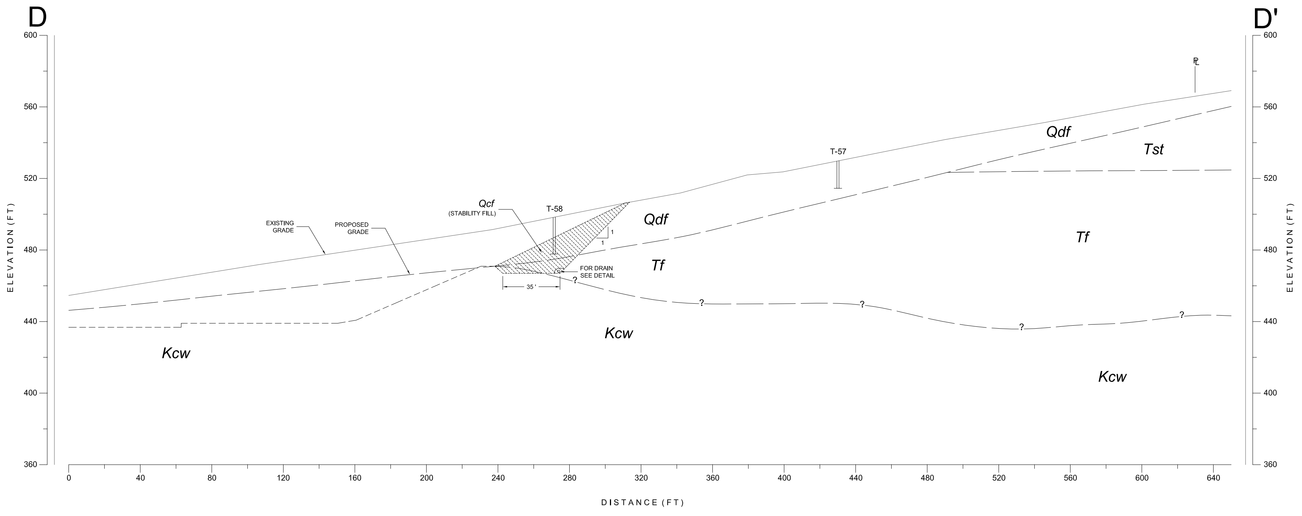


NOTES:

1. ...WHERE SEEPAGE IS ENCOUNTERED IN BACKCUT, CHIMNEY DRAINS TO BE APPROVED, PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN, TENSAR, OR EQUIVALENT) SPACED APPROXIMATELY 30 FEET CENTER TO CENTER, ADDITIONAL DRAINS WILL BE REQUIRED WHERE AREAS OF SEEPAGE ARE ENCOUNTERED.
2. ...FILTER MATERIAL TO BE 1-INCH, OPEN-GRADED, CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC, (MIRAFI 140N OR EQUIVALENT)
3. ...COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

BUTTRESS AND STABILITY FILL DRAIN DETAIL

NO SCALE



GEOLOGIC CROSS-SECTION D-D'

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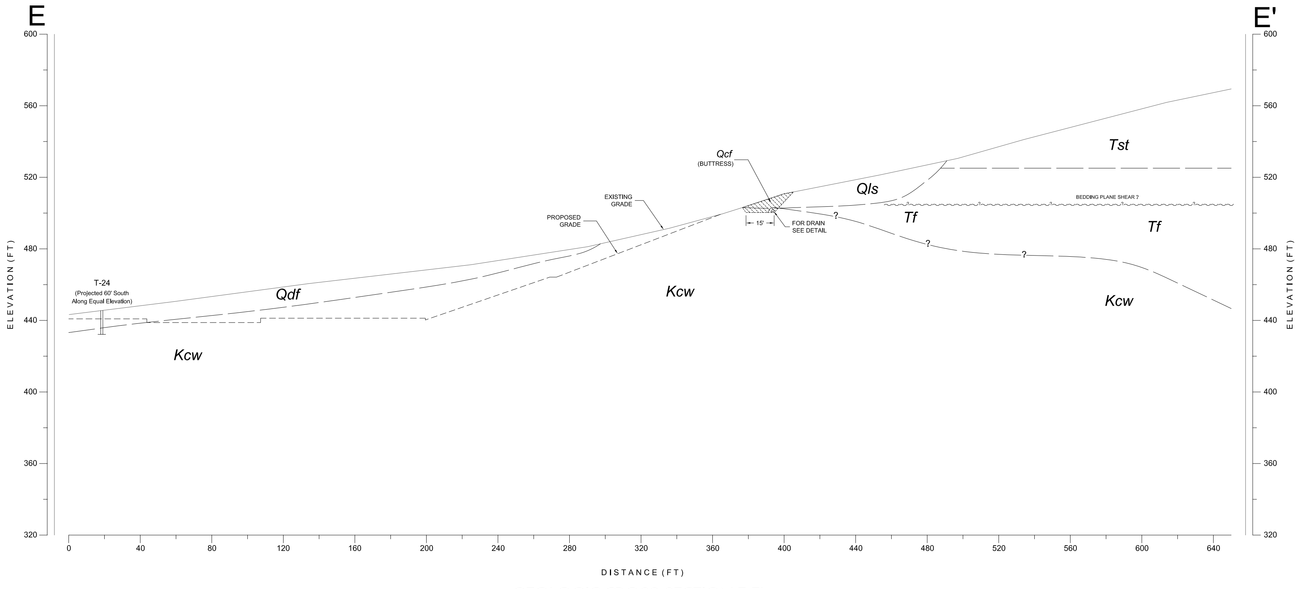

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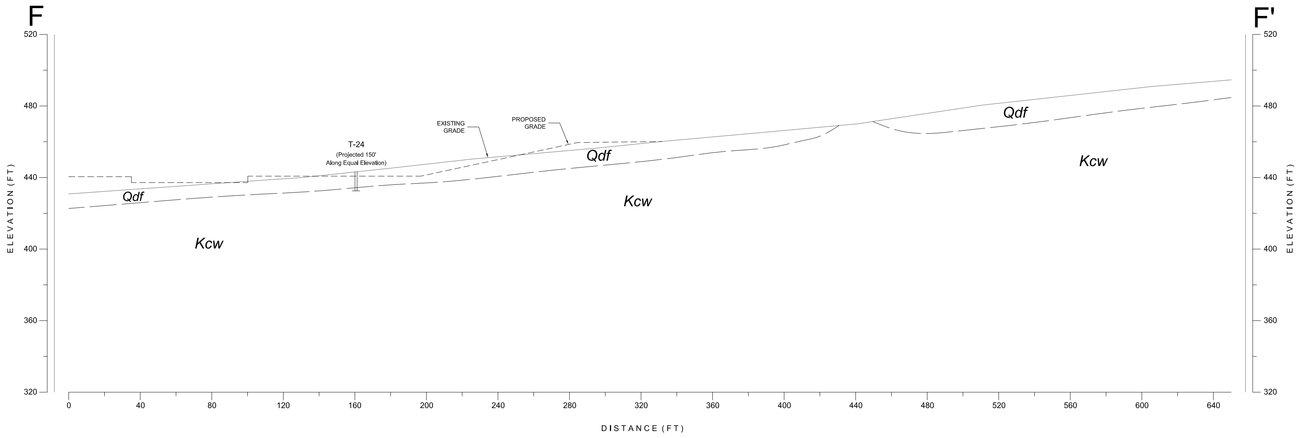

GEOLOGIC CROSS-SECTION F-F'

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

GEOLOGIC CROSS-SECTIONS

D-D', E-E', F-F'

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SCALE	DATE
1" = 40'	05 - 05 - 2006

PROJECT NO.	FIGURE
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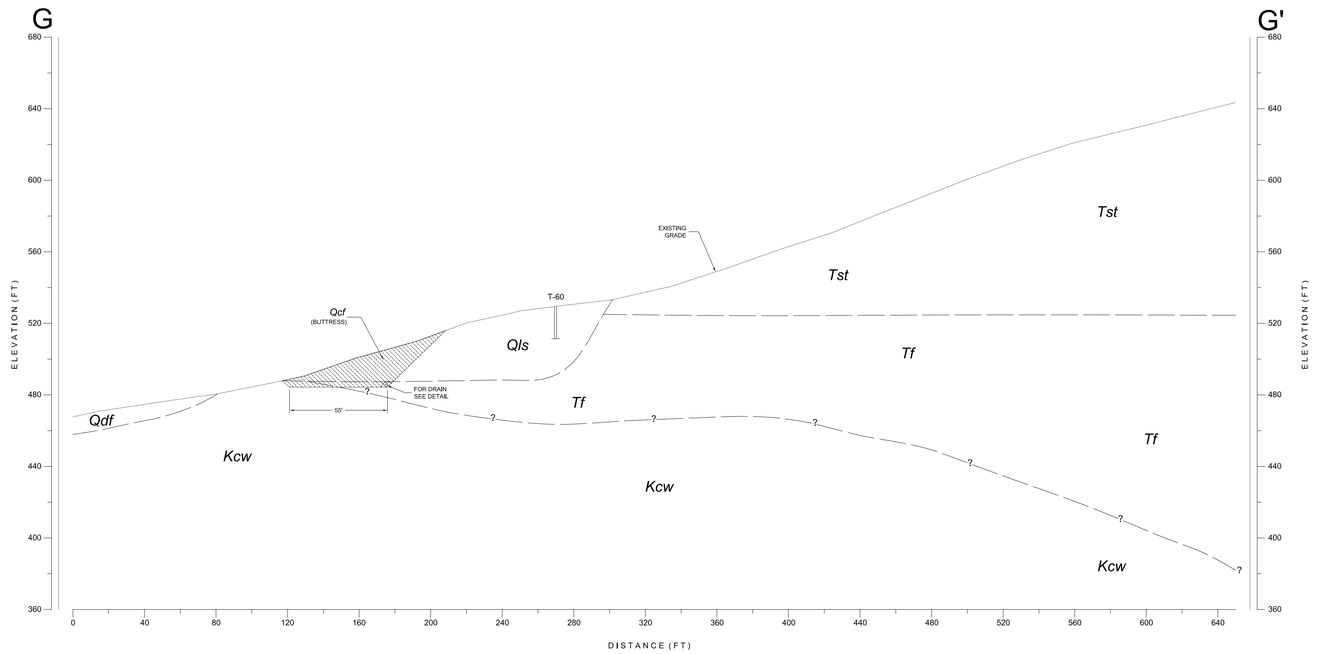
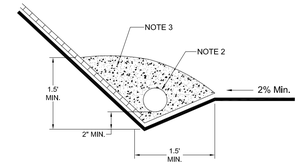


GEOLOGIC CROSS-SECTION G-G'

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



NOTES:

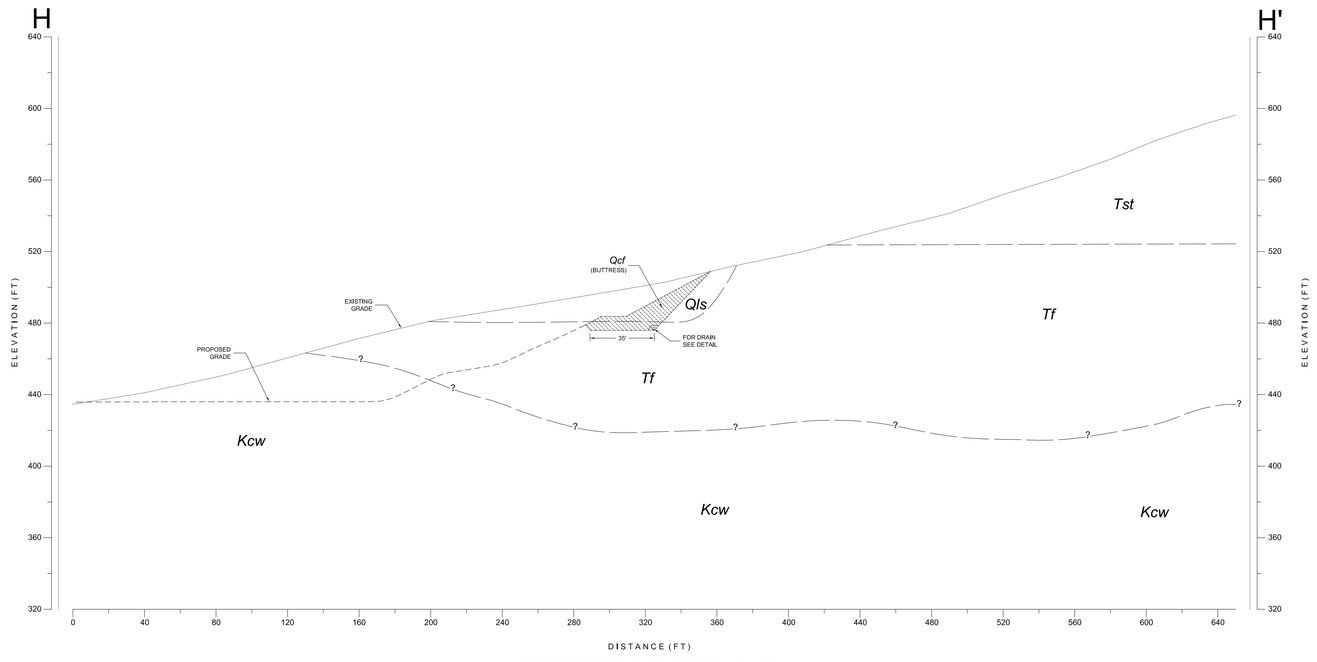
1....WHERE SEEPAGE IS ENCOUNTERED IN BACKCUT, CHIMNEY DRAINS TO BE APPROVED, PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN, TENSAR, OR EQUIVALENT) SPACED APPROXIMATELY 30 FEET CENTER TO CENTER. ADDITIONAL DRAINS WILL BE REQUIRED WHERE AREAS OF SEEPAGE ARE ENCOUNTERED.

2....FILTER MATERIAL TO BE 1-INCH, OPEN-GRADED, CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC. (MIRAFI 140N OR EQUIVALENT)

3....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

BUTTRESS AND STABILITY FILL DRAIN DETAIL

NO SCALE



GEOLOGIC CROSS-SECTION H-H'

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

GEOLOGIC CROSS-SECTIONS

G-G', H-H'

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PROJECT NO.	06696 - 42 - 01	FIGURE	5
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A

APPENDIX A

FIELD INVESTIGATION

The field investigation was performed between April 16 and April 21, 2001 and consisted of excavating 64 backhoe trenches and one large diameter boring. Trenches were excavated using a John Deere 710 backhoe equipped with a 24-inch wide bucket. Backhoe trenches were excavated to depths of 4 feet to 17 feet below existing grade. The large diameter boring was excavated using a truck mounted drill rig equipped with a 30 inch diameter bucket auger. During drilling, relatively undisturbed soil samples were obtained by driving a 3-inch O.D., split-tube sampler into the undisturbed soil mass with a telescoping kelly bar. Disturbed bulk samples were obtained from the trenches.

The soils encountered in the boring and backhoe trenches were visually examined, classified, and logged in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual-Manual Procedure D2844). Logs of the boring and backhoe trenches are presented on Figures A-1 through A-66. The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained.

PROJECT NO. 06696-42-01

TRENCH T 1

ELEV. (MSL.) 390 DATE COMPLETED 4/16/01

EQUIPMENT JD 710D W/24" BUCKET

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			SM	**ALLUVIUM** Loose, moist, dark brown, Silty, fine SAND with clay, few subrounded cobbles to 6-inches diameter; porous, with roots.			
2								
4	T1-2				**CUYAMACA GABBRO** Highly weathered, reddish-brown, moderately strong, GABBRO ROCK. Excavates to: moist, reddish-brown, Silty fine to coarse SAND. -Becomes strong at 5 feet.			
					TRENCH TERMINATED AT 5 FEET No groundwater encountered Backfilled 4-16-2001			

Figure A-1, Log of Trench T 1

ESTEL

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. 06696-42-01

TRENCH T 2

ELEV. (MSL.) 403 DATE COMPLETED 4/16/01

EQUIPMENT JD 710D W/24" BUCKET

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Soft to firm, moist, dark brown, Sandy CLAY, porous, with roots.			
2				CL/CH				
4								
6								
8					Approximate 6 to 8-inch thick subrounded cobble zone at contact. Irregular contact is inclined approximately 12 degrees SE. **CUYAMACA GABBRO** Highly weathered, reddish-brown, weak to moderately strong GABBRO ROCK. Excavates to: moist, reddish-brown, Silty, fine to coarse SAND.			

TRENCH TERMINATED AT 9 FEET
No groundwater encountered
Backfilled 4-16-2001

Figure A-2, Log of Trench T 2

ESTEL

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. 06696-42-01

TRENCH T 3

ELEV. (MSL.) 419 DATE COMPLETED 4/16/01

EQUIPMENT JD 710D W/24" BUCKET

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/CH	**COLLUVIUM** Soft to firm, moist, dark brown, Sandy CLAY, porous, few roots.			
2					**CUYAMACA GABBRO** Highly weathered, yellowish-brown, weak to moderately strong GABBRO ROCK. Excavates to: moist, yellowish-brown to brownish-gray, Silty, medium to coarse SAND.			
4								
6					TRENCH TERMINATED AT 6 FEET No groundwater encountered Backfilled 4-16-2001			

Figure A-3, Log of Trench T 3

ESTEL

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. 06696-42-01

TRENCH T 4

ELEV. (MSL.) 407 DATE COMPLETED 4/16/01

EQUIPMENT JD 710D W/24" BUCKET

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Soft to firm, dark brown, moist, Sandy CLAY and Clayey SAND, porous, few roots.			
2				CL-SC				
4								
					-Irregular contact, dips 12 to 20 degrees SE.			
6					**CUYAMACA GABBRO** Highly weathered, reddish-brown, weak to moderately strong, GABBRO ROCK. Excavates to: moist, reddish-brown, Silty, fine to coarse SAND.			
8					TRENCH TERMINATED AT 8 FEET No groundwater encountered Backfilled 4-16-2001			

Figure A-4, Log of Trench T 4

ESTEL

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. 06696-42-01

TRENCH T 5

ELEV. (MSL.) 452 DATE COMPLETED 4/16/01

EQUIPMENT JD 710D W/24" BUCKET

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
	T5-1 T5-3			CL/CH	**COLLUVIUM** Soft to firm, moist, dark brown, Sandy CLAY, porous, few roots, caliche inclusions.			
2								
	T5-2							
4				SM	**FRIARS FORMATION** Dense, moist, yellowish-gray, Silty, fine to medium SANDSTONE, massive.			
6					TRENCH TERMINATED AT 6 FEET No groundwater encountered Backfilled 4-16-2001			

Figure A-5, Log of Trench T 5

ESTEL

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. 06696-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 6 ELEV. (MSL.) 500 DATE COMPLETED 4/16/01 EQUIPMENT JD 710D W/24" BUCKET	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0								
				CL/CH	**COLLUVIUM** Soft to firm, dark brown, moist, Sandy CLAY, few roots, few subrounded cobbles to 8-inches diameter.			
2								
					FRIARS FORMATION Very dense, moist, light to medium brownish-gray, Silty, fine to medium SANDSTONE, massive.			
4	T6-1			SM				
6								
8					TRENCH TERMINATED AT 8 FEET No groundwater encountered Backfilled 4-16-2001			

Figure A-6, Log of Trench T 6

ESTEL

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. 06696-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 7 ELEV. (MSL.) 473 DATE COMPLETED 4/16/01 EQUIPMENT JD 710D W/24" BUCKET	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**COLLUVIUM** Soft to firm, dark brown, moist, Sandy CLAY, few roots, few subrounded cobbles to 6-inches diameter.			
2								
4				SM	**FRIARS FORMATION** Dense, moist, gray to light brownish-gray, Silty, fine to medium SANDSTONE, massive.			
	T7-1							
6					Steep to vertical caliche lined fractures to approximately 1/4-inch wide.			
					TRENCH TERMINATED AT 7.5 FEET No groundwater encountered Backfilled 4-16-2001			

Figure A-7, Log of Trench T 7

ESTEL

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. 06696-42-01

TRENCH T 8

ELEV. (MSL.) 466 DATE COMPLETED 4/16/01

EQUIPMENT JD 710D W/24" BUCKET

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/CH	**COLLUVIUM** Soft to firm, moist, dark blackish-brown, fine Sandy CLAY, few roots.			
2								
4				SM	**FRIARS FORMATION** Dense, moist, brownish-gray, Silty, fine to coarse SANDSTONE, massive, steep to vertical caliche lined fractures to approximately 1/4-inch wide.			
6								
					TRENCH TERMINATED AT 7 FEET No groundwater encountered Backfilled 4-21-2001			

Figure A-8, Log of Trench T 8

ESTEL

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. 06696-42-01

TRENCH T 9

ELEV. (MSL.) 446 DATE COMPLETED 4/16/01

EQUIPMENT JD 710D W/24" BUCKET

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/CH	**COLLUVIUM** Soft to firm, dark brown, moist, fine Sandy CLAY.			
2				SM	**FRIARS FORMATION** Dense, moist, light yellowish-brown, Silty, fine to coarse SANDSTONE, massive.			
4								
6								
					TRENCH TERMINATED AT 7 FEET No groundwater encountered Backfilled 4-10-2001			

Figure A-9, Log of Trench T 9

ESTEL

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. 06696-42-01

TRENCH T 10

ELEV. (MSL.) 431 DATE COMPLETED 4/16/01

EQUIPMENT JD 710D W/24" BUCKET

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/CH	**COLLUVIUM** Loose to firm, moist, dark brown, fine Sandy CLAY, few roots.			
2				SM	**FRIARS FORMATION** Dense, damp, brownish gray, Silty, fine to coarse SANDSTONE, massive.			
4					Hard, moist, light greenish-gray, CLAYSTONE, thinly laminated.			
6	T10-1			CL				
8					TRENCH TERMINATED AT 8 FEET No groundwater encountered Backfilled 4-16-2001			

Figure A-10, Log of Trench T 10

ESTEL

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. 06696-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 11 ELEV. (MSL.) 411 DATE COMPLETED 4/16/01 EQUIPMENT JD 710D W/24" BUCKET	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL/CH	**ALLUVIUM** Soft to firm, moist, dark brown, Sandy CLAY, porous, few roots, few subrounded cobble clasts to 6-inches diameter.			
2								
4					Abundant subrounded cobbles to 9-inches diameter.			
6								
8					**CUYAMACA GABBRO** Highly weathered, yellowish-brown, weak to moderately strong GABBRO ROCK. Excavates to: moist, yellowish-brown, silty, fine to coarse SAND.			
10					TRENCH TERMINATED AT 10 FEET No groundwater encountered Backfilled 4-16-2001			

Figure A-11, Log of Trench T 11

ESTEL

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. 06696-42-01

TRENCH T 12

ELEV. (MSL.) 405 DATE COMPLETED 4/16/01

EQUIPMENT JD 710D W/24" BUCKET

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	**ALLUVIUM** Loose to dense, brown, moist, Clayey SAND, porous, few subrounded cobble clasts to 6-inches diameter.			
2								
				CL	Firm, dark brown, moist, Sandy CLAY, few subrounded cobbles to 6-inches diameter.			
4								
6	T12-1			GM	**TERRACE DEPOSIT** Dense, very moist, reddish-brown COBBLE CONGLOMERATE, with Clayey, fine to medium SAND matrix. ~60% matrix supported, subrounded cobbles to 8-inches diameter.			
8					TRENCH TERMINATED AT 8 FEET No groundwater encountered Backfilled 4-16-2001			

Figure A-12, Log of Trench T 12

ESTEL

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. 06696-42-01

TRENCH T 13

ELEV. (MSL.) 429 DATE COMPLETED 4/16/01

EQUIPMENT JD 710D W/24" BUCKET

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/CH	**COLLUVIUM** Soft to firm, moist, dark brown, Sandy CLAY, porous, few roots.			
2				SM	**FRIARS FORMATION** Dense, moist, light brownish-yellow, Silty, fine to coarse SANDSTONE, moderately cemented, massive.			
4								
6								
					TRENCH TERMINATED AT 7.5 FEET No groundwater encountered Backfilled 4-16-2001			

Figure A-13, Log of Trench T 13

ESTEL

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. 06696-42-01

TRENCH T 14

ELEV. (MSL.) 421 DATE COMPLETED 4/16/01

EQUIPMENT JD 710D W/24" BUCKET

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	**ALLUVIUM** Soft to firm, dark brown, moist, Sandy CLAY, few roots.			
2								
4								
				SM-GM	**TERRACE DEPOSIT** Dense, moist, light reddish-brown to brownish-gray, Silty, fine to medium SANDSTONE, (gritstone), massive.			
6								
8								
					TRENCH TERMINATED AT 9 FEET No groundwater encountered Backfilled 4-16-2001			

Figure A-14, Log of Trench T 14

ESTEL

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. 06696-42-01

TRENCH T 15

ELEV. (MSL.) 401 DATE COMPLETED 4/16/01

EQUIPMENT JD 710D W/24" BUCKET

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	**ALLUVIUM** Soft to firm, moist, dark brown, Sandy CLAY, fine roots, few cobbles.			
2								
4				GM	**TERRACE DEPOSIT** Dense, moist, light reddish-brown, Cobble CONGLOMERATE with Silty, fine to coarse SAND matrix, ~65% matrix supported, subrounded cobbles to 6-inches diameter.			
6								
8								
10					TRENCH TERMINATED AT 10 FEET No groundwater encountered Backfilled 4-16-2001			

Figure A-15, Log of Trench T 15

ESTEL

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. 06696-42-01

TRENCH T 16

ELEV. (MSL.) 397 DATE COMPLETED 4/16/01

EQUIPMENT JD 710D W/24" BUCKET

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	**ALLUVIUM** Soft to firm, moist, dark brown, Sandy CLAY, porous, few roots, few subrounded cobbles to 8-inches diameter.			
2								
				SC	**TERRACE DEPOSIT** Dense, very moist, light reddish-brown to brownish-gray, Clayey, fine to coarse SANDSTONE, massive, subrounded sand grains, some silt.			
4								
6					TRENCH TERMINATED AT 6 FEET No groundwater encountered Backfilled 4-16-2001			

Figure A-16, Log of Trench T 16

ESTEL

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. 06696-42-01

TRENCH T 17

ELEV. (MSL.) 450 DATE COMPLETED 4/16/01

EQUIPMENT JD 710D W/24" BUCKET

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	**COLLUVIUM** Stiff, moist, dark brown, Sandy CLAY, porous, few roots.			
2								
4	T17-1			SM	**FRIARS FORMATION** Dense, moist, light grayish-brown, Silty, fine to coarse SANDSTONE, massive.			
6								
					TRENCH TERMINATED AT 7 FEET No groundwater encountered Backfilled 4-16-2001			

Figure A-17, Log of Trench T 17

ESTEL

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. 06696-42-01

TRENCH T 18

ELEV. (MSL.) 460 DATE COMPLETED 4/16/01

EQUIPMENT JD 710D W/24" BUCKET

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/CH	**COLLUVIUM** Soft to firm, moist, dark brown, Sandy CLAY, few roots.			
2								
4				SM	**FRIARS FORMATION** Dense, damp, light grayish-brown, Silty, fine to coarse SANDSTONE, massive.			
6								
8				CL	Hard, moist, grayish-brown, CLAYSTONE with steep to vertical fractures lined with up to 1/2" calcium carbonate.			
					TRENCH TERMINATED AT 9 FEET No groundwater encountered Backfilled 4-16-2001			

Figure A-18, Log of Trench T 18

ESTEL

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. 06696-42-01

TRENCH T 19

ELEV. (MSL.) 472 DATE COMPLETED 4/16/01

EQUIPMENT JD 710D W/24" BUCKET

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/CH	**COLLUVIUM** Soft to stiff, moist, dark brown, Sandy CLAY, porous, with roots.			
2								
4	T19-1			SM	**FRIARS FORMATION** Dense, damp, dark gray, Silty, fine SANDSTONE, massive with steep to vertical, lined with up to 1/2" calcium carbonate with thin-bedded clay layers.			
6								
8					TRENCH TERMINATED AT 8 FEET No groundwater encountered Backfilled 4-16-2001			

Figure A-19, Log of Trench T 19

ESTEL

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. 06696-42-01

TRENCH T 20

ELEV. (MSL.) 488 DATE COMPLETED 4/17/01

EQUIPMENT JD 710D W/24" BUCKET

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/CH	**COLLUVIUM** Soft to firm, dark brown, moist, Sandy CLAY, few roots, few subrounded cobbles to approximately 6-inches diameter.			
2								
				SM	**FRIARS FORMATION** Very dense, damp, dark to medium gray, Silty, fine to coarse SANDSTONE, massive, few steep to vertical caliche - inclined fractures 1/4-inch wide.			
4								
6					TRENCH TERMINATED AT 6 FEET No groundwater encountered Backfilled 4-17-2001			

Figure A-20, Log of Trench T 20

ESTEL

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. 06696-42-01

TRENCH T 21

ELEV. (MSL.) 511 DATE COMPLETED 4/17/01

EQUIPMENT JD 710D W/24" BUCKET

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	**COLLUVIUM** Loose to medium dense, dry to moist, reddish-brown, Silty, fine SAND, abundant subrounded cobbles to 1-inches diameter.			
2								
				CL	Firm, reddish-brown, moist, Sandy CLAY.			
4								
				SM	**FRIARS FORMATION** damp, damp, reddish-brown, Silty, fine to medium SANDSTONE, up to 6-inch conglomerate layers with subrounded cobbles to 4-inches diameter. (may be transition from overlying stadium conglomerate).			
6								
				SM	Dense, moist, dark gray, Silty fine SANDSTONE, moderately cemented, massive.			
8	T21-1							
					TRENCH TERMINATED AT 9 FEET No groundwater encountered Backfilled 4-17-2001			

Figure A-21, Log of Trench T 21

ESTEL

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. 06696-42-01

TRENCH T 22

ELEV. (MSL.) 461 DATE COMPLETED 4/17/01

EQUIPMENT JD 710D W/24" BUCKET

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/CH	**COLLUVIUM** Soft to firm, moist, dark brown, Sandy CLAY, few roots, few subrounded cobble clasts to 6-inches diameter.			
2								
	T22-1							
4					-Becomes stiff to hard at 4 feet			
					Up to 10-inch diameter subrounded cobbles at contact.			
6				SM	**FRIARS FORMATION** Dense, moist, light yellowish-brown, Silty, fine to coarse SANDSTONE, massive.			
8								
					TRENCH TERMINATED AT 8 FEET No groundwater encountered Backfilled 4-17-2001			

Figure A-22, Log of Trench T 22

ESTEL

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. 06696-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 23 ELEV. (MSL.) 442 DATE COMPLETED 4/17/01 EQUIPMENT JD 710D W/24" BUCKET	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**COLLUVIUM** Loose to medium dense, moist, reddish-brown, Clayey SAND, with abundant subrounded cobble clasts to 6- inches diameter.			
2								
4				GM	**TERRACE DEPOSIT** Dense, reddish-brown, moist, coarse COBBLE CONGLOMERATE with Silty, fine to medium SAND matrix, 65% matrix supported, massive, subrounded cobble clasts, to 10-inches diameter.			
6								
8								
					TRENCH TERMINATED AT 9 FEET No groundwater encountered Backfilled 4-17-2001			

Figure A-23, Log of Trench T 23

ESTEL

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. 06696-42-01

TRENCH T 24

ELEV. (MSL.) 443 DATE COMPLETED 4/17/01

EQUIPMENT JD 710D W/24" BUCKET

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	T24-1 T24-2			CL	**DEBRIS FLOW** Firm, moist, reddish-brown, Sandy CLAY and Clayey SAND, few subrounded cobbles to approximately 4-inches diameter.			
4								
6				CL	Stiff to hard, dark brown, moist, Silty CLAY, abundant subrounded cobbles to 6-inches diameter, calcium carbonate (caliche) inclusions.			
8								
10	T24-3				**CUYAMACA GABBRO** Highly weathered moist, light reddish-brown, weak to moderately strong, GABBRO ROCK. Excavates to: light reddish-brown, Silty, fine to coarse SAND. -Becomes strong at 12 feet, rippable			
12					TRENCH TERMINATED AT 12 FEET No groundwater encountered Backfilled 4-17-2001			

Figure A-24, Log of Trench T 24

ESTEL

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. 06696-42-01

TRENCH T 25

ELEV. (MSL.) 469 DATE COMPLETED 4/17/01

EQUIPMENT JD 710D W/24" BUCKET

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/CH	**COLLUVIUM** Soft to firm, moist, dark brown, Silty CLAY, few roots.			
2	T25-1				**CUYAMACA GABBRO** Highly weathered, moist, grayish-brown, weak to moderately strong, GABBRO ROCK. Excavates to: Silty, fine to medium SAND.			
4								
6					Less weathered, strong at 6 feet; rippable			
					TRENCH TERMINATED AT 6 FEET No groundwater encountered Backfilled 4-16-2001			

Figure A-25, Log of Trench T 25

ESTEL

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. 06696-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 26 ELEV. (MSL.) 424 DATE COMPLETED 4/17/01 EQUIPMENT JD 710D W/24" BUCKET	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**ALLUVIUM** Loose to medium dense, moist, reddish-brown, Silty SAND with clay, abundant subrounded cobble clasts to 4-inches diameter.			
2					**CUYAMACA GABBRO** Highly weathered, grayish-brown, weak to moderately strong GABBRO ROCK Excavates to: Silty, fine to medium SAND.			
4					-Becomes strong at 6 feet, rippable			
6					TRENCH TERMINATED AT 6 FEET No groundwater encountered Backfilled 4-17-2001			

Figure A-26, Log of Trench T 26

ESTEL

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. 06696-42-01

TRENCH T 27

ELEV. (MSL.) 428 DATE COMPLETED 4/17/01

EQUIPMENT JD 710D W/24" BUCKET

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	**ALLUVIUM** Soft to firm, dark brown, moist, Sandy CLAY, few roots, subrounded cobble clasts to 6-inches diameter.			
2								
4								
6				GM	**TERRACE DEPOSIT** Dense, moist, reddish-brown, medium to coarse, COBBLE CONGLOMERATE with Silty, fine to medium SAND matrix, approximately 65% matrix supported, subrounded cobble clasts to 8-inches diameter.			
8								
					TRENCH TERMINATED AT 9 FEET No groundwater encountered Backfilled 4-17-2001			

Figure A-27, Log of Trench T 27

ESTEL

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. 06696-42-01

TRENCH T 28

ELEV. (MSL.) 404 DATE COMPLETED 4/17/01

EQUIPMENT JD 710D W/24" BUCKET

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/CL	**ALLUVIUM** Loose to firm, dark brown, moist, Silty, fine SAND and Sandy CLAY, few subrounded cobble clasts to 6-inches diameter, few roots.			
4				GM	**TERRACE DEPOSIT** Dense, moist, reddish-brown, COBBLE CONGLOMERATE with Silty, fine to medium SAND matrix, approximately 65% matrix supported, subrounded cobble clasts to 10-inches diameter.			
6								
					TRENCH TERMINATED AT 7 FEET No groundwater encountered Backfilled 4-17-2001			

Figure A-28, Log of Trench T 28

ESTEL

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. 06696-42-01

TRENCH T 29

ELEV. (MSL.) 419 DATE COMPLETED 4/17/01

EQUIPMENT JD 710D W/24" BUCKET

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/SM	**TOPSOIL** Loose to firm, moist, dark brown, Clayey SAND and Silty SAND, few roots, few subrounded cobble clasts to 6-inches diameter.			
2								
					FRIARS FORMATION Dense, moist, light brownish-gray, Clayey fine SANDSTONE, weakly cemented, massive, calcium carbonate-lined fractures to 1/2 inch wide.			
4				SM				
6								
8					TRENCH TERMINATED AT 8 FEET No groundwater encountered Backfilled 4-17-2001			

Figure A-29, Log of Trench T 29

ESTEL

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. 06696-42-01

TRENCH T 30

ELEV. (MSL.) 397 DATE COMPLETED 4/17/01

EQUIPMENT JD 710D W/24" BUCKET

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-CH	**ALLUVIUM** Loose to firm, moist, dark brown, Clayey, fine SAND, and Sandy clay, few subrounded cobble clasts to 6-inches diameter, porous, with roots.			
4					-Abundant cobbles to 8-inches diameter, with calcium carbonate inclusions.			
6								
8	T30-1			SC/SM	**FRIARS FORMATION** Dense, moist, light to medium gray, Silty to Clayey, fine to coarse SANDSTONE, weakly cemented, massive. -Highly weathered clay/claystone from 8 to 9 feet			
10								
					TRENCH TERMINATED AT 11 FEET No groundwater encountered Backfilled 4-17-2001			

Figure A-30, Log of Trench T 30

ESTEL

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. 06696-42-01

TRENCH T 31

ELEV. (MSL.) 410 DATE COMPLETED 4/17/01

EQUIPMENT JD 710D W/24" BUCKET

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	**TOPSOIL** Firm, moist, dark brown, Sandy CLAY, porous with roots, few subrounded cobble clasts to 6-inches diameter.			
2								
4				SM	**TERRACE DEPOSIT** Dense, damp, brownish-gray to reddish-brown, Clayey fine SANDSTONE, weakly cemented, massive, abundant steep to vertical caliche-lined fractures to 1/2-inch wide, randomly oriented.			
6								
8				GM	Dense, moist, reddish-brown, coarse COBBLE CONGLOMERATE with Silty, fine to coarse SAND matrix, approximately 65% matrix supported, subrounded cobble clasts to 6-inches diameter.			
					TRENCH TERMINATED AT 9 FEET No groundwater encountered Backfilled 4-17-2001			

Figure A-31, Log of Trench T 31

ESTEL

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. 06696-42-01

TRENCH T 32

ELEV. (MSL.) 424 DATE COMPLETED 4/17/01

EQUIPMENT JD 710D W/24" BUCKET

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	**ALLUVIUM** Loose to firm, moist, dark brown, Clayey SAND to Sandy CLAY, porous, with roots.			
2								
					CUYAMACA GABBRO Highly weathered, damp, reddish-brown, weak to moderately strong, GABBRO ROCK. Excavates to: light reddish-brown Silty, fine to coarse SAND.			
4								
					Moderately weathered and strong at 6 1/2 feet.			
6								
					TRENCH TERMINATED AT 6 1/2 FEET No groundwater encountered Backfilled 4-17-2001			

Figure A-32, Log of Trench T 32

ESTEL

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. 06696-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 33 ELEV. (MSL.) 394 DATE COMPLETED 4/17/01 EQUIPMENT JD 710D W/24" BUCKET	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC-CL	**ALLUVIUM** Loose to firm, moist, dark brown, Clayey fine SAND, to Sandy CLAY, porous, with roots, subrounded cobble clasts to 4-inches diameter.			
2								
4					**CUYAMACA GABBRO** Highly weathered, reddish-brown, weak to moderately strong, GABBRO ROCK Excavates to: moist, reddish-brown, Silty, fine to coarse SAND. Moderately weathered, strong at 5 feet.			
					TRENCH TERMINATED AT 5 FEET No groundwater encountered Backfilled 4-17-2001			

Figure A-33, Log of Trench T 33

ESTEL

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. 06696-42-01

TRENCH T 34

ELEV. (MSL.) 421 DATE COMPLETED 4/17/01

EQUIPMENT JD 710D W/24" BUCKET

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	**ALLUVIUM** Loose to firm, moist, dark brown, Clayey SAND, and Sandy CLAY, few roots.			
2								
					CUYAMACA GABBRO Highly weathered, reddish-brown, weak to moderately strong GABBRO ROCK Excavates to: moist, light reddish-brown, Silty, fine to coarse SAND.			
4								
6					-Becomes strong at 7 feet			
					TRENCH TERMINATED AT 7 FEET No groundwater encountered Backfilled 4-17-2001			

Figure A-34, Log of Trench T 34

ESTEL

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. 06696-42-01

TRENCH T 35

ELEV. (MSL.) 388 DATE COMPLETED 4/17/01

EQUIPMENT JD 710D W/24" BUCKET

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	**ALLUVIUM** Loose to firm, moist, dark brown, Clayey, fine SAND, and Sandy CLAY, few roots, few subrounded cobble clasts to 4-inches diameter.			
4				SM	**FRIARS FORMATION** Dense, moist, light gray to brownish-gray, Silty, fine to medium SANDSTONE, moderately to well cemented, massive.			
6					**CUYAMACA GABBRO** Moderate to highly weathered, brownish-gray, weak to moderately strong GABBRO ROCK Excavates to: Silty, fine to medium SAND.			
8					TRENCH TERMINATED AT 8 FEET No groundwater encountered Backfilled 4-17-2001			

Figure A-35, Log of Trench T 35

ESTEL

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. 06696-42-01

TRENCH T 36

ELEV. (MSL.) 440 DATE COMPLETED 4/18/01

EQUIPMENT JD 710D W/24" BUCKET

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/CH	**COLLUVIUM** Soft to firm, moist, dark brown to reddish-brown, Sandy to Silty CLAY, porous, with roots, calcium carbonate inclusions.			
2								
4					**CUYAMACA GABBRO** Highly weathered, reddish-brown, weak to moderately strong, GABBRO ROCK. Excavates to: reddish-brown Silty, fine to coarse SAND. -Becomes strong at 5 feet.			
6					TRENCH TERMINATED AT 6 FEET No groundwater encountered Backfilled 04-18-2001			

Figure A-36, Log of Trench T 36

ESTEL

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. 06696-42-01

TRENCH T 37

ELEV. (MSL.) 448 DATE COMPLETED 4/18/01

EQUIPMENT JD 710D W/24" BUCKET

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/CH	**COLLUVIUM** Soft to firm, moist, dark brown, Silty CLAY, few roots.			
2					**CUYAMACA GABBRO** Highly weathered, reddish-brown to brownish-gray, weak, GABBRO ROCK. Excavates to: reddish-brown to brownish-gray, Silty, fine to coarse SAND. -Becomes strong at 5 feet.			
4								
					TRENCH TERMINATED AT 5 FEET No groundwater encountered Backfilled 04-18-2001			

Figure A-37, Log of Trench T 37

ESTEL

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. 06696-42-01

TRENCH T 38

ELEV. (MSL.) 460 DATE COMPLETED 4/18/01

EQUIPMENT JD 710D W/24" BUCKET

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/CH	**COLLUVIUM** Soft to firm, moist, dark brown, Sandy CLAY, plastic, porous, with roots.			
2					**CUYAMACA GABBRO** Highly weathered, brownish-gray, weak, to moderately strong, GABBRO ROCK. Excavates to: moist, brownish-gray, Silty, fine to coarse SAND. -Becomes strong at 5 feet.			
4					TRENCH TERMINATED AT 5 FEET No groundwater encountered Backfilled 04-18-2001			

Figure A-38, Log of Trench T 38

ESTEL

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. 06696-42-01

TRENCH T 39

ELEV. (MSL.) 476 DATE COMPLETED 4/18/01

EQUIPMENT JD 710D W/24" BUCKET

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/CH	**COLLUVIUM** Soft to firm, moist, dark brown, Sandy to Silty CLAY, porous, medium plasticity, roots.			
2								
4					**CUYAMACA GABBRO** Highly weathered, reddish-brown, weak to moderately strong, GABBRO ROCK. Excavates to: reddish-brown, Silty, fine to coarse SAND. -Becomes strong at 5 feet.			
6					TRENCH TERMINATED AT 6 FEET No groundwater encountered Backfilled 04-18-2001			

Figure A-39, Log of Trench T 39

ESTEL

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. 06696-42-01

TRENCH T 40

ELEV. (MSL.) 496 DATE COMPLETED 4/18/01

EQUIPMENT JD 710D W/24" BUCKET

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/CH	**COLLUVIUM** Soft to firm, dark brown, moist, Sandy CLAY, few roots, caliche stringers to 1/64-inch wide at contact.			
2								
					CUYAMACA GABBRO Highly weathered, reddish-brown, weak to moderately strong, GABBRO ROCK. Excavates to: reddish-brown, Silty, fine to coarse SAND.			
4								
					-Strong at 7 feet.			
6								
					TRENCH TERMINATED AT 7 FEET No groundwater encountered Backfilled 04-18-2001			

Figure A-40, Log of Trench T 40

ESTEL

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. 06696-42-01

TRENCH T 41

ELEV. (MSL.) 433 DATE COMPLETED 4/18/01

EQUIPMENT JD 710D W/24" BUCKET

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/CH	**COLLUVIUM** Soft to firm, moist, dark brown, Sandy CLAY, porous, with roots, some plasticity.			
2								
4				SM	**TERRACE DEPOSIT** Dense, moist, light reddish-brown, Silty fine SANDSTONE, massive, moderately cemented.			
6								
	T41-1			GM	Dense, moist, light reddish-brown to yellowish-brown, coarse CONGLOMERATE with Silty, fine to medium SAND matrix, 60% matrix supported, trace clay, subrounded cobble clasts to 8 inches diameter.			
8								
10								
12					TRENCH TERMINATED AT 12 FEET No groundwater encountered Backfilled 04-18-2001			

Figure A-41, Log of Trench T 41

ESTEL

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. 06696-42-01

TRENCH T 42

ELEV. (MSL.) 433 DATE COMPLETED 4/18/01

EQUIPMENT JD 710D W/24" BUCKET

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	**COLLUVIUM** Loose to firm, dark brown, moist, Clayey SAND to Sandy CLAY, porous, with roots, some silt and subrounded cobble clasts to 4" in diameter.			
4				GM	**TERRACE DEPOSIT** Dense, moist, dark reddish-brown, coarse CONGLOMERATE with silty fine to coarse sand matrix, 65% matrix supported, subrounded cobble clasts to 8-inches diameter.			
10					TRENCH TERMINATED AT 10 FEET No groundwater encountered Backfilled 04-18-2001			

Figure A-42, Log of Trench T 42

ESTEL

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. 06696-42-01

TRENCH T 43

ELEV. (MSL.) 449 DATE COMPLETED 4/18/01

EQUIPMENT JD 710D W/24" BUCKET

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	**COLLUVIUM** Loose to firm, moist, dark brown, Clayey fine SAND to Sandy CLAY, porous, with roots.			
2								
4		+ +			**CUYAMACA GABBRO** Highly weathered brownish-gray, weak to moderately strong, GABBRO ROCK. Excavates to: light brownish-gray, Silty fine to medium SAND, with some clay.			
6		+ +			Moderately weathered, becomes strong at 7 feet.			
					TRENCH TERMINATED AT 7 FEET No groundwater encountered Backfilled 04-18-2001			

Figure A-43, Log of Trench T 43

ESTEL

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. 06696-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 44 ELEV. (MSL.) 460 DATE COMPLETED 4/18/01 EQUIPMENT JD 710D W/24" BUCKET	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC/CL	**COLLUVIUM** Loose to firm, dark brown, moist, Clayey fine SAND to Sandy CLAY, porous, with roots, with cobble clasts to 6-inches diameter.			
2								
4				GM	**TERRACE DEPOSIT** Dense, moist, reddish-brown, coarse CONGLOMERATE, with silty fine to medium sand matrix, 65 to 70% matrix supported, subrounded cobble clasts to 8-inches diameter.			
6					**CUYAMACA GABBRO** Highly weathered, moist, brownish-gray, weak to moderately strong, GABBRO ROCK. Excavates to: light brownish-gray, Silty fine to medium SAND.			
8								
10					-Becomes less weathered, strong at 11 feet.			
					TRENCH TERMINATED AT 11 FEET No groundwater encountered Backfilled 04-18-2001			

Figure A-44, Log of Trench T 44

ESTEL

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. 06696-42-01

TRENCH T 45

ELEV. (MSL.) 439 DATE COMPLETED 4/18/01

EQUIPMENT JD 710D W/24" BUCKET

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	**COLLUVIUM** Loose to firm, moist, light brown, Clayey, fine to medium SAND, to Sandy CLAY, few subrounded to rounded cobble clasts to 6-inches diameter.			
2								
4				GM	**TERRACE DEPOSIT** Dense, moist, yellowish-brown to brownish-gray, coarse CONGLOMERATE with silty to clayey, fine to medium sand matrix, 65% matrix supported subrounded cobble clasts to 8-inches diameter.			
6								
8								
					TRENCH TERMINATED AT 9 FEET No groundwater encountered Backfilled 04-18-2001			

Figure A-45, Log of Trench T 45

ESTEL

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. 06696-42-01

TRENCH T 46

ELEV. (MSL.) 444 DATE COMPLETED 4/18/01

EQUIPMENT JD 710D W/24" BUCKET

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	**COLLUVIUM** Loose to firm, moist, dark brown, Clayey, fine to medium SAND and Sandy CLAY, porous, with roots, subrounded cobble clasts to 6-inches diameter, some silt.			
2								
4					**CUYAMACA GABBRO** Highly weathered, moist, brownish-gray, weak to moderately strong, GABBRO ROCK. Excavates to: Silty fine to coarse SAND, some clay.			
6								
8					-Becomes moderately weathered, strong at 8 feet.			
					TRENCH TERMINATED AT 8 FEET No groundwater encountered Backfilled 04-18-2001			

Figure A-46, Log of Trench T 46

ESTEL

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. 06696-42-01

TRENCH T 47

ELEV. (MSL.) 416 DATE COMPLETED 4/18/01

EQUIPMENT JD 710D W/24" BUCKET

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Loose to medium dense, moist, dark brown, Clayey fine SAND to Sandy CLAY, abundant subrounded cobble clasts to 8-inches diameter, some silt; possible debris-flow deposits, or interbedded debris-flow/alluvium.			
2								
4				CL-GC				
6								
8								
10			▼		Light seepage at 11 feet.			
12					Refusal at 12 feet on cobble.			
					TRENCH TERMINATED AT 12 FEET No groundwater encountered Backfilled 04-18-2001			

Figure A-47, Log of Trench T 47

ESTEL

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. 06696-42-01

TRENCH T 48

ELEV. (MSL.) 427 DATE COMPLETED 4/18/01

EQUIPMENT JD 710D W/24" BUCKET

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Soft, moist, dark brown, Sandy CLAY, few cobbles, few roots; possible intercalated debris-flow and alluvial deposits.			
2								
4				CL-GC	-Abundant subrounded cobble clasts to 10-inches diameter.			
6					-Caving at 6 feet.			
8			▼		Moderate to heavy seepage encountered at 8 feet.			
10					Refusal on cobble at 11 feet.			
					TRENCH TERMINATED AT 11 FEET Groundwater seepage at 8 feet Backfilled 04-18-2001			

Figure A-48, Log of Trench T 48

ESTEL

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. 06696-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 49 ELEV. (MSL.) 427 DATE COMPLETED 4/18/01 EQUIPMENT JD 710D W/24" BUCKET	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**COLLUVIUM** Loose, dark brown, moist, Silty fine SAND, trace clay, abundant subrounded cobble clasts to 6-inches diameter.			
2								
4				GM	**TERRACE DEPOSIT** Dense, moist, reddish-brown, coarse COBBLE CONGLOMERATE, with silty fine to medium SAND matrix, trace clay, 70% matrix supported subrounded cobble and boulder clasts to 12-inches diameter. -Refusal at 5 feet.			
					TRENCH TERMINATED AT 5 FEET - REFUSAL No groundwater encountered Backfilled 04-18-2001			

Figure A-49, Log of Trench T 49

ESTEL

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. 06696-42-01

TRENCH T 50

ELEV. (MSL.) 396 DATE COMPLETED 4/18/01

EQUIPMENT JD 710D W/24" BUCKET

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	**COLLUVIUM** Loose, moist, dark brown, Silty fine SAND, few roots.			
2								
4				ML	**FRIARS FORMATION** Hard, damp, light gray, Sandy SILTSTONE, moderately indurated, massive.			
6				SM	Dense, moist, light gray, Silty fine SANDSTONE, moderately cemented, massive.			
8								
					TRENCH TERMINATED AT 9 FEET No groundwater encountered Backfilled 04-18-2001			

Figure A-50, Log of Trench T 50

ESTEL

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. 06696-42-01

TRENCH T 51

ELEV. (MSL.) 413 DATE COMPLETED 4/18/01

EQUIPMENT JD 710D W/24" BUCKET

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	**COLLUVIUM** Loose, moist, reddish-brown, Silty fine SAND, with trace clay, few roots.			
2				CL	Stiff, moist, reddish-brown, Sandy CLAY, caliche inclusions.			
4								
6				GM	**TERRACE DEPOSIT** Dense, damp, reddish-brown, coarse COBBLE CONGLOMERATE, with silty to clayey fine to medium sand matrix, 60% matrix supported, subrounded cobble clasts to 10-inches diameter.			
8								
					TRENCH TERMINATED AT 9 FEET No groundwater encountered Backfilled 04-18-2001			

Figure A-51, Log of Trench T 51

ESTEL

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. 06696-42-01

TRENCH T 52

ELEV. (MSL.) 411 DATE COMPLETED 4/18/01

EQUIPMENT JD 710D W/24" BUCKET

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	**COLLUVIUM** Loose, moist, reddish-brown, Silty fine SAND, with trace clay, few roots.			
2				CL	Firm, reddish-brown, moist, Sandy CLAY, caliche flecks.			
4				SM/SC	**TERRACE DEPOSIT** Dense, moist, reddish-brown, Silty to Clayey fine to medium SANDSTONE, moderately cemented, massive.			
6				GM	Dense, moist, reddish-brown, coarse COBBLE CONGLOMERATE, with silty to clayey fine to medium sand matrix, 60-70% matrix supported, subrounded cobbles to 6-inches diameter.			
8					TRENCH TERMINATED AT 8 FEET No groundwater encountered Backfilled 04-18-2001			

Figure A-52, Log of Trench T 52

ESTEL

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. 06696-42-01

TRENCH T 53

ELEV. (MSL.) 410 DATE COMPLETED 4/18/01

EQUIPMENT JD 710D W/24" BUCKET

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	**COLLUVIUM** Loose, moist, reddish-brown, Clayey SAND, with some silt, few subrounded cobble clasts to 6-inches diameter, roots, porous.			
2								
				SM	**FRIARS FORMATION** Dense, moist, light brownish-gray to yellowish-brown, Silty, fine to medium SANDSTONE, moderately cemented, massive.			
4					TRENCH TERMINATED AT 4.5 FEET No groundwater encountered Backfilled 04-18-2001			

Figure A-53, Log of Trench T 53

ESTEL

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. 06696-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 54 ELEV. (MSL.) 415 DATE COMPLETED 4/18/01 EQUIPMENT JD 710D W/24" BUCKET	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**COLLUVIUM** Soft to firm, moist, dark brown, Sandy CLAY, porous, with roots, subrounded cobble clasts to 4-inches diameter.			
2								
4				GM	**TERRACE DEPOSIT** Very dense, moist, light reddish-brown, COBBLE CONGLOMERATE, with silty to clayey, fine to medium sand matrix, 60% matrix supported, subrounded cobble clasts to 8-inches diameter.			
6								
8								
					TRENCH TERMINATED AT 9 FEET No groundwater encountered Backfilled 04-18-2001			

Figure A-54, Log of Trench T 54

ESTEL

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. 06696-42-01

TRENCH T 55

ELEV. (MSL.) 490 DATE COMPLETED 4/18/01

EQUIPMENT JD 710D W/24" BUCKET

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	**COLLUVIUM** Loose to firm, moist, dark brown, Clayey fine SAND and Sandy CLAY, porous, with roots, few subrounded cobble clasts to 6-inches diameter, caliche inclusions.			
2								
4				SM	**FRIARS FORMATION** Dense, moist, greenish-gray, Silty fine SANDSTONE, moderately cemented, massive.			
6								
					TRENCH TERMINATED AT 7 FEET No groundwater encountered Backfilled 04-18-2001			

Figure A-55, Log of Trench T 55

ESTEL

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. 06696-42-01

TRENCH T 56

ELEV. (MSL.) 521 DATE COMPLETED 4/18/01

EQUIPMENT JD 710D W/24" BUCKET

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	**DEBRIS FLOW** Loose to dense, moist, dark reddish-brown, Clayey fine SAND to Sandy CLAY with some silt; abundant subrounded cobble clasts to 8-inches diameter.			
4				CL-GC	Stiff, moist, dark brown, Sandy CLAY, abundant subrounded cobble clasts to 8-inches diameter.			
10					-Fewer cobble clasts.			
18				SM	**FRIARS FORMATION** Dense, damp, greenish-gray, Silty fine SANDSTONE, massive.			
					TRENCH TERMINATED AT 18 FEET No groundwater encountered Backfilled 04-18-2001			

Figure A-56, Log of Trench T 56

ESTEL

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. 06696-42-01

TRENCH T 57

ELEV. (MSL.) 530 DATE COMPLETED 4/18/01

EQUIPMENT JD 710D W/24" BUCKET

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/SC	**DEBRIS FLOW** Loose to medium dense, dark brown, moist, Silty fine SAND and Sandy CLAY, abundant subrounded cobble clasts to 10-inches diameter, few roots.			
2								
4								
6				SC	Dense, reddish-brown to grayish-brown, moist, Clayey fine to medium SAND with abundant subrounded cobble clasts to 8-inches diameter.			
8				GM	Very dense, damp, light brownish-gray coarse GRAVEL, with clayey to silty fine to medium sand matrix, 60% matrix supported, abundant subrounded cobble clasts to 10-inches diameter.			
10								
12								
14					TRENCH TERMINATED AT 14 FEET No groundwater encountered Backfilled 04-19-2001			

Figure A-57, Log of Trench T 57

ESTEL

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. 06696-42-01

TRENCH T 58

ELEV. (MSL.) 496 DATE COMPLETED 4/19/01

EQUIPMENT JD 710D W/24" BUCKET

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	**DEBRIS FLOW** Loose, moist, dark brown, Silty fine SAND, trace clay, few roots, few cobbles.			
2				SC	Dense, moist, dark reddish-brown, Clayey fine SAND, abundant subrounded cobble clasts to 8-inches diameter.			
4								
6								
8				GM	Dense, damp, grayish-brown, Sandy coarse GRAVEL, with silty fine to medium sand matrix, approximately 60 to 65% matrix supported, abundant subrounded cobble clasts to 10-inches diameter, moderately cemented.			
10								
12								
14					Well cemented.			
16								
					TRENCH TERMINATED AT 17 FEET No groundwater encountered Backfilled 04-19-2001			

Figure A-58, Log of Trench T 58

ESTEL

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. 06696-42-01

TRENCH T 59

ELEV. (MSL.) 535 DATE COMPLETED 4/19/01

EQUIPMENT JD 710D W/24" BUCKET

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	**COLLUVIUM** Loose to medium dense, moist, reddish-brown, Silty fine SAND, few roots, few gravels.			
2				CL/CH	Firm, moist, dark reddish-brown, Sandy CLAY, abundant cobbles to 3-inches diameter, caliche inclusions.			
4				SM	**STADIUM CONGLOMERATE** Dense, moist, reddish-brown, Silty, fine to medium SANDSTONE, moderately cemented, massive.			
6								
8								
10					TRENCH TERMINATED AT 10 FEET No groundwater encountered Backfilled 04-19-2001			

Figure A-59, Log of Trench T 59

ESTEL

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. 06696-42-01

TRENCH T 60

ELEV. (MSL.) 538 DATE COMPLETED 4/19/01

EQUIPMENT JD 710D W/24" BUCKET

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	**LANDSLIDE DEBRIS** Loose to firm, reddish-brown, moist, Sandy CLAY, few subrounded cobble clasts to 6-inches diameter, porous, some silt, roots.			
4				CL-CH	Firm, moist, reddish-brown, Sandy CLAY, high plasticity.			
6				SC	Medium dense, moist, reddish-brown, Clayey fine SAND, few subrounded cobble clasts to 6-inches diameter.			
8				CL	Firm, moist, reddish-brown, Sandy CLAY.			
10								
12								
14								
16					Very moist.			
					TRENCH TERMINATED AT 17 FEET No groundwater encountered Backfilled 04-19-2001			

Figure A-60, Log of Trench T 60

ESTEL

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. 06696-42-01

TRENCH T 61

ELEV. (MSL.) 482 DATE COMPLETED 4/19/01

EQUIPMENT JD 710D W/24" BUCKET

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	**COLLUVIUM** Loose, moist, dark brown, Clayey fine SAND, few roots.			
2								
					CUYAMACA GABBRO Highly weathered, brownish-gray, weak to moderately strong, GABBRO ROCK. Excavates to: moist, brownish-gray to grayish-brown, Silty fine to medium SAND. -Becomes strong at 6 feet			
4								
6					TRENCH TERMINATED AT 6 FEET No groundwater encountered Backfilled 04-19-2001			

Figure A-61, Log of Trench T 61

ESTEL

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. 06696-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 62 ELEV. (MSL.) 516 DATE COMPLETED 4/19/01 EQUIPMENT JD 710D W/24" BUCKET	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**DEBRIS FLOW** Loose to medium dense, moist, dark brown, Clayey SAND, porous, with roots, few subrounded cobble clasts to 8-inches diameter, some silt.			
2								
4								
6				SC-GC	Medium dense, moist, grayish-brown, Clayey SAND to Clayey coarse gravel, abundant subrounded cobble and boulder clasts to 15-inches diameter.			
8								
10								
12								
14								
					TRENCH TERMINATED AT 15 FEET No groundwater encountered Backfilled 04-19-2001			

Figure A-62, Log of Trench T 62

ESTEL

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. 06696-42-01

TRENCH T 63

ELEV. (MSL.) 542 DATE COMPLETED 4/19/01

EQUIPMENT JD 710D W/24" BUCKET

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	**DEBRIS FLOW** Loose, moist, dark reddish-brown, Clayey SAND and Sandy CLAY, porous, with few subrounded cobble clasts to 6-inches diameter.			
2								
4								
6				SC	Medium dense, moist, reddish-brown, Clayey fine SAND; some silt.			
8				GP	2' thick subrounded cobble to boulder zone.			
10								
12				SC-GC	Medium dense, moist, reddish-brown, Gravelly, Clayey SAND to Clayey coarse GRAVEL.			
14					TRENCH TERMINATED AT 14 FEET No groundwater encountered Backfilled 04-19-2001			

Figure A-63, Log of Trench T 63

ESTEL

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. 06696-42-01

TRENCH T 64

ELEV. (MSL.) 480 DATE COMPLETED 4/19/01

EQUIPMENT JD 710D W/24" BUCKET

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-CL	**COLLUVIUM** Loose, dark brown, moist, Clayey fine SAND to Sandy CLAY, porous, with few subrounded cobble clasts to 6-inches diameter, some silt, roots.			
4					**CUYAMACA GABBRO** Highly weathered, yellowish-brown, weak to moderately strong, GABBRO ROCK. Excavates to: moist, yellow-brownish to grayish-brown, Clayey, fine to coarse SAND with some silt.			
6								
8					-Becomes strong at 9 feet.			
					TRENCH TERMINATED AT 9 FEET No groundwater encountered Backfilled 04-19-2001			

Figure A-64, Log of Trench T 64

ESTEL

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. 06696-42-01

BORING B 1

ELEV. (MSL.) 497 DATE COMPLETED 4/25/01

EQUIPMENT 30-INCH BUCKET

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				ML	**FRIARS FORMATION** Dense, moist, greenish-gray, fine Sandy to Clayey SILTSTONE, massive, fractured and weathered.			
4								
6	B1-1					6	105.3	21.2
8				ML	Dense, moist, greenish-gray, Sandy SILTSTONE, massive.			
10	B1-2			SM	Medium dense, moist, light greenish-gray, Silty fine SANDSTONE, massive, fractured, with calcium carbonate linings.	2	96.6	20.0
12					-Undulatory contact			
14				ML	Dense, moist, greenish-gray, Sandy SILTSTONE, with some interbedded thin silty claystone layers.			
16	B1-3					8	113.4	13.6
18				SC	Dense, moist, greenish-gray, Clayey, very coarse SANDSTONE to GRITSTONE; friable when disturbed.			
20	B1-4					7	104.5	21.6
22				SC	Dense, moist, olive to greenish-gray, Clayey, fine to medium SANDSTONE; some silt with thin claystone zones containing polished discontinuous fracture surfaces.			
24								
26					Grades to: Clayey SILTSTONE			
28				SM	Dense, moist, olive to greenish-gray, Clayey coarse GRITSTONE; massive. Coarse gritstone at 28 feet.			
30	B1-5					8		

Figure A-65, Log of Boring B 1

ESTEL

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. 06696-42-01

BORING B 1

ELEV. (MSL.) 497 DATE COMPLETED 4/25/01

EQUIPMENT 30-INCH BUCKET

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
32								
34	B1-6			CL	Hard, moist, light gray, Silty CLAYSTONE; massive, with discontinuous randomly oriented polished fractures.			
36	B1-7							
38								
40	B1-8			ML	Very dense, moist, olive brown, Sandy SILTSTONE.	22	108.4	19.0
42					Extremely dense, humid, light gray, strongly cemented concretion layer (approximately 6-inches thick).			
44				ML	Very dense, moist, olive brown, Sandy SILTSTONE.			
46								
48								
50	B1-9			CL	Hard, moist, light olive, Silty CLAYSTONE Slickensided fractured zone approximately at 51 feet, 10" thick, undulating, approximately horizontal to west-dipping, continuous across boring.	25	100.8	22.9
52								
54								
56				SM	Very dense, moist, greenish-gray to olive, Silty fine SANDSTONE.			
58								
60					BORING TERMINATED AT 60 FEET No groundwater encountered			

Figure A-66, Log of Boring B 1

ESTEL

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.

B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in general accordance with test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected, relatively undisturbed drive samples were tested for their in-place dry density, moisture content, and shear strength characteristics. Portions of the bulk samples were remolded to selected densities and subjected to direct shear testing, expansion testing, and soluble sulfate testing.

The results of our laboratory tests are presented in tabular form hereinafter. The in-place dry density and moisture characteristics are also presented on the exploratory boring log in Appendix A.

TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS ASTM D 1557-01

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
T1-2	Brown, fine to coarse SAND with little silt	129.8	9.1
T5-2	Yellow-tan, Silty, fine to medium SAND with little clay	120.4	12.0
T12-1	Light brown, Silty CLAY with trace sand	124.5	9.5
T30-1	Dark brownish gray, Silty CLAY	106.6	19.9

TABLE B-II
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS

Sample No.	Moisture Content		Dry Density (pcf)	Expansion Index
	Before Test (%)	After Test (%)		
T10-1	10.9	28.1	104.6	41
T30-1	14.2	38.2	95.8	135

TABLE B-III
SUMMARY OF DIRECT SHEAR TEST RESULTS

Sample No.	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
B1-4	105.3	20.1	400	39
B1-9	101.0	22.7	350	33

TABLE B-IV
SUMMARY OF LABORATORY SOLUBLE SULFATE TEST RESULTS

Sample No.	Sulfate Content (% SO_4)	Sulfate Rating*
T10-1	.005	Negligible
T30-1	.005	Negligible

*Reference: 1997 Uniform Building Code (UBC) Table 19-A-4.

C

APPENDIX C

SLOPE STABILITY EVALUATION

General

Slope stability analyses were performed on the proposed finish grade configuration along eight cross-sections across the property (see Geologic Map, Figure 2). The sections are generally located in proposed cut slopes, postulated landslide areas, and debris flow areas. The slope geometry, geologic structure, and calculated factor of safety for each cross-section are presented on Figures C-1 through C-9.

The computer program SLOPE/W distributed by Geo-Slope International was utilized to perform the 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 analysis, Spencer's Method with a block failure mode was used for failure along landslide basal surfaces and in weak claystone beds. Where weak claystone beds were identified to be discontinuous or nonexistent, Spencer's Method with a circular failure mechanism was used. Spencer's Method satisfies both moment and force equilibrium.

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 C-1 through C-9). The factor of safety is shown on each figure directly above the failure surface. For a circular failure search (see Figure C-1), a grid of search midpoints and radii are specified and the computer searches for the critical failure surface. The most critical failure surface is shown as the hatched area on each figure.

Shear Strength Parameters

Shear strength parameters used in the analyses are based on direct shear testing performed on samples obtained from Boring B-1 and information obtained from Geocon's Fanita Ranch project located directly east of the Castlerock property. Fanita Ranch has very similar geologic conditions and geologic structure as the Castlerock property, specifically granitic rock that is overlain by the Friars Formation and Stadium Conglomerate. Similar weak claystone beds as observed in the boring and trenches performed for this study were encountered in Fanita Ranch.

The specific shear strength value used for each cross-section analyzed is shown on Figures C-1 through C-9. Presented on the following table is a summary of the shear strength parameters used in the slope stability analyses. Table C-III at the end of this Appendix summarizes the results of laboratory shear strength tests performed for both this study and Fanita Ranch.

TABLE C-I
SOIL SHEAR STRENGTH PARAMETERS

Soil Type	Angle of Internal Friction (degrees)	Cohesion (psf)
Qcf (compacted fill for buttress and stability fill)	30	300
Qdf (debris flow)	20	100
Qls (landslide debris)	20	200
Slide Plane (basal surface)	7	150
Tf (Friars Formation)	33	500
Tf (cl) (weak claystone bed)	16	800
Tst (Stadium Conglomerate)	35	500
Kcw (Weathered Cuyamaca Gabbro)	35	600

Slope Stability — Weak Claystone Beds

Cross-sections A-A' and B-B' were used to analyze overall stability in the proposed cut slope at the southwest end of the site where weak clay beds in the Friars Formation were encountered. As shown on Cross-Section B-B', a weak clay bed and two weak clay seams have been identified. The slope at Cross Section C-C' was originally planned as a cut slope. The new design retains a natural slope configuration. Our analyses indicate the weak clay bed near an elevation of 456 feet MSL to 464 feet MSL (at toe of proposed cut slope) is the most critical failure surface with respect to gross stability of the slope. Analyses performed on the other clay beds above and below this clay bed indicated a higher factor-of-safety. Only the analysis performed on the critical clay bed has been included in this report. No clay beds were identified on Cross-Section A-A'. Figures C-1 and C-3 summarize the results of the analyses and indicate that the proposed finish grade slopes possess a factor of safety of at least 1.8.

Weak shear zones are common within the Friars Formation. These shear zones can be significant when they “daylight” in cut slopes. Although our analyses indicate a factor of safety greater than 1.5 and that stability buttresses are not required, stability fills are recommended in project cut slopes that “daylight” the Friars Formation to mitigate potential surficial slope instability. The approximate limits of recommended stability fills are shown on the Geologic Map (Figure 2, map pocket).

Slope Stability — Debris Flow

Cross-Sections D-D' and F-F' were used to analyze debris flows in the north-central portion of the property. Figures C-4 and C-6 present the results of the analyses. Because the debris flow in the area of Cross-Section D-D' “daylights” along the cut slope, we recommend a stability fill be constructed. The backcut of the stability fill, as shown on the section D-D', extends down to a depth of at least 2 to

3 feet below the toe of the proposed cut slope. This provides a stability fill width of approximately 35 feet at the base. Our analysis indicates that a stability fill, as shown cross-section D-D', provides a factor-of-safety of 1.7 for the finish grade slope condition (see Figure C-4). The approximate limits of the proposed stability fill are shown on Figure 2 (map pocket).

With respect to Cross-Section F-F', our analyses indicate a factor-of-safety against slope instability of 2.5 for proposed finish grade conditions assuming the debris flow above grading limits is left in-place. However, during mass grading the debris flow will be completely removed and recompacted to near the MHPA boundary. This will result in a significant amount of compacted fill stabilizing the slope and a subsequent factor-of-safety in excess of 2.5.

Slope Stability — Landslides

Cross-Sections E-E', G-G', and H-H' were used to analyze landslides that either encroach onto the property or affect the property because of their proximity. Figures C-5, C-7, C-8 and C-9 present the results of the stability analyses. The analyses were performed assuming a block slide failure along the basal slip surface of the landslide. At Cross-Section E-E', a buttress with a bottom width of approximately 15 feet provides an as-graded factor-of-safety of 1.6 (see Figure C-5). At Cross-Section G-G' the landslide in its existing condition has a factor-of-safety of 1.2 (see Figure C-7). Our analyses indicate a buttress with a bottom width of approximately 55 feet would provide a factor-of-safety of 1.5 (see Figure C-8). At Cross-Section H-H' a 35-foot-wide buttress provides a factor-of-safety of 1.5. The approximate limits of stabilizing buttresses are shown on Figure 2.

Summary

Slope stability analyses were conducted on the cross-sections discussed above due to the presence of mapped landslides and debris flows with respect to planned development and also to evaluate cut slopes planned in the Friars Formation. Where stabilization fills are not required, slope stability analyses using conventional slope stability methods for homogeneous soil conditions (circular failure) were also conducted. The results indicate a factor of safety greater than 1.5 for both deep seated and surficial conditions. Results of these analyses are presented on Figures C-10 through C-13.

The following table summarizes computer slope 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 C-II
SUMMARY OF STABILITY ANALYSES
AND RECOMMENDED STABILIZATION METHOD

Cross-Section	Proposed Graded Factor-of-Safety	Stabilization Method
A-A'	2.4	None
B-B'	1.8	Stabilization fill for cut slopes exposing Friars Formation
C-C'	2.2	Stabilization fill for cut slopes exposing Friars Formation
D-D'	1.7	Stabilization fill for cut slopes exposing Debris Flow
E-E'	1.6	15-foot-wide buttress for landslide
F-F'	2.5	None
G-G'	1.5	55-foot-wide buttress for landslide
H-H'	1.5	35-foot-wide buttress for landslide

TABLE C-III
SUMMARY OF DIRECT SHEAR TEST RESULTS
(COMPILATION OF FANITA RANCH AND EAST ELLIOTT)

Soil/Geologic Unit	Sample No.	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
Compacted Fill (Qcf)	B3-7*	525	29
	B3-16*	800	32
	B11-2*	1000	7
	B16-2*	425	30
	B16-10*	940	30
	B20-1*	900	25
	B21-5*	950	36
	B26-2*	900	38
	B27-1*	450	34
	B29-4*	975	32
	B34-1*	775	27
	B37-1*	400	30
	B43-1*	890	30
	B45-5*	1070	30
	B50-7*	750	36
	B51-2*	1050	23
	B55-3*	385	31
Stadium Conglomerate (Tst)	B26-1	1350	39

*Sample remolded to approximately 90 percent of maximum dry density at near optimum moisture content.

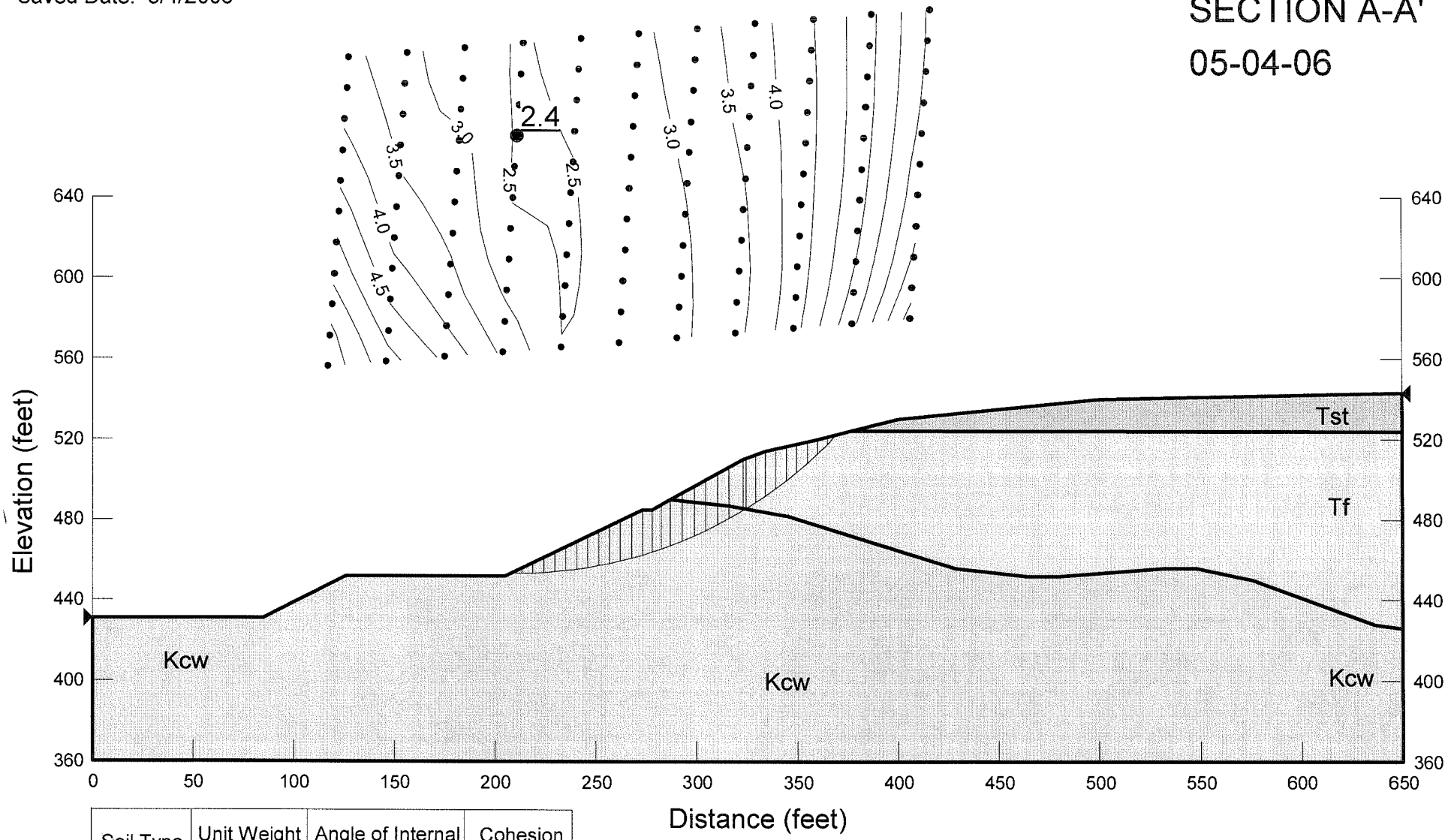
TABLE C-III (Continued)
SUMMARY OF DIRECT SHEAR TEST RESULTS
(COMPILATION OF FANITA RANCH AND EAST ELLIOTT)

Soil/Geologic Unit	Sample No.	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
Friars Formation (Tf)	B1-4 (Elliott)	400	39
	B1-9 (Elliott)	350	33
	B3-8	390	37
	B3-14	420	43
	B8-3	700	19
	B8-10	2200	21
	B11-6	600	44
	B11-11	270	38
	B16-9	1375	20
	B19-3	450	37
	B19-7	375	28
	B24-2	1000	36
	B26-5	1940	33
	B29-8	1500	45
	B29-12	900	45
	B35-3	880	41
	B35-4	600	24
	B43-2	760	30
	B43-4	700	45
	B44-1	650	37
	B44-5	1400	40
	B45-4	1500	30
	B50-2	1000	30
	B50-6	1600	45
	B52-1	350	45
	B55-2	590	34
	B55-4	790	44
	B68-6	800	34
	B75-3	1340	29
Residual Shear (Slide Plane)	B5-8**	240	7
	B60-1**	300	14
	B68-10**	100	12
	B75-1**	695	18

**Residual shear.

Project No. 06696-42-01
Saved Date: 5/4/2006

CASTLEROCK
SECTION A-A'
05-04-06



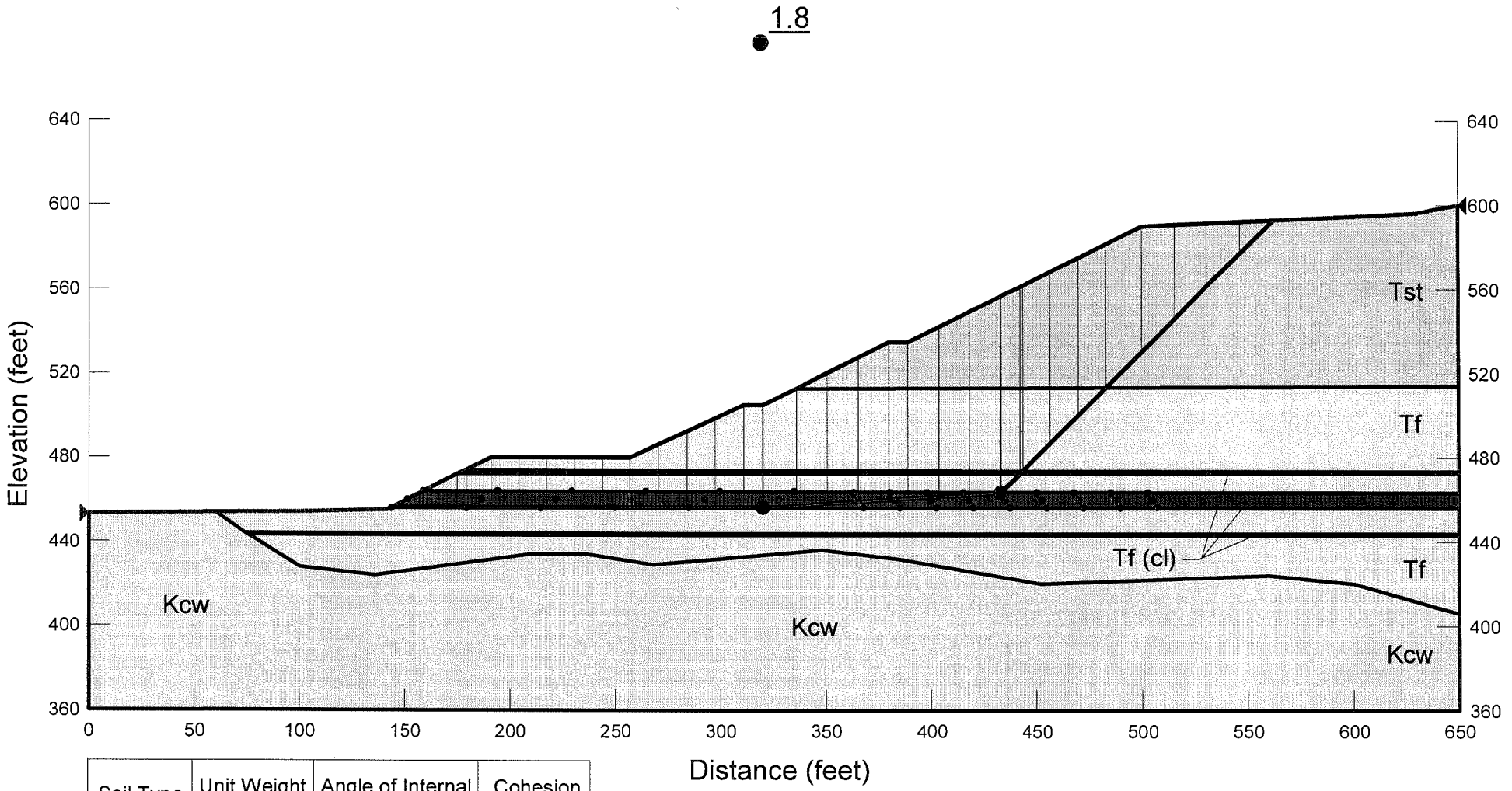
Soil Type	Unit Weight (pcf)	Angle of Internal Friction (deg)	Cohesion (psf)
Tst	130	35	500
Tf	130	33	500
Kcw	130	35	600

File Name : 06696-42-01\AA1a.gsz

Figure C-1

Project No. 06696-42-01
Saved Date: 5/4/2006

CASTLEROCK
SECTION B-B'
05-04-06



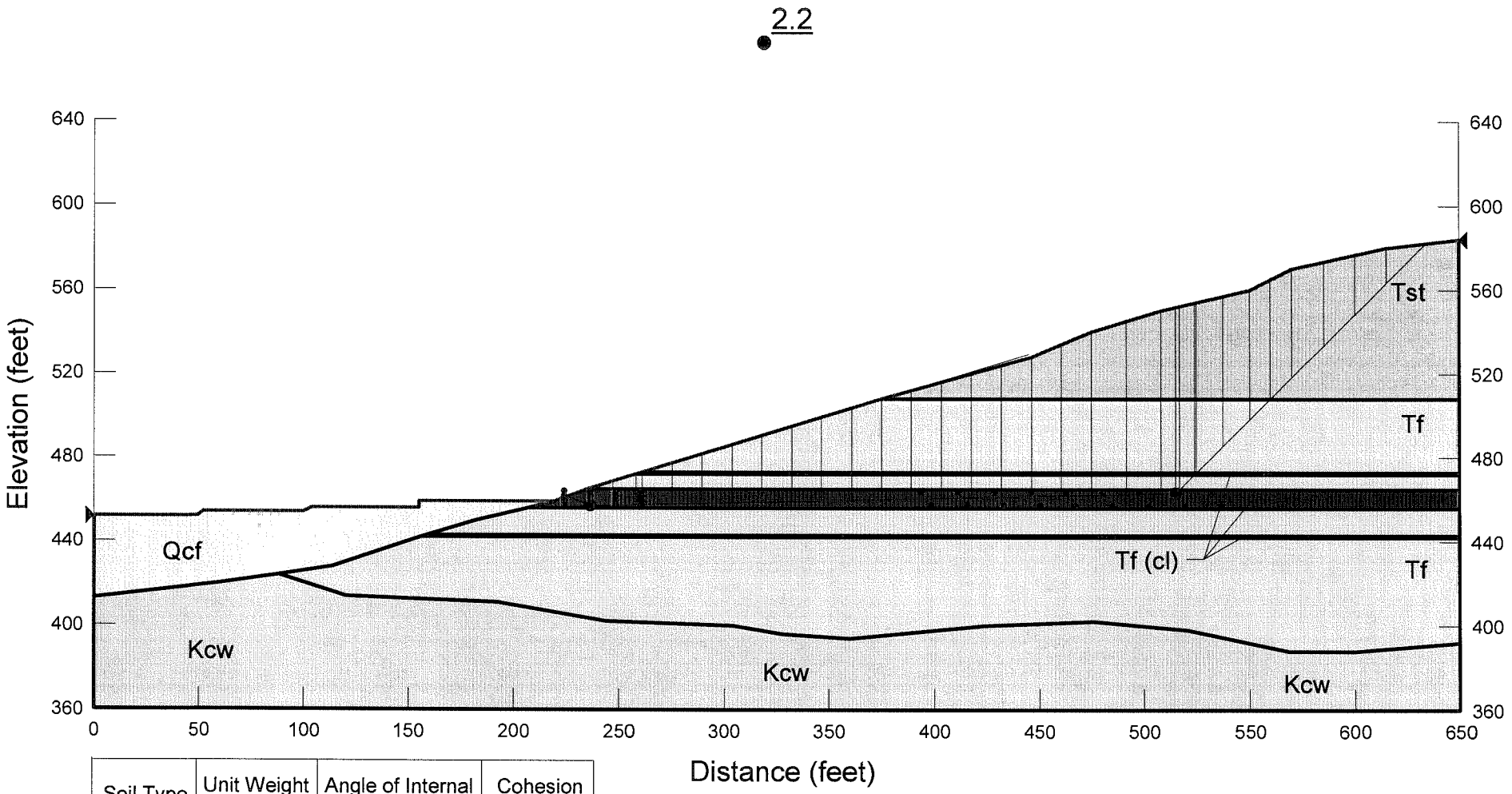
Soil Type	Unit Weight (pcf)	Angle of Internal Friction (deg)	Cohesion (psf)
Tst	130	35	500
Tf	130	33	500
Tf (cl)	130	16	800
Kcw	130	35	600

File Name : 06696-42-01\BB2Aa.gsz

Figure C-2

Project No. 06696-42-01
Saved Date: 5/4/2006

CASTLEROCK
SECTION C-C'
05-04-06



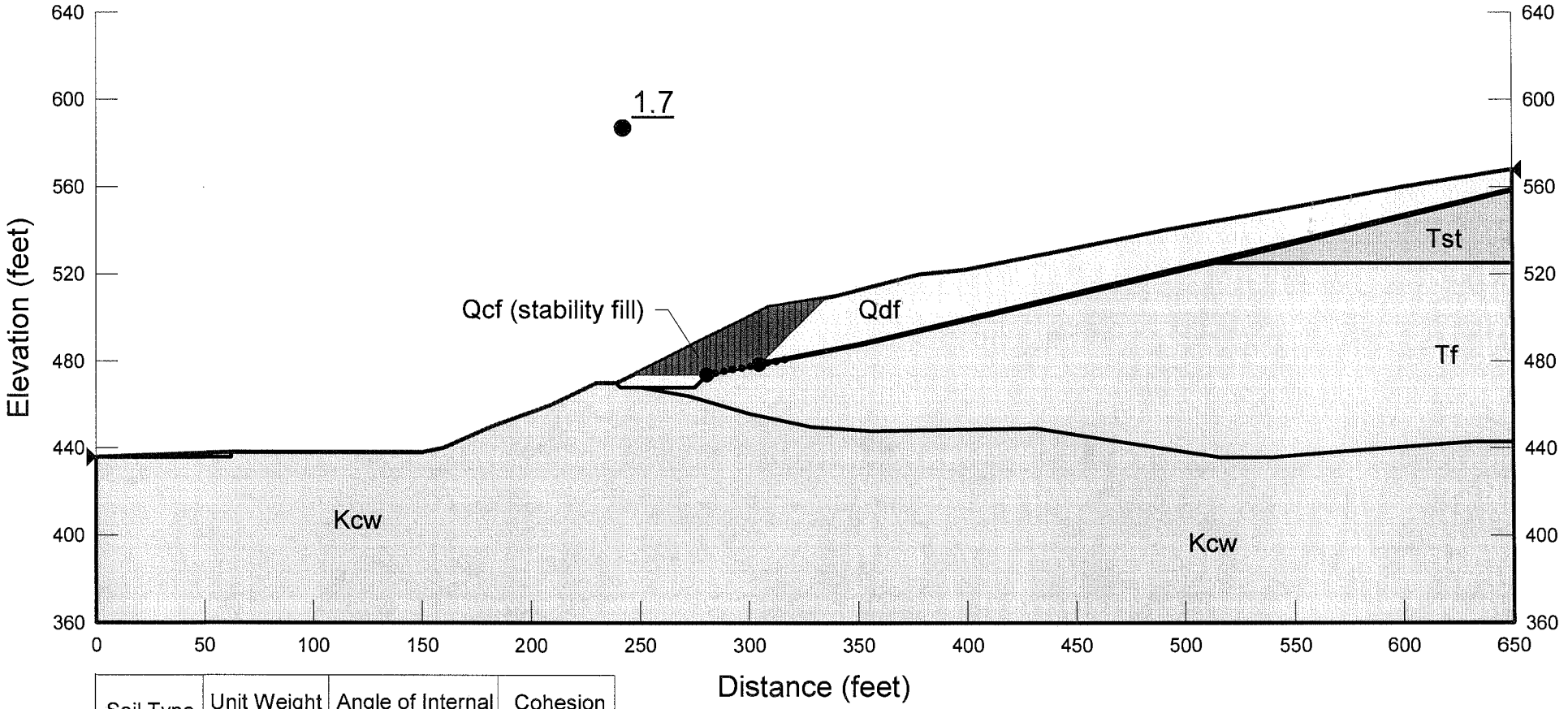
Soil Type	Unit Weight (pcf)	Angle of Internal Friction (deg)	Cohesion (psf)
Qcf	130	30	300
Tst	130	35	500
Tf	130	33	500
Tf (cl)	130	16	800
Kcw	130	35	600

File Name : 06696-42-01\CC2Ab.gsz

Figure C-3

Project No. 06696-42-01
Saved Date: 5/4/2006

CASTLEROCK
SECTION D-D'
05-04-06



Soil Type	Unit Weight (pcf)	Angle of Internal Friction (deg)	Cohesion (psf)
Qcf	130	30	300
Qdf	130	20	100
Tst	130	35	500
Tf	130	33	500
Kcw	130	35	600

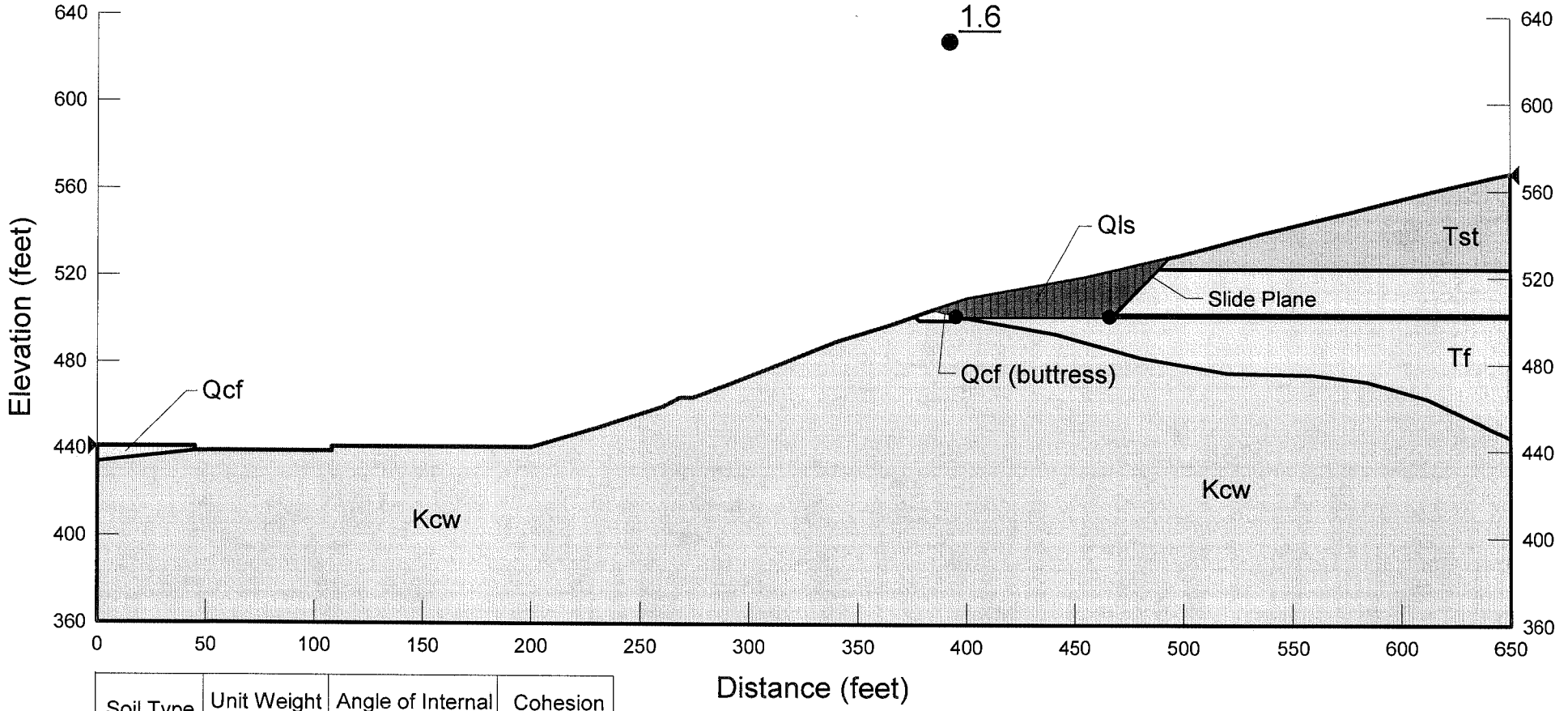
File Name : 06696-42-01\DD2a.gsz

35-foot wide stability fill
1:1 Backcut

Figure C-4

Project No. 06696-42-01
Saved Date: 5/4/2006

CASTLEROCK
SECTION E-E'
05-04-06



Soil Type	Unit Weight (pcf)	Angle of Internal Friction (deg)	Cohesion (psf)
Qcf	130	30	300
Slide Plane	130	7	150
Qls	130	20	200
Tf	130	33	500
Tst	130	35	500

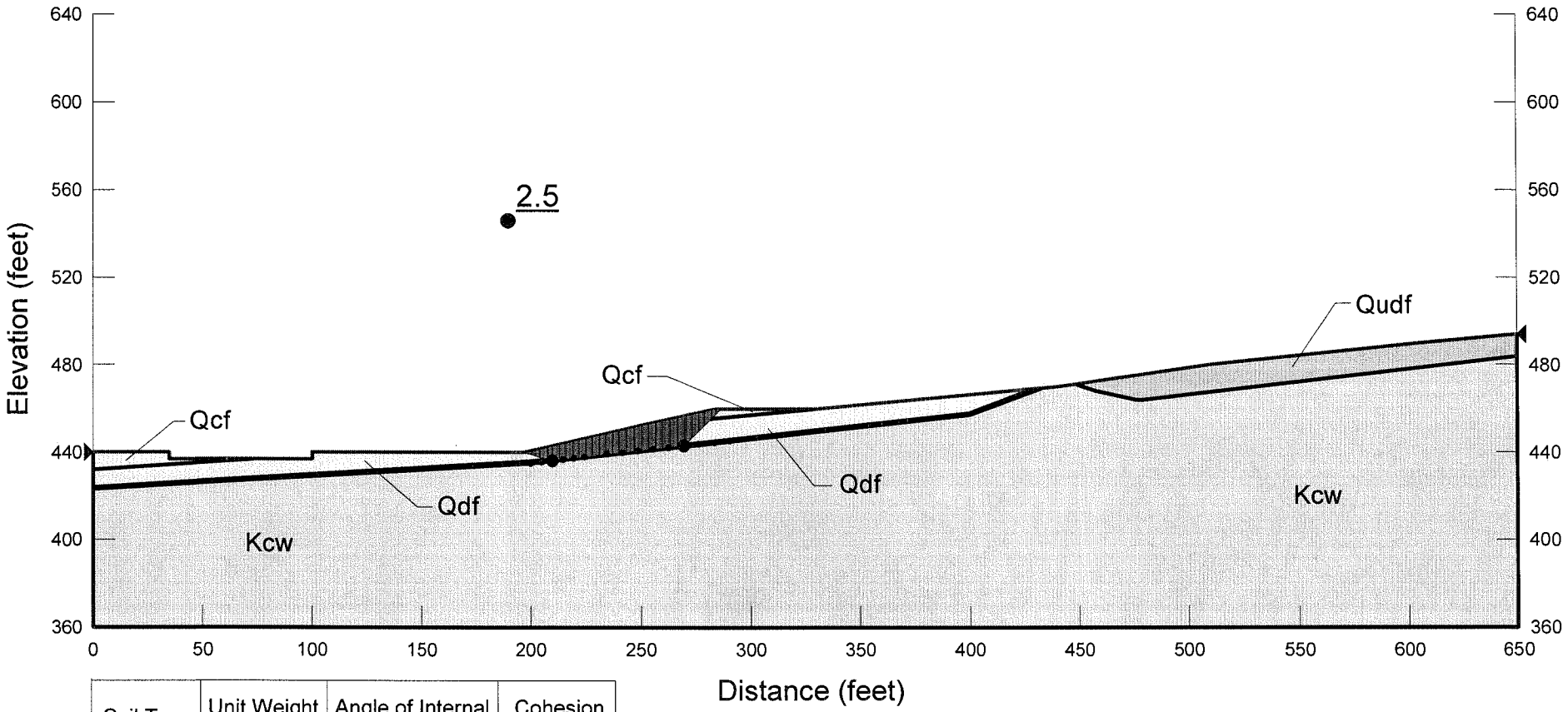
File Name : 06696-42-01\EE3B.gsz

15-foot wide buttress

Figure C-5

Project No. 06696-42-01
Saved Date: 5/4/2006

CASTLEROCK
SECTION F-F'
05-04-06



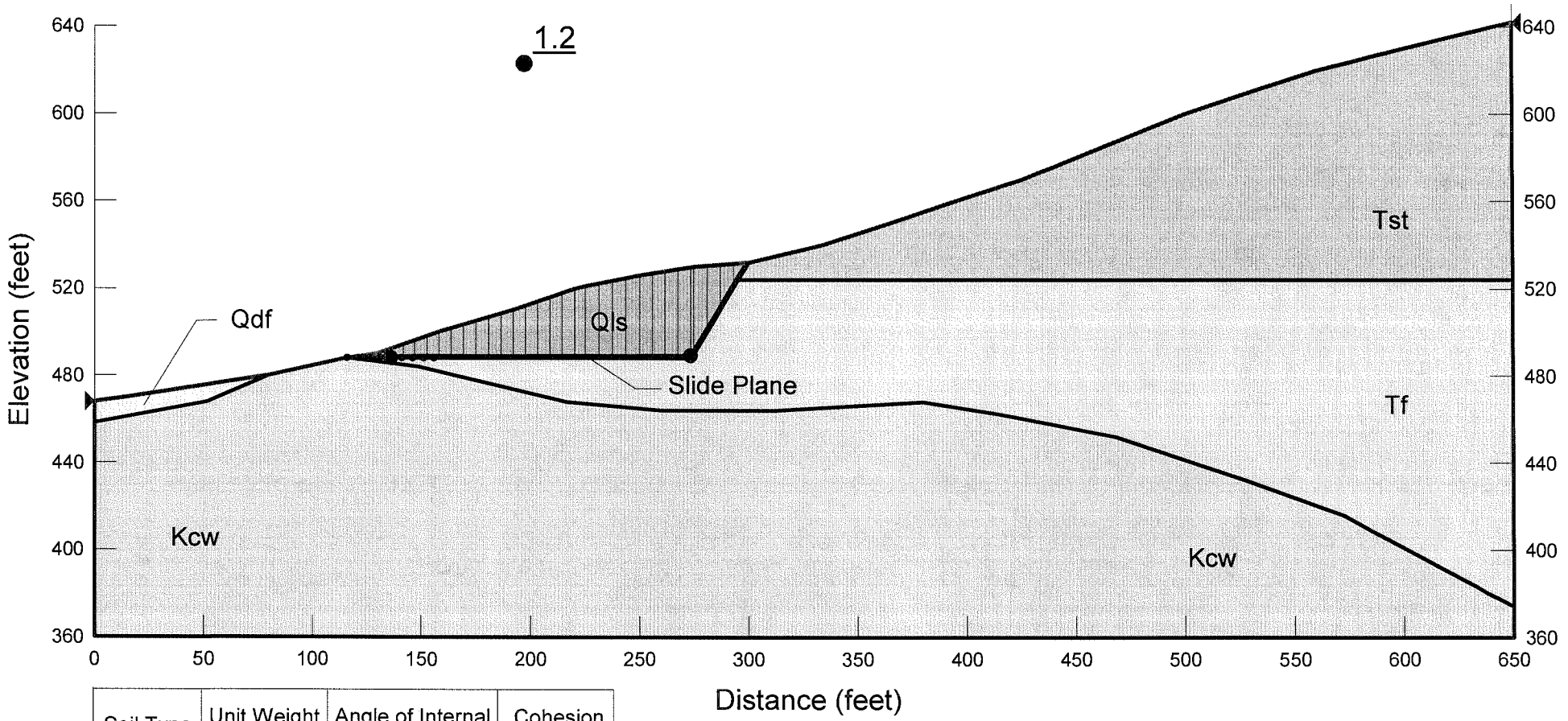
Soil Type	Unit Weight (pcf)	Angle of Internal Friction (deg)	Cohesion (psf)
Qcf	130	30	300
Qdf	130	20	100
Qudf	130	20	100
Kcw	130	35	600

File Name : 06696-42-01\FF1a.gsz

Figure C-6

Project No. 06696-42-01
Saved Date: 5/4/2006

CASTLEROCK
SECTION G-G'
05-04-06



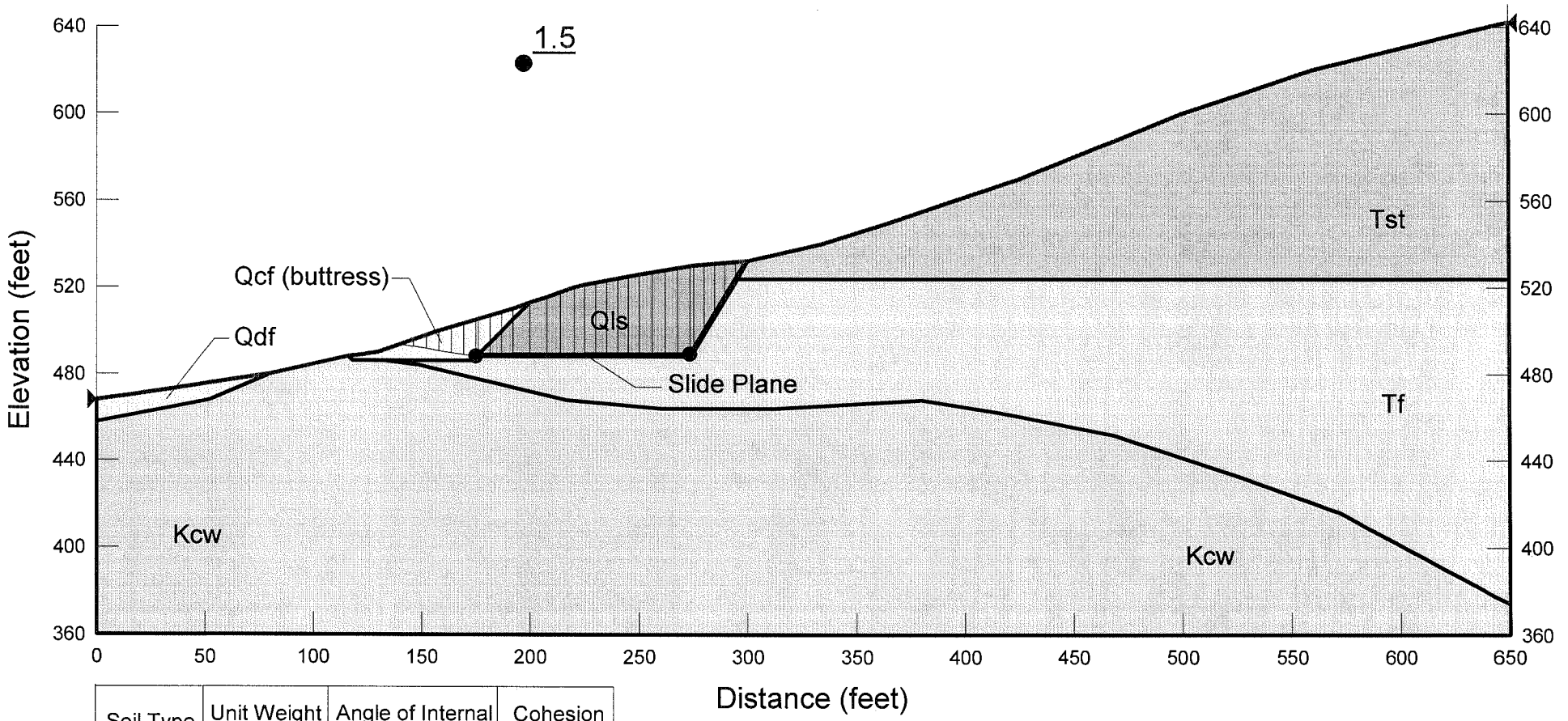
Soil Type	Unit Weight (pcf)	Angle of Internal Friction (deg)	Cohesion (psf)
Qdf	130	20	100
Slide Plane	130	7	150
Tst	130	35	500
Tf	130	33	500
Qls	130	20	200

File Name : 06696-42-01\GG1a.gsz

Figure C-7

Project No. 06696-42-01
Saved Date: 5/4/2006

CASTLEROCK
SECTION G-G'
05-04-06



Soil Type	Unit Weight (pcf)	Angle of Internal Friction (deg)	Cohesion (psf)
Qcf	130	30	300
Slide Plane	130	7	150
Tst	130	35	500
Tf	130	33	500
Qls	130	20	200

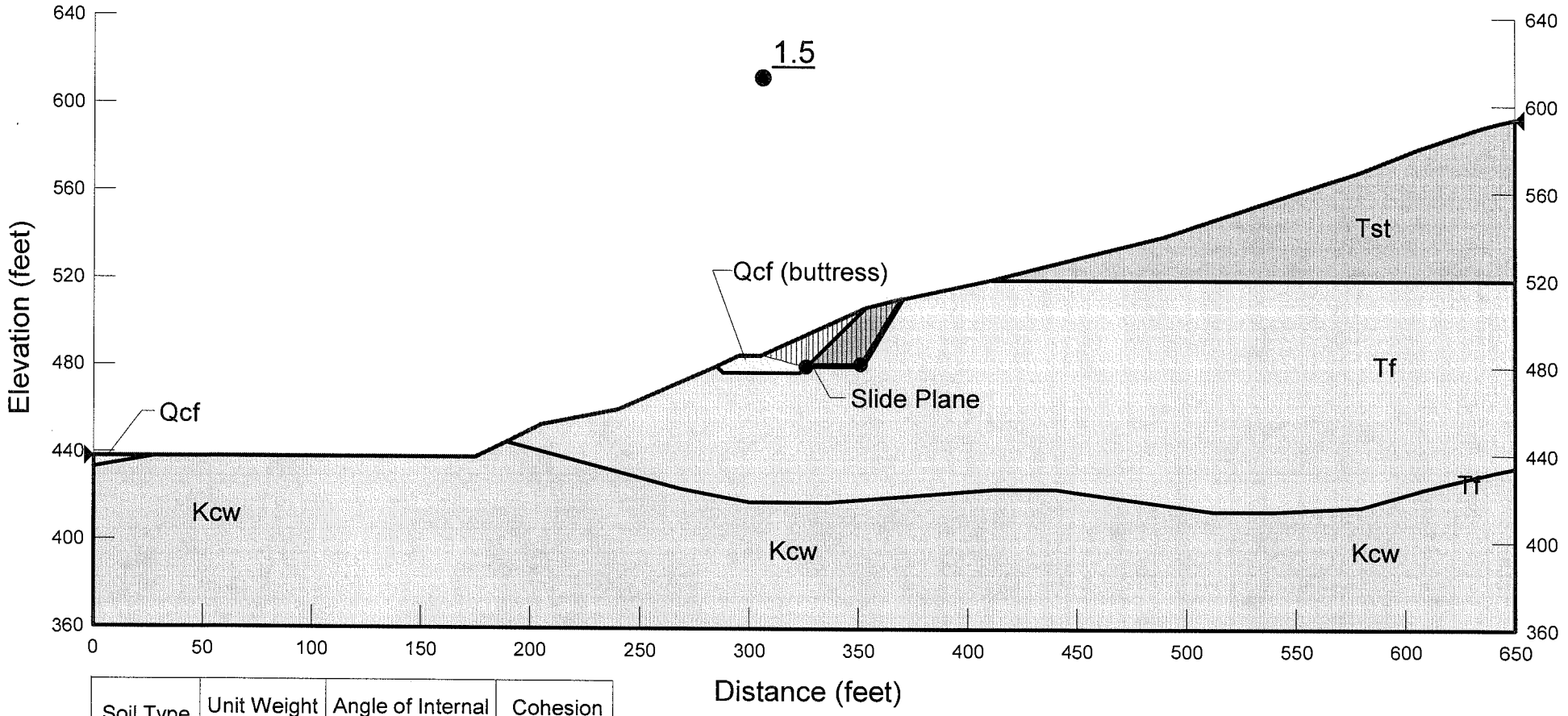
File Name : 06696-42-01\GG2a.gsz

55-foot wide buttress

Figure C-8

Project No. 06696-42-01
Saved Date: 5/4/2006

CASTLEROCK
SECTION H-H'
05-04-06



Soil Type	Unit Weight (pcf)	Angle of Internal Friction (deg)	Cohesion (psf)
Qcf	130	30	300
Qls	130	20	200
Slide Plane	130	7	150
Tf	130	33	500
Tst	130	35	500

35-foot wide buttress

File Name : 06696-42-01\HH2V2a.gsz

Figure C-9

ASSUMED CONDITIONS :

SLOPE HEIGHT	H	=	90 feet
SLOPE INCLINATION	2 : 1 (Horizontal : Vertical)		
TOTAL UNIT WEIGHT OF SOIL	γ_t	=	127 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	=	33 degrees
APPARENT COHESION	C	=	500 pounds per square foot
NO SEEPAGE FORCES			

ANALYSIS :

$\gamma_{c\phi}$	=	$\frac{\gamma H \tan\phi}{C}$	EQUATION (3-3), REFERENCE 1
FS	=	$\frac{NcfC}{\gamma H}$	EQUATION (3-2), REFERENCE 1
$\gamma_{c\phi}$	=	14.8	CALCULATED USING EQ. (3-3)
Ncf	=	43	DETERMINED USING FIGURE 10, REFERENCE 2
FS	=	1.88	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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CASTLEROCK
SAN DIEGO, CALIFORNIA

JM / DW		DSK/GTYPD	DATE 05 - 05 - 2006	PROJECT NO. 06696 - 42 - 01	FIG. C-10

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	=	127 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	=	33 degrees
APPARENT COHESION	C	=	500 pounds per square foot

SLOPE SATURATED TO VERTICAL DEPTH Z BELOW SLOPE FACE

SEEPAGE FORCES PARALLEL TO SLOPE FACE

ANALYSIS :

$$FS = \frac{C + (\gamma_t - \gamma_w)\ Z\ cos^2\ i\ tan\ \phi}{\gamma_t\ Z\ sin\ i\ cos\ i} = 3.93$$

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 FILL SLOPE STABILITY ANALYSIS - CUT SLOPES

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JM / DW		DSK/GTYPD	DATE 05 - 05 - 2006	PROJECT NO. 06696 - 42 - 01	FIG. C-11

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ASSUMED CONDITIONS :

SLOPE HEIGHT	H	=	65 feet
SLOPE INCLINATION	2 : 1 (Horizontal : Vertical)		
TOTAL UNIT WEIGHT OF SOIL	γ_t	=	127 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	=	30 degrees
APPARENT COHESION	C	=	300 pounds per square foot
NO SEEPAGE FORCES			

ANALYSIS :

$\gamma_{c\phi}$	=	$\frac{\gamma H \tan\phi}{C}$	EQUATION (3-3), REFERENCE 1
FS	=	$\frac{NcfC}{\gamma H}$	EQUATION (3-2), REFERENCE 1
$\gamma_{c\phi}$	=	15.9	CALCULATED USING EQ. (3-3)
Ncf	=	46	DETERMINED USING FIGURE 10, REFERENCE 2
FS	=	1.67	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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CASTLEROCK
SAN DIEGO, CALIFORNIA

JM / DW		DSK/GTYPD	DATE 05 - 05 - 2006	PROJECT NO. 06696 - 42 - 01	FIG. C-12

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	=	127 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 FILL SLOPE STABILITY ANALYSIS - CUT SLOPES

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CASTLEROCK
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JM / DW		DSK/GTYPD	DATE 05 - 05 - 2006	PROJECT NO. 06696 - 42 - 01	FIG. C-13

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D

APPENDIX D

RECOMMENDED GRADING SPECIFICATIONS

FOR

CASTLEROCK
SAN DIEGO, CALIFORNIA

PROJECT NO. 06696-42-01

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 Incorporated. 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. It will be necessary that the Consultant provide adequate testing and observation services so that he may determine that, in his 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 him 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, adverse weather, and so forth, 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 construction 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 3/4 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 3/4 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. Representative samples of soil materials to be used for fill shall 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

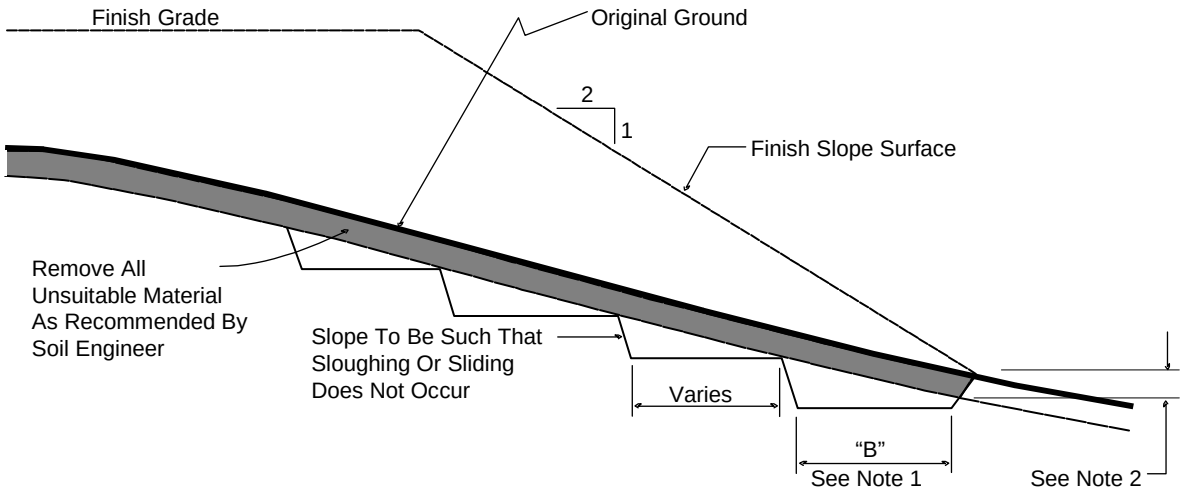
4.1. Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1-1/2 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. Any asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility. Concrete fragments which 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 or other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction shall 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 6:1 (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 wide, 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 bottom 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, plowed or scarified, the surface should be disced or bladed by the Contractor until it is uniform and free from large clods. The area should then be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6.0 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 D1557-00.

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 D1557-00. 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. Soils having an Expansion Index of greater than 50 may be used in fills if 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. All rock placement, fill placement and flooding of approved granular soil in the windrows must be continuously observed by the Consultant or his representative.

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, maximum slope of 5 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 will 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 D1196-93, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the number of passes of the compaction equipment to be performed. If performed, a minimum of three plate bearing tests shall 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 shall be present during *rock* fill operations to verify 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. In general, at least one test should be performed for each approximately 5,000 to 10,000 cubic yards of *rock* fill placed.

6.3.5. Test pits shall be excavated by the Contractor so that the Consultant can state that, in his 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. All *rock* fill placement shall be continuously observed during placement by representatives of the Consultant.

7. OBSERVATION AND TESTING

7.1. The Consultant shall be the Owners 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 shall be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test shall be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

7.2. The Consultant shall perform random field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion as to 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.

7.3. During placement of *rock* fill, the Consultant shall verify that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant shall 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. If performed, plate bearing tests will be performed randomly on the surface of the most-recently placed lift. Plate bearing tests will be performed to provide a basis for expressing an opinion as to whether the *rock* fill is adequately seated. The maximum deflection in the *rock* fill determined in Section 6.3.3 shall be less than the maximum deflection of the properly compacted *soil* fill. When any of the above criteria 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.

7.4. 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.

7.5. The Consultant shall observe the placement of subdrains, to verify that the drainage devices have been placed and constructed in substantial conformance with project specifications.

7.6. Testing procedures shall conform to the following Standards as appropriate:

7.6.1. Soil and Soil-Rock Fills:

7.6.1.1. Field Density Test, ASTM D1556-00, *Density of Soil In-Place By the Sand-Cone Method.*

7.6.1.2. Field Density Test, Nuclear Method, ASTM D2922-96, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

7.6.1.3. Laboratory Compaction Test, ASTM D1557-00, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.

7.6.1.4. Expansion Index Test, ASTM D4829-95, *Expansion Index Test*.

7.6.2. Rock Fills

7.6.2.1. Field Plate Bearing Test, ASTM D1196-93 (Reapproved 1997) *Standard Method for Nonreparative Static Plate Load Tests of Soils and Flexible Pavement Components, For Use in Evaluation and Design of Airport and Highway Pavements.*

8. PROTECTION OF WORK

8.1. 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.

8.2. 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.

9. CERTIFICATIONS AND FINAL REPORTS

9.1. 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.

9.2. 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.

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4. California Department of Conservation, California Geological Survey, formerly Division of Mines and Geology, *Probabilistic Seismic Hazard Assessment for the State of California,* Open File Report 96-08, 1996.

5. City of San Diego Seismic Safety Study, Map No. 33, 1995.

6. *Fault Activity Map of California and Adjacent Areas,* California Geological Survey, formerly California Division of Mines and Geology, 1992, complied by C. W. Jennings, 1994.

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