GEOTECHNICAL EVALUATION

FOR

PROPOSED MIXED-USE DEVELOPMENT
EAST VALLEY BOULEVARD PROPERTY
CITY OF WALNUT, LOS ANGELES COUNTY, CALIFORNIA

PREPARED FOR

SUNJOINT DEVELOPMENT, LLC
280 MACHLIN CT.
CITY OF INDUSTRY, California 91789

PREPARED BY

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March 27, 2015
Project No. 1280-CR

Sunjoint Development, LLC
280 Machlin Ct.
City of Industry, California 91789

Attention: Mr. Shan Lee

Subject: Geotechnical Evaluation
Proposed Mixed-Use Development
East Valley Boulevard Property
City of Walnut, Los Angeles County, California

Dear Mr. Lee:

We are pleased to provide the results of our geotechnical evaluation for the subject project located adjacent to and northwest of East Valley Boulevard approximately ¼-mile northeast of North Grand Avenue in the city of Walnut, Los Angeles County, California. This report presents the results of our evaluation and discussion of our findings. In our opinion, site development appears feasible from a geotechnical viewpoint. Site development and grading plans should be reviewed by this firm as they become available, as it will be necessary to provide appropriate recommendations for intended specific site development as those plans become refined.

The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to call our office.

Respectfully submitted,
GeoTek, Inc.

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1. PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to evaluate the general geotechnical conditions on the site. Services provided for this study included the following:

- Research and review of available geologic and geotechnical data, and general information pertinent to the site,
- Site exploration consisting of the excavation, logging and sampling of six exploratory hollow-stem borings by an engineering geologist from our firm,
- Laboratory testing of soil samples collected during the field investigation,
- Evaluation of the liquefaction potential at the site,
- Review and evaluation of site seismicity, and
- Compilation of this geotechnical report which presents our findings and a general summary of pertinent geotechnical conditions relevant for site development.

The intent of this report is to aid in the evaluation of the site for future development from a geotechnical perspective. The professional opinions and geotechnical information contained in this report will likely need to be updated based on our review of final site development plans. These should be provided to GeoTek for review when available.

2. SITE DESCRIPTION AND PROPOSED DEVELOPMENT

2.1 SITE DESCRIPTION

The project site is located adjacent to and northwest of East Valley Boulevard approximately ¼-mile northeast of North Grand Avenue in the city of Walnut, Los Angeles County, California (see Figure 1). The irregular-shaped site is approximately 49 acres in size and is currently comprised of vacant land. An existing City of Walnut Parks and Recreation facility exists along East Valley Boulevard and borders the property on the southwest, and existing single-family residential properties border the property to the north and northwest.

The project site contains gently sloping topography in the southwestern portion of the property, with a domical-shaped elevated area in the central portion of the site that is over 200 feet in height. Topographically, the project site contains elevations that range between approximately 620 and 855 feet above mean sea level (msl), with surface drainage generally directed toward the southwest. Figure 1, to the rear of the text of this report, shows historic topographic contours of the site and site area.

The existing natural slopes throughout the project site are at inclinations that are generally 2:1 (horizontal:vertical) or flatter, with the exception of an area located on the south facing side of the central elevated portion of the project site, where the existing natural slopes are slightly steeper than 2:1 (h:v) in isolated areas. There are two existing steep cut slopes located toward the eastern portion of the site along East Valley Boulevard, that are between approximately 40 and 50 feet in height and at an inclination of approximately 1:1 (h:v). There are concrete drainage swales located along the top of these two existing steep cut slopes.

Based on review of historical aerial photographs (NETR), it appears that the property as a whole does not appear to have been extensively altered from its natural condition (i.e. no apparent large-scale earthwork is obvious).

2.2 PROPOSED DEVELOPMENT

A conceptual site plan prepared by RBF Consulting and dated March 6, 2015, was provided to us that shows a currently anticipated development scheme for the project site. The current development scheme for the site is understood to consist of grading and construction for a combination of low density residential, greater-density residential, and commercial retail. The conceptual plan provided shows 19 single-family residential lots, two large pad areas, one park site, and associated slopes and streets. The conceptual site plan provided shows cut and fill slopes up to a maximum of approximately 100 feet in height. Additionally, cuts of up to approximately 90 feet and fills of up to approximately 75 feet are required to reach the proposed conceptual design grade from the existing profile. Several large retaining walls are also proposed along the perimeter of the property and within the southwestern portion of the site.

The primary access point for the proposed development is via East Valley Boulevard on the southeast, with a secondary access also proposed via Bridle Way on the north. It is our understanding that development of the property is likely to include two- and three-story, wood-framed structures with associated utility and street improvements.

As site development planning progresses and plans become available, the plans should be provided to GeoTek for review and comment. Additional engineering analyses may be necessary in order to provide specific earthwork recommendations and geotechnical design parameters for actual site development.

2.3 PREVIOUS INVESTIGATION

A geotechnical feasibility evaluation was previously performed for the subject property by GeoTek (2008), and consisted of excavating, logging and sampling a total of 17 exploratory trenches across the project site. The approximate locations of the previously excavated exploratory trenches are shown on Figure 4 of this report and a copy of the trench logs are included in Appendix A. The geotechnical feasibility evaluation also included laboratory testing and preliminary geotechnical recommendations for site development. Results of the laboratory testing program from the previous evaluation are included in Appendix B.

3. FIELD EXPLORATION AND LABORATORY TESTING

3.1 FIELD EXPLORATION

The recent field exploration was conducted on February 27, 2015 and consisted of excavating six exploratory hollow-stem borings to a maximum depth of approximately 26.5 feet below the existing ground surface (bgs). Approximate locations of the borings are shown on the Geotechnical Map (see Figure 4). The logs of the exploratory borings are included in Appendix A. An engineering geologist from our firm logged the excavations and collected samples for laboratory testing and evaluation.

3.2 LABORATORY TESTING

Laboratory testing was performed on selected soil samples collected during the field exploration. The purpose of the laboratory testing was to help confirm the field classification of the soil materials encountered and to evaluate their physical and chemical properties for use in engineering design and analysis. Results of the laboratory testing program, along with a brief description and relevant information regarding testing procedures, are included in Appendix B.

4. GEOLOGIC AND SOILS CONDITIONS

4.1 REGIONAL SETTING

The subject property is situated in the Peninsular Ranges geomorphic province. The Peninsular Ranges province is one of the largest geomorphic units in western North America. Basically, it extends approximately 975 miles from the Transverse Ranges geomorphic province southerly to the tip of Baja California. This province varies in width from about 30 to 100 miles. It is bounded on the west by the Pacific Ocean, on the south by the Gulf of California and on the east by the Colorado Desert Province.

The Peninsular Ranges are essentially a series of northwest-southeast oriented fault blocks. Several major fault zones are found in this province. The Elsinore Fault zone and the San Jacinto Fault zone trend northwest-southeast and are found near the middle of the province. The Newport-Inglewood Fault zone is located in the western portion of the province and the San Andreas Fault zone borders the northeasterly margin of the province.

More specific to the subject property, the site is located in an area geologically mapped to be underlain mostly by Quaternary age alluvial deposits and Tertiary age sedimentary bedrock (Dibblee, 2002; Morton and Miller, 2006). No active faults are shown in the immediate site vicinity on the maps reviewed for the area.

4.2 EARTH MATERIALS

A brief description of the earth materials encountered during our subsurface exploration is presented in the following section. Based on our site reconnaissance, field observations, our exploratory excavations and review of available geotechnical reports and published geologic maps, the site is locally underlain by undocumented fill materials, young alluvial fan deposits, and bedrock of the Puente Formation. Based on the results of the laboratory testing performed on soil samples collected during our previous evaluation (GeoTek, 2008) and during our recent investigation, and our experience in the project area with similar soils, the expansion potential of the on-site earth materials is highly variable. The results of the laboratory testing generally indicated a "low" ($21 \leq EI \leq 50$) to "very high" ($131 \leq EI$) expansion potential when tested in accordance with ASTM Test Method D 4829.

4.2.1 Undocumented Fill (Unmapped)

Small amounts of man-made undocumented fill materials exist along existing site access roads, and across a majority of the former agricultural (relatively flat lying) site areas. The fill was observed to consist of native site soils, which appear to have been either disced or pushed into their current configurations. Localized thicker accumulations of undocumented fill materials may exist in the unexplored areas of the project site.

Undocumented fill soils are not considered suitable for support of structural site improvements, but may be re-used as engineered fill if properly placed. Should existing underground utility improvements underlie portions of the site, then the existing backfill of these improvement trenches should be removed. If it is desired (or necessary) to leave these materials in-place, then further evaluation and possible implementation of additional mitigative measures would be necessary.

4.2.2 Colluvium (Unmapped)

The site is mantled with a thin to relatively thick layer of colluvial materials, varying from approximately one (1) to five (5) feet in thickness. These materials are generally described as dark gray brown, damp to slightly moist, porous, silty clay to clayey silt.

4.2.3 Alluvium (Map Symbol: Qa)

Quaternary age alluvial deposits were observed to underlie the project site primarily in the lower-lying areas that surround the elevated area in the central portion of the property (see Figure 4). These alluvial deposits generally consist of clay, silty clay and clayey silt, which is mostly dark brown to medium brown and slightly moist to very moist (see logs in Appendix A). These alluvial soils are susceptible to consolidation and settlement.

4.2.4 Puente Formation Bedrock – Yorba Member (Map Symbol: Tpy)

Tertiary age Puente Formation (Yorba Member) bedrock was observed to underlie the colluvial and alluvial deposits across the property. Additionally, these bedrock materials were locally observed to be exposed in the central (elevated) portion of the site and in the existing steep cut slopes in the eastern portion of the site along East Valley Boulevard. These bedrock materials generally consist of interbedded silty claystone to clayey siltstone, and silty fine sandstone, which is mostly olive gray to orange brown and moist to very moist (see logs in Appendix A). The bedding structure of the bedrock during our previous evaluation (GeoTek, 2008) at the surface and in the exploratory trenches (T-8, T-11, T-13, T-14, and T-17) is generally dipping down towards the north-northeast at approximately 33 to 61 degrees, with the exception of an area located near the northwestern portion of the site, which was measured to dip to the east-southeast at approximately 31 degrees (see Figure 4 and logs in

Appendix A). Bedrock materials were encountered in all six of the exploratory borings drilled as a part of this investigation at depths that range between approximately 7.5 and 20 feet bgs. The bedrock was also encountered in all 17 of the exploratory trenches excavated as a part of the previous evaluation (GeoTek, 2008) at depths that range between the ground surface to approximately 12 feet bgs.

4.3 SURFACE WATER AND GROUNDWATER

4.3.1 Surface Water

Surface water was not observed during our site investigation. If encountered during earthwork construction, surface water on this site is the result of precipitation or possibly some minor surface run-off from immediately surrounding properties. Overall site area drainage is generally in a southwesterly direction, as directed by site topography. Provisions for surface drainage will need to be accounted for by the project civil engineer.

4.3.2 Groundwater

Groundwater was not encountered in our exploratory excavations at the project site. No natural groundwater condition is known to be present at the site which would impact proposed site improvements. However, groundwater in the mapped alluvium adjacent to East Valley Boulevard toward the northeast corner of the project site could be encountered depending on the time of year since this area does appear to be an ephemeral drainage. This area also has abundant natural vegetation, which is usually indicative of the presence of some shallow groundwater.

4.4 EARTHQUAKE HAZARDS

4.4.1 Surface Fault Rupture

The geologic structure of the entire southern California area is dominated mainly by northwest-trending faults associated with the San Andreas system. The site is in a seismically active region. No active or potentially active fault is known to exist at this site nor is the site situated within an *"Alquist-Priolo"* Earthquake Fault Zone (Bryant and Hart, 2007). No faults are identified on geologic maps readily available and reviewed by this firm for the immediate study area.

4.4.2 Liquefaction/Seismic Settlement

Liquefaction describes a phenomenon in which cyclic stresses, produced by earthquake-induced ground motion, create excess pore pressures in relatively cohesionless soils. These soils may thereby acquire a high degree of mobility, which can lead to lateral movement, sliding and settlement of loose sediments, sand boils and other damaging deformations. This phenomenon occurs only below the water table, but, after liquefaction has developed, the effects can propagate upward into overlying non-saturated soil as excess pore water dissipates.

The factors known to influence liquefaction potential include soil type and grain size, relative density, groundwater level, confining pressures, and both intensity and duration of ground shaking. In general, materials that are susceptible to liquefaction are loose, saturated granular soils having low fines content under low confining pressures.

Relatively small portions of the project site are located in areas identified by the State of California as having the potential for liquefaction (see Figure 3; CGS, 1999). These areas are located in the southwest portion of the site and in the lower lying drainage areas in the northeastern portion of the property. According to the State of California Special Publication 117A (CGS, 2008), *Guidelines for Evaluating and Mitigating Seismic Hazards in California*, a geotechnical investigation is required to evaluate the liquefaction potential for new residential structures proposed within a liquefaction hazard zone.

GeoTek excavated four borings within the areas identified as having the potential for liquefaction. Due to the lack of existing groundwater at the site, relatively shallow bedrock, primarily fine-grained nature of the alluvial soils and recommendations for complete removal of the alluvial materials during rough grading as presented in a subsequent section of this report, the potential for liquefaction was determined to be negligible.

4.4.3 Other Seismic Hazards

One small area of the project site is identified by the State of California as having the potential for earthquake-induced landslides (see Figure 3; CGS, 1999). This area is located in the east-southeast facing natural slope in the eastern portion of the site. This area appears to be relatively steep (2:1 slope gradient or slightly steeper) and contains several drainage gullies directed to one central drainage gully, suggesting past surficial erosion. Evidence of ancient landslides or gross slope instabilities at this site was not observed during our investigation. The regional bedrock structural orientation in the area is also anticipated to be generally favorable with respect to gross (global) slope stability. In addition, the proposed site topography at the completion of grading for the project site is understood to contain several level pads and several 2:1 (h:v) or flatter graded slopes; thus, the potential for earthquake-induced landslides is considered low, but should be further evaluated when site development plans become more refined.

The potential for secondary seismic hazards such as seiche and tsunami are considered to be remote due to site elevation and distance from an open body of water.

4.5 MATERIAL PROPERTIES

4.5.1 Hydro-Consolidation

Hydro-consolidation is a response to the introduction of water into collapse-prone alluvial soils. Upon initial wetting, the soil structure and apparent strength are altered, and a virtual immediate response occurs. Materials susceptible to hydro-consolidation should be removed within the project limits and replaced as engineered fill. Where complete removals of the potentially hydro-collapsible alluvial soils are accomplished, it is GeoTek's opinion that hydro-collapse will not significantly affect the subject site.

4.5.2 Compressibility

The on-site materials that are potentially compressible include undocumented fill materials, and colluvium and alluvium. Soils that are potentially adversely compressible will require removal from fill areas prior to placement of engineered fill and where exposed at grade in cut areas. Recommendations for remedial grading are presented in Section 5.2.3 and earthwork adjustment estimates are presented in Section 4.5.5 below.

4.5.3 Soil Corrosivity and Geochemical Analysis

The soil resistivity at this site was tested in the laboratory on samples collected during the current field investigation and during the previous field investigation (GeoTek, 2008). The results of the testing indicate that the on-site soils tested are considered "severely corrosive" to buried ferrous metal in accordance with current standards used by corrosion engineers. These characteristics are considered typical of soils commonly found in southern California. We recommend that a corrosion engineer be consulted to provide recommendations for protection of buried ferrous metal at this site.

The soluble sulfate content was also determined in the laboratory for on-site soil samples. The results indicate that the water soluble sulfate range is less than 0.1 percent by weight for the samples tested, which is considered "not applicable" (negligible) as per Table 4.2.1 of ACI 318.

4.5.4 Excavation Characteristics

Excavations in the on-site undocumented artificial fill and native colluvial and alluvial materials should be readily accomplished with heavy-duty earthmoving or excavating equipment in good operating condition. However, the on-site bedrock materials may be locally difficult to excavate where encountered in the deeper planned excavation areas and where required to be overexcavated per the remedial earthwork recommendations presented in this report. Further evaluation of rippability of the bedrock materials may be considered based on more finalized site development plans. Based on our review of the current development plan and our understanding of the geologic conditions of the project site, recommendations to overexcavate bedrock materials will likely be located in the central and northwest portions of the site.

4.5.5 Shrinkage and Bulking

For planning purposes, a shrinkage factor from 0 to 15 percent may be considered for the undocumented artificial fill and native colluvial and alluvial materials requiring removal and recompaction. Subsidence is not anticipated to be a consideration due to the removals extending to competent bedrock. A bulking factor from 0 to 10 percent may be considered for the bedrock requiring mass excavation and overexcavation.

Several factors will impact earthwork balancing on the site, including shrinkage, trench spoil from utilities and footing excavations, as well as the accuracy of topography. Shrinkage and bulking are primarily dependent upon the degree of compactive effort achieved during construction, depth of fill and underlying site conditions.

Site balance areas should be available in order to adjust project grades, depending on actual field conditions at the conclusion of earthwork construction.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 GENERAL

Development of the site appears feasible from a geotechnical viewpoint. Specific recommendations for site development provided in this report will need to be further evaluated when development plans are provided for our review. The following sections present general recommendations only. More specific geotechnical recommendations for site development can be provided when more finalized site development plans are available for review.

5.2 EARTHWORK CONSIDERATIONS

5.2.1 General

Earthwork and grading should be performed in accordance with the applicable grading ordinances of the County of Los Angeles and City of Walnut, the 2013 California Building Code (CBC), and recommendations contained in this report. The General Grading Guidelines included in Appendix C outline general procedures and do not anticipate all site specific situations. In the event of conflict, the recommendations presented in the text of this report should supersede those contained in Appendix C.

5.2.2 Site Clearing and Preparation

Site preparation should start with removal of deleterious materials and vegetation. These materials should be properly disposed of off-site. Existing underground improvements, utilities and trench backfill should also be removed or be further evaluated as part of site development operations.

5.2.3 Remedial Grading

Prior to placement of engineered fill, all undocumented fill materials, and colluvium and alluvium should be removed to expose competent bedrock. The lateral extent of removals beyond the outside edge of all settlement sensitive structures/foundations should minimally be equivalent to the depth of removals or five (5) feet, whichever is greater. Depending on actual field conditions encountered during grading, locally deeper and/or shallower areas of removal may be necessary. It is anticipated that remedial earthwork along the property boundaries will be limited due to the inability to extend grading operations off-site beyond property lines. If remedial earthwork is limited along the property lines, these areas should be further evaluated based on actual conditions encountered during earthwork construction, and zones of special foundation design and/or structural setbacks may be established in these areas.

Removal depths are estimated to range between approximately seven (7) to 12 feet in the alluvial areas mapped in the southwestern and northern portions of the site. Removal depths are estimated to be up to a maximum of approximately 15 feet to 25 feet in the alluvial areas mapped in the northeastern portion of the site. Localized areas requiring deeper removals may be encountered during grading. At a minimum, removal bottoms should extend down to relatively competent bedrock.

The cut portions of any transition building pad areas should be overexcavated a minimum of five (5) feet below finish pad grade or a minimum of three (3) feet below the bottom of the deepest proposed footing, whichever is greater. Overexcavations should extend a minimum of five (5) feet outside the proposed building envelope(s). The intent of the recommended overexcavation is to support the improvements on engineered fill with relatively uniform engineering characteristics and decrease the potential for future differential settlement. Additionally, in areas where future utilities are proposed in bedrock cut areas, overexcavation should be considered for ease in utility placement subsequent to remedial grading, if bedrock materials are considered potentially difficult to excavate for typical utility trenching equipment.

The remedial excavation bottoms should be observed by a GeoTek representative prior to scarification. Upon approval, the bottom of all removals should be scarified to a minimum depth of eight (8) inches, brought to above optimum moisture content, and then compacted to minimum project standards prior to fill placement. The resultant voids from remedial grading/overexcavation should be filled with materials placed in accordance with the following section of this report.

5.2.4 Engineered Fill

The on-site soils are generally considered suitable for reuse as engineered fill provided they are free from vegetation, debris and other deleterious material. The undercut areas should be brought to final subgrade elevations with fill materials that are placed and compacted in general accordance with minimum project standards. Soils with a "very high" expansion potential should not be placed within 10 feet of proposed finished grade. Engineered fill should be placed in six (6) inch to eight (8) inch loose lifts, moisture conditioned to at least two percent above the optimum moisture content and compacted to a minimum relative compaction of 90% as determined by ASTM Test Method D 1557.

If saturated soils are encountered during remedial grading, methods for drying soils such as stockpiling or mixing with dry soils may be required to bring the soils to the required moisture content for placement as engineered fill. Placement of engineered fill should be observed and tested by a GeoTek representative during grading activities.

For the deeper fill areas, primarily anticipated to be located in the northeastern portion of the project site, it is recommended that engineered fills placed at a depth greater than 30 feet below finish grade should be moisture conditioned to at least the optimum moisture content and placed at 93% relative compaction as determined by ASTM Test Method D 1557. Additionally, settlement monitoring should be performed in the deeper fill areas that exceed 30 feet to evaluate whether the estimated remaining settlement is within the project specifications prior to construction of structural improvements. The final locations of the settlement monitoring areas will be determined during earthwork construction when the as-graded site conditions become apparent.

5.2.5 Slope Construction

Where fill is to be placed against slopes inclined at inclinations of 5 horizontal to 1 vertical or steeper, the sloping ground surface should be benched to remove loose and disturbed surface soil to assure that the new fill is placed in direct contact with competent, undisturbed soil or rock, and to provide horizontal surfaces for fill placement. A keyway should be constructed at the toe of the fill areas extending at least 18 inches into dense natural soil or bedrock. The keyway should be at least 12 feet wide or 1.5 times the width of the equipment, whichever is greater. The base of the keyways and benches should be sloped back into the hillside at a gradient of at least 2 percent. The base of the benches should be evaluated by a representative of GeoTek prior to processing. Any fill or unsuitable material should be removed until competent soils or bedrock are encountered. Upon approval, the exposed soils should be moistened to at least the optimum moisture content, and densified to a relative compaction of at least 90 percent (ASTM D 1557).

Cut and fill slopes should be constructed no steeper than 2:1 (H:V). Fill slopes should be overfilled during construction and then cut back to expose fully compacted soil. A suitable alternative would be to compact the slopes during construction and then roll the final slope to provide a dense, erosion resistant surface.

The surface of the site should be graded to provide positive drainage away from the structures and slope faces. A berm or brow ditch should be constructed at the top of all slopes that will contain the water flow and control the surface runoff. Drainage should be directed to established swales and then to appropriate drainage structures to minimize the possibility of erosion. Water should not be allowed to pond adjacent to footings.

5.2.6 Slopes

Any proposed cut or fill slopes will need to be further evaluated when site development plans become available. Several cut slopes (up to 85 feet in height) and fill slopes (up to approximately 100 feet in height) with a 2:1 (horizontal:vertical) inclination are proposed throughout the site. Based on review of the currently proposed conceptual plan provided, the proposed cut slopes at the site are generally oriented in a south-facing direction, or generally in a favorable orientation with respect to the majority of the available bedrock bedding structure data available. Additional exploration and evaluation of the bedrock in the vicinity of the proposed cut slopes should be performed along with slope stability analyses prior to construction to verify the anticipated conditions at the actual locations of the proposed cut slopes. Revised remedial recommendations can be provided based on additional subsurface geologic data obtained and analyses performed, as necessary. Proposed fill slopes constructed at gradients of 2:1 (h:v), in accordance with industry standards, are anticipated to be both grossly and surficially stable; however, they should also be evaluated.

Remedial removals and/or a keyway will be required at the toe of the large proposed fill slopes located in the northeastern portion of the project. The lateral extension of the remedial grading limits in this area is limited due to the existing property lines. These areas should be further evaluated based on actual conditions encountered during earthwork construction, and zones of special foundation design and/or structural setbacks may be established in these areas. Proposed cut or fill slopes should be evaluated when site grading plans are further refined and become available for review. Revised recommendations for remedial grading of proposed cut and fill slopes can be provided at that time, if necessary. These slopes are also anticipated to contain cut/fill transition conditions from existing grade in several areas; however, these conditions will vary depending on actual depths of remedial removals encountered during grading. All cut slopes should be observed and mapped by an engineering geologist to confirm the anticipated geologic conditions and to provide revised remedial recommendations as necessary.

The two existing cut slopes that are at an inclination of approximately 1:1 (h:v) located in the eastern portion of the site along East Valley Boulevard appear to have been constructed during the late 1960's as a part of widening Valley Boulevard. The bedrock bedding appears to be dipping down towards the north-northeast, or generally in a favorable condition that is approximately neutral to slightly into slope. There was no evidence of slope instability observed in these cut slopes and they appear to have performed adequately for nearly 50 years. Based on review of the currently proposed conceptual plan provided, these existing cut slopes are proposed to generally remain untouched; however, a proposed retaining wall is located near the toe of one of the cut slopes and near the top of the other cut slope. Further evaluation of these slopes with respect to the proposed site development should be considered.

5.2.7 Trench Excavations and Backfill

Temporary excavations within the on-site materials should be stable at 1:1 inclinations for short durations during construction and where cuts do not exceed 10 feet in height. Temporary cuts to a maximum height of 4 feet can be excavated vertically.

Trench excavations should conform to Cal-OSHA regulations. The contractor should have a competent person, per OSHA requirements, on site during construction to observe conditions and to make the appropriate recommendations.

Utility trench backfill should be compacted to at least 90% relative compaction (as determined per ASTM D 1557). Under-slab trenches should also be compacted to project specifications. Where applicable, based on jurisdictional requirements, the top 12 inches of backfill below subgrade for road pavements should be compacted to at least 95 percent relative compaction. On-site materials may not be suitable for use as bedding material, but should be suitable as backfill provided particles larger than 6 inches are removed.

Compaction should be achieved with a mechanical compaction device. Ponding or jetting of trench backfill is not recommended. If backfill soils have dried out, they should be thoroughly moisture conditioned prior to placement in trenches.

5.3 DESIGN RECOMMENDATIONS

5.3.1 Foundation Design Criteria

Foundation design criteria for a conventional foundation system, in general conformance with the 2013 CBC, are presented herein. These are typical design criteria and are not intended to supersede the design by the structural engineer. If desirable, preliminary design recommendations for post-tension foundation systems can be provided upon request.

Based on the results of this investigation GeoTek anticipates that the majority of the on-site soils to be encountered during grading may be classified as having "medium" ($51 \leq EI \leq 90$) to "high" ($91 \leq EI \leq 130$) expansion potential per ASTM D 4829. Additional laboratory testing should be performed at the completion of site grading to verify the expansion potential, plasticity index, and grain size characteristics of the near-surface soils.

A summary of our preliminary foundation design recommendations is presented in the table below:

MINIMUM DESIGN REQUIREMENTS FOR CONVENTIONALLY REINFORCED FOUNDATIONS		
Design Parameter	**"Medium" Expansion Potential (51≤EI≤90)**	**"High" Expansion Potential (91≤EI≤130)**
Foundation Depth or Minimum Perimeter Beam Depth (inches below lowest adjacent grade)	One- and Two-Story – 18	One- and Two-Story – 24
Minimum Foundation Width (Inches)*	One- and Two-Story – 12	One- and Two-Story – 12
Minimum Slab Thickness (actual)	4 inches	4 inches
Sand Blanket and Moisture Retardant Membrane below On-Grade Building Slabs	2 inches of sand** overlying moisture vapor retardant membrane overlying 2 inches of sand**	2 inches of sand** overlying moisture vapor retardant membrane overlying 4 inches of sand**
Minimum Slab Reinforcing	No. 3 rebar 24 inches on-center, each way, placed in middle of slab	No. 3 rebar 18 inches on-center, each way, placed in middle of slab. The recommended reinforcement is applicable to building slabs and exterior walkway and hardscape areas. Building slabs should be dowelled into perimeter footings
Minimum Footing Reinforcement	Four No. 4 Reinforcing Bars, two top and two bottom	Four No. 5 Reinforcing Bars, two top and two bottom
Design Plasticity Index (PI)***	20- design value	28- design value
Presaturation of Subgrade Soil (Percent of Optimum)	Minimum 120% to a depth of 18 inches	Minimum 130% to a depth of 24 inches
*Code minimums per Table 1809.7 of the 2013 CBC. ** Sand should have a sand equivalent of at least 30 ***Effective plasticity index should be verified at the completion of rough grading.		

It should be noted that the criteria provided are based on soil support characteristics only. The structural engineer should design the slab and beam reinforcement based on actual loading conditions.

The following criteria for design of foundations are preliminary, and should be re-evaluated based on the results additional laboratory testing of samples obtained at/near finish pad grade.

5.3.1.1 An allowable bearing capacity of 1500 pounds per square foot (psf) may be used for design of continuous and perimeter footings 12 inches deep and 12 inches wide, and pad footings 24 inches square and 12 inches deep. This value may be increased by 200 pounds per square foot for each additional 12 inches in depth and 100 pounds per square foot for each additional 12 inches in width to a maximum value of 2500 psf.

Additionally, an increase of one-third may be applied when considering short-term live loads (e.g. seismic and wind loads).

5.3.1.2 Structural foundations may be designed in accordance with the 2013 CBC, and to withstand a total settlement of 1 inch and maximum differential settlement of one-half of the total settlement over a horizontal distance of 40 feet. These values assume that seismic settlement potential is not a significant constraint and that appropriate remedial grading is performed and that, if necessary, a settlement monitoring program has been completed.

5.3.1.3 The passive earth pressure may be computed as an equivalent fluid having a density of 250 psf per foot of depth, to a maximum earth pressure of 2,500 psf for footings founded on engineered fill. A coefficient of friction between soil and concrete of 0.30 may be used with dead load forces. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

5.3.1.4 A grade beam, a minimum of 12 inches wide and 18 inches deep, should be utilized across large entrances. The base of the grade beam should be at the same elevation as the bottom of the adjoining footings.

5.3.1.5 A moisture and vapor retarding system should be placed below slabs-on-grade where moisture migration through the slab is undesirable. Guidelines for these are provided in the 2013 California Green Building Standards Code (CALGreen) Section 4.505.2, the 2013 CBC Section 1907.1 and ACI 360R-10. The vapor retarder design and construction should also meet the requirements of ASTM E 1643. A portion of the vapor retarder design should be the implementation of a moisture vapor retardant membrane.

It should be realized that the effectiveness of the vapor retarding membrane can be adversely impacted as a result of construction related punctures (e.g. stake penetrations, tears, punctures from walking on the vapor retarder placed atop the underlying aggregate layer, etc.). These occurrences should be limited as much as possible during construction. Thicker membranes are generally more resistant to accidental puncture than thinner ones. Products specifically designed for use as moisture/vapor retarders may also be more puncture resistant. Although the CBC specifies a 6 mil vapor retarder membrane, it is GeoTek's opinion that a minimum 10 mil thick membrane with joints properly overlapped and sealed should be considered, unless otherwise specified by the slab design professional. The membrane should consist of Stego wrap or the equivalent.

A two (2) inch layer of clean sand with a sand equivalent of at least 30 should be placed over the moisture vapor retardant membrane to promote setting of the concrete. The moisture in the sand should not exceed two (2) percent below the optimum moisture content.

Moisture and vapor retarding systems are intended to provide a certain level of resistance to vapor and moisture transmission through the concrete, but do not eliminate it. The acceptable level of moisture transmission through the slab is to a large extent based on the type of flooring used and environmental conditions. Ultimately, the vapor retarding system should be comprised of suitable elements to limited migration of water and reduce transmission of water vapor through the slab to acceptable levels. The selected elements should have suitable properties (i.e. thickness, composition, strength, and permeability) to achieve the desired performance level.

Moisture retarders can reduce, but not eliminate, moisture vapor rise from the underlying soils up through the slab. Moisture retarder systems should be designed and constructed in accordance with applicable American Concrete Institute, Portland Cement Association, Post-Tensioning Concrete Institute, ASTM and California Building Code requirements and guidelines.

GeoTek recommends that a qualified person, such as the flooring contractor, structural engineer, architect, and/or other experts specializing in moisture control within the building be consulted to evaluate the general and specific moisture and vapor transmission paths and associated potential impact on the proposed construction. That person (or persons) should provide recommendations relative to the slab moisture and vapor retarder systems and for migration of potential adverse impact of moisture vapor transmission on various components of the structures, as deemed appropriate.

In addition, the recommendations in this report and our services in general are not intended to address mold prevention; since we, along with geotechnical consultants in general, do not practice in the area of mold prevention. If specific recommendations addressing potential mold issues are desired, then a professional mold prevention consultant should be contacted.

5.3.1.6 We recommend that control joints be placed in two directions spaced approximately 24 to 36 times the thickness of the slab in inches. These joints are a widely accepted means to control cracks and should be reviewed by the project structural engineer.

5.3.2 Miscellaneous Foundation Recommendations

5.3.2.1 To minimize moisture penetration beneath the slab-on-grade areas, utility trenches should be backfilled with engineered fill, lean concrete or concrete slurry where they intercept the perimeter footing or thickened slab edge.

5.3.2.2 Isolated exterior footings should be tied back to the main foundation system in two orthogonal directions.

5.3.2.3 Soils from the footing excavations should not be placed in the slab-on-grade areas unless properly compacted and tested. The excavations should be free of loose/sloughed materials and be neatly trimmed at the time of concrete placement.

5.3.2.4 Unsuitable soil removals along the property lines will likely be restricted due to adjacent improvements. Special considerations will be required for foundation elements in these areas. Such considerations may include deepening of foundations, reduced bearing capacity, or other measures. This issue should be further evaluated once site plans become available.

5.3.3 Foundation Set Backs

Where applicable, the following setbacks should apply to all foundations. Any improvements not conforming to these setbacks may be subject to lateral movements and/or differential settlements:

- The outside bottom edge of all footings should be set back a minimum of H/3 (where H is the slope height) from the face of any descending slope. The setback should be at least 7 feet and need not exceed 40 feet.
- The bottom of all footings for structures near retaining walls should be deepened so as to extend below a 1:1 projection upward from the bottom inside edge of the wall stem. This applies to the existing retaining walls along the perimeter, if they are to remain.
- The bottom of any proposed foundations for structures should be deepened so as to extend below a 1:1 projection upward from the bottom of the nearest excavation.

5.3.4 2013 CBC Seismic Design Parameters

The site is located at approximately 34.0323 Latitude and -117.8292 Longitude. Site spectral accelerations (S_S and S_1), for 0.2 and 1.0 second periods for a Class "D" site, were determined from the USGS Website, Earthquake Hazards Program, U.S. Seismic Design Maps for Risk-Targeted Maximum Considered Earthquake (MCE_R) Ground Motion Response Accelerations for the Conterminous 48 States by Latitude/Longitude in accordance with the 2013 CBC. The results are presented in the following table:

2013 CBC SITE SEISMIC PARAMETERS	
Mapped 0.2 sec Period Spectral Acceleration, S_S	2.188g
Mapped 1.0 sec Period Spectral Acceleration, S_1	0.776g
Site Coefficient for Site Class "D", Fa	1.0
Site Coefficient for Site Class "D", Fv	1.5
Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameter at 0.2 Second, S_{MS}	2.188g
Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameter at 1 second, S_{M1}	1.165g
Design Spectral Response Acceleration for Parameter for 0.2 Second, S_{DS}	1.459g
Design Spectral Response Acceleration for Parameter 1.0 Second, S_{D1}	0.776g
Peak Ground Acceleration (based on MCE_G) Adjusted for Site Class Effects, PGA_M	0.780g

5.4 RETAINING WALL DESIGN AND CONSTRUCTION

5.4.1 General Design Criteria

Recommendations presented herein may apply to typical masonry or concrete vertical retaining walls to a maximum height of six (6) feet. Additional review and recommendations should be requested for higher walls.

Retaining wall foundations embedded a minimum of 18 inches into engineered fill or dense formational materials should be designed using an allowable bearing capacity of 1,500 psf. An increase of one-third may be applied when considering short-term live loads (e.g. seismic and wind loads). The passive earth pressure may be computed as an equivalent fluid having a density of 250 psf per foot of depth, to a maximum earth pressure of 2,500 psf. A coefficient of friction between soil and concrete of 0.30 may be used with dead load forces. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

An equivalent fluid pressure approach may be used to compute the horizontal active pressure against the wall. The appropriate fluid unit weights are given in the table below for specific slope gradients of retained materials.

Surface Slope of Retained Materials (H:V)	Equivalent Fluid Pressure (PCF) Select Backfill*
Level	35
2:1	60

*Select backfill should consist of imported sand other approved materials with an expansion index less than or equal to 20.

The above equivalent fluid weights do not include superimposed loading conditions such as expansive soils, vehicular traffic, structures, seismic conditions or adverse geologic conditions.

Additional lateral forces can be induced on retaining walls during an earthquake. For retaining walls 6 feet in height or greater with level backfill and a Site Class "D", the minimum earthquake-induced force (F_{eq}) should be equal to $10H^2$ (lbs/linear foot of wall) for cantilever walls. This force can be assumed to act at a distance of 0.6H above the base of the wall, where "H" is the height of the retaining wall measured from the base of the footing (in feet).

5.4.2 Wall Backfill and Drainage

Wall backfill should include a minimum one (1) foot wide section of ¾- to 1-inch clean crushed rock (or approved equivalent). The rock should be placed immediately adjacent to the back of the wall and extend up from the backdrain to within approximately 12 inches of finish grade. The upper 12 inches should consist of compacted on-site materials. If the walls are designed using the "select" backfill design parameters, then the "select" materials shall be placed within the active zone as defined by a 1:1 (H:V) projection from the back of the retaining wall footing up to the retained surface behind the wall. The presence of other materials might necessitate revision to the parameters provided and modification of wall designs.

The backfill materials should be placed in lifts no greater than eight (8) inches in thickness and compacted to a minimum of 90% relative compaction in accordance with ASTM Test Method D 1557. Proper surface drainage needs to be provided and maintained. Water should not be allowed to pond behind retaining walls. Waterproofing of site walls should be performed where moisture migration through the walls is undesirable.

Retaining walls should be provided with an adequate pipe and gravel back drain system to reduce the potential for hydrostatic pressures to develop. A 4-inch diameter perforated collector pipe (Schedule 40 PVC, or approved equivalent) in a minimum of one (1) cubic foot per linear foot of ¾-inch or one (1) inch clean crushed rock or equivalent, wrapped in filter fabric should be placed near the bottom of the backfill and be directed (via a solid outlet pipe) to an appropriate disposal area.

Walls from two (2) to four (4) feet in height may be drained using localized gravel packs behind weep holes at 10 feet maximum spacing (e.g. approximately 1.5 cubic feet of gravel in a woven plastic bag). Weep holes should be provided or the head joints omitted in the first course of block extended above the ground surface. However, nuisance water may still collect in front of the wall.

Drain outlets should be maintained over the life of the project and should not be obstructed or plugged by adjacent improvements.

5.4.3 Restrained Retaining Walls

Any retaining wall that will be restrained prior to placing backfill or walls that have male or reentrant corners should be designed for at-rest soil conditions using an equivalent fluid pressure of 60 pcf (select backfill), plus any applicable surcharge loading. For areas having male or reentrant corners, the restrained wall design should extend a minimum distance equal to twice the height of the wall laterally from the corner, or as otherwise determined by the structural engineer.

5.5 CONCRETE CONSTRUCTION

5.5.1 General

Concrete construction should follow the 2013 CBC and ACI guidelines regarding design, mix placement and curing of the concrete. If desired, we could provide quality control testing of the concrete during construction.

5.5.2 Concrete Mix Design

Laboratory testing has indicated that the sulfate content of the soil tested is "not applicable" (i.e. negligible) and has an exposure classification of "S0" per Table 4.2.1 of ACI 318. Based on these results and Table 4.3.1 of ACI 318, no special concrete mix design is required by code to resist sulfate attack. However, additional testing should be performed during grading so that specific recommendations can be formulated based on the as-graded conditions.

5.5.3 Concrete Flatwork

Exterior concrete slabs, sidewalks and driveways should be designed using a four (4) inch minimum thickness. Exterior walkway and hardscape areas should be reinforced with No. 3 bars spaced 18 inches on center, each way and should be underlain by at least 4 inches of aggregate base. Some shrinkage and cracking of the concrete should be anticipated as a result of typical mix designs and curing practices typically utilized in residential construction.

Sidewalks and driveways may be under the jurisdiction of the governing agency. If so, jurisdictional design and construction criteria would apply, if more restrictive than the recommendations presented herein.

Subgrade soils should be pre-moistened prior to placing concrete. The subgrade soils below exterior slabs, sidewalks, driveways, etc. should be pre-saturated to a minimum of 130% of the optimum moisture content to a depth of 24 inches.

All concrete installation, including preparation and compaction of subgrade, should be done in accordance with the City of Walnut specifications, and under the observation and testing of GeoTek and a City inspector, if necessary.

5.5.4 Concrete Performance

Concrete cracks should be expected. These cracks can vary from sizes that are essentially unnoticeable to more than 1/8 inch in width. Most cracks in concrete while unsightly do not significantly impact long-term performance. While it is possible to take measures (proper concrete mix, placement, curing, control joints, etc.) to reduce the extent and size of cracks that occur, some cracking will occur despite the best efforts to minimize it. Concrete undergoes chemical processes that are dependent on a wide range of variables, which are difficult, at best, to control. Concrete, while seemingly a stable material, is subject to internal expansion and contraction due to external changes over time.

One of the simplest means to control cracking is to provide weakened control joints for cracking to occur along. These do not prevent cracks from developing; they simply provide a relief point for the stresses that develop. These joints are a widely accepted means to control cracks but are not always effective. Control joints are more effective the more closely spaced they are. GeoTek suggests that control joints be placed in two directions and located a distance apart approximately equal to 24 to 36 times the slab thickness.

5.6 POST CONSTRUCTION CONSIDERATIONS

5.6.1 Landscape Maintenance and Planting

Water has been shown to weaken the inherent strength of soil, and slope stability is significantly reduced by overly wet conditions. Positive surface drainage away from graded slopes should be maintained and only the amount of irrigation necessary to sustain plant life should be provided for planted slopes. Controlling surface drainage and runoff, and maintaining a suitable vegetation cover can minimize erosion. Plants selected for landscaping should be lightweight, deep-rooted types that require little water and are capable of surviving the prevailing climate.

Overwatering should be avoided. Care should be taken when adding soil amendments to avoid excessive watering. Leaching as a method of soil preparation prior to planting is not recommended. An abatement program to control ground-burrowing rodents should be implemented and maintained. This is critical as burrowing rodents can decreased the long-term performance of slopes.

It is common for planting to be placed adjacent to structures in planter or lawn areas. This will result in the introduction of water into the ground adjacent to the foundations. This type of landscaping should be avoided. Due to the presence of high expansive soils, irrigation should be minimized adjacent to the buildings. Planters within 30 feet of the buildings should be above ground and underlain by a concrete slab. Waterproofing of the foundation and/or subdrains may be warranted and advisable. We could discuss these issues, if desired, when plans are made available.

5.6.2 Drainage

The need to maintain proper surface drainage and subsurface systems cannot be overly emphasized. Positive site drainage should be maintained at all times. Drainage should not flow uncontrolled down any descending slope. Water should be directed away from foundations and not allowed to pond or seep into the ground adjacent to the footings and floor-slabs. Pad drainage should be directed toward approved area(s) and not be blocked by other improvements.

Roof gutters should be installed that will direct the collected water at least 20 feet from the buildings.

It is the owner's responsibility to maintain and clean drainage devices on or contiguous to their lot. In order to be effective, maintenance should be conducted on a regular and routine schedule and necessary corrections made prior to each rainy season.

5.7 PLAN REVIEW AND CONSTRUCTION OBSERVATIONS

We recommend that site grading, specifications, retaining wall/shoring plans and foundation plans be reviewed by this office prior to construction to check for conformance with the recommendations of this report. Additional recommendations may be necessary based on these reviews. We also recommend that GeoTek representatives be present during site grading and foundation construction to check for proper implementation of the geotechnical recommendations. The owner/developer should have GeoTek's representative perform at least the following duties:

- Observe site clearing and grubbing operations for proper removal of unsuitable materials.
- Observe and test bottom of removals prior to fill placement.
- Evaluate the suitability of on-site and import materials for fill placement, and collect soil samples for laboratory testing when necessary.
- Observe the fill for uniformity during placement including utility trenches.
- Test the fill for field density and relative compaction.
- Test the near-surface soils to verify proper moisture content.
- Observe and probe foundation excavations to confirm suitability of bearing materials.

If requested, a construction observation and compaction report can be provided by GeoTek, which can comply with the requirements of the governmental agencies having jurisdiction over the project. We recommend that these agencies be notified prior to commencement of construction so that necessary grading permits can be obtained.

6. LIMITATIONS

The scope of our evaluation is limited to the area explored that is shown on the Geotechnical Map (Figure 3). This evaluation does not and should in no way be construed to encompass any areas beyond the specific area of proposed construction as indicated to us by the client.

Further, no evaluation of any existing site improvements is included. The scope is based on our understanding of the project and the client's needs, our proposal (Proposal No. P-1200914) dated December 12, 2014 and geotechnical engineering standards normally used on similar projects in this region.

The materials observed on the project site appear to be representative of the area; however, soil and bedrock materials vary in character between excavations and natural outcrops or conditions exposed during site construction. Site conditions may vary due to seasonal changes or other factors. GeoTek, Inc. assumes no responsibility or liability for work, testing or recommendations performed or provided by others.

Since our recommendations are based on the site conditions observed and encountered, and laboratory testing, our conclusions and recommendations are professional opinions that are limited to the extent of the available data. Observations during construction are important to allow for any change in recommendations found to be warranted. These opinions have been derived in accordance with current standards of practice and no warranty is expressed or implied. Standards of practice are subject to change with time.

7. SELECTED REFERENCES

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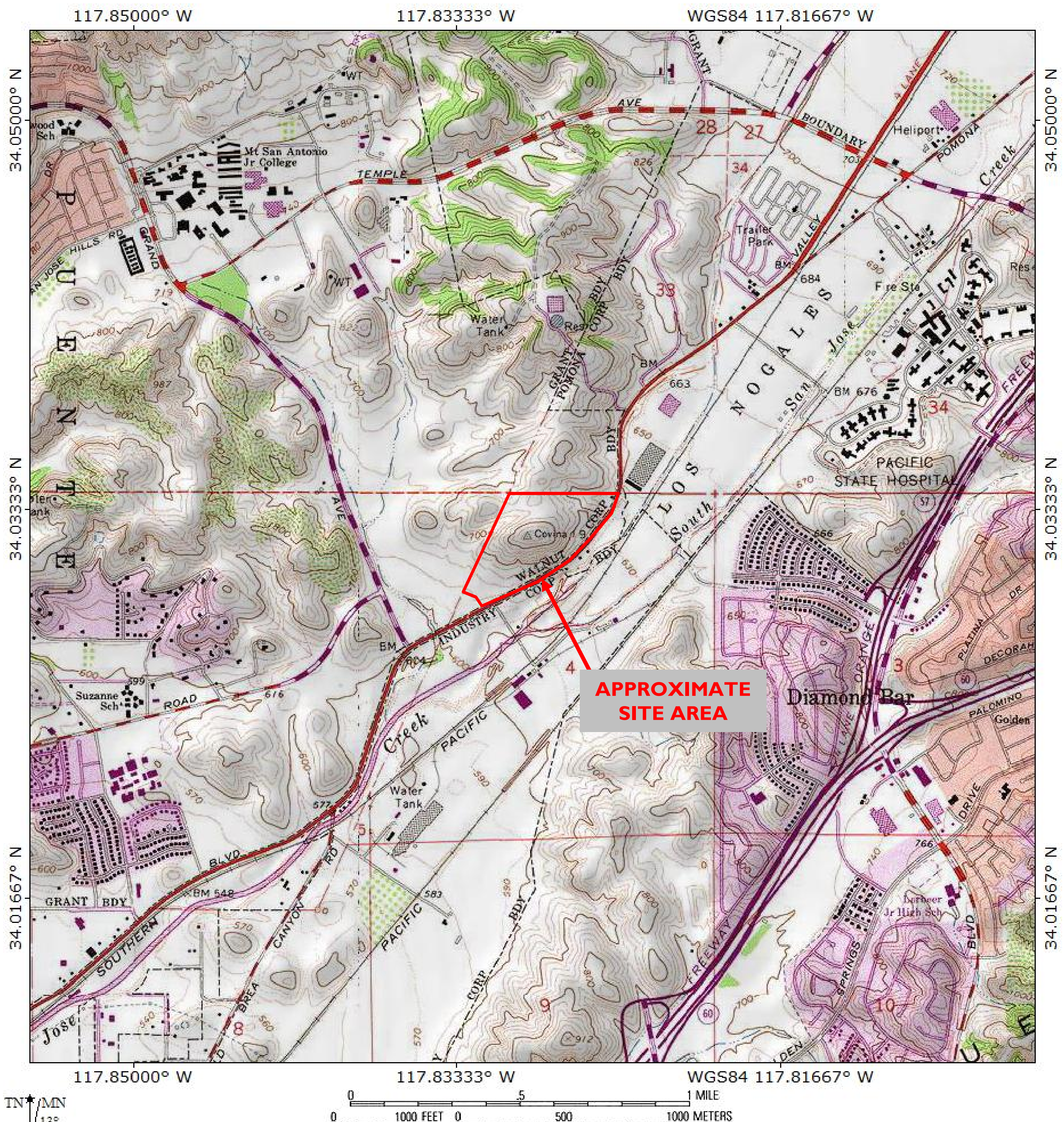

Map created with TOPO!® ©2003 National Geographic (www.nationalgeographic.com/topo)

Sunjoint Development, LLC
Proposed Mixed-Use Development
East Valley Boulevard Property
City of Walnut
Los Angeles County, California

GeoTek Project No. 1280-CR

N

Modified from USGS 7.5 Topographic Map

Figure 1

Site Location & Topographic Map

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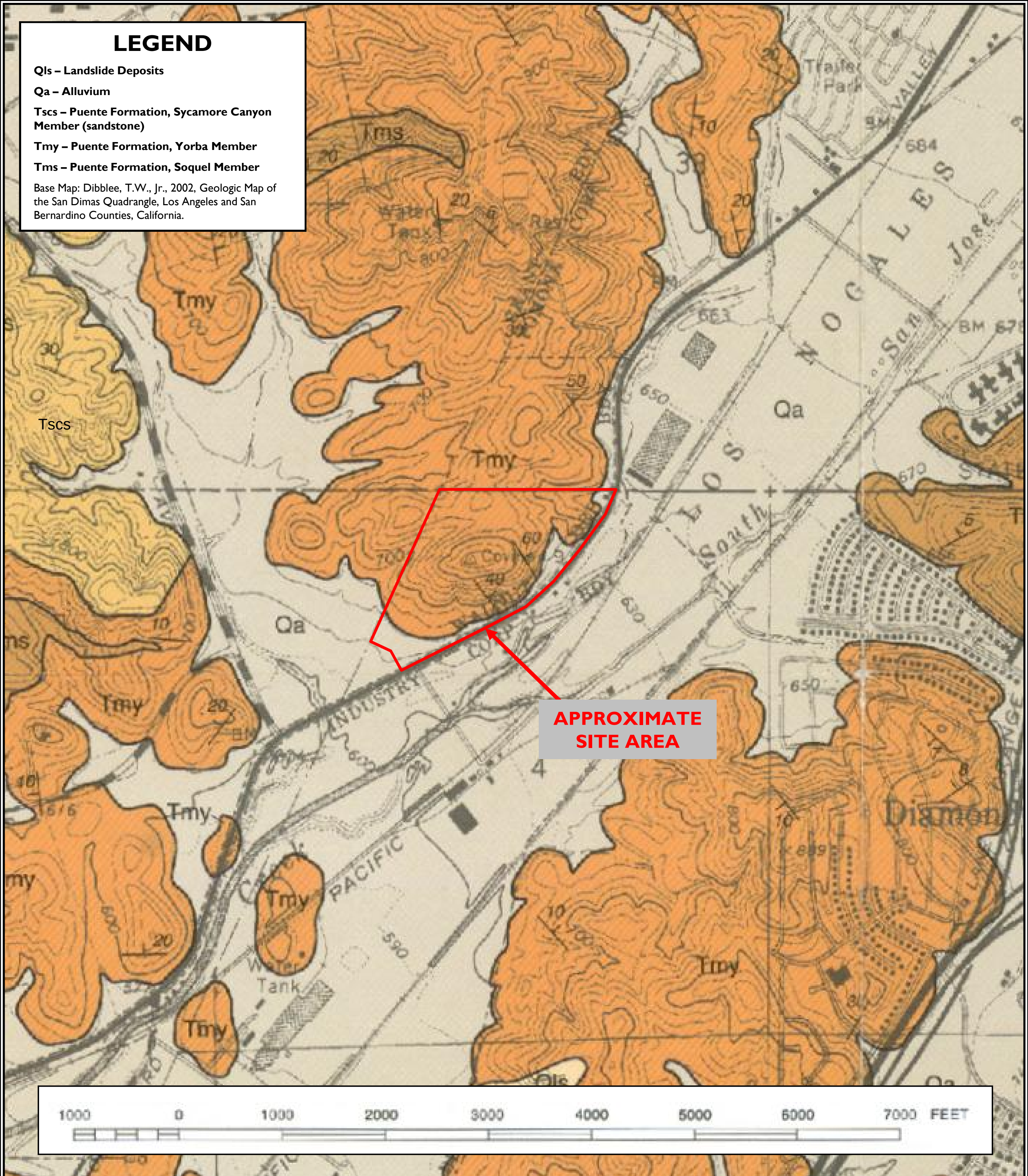

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GeoTek Project No. 1280-CR

Figure 2

Regional Geologic Map

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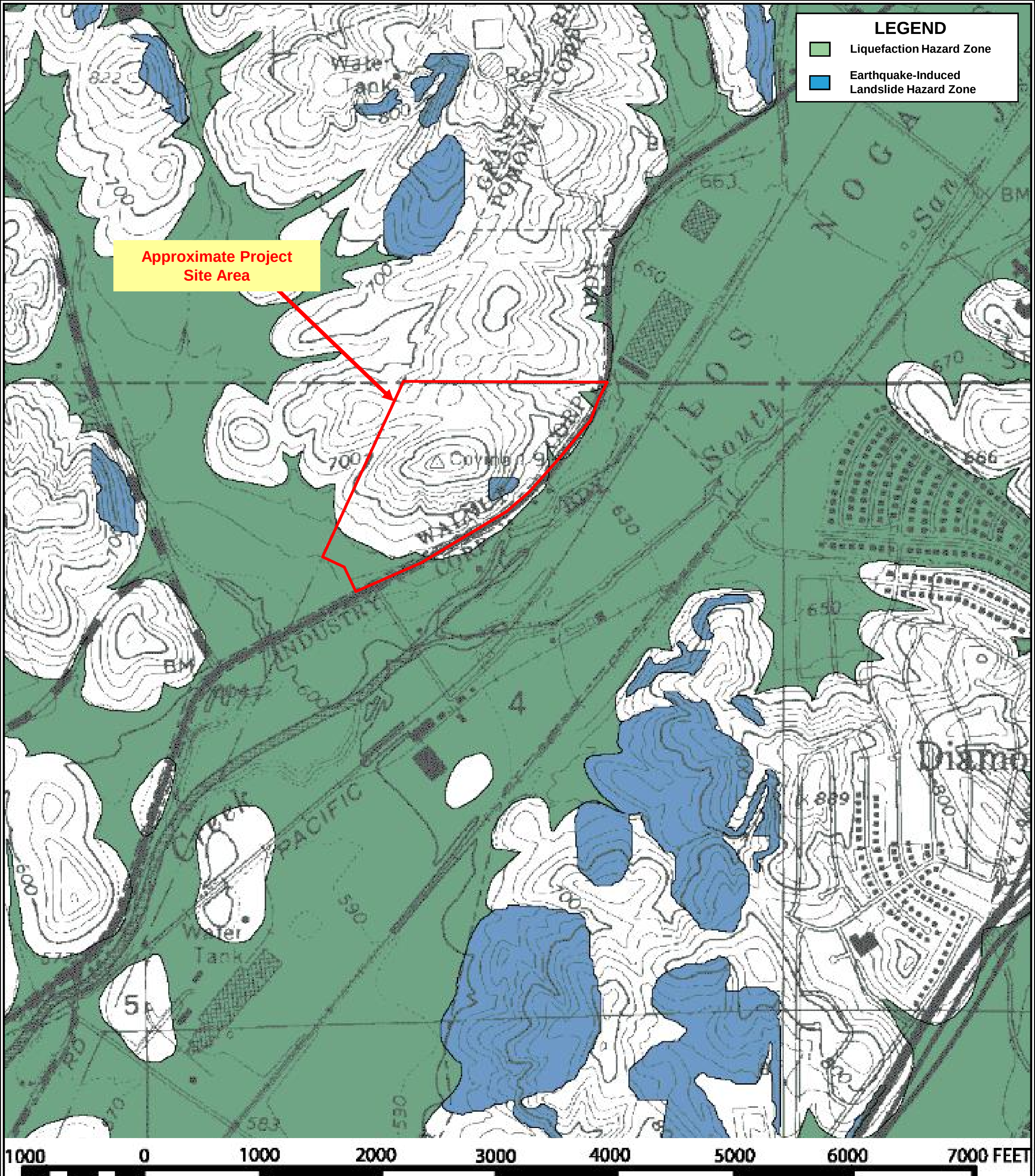

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Los Angeles County, California

GeoTek Project No. 1280-CR

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Base Map: CGS, 1999, State of California
SHZ Map for the San Dimas Quadrangle

Figure 3

Seismic Hazard Zones Map

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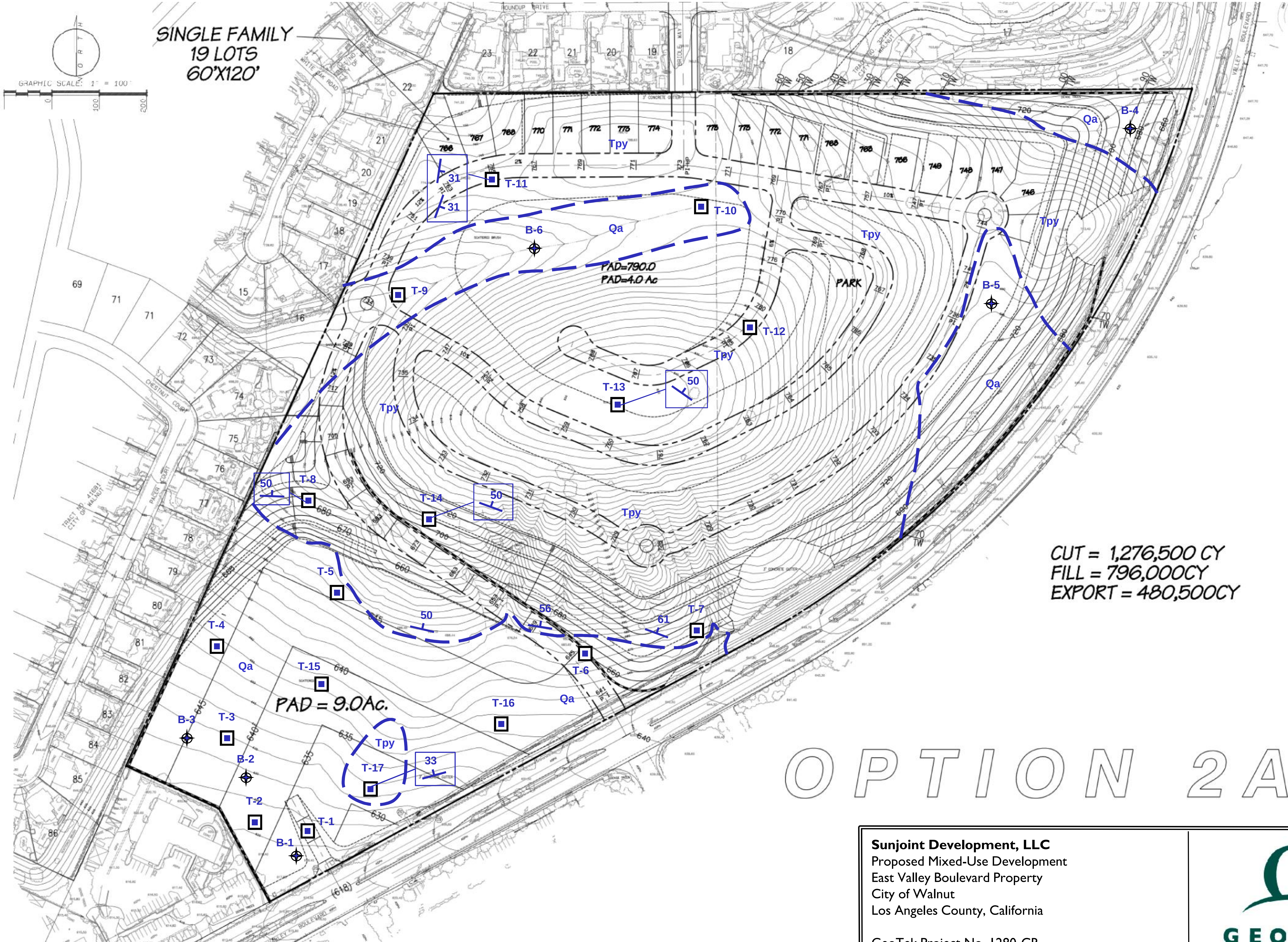

LEGEND

T-17	Approximate Location of Exploratory Trench (GeoTek, 2008)
B-6	Approximate Location of Hollow-Stem Auger Boring (this investigation)
Qa	Alluvium
Tpy	Puente Formation Bedrock, Yorba Member
	Approximate Location of Geologic Contact
56	Bedding Attitude

Basemap from conceptual plan prepared by RBF Consulting and dated March 6, 2015.

Sunjoint Development, LLC
Proposed Mixed-Use Development
East Valley Boulevard Property
City of Walnut
Los Angeles County, California

GeoTek Project No. 1280-CR

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Figure 4

Geotechnical Map

<u>APPENDIX A</u>

BORING AND TRENCH LOGS

A - FIELD TESTING AND SAMPLING PROCEDURES

The Standard Penetration Test (SPT)
The SPT is performed in accordance with ASTM Test Method D 1586. The SPT sampler is typically driven into the ground 12 or 18 inches with a 140-pound hammer free falling from a height of 30 inches. Blow counts are recorded for every 6 inches of penetration as indicated on the log of boring. The split-barrel sampler has an external diameter of 2 inches and an unlined internal diameter of 1-3/8 inches. The samples of earth materials collected in the sampler are typically classified in the field, bagged, sealed and transported to the laboratory for further testing.

The Modified Split-Barrel Sampler (Ring)
The Ring sampler is driven into the ground in accordance with ASTM Test Method D 3550. The sampler, with an external diameter of 3.0 inches, is lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sampler is typically driven into the ground 12 or 18 inches with a 140-pound hammer free falling from a height of 30 inches. Blow counts are recorded for every 6 inches of penetration as indicated on the log of boring. The samples are removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

Bulk Samples (Large)
These samples are normally large bags of representative earth materials over 20 pounds in weight collected from the field by means of hand digging or exploratory cuttings.

Bulk Samples (Small)
These are plastic bag samples which are normally airtight and contain less than 5 pounds in weight of representative earth materials collected from the field by means of hand digging or exploratory cuttings. These samples are primarily used for determining natural moisture content and classification indices.

B – BORING/TRENCH LOG LEGEND

The following abbreviations and symbols often appear in the classification and description of soil and rock on the logs of borings/trenches:

SOILS

USCS	Unified Soil Classification System
f-c	Fine to coarse
f-m	Fine to medium

GEOLOGIC

B: Attitudes	Bedding: strike/dip
J: Attitudes	Joint: strike/dip
C:	Contact line
………..	Dashed line denotes USCS material change
———	Solid Line denotes unit / formational change
━━━	Thick solid line denotes end of boring

(Additional denotations and symbols are provided on the log of boring)

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	Sunjoint Development, LLC	**DRILLER:**	2R Drilling	**LOGGED BY:**	JMP
PROJECT NAME:	Walnut 49-Acre Site	**DRILL METHOD:**	8" Hollow Stem	**OPERATOR:**	Jeff
PROJECT NO.:	1280-CR	**HAMMER:**	Auto 140#/30"	**RIG TYPE:**	CME 75 (Track Rig)
LOCATION:	See Geotechnical Map			**DATE:**	2/27/2015

BORING NO.: B-1

Depth (ft)	Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Water Content (%)	Dry Density (pcf)	Others
	Large Bulk		B1 @ 0-5'		**Alluvium**			AL
	Ring	21 28 29	R1	CL/ML	@ 2.5': Silty CLAY to clayey SILT, dark brown, moist to very moist, hard, minor CaCO3 deposits.	18.7	102.5	
5	SPT	4 7 10	S1	CL	@ 5': Silty CLAY, brown, very moist, very stiff, increase in CaCO3 deposits.			
	Ring	9 16 22	R2	CL	@ 7.5': Silty CLAY, brown to olive brown, very moist, very stiff, CaCO3 deposits.	28.6	93.1	
10	SPT	4 5 5	S2		**Puente Formation Bedrock, Yorba Member** @ 10': SILTSTONE, olive gray with orange brown oxidation, moist, medium stiff, moderately weathered.			
	Ring	18 34 46	R3		@ 12.5': same as above, hard, thinnly bedded, bedding inclined aproximately 45-50 degrees.	26.5	115.2	
15	SPT	7 11 14	S3		@ 15': same as above, stiff to very stiff.			
20					**Notes:** Total depth of boring: 16.5' No groundwater encountered Boring backfilled with soil cuttings			
25								
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing:
AL = Atterberg Limits | EI = Expansion Index | SA = Sieve Analysis | RV = R-Value Test
SR = Sulfate/Resisitivity Test | SH = Shear Test | HC= Consolidation | MD = Maximum Density

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	Sunjoint Development, LLC	**DRILLER:**	2R Drilling	**LOGGED BY:**	JMP
PROJECT NAME:	Walnut 49-Acre Site	**DRILL METHOD:**	8" Hollow Stem	**OPERATOR:**	Jeff
PROJECT NO.:	1280-CR	**HAMMER:**	Auto 140#/30"	**RIG TYPE:**	CME 75 (Track Rig)
LOCATION:	See Geotechnical Map			**DATE:**	2/27/2015

BORING NO.: B-2

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Others
					Alluvium			
	SPT	8 10 11	S1	CL/ML	@ 1': Silty CLAY to clayey SILT, dark brown, dry to slightly moist, stiff.			
5	Ring	15 35 37	R1	CL/ML	@ 3.5': same as above, moist.	10.4	115.2	
	SPT	6 11 19	S2	CL	@ 6': Silty CLAY, olive brown, moist, very stiff, abundant $CaCO_3$ deposits.			
10	Ring	14 28 38	R2	CL/ML	@ 8.5': Silty CLAY to clayey SILT, brown to olive brown, very moist, hard, transitioning to intensely weathered bedrock.	25.8	97.4	
					Puente Formation Bedrock, Yorba Member			
	SPT	8 12 18	S3		@ 11': SILTSTONE, olive gray with orange brown oxidation, slightly moist, very stiff.	21.4	100.2	
15	Ring	30 50/4"	R3		@ 13.5': SILTSTONE to fine SANDSTONE, interbedded, olive gray to orange brown with oxidation, slightly moist, hard.			
20					**Notes:** Total depth of boring: 14.3' No groundwater encountered Boring backfilled with soil cuttings			
25								
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing:
AL = Atterberg Limits EI = Expansion Index SA = Sieve Analysis RV = R-Value Test
SR = Sulfate/Resisitivity Test SH = Shear Test HC= Consolidation MD = Maximum Density

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	Sunjoint Development, LLC	**DRILLER:**	2R Drilling	**LOGGED BY:**	JMP
PROJECT NAME:	Walnut 49-Acre Site	**DRILL METHOD:**	8" Hollow Stem	**OPERATOR:**	Jeff
PROJECT NO.:	1280-CR	**HAMMER:**	Auto 140#/30"	**RIG TYPE:**	CME 75 (Track Rig)
LOCATION:	See Geotechnical Map			**DATE:**	2/27/2015

BORING NO.: B-3

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
	Large Bulk		B1 @ 0-5'		**Alluvium**			MD,SH,EI,AL,SR
	SPT	8 9 11	S1	CL/ML	@ 2.5': Silty CLAY to clayey SILT, dark brown, slightly moist, stiff.			
5	Ring	18 26 33	R1	CL	@ 5': Silty CLAY, dark brown, moist to very moist, hard.	16.4	113.7	
	SPT	5 11 18	S2		**Puente Formation Bedrock, Yorba Member** @ 7.5': SILTSTONE, olive gray to orange brown with oxidation, slightly moist, very stiff.			
10	Ring	40 50/3"	R2		@ 10': SILTSTONE to fine SANDSTONE, interbedded, olive gray to orange brown with oxidation, slightly moist, hard.	26.1	90.1	
15								
20					**Notes:** Total depth of boring: 10.8' No groundwater encountered Boring backfilled with soil cuttings			
25								
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing:

AL = Atterberg Limits	EI = Expansion Index	SA = Sieve Analysis	RV = R-Value Test
SR = Sulfate/Resisitivity Test	SH = Shear Test	HC= Consolidation	MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	Sunjoint Development, LLC	**DRILLER:**	2R Drilling	**LOGGED BY:**	JMP
PROJECT NAME:	Walnut 49-Acre Site	**DRILL METHOD:**	8" Hollow Stem	**OPERATOR:**	Jeff
PROJECT NO.:	1280-CR	**HAMMER:**	Auto 140#/30"	**RIG TYPE:**	CME 75 (Track Rig)
LOCATION:	See Geotechnical Map			**DATE:**	2/27/2015

BORING NO.: B-4

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
					Alluvium			
	Small Bulk		B1 @ 0-5'					MD,SH,EI,AL,SR
	Ring	15 22 22	R1	CL/ML	@ 2.5': Silty CLAY to clayey SILT, dark brown, moist to very moist, hard, minor CaCO3 deposits.			
5	SPT	6 7 7	S1	CL/ML	@ 5': same as above, siff.			
	Ring	12 28 39	R2	CL/ML	@ 7.5': same as above, very moist, hard.	22.9	102.1	
10	SPT	5 6 10	S2	CL/ML	@ 10': same as above, very stiff, abundant CaCO3 deposits.			
	Ring	8 11 14	R3	CL	@ 12.5': CLAY, medium brown, very moist, stiff to very stiff, minor CaCO3 deposits.	30.4	91.7	HC
15	SPT	3 5 8	S3	CL	@ 15': same as above, stiff.			
	Ring	6 12 19	R4	CL	@ 17.5': Silty CLAY, light yellow brown to white, moist, very stiff, very abundant CaCO3.	23.0	101.3	
20	SPT	5 7 7	S4		**Puente Formation Bedrock, Yorba Member** @ 20': SILTSTONE, light orange brown to light yellow brown, slightly moist, medium stiff to stiff, intensely weathered.			
	Ring	10 20 27	R5		@ 22.5': SILTSTONE with interbedded fine SANDSTONE, olive gray to orange brown with oxidation, moist, very stiff, CaCO3 deposits.	25.7	94.8	
25	SPT	5 8 10	S5		@ 25': same as above.			
30					**Notes:** Total depth of boring: 26.5' No groundwater encountered Boring backfilled with soil cuttings			

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing:

AL = Atterberg Limits	EI = Expansion Index	SA = Sieve Analysis	RV = R-Value Test
SR = Sulfate/Resisitivity Test	SH = Shear Test	HC= Consolidation	MD = Maximum Density

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	Sunjoint Development, LLC	**DRILLER:**	2R Drilling	**LOGGED BY:**	JMP
PROJECT NAME:	Walnut 49-Acre Site	**DRILL METHOD:**	8" Hollow Stem	**OPERATOR:**	Jeff
PROJECT NO.:	1280-CR	**HAMMER:**	Auto 140#/30"	**RIG TYPE:**	CME 75 (Track Rig)
LOCATION:	See Geotechnical Map			**DATE:**	2/27/2015

BORING NO.: B-5

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Others
					Alluvium			
	SPT	8 9 9	S1	CL	@ 1': Silty CLAY, dark brown, slightly moist to moist, very stiff.			
5	Ring	22 39 50	R1	CL	@ 3.5': same as above, very moist, hard.	20.9	103.3	
	SPT	7 8 9	S2	CL	@ 6': same as above, very moist, very stiff.			
10	Ring	18 30 39	R2	CL	@ 8.5': same as above, very moist, hard.	23.4	101.7	
	SPT	5 9 12	S3	CL	@ 11': Silty CLAY, brown, very moist, stiff, some CaCO3 deposits.			
15	Ring	14 20 25	R3	CL	@ 13.5': same as above, very stiff.	25.1	100.6	
	SPT	4 7 10	S4		**Puente Formation Bedrock, Yorba Member** @ 16': SILTSTONE, olive gray to orange brown with oxidation, moist, very stiff, CaCO3 deposits.			
20	Ring	17 26 36	R4		@ 18.5': SILTSTONE with fine SANDSTONE, interbedded, olive gray to orange brown with oxidation, moist, hard.	28.0	92.8	
25					**Notes:** Total depth of boring: 20' No groundwater encountered Boring backfilled with soil cuttings			
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing:

AL = Atterberg Limits	EI = Expansion Index	SA = Sieve Analysis	RV = R-Value Test
SR = Sulfate/Resisitivity Test	SH = Shear Test	HC= Consolidation	MD = Maximum Density

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT:	Sunjoint Development, LLC	**DRILLER:**	2R Drilling	**LOGGED BY:**	JMP
PROJECT NAME:	Walnut 49-Acre Site	**DRILL METHOD:**	8" Hollow Stem	**OPERATOR:**	Jeff
PROJECT NO.:	1280-CR	**HAMMER:**	Auto 140#/30"	**RIG TYPE:**	CME 75 (Track Rig)
LOCATION:	See Geotechnical Map			**DATE:**	2/27/2015

BORING NO.: B-6

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Others
					Alluvium			
	Ring	9 14 17	R1	CL	@ 1': Silty CLAY, dark brown, very moist, very stiff.	31.6	78.7	
5	SPT	3 5 5	S1	CL/ML	@ 3.5': Silty CLAY to clayey SILT, dark brown, moist, stiff.			
	Ring	26 40 50/5"	R2	CL/ML	@ 6': Silty CLAY to clayey SILT, medium brown, very moist, hard.	20.3	100.9	
10	SPT	10 10 12	S2	CL/ML	@ 8.5': Silty CLAY to clayey SILT, gray brown to olive brown, moist, stiff, transitioning to weathered bedrock.			
					Puente Formation Bedrock, Yorba Member			
	Ring	20 25 27	R3		@ 11': SILTSTONE yto CLAYSTONE, olive gray to orange brown with oxidation, very moist, hard, CaCO3 deposits.	32.0	83.3	
15					**Notes:** Total depth of boring: 12.5' No groundwater encountered Boring backfilled with soil cuttings			
20								
25								
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

PROJECT NO.: 0468-CR3
PROJECT NAME: APN's 8709-023-273, -274 & -275
CLIENT: Mr. Tom Lee
LOCATION: See Trench Location Map
LOGGED BY: EHL
EQUIPMENT: Backhoe
DATE: 7/7/2008

TRENCH NO.: *T-1*

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
				Colluvium (Qcol):			
	Large Bulk Sample		CL/ML	Silty Clay (CL) to clayey Silt (ML), dark gray brown, damp to slightly moist, soft to medium stiff, dessicated to at least three feet, locally porous with rootlets, locally heavily stained with calcium carbonate - more at three to five feet, seems slightly coarser grained with depth, rootlets down to five to seven feet			MD, EI
5							
			ML	Becomes mostly clayey Silt (ML), medium to dark gray brown, slightly moist to moist, soft to medium stiff, more ped structure, locally porous			
			CL/ML	Silty Clay (CL) to clayey Silt (ML), medium yellow brown, slightly moist, medium stiff			
10				**Bedrock - Puente Formation (Tp):**			
				Clayey Siltstone, dark gray and brown, thinly bedded			
				TRENCH TERMINATED AT 11 FEET			
				No Groundwater Encountered			
				Trench Backfilled with Soil Cuttings			
15							

LEGEND

Sample Type: --- Ring Sample; --- Large Bulk Sample; ---Water Table

Laboratory Testing:
AL = Atterberg Limits; EI = Expansion Index; MD = Maximum Density; SA = Sieve Analysis
SR = Sulfate/Resistivity Test; SH = Shear Testing; RV = R-Value Test; CO = Consolidation

GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

PROJECT NO.:	0468-CR3	**LOGGED BY:**	EHL
PROJECT NAME:	APN's 8709-023-273, -274 & -275	**EQUIPMENT:**	Backhoe
CLIENT:	Mr. Tom Lee	**DATE:**	7/7/2008
LOCATION:	See Trench Location Map		

TRENCH NO.: *T-2*

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
				Colluvium (Qcol):			
			CL/ML	Silty Clay (CL) to clayey Silt (ML), dark gray, damp to slightly moist, soft to medium stiff, dessicated to at least three feet, locally porous with rootlets, locally heavily stained with calcium carbonate - more at three to five feet, seems slightly coarser grained with depth, rootlets down to five to seven feet			
				@3', becomes dark gray brown			
5							
				@7', more calcium carbonate along ped faces			
			ML	Becomes clayey Silt (ML), yellow brown, slightly moist, stiff			
10							
				Bedrock - Puente Formation (Tp): Clayey Siltstone, dark gray and brown, thinly bedded			
				TRENCH TERMINATED AT 11.5 FEET			
				No Groundwater Encountered Trench Backfilled with Soil Cuttings			
15							

LEGEND

Sample Type: --- Ring Sample --- Large Bulk Sample ---Water Table

Laboratory Testing: AL = Atterberg Limits EI = Expansion Index MD = Maximum Density SA = Sieve Analysis SR = Sulfate/Resistivity Test SH = Shear Testing RV = R-Value Test CO = Consolidation

GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

PROJECT NO.:	0468-CR3	**LOGGED BY:**	EHL
PROJECT NAME:	APN's 8709-023-273, -274 & -275	**EQUIPMENT:**	Backhoe
CLIENT:	Mr. Tom Lee	**DATE:**	7/7/2008
LOCATION:	See Trench Location Map		

TRENCH NO.: *T-3*

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
				Colluvium (Qcol):			
			CL	Silty Clay (CL), dark gray brown, damp, soft, dessicated, some rootlets			
			ML	Becomes clayey Silt (ML), dark yellow gray brown, slightly moist, soft to medium stiff			
5							
				Bedrock - Puente Formation (Tp):			
				Clayey Siltstone, dark gray and brown, thinly bedded			
				TRENCH TERMINATED AT 8 FEET			
10				No Groundwater Encountered			
				Trench Backfilled with Soil Cuttings			
15							

LEGEND

Sample Type: --- Ring Sample; --- Large Bulk Sample; ---Water Table

Laboratory Testing:

AL = Atterberg Limits	EI = Expansion Index	MD = Maximum Density	SA = Sieve Analysis
SR = Sulfate/Resistivity Test	SH = Shear Testing	RV = R-Value Test	CO = Consolidation

GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

PROJECT NO.:	0468-CR3	**LOGGED BY:**	EHL
PROJECT NAME:	APN's 8709-023-273, -274 & -275	**EQUIPMENT:**	Backhoe
CLIENT:	Mr. Tom Lee	**DATE:**	7/7/2008
LOCATION:	See Trench Location Map		

TRENCH NO.: *T-4*

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
			CL	**Colluvium (Qcol):** Silty Clay (CL), dark gray brown, damp, soft, dessicated, some rootlets			
			ML	Becomes clayey Silt (ML), dark yellow brown, slightly moist to moist, soft to medium stiff			
5				**Bedrock - Puente Formation (Tp):** Clayey Siltstone, olive gray, thinly bedded			
				TRENCH TERMINATED AT 7 FEET No Groundwater Encountered Trench Backfilled with Soil Cuttings			
10							
15							

LEGEND

Sample Type: --- Ring Sample --- Large Bulk Sample ---Water Table

Laboratory Testing: AL = Atterberg Limits; EI = Expansion Index; MD = Maximum Density; SA = Sieve Analysis; SR = Sulfate/Resistivity Test; SH = Shear Testing; RV = R-Value Test; CO = Consolidation

GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

PROJECT NO.:	0468-CR3	**LOGGED BY:**	EHL
PROJECT NAME:	APN's 8709-023-273, -274 & -275	**EQUIPMENT:**	Backhoe
CLIENT:	Mr. Tom Lee	**DATE:**	7/7/2008
LOCATION:	See Trench Location Map		

TRENCH NO.: *T-5*

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
			CL	**Colluvium (Qcol):** Silty Clay (CL), dark gray brown, damp, loose/soft, dessicated, becomes slightly moist at one foot			
			ML	Becomes clayey Silt (ML), dark yellow gray mottled, soft to medium stiff Becomes medium yellow brown, slightly moist to moist, firm/stiff			
5							
				Bedrock - Puente Formation (Tp): Interbedded Clayey Siltstone and fine Sandstone, medium brown yellow, slightly moist			
				TRENCH TERMINATED AT 8 FEET			
10				No Groundwater Encountered Trench Backfilled with Soil Cuttings			
15							

LEGEND

Sample Type: --- Ring Sample; --- Large Bulk Sample; ---Water Table

Laboratory Testing:

AL = Atterberg Limits	EI = Expansion Index	MD = Maximum Density	SA = Sieve Analysis
SR = Sulfate/Resistivity Test	SH = Shear Testing	RV = R-Value Test	CO = Consolidation

GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

PROJECT NO.: 0468-CR3
PROJECT NAME: APN's 8709-023-273, -274 & -275
CLIENT: Mr. Tom Lee
LOCATION: See Trench Location Map
LOGGED BY: EHL
EQUIPMENT: Backhoe
DATE: 7/7/2008

TRENCH NO.: *T-6*

Depth (ft)	Sample Type*	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Water Content (%)	Dry Density (pcf)	Others
				Colluvium (Qcol):			
			ML	Clayey fine sandy Silt (ML), light to medium gray, damp, soft to firm, porous, rootlets			
5							
				Bedrock - Puente Formation (Tp):			
				Interbedded clayey Siltstone and fine Sandstone, medium brown yellow, slightly moist			
				TRENCH TERMINATED AT 8 FEET			
				No Groundwater Encountered			
10				Trench Backfilled with Soil Cuttings			
15							

LEGEND

Sample Type: --- Ring Sample; --- Large Bulk Sample; ---Water Table

Laboratory Testing:
AL = Atterberg Limits; EI = Expansion Index; MD = Maximum Density; SA = Sieve Analysis
SR = Sulfate/Resistivity Test; SH = Shear Testing; RV = R-Value Test; CO = Consolidation

GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

PROJECT NO.:	0468-CR3	**LOGGED BY:**	EHL
PROJECT NAME:	APN's 8709-023-273, -274 & -275	**EQUIPMENT:**	Backhoe
CLIENT:	Mr. Tom Lee	**DATE:**	7/7/2008
LOCATION:	See Trench Location Map		

TRENCH NO.: *T-7*

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
			ML	**Colluvium (Qcol):** Clayey fine sandy Silt (ML), light to medium gray, damp, soft to firm, porous, rootlets			
				Bedrock - Puente Formation (Tp): Thinly bedded silty fine Sandstone, light gray with calcium carbonate along bedding planes and fractures, damp			
				TRENCH TERMINATED AT 4 FEET			
5				No Groundwater Encountered Trench Backfilled with Soil Cuttings			
10							
15							

LEGEND

Sample Type: --- Ring Sample; --- Large Bulk Sample; ---Water Table

Laboratory Testing:

AL = Atterberg Limits	EI = Expansion Index	MD = Maximum Density	SA = Sieve Analysis
SR = Sulfate/Resistivity Test	SH = Shear Testing	RV = R-Value Test	CO = Consolidation

GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

PROJECT NO.:	0468-CR3	**LOGGED BY:**	EHL
PROJECT NAME:	APN's 8709-023-273, -274 & -275	**EQUIPMENT:**	Backhoe
CLIENT:	Mr. Tom Lee	**DATE:**	7/7/2008
LOCATION:	See Trench Location Map		

TRENCH NO.: *T-8*

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
				Bedrock - Puente Formation (Tp): Thinly bedded Siltstone, light olive gray with calcium carbonate along fractures and bedding planes, rootlets down to two to three feet			
				@3', B: N88W, 50NE			
5				TRENCH TERMINATED AT 5 FEET			
				No Groundwater Encountered			
				Trench Backfilled with Soil Cuttings			
10							
15							

LEGEND

Sample Type: --- Ring Sample; --- Large Bulk Sample; ---Water Table

Laboratory Testing:
AL = Atterberg Limits; EI = Expansion Index; MD = Maximum Density; SA = Sieve Analysis
SR = Sulfate/Resistivity Test; SH = Shear Testing; RV = R-Value Test; CO = Consolidation

GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

PROJECT NO.: 0468-CR3
PROJECT NAME: APN's 8709-023-273, -274 & -275
CLIENT: Mr. Tom Lee
LOCATION: See Trench Location Map
LOGGED BY: EHL
EQUIPMENT: Backhoe
DATE: 7/7/2008

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	TRENCH NO.: *T-9* — MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
				Colluvium (Qcol):			
	Large Bulk Sample		CL	Silty Clay (CL), dark gray brown, slightly moist, soft, dessicated, rootlets, locally porous			MD, EI
			ML	Becomes clayey Silt (ML), dark olive gray brown, slightly moist to moist, soft, some calcium carbonate, ped structure			
5							
			ML/CL	Clayey Silt (ML) to silty Clay (CL), dark yellow olive brown, moist, firm/stiff			
10							
				Bedrock - Puente Formation (Tp):			
				Thinly bedded Clayey Siltstone, olive brown			
				TRENCH TERMINATED AT 13 FEET			
				No Groundwater Encountered			
				Trench Backfilled with Soil Cuttings			
15							

LEGEND

Sample Type: --- Ring Sample; --- Large Bulk Sample; ---Water Table

Laboratory Testing:
AL = Atterberg Limits; EI = Expansion Index; MD = Maximum Density; SA = Sieve Analysis
SR = Sulfate/Resistivity Test; SH = Shear Testing; RV = R-Value Test; CO = Consolidation

GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

PROJECT NO.:	0468-CR3	**LOGGED BY:**	EHL
PROJECT NAME:	APN's 8709-023-273, -274 & -275	**EQUIPMENT:**	Backhoe
CLIENT:	Mr. Tom Lee	**DATE:**	7/7/2008
LOCATION:	See Trench Location Map		

TRENCH NO.: *T-10*

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
				Colluvium (Qcol):			
			CL	Silty Clay (CL), dark gray brown, slightly moist, soft, dessicated, rootlets, locally porous			
				@3', some calcium carbonate			
5							
				Bedrock - Puente Formation (Tp):			
				Fine Sandstone, thinly bedded with some Siltstone, light gray			
				TRENCH TERMINATED AT 8 FEET			
10				No Groundwater Encountered			
				Trench Backfilled with Soil Cuttings			
15							

LEGEND

Sample Type: --- Ring Sample; --- Large Bulk Sample; ---Water Table

Laboratory Testing: AL = Atterberg Limits; EI = Expansion Index; MD = Maximum Density; SA = Sieve Analysis; SR = Sulfate/Resistivity Test; SH = Shear Testing; RV = R-Value Test; CO = Consolidation

GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

PROJECT NO.:	0468-CR3	**LOGGED BY:**	EHL
PROJECT NAME:	APN's 8709-023-273, -274 & -275	**EQUIPMENT:**	Backhoe
CLIENT:	Mr. Tom Lee	**DATE:**	7/7/2008
LOCATION:	See Trench Location Map		

TRENCH NO.: *T-11*

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
			CL	**Colluvium (Qcol):** Silty Clay (CL), dark gray, damp, soft, dessicated, porous, rootlets			
5				**Bedrock - Puente Formation (Tp):** Thinly bedded clayey Siltstone and silty Sandstone, light yellow to olive gray B: N8E, 31SE B: N20E, 31SE			
10				TRENCH TERMINATED AT 6 FEET No Groundwater Encountered Trench Backfilled with Soil Cuttings			
15							

LEGEND

Sample Type: --- Ring Sample; --- Large Bulk Sample; ---Water Table

Laboratory Testing:
AL = Atterberg Limits; EI = Expansion Index; MD = Maximum Density; SA = Sieve Analysis
SR = Sulfate/Resistivity Test; SH = Shear Testing; RV = R-Value Test; CO = Consolidation

GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

PROJECT NO.:	0468-CR3	**LOGGED BY:**	EHL
PROJECT NAME:	APN's 8709-023-273, -274 & -275	**EQUIPMENT:**	Backhoe
CLIENT:	Mr. Tom Lee	**DATE:**	7/7/2008
LOCATION:	See Trench Location Map		

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	**TRENCH NO.:** *T-12* **MATERIAL DESCRIPTION AND COMMENTS**	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
			CL	**Colluvium (Qcol):** Silty Clay (CL), dark gray, damp, soft, dessicated, porous, rootlets			
5				**Bedrock - Puente Formation (Tp):** Clayey Siltstone, weathered & highly fractured with calcium carbonate along bedding and fracture planes			
10				TRENCH TERMINATED AT 6 FEET No Groundwater Encountered Trench Backfilled with Soil Cuttings			
15							

LEGEND

Sample Type: --- Ring Sample --- Large Bulk Sample ---Water Table

Laboratory Testing:
AL = Atterberg Limits; EI = Expansion Index; MD = Maximum Density; SA = Sieve Analysis
SR = Sulfate/Resistivity Test; SH = Shear Testing; RV = R-Value Test; CO = Consolidation

GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

PROJECT NO.:	0468-CR3	**LOGGED BY:**	EHL
PROJECT NAME:	APN's 8709-023-273, -274 & -275	**EQUIPMENT:**	Backhoe
CLIENT:	Mr. Tom Lee	**DATE:**	7/7/2008
LOCATION:	See Trench Location Map		

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	**TRENCH NO.:** *T-13* **MATERIAL DESCRIPTION AND COMMENTS**	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
			CL	**Colluvium (Qcol):** Silty Clay (CL), dark gray, damp, soft, dessicated, porous, rootlets			
				Bedrock - Puente Formation (Tp): Silty Sandstone to fine sandy Siltstone, light yellow, thinly bedded, excavates easily			
5				@5', B: N55W, 50NE			
10				TRENCH TERMINATED AT 10 FEET No Groundwater Encountered Trench Backfilled with Soil Cuttings			
15							

LEGEND

Sample Type: --- Ring Sample; --- Large Bulk Sample; ---Water Table

Laboratory Testing:				
	AL = Atterberg Limits	EI = Expansion Index	MD = Maximum Density	SA = Sieve Analysis
	SR = Sulfate/Resistivity Test	SH = Shear Testing	RV = R-Value Test	CO = Consolidation

GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

PROJECT NO.:	0468-CR3	**LOGGED BY:**	EHL
PROJECT NAME:	APN's 8709-023-273, -274 & -275	**EQUIPMENT:**	Backhoe
CLIENT:	Mr. Tom Lee	**DATE:**	7/7/2008
LOCATION:	See Trench Location Map		

TRENCH NO.: *T-14*

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
				Colluvium (Qcol):			
			CL	Silty Clay (CL), dark gray, damp, soft, dessicated, porous, rootlets			
				Bedrock - Puente Formation (Tp):			
				Silty Sandstone, light yellow, thinly bedded, indurated, fractured			
				B: N70W, 50 NE			
				TRENCH TERMINATED AT 3 FEET			
				No Groundwater Encountered			
5				Trench Backfilled with Soil Cuttings			
10							
15							

LEGEND

Sample Type: --- Ring Sample; --- Large Bulk Sample; ---Water Table

Laboratory Testing:
AL = Atterberg Limits; EI = Expansion Index; MD = Maximum Density; SA = Sieve Analysis
SR = Sulfate/Resistivity Test; SH = Shear Testing; RV = R-Value Test; CO = Consolidation

GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

PROJECT NO.:	0468-CR3	**LOGGED BY:**	EHL
PROJECT NAME:	APN's 8709-023-273, -274 & -275	**EQUIPMENT:**	Backhoe
CLIENT:	Mr. Tom Lee	**DATE:**	7/7/2008
LOCATION:	See Trench Location Map		

TRENCH NO.: *T-15*

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
				Colluvium (Qcol):			
			CL	Silty Clay (CL), dark gray, damp, soft, dessicated, porous, rootlets			
				@4', some calcium carbonate			
5							
			ML	Becomes clayey Silt (ML), dark brown, slightly moist, medium stiff			
				Bedrock - Puente Formation (Tp):			
				Siltstone, thinly bedded			
				TRENCH TERMINATED AT 9 FEET			
10				No Groundwater Encountered			
				Trench Backfilled with Soil Cuttings			
15							

LEGEND

Sample Type: --- Ring Sample --- Large Bulk Sample ---Water Table

Laboratory Testing: AL = Atterberg Limits EI = Expansion Index MD = Maximum Density SA = Sieve Analysis

SR = Sulfate/Resistivity Test SH = Shear Testing RV = R-Value Test CO = Consolidation

GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

PROJECT NO.:	0468-CR3	**LOGGED BY:**	EHL
PROJECT NAME:	APN's 8709-023-273, -274 & -275	**EQUIPMENT:**	Backhoe
CLIENT:	Mr. Tom Lee	**DATE:**	7/7/2008
LOCATION:	See Trench Location Map		

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	**TRENCH NO.:** *T-16* / **MATERIAL DESCRIPTION AND COMMENTS**	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
				Colluvium (Qcol):			
			CL	Silty Clay (CL), dark gray, damp, soft, dessicated, porous, rootlets			
			ML	Becomes clayey Silt (ML), gray brown, with calcium carbonate, soft to medium stiff			
5							
				Bedrock:			
				Clayey Siltstone, thinly bedded			
				TRENCH TERMINATED AT 7 FEET			
				No Groundwater Encountered			
				Trench Backfilled with Soil Cuttings			
10							
15							

LEGEND

Sample Type: --- Ring Sample --- Large Bulk Sample ---Water Table

Laboratory Testing:

AL = Atterberg Limits	EI = Expansion Index	MD = Maximum Density	SA = Sieve Analysis
SR = Sulfate/Resistivity Test	SH = Shear Testing	RV = R-Value Test	CO = Consolidation

GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

PROJECT NO.: 0468-CR3
PROJECT NAME: APN's 8709-023-273, -274 & -275
CLIENT: Mr. Tom Lee
LOCATION: See Trench Location Map

LOGGED BY: EHL
EQUIPMENT: Backhoe
DATE: 7/7/2008

TRENCH NO.: *T-17*

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
			CL	**Colluvium (Qcol):** Silty Clay (CL), dark gray, damp, soft, dessicated, porous, rootlets			
				Bedrock - Puente Formation (Tp): Clayey Siltstone, thinly bedded @3', B: N75E, 33 NW			
5				TRENCH TERMINATED AT 5 FEET No Groundwater Encountered Trench Backfilled with Soil Cuttings			
10							
15							

LEGEND

Sample Type: --- Ring Sample; --- Large Bulk Sample; ---Water Table

Laboratory Testing:
AL = Atterberg Limits; EI = Expansion Index; MD = Maximum Density; SA = Sieve Analysis
SR = Sulfate/Resistivity Test; SH = Shear Testing; RV = R-Value Test; CO = Consolidation

APPENDIX B

RESULTS OF LABORATORY TESTING

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SUMMARY OF LABORATORY TESTING

Classification
Soils were classified visually in general accordance to the Unified Soil Classification System (ASTM Test Method D 2487). The soil classifications are shown on the logs of exploratory test borings in Appendix A.

In Situ Moisture Content and Unit Weight
The field moisture content was measured in the laboratory on selected samples collected during the field investigation. The field moisture content is determined as a percentage of the dry unit weight. The dry density was measured in the laboratory on selected ring samples. The results are shown on the logs of exploratory borings in Appendix A.

Moisture-Density Relationship
Laboratory testing was performed on a representative site sample collected during the recent subsurface exploration. The laboratory maximum dry density and optimum moisture content for the sample tested was determined in general accordance with test method ASTM Test Procedure D 1557. The results are included herein.

Expansion Index
Expansion Index testing was performed on a site soil sample. Testing was performed in general accordance with ASTM Test Method D 4829. The lab results are included herein.

Direct Shear Test
Shear testing was performed by others on a remolded sample of the site soil materials in general accordance with ASTM Test Method D 3080. The test results are included herein.

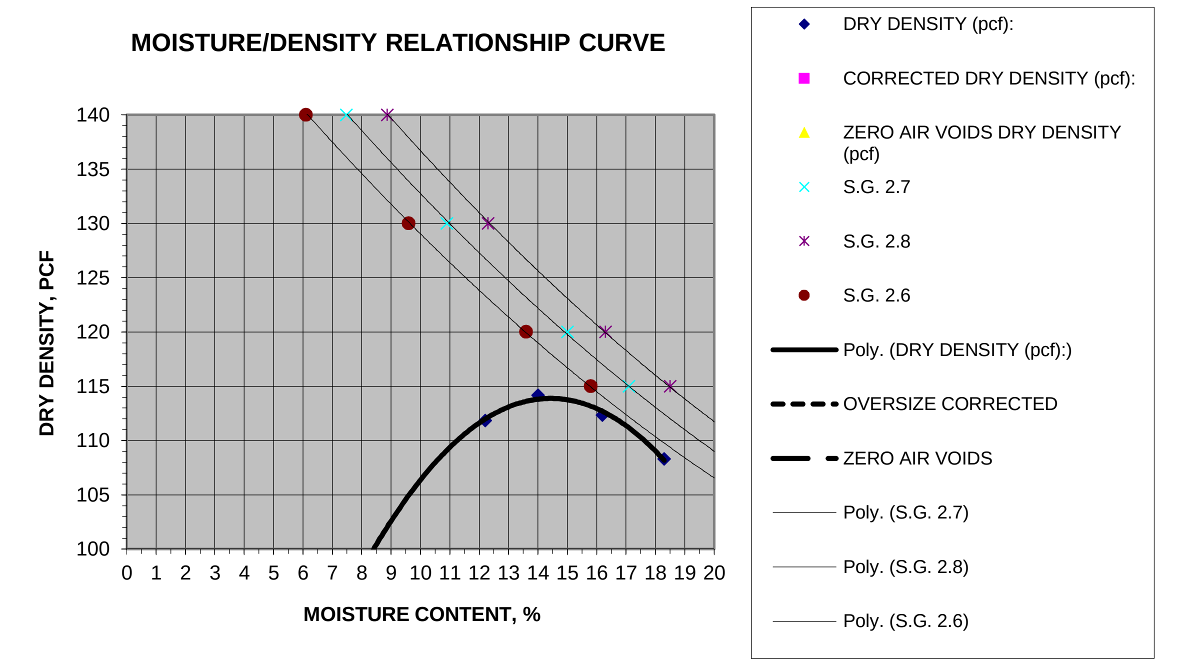
Atterberg Limits
Liquid limit and plastic limit testing was completed in general accordance with ASTM Test Method D 4318 on a soil sample collected from the site. Results are included herein.

Consolidation
Consolidation testing was performed on a selected sample of the site soils in general accordance with ASTM Test Method D 2435. The results of this testing are presented herein.

Sulfate Content, Resistivity and Chloride Content
Testing to determine the water-soluble sulfate content was performed by others in general accordance with California Test No. 417. Resistivity testing was completed by others in general accordance with California Test 643. Testing to determine the chloride content was performed by others in general accordance with California Test No. 422. The results of the testing are included herein.

MOISTURE/DENSITY RELATIONSHIP

Client:	Sunjoint Development	**Job No.:**	1280-CR
Project:	Walunt	**Lab No.:**	Corona
Location:			
Material Type:	Dark Brown Silty Clay to Clayey Silt		
Material Supplier:			
Material Source:			
Sample Location:	B-3 @ 0 - 5		
Sampled By:	JMP	**Date Sampled:**	27-Feb-15
Received By:	DLI	**Date Received:**	27-Feb-15
Tested By:	DLI	**Date Tested:**	9-Mar-15
Reviewed By:		**Date Reviewed:**	
Test Procedure:	ASTM 1557	**Method:**	A
Oversized Material (%):	4.2	**Correction Required:**	☐ yes ☒ no



MOISTURE DENSITY RELATIONSHIP VALUES

Maximum Dry Density, pcf	114.5	@ **Optimum Moisture, %**	14.5
Corrected Maximum Dry Density, pcf		@ **Optimum Moisture, %**	

MATERIAL DESCRIPTION

Grain Size Distribution:

	% Gravel (retained on No. 4)
	% Sand (Passing No. 4, Retained on No. 200)
	% Silt and Clay (Passing No. 200)

Atterberg Limits:

	Liquid Limit, %
	Plastic Limit, %
	Plasticity Index, %

Classification:

Unified Soils Classification:

AASHTO Soils Classification:

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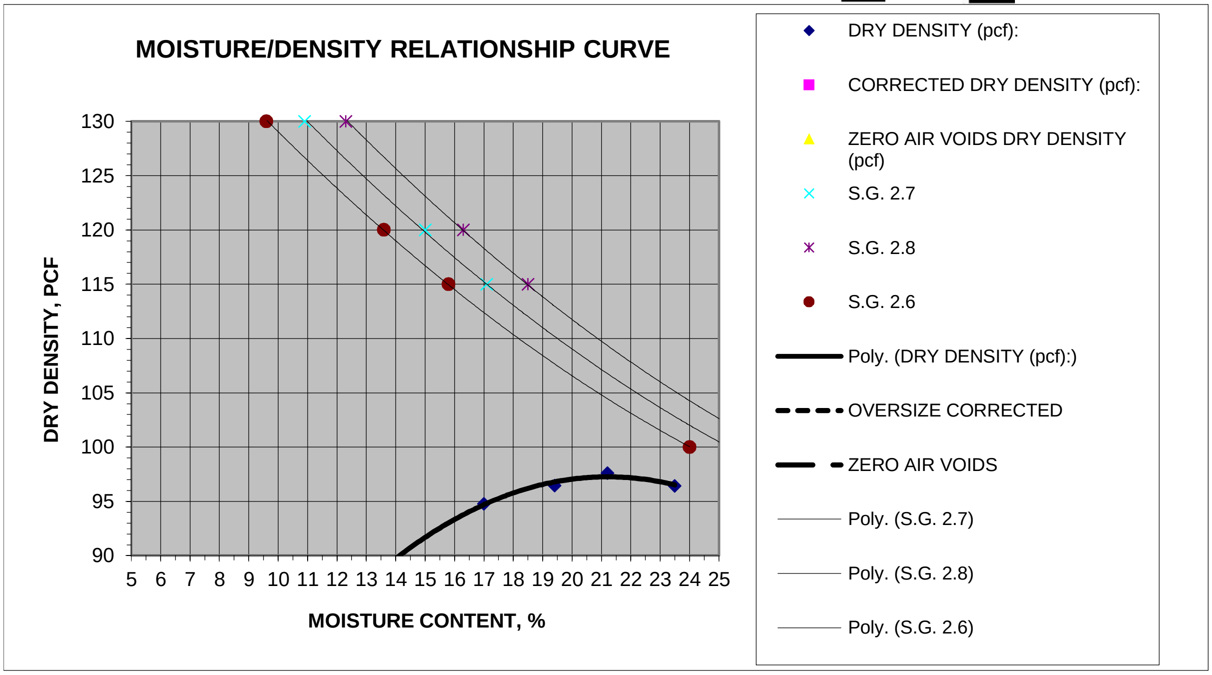
MOISTURE/DENSITY RELATIONSHIP

Client: Sunjoint Development
Job No.: 1280-CR
Project: Walnut
Lab No.: Corona
Location:
Material Type: Dark Brown Silty Clay to Clayey Silt
Material Supplier:
Material Source:
Sample Location: B-4 @ 0 - 5

Sampled By: JMP
Date Sampled: 27-Feb-15
Received By: DLI
Date Received: 27-Feb-15
Tested By: DLI
Date Tested: 9-Mar-15
Reviewed By:
Date Reviewed:

Test Procedure: ASTM 1557
Method: A
Oversized Material (%): 3.8
Correction Required: ☐ yes ☒ no



MOISTURE DENSITY RELATIONSHIP VALUES

Maximum Dry Density, pcf	97.5	@ **Optimum Moisture, %**	21.5
Corrected Maximum Dry Density, pcf		@ **Optimum Moisture, %**	

MATERIAL DESCRIPTION

Grain Size Distribution:

	% Gravel (retained on No. 4)
	% Sand (Passing No. 4, Retained on No. 200)
	% Silt and Clay (Passing No. 200)

Atterberg Limits:

	Liquid Limit, %
	Plastic Limit, %
	Plasticity Index, %

Classification:

Unified Soils Classification:
AASHTO Soils Classification:

GEOTEK
4130 Flat Rock Drive, Suite 140, Riverside, CA, 92505-5864
951-710-1160 Office 951-710-1167 Fax

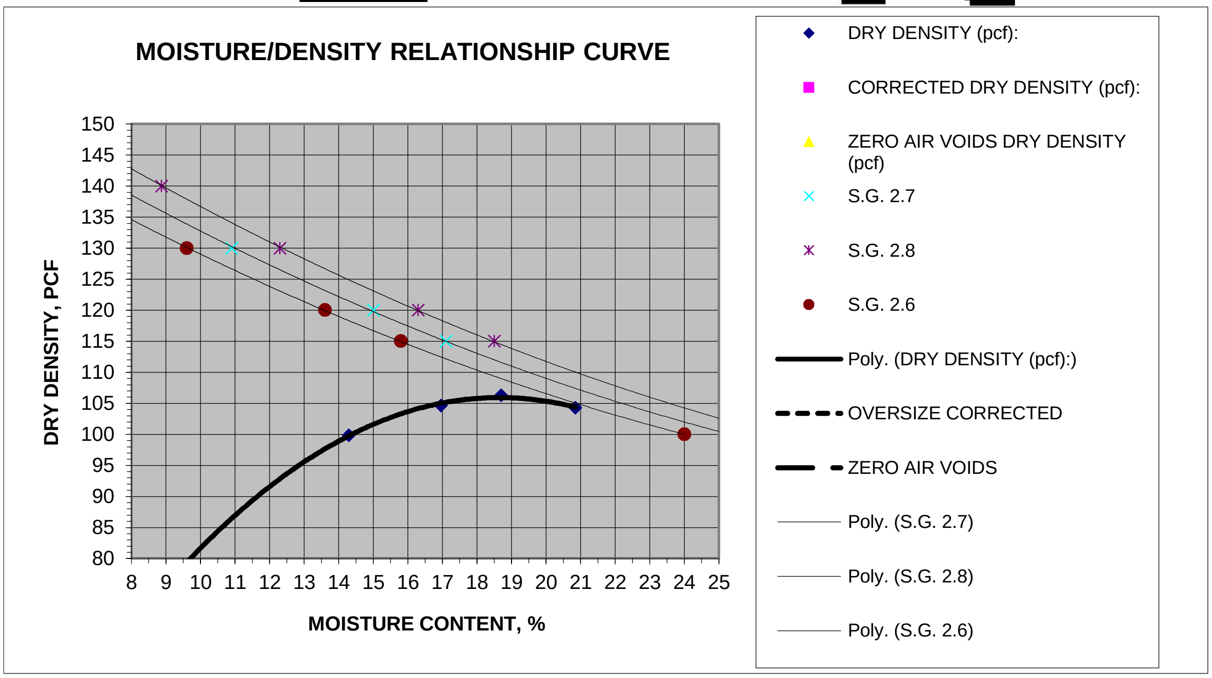
MOISTURE/DENSITY RELATIONSHIP

Client: Mr. Tom Lee
Project: APN's 8709-230-273, -274 & -275
Location: Walnut
Material Type: 0
Material Supplier: N/A
Material Source: 0
Sample Location: T - 1 @ 0 - 3'
0
Sampled By: EHL
Received By: N/A
Tested By: FH
Reviewed By: N/A

Job No.: 0468-CR3
Lab No.: Riv

Date Sampled: 3-Jul-08
Date Received: 3-Jul-08
Date Tested: 9-Jul-08
Date Reviewed: 15-Jul-08

Test Procedure: ASTM 1557 **Method:** 0
Oversized Material (%): 0.0 **Correction Required:** yes no



MOISTURE DENSITY RELATIONSHIP VALUES

Maximum Dry Density, pcf	107.0	**@ Optimum Moisture, %**	18.0
Corrected Maximum Dry Density, pcf		**@ Optimum Moisture, %**	

MATERIAL DESCRIPTION

Grain Size Distribution:

	% Gravel (retained on No. 4)
	% Sand (Passing No. 4, Retained on No. 200)
	% Silt and Clay (Passing No. 200)

Atterberg Limits:

	Liquid Limit, %
	Plastic Limit, %
	Plasticity Index, %

Classification:
Unified Soils Classification:
AASHTO Soils Classification:

Plate MD-1

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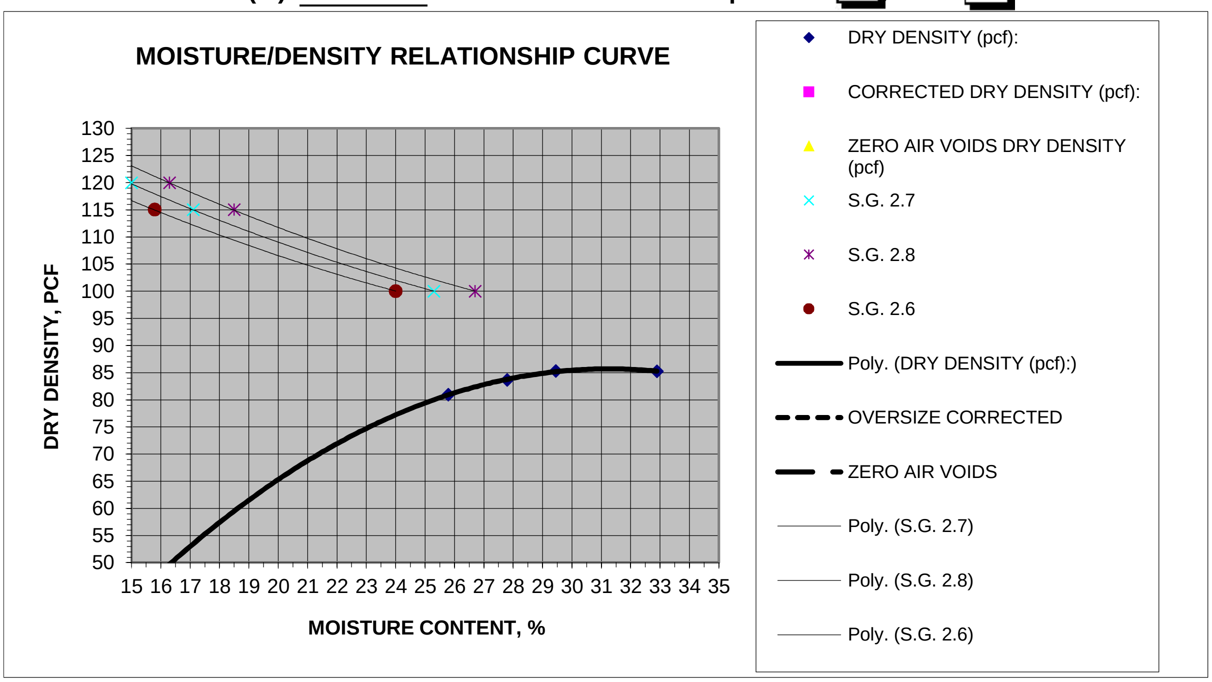
4130 Flat Rock Drive, Suite 140, Riverside, CA, 92505-5864
951-710-1160 Office 951-710-1167 Fax

MOISTURE/DENSITY RELATIONSHIP

Client:	Mr. Tom Lee	**Job No.:**	0468-CR3
Project:	APN's 8709-230-273, -274 & -275	**Lab No.:**	Riv
Location:	Walnut		
Material Type:	0		
Material Supplier:	N/A		
Material Source:	0		
Sample Location:	T - 9 @ 0 - 3'		
	0		
Sampled By:	EHL	**Date Sampled:**	3-Jul-08
Received By:	N/A	**Date Received:**	3-Jul-08
Tested By:	FH	**Date Tested:**	10-Jul-08
Reviewed By:	N/A	**Date Reviewed:**	15-Jul-08

Test Procedure: ASTM 1557 **Method:** 0
Oversized Material (%): 0.0 **Correction Required:** yes no



MOISTURE DENSITY RELATIONSHIP VALUES

Maximum Dry Density, pcf	86.5	**@ Optimum Moisture, %**	31.0
Corrected Maximum Dry Density, pcf		**@ Optimum Moisture, %**	

MATERIAL DESCRIPTION

Grain Size Distribution:

	% Gravel (retained on No. 4)
	% Sand (Passing No. 4, Retained on No. 200)
	% Silt and Clay (Passing No. 200)

Atterberg Limits:

	Liquid Limit, %
	Plastic Limit, %
	Plasticity Index, %

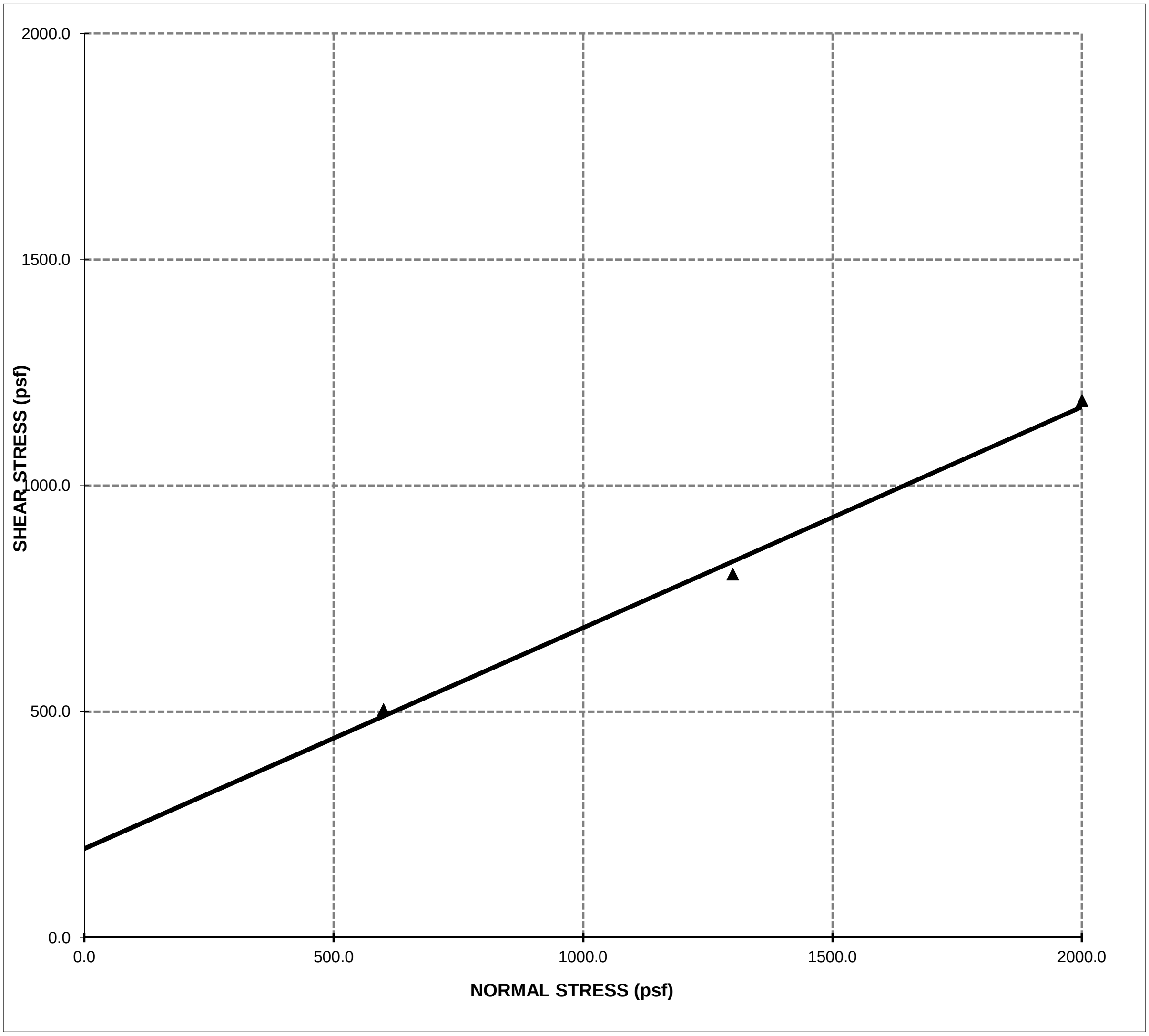
Classification:

Unified Soils Classification: ____________________
AASHTO Soils Classification: ____________________

Plate MD-2

DIRECT SHEAR TEST

Project Name:	Walnut	***Sample Location:***	B-3 @ 0 - 5
Project Number:	1280-CR	***Date Tested:***	3/18/2015



Shear Strength: F = **26.0** ° , **C = 196.86 psf**

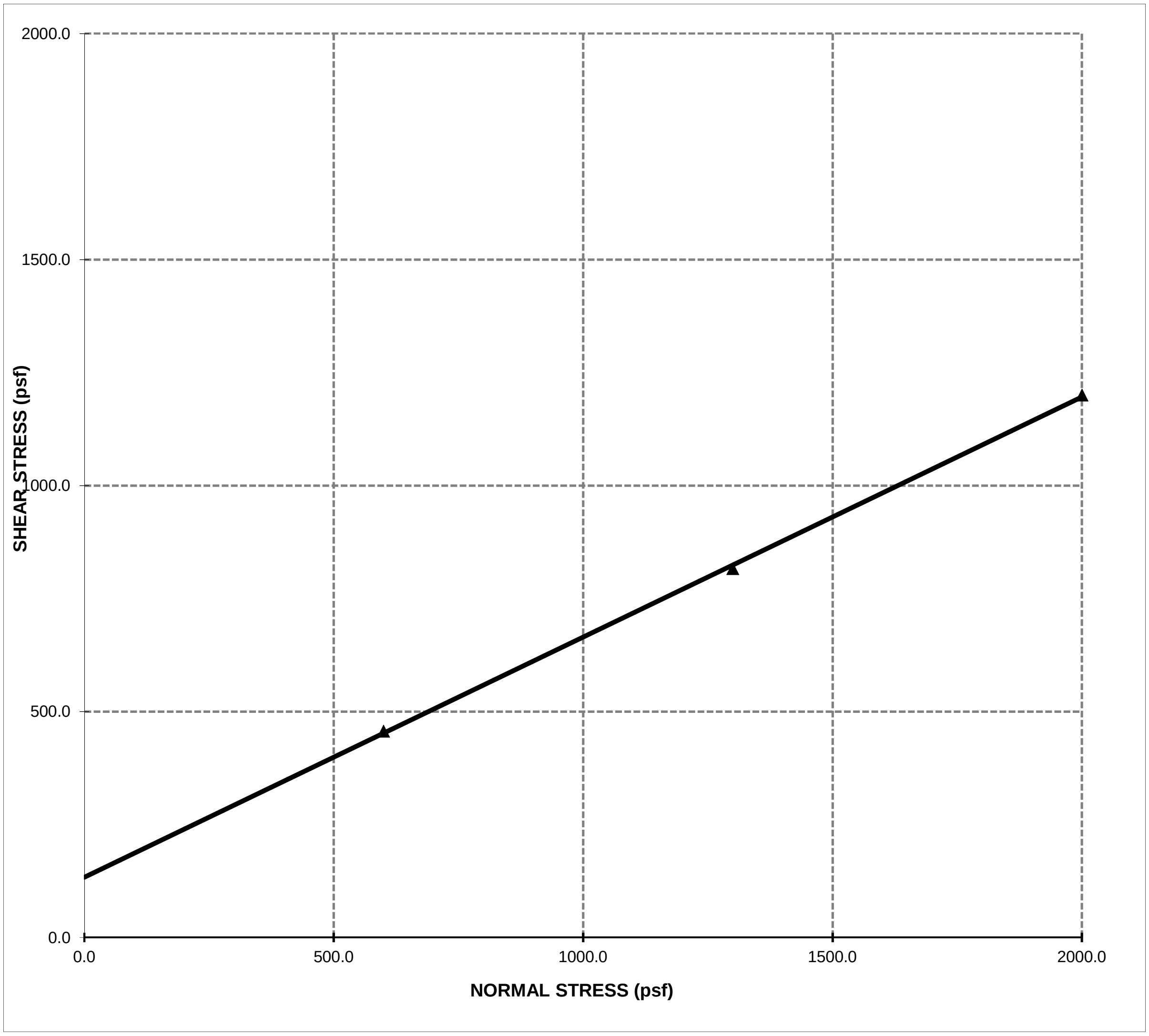
Notes: 1 - The soil specimen used in the shear box was a ring sample remolded to approximately 90% relative compaction from a bulk sample collected during the field investigation.

2 - The above reflect residual shear strength at saturated conditions.

3 - The tests were run at a shear rate of 0.010 in/min.

DIRECT SHEAR TEST

Project Name:	Walnut	***Sample Location:***	B-4 @ 0 - 5
Project Number:	1280-CR	***Date Tested:***	3/18/2015



Shear Strength: F = **28.0 °** , **C = 133.14 psf**

Notes: 1 - The soil specimen used in the shear box was a ring sample remolded to approximately 90% relative compaction from a bulk sample collected during the field investigation.

2 - The above reflect residual shear strength at saturated conditions.

3 - The tests were run at a shear rate of 0.010 in/min.

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EXPANSION INDEX TEST

(ASTM D4829)

Client: Sunjoint Development

Project Number: 1280-CR

Project Location: Walnut

Tested/ Checked By: DI Lab No Corona

Date Tested: 3/11/2015

Sample Source: B-3 @ 0 - 5

Sample Description:

Ring #:______ Ring Dia. : 4.01" Ring Ht. 1"

DENSITY DETERMINATION

A	Weight of compacted sample & ring (gm)	730.3
B	Weight of ring (gm)	365.4
C	Net weight of sample (gm)	**364.9**
D	Wet Density, lb / ft3 (C*0.3016)	**110.1**
E	Dry Density, lb / ft3 (D/1.F)	**96.7**

SATURATION DETERMINATION

F	Moisture Content, %	13.8
G	Specific Gravity, assumed	**2.70**
H	Unit Wt. of Water @ 20°C, (pcf)	**62.3**
I	% Saturation	**50.4**

READINGS

DATE	TIME	READING	
3/11/2015	6:38	0.3590	Initial
	6:48	0.3590	10 min/Dry
	7:40	0.4480	
	12:40	0.4580	
3/12/2015	3:05	0.4630	Final

FINAL MOISTURE

Final Weight of wet sample & tare	% Moisture
785.3	**28.9**

EXPANSION INDEX = 104

GEOTEK

EXPANSION INDEX TEST

(ASTM D4829)

Client:	Sunjoint Development	***Tested/ Checked By:***	DI Lab No Corona
Project Number:	1280-CR	***Date Tested:***	3/11/2015
Project Location:	Walnut	***Sample Source:***	B-4 @ 0 - 5
		Sample Description:	

Ring #:______ Ring Dia. : 4.01" Ring Ht. 1"

DENSITY DETERMINATION

A	Weight of compacted sample & ring (gm)	690.6
B	Weight of ring (gm)	365.1
C	Net weight of sample (gm)	**325.5**
D	Wet Density, lb / ft3 (C*0.3016)	**98.2**
E	Dry Density, lb / ft3 (D/1.F)	**81.5**

SATURATION DETERMINATION

F	Moisture Content, %	20.4
G	Specific Gravity, assumed	**2.70**
H	Unit Wt. of Water @ 20°C, (pcf)	**62.3**
I	% Saturation	**51.8**

READINGS

DATE	TIME	READING	
3/11/2015	6:20	0.2090	Initial
	6:30	0.2090	10 min/Dry
	7:40	0.3230	
	12:40	0.3360	
3/12/2015	3:05	0.3400	Final

FINAL MOISTURE

Final Weight of wet sample & tare	% Moisture
754.3	**40.0**

EXPANSION INDEX = 131

GEOTEK

EXPANSION INDEX TEST

(ASTM D4829)

Project Name:	Mr. Tom Lee		***Tested/ Checked By:***	EV Lab No Riv
Project Number:	0468-CR3		***Date Tested:***	7/19/2008
Project Location:	Walnut		***Sample Source:***	T-1 @ 0-3'
			Sample Description:	Dark Brown Silty Clay

Ring Id 12 Ring Dia. " 4" Ring I 1"

Loading weight: 5516. grams

DENSITY DETERMINATION

A	Weight of compacted sample & ring	710.0
B	Weight of ring	363.5
C	Net weight of sample	346.5
D	Wet Density, lb / ft3 (C*0.3017)	104.5
E	Dry Density, lb / ft3 (D/1.F)	**89.3**

SATURATION DETERMINATION

F	Moisture Content, %	17.0
G	(E*F)	1518.9
H	(E/167.48)	0.53
I	(1.-H)	0.47
J	(62.4*I)	29.1
K	(G/J)= **L** % Saturation	**52.2**

READINGS

DATE	TIME	READING	
7/19/2008	1:05	0.000	Initial
7/19/2008	1:15	0.000	10 min/Dry
7/19/2008	1:16	0.050	1 min/Wet
7/19/2008	1:21	0.150	5 min/Wet
7/19/2008	3:00	0.150	Random
7/20/2008	1:05	51.000	Final

FINAL MOISTURE

Weight of wet sample & tare	Weight of dry sample & tare	Tare	% Moisture

EXPANSION INDEX = 51

(@50% SATURATION)

Plate EI-1

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EXPANSION INDEX TEST

(ASTM D4829)

Project Name: Mr. Tom Lee
Project Number: 0468-CR3
Project Location: Walnut

Tested/ Checked By: EV Lab No Riv
Date Tested: 7/19/2008
Sample Source: T-9 @ 0-3'
Sample Description: Light Brown Silty Sand

Ring Id 12 Ring Dia. " 4" Ring I 1"

Loading weight: 5516. grams

DENSITY DETERMINATION

A	Weight of compacted sample & ring	709.0
B	Weight of ring	369.4
C	Net weight of sample	339.6
D	Wet Density, lb / ft3 (C*0.3017)	102.5
E	Dry Density, lb / ft3 (D/1.F)	**77.4**

SATURATION DETERMINATION

F	Moisture Content, %	32.4
G	(E*F)	2507.3
H	(E/167.48)	0.46
I	(1.-H)	0.54
J	(62.4*I)	33.6
K	(G/J)= **L** % Saturation	**74.7**

READINGS

DATE	TIME	READING	
7/19/2008	1:05	0.000	Initial
7/19/2008	1:15	0.000	10 min/Dry
7/19/2008	1:16	0.050	1 min/Wet
7/19/2008	1:21	0.150	5 min/Wet
7/19/2008	3:00	0.150	Random
7/20/2008	1:05	27.000	Final

FINAL MOISTURE

Weight of wet sample & tare	Weight of dry sample & tare	Tare	% Moisture

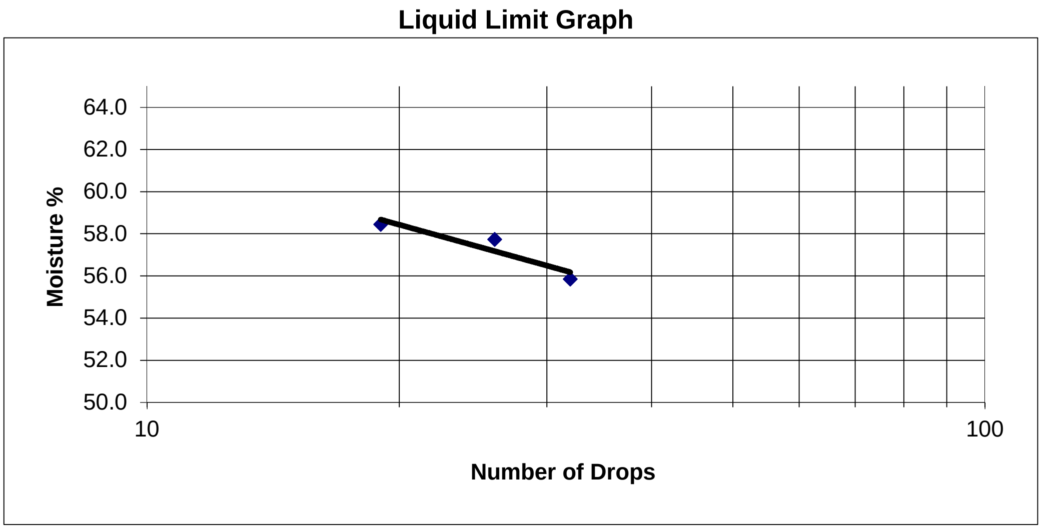
EXPANSION INDEX = 27
(@50% SATURATION)

Plate EI-2

ATTERBERG LIMITS DATA

Field Classification		Job No.	1280-CR
Sample Number		Client	Sunjoint Development
Sample Type	Bulk	Project	Walnut
Location	B-1 @ 0 - 5		
Tested by:	DI		

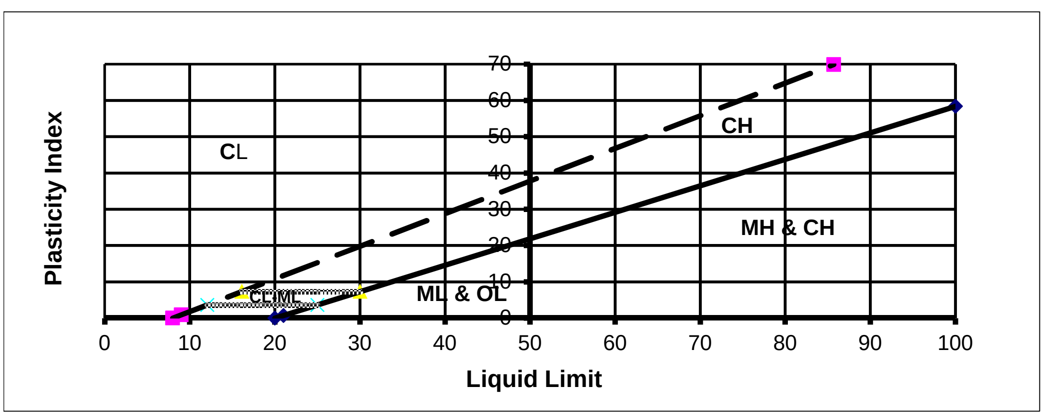
	Plastic Limit			Liquid Limit		
Number of Blows				32	26	19
Determination	1	2	3	4	5	6
Dish						
Wt. of Dish + Wet Soil	13.60	13.54		20.44	20.29	20.25
Wt. of Dish + Dry Soil	12.34	12.31		15.28	15.10	15.03
Wt. of Moisture	1.26	1.23		5.16	5.19	5.22
Wt. of Dish	6.04	6.06		6.04	6.11	6.10
Wt. of Dry Soil	6.30	6.25		9.24	8.99	8.93
Moisture Content %	20.0	19.7		55.8	57.7	58.5



Liquid Limit
57

Plastic Limit
20

Plasticity Index
37

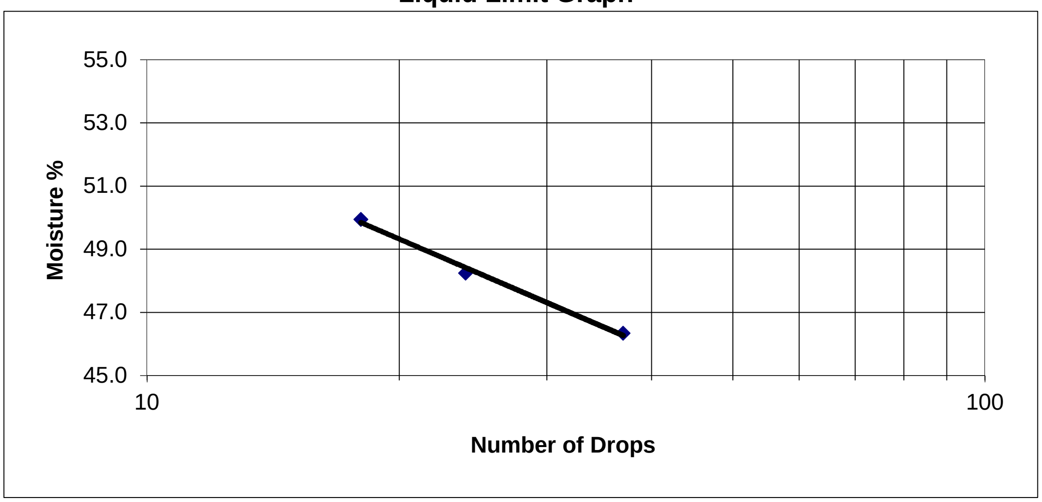


ATTERBERG LIMITS DATA

Field Classification		Job No.	1280-CR
Sample Number		Client	Sunjoint Development
Sample Type	Bulk	Project	Walnut
Location	B-3 @ 0 - 5		
Tested by:	DI		

	Plastic Limit			Liquid Limit		
Number of Blows				37	24	18
Determination	1	2	3	4	5	6
Dish						
Wt. of Dish + Wet Soil	13.56	13.55		20.32	20.43	20.39
Wt. of Dish + Dry Soil	12.32	12.30		15.83	15.76	15.63
Wt. of Moisture	1.24	1.25		4.49	4.67	4.76
Wt. of Dish	6.05	6.10		6.14	6.08	6.10
Wt. of Dry Soil	6.27	6.20		9.69	9.68	9.53
Moisture Content %	19.8	20.2		46.3	48.2	49.9

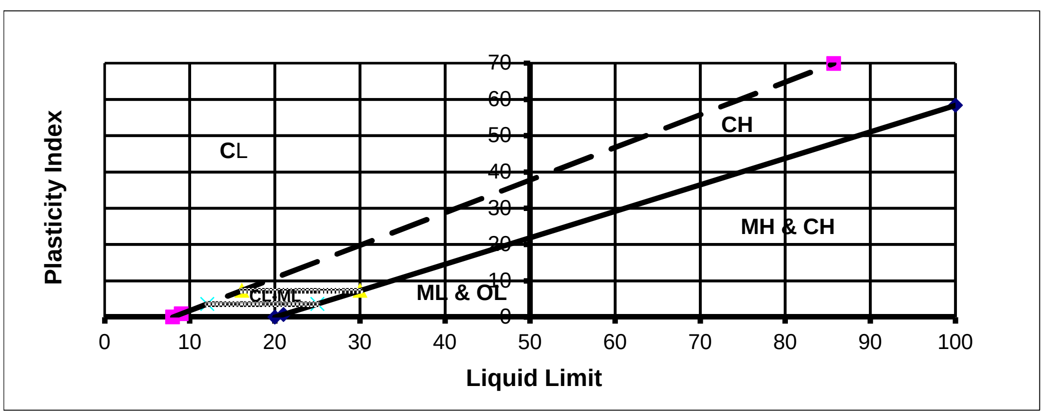
Liquid Limit Graph



Liquid Limit
48

Plastic Limit
20

Plasticity Index
28



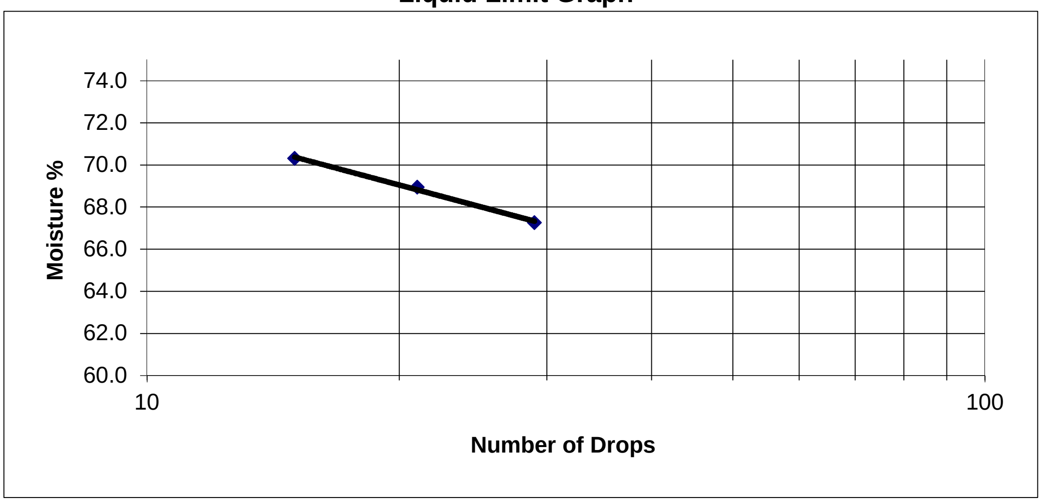
GEOTEK

ATTERBERG LIMITS DATA

Field Classification		Job No.	1280-CR
Sample Number		Client	Sunjoint Development
Sample Type	Bulk	Project	Walnut
Location	B-4 @ 0 - 5		
Tested by:	DI		

	Plastic Limit			Liquid Limit		
Number of Blows				29	21	15
Determination	1	2	3	4	5	6
Dish						
Wt. of Dish + Wet Soil	13.51	13.47		20.03	20.14	20.11
Wt. of Dish + Dry Soil	11.80	11.79		14.42	14.39	14.33
Wt. of Moisture	1.71	1.68		5.61	5.75	5.78
Wt. of Dish	6.09	6.12		6.08	6.05	6.11
Wt. of Dry Soil	5.71	5.67		8.34	8.34	8.22
Moisture Content %	29.9	29.6		67.3	68.9	70.3

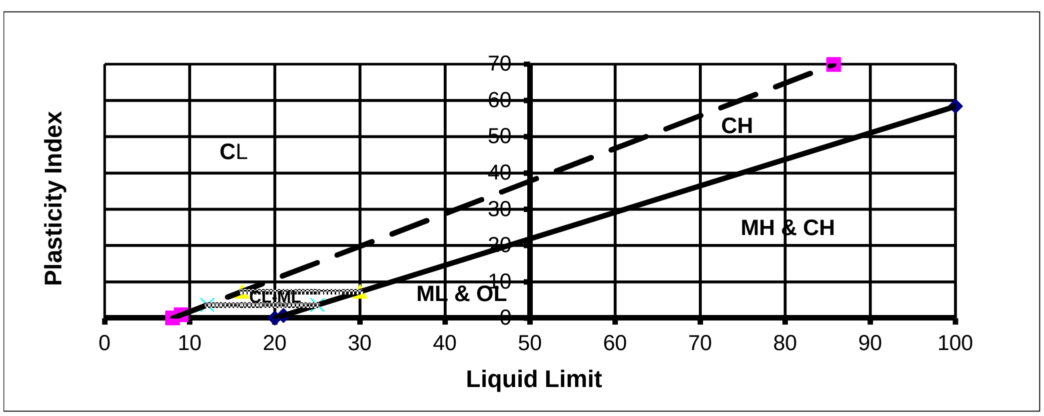
Liquid Limit Graph

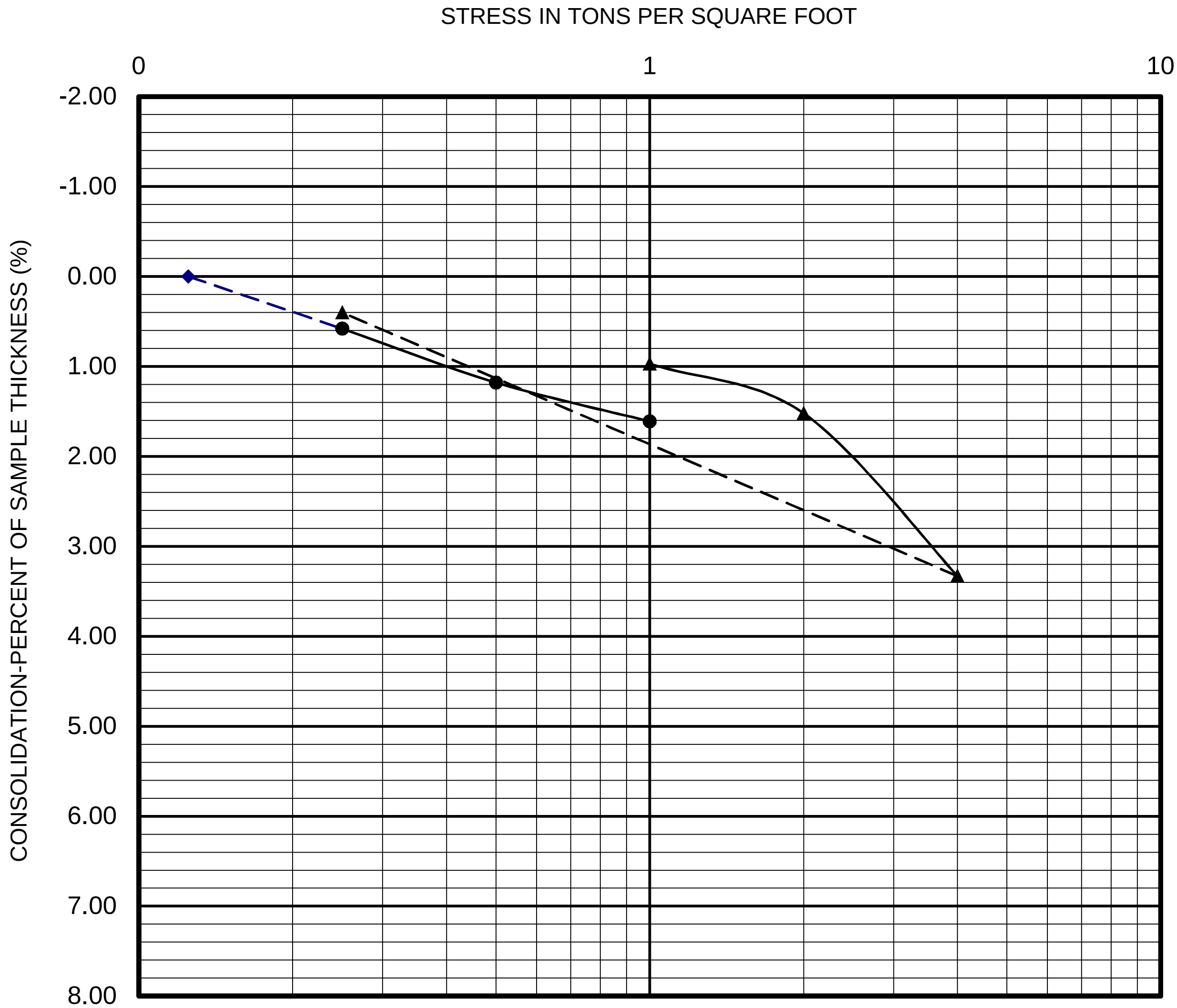


Liquid Limit
68

Plastic Limit
30

Plasticity Index
38





Seating Cycle
Loading Prior to Inundation
Loading After Inundation
Rebound Cycle

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2435

GEOTEK

CONSOLIDATION REPORT

Sample: B-4 @ 12.5'

East Valley Blvd. Property
City of Walnut, California

Plate C-1

CHECKED BY: GF	Lab: DI
PROJECT NO.: 1280-CR	Date: 03/15

Cal Land Engineering, Inc.
dba Quartech Consultants
Geotechnical, Environmental, and Civil Engineering

GeoTek, Inc.
710 East Parkridge Avenue, Suite 105
Corona, California 92879

Client: Sunjoint Development
W.O.: 1280-CR3
Project: Walnut

Date: March 26, 2015
QCI Project No.: 15-167-003p
Summarized by: KA

Corrosivity Test Results

Sample ID	Sample Depth (Feet)	pH CT-532 (643)	Chloride CT-422 (ppm)	Sulfate CT-417 (% By Weight)	Resistivity CT-532 (643) (ohm-cm)
B-3	0-5’	6.82	185	0.0010	1000
B-4’	0-5’	N/A	N/A	0.0015	N/A

Cal Land Engineering, Inc.
dba Quartech Consultants
Geotechnical, Environmental & Civil Engineering

July 14, 2008

Geo Tek Inc.
4130 Flatrock, Suite 140
Riverside, California 92505

Attn: Mr. Edward Lamont

RE: LABORATORY TEST RESULTS/REPORT
Client: Lee
W.O. 0468-CR3
Project: Walnut
QCI Job No.: 08-167-028

Gentlemen:

We have completed the testing program conducted on samples from the above project. The tests were performed in accordance with testing procedures as follows:

TEST	METHOD
Corrosion Potential	CT- 417, CT- 422, CT-532 (643)

Enclosed is Summary of Laboratory Test Results.

We appreciate the opportunity to provide testing services to Geo Tek, Inc. Should you have any questions, please call the undersigned.

Sincerely yours,
Quartech Consultants (QCI)

Jack C. Lee, PE, GE
President

Enclosure

Cal Land Engineering, Inc.
dba Quartech Consultants
Geotechnical, Environmental, and Civil Engineering

For: GeoTek, Inc.
W.O.: 0468-CR3
Client: Lee
Project: Walnut

QCI Project No.:08-167-028
Date: July 14, 2008
Summarized by: ABK

Sample ID #	Sample Depth (Feet)	pH CT-532 (643)	Chloride CT-422 (ppm)	Sulfate CT-417 (% By Weight)	Resistivity CT-532 (643) (ohm-cm)
T-1	0-3	6.95	67	0.0075	850
T-9	0-3	7.45	54	0.0085	890

APPENDIX C

GENERAL GRADING GUIDELINES

GEOTEK

GENERAL GRADING GUIDELINES

Guidelines presented herein are intended to address general construction procedures for earthwork construction. Specific situations and conditions often arise which cannot reasonably be discussed in general guidelines, when anticipated these are discussed in the text of the report. Often unanticipated conditions are encountered which may necessitate modification or changes to these guidelines. It is our hope that these will assist the contractor to more efficiently complete the project by providing a reasonable understanding of the procedures that would be expected during earthwork and the testing and observation used to evaluate those procedures.

General

Grading should be performed to at least the minimum requirements of governing agencies, Chapters 18 and 33 of the Uniform Building Code, CBC (2013) and the guidelines presented below.

Preconstruction Meeting

A preconstruction meeting should be held prior to site earthwork. Any questions the contractor has regarding our recommendations, general site conditions, apparent discrepancies between reported and actual conditions and/or differences in procedures the contractor intends to use should be brought up at that meeting. The contractor (including the main onsite representative) should review our report and these guidelines in advance of the meeting. Any comments the contractor may have regarding these guidelines should be brought up at that meeting.

Grading Observation and Testing

1. Observation of the fill placement should be provided by our representative during grading. Verbal communication during the course of each day will be used to inform the contractor of test results. The contractor should receive a copy of the "Daily Field Report" indicating results of field density tests that day. If our representative does not provide the contractor with these reports, our office should be notified.
2. Testing and observation procedures are, by their nature, specific to the work or area observed and location of the tests taken, variability may occur in other locations. The contractor is responsible for the uniformity of the grading operations; our observations and test results are intended to evaluate the contractor's overall level of efforts during grading. The contractor's personnel are the only individuals participating in all aspect of site work. Compaction testing and observation should not be considered as relieving the contractor's responsibility to properly compact the fill.
3. Cleanouts, processed ground to receive fill, key excavations, and subdrains should be observed by our representative prior to placing any fill. It will be the contractor's responsibility to notify our representative or office when such areas are ready for observation.
4. Density tests may be made on the surface material to receive fill, as considered warranted by this firm.

5. In general, density tests would be made at maximum intervals of two feet of fill height or every 1,000 cubic yards of fill placed. Criteria will vary depending on soil conditions and size of the fill. More frequent testing may be performed. In any case, an adequate number of field density tests should be made to evaluate the required compaction and moisture content is generally being obtained.
6. Laboratory testing to support field test procedures will be performed, as considered warranted, based on conditions encountered (e.g. change of material sources, types, etc.) Every effort will be made to process samples in the laboratory as quickly as possible and in progress construction projects are our first priority. However, laboratory workloads may cause in delays and some soils may require a **minimum of 48 to 72 hours to complete test procedures**. Whenever possible, our representative(s) should be informed in advance of operational changes that might result in different source areas for materials.
7. Procedures for testing of fill slopes are as follows:
   a) Density tests should be taken periodically during grading on the flat surface of the fill, three to five feet horizontally from the face of the slope.
   b) If a method other than over building and cutting back to the compacted core is to be employed, slope compaction testing during construction should include testing the outer six inches to three feet in the slope face to determine if the required compaction is being achieved.
8. Finish grade testing of slopes and pad surfaces should be performed after construction is complete.

Site Clearing

1. All vegetation, and other deleterious materials, should be removed from the site. If material is not immediately removed from the site it should be stockpiled in a designated area(s) well outside of all current work areas and delineated with flagging or other means. Site clearing should be performed in advance of any grading in a specific area.
2. Efforts should be made by the contractor to remove all organic or other deleterious material from the fill, as even the most diligent efforts may result in the incorporation of some materials. This is especially important when grading is occurring near the natural grade. All equipment operators should be aware of these efforts. Laborers may be required as root pickers.
3. Nonorganic debris or concrete may be placed in deeper fill areas provided the procedures used are observed and found acceptable by our representative. Typical procedures are similar to those indicated on Plate G-4.

Treatment of Existing Ground

1. Following site clearing, all surficial deposits of alluvium and colluvium as well as weathered or creep effected bedrock, should be removed (see Plates G-1, G-2 and G-3) unless otherwise specifically indicated in the text of this report.

2. In some cases, removal may be recommended to a specified depth (e.g. flat sites where partial alluvial removals may be sufficient). The contractor should not exceed these depths unless directed otherwise by our representative.
3. Groundwater existing in alluvial areas may make excavation difficult. Deeper removals than indicated in the text of the report may be necessary due to saturation during winter months.
4. Subsequent to removals, the natural ground should be processed to a depth of six inches, moistened to near optimum moisture conditions and compacted to fill standards.
5. Exploratory back hoe or dozer trenches still remaining after site removal should be excavated and filled with compacted fill if they can be located.

Subdrainage

1. Subdrainage systems should be provided in canyon bottoms prior to placing fill, and behind buttress and stabilization fills and in other areas indicated in the report. Subdrains should conform to schematic diagrams G-1 and G-5, and be acceptable to our representative.
2. For canyon subdrains, runs less than 500 feet may use six-inch pipe. Typically, runs in excess of 500 feet should have the lower end as eight-inch minimum.
3. Filter material should be clean, 1/2 to 1-inch gravel wrapped in a suitable filter fabric. Class 2 permeable filter material per California Department of Transportation Standards tested by this office to verify its suitability, may be used without filter fabric. A sample of the material should be provided to the Soils Engineer by the contractor at least two working days before it is delivered to the site. The filter should be clean with a wide range of sizes.
4. Approximate delineation of anticipated subdrain locations may be offered at 40-scale plan review stage. During grading, this office would evaluate the necessity of placing additional drains.
5. All subdrainage systems should be observed by our representative during construction and prior to covering with compacted fill.
6. Subdrains should outlet into storm drains where possible. Outlets should be located and protected. The need for backflow preventers should be assessed during construction.
7. Consideration should be given to having subdrains located by the project surveyors.

Fill Placement

1. Unless otherwise indicated, all site soil and bedrock may be reused for compacted fill; however, some special processing or handling may be required (see text of report).
2. Material used in the compacting process should be evenly spread, moisture conditioned, processed, and compacted in thin lifts six (6) to eight (8) inches in compacted thickness to obtain a uniformly dense layer. The fill should be placed and compacted on a nearly horizontal plane, unless otherwise found acceptable by our representative.
3. If the moisture content or relative density varies from that recommended by this firm, the contractor should rework the fill until it is in accordance with the following:

a) Moisture content of the fill should be at or above optimum moisture. Moisture should be evenly distributed without wet and dry pockets. Pre-watering of cut or removal areas should be considered in addition to watering during fill placement, particularly in clay or dry surficial soils. The ability of the contractor to obtain the proper moisture content will control production rates.

b) Each six-inch layer should be compacted to at least 90 percent of the maximum dry density in compliance with the testing method specified by the controlling governmental agency. In most cases, the testing method is ASTM Test Designation D 1557.

4. Rock fragments less than eight inches in diameter may be utilized in the fill, provided:
   a) They are not placed in concentrated pockets;
   b) There is a sufficient percentage of fine-grained material to surround the rocks;
   c) The distribution of the rocks is observed by, and acceptable to, our representative.
5. Rocks exceeding eight (8) inches in diameter should be taken off site, broken into smaller fragments, or placed in accordance with recommendations of this firm in areas designated suitable for rock disposal (see Plate G-4). On projects where significant large quantities of oversized materials are anticipated, alternate guidelines for placement may be included. If significant oversize materials are encountered during construction, these guidelines should be requested.
6. In clay soil, dry or large chunks or blocks are common. If in excess of eight (8) inches minimum dimension, then they are considered as oversized. Sheepsfoot compactors or other suitable methods should be used to break up blocks. When dry, they should be moisture conditioned to provide a uniform condition with the surrounding fill.

Slope Construction

1. The contractor should obtain a minimum relative compaction of 90 percent out to the finished slope face of fill slopes. This may be achieved by either overbuilding the slope and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment.
2. Slopes trimmed to the compacted core should be overbuilt by at least three (3) feet with compaction efforts out to the edge of the false slope. Failure to properly compact the outer edge results in trimming not exposing the compacted core and additional compaction after trimming may be necessary.
3. If fill slopes are built "at grade" using direct compaction methods, then the slope construction should be performed so that a constant gradient is maintained throughout construction. Soil should not be "spilled" over the slope face nor should slopes be "pushed out" to obtain grades. Compaction equipment should compact each lift along the immediate top of slope. Slopes should be back rolled or otherwise compacted at approximately every 4 feet vertically as the slope is built.
4. Corners and bends in slopes should have special attention during construction as these are the most difficult areas to obtain proper compaction.

5. Cut slopes should be cut to the finished surface. Excessive undercutting and smoothing of the face with fill may necessitate stabilization.

Keyways, Buttress and Stabilization Fills

Keyways are needed to provide support for fill slope and various corrective procedures.

1. Side-hill fills should have an equipment-width key at their toe excavated through all surficial soil and into competent material and tilted back into the hill (Plates G-2, G-3). As the fill is elevated, it should be benched through surficial soil and slopewash, and into competent bedrock or other material deemed suitable by our representatives (See Plates G-1, G-2, and G-3).
2. Fill over cut slopes should be constructed in the following manner:
   a) All surficial soils and weathered rock materials should be removed at the cut-fill interface.
   b) A key at least one and one-half (1.5) equipment width wide (or as needed for compaction), and tipped at least one (1) foot into slope, should be excavated into competent materials and observed by our representative.
   c) The cut portion of the slope should be excavated prior to fill placement to evaluate if stabilization is necessary. The contractor should be responsible for any additional earthwork created by placing fill prior to cut excavation. (see Plate G-3 for schematic details.)
3. Daylight cut lots above descending natural slopes may require removal and replacement of the outer portion of the lot. A schematic diagram for this condition is presented on Plate G-2.
4. A basal key is needed for fill slopes extending over natural slopes. A schematic diagram for this condition is presented on Plate G-2.
5. All fill slopes should be provided with a key unless within the body of a larger overall fill mass. Please refer to Plate G-3 for specific guidelines.

Anticipated buttress and stabilization fills are discussed in the text of the report. The need to stabilize other proposed cut slopes will be evaluated during construction. Plate G-5 shows a schematic of buttress construction.

1. All backcuts should be excavated at gradients of 1:1 or flatter. The backcut configuration should be determined based on the design, exposed conditions, and need to maintain a minimum fill width and provide working room for the equipment.
2. On longer slopes, backcuts and keyways should be excavated in maximum 250 feet long segments. The specific configurations will be determined during construction.
3. All keys should be a minimum of two (2) feet deep at the toe and slope toward the heel at least one foot or two (2%) percent, whichever is greater.
4. Subdrains are to be placed for all stabilization slopes exceeding 10 feet in height. Lower slopes are subject to review. Drains may be required. Guidelines for subdrains are presented on Plate G-5.

5. Benching of backcuts during fill placement is required.

Lot Capping

1. When practical, the upper three (3) feet of material placed below finish grade should be comprised of the least expansive material available. Preferably, highly and very highly expansive materials should not be used. We will attempt to offer advice based on visual evaluations of the materials during grading, but it must be realized that laboratory testing is needed to evaluate the expansive potential of soil. Minimally, this testing takes two (2) to four (4) days to complete.
2. Transition lots (cut and fill) both per plan and those created by remedial grading (e.g. lots above stabilization fills, along daylight lines, above natural slopes, etc.) should be capped with a minimum three foot thick compacted fill blanket.
3. Cut pads should be observed by our representative(s) to evaluate the need for overexcavation and replacement with fill. This may be necessary to reduce water infiltration into highly fractured bedrock or other permeable zones, and/or due to differing expansive potential of materials beneath a structure. The overexcavation should be at least three feet. Deeper overexcavation may be recommended in some cases.

ROCK PLACEMENT AND ROCK FILL GUIDELINES

It is anticipated that large quantities of oversize material would be generated during grading. It's likely that such materials may require special handling for burial. Although alternatives may be developed in the field, the following methods of rock disposal are recommended on a preliminary basis.

Limited Larger Rock

When materials encountered are principally soil with limited quantities of larger rock fragments or boulders, placement in windrows is recommended. The following procedures should be applied:

1. Oversize rock (greater than 8 inches) should be placed in windrows.
    a) Windrows are rows of single file rocks placed to avoid nesting or clusters of rock.
    b) Each adjacent rock should be approximately the same size (within ~one foot in diameter).
    c) The maximum rock size allowed in windrows is four feet
2. A minimum vertical distance of three feet between lifts should be maintained. Also, the windrows should be offset from lift to lift. Rock windrows should not be closer than 15 feet to the face of fill slopes and sufficient space must be maintained for proper slope construction (see Plate G-4).
3. Rocks greater than eight inches in diameter should not be placed within seven feet of the finished subgrade for a roadway or pads and should be held below the depth of the lowest utility. This will allow easier trenching for utility lines.

4. Rocks greater than four feet in diameter should be broken down, if possible, or they may be placed in a dozer trench. Each trench should be excavated into the compacted fill a minimum of one foot deeper than the largest diameter of rock.
   a) The rock should be placed in the trench and granular fill materials (SE>30) should be flooded into the trench to fill voids around the rock.
   b) The over size rock trenches should be no closer together than 15 feet from any slope face.
   c) Trenches at higher elevation should be staggered and there should be a minimum of four feet of compacted fill between the top of the one trench and the bottom of the next higher trench.
   d) It would be necessary to verify 90 percent relative compaction in these pits. A 24 to 72 hour delay to allow for water dissipation should be anticipated prior to additional fill placement.

Structural Rock Fills

If the materials generated for placement in structural fills contains a significant percentage of material more than six (6) inches in one dimension, then placement using conventional soil fill methods with isolated windrows would not be feasible. In such cases the following could be considered:

1. Mixes of large rock or boulders may be placed as rock fill. They should be below the depth of all utilities both on pads and in roadways and below any proposed swimming pools or other excavations. If these fills are placed within seven (7) feet of finished grade, they may affect foundation design.
2. Rock fills are required to be placed in horizontal layers that should **not exceed two feet in thickness, or the maximum rock size present, which ever is less**. All rocks exceeding two feet should be broken down to a smaller size, windrowed (see above), or disposed of in non-structural fill areas. Localized larger rock up to 3 feet in largest dimension may be placed in rock fill as follows:
   a) individual rocks are placed in a given lift so as to be roughly 50% exposed above the typical surface of the fill ,
   b) loaded rock trucks or alternate compactors are worked around the rock on all sides to the satisfaction of the soil engineer,
   c) the portion of the rock above grade is covered with a second lift.
3. Material placed in each lift should be well graded. No unfilled spaces (voids) should be permitted in the rock fill.

Compaction Procedures

Compaction of rock fills is largely procedural. The following procedures have been found to generally produce satisfactory compaction.

1. Provisions for routing of construction traffic over the fill should be implemented.

a) Placement should be by rock trucks crossing the lift being placed and dumping at its edge.
b) The trucks should be routed so that each pass across the fill is via a different path and that all areas are uniformly traversed.
c) The dumped piles should be knocked down and spread by a large dozer (D-8 or larger suggested). (Water should be applied before and during spreading.)

2. Rock fill should be generously watered (sluiced)
   a) Water should be applied by water trucks to the:
      i) dump piles,
      ii) front face of the lift being placed and,
      iii) surface of the fill prior to compaction.
   b) No material should be placed without adequate water.
   c) The number of water trucks and water supply should be sufficient to provide constant water.
   d) Rock fill placement should be suspended when water trucks are unavailable:
      i) for more than 5 minutes straight, or,
      ii) for more than 10 minutes/hour.

3. In addition to the truck pattern and at the discretion of the soil engineer, large, rubber tired compactors may be required.
   a) The need for this equipment will depend largely on the ability of the operators to provide complete and uniform coverage by wheel rolling with the trucks.
   b) Other large compactors will also be considered by the soil engineer provided that required compaction is achieved.

4. Placement and compaction of the rock fill is largely procedural. Observation by trenching should be made to check:
   a) the general segregation of rock size,
   b) for any unfilled spaces between the large blocks, and
   c) the matrix compaction and moisture content.

5. Test fills may be required to evaluate relative compaction of finer grained zones or as deemed appropriate by the soil engineer.
   a) A lift should be constructed by the methods proposed, as proposed

6. Frequency of the test trenching is to be at the discretion of the soil engineer. Control areas may be used to evaluate the contractor's procedures.

7. A minimum horizontal distance of 15 feet should be maintained from the face of the rock fill and any finish slope face. At least the outer 15 feet should be built of conventional fill materials.

Piping Potential and Filter Blankets

Where conventional fill is placed over rock fill, the potential for piping (migration) of the fine grained material from the conventional fill into rock fills will need to be addressed.

The potential for particle migration is related to the grain size comparisons of the materials present and in contact with each other. Provided that 15 percent of the finer soil is larger than the effective pore size of the coarse soil, then particle migration is substantially mitigated. This can be accomplished with a well-graded matrix material for the rock fill and a zone of fill similar to the matrix above it. The specific gradation of the fill materials placed during grading must be known to evaluate the need for any type of filter that may be necessary to cap the rock fills. This, unfortunately, can only be accurately determined during construction.

In the event that poorly graded matrix is used in the rock fills, properly graded filter blankets 2 to 3 feet thick separating rock fills and conventional fill may be needed. As an alternative, use of two layers of filter fabric (Mirafi 700 x or equivalent) could be employed on top of the rock fill. In order to mitigate excess puncturing, the surface of the rock fill should be well broken down and smoothed prior to placing the filter fabric. The first layer of the fabric may then be placed and covered with relatively permeable fill material (with respect to overlying material) 1 to 2 feet thick. The relative permeable material should be compacted to fill standards. The second layer of fabric should be placed and conventional fill placement continued.

Subdrainage

Rock fill areas should be tied to a subdrainage system. If conventional fill is placed that separates the rock from the main canyon subdrain, then a secondary system should be installed. A system consisting of an adequately graded base (3 to 4 percent to the lower side) with a collector system and outlets may suffice.

Additionally, at approximately every 25 foot vertical interval, a collector system with outlets should be placed at the interface of the rock fill and the conventional fill blanketing a fill slope

Monitoring

Depending upon the depth of the rock fill and other factors, monitoring for settlement of the fill areas may be needed following completion of grading. Typically, if rock fill depths exceed 40 feet, monitoring would be recommend prior to construction of any settlement sensitive improvements. Delays of 3 to 6 months or longer can be expected prior to the start of construction.

UTILITY TRENCH CONSTRUCTION AND BACKFILL

Utility trench excavation and backfill is the contractor's responsibility. The geotechnical consultant typically provides periodic observation and testing of these operations. While efforts are made to make sufficient observations and tests to verify that the contractors' methods and procedures are adequate to achieve proper compaction, it is typically impractical to observe all backfill procedures. As such, it is critical that the contractor use consistent backfill procedures.

Compaction methods vary for trench compaction and experience indicates many methods can be successful. However, procedures that "worked" on previous projects may or may not prove effective on a given site. The contractor(s) should outline the procedures proposed, so that we may discuss them **prior** to construction. We will offer comments based on our knowledge of site conditions and experience.

1. Utility trench backfill in slopes, structural areas, in streets and beneath flat work or hardscape should be brought to at least optimum moisture and compacted to at least 90 percent of the laboratory standard. Soil should be moisture conditioned prior to placing in the trench.
2. Flooding and jetting are not typically recommended or acceptable for native soils. Flooding or jetting may be used with select sand having a Sand Equivalent (SE) of 30 or higher. This is typically limited to the following uses:
   a) shallow (12 + inches) under slab interior trenches and,
   b) as bedding in pipe zone.

   The water should be allowed to dissipate prior to pouring slabs or completing trench compaction.
3. Care should be taken not to place soils at high moisture content within the upper three feet of the trench backfill in street areas, as overly wet soils may impact subgrade preparation. Moisture may be reduced to 2% below optimum moisture in areas to be paved within the upper three feet below sub grade.
4. Sand backfill should not be allowed in exterior trenches adjacent to and within an area extending below a 1:1 projection from the outside bottom edge of a footing, unless it is similar to the surrounding soil.
5. Trench compaction testing is generally at the discretion of the geotechnical consultant. Testing frequency will be based on trench depth and the contractor's procedures. A probing rod would be used to assess the consistency of compaction between tested areas and untested areas. If zones are found that are considered less compact than other areas, this would be brought to the contractor's attention.

JOB SAFETY

General

Personnel safety is a primary concern on all job sites. The following summaries are safety considerations for use by all our employees on multi-employer construction sites. On ground personnel are at highest risk of injury and possible fatality on grading construction projects. The company recognizes that construction activities will vary on each site and that job site safety is the contractor's responsibility. However, it is, imperative that all personnel be safety conscious to avoid accidents and potential injury.

In an effort to minimize risks associated with geotechnical testing and observation, the following precautions are to be implemented for the safety of our field personnel on grading and construction projects.

1. Safety Meetings: Our field personnel are directed to attend the contractor's regularly scheduled safety meetings.
2. Safety Vests: Safety vests are provided for and are to be worn by our personnel while on the job site.
3. Safety Flags: Safety flags are provided to our field technicians; one is to be affixed to the vehicle when on site, the other is to be placed atop the spoil pile on all test pits.

In the event that the contractor's representative observes any of our personnel not following the above, we request that it be brought to the attention of our office.

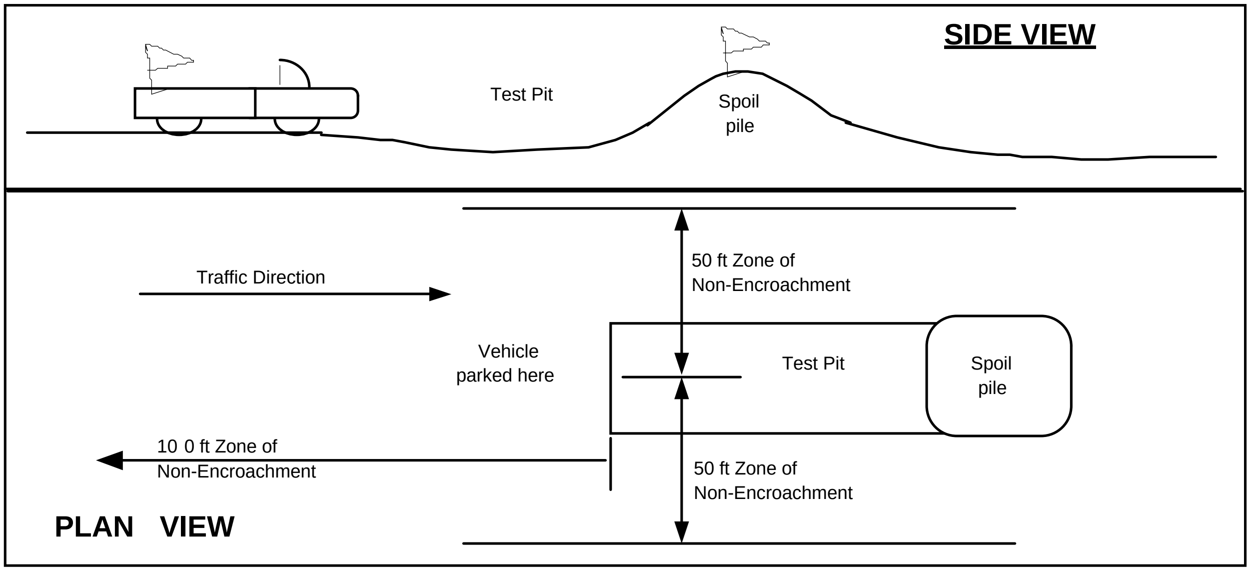
Test Pits Location, Orientation and Clearance

The technician is responsible for selecting test pit locations. The primary concern is the technician's safety. However, it is necessary to take sufficient tests at various locations to obtain a representative sampling of the fill. As such, efforts will be made to coordinate locations with the grading contractors authorized representatives (e.g. dump man, operator, supervisor, grade checker, etc.), and to select locations following or behind the established traffic pattern, preferably outside of current traffic. The contractors authorized representative should direct excavation of the pit and safety during the test period. Again, safety is the paramount concern.

Test pits should be excavated so that the spoil pile is placed away from oncoming traffic. The technician's vehicle is to be placed next to the test pit, opposite the spoil pile. This necessitates that the fill be maintained in a drivable condition. Alternatively, the contractor may opt to park a piece of equipment in front of test pits, particularly in small fill areas or those with limited access.

A zone of non-encroachment should be established for all test pits (see diagram below). No grading equipment should enter this zone during the test procedure. The zone should extend outward to the sides approximately 50 feet from the center of the test pit and 100 feet in the direction of traffic flow. This zone is established both for safety and to avoid excessive ground vibration, which typically decreases test results.

TEST PIT SAFETY PLAN



Slope Tests

When taking slope tests, the technician should park their vehicle directly above or below the test location on the slope. The contractor's representative should effectively keep all equipment at a safe operation distance (e.g. 50 feet) away from the slope during testing.

The technician is directed to withdraw from the active portion of the fill as soon as possible following testing. The technician's vehicle should be parked at the perimeter of the fill in a highly visible location.

Trench Safety

It is the contractor's responsibility to provide safe access into trenches where compaction testing is needed. Trenches for all utilities should be excavated in accordance with CAL-OSHA and any other applicable safety standards. Safe conditions will be required to enable compaction testing of the trench backfill.

All utility trench excavations in excess of 5 feet deep, which a person enters, are to be shored or laid back. Trench access should be provided in accordance with OSHA standards. Our personnel are directed not to enter any trench by being lowered or "riding down" on the equipment.

Our personnel are directed not to enter any excavation which;

1. is 5 feet or deeper unless shored or laid back,
2. exit points or ladders are not provided,
3. displays any evidence of instability, has any loose rock or other debris which could fall into the trench, or
4. displays any other evidence of any unsafe conditions regardless of depth.

If the contractor fails to provide safe access to trenches for compaction testing, our company policy requires that the soil technician withdraws and notifies their supervisor. The contractor's representative will then be contacted in an effort to affect a solution. All backfill not tested due to safety concerns or other reasons is subject to reprocessing and/or removal.

Procedures

In the event that the technician's safety is jeopardized or compromised as a result of the contractor's failure to comply with any of the above, the technician is directed to inform both the developer's and contractor's representatives. If the condition is not rectified, the technician is required, by company policy, to immediately withdraw and notify their supervisor. The contractor's representative will then be contacted in an effort to affect a solution. No further testing will be performed until the situation is rectified. Any fill placed in the interim can be considered unacceptable and subject to reprocessing, recompaction or removal.

In the event that the soil technician does not comply with the above or other established safety guidelines, we request that the contractor bring this to technician's attention and notify our project manager or office. Effective communication and coordination between the contractors' representative and the field technician(s) is strongly encouraged in order to implement the above safety program and safety in general.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures particularly the zone of non-encroachment.

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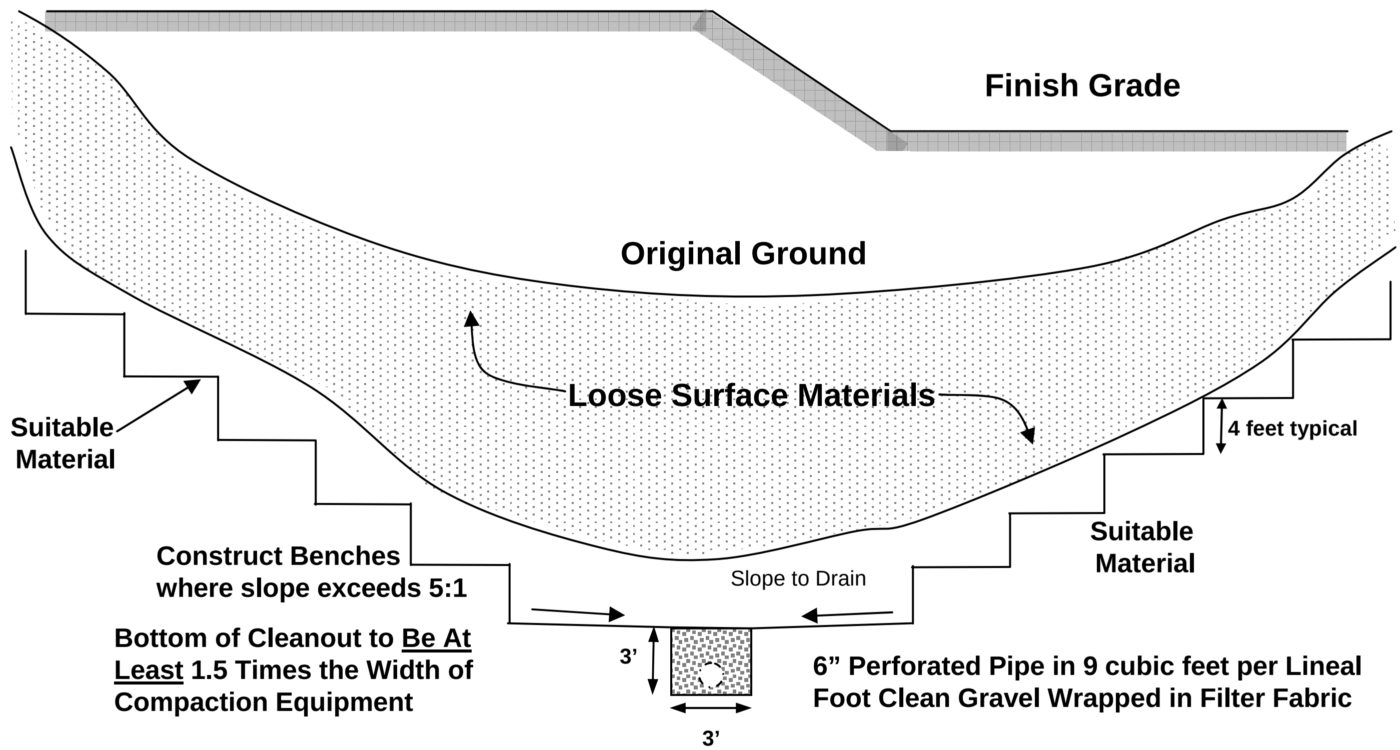
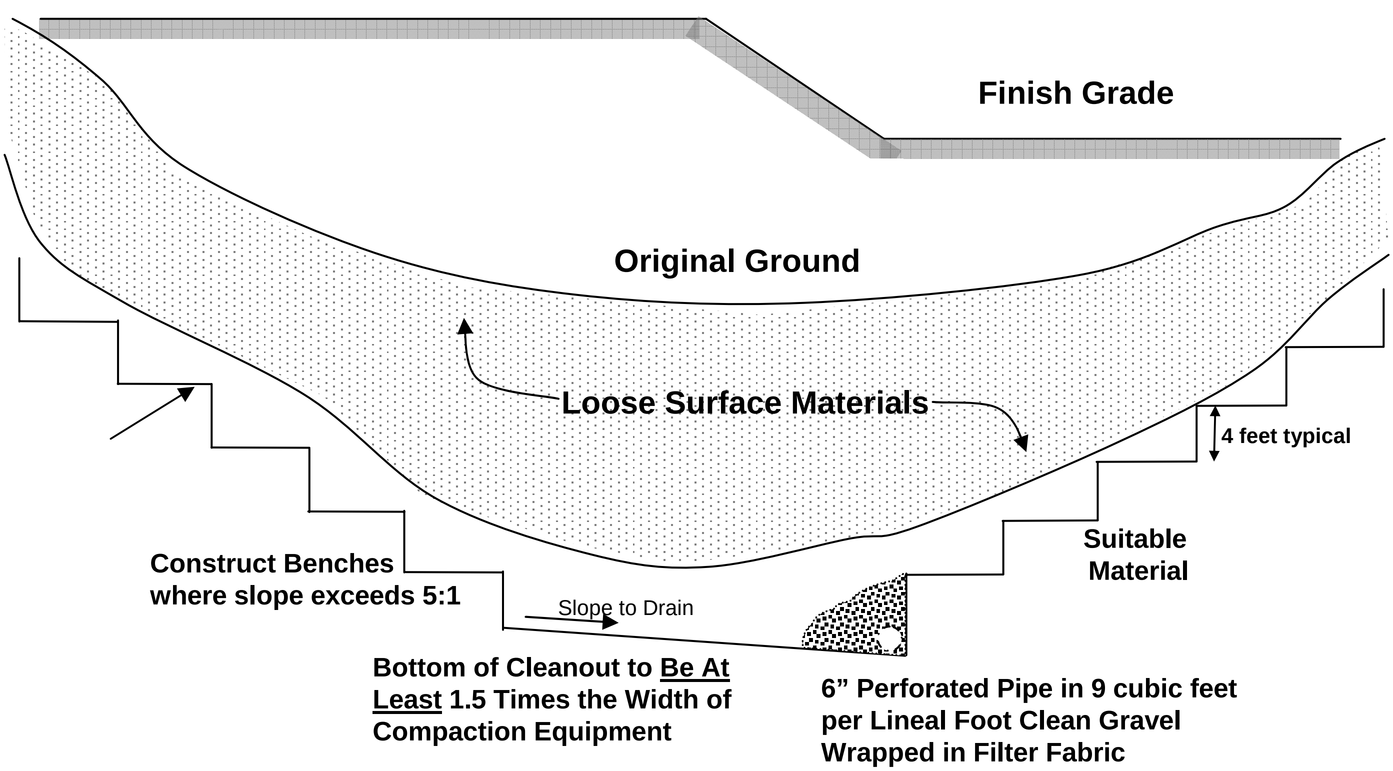
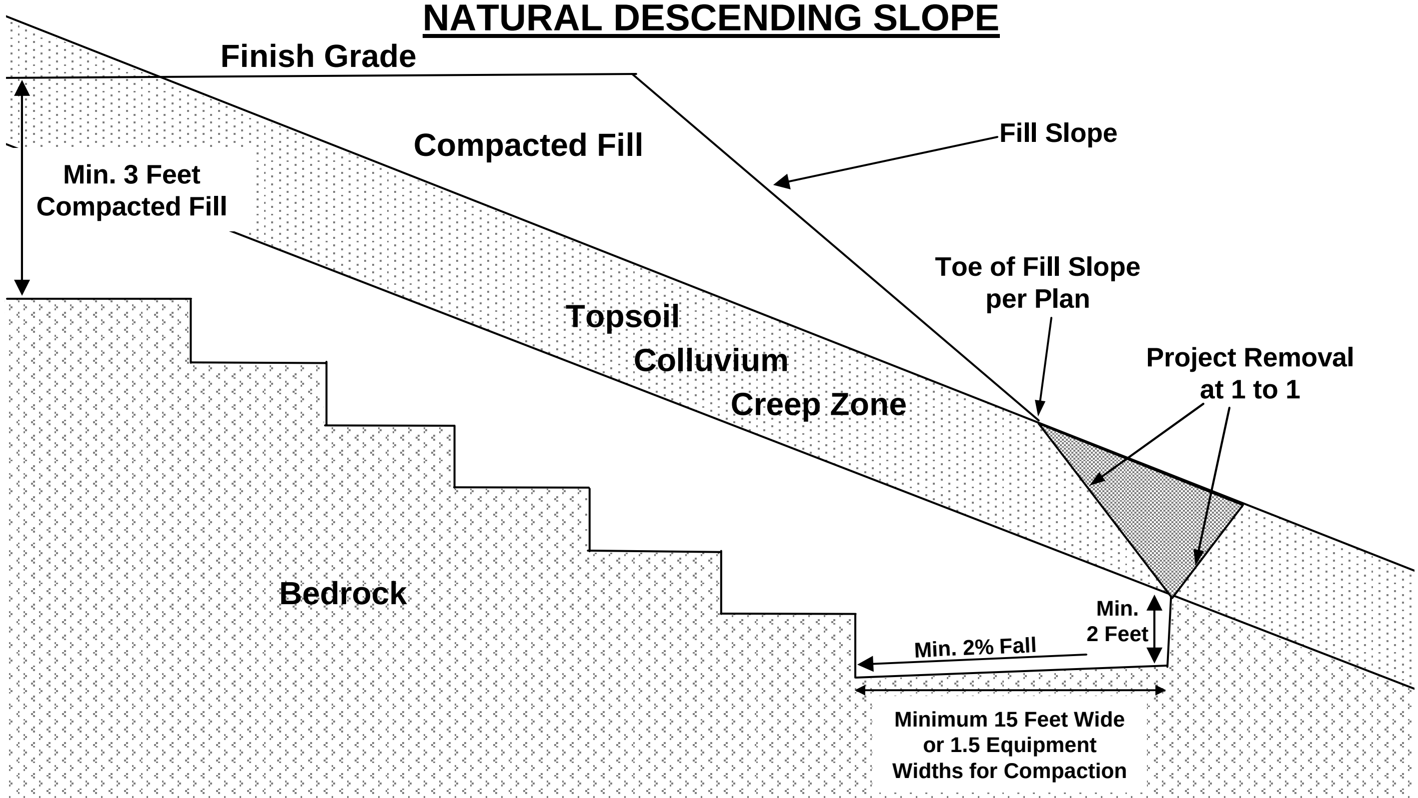
ALTERNATES



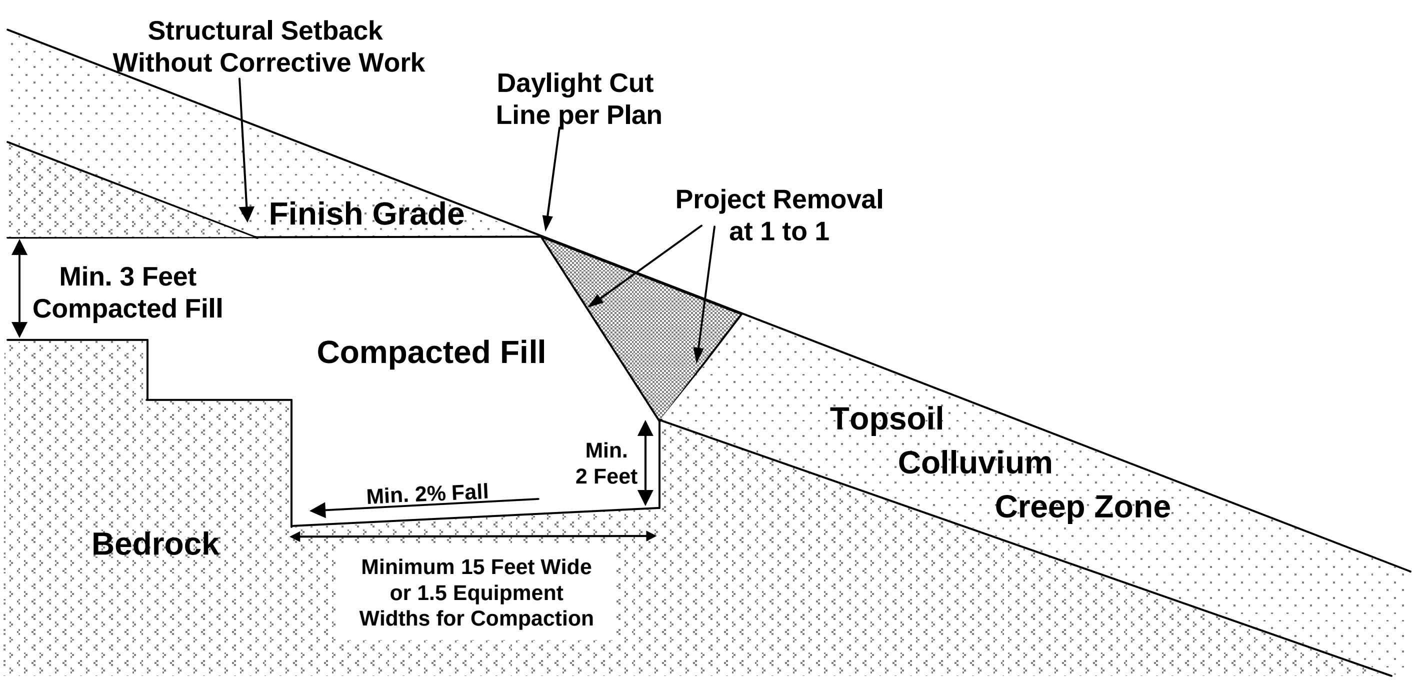


GEOTEK	710 E. Parkridge Ave, Suite 105 Corona, CA 92879	TYPICAL CANYON CLEANOUT	STANDARD GRADING GUIDELINES PLATE G-1

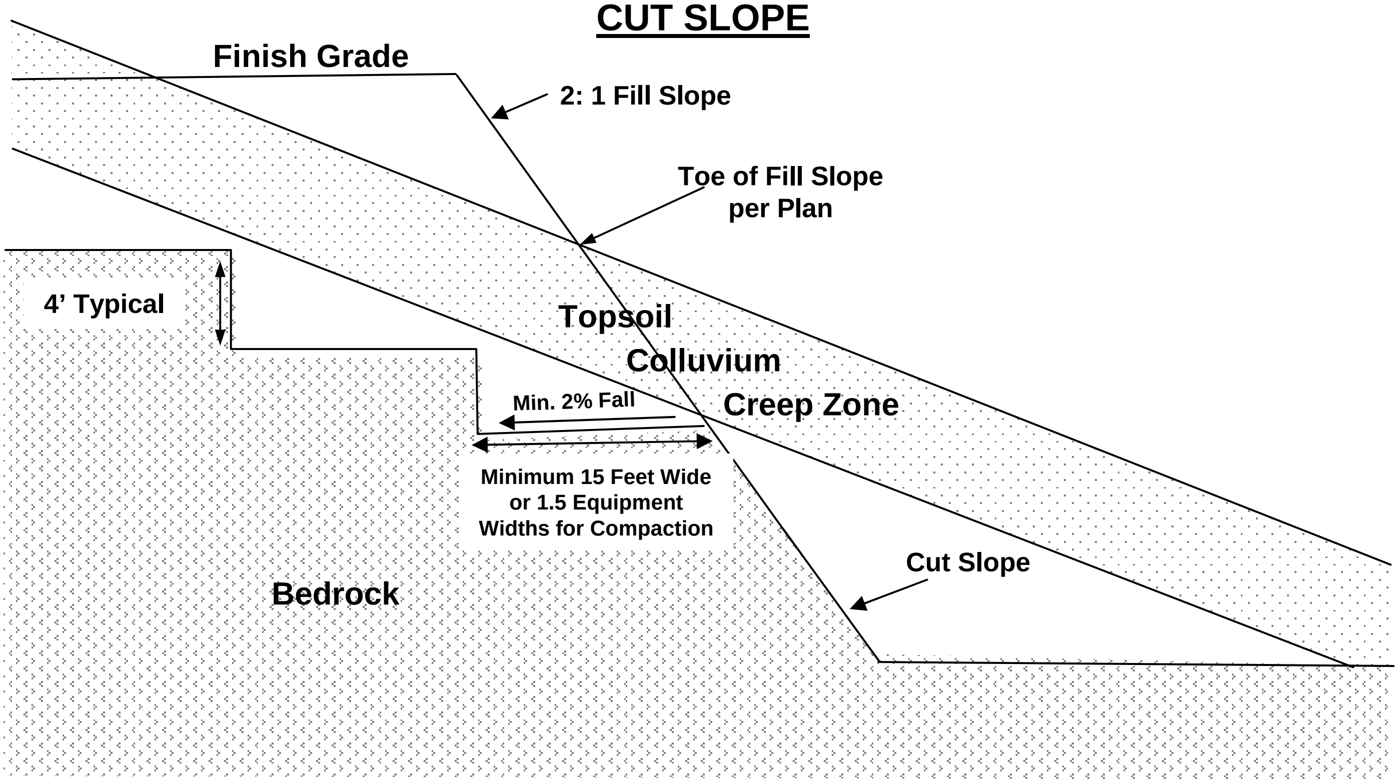
TYPICAL FILL SLOPE OVER NATURAL DESCENDING SLOPE



DAYLIGHT CUT AREA OVER NATURAL DESCENDING SLOPE



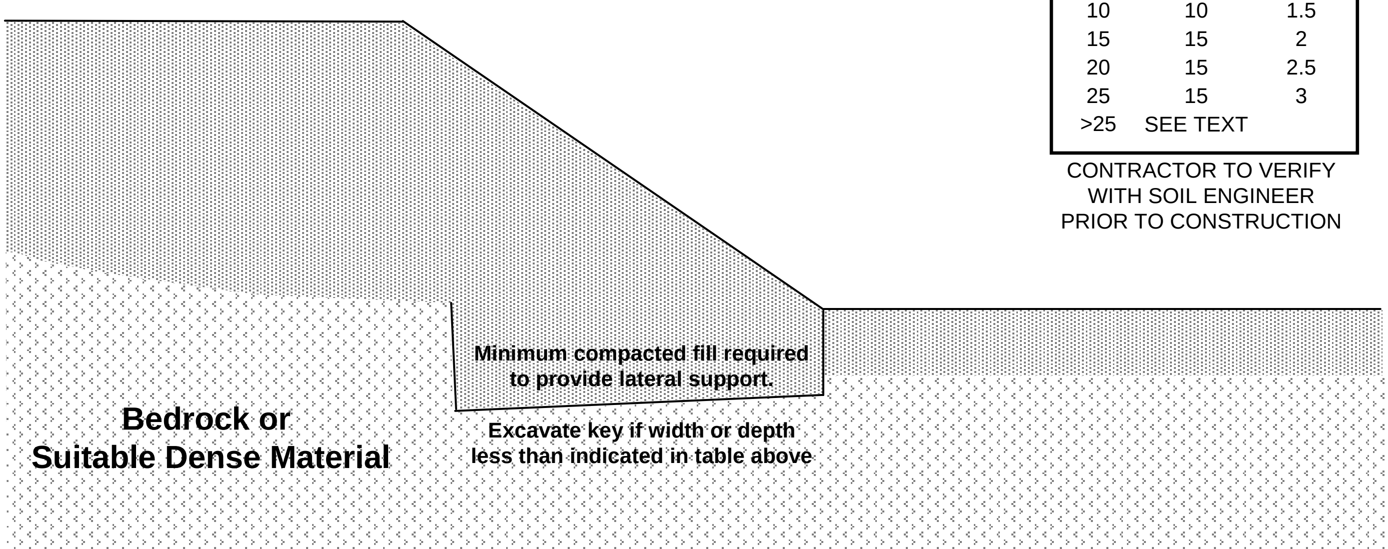
TYPICAL FILL SLOPE OVER CUT SLOPE



TYPICAL FILL SLOPE

SLOPE HEIGHT	MIN. KEY WIDTH	MIN. KEY DEPTH
5	7	1
10	10	1.5
15	15	2
20	15	2.5
25	15	3
>25	SEE TEXT	

CONTRACTOR TO VERIFY
WITH SOIL ENGINEER
PRIOR TO CONSTRUCTION



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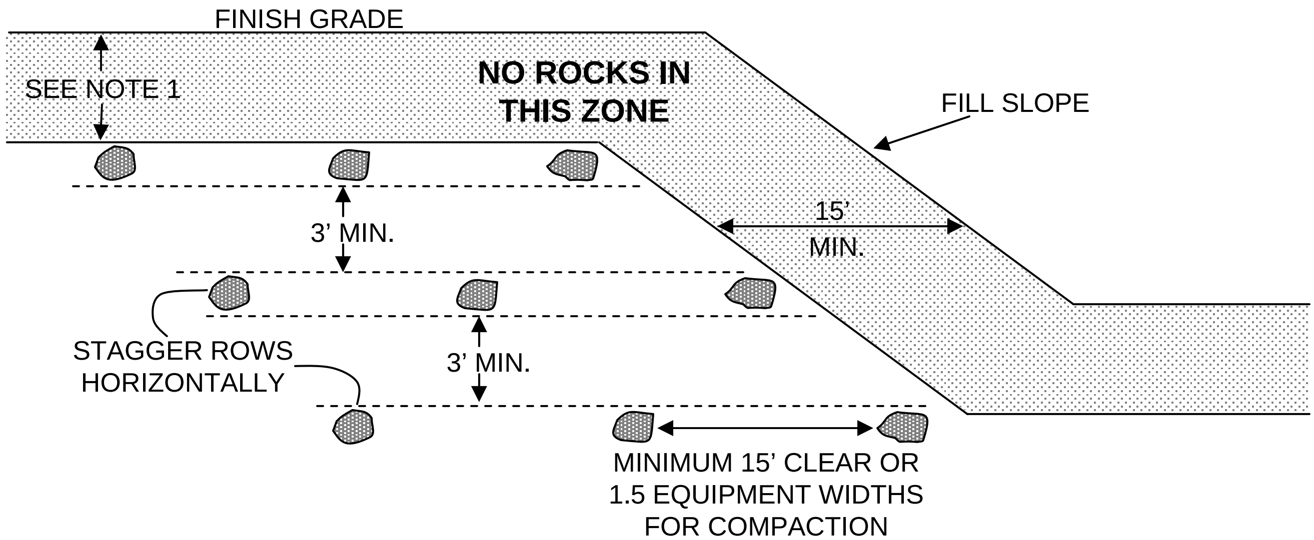
COMMON FILL
SLOPE KEYS

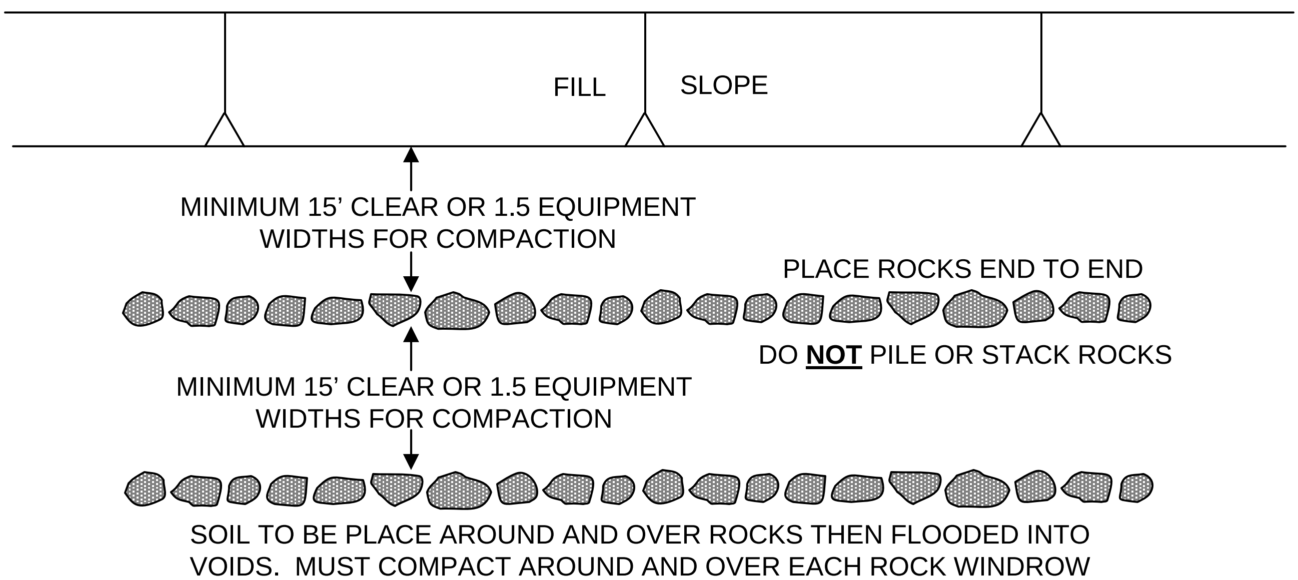
STANDARD GRADING
GUIDELINES

PLATE G-3

CROSS SECTIONAL VIEW



PLAN VIEW



NOTES:

1) SOIL FILL OVER WINDROW SHOULE BE 7 FEET OR PER JURISDUICTIONAL STANDARDS AND SUFFICIENT FOR FUTURE EXCAVATIONS TO AVOID ROCKS
2) MAXIMUM ROCK SIZE IN WINDROWS IS 4 FEET MINIMUM DIAMETER
3) SOIL AROUND WINDROWS TO BE SANDY MATERIAL SUBJECT TO SOIL ENGINEER ACCEPTANCE
4) SPACING AND CLEARANCES MUST BE SUFFICIENT TO ALLOW FOR PROPER COMPACTION
5) INDIVDUAL LARGE ROCKS MAY BE BURIED IN PITS.

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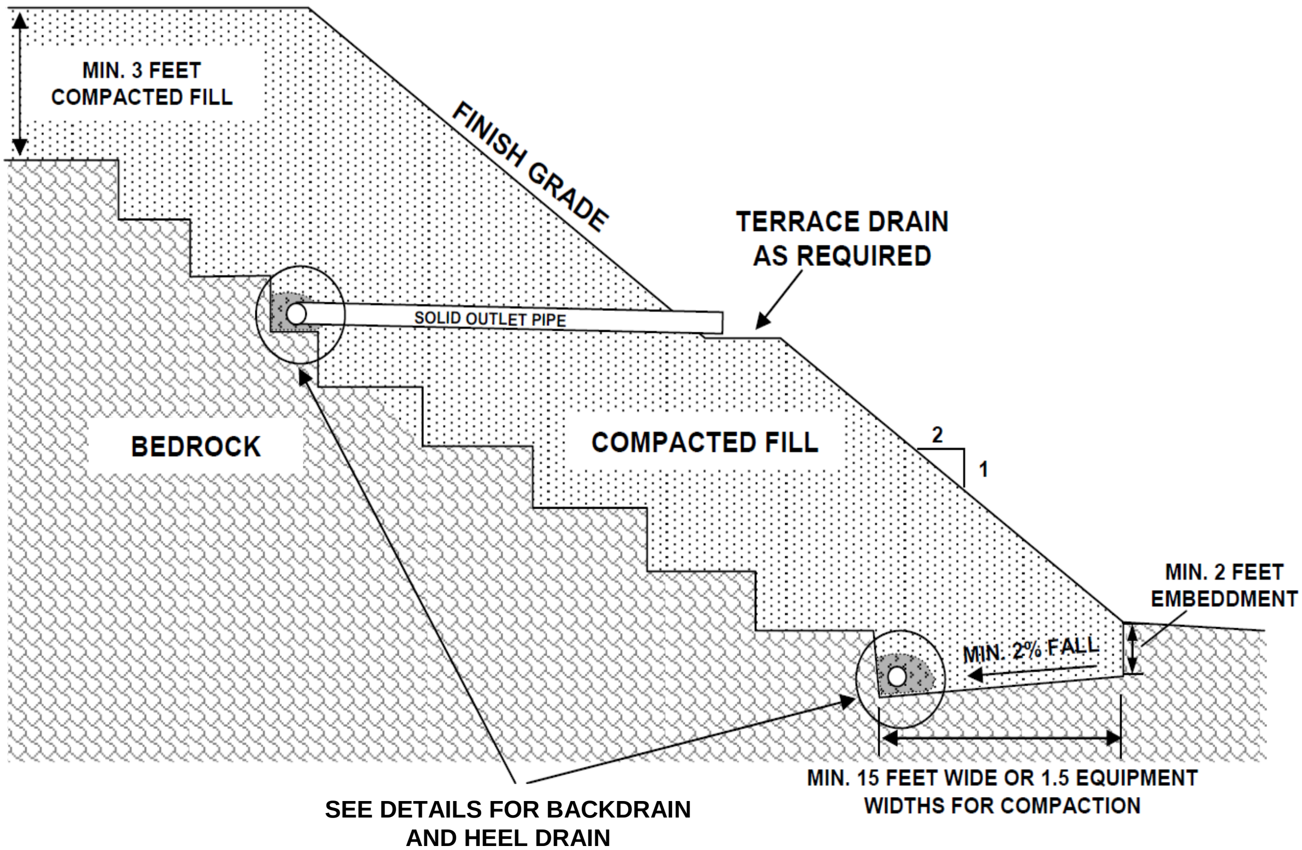

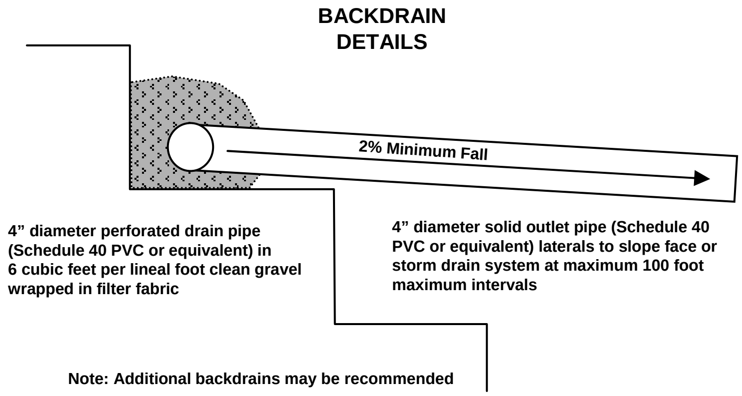

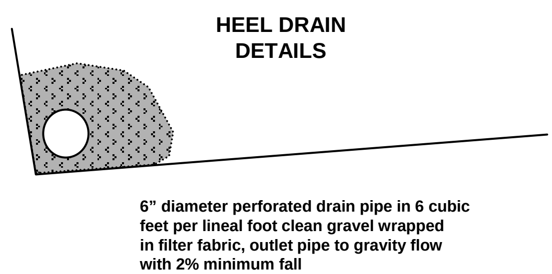

GEOTEK	710 E. Parkridge Ave, Suite 105 Corona, CA 92879	TYPICAL BUTTRESS AND STABILIZATION FILL	STANDARD GRADING GUIDELINES PLATE G-5