C. W. La Monte Company Inc.

Soil and Foundation Engineers

REPORT OF LIMITED GEOTECHNICAL INVESTIGATION

Alpine 21
Proposed 20-Lot Subdivision
Country Meadows Road
Alpine, California
San Diego County Tract No. 5431
Assessor's Parcel Number 403-160-15

JOB NO. 16 6706

August 19, 2016

Prepared for:
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TO: William Goodman and Dennis Carson
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SUBJECT: Report of Limited Geotechnical Investigation
Alpine 21, Proposed 20-Lot Subdivision, Country Meadows Road,
Alpine, California, San Diego County Tract No. 5431
Assessor's Parcel Number 403-160-15

Reference: *Preliminary Evaluation Report for Infiltration Lid Improvements, Alpine 21, Proposed 20-Lot Subdivision, Country Meadows Road, Alpine, California, San Diego County Tract No. 5431, Assessor's Parcel Number 403-160-15,* by C.W. La Monte Company, Inc., dated August 19, 2016

In accordance with your request, we have performed a geotechnical investigation for the proposed residential development. We are presenting herein our findings and recommendations. In general, we found the property suitable for the proposed project provided that the recommendations contained herein are adhered to. The site is underlain with competent decomposed granitic bedrock with associated surficial slope wash. Loose alluvial soils underlie the drainage course areas crossing the site. These loose surface soils will require removal and/or recompaction during future grading operations, if not removed by site grading. Bedrock conditions will likely be encountered, which require special processing.

If you should have any questions after reviewing this report, please do not hesitate to contact our office. This opportunity to be of professional service is sincerely appreciated.

Respectfully submitted,
C.W. La Monte Company Inc.

Jerry Redolfi

Jerry Redolfi, Project Geologist

Clifford W. La Monte

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PROJECT DESCRIPTION

The following report presents the results of a limited geotechnical investigation performed for the proposed residential subdivision project. The project site is an approximate 81 acre parcel of undeveloped land located north of Interstate 8 between Victoria Circle and E. Victoria Drive in the Alpine area of the County of San Diego. The property is wilderness, generally, consisting of hilly terrain incised by multiple drainage courses.

It is our understanding the property will be subdivided into 20 single-family residential lots with associated roads and utilities. Approximately half of the land will be dedicated open space. Proposed cuts to construct the building pads will be less than 18 feet in height. Proposed fill slopes will approach 30 feet in maximum height and will be constructed at a maximum inclination of 2:1 (horizontal to vertical). The maximum height of cut slopes to construct the road system will be on the order of 30 feet and will be excavated to a maximum inclination of 1.5:1 (horizontal to vertical).

Retaining walls a maximum of 6 feet in height may be incorporated into the project design. Some walls may retain 1.5:1 and/or 2:1 (horizontal to vertical) sloping backfill. Major drainages along the central and southern portions of the property will be dedicated to open space plus hillside terrain at the northeast corner of the site. Each lot will receive an onsite wastewater treatment system consisting of leach lines. Bioretention ponds will be dispersed through subdivision to collect, retain and infiltrate storm drainage.

To aid in the preparation of this report, we were provided with *Victoria Drive, Preliminary Grading Plan, County of San Diego Tract No. 5431,* by Jones Engineers, Inc., dated February 2016. These plans were used as the basis for the preparation our Plot Plan and Geotechnical Map (attached Figure No. 2A) and Site Plan (Figure No. 2B) plus the plans were utilized for our field mapping.

This report has been prepared for the exclusive use of the stated client and his or her design consultants for specific application to the project described herein. Should the project be changed in any way, the modified plans should be submitted to C.W. La

Monte Company, Inc. for review to determine their conformance with our recommendations and to determine if any additional subsurface investigation, laboratory testing and/or recommendations are necessary. Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, expressed or implied.

SCOPE OF WORK

The scope of this investigation was limited to: surface reconnaissance, research of readily available geotechnical literature pertinent to the site; subsurface exploration, laboratory testing, engineering and geologic analysis of the field and laboratory data and preparation of this report. More specifically, the intent of this investigation was to:

- Review available geotechnical reports and maps pertinent to the subject site.

- Identify the subsurface conditions of the site to the depths influenced by the proposed grading and construction.

- Based on laboratory testing, empirical evaluation and our experience with similar sites in the area, identify the engineering properties of the various strata that may influence the proposed construction, including the allowable soil bearing pressures, expansive characteristics and settlement potential.

- Describe the general geology of the site including possible geologic factors that could have an effect on the site development.

- Provide a site soil classification and mapped spectral acceleration parameters.

- Address potential construction difficulties that may be encountered due to soil conditions, groundwater and provide recommendations concerning these problems.

- Develop soil engineering criteria for site grading.

- Recommend an appropriate foundation system for the type of structures anticipated and develop soil engineering design criteria for the recommended foundation designs.

- Present our opinions in this written report, which includes in addition to our findings and recommendations, a site plan showing the location of our subsurface explorations, logs of the test trenches and a summary of our laboratory test results.

We did not evaluate the site for hazardous materials contamination. Further, we did not perform laboratory tests to evaluate the chemical characteristics of the on-site soils in regard to their potentially corrosive impact to on-grade concrete and below grade improvements.

FINDINGS

SITE DESCRIPTION

The project site is an irregular-shaped parcel of land approximately 81 acres in size. The general location of the site is north of Interstate 8 between Victoria Circle and E. Victoria Drive in the Alpine area of the County of San Diego. The main access to the site is via Country Meadows Road, which enters near the northwest quarter of the property. An existing residential parcel at 2683 Country Meadows Road is inset at this location. Existing residential development along Victoria Circle and Homeward Way also bound the west side of the property. The property is bounded on the north with single-family homes located at the south terminations of Coyote Road, Rushing's Trace and Oak Lee Lane. Several homes border the east side of the project. The Interstate 8 easement and the undeveloped easement of Victoria Place are located south of the project.

The property consists of undeveloped wilderness, generally, consisting of hill and ridge terrain incised by multiple drainages. Alpine Creek enters the property near the northeast quarter and exits at the west central edge of the site. Historically, the stream was dammed in an area adjacent to the western edge of the property, which created a sizeable pond. The area is currently dry.

The hilly terrain is generally moderately to steeply sloping, Elevations on the site range from a high of approximately 2325 feet at the top of a knob at the northeast corner of the property to a low of 1948 feet (MSL) in the bottom of Alpine Creek where it exits the property at the west central edge of the site. Vegetation consists of a moderate to heavy growth of native shrubs and dense riparian vegetation along the bisecting stream.

DESCRIPTION OF SUBSURFACE SOIL AND GEOLOGIC CONDITIONS

The subject site is located in the Foothills Physiographic Province of San Diego County, which is underlain at depth with Cretaceous-aged granitic bedrock with associated residual soils. Typical, over burden deposits consist of slope wash, topsoil and colluvium/alluvium. These soil types are described individually below in order of increasing age. Refer the attached Test Excavation Logs, (Figures 3A-3H) and the Test Boring Logs (Figures 4A-4E) for a more detailed description of subsurface conditions. The units are mapped approximately as shown on the Plot Plan and Geotechnical Map, Figure No. 2A. An excerpt from a regional geologic map is attached as Figure No. 6.

Based on laboratory testing, our visual and textural classification plus our past experience with similar soils in the vicinity of the subject site, the materials described above are anticipated to possess a "low" expansion potential as determined by ASTM D4829.

Topsoil / Slope Wash: The site is mantled with a thin veneer of undifferentiated natural ground topsoil and slope wash materials. The slope topsoil generally ranges from about one foot to over 4 feet in thickness. The slope wash typically consist of dark brown, loose, silty sand with occasional rock fragments. The topsoil materials are not suitable to support proposed structure and improvements in their present loose condition and require removal and recompaction in areas to receive grading and improvements.

Young Alluvium (Qya): Young alluvium is confined to the drainage bottoms that cross the site and are generally only a few feet in thickness. Alluvium encountered at the historic pond area was 12 feet in thickness and may be thicker further to the west. The alluvium consists primarily of dark brown, silty sands and light grayish brown, sands.

Older Alluvium (Qoa): Localized deposits of older alluvium were encountered in Test Excavations 1 and 12. The aerial extent is estimated on the attached geotechnical map. These well indurated alluvial materials consist primarily of dark reddish brown, dense to very dense, silty sands.

Granitic Bedrock (Ka): The site is underlain with Cretaceous-aged granitic bedrock. According to the *Geologic Map of the El Cajon 7.5 Quadrangle, San Diego County, California,* (Siang S. Tan, 2002) the bedrock is identified as *"Tonalite of Alpine (Early Cretaceous); Biotite-hornblende tonalite, lesser quartz diorite, and scarce granodioritic tonalite. Medium to coarse grained; moderately to strongly foliated; mafic inclusions. Average color index 30. Unit is heterogeneous in outcrop and handspecimen."*

The granite is generally decomposed to a silty sand and fine to coarse sand material. The granite is grayish brown to light brown in color and dense to very dense in consistency.

GROUND WATER

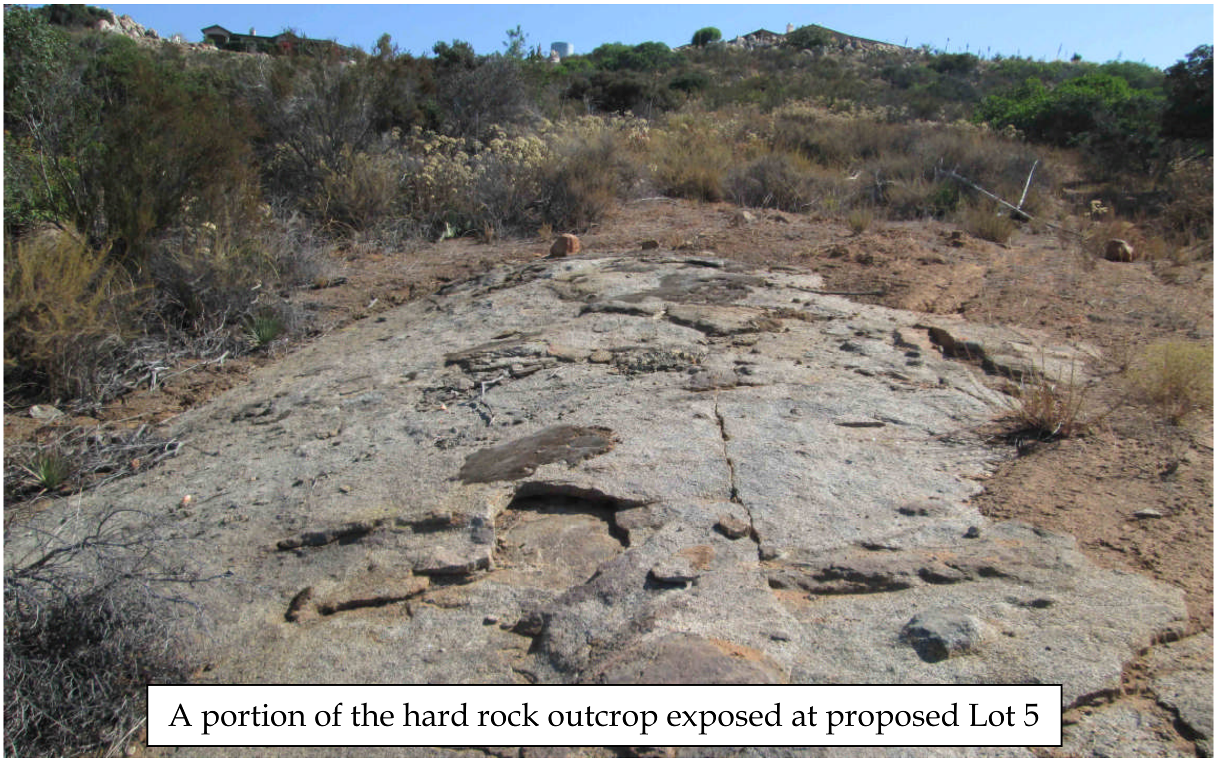
Groundwater was not encountered in areas of the property that will be developed to receive homes. Groundwater was only encountered in the stream bed area of Alpine Creek at the west central edge of the property. The capillary fringe of the groundwater level was encountered at an approximate depth of 11 feet below the existing grade and is perched on bedrock. No groundwater was encountered in any other areas of the project. Also no groundwater was encountering during the course of the referenced percolation testing.

It should also be recognized that minor groundwater seepage problems might occur after development of a site even where none were present before development. These are usually minor phenomena and are often the result of an alteration in drainage patterns and/or an increase in irrigation water. Based on the permeability characteristics of the soil and the anticipated usage and development, it is our opinion that any seepage problems, which may occur, will be minor in extent. It is further our opinion that these problems can be most effectively corrected on an individual basis if and when they occur.

RIPPABILTY OF BEDROCK

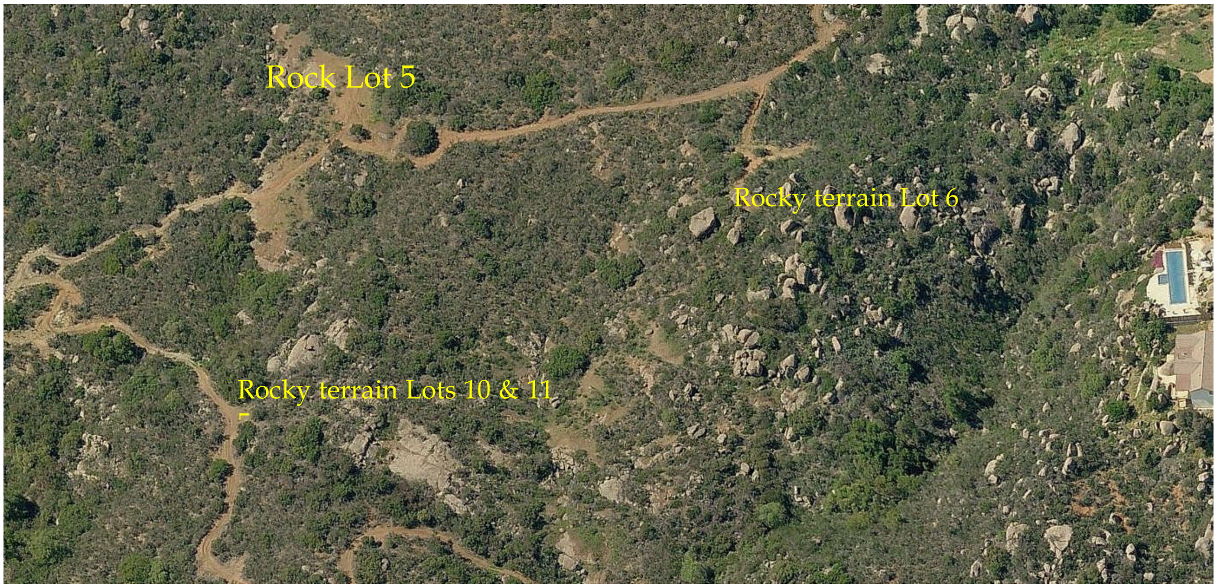
Generally, it appears the decomposed granitic along the southerly ridge will, be rippable to the intended depth of excavation; although some localized “floaters” (isolated surface boulders) and/or hard rock outcrops may be encountered.

Floaters and hard rock outcrops are abundant on the hillside terrain at the northerly portion of the project site and are easily discernible from a visual site reconnaissance. Also the possibility of near surface, buried, hard rock cannot be ruled out. Some blasting and/or breaking can be anticipated when grading the northerly portion of the subdivision as the project as it is currently designed. Also note that a large area “Sheet rock” is exposed at or near the ground surface over much of the area for proposed Lot 5 and will likely require rock processing to develop the lot (See below photograph). It may be desirable to redesign the building pad to conform more to the existing topography rather than trying to construct a conventional level cut and fill building pad.



A portion of the hard rock outcrop exposed at proposed Lot 5

Also abundant clusters of hard rock and floaters are present on Lots 6 through 11 and the high ground area of Lot 3. Other rock clusters are scattered throughout the northerly area. Examples of rock areas are shown on the below photograph.



Practical excavating refusal was reached in many of the test explorations at relatively shallow depths (Practical refusal means the material is still decomposed and rippable, however, the excavation progress with the light equipment is so slow it is not "practical" to continue). However, percolation testing was performed at the project site in 2004 by Gary Maxwell Testing. To aid in analyzing the site rippability conditions we reviewed the Percolation Test data. A series of 4 to 8 percolation test were placed on each of the tested lots (or sub-lot areas). The percolation test groups also included at least one observation boring which were advanced to a maximum depth of 16 feet or to drilling refusal (if less than 16 feet). The findings of the observation borings are summarized in the below table. The borings are also located on the attached Figures 2A and 2B.

TABLE I
Summary of Drilled Depth of Percolation Test Borings

Current Lot Location	Boring Depth
Lot 1	16'+
Lot 6	16'+
Lot 8	16'+
Lot 10 North	13' Refusal
Lot 10 South	16'+
Lot 14 North	14' refusal
Lot 14 South	16'+
Lot 15	13.5' Refusal
Lot 16	12' Refusal
Lot 17	16'+
Lot 19	16'+

Drilling refusal is a better indication of rippability conditions than the excavations placed using light equipment. However, the drills ability to advance through rock depends on many factors (such as size, power and condition of the lead drill bit) and therefore; is not a precise indicator. If more precise information regarding the rippability of bedrock is needed than a specific study should be conducted. One method to determine rippability is by using an air-track drill rig (more commonly used in blasting operations). The drilling rate of the air-track rig has been empirically correlated to rippability by accepted standardized charts. Also non-destructive geophysical methods can provide precise rippability information.

FAULTING AND SEISMICITY

No faults are known to traverse the site, thus it is not considered susceptible to surface rupture as a result of on-site faulting. The probability of soil cracking caused by shaking from close or distant fault sources is also considered to be low. It should be noted that much of Southern California, including the San Diego County area is characterized by a series of Quaternary-age fault zones, which typically consist of several individual, en echelon faults that generally strike in a northerly to north-westerly direction. Some of these fault zones (and the individual faults within the zones) are classified as active while others are classified as only potentially active, according to the criteria of the California Division of Mines and Geology (currently California Geological Survey). Active fault zones are those that have shown conclusive evidence of faulting during the Holocene Epoch (the most recent 11,000 years), while potentially active fault zones have demonstrated movement during the Pleistocene Epoch (11,000 to 2 million years before the present) but no movement during Holocene time. An excerpt from the 2010 Fault Activity Map of California (California Geological Survey) is attached as Figure No. 7 and provides the recency of faulting in the site vicinity.

Current geologic literature indicates that the Elsinore Fault Zone is the nearest known active fault and is located approximately 18 miles northeast of the site. The San Jacinto Fault Zones is parallel to the Elsinore Fault and is located about 40 miles to the northeast. The City of San Diego Seismic Safety Element estimates the maximum probable earthquake for both the San Jacinto and the Elsinore fault zones is between M 6.9 and 7.3, with a repeat interval of approximately 100 years. The maximum credible earthquake for both fault zones is estimated at M 7.6. The Julian segment of the Elsinore Fault Zone is classified as a Type "A" fault with a slip rate of 2.0 (*California Probabilistic Seismic Hazard Maps,* June 2003.

The active Rose Canyon Fault Zone is mapped about 24 miles southwest of the site. According to the 2008 *National Seismic Hazard Maps - Fault Parameters* (USGS website), the Maximum Magnitude earthquake on the Rose Canyon Fault Zone is 6.9 (Ellsworth) or 6.7 (Hanks) with a slip rate of 1.5. The Rose Canyon Fault Zone is currently classified as a Type "B" fault (*California Probabilistic Seismic Hazard Maps,* June 2003.

Other active fault zones in the region that could possibly affect the site include the Coronado Bank and San Clemente Fault Zones to the southwest, and the Earthquake Valley Fault and San Andreas Fault Zones to the northeast. However, a Maximum Magnitude Earthquake on the Elsinore Fault Zones is anticipated to generate ground accelerations on the site, greater than any of the other nearby fault

Other nearby faults, as shown on Figure Number 7, includes several unnamed Pre-Quaternary (mostly inactive) short fault breaks located within 5 mile radius of the site (the closest is less than a mile to the north). Also the La Nacion Fault Zone and other Quaternary faults are located over 20 miles southwest of the property. These faults are considered potentially active, inactive, presumed inactive, or activity unknown, by the City of San Diego Seismic Safety Study [potentially active faults have demonstrated movement during the Pleistocene Epoch (11,000 to 1.6 million years before the present) but no movement during Holocene (recent) times].

According to the *Official Map of Alquist-Priolo Earthquake Fault Zones of California,* by the California Division of Mines and Geology (currently California Geological Survey) (CDMG, 1991) the site **IS NOT** located an Alquist-Priolo Earthquake Fault Zone map.

SEISMIC DESIGN PARAMETERS

We have determined the mapped spectral acceleration values for the site utilizing U.S. Seismic Design Maps, Version 3.1.0 (July 11, 2013) from the USGS website. The seismic design parameters are specific to the site and provide a solution for Section 1613 of the 2012 IBC (which uses USGS hazard data available in 2008).

The analysis included the following input parameters:

Design Code Reference Document: ASCE 7-10 Standard

Site Soil Classification: Site Class c

Risk Category: I or II or III

Site Coordinates: 32.84038°N, 116.75956°W

The values generated by the *Design Map Report* are provided in the following table:

TABLE II

Site Coefficients and Spectral Response Acceleration Parameters

S_s	S_1	F_a	F_v	S_{ms}	S_{m1}	S_{ds}	S_{d1}
0.983	0.363	1.007	1.437	0.990	0.522	0.660	0.348

Application to the criteria in Table I for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if ever seismic shaking occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

GEOLOGIC HAZARDS

General

No geologic hazards of sufficient magnitude to preclude development of the site as we presently contemplate it are known to exist. In our professional opinion and to the best of our knowledge, the site is suitable for the proposed development.

Ground Shaking

A likely geologic hazard to affect the site is ground shaking as a result of movement along one of the major active fault zones mentioned above. Probable ground shaking levels at the site could range from slight to severe, depending on such factors as the magnitude of the seismic event and the distance to the epicenter. It is likely that the site will experience the effects of at least one moderate to large earthquake during the life of the proposed structure. Construction in accordance with the minimum requirements of the California Building Code, the Structural Engineers Association of California lateral force design requirements, and local governing agencies should minimize potential damage due to seismic activity.

Landslide Potential and Slope Stability

A review of the geologic hazards map indicates there are no known deep or suspected ancient landslides located on the site. Due to the sites underlying competent bedrock deep-seated landslide hazards risk is nominal.

Liquefaction

The materials in the areas of the site to be developed are not subject to liquefaction due to such factors as soil density, grain-size distribution, and groundwater conditions.

Flooding

The site is located outside the boundaries of both the 100-year and the 500-year floodplains according to the maps prepared by the Federal Emergency Management Agency.

Tsunamis and Seiches

Tsunamis are great sea waves produced by submarine earthquakes or volcanic eruptions. Based on the project's inland and elevated location, the site is considered to possess a very low risk potential from tsunamis. Seiches are periodic oscillations in large bodies of water such as lakes, harbors, bays or reservoirs. The site is considered to have a very low risk potential for damage caused by seiches.

CONCLUSIONS

In general, we found the subject property suitable for the proposed construction, provided the recommendations provided herein are followed. The most significant findings and geotechnical conditions that will influence site development are summarized below. Detailed recommendations for precede this section of the report.

- The building sites are overlain with surficial slope wash and topsoil overlying dense, decomposed bedrock material and/or competent old alluvium. The encountered topsoil materials range from approximately 0.5 to 4 feet in thickness. The bottom of major drainages are underlain with poorly consolidated alluvium. The alluvial thickness at the "road crossing" is anticipated to be less than 12 feet. These surficial materials are considered unsuitable in their present condition to support structural fill and/or settlement sensitive improvements. As such, all slope wash and alluvial materials not removed by planned site grading will need to be removed from areas to support fills and/or settlement sensitive improvements and, where necessary to achieve planned site grades, be replaced as properly compacted fill.

- Proposed Chelsea Leigh Way will connect the northern and southern portions of the subdivision. The proposed road will likely cross Alpine Creek by placing fills as needed to construct the road bed and storm drainage structures. Depending on seasonal or cyclic conditions, perched groundwater may be encountered in the creek bottom excavation. It may be necessary to divert or dam the water during construction or "bridge" over any such water with a gravel bed. This condition and solution can be bettered evaluated at the time of grading. Grading this area near the end of the dry season would likely produce the most optimal groundwater conditions.

- The site is underlain at relatively shallow depths by Cretaceous-age granitic material. Though variable throughout the site, the granitic material generally consists of highly weathered or decomposed material within the upper portions of the bedrock and becomes denser with depth. Our site investigation indicates that the granitic materials underlying the site are generally rippable to the intended depths of removal. However, it should be noted that areas of hard rock outcrops and floaters were observed throughout the northern portion of the site. Therefore, it is likely hard rock outcrops or floaters will be encountered during grading operations. Typically small to moderately sized floaters can be moved with large excavating equipment. It should be anticipated, however, that the grading operations will likely encounter some non-rippable material and/or partially buried boulders. Large hard rock outcrops that may be encountered would require chemical breaking, demolition equipment and/or blasting to excavate. Hard rock outcrops are particularly abundant in the area of proposed Lot 5. Other notable exposes are shown on the attached geotechnical map (not all rock areas are shown)

- Lot 5, in particular, appears to consist primarily of exposed rock outcrops. It may be desirable to redesign the building pad to conform more to the existing topography rather than trying to construct a conventional level cut and fill building pad.

- Oversize rock material generated by the excavations shall be handled in accordance with the recommendations provided in the "Oversize Rock Disposal" section of this report.

- Based our estimated site grades, we anticipate the proposed building pads will be traversed by a cut/fill transition. In order to mitigate for potential differential settlement of the proposed structure, the cut portion of the lot should be undercut as recommended in the "Transition Conditions" section of this report. Where undercutting the pads is not practical, minor transitions (less than 15 feet) can also be mitigated with the placement of additional reinforcing steel (in lieu of an undercutting operation).

- It is our preliminary opinion; cut slopes excavated into competent bedrock will be stable at an inclination that does not exceed 1.5:1.0 (horizontal to vertical) for a slope height up to 30 feet. All fill slopes shall be constructed at a 2:1 inclination

- If non-rippable bedrock is exposed as finish pad grades; it may be possible to incorporate some of the bedrock into the foundation system by doweling the foundation to rock outcrops in lieu of foundation embedment.

- Generally, the soils underlying the site are considered to possess a low to very low expansive potential as determined by ASTM D4829.

- It is anticipated hillside excavations may encounter occasional large rounded boulders. "Loose" rocks present a potential hazard if dislodged uncontrolled. Dislodged rounded rocks could potentially roll down slope and creating a hazard for improvements or pedestrians located down slope. Therefore, the grading contractor must take special precautions when moving boulders, so none roll uncontrolled down the slope, where downslope improvements can be impacted or for safety reasons.

RECOMMENDATIONS

EARTH WORK AND GRADING

Specification Guidelines

All grading should conform to the guidelines presented in this report, Sections 1804, J107, J108, J109 and J110S of the 2013 California Building Code, the minimum requirements of the County of San Diego, and the Standard Grading and Construction Specifications, Appendix "A", attached hereto, except where specifically superseded in the text of this report. Prior to grading, a representative of C.W. La Monte Company Inc. should be present at the preconstruction meeting to provide additional grading guidelines, if necessary, and to review the earthwork schedule.

Observation and testing by the soil engineer is essential during the grading operations. This allows the soil engineer to confirm the conditions anticipated by our investigation, to allow adjustments in design criteria to reflect the actual field conditions exposed, and to determine that the grading proceeds in general accordance with the recommendations contained herein

Fill Suitability

On-site excavated materials may be used as compacted fill material or backfill. The on-site materials are anticipated to possess a very low- to low-expansion potential. At least two working days notice of a potential import source should be given to the Geotechnical Consultant so that appropriate testing can be accomplished. The type of material considered most desirable for import is a non-detrimentally expansive granular material with some silt or clay binder.

Site Preparation

Site preparation should begin with the removal of all vegetation and other deleterious materials from the portion of lot that will be graded and that will receive improvements. This should include all root balls from the trees and shrubs removed and all significant root material. The resulting materials should be disposed of off-site.

After clearing and grubbing, site preparation should continue with the removal all existing loose topsoil, slope wash and young alluvium from areas that will be graded or that will support settlement-sensitive improvements. As the project is presently planned, topsoil removals are, generally, expected to vary from about 1 to 4 feet (the creek bed crossing may encounter 10 to 15 feet of loose alluvium). Please note the estimated removal depths may be thicker in localized areas. The loose soil shall be removed to expose firm natural ground as determined by our field representative during grading.

In areas to support fill slopes or where the existing grade is at a slope steeper than five units horizontal to one unit vertical (20-percent slope) and the depth of the fill exceeds 5 feet (1524 mm) benching shall be provided in accordance with Figure J107.3 (reproduced below) of the 2010 California Building Code (A copy is attached to the back of Appendix A). A key shall be provided which is at least 10 feet (3048 mm) in width and 2 feet (610 mm) in depth (into competent material). All removal areas should be approved by a representative of our office prior to the placement of fill or improvements.

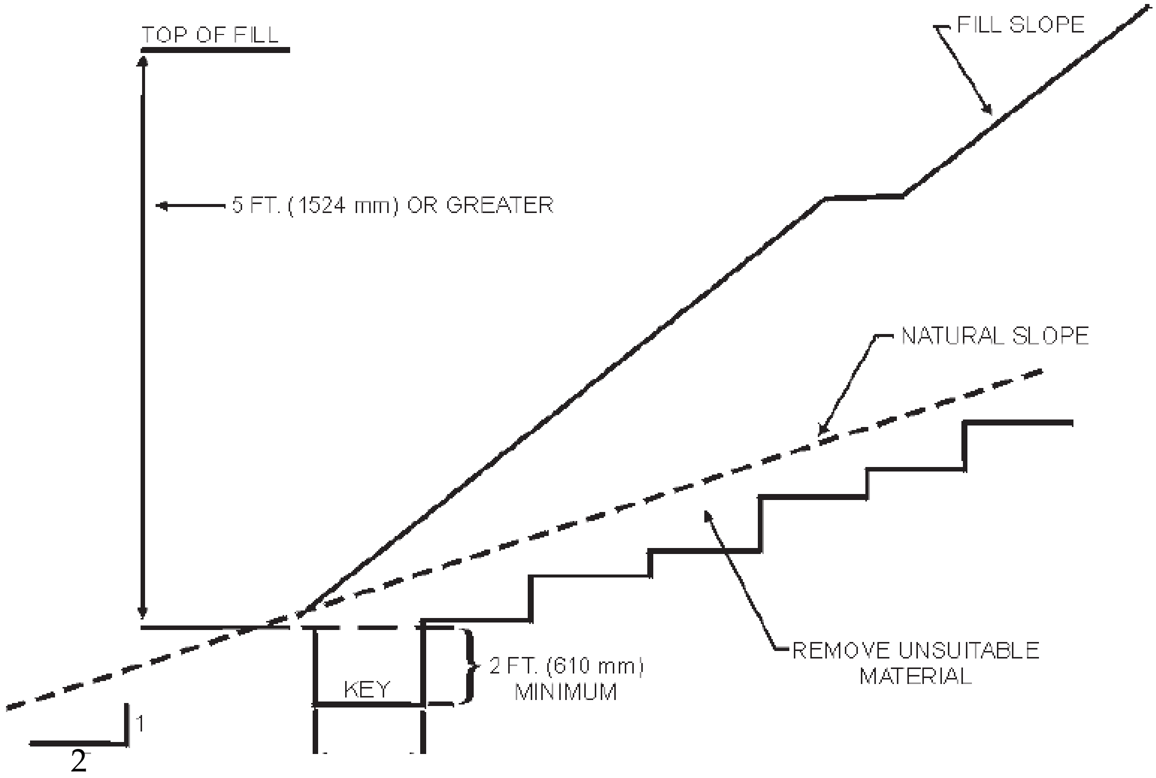


Figure J107.3 from the 2010 California Building Code

Prior to placing any fill soils or constructing any new improvements in areas that have been cleaned out to receive fill, the exposed soils should be scarified to a depth of approximately 6 to 12 inches, be moisture conditioned, and compacted to at least 90 percent relative compaction.

Compaction and Method of Filling

Any structural fill placed at the site should be compacted to a relative compaction of at least 90 percent of its maximum dry density as determined by ASTM Laboratory Test D1557 guidelines. Fills should be placed at or slightly above optimum moisture content, in lifts six to eight inches thick, with each lift compacted by mechanical means. Fills should consist of approved earth material, free of trash or debris, roots, vegetation, or other materials determined to be unsuitable by our soil technicians or project geologist. All material should be free of rocks or lumps of soil in excess of twelve inches in maximum width. However, in the upper two feet of pad grade, no rocks or lumps of soil in excess of six inches should be allowed.

Utility trench backfill within five feet of the proposed structure and beneath all pavements and concrete flatwork should be compacted to a minimum of 90 percent of its maximum dry density. The upper one-foot of pavement subgrade and base material should be compacted to at least 95 percent relative density. All grading and fill placement should be performed in accordance with the local Grading Ordinance, the California Building Code, and the Recommended Grading Specifications and Special Provisions attached hereto as Appendix A.

Excavation Characteristics

The on-site decomposed bedrock material is likely to be excavated with moderate to difficult effort using large excavating equipment. Localized large, hard rock floaters and/or crystalline bedrock could be encountered during excavating operations, which could require demolition, chemical fracturing and/or blasting for removal. We anticipate planned site excavations will generate some oversize rock debris (rock material over 12 inches in width is considered to be oversize).

Disposal of Oversize Rock

The following list provides our recommendations for placement of oversize rock in structural fills. Please note that the following rock disposal recommendations must be approved by the City of San Marcos prior to implementation. Also refer to the attached Figure No. 8.

- No oversize rock should be placed within fifteen (15) feet, measured horizontally, from the face of fill slopes.

- No oversize rock should be placed within five (5) feet of finish pad grade on fill pads. In addition, no rock should be placed within three (3) feet of the bottom of the lowest utilities in street areas.

- Oversize rock up to two feet in average dimension may be placed in uniform lifts across the fill area in an unnested manner. Prior to placing each subsequent lift, sand material with a Sand Equivalent (SE) of at least 25 should be spread over the rock. This material should be flooded into the voids between the rocks and should cover the rock by at least six inches. The top of each lift should be smoothed out with a dozer and be wheel rolled with a loaded scraper or other suitable heavy compaction equipment approved by the geotechnical consultant.

- Rocks two to four feet in average dimension may be placed in windrows. The windrows should be at least 12 feet apart to allow compaction equipment to move between the rows. As the fill is brought up between the windrows, sand material with a SE of at least 25 should be flooded between and around the rocks to fill all voids. There should be at least one foot of cover over the top of windrows before the next windrows are started. The windrows placed above previously placed windrows should be staggered halfway between the lower windrows.

- Rocks larger than two feet in average dimension may also be individually placed. This placement should consist of excavating a trench or ditch to a depth of at least one-third the diameter of the rock and rolling the rock into the excavation. Such rocks should be spaced at least 12 feet apart in order to allow compaction equipment to move around the rock. As the fill is brought up around the rock, sand material with a SE of at least 25 should be flooded against the lower third of the rock. Above this, the compaction equipment should compact the fill against and over the rock.

- Sufficient compaction effort should be made such that all fill material placed around and between the oversize rocks is compacted to at least 90 percent of maximum dry density as determined by ASTM D1557.

- The placement of all fill and all oversize rock disposals, including flooding, should be continuously observed by a representative of the geotechnical consultant. This is required to allow us to provide a professional opinion after grading that the fill and rock disposal was done in accordance with the recommendations contained herein.

Also rock material may be used as landscape features without any special preparation.

Transition Conditions

Our review of the project indicates that some structures may be partially founded on cuts into dense natural ground, and partially on compacted fill. Structures founded on such transition conditions can undergo minor distress as a result of differential settlement between portions of the structure founded on undisturbed natural ground and portions on compacted fill materials. Although the fills may be properly placed and compacted, they possess a considerably greater potential for anticipated post construction settlement then the denser, natural ground. Such distress can manifest itself as minor wall, slab and foundation cracking.

The cut portion of any building pad that will be traversed by a cut/fill transition line should be undercut at least three feet below finish grade. As an alternative, additional reinforcing steel may be placed in footings supported by fill material to mitigate the potential for differential settlement for transitions that do not exceed 15 feet of differential. Specific reinforcement recommendations are provided in the "Footing Reinforcement" section of this report.

Additionally, the grading for the proposed cut pads and cut street sections may expose very dense granitic or hard rock that cannot be excavated with light trenching equipment. If this is the case, consideration should be given to undercutting hard rock areas in the building pad and utility alleys to at least six inches below the bottom of the foundations and utilities and replacing the excavated material with compacted fill material.

The bottom of all over-excavated areas should be sloped in such a manner that water does not become trapped in the over-excavated zone. Prior to replacing the excavated materials, the soils exposed at the bottom of the excavation should be scarified to a depth of six inches, moisture conditioned and compacted to at least 90 percent relative compaction.

Subdrains

It is recommended that subdrains be installed in any major drainage swales that will receive fill material over 15 feet thick. Any drainage subdrains should consist of four-inch-diameter, perforated pipe surrounded with six cubic feet per linear foot of three-quarter inch crushed rock, which it turn should be surrounded with filter fabric such as Mirafi 140N or equivalent. The subdrain pipe should consist of Schedule 40 PVC or other pipe approved by the geotechnical engineer (See Figure No. 9 for a suggested detail).

Surface Drainage

Per Section 1804 of the California Building Code, in general, the ground immediately adjacent to foundations shall be sloped away from the building at a slope of not less than one unit vertical in 20 units horizontal (5-percent slope) for a minimum distance of 10 feet (3048 mm) measured perpendicular to the face of the wall. If physical obstructions or lot lines prohibit 10 feet (3048 mm) of horizontal distance, a 5-percent slope shall be provided to an approved alternative method of diverting water away from the foundation. Swales used for this purpose shall be sloped a minimum of 2 percent where located within 10 feet (3048 mm) of the building foundation. Impervious surfaces within 10 feet (3048 mm) of the building foundation shall be sloped a minimum of 2 percent away from the building.

Exceptions are allowed where climatic or soil conditions warrant, the slope of the ground away from the building foundation shall be permitted to be reduced to not less than one unit vertical in 48 units horizontal (2-percent slope). The procedure used to establish the final ground level adjacent to the foundation shall account for additional settlement of the backfill.

Erosion Control

In addition, appropriate erosion-control measures shall be taken at all times during construction to prevent surface runoff waters from entering footing excavations, ponding on finished building pad or pavement areas, or running uncontrolled over the tops of newly-constructed cut or fill slopes. Appropriate Best Management Practice (BMP) erosion control devices should be provided in accordance with local and federal governing agencies.

Grading Plans Review

The finalized, grading plans should be submitted to this office for review to ascertain that the recommendations provided in this report have been followed and that the assumptions utilized in its preparation are still valid. Additional or amended recommendations may be issued based on this review.

SLOPE CONSTRUCTION AND SLOPE STABILITY

The maximum height of proposed cut and fill slopes is approximately 30 feet. All fill slopes at the subject development will be constructed at a slope ratio of 2:0 horizontal units to 1.0 vertical unit (2:1) or flatter. The maximum fill slope height is expected to be less than 20 feet. Based on the relatively high strength parameters of the on-site granular soils, it is our opinion that the proposed fill slopes will be stable in regards to deep-seated slope failure and surficial slope failure. We anticipate the proposed slopes will have a factor of safety against failure in excess of the normally required minimum safety factor of 1.5. All fill slopes should be constructed in accordance with the grading recommendations presented above.

Cut Slopes

Cuts will be excavated at inclinations ranging from 1.5:1 (horizontal to vertical) to 2:1. Proposed cuts will be excavated primarily into competent decomposed granitic bedrock materials, typically consisting of slightly silty and relatively clean well sorted sands. The granitic bedrock is, typically, massively bedded with good soil strength characteristics and no encountered groundwater seepage.

A slope stability screening was performed using stability analysis derived from the statistical accumulation of 255 trial failure circles. The resultant chart is based on a factor-of-safety of 1.5, a seismic load of 0.1 g, and Taylor's Chart. The existing cut slope is composed of competent granitic bedrock with high soil-strength characteristics, massive, neutral or favorable bedding, and no significant geologic variations. Because the cut consists of uniform geologic and soil conditions with no significant varying factors, in our opinion, the use of generalized failure scenarios can be applicable to the project site as a screening method for slope stability conditions. Computer generated slope stability analysis is mandatory when significant variations are present (such as multiple and/or weak soil types, adverse bedding or jointing, groundwater, etc.), unlike the uniform conditions encountered at the subject site. Also contemporary computer generated analysis is considerably more qualitative than the chart values used for this screening purpose.

Our slope evaluation was conducted using the chart attached as Figure Number 10. The slope stability plots incorporate soil strength characteristic, (angle of internal friction and the cohesion), slope angle and slope height. A remolded, representative shear sample was used for the evaluation of fill slopes using. The chart plot indicates that a maximum 43-foot high slope at a 2:1 (horizontal to vertical) inclination would possess a factor-of-safety of at least 1.5 with seismic. The shear strength of a representative sample ($\Phi = 39^{o}$ and Cohesion = 200 psf) was used for the proposed cut slope evaluation. The chart plot indicates that a maximum 50-foot high slope at a 1.5:1 (horizontal to vertical) inclination would possess a factor-of-safety of at least 1.5 with seismic input. The maximum height of proposed cuts is only 30 feet.

The slope evaluation indicates the proposed cut and fill slopes will possess an adequate factor-of-safety against deep-seated slope failure. However, due to the steep inclination (1.5:1) of planned cut slopes, erosion and other natural weathering processes will be accelerated. Implementing proper surface drainage (such as a "brow" ditch and appropriate drainage terraces), an appropriate vegetative cover, plus periodic maintenance of the drainage system should significantly reduce the severity of such erosional and weathering damage. Also keep in mind that steeper slopes are more difficult to establish landscape vegetation (compared to a 2:1 slope) and also more difficult to traverse and maintain (from a health and safety standpoint).

Fill Slopes

We anticipate fill slopes will be comprised of excavated granitics derived from onsite. Proposed fill slopes should be constructed at an inclination of 2:1 or flatter (horizontal to vertical), which will produce an adequately stable slope as discussed above. Compaction of fill slopes should be performed by back-rolling with a sheepsfoot compactor at vertical intervals of four feet or less as the fill is being placed, and track-walking the face of the slope when the slope is completed. As an alternative, the fill slopes may be overfilled by at least three feet and then cut back to the compacted core at the design line and grade.

Slope Maintenance

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

Temporary Cut Slopes

We anticipate temporary slopes placed in the granitic bedrock may be cut at a minimum inclination of 0.75: 1, (horizontal to vertical) for heights of up to 10 feet. However, any surficial topsoil, fill, or residual soil overlying the bedrock should be inclined at a 1.0:1.0 slope angle. Actual safe slope angles should be verified by the geotechnical consultant at the time of excavation.

Temporary cut slopes should be observed by the Geotechnical Consultant during grading to ascertain that no unforeseen adverse conditions exist. No surcharge loads such as stockpiles, vehicles, etc. should be allowed within a distance from the top of temporary slopes equal to half the slope height.

Temporary slopes at the subject site shall be constructed in accordance with the latest addition of *Construction Safety Orders*, issued by OSHA. The contractor is solely responsible for designing and constructing stable, temporary excavations and will need to shore the sides of trench excavations as required to maintain the stability of the excavation sides. The contractor's "responsible person", as defined in the OSHA

Construction Standards for Excavations, 29 CFR, Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety process. Temporary cut slopes should be constructed in accordance with the recommendations presented in this section. In no other case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

FOUNDATIONS

Based on the findings of our investigation, it is our opinion the proposed structures may be supported by conventional continuous and isolated spread footings. The on-site materials generally possess a low expansive potential and therefore, consideration for heaving soils is included in our recommendations.

Dimensions and Embedment

Conventional shallow foundations may be utilized in the support of the proposed structures when founded on firm natural ground or properly compacted fill soils. Foundations should be constructed in accordance with the recommendations of the project structural engineer. The table provided below is suggests minimum foundation dimensions:

TABLE III
FOUNDATION EMBEDMENT

Number of Floors Supported by The Foundation	Width of Footing (Inches)	Embedment Depth Below Undisturbed Ground Surface (Inches)
1	12	12
2	15	18
3	18	24

Isolated pad footings should have a minimum width of 24 inches.

If grading for the building pad exposes nonrippable granitic material and the pad is not undercut, hard rock may be encountered the footing excavation elevations. In this case, it may be necessary to dowel the foundation to the rock (in lieu of conventional foundation embedment). Site-specific recommendations for doweling should be provided by the geotechnical engineer and/or structural engineer as these conditions arise.

Soil Bearing Value

A bearing capacity of **2500 psf** may be assumed for footings when founded a minimum of 12 inches into firm natural ground or properly compacted fill. This bearing capacity may be increased by one-third, when considering wind and/or seismic loading.

Lateral Load Resistance

Lateral loads against foundations may be resisted by friction between the bottom of the footing and the supporting soil, and by the passive pressure against the footing. The coefficient of friction between concrete and soil may be considered to be 0.40. The passive resistance may be considered to be equal to an equivalent fluid weight of 325 pounds per cubic foot. This assumes the footings are poured tight against undisturbed soil. If a combination of the passive pressure and friction is used, the friction value should be reduced by one-third.

Foundation Reinforcement

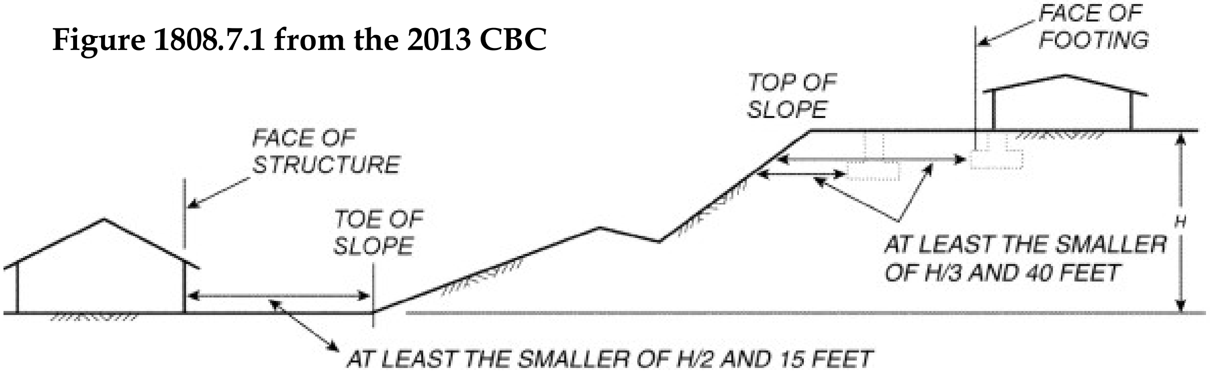
Reinforcement requirements for foundations should be provided by a structural engineer. However, based on the existing soil conditions and provided the transition building pads are undercut as recommended above, we recommend that the minimum reinforcing for continuous footings consist of at least two No. 5 bars, one bar positioned three inches above the bottom of the footing and one No. 5 bar positioned approximately three inches below the top of the footing.

Where transition building pads are not undercut, footings should have a minimum reinforcing of at least two No. 5 bars positioned three inches above the bottom of the footing and two No. 5 bars positioned approximately two inches below the top of the footing.

Horizontal Distance of Footings from Slopes

According to Section 1808.7 (Foundation on or adjacent to slopes), of the 2013 California Building Code **f**oundations on or adjacent to slope surfaces shall be founded in firm material with an embedment and set back from the slope surface sufficient to provide vertical and lateral support for the foundation without detrimental settlement. Generally, setbacks should conform to Figure 1808*A*.7.1, which is reproduced below. Where the slope is steeper than 1 unit vertical in 1 unit horizontal (100-percent slope), the required setback shall be measured from an imaginary plane 45 degrees to the horizontal, projected upward from the toe of the slope.

Figure 1808.7.1 from the 2013 CBC



Anticipated Settlements

Based on our experience with the soil types on the subject site, the soils should experience settlement in the magnitude of less than 0.5 inches under proposed structural loads.

It should be recognized that minor hairline cracks normally occur in concrete slabs and foundations due to shrinkage during curing and/or redistribution of stresses and some cracks may be anticipated. Such cracks are not necessarily an indication of excessive vertical movements.

Foundation Plans Review

The finalized, foundation plans (if significantly different from the referenced plans) should be submitted to this office for review to ascertain that the recommendations provided in this report have been followed and that the assumptions utilized in its preparation are still valid. Additional or amended recommendations may be issued based on this review.

CONCRETE SLABS-ON-GRADE

Interior Floor Slabs

The minimum floor slab thickness should be 4 inches. The floor slabs should be reinforced with at least No. 3 bars placed at 18 inches on center each way. Slab reinforcing should be supported by chairs and be positioned at mid-height in the floor slab. This recommendation does not supersede the section required for structural considerations.

Exterior Concrete Flatwork

On-grade exterior concrete slabs for walks and patios should have a thickness of four inches and should be reinforced with at least No. 3 reinforcing bars placed at 24 inches on center each way. Exterior slab reinforcement should be placed approximately at mid-height of the slab. Reinforcement and control joints should be constructed in exterior concrete flatwork to reduce the potential for cracking and movement. Joints should be placed in exterior concrete flatwork to help control the location of shrinkage cracks. Spacing of control joints should be in accordance with the American Concrete Institute specifications. Where slabs abut foundations they should be doweled into the footings.

SLAB MOISTURE BARRIERS

A moisture barrier system is recommended beneath any new interior slab-on-grade floors with moisture sensitive floor coverings or coatings to help reduce the upward migration of moisture vapor from the underlying subgrade soil. A properly selected and installed vapor retarder is essential for long-term moisture resistance and can minimize the potential for flooring problems related to excessive moisture.

Interior floor slabs should be underlain by a minimum 10-mil thick moisture retarder product over a two-inch thick layer of clean sand (Please note, additional moisture reduction and/or prevention measures may be needed, depending on the performance requirements for future floor covering products). The moisture retarder product used should meet or exceed the performance standards dictated by ASTM E 1745 Class A material and be properly installed in accordance with ACI publication 302 (*Guide to Concrete Floor and Slab Construction*) and ASTM E1643 (*Standard Practice for Installation of Water Vapor Retarder Used in Contact with Earth or Granular Fill Under Concrete Slabs)*. Ultimately, the design of the moisture retarder system and recommendations for concrete placement and curing are purview of the structural engineer, in consideration of the project requirements provided by the project architect and developer.

Moisture Retarders and Installation

Vapor retarder joints must have at least 6-inch-wide overlaps and be sealed with mastic or the manufacturer's recommended tape or compound. No heavy equipment, stakes or other puncturing instruments should be used on top of the liner before or during concrete placement. In actual practice, stakes are often driven through the retarder material, equipment is dragged or rolled across the retarder, overlapping or jointing is not properly implemented, etc. All these construction deficiencies reduce the retarders' effectiveness. It is the responsibility of the contractor to ensure that the moisture retarder is properly placed in accordance with the project plans and specifications and that the moisture retarder material is free of tears and punctures and is properly sealed prior to the placement of concrete.

Interior Slab Curing Time

Following placement of concrete floor slabs, sufficient drying time must be allowed prior to placement of floor coverings. Premature placement of floor coverings may result in degradation of adhesive materials and loosening of the finish floor materials. Prior to installation, standardized testing (calcium chloride test and/or relative humidity) should be performed to determine if the slab moisture emissions are within the limits recommended by the manufacturer of the specified floor-covering product.

DESIGN PARAMETERS FOR EARTH RETAINING STRUCTURES

Parameters for masonry retaining walls are provided as follows.

Passive Pressure

The **passive pressure** for the prevailing soil conditions may be considered to **be 350 pounds per square foot** per foot of depth. This pressure may be increased one-third for seismic loading. The **coefficient of friction** for concrete to soil may be assumed to be **0.40** for the resistance to lateral movement. When combining frictional and passive resistance, the friction value should be reduced by one-third.

Active Pressure for Retaining Walls

Lateral pressures acting against masonry and cast-in-place concrete retaining walls can be calculated using soil equivalent fluid weight. The equivalent fluid weight value used for design depends on allowable wall movement. Walls that are free to rotate at least 0.5 percent of the wall height can be designed for the active equivalent fluid weight. Retaining walls that are restrained at the top (such as basement walls), or are sensitive to movement and tilting should be designed for the at-rest equivalent fluid weight.

Values given in the table below are in terms of equivalent fluid weight and assume a triangular distribution. The provided equivalent fluid weight values assume that imported granular soils consisting of crushed rock (GP) will be used as backfill.

Table IV
Equivalent Fluid Weights (efw) For Calculating Lateral Earth Pressures
(Using "Select" Onsite Backfill)

Surface slope of Retained material Horizontal to vertical*	Cantilever equivalent Fluid weight (*active* pressure) (pcf)	Restrained equivalent Fluid weight (*at-rest* pressure) (pcf)
LEVEL	30	60
2 to 1	43	76
1.5 to l	55	80

Vehicular Loads

In the case of vehicular loads coming closer than one-half the height of the wall, we recommend a live load surcharge pressure equal to not less than 2 feet of soil surcharge with an average unit weight of 125 pcf.

Retaining Wall Foundations:

Retaining wall foundations shall be designed by the structural engineer based on the appropriate parameters provided in this report.

Waterproofing and Drainage

In general, retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and be waterproofed as specified by the project architect. Also refer to American Concrete Institute ACI 515.R (A Guide to the Use of Waterproofing, Damp Proofing, Protective and Decorative Barriers Systems for Concrete).

Positive drainage for retaining walls should consist of a vertical layer of permeable material positioned between the retaining wall and the soil backfill. Such permeable material may be composed of a composite drainage geosynthetic or a natural permeable material such as crushed rock or clean sand at least 12 inches thick and capped with at least 12 inches of backfill soil. The gravel should be wrapped in a geosynthetic filter fabric. Provisions should be made for the discharge of any accumulated groundwater. The selected drainage system should be provided with a perforated collection and discharge pipe placed along the bottom of the permeable material near the base of the wall. The drain pipe should discharge to a suitable drainage facility. If lateral space (due to property line constraints) is insufficient to allow installation of the gravel-wrapped "burrito" drain, a geocomposite system may be used in lieu of the typical gravel and pipe subdrain system. TenCate's MiraDrain (and similar products) provide a "low-profile" drainage system that requires minimal lateral clearance for installation. MiraDRAIN and similar products may also be incorporated into a waterproofing system and provide a slab drainage system (Please note that supplemental manufacturer's details will be required to provide a waterproofed system). See Figure No. 11A and 11B for suggested retaining wall drainage details.

Backfill

All backfill soils should be compacted to at least 90% relative compaction. Imported or on-site sands, gravels, silty sand (SM) and clayey sand (SC) materials are suitable for retaining wall backfill. The wall should not be backfilled until the masonry has reached an adequate strength. Soil with an expansion index (EI) of greater than 50 should not be used as backfill material behind retaining walls, which includes the predominant on-site material.

PAVEMENT RECOMMENDATIONS

Asphalt Pavement Section

Final pavement design should be based upon sampling and testing of post graded conditions. For preliminary design and estimating purposes, the following pavement structural sections can be used for the range of likely Traffic Index wheel loads. The preliminary sections are based on an assumed R-Value of 40, which in our opinion is a conservative estimate for local material.

TABLE V

Preliminary Pavement Design			
R-Value*	Traffic Index	Asphaltic Concrete Thickness (Inches)	Aggregate Base Thickness (Inches)
40	4.5	3	4
	6	3	5
	7	4	8

* Estimated value-testing required during site grading.

Site Preparation for Pavement Areas

The upper one (1) foot of pavement subgrade soils should be at or near optimum moisture content and should be compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM D1557. Aggregate base should be compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM D1557and should conform with the specifications listed in Section 26 of the *Standard Specifications for the State of California Department of Transportation* (Caltrans) or Section 200-2 of the *Standard Specifications for Public Works Construction* (Green Book). The asphalt concrete should conform to Section 26 of the Caltrans *Standard Specifications* or Section 203-6 of the Green Book.

FIELD INVESTIGATION

Fifteen test pit explorations were placed on the site using a backhoe, in areas with poor access test borings were placed using a hand auger sampling system. The excavations were placed specifically in areas where representative soil conditions were expected and/or where the proposed structures will be located. Our investigation also included a visual site reconnaissance. The excavations were visually inspected and logged by our field geologist, and samples were taken of the predominant soils throughout the field operation. Test excavation logs have been prepared on the basis of our inspection and the results have been summarized on Figures No. 3 A through 3H for the backhoe excavated test pits and Figures 4A through 4E for the angered test borings. The predominant soils have been classified in conformance with the Unified Soil Classification System (refer to Appendix B). In addition, a verbal textural description, the wet color, the apparent moisture and the density or consistency are provided. The density of granular soils is given as very loose, loose, medium dense, dense or very dense. The density of cohesive soils is given as either very soft, soft, medium stiff, stiff, very stiff, and hard. Disturbed and relatively undisturbed samples of typical and representative soils were obtained from the test excavations and transported to the laboratory for testing.

LABORATORY TESTS AND SOIL INFORMATION

Laboratory tests were performed in accordance with the generally accepted American Society for Testing and Materials (ASTM) test methods or suggested procedures. A brief description of the tests performed is presented below:

CLASSIFICATION: Field classifications were verified in the laboratory by visual examination. The final soil classifications are in accordance with the Unified Soil Classification System.

MOISTURE-DENSITY: In-place moisture contents and dry densities were determined for representative soil samples. This information was an aid to classification and permitted recognition of variations in material consistency with depth. The dry unit weight is determined in pounds per cubic foot, and the in-place moisture content is determined as a percentage of the soil's dry weight. The results are summarized in the test excavation logs.

MAXIMUM DRY DENSITY: The maximum dry density and optimum moisture content of a typical soil were determined in the laboratory in accordance with ASTM Standard Test D-1557, Method A. The results of this test are presented as follows:

Soil Type Location	**Test Pit T-6 @ 1′ – 3′**
Sample Description	Light-brown, slightly silty sand (SM-SW)
Maximum Density	135 pcf
Optimum Moisture	9.0 %

DIRECT SHEAR TEST: A direct shear test was performed in accordance with ASTM D3080 as a guideline. The results are presented below.

Sample Number:	**Test Pit T-6 @ 1′ – 3′**
Description:	Remold to Natural Density
Angle of Internal Friction:	39^{0}
Apparent Cohesion:	200 psf

EXPANSION INDEX: Expansion index testing was performed in accordance with ASTM D4829 as a guideline. The results are presented below.

Sample Location: B-7 @ 1' to 3'
Initial Moisture Content: 12.5%
Initial Dry Density: 112.0
Final Moisture Content: 25%
Expansion Index: 15
CBC Classification: Very low

LIMITATIONS

The recommendations presented in this report are contingent upon our review of final plans and specifications. Such plans and specifications should be made available to the Geotechnical Engineer and Engineering Geologist so that they may review and verify their compliance with this report and with Appendix A and the current California Building Code. It is recommended that C.W. La Monte Company Inc. be retained to provide soil-engineering services during the construction operations. This is to verify compliance with the design concepts, specifications or recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to start of construction.

The recommendations and opinions expressed in this report reflect our best estimate of the project requirements based on an evaluation of the subsurface soil conditions encountered at the subsurface exploration locations and on the assumption that the soil conditions do not deviate appreciably from those encountered. It should be recognized that the performance of the foundations and/or cut and fill slopes may be influenced by undisclosed or unforeseen variations in the soil conditions that may occur in the intermediate and unexplored areas. Any unusual conditions not covered in this report that may be encountered during site development should be brought to the attention of the Geotechnical Engineer so that he may make modifications if necessary.

This office should be advised of any changes in the project scope or proposed site grading so that we may determine if the recommendations contained herein are appropriate. It should be verified in writing if the recommendations are found to be appropriate for the proposed changes or our recommendations should be modified by a written addendum.

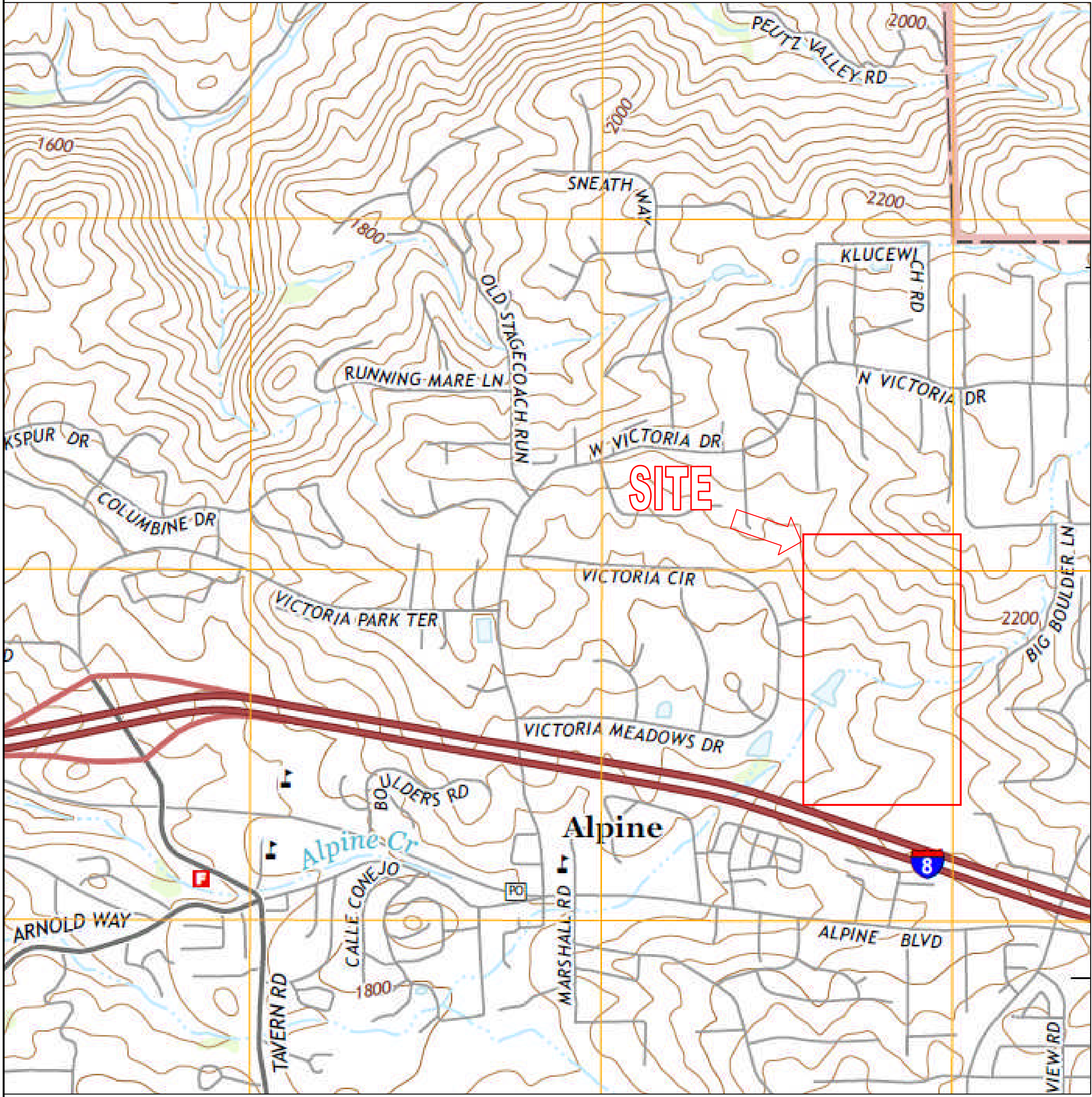
The findings of this report are valid as of this date. Changes in the condition of a property can, however, occur with the passage of time, whether they are due to natural processes or the work of man on this or adjacent properties. In addition, changes in the Standards-of-Practice and/or Government Codes may occur. Due to such changes, the findings of this report may be invalidated wholly or in part by changes beyond our control. Therefore, this report should not be relied upon after a period of two years without a review by us verifying the suitability of the conclusions and recommendations.

In the performance of our professional services, we comply with that level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions and in the same locality. The client recognizes that subsurface conditions may vary from those encountered at the locations where our borings, surveys, and explorations are made, and that our data, interpretations, and recommendations are based solely on the information obtained by us. We will be responsible for those data, interpretations, and recommendations, but shall not be responsible for the interpretations by others of the information developed. Our services consist of professional consultation and observation only, and no warranty of any kind whatsoever, express or implied, is made or intended in connection with the work performed or to be performed by us, or by our proposal for consulting or other services, or by our furnishing of oral or written reports or findings.

Our firm will not be responsible for the safety of personnel other than our own on the site; the safety of others is the responsibility of the Contractor. The Contractor should notify the Owner if he considers any of the recommended actions presented herein to be unsafe.

It is the responsibility of the stated client or their representatives to ensure that the information and recommendations contained herein are brought to the attention of the structural engineer and architect for the project and incorporated into the project's plans and specifications. It is further their responsibility to take the necessary measures to insure that the contractor and his subcontractors carry out such recommendations during construction. The firm of C.W. La Monte Co. Inc. shall not be held responsible for changes to the physical condition of the property, such as addition of fill soils or changing drainage patterns, which occur subsequent to the issuance of this report.

SITE LOCATION AND TOPOGRAPHIC MAP



Excerpt from USGS Topographic Map
Alpine Quadrangle, 7.5-Minute Series, 2015

C.W. La Monte Company Inc.
Soil and Foundation Engineers

Figure No. 1

LEGEND TO FIGURES 2A AND 2B

Approximate Test Boring Location (Hand Auger)	⊗ B-2
Approximate Test Pit Location (Backhoe Excavated)	T-12
Observation Boring Placed During Percolation Testing (2004)	●
Geologic Contact	Qoa - - - - - - - Ka

Qya = Young Alluvium
Qoa = Older Alluvium
Ka = Tonalite of Alpine
(Granitic Bedrock)

Observed Hard Rock Outcrops (Also see noted rock locations on Topographic Map)	R

PLOT PLAN AND GEOTECHNICAL MAP

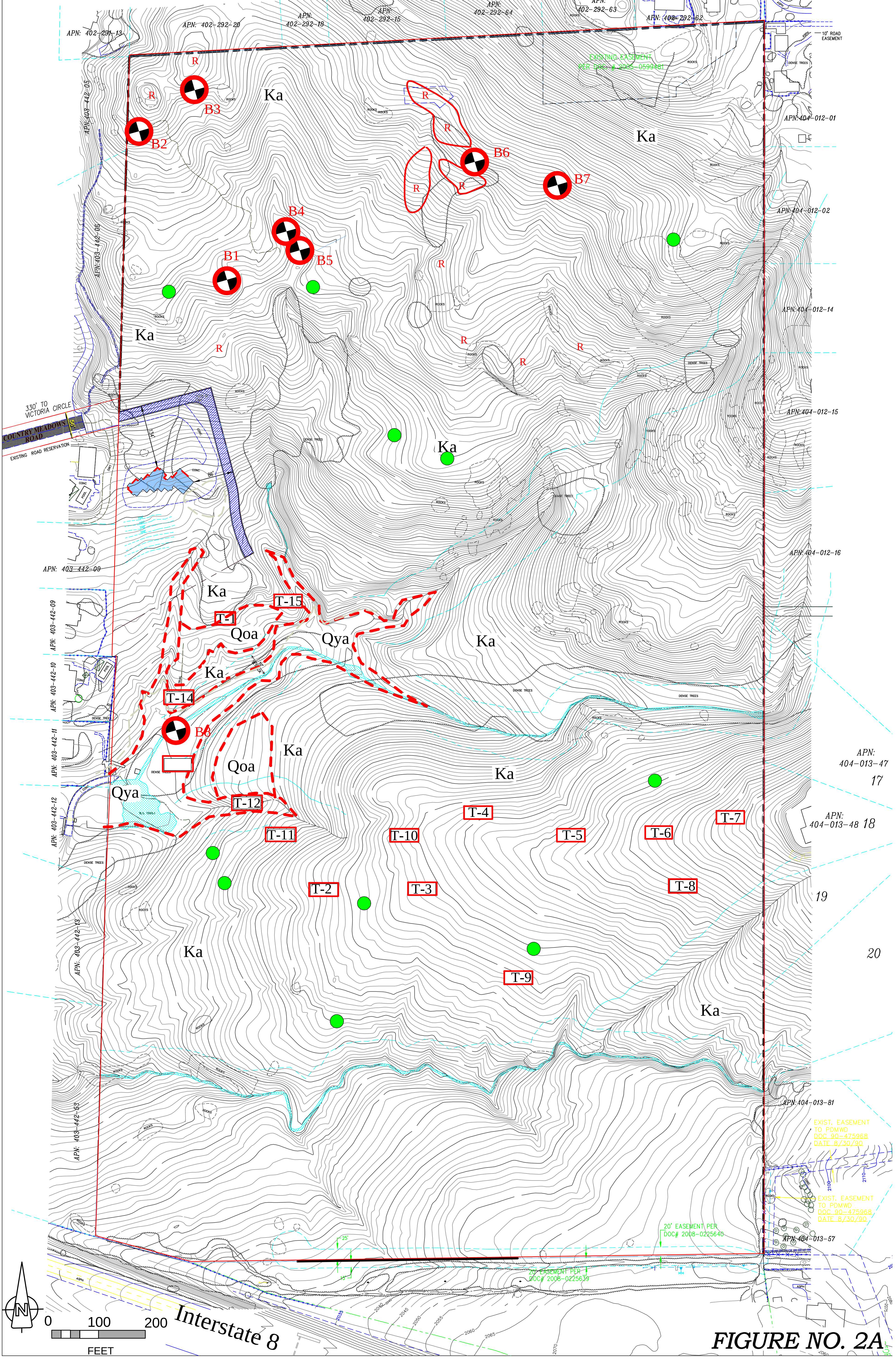


FIGURE NO. 2A

SITE PLAN PROPOSED DEVELOPMENT

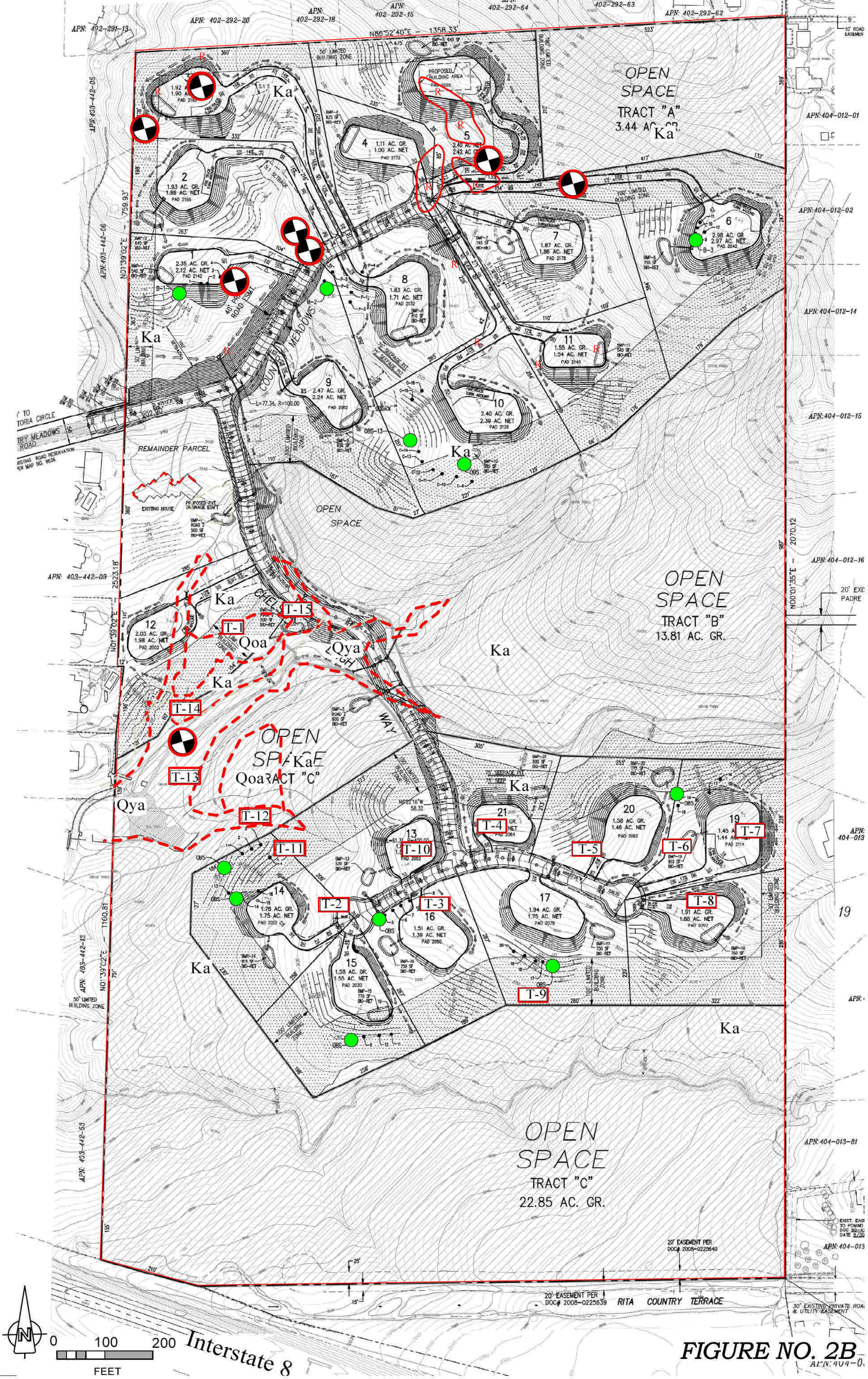


FIGURE NO. 2B

TEST EXCAVATION NO. T-1

Elevation: 2000' **Date:** 07/26/2016 **Logged By:** JBR **Excavation Method :** Backhoe

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	U.S.C.S.	SOIL DESCRIPTION
1						OLDER ALLUVIUM (Qoa)
2					SM	Dark reddish brown, dry to slightly moist, dense, very silty sand
3						
4						
5						@5.5 feet refusal on hard rock EXCAVATION BOTTOM
6						
7						

TEST EXCAVATION NO. T-2

Elevation: 2032' **Date:** 07/26/2016 **Logged By:** JBR **Excavation Method :** Backhoe

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	U.S.C.S.	SOIL DESCRIPTION
1					SM	TOPSOIL / SLOPE WASH Dark reddish brown, dry, loose, silty sand.
2						
3					SM SW	DECOMPOSED GRANITIC BEDROCK (Ka) Light brown, dry, very dense, slightly silty, fine to coarse sand.
4						@ 4 feet practical refusal
5						EXCAVATION BOTTOM
6						
7						

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Alpine, California

FIGURE NO. 3 A

TEST EXCAVATION NO. T-3

Elevation: 2056' **Date:** 07/26/2016 **Logged By:** JBR **Excavation Method :** Backhoe

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	U.S.C.S.	SOIL DESCRIPTION
					SM	TOPSOIL / SLOPE WASH Dark reddish brown, dry, loose, silty sand.
1						
2	▨				SM	DECOMPOSED GRANITIC BEDROCK (Ka)
3	▨	▨	123	4.1		Dark reddish brown, slightly moist, dense, silty sand
4	▨					
5	▨				SM SW	Light brown, dry, very dense, slightly silty, fine to coarse sand.
6	▨					
7	▨					
						@8 feet practical refusal

EXCAVATION BOTTOM

TEST EXCAVATION NO. T-4

Elevation: 2072' **Date:** 07/26/2016 **Logged By:** JBR **Excavation Method :** Backhoe

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	U.S.C.S.	SOIL DESCRIPTION
					SM	TOPSOIL / SLOPE WASH Dark reddish brown, dry, loose, silty sand.
1						
2					SM	DECOMPOSED GRANITIC BEDROCK (Ka)
3						Dark reddish brown, slightly moist, dense, silty sand
4					SM SW	Light brown, dry, very dense, slightly silty, fine to coarse sand.
5						@5 feet practical refusal
6						EXCAVATION BOTTOM
7						

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FIGURE NO. 3 B

TEST EXCAVATION NO. T-5

Elevation: 2084' **Date:** 07/26/2016 **Logged By:** JBR **Excavation Method :** Backhoe

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	u.s.c.s.	SOIL DESCRIPTION
					SM	TOPSOIL / SLOPE WASH Dark reddish brown, dry, loose, silty sand.
1						
2					SM SW	DECOMPOSED GRANITIC BEDROCK (Ka) Light brown, dry, very dense, slightly silty, fine to coarse sand.
3						@ 3 feet practical refusal
4						EXCAVATION BOTTOM
5						
6						
7						

TEST EXCAVATION NO. T-6

Elevation: 2105' **Date:** 07/26/2016 **Logged By:** JBR **Excavation Method :** Backhoe

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	u.s.c.s.	SOIL DESCRIPTION
					SM	TOPSOIL / SLOPE WASH Dark reddish brown, dry, loose, silty sand.
1	▨					
2	▨				SM SW	DECOMPOSED GRANITIC BEDROCK (Ka) Light brown, dry, very dense, slightly silty, fine to coarse sand.
3						
4						@ 4 feet practical refusal
5						EXCAVATION BOTTOM
6						
7						

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FIGURE NO. 3 C

TEST EXCAVATION NO. T-7

Elevation: 2124' **Date:** 07/26/2016 **Logged By:** JBR **Excavation Method :** Backhoe

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	U.S.C.S.	SOIL DESCRIPTION
1					SM	TOPSOIL / SLOPE WASH Dark reddish brown, dry, loose, silty sand.
2					SM SW	DECOMPOSED GRANITIC BEDROCK (Ka) Light brown, dry, very dense, slightly silty, fine to coarse sand.
3						@ 3.5 feet practical refusal
4						EXCAVATION BOTTOM
5						
6						
7						

TEST EXCAVATION NO. T-8

Elevation: 2100' **Date:** 07/26/2016 **Logged By:** JBR **Excavation Method :** Backhoe

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	U.S.C.S.	SOIL DESCRIPTION
1					SM	TOPSOIL / SLOPE WASH Dark reddish brown, dry, loose, silty sand.
2					SM	DECOMPOSED GRANITIC BEDROCK (Ka) Dark reddish brown, slightly moist, dense, silty sand
3					SM SW	Light brown, dry, very dense, slightly silty, fine to coarse sand. @ 3.5 feet practical refusal
4						EXCAVATION BOTTOM
5						
6						
7						

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FIGURE NO. 3 D

TEST EXCAVATION NO. T-9

Elevation: 2050' **Date:** 07/26/2016 **Logged By:** JBR **Excavation Method :** Backhoe

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	U.S.C.S.	SOIL DESCRIPTION
					SM	TOPSOIL / SLOPE WASH Dark reddish brown, dry, loose, silty sand.
1						
2					SM SW	DECOMPOSED GRANITIC BEDROCK (Ka) Light brown, dry, very dense, slightly silty, fine to coarse sand.
3						
4						@ 3.5 feet practical refusal EXCAVATION BOTTOM
5						
6						
7						

TEST EXCAVATION NO. T-10

Elevation: 2055' **Date:** 07/26/2016 **Logged By:** JBR **Excavation Method :** Backhoe

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	U.S.C.S.	SOIL DESCRIPTION
					SM	TOPSOIL / SLOPE WASH Dark reddish brown, dry, loose, silty sand.
1					SW	DECOMPOSED GRANITIC BEDROCK (Ka) Grayish brown, dry, very dense, fine to coarse sand.
2						
3						@ 2 feet practical refusal EXCAVATION BOTTOM
4						
5						
6						
7						

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FIGURE NO. 3 E

TEST EXCAVATION NO. T-11

Elevation: 2006' **Date:** 07/26/2016 **Logged By:** JBR **Excavation Method :** Backhoe

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	U.S.C.S.	SOIL DESCRIPTION
					SM	TOPSOIL / SLOPE WASH
1						Dark reddish brown, dry, loose, silty sand.
2					SM	DECOMPOSED GRANITIC BEDROCK (Ka)
3						Dark reddish brown, slightly moist, dense, silty sand
4					SW	Light brown, dry, very dense, fine to coarse sand. @ 5 feet practical refusal
5						EXCAVATION BOTTOM
6						
7						

TEST EXCAVATION NO. T-12

Elevation: 1990' **Date:** 07/26/2016 **Logged By:** JBR **Excavation Method :** Backhoe

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	U.S.C.S.	SOIL DESCRIPTION
						ALLUVIUM (Qya)
1	▨				SM	Dark brown, slightly moist, loose to medium dense, silty sand.
2	▨					
3						
4						OLDER ALLUVIUM (Qoa)
5	▨				SM	Dark grayish brown,slightly moist, very dense, silty sand
6	▨					
7						

EXCAVATION BOTTOM

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FIGURE NO. 3 F

TEST EXCAVATION NO. T-13

Elevation: 1972' **Date:** 07/26/2016 **Logged By:** JBR **Excavation Method :** Backhoe

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	U.S.C.S.	SOIL DESCRIPTION
						ALLUVIUM (Qya)
1					SM	Dark brown, slightly moist, loose to medium dense, silty sand.
2						
3						
4						Grayish brown,slightly moist, loose to medium dense, fine to medium sand
5						
6						
7						@ 8 feet excavation terminated due to excessive caving

EXCAVATION BOTTOM

TEST EXCAVATION NO. T-14

Elevation: 1977' **Date:** 07/26/2016 **Logged By:** JBR **Excavation Method :** Backhoe

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	U.S.C.S.	SOIL DESCRIPTION
					SM	TOPSOIL / SLOPE WASH
1						Dark reddish brown, dry, loose, silty sand.
2					SM SW	DECOMPOSED GRANITIC BEDROCK (Ka)
3						Light brown, dry, very dense, slightly silty, fine to coarse sand.
4						EXCAVATION BOTTOM
5						
6						
7						

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FIGURE NO. 3 G

TEST EXCAVATION NO. T-15

Elevation: 1996' **Date:** 07/26/2016 **Logged By:** JBR **Excavation Method :** Backhoe

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	U.S.C.S.	SOIL DESCRIPTION
1					SM	TOPSOIL / SLOPE WASH Dark reddish brown, dry, loose, silty sand.
2					SM SW	DECOMPOSED GRANITIC BEDROCK (Ka) Grayish brown, dry, very dense, silty, fine to coarse sand.
3						
4						EXCAVATION BOTTOM
5						
6						
7						

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FIGURE NO. 3 H

TEST BORING NO. B-1

Elevation: 2000' **Date:** 08/01/2016 **Logged By:** JBR **Excavation Method :** Hand Auger

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	U.S.C.S.	SOIL DESCRIPTION
1					SM	TOPSOIL / SLOPE WASH Dark reddish brown, dry, loose, silty sand.
2 3					SM SW	DECOMPOSED GRANITIC BEDROCK (Ka) Light brown, dry, very dense, slightly silty, fine to coarse sand. @ 4 feet practical refusal
4 5 6 7						EXCAVATION BOTTOM

TEST BORING NO. B-2

Elevation: 2032' **Date:** 08/01/2016 **Logged By:** JBR **Excavation Method :** Hand Auger

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	U.S.C.S.	SOIL DESCRIPTION
1					SM	TOPSOIL / SLOPE WASH Dark reddish brown, dry, loose, silty sand.
2 3					SM SW	DECOMPOSED GRANITIC BEDROCK (Ka) Light grayish brown, dry, very dense, slightly silty, fine to coarse sand. @ 3 feet practical refusal
4 5 6 7						EXCAVATION BOTTOM

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FIGURE NO. 4 A

TEST BORING NO. B-3

Elevation: 2056' **Date:** 08/01/2016 **Logged By:** JBR **Excavation Method :** Hand Auger

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	u.s.c.s.	SOIL DESCRIPTION
					SM	TOPSOIL / SLOPE WASH Dark reddish brown, dry, loose, silty sand.
1						
2						DECOMPOSED GRANITIC BEDROCK (Ka)
3					SM SW	Light grayish brown, dry, very dense, slightly silty, fine to coarse sand.
4						
5						
6						
7						EXCAVATION BOTTOM

TEST BORING NO. B-4

Elevation: 2072' **Date:** 08/01/2016 **Logged By:** JBR **Excavation Method :** Hand Auger

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	u.s.c.s.	SOIL DESCRIPTION
					SM	ALLUVIUM (Qya) Dark reddish brown, dry, loose, silty sand.
1						
2					SM SW	DECOMPOSED GRANITIC BEDROCK (Ka)
3						Light brown, dry, very dense, slightly silty, fine to coarse sand.
4						@ 3.5 feet practical refusal EXCAVATION BOTTOM
5						
6						
7						

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FIGURE NO. 4 B

TEST BORING NO. B-5

Elevation: 2084' **Date:** 08/01/2016 **Logged By:** JBR **Excavation Method :** Hand Auger

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	U.S.C.S.	SOIL DESCRIPTION
1					SM	TOPSOIL / SLOPE WASH Dark reddish brown, dry, loose, silty sand.
2						DECOMPOSED GRANITIC BEDROCK (Ka)
3					SM SW	Light grayish brown, dry, very dense, slightly silty, fine to coarse sand.
4						
5						
6						
7						EXCAVATION BOTTOM

TEST BORING NO. B-6

Elevation: 2105' **Date:** 08/01/2016 **Logged By:** JBR **Excavation Method :** Hand Auger

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE UNDISTURBED	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	U.S.C.S.	SOIL DESCRIPTION
1					SM	TOPSOIL / SLOPE WASH
2						DECOMPOSED GRANITIC BEDROCK (Ka)
3					SM SW	Light grayish brown, dry, very dense, slightly silty, fine to coarse sand.
4						
5						
6						
7						EXCAVATION BOTTOM

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FIGURE NO. 4 C

TEST BORING NO. B-7

Elevation: 2124' **Date:** 08/01/2016 **Logged By:** JBR **Excavation Method :** Hand Auger

DEPTH (FEET)	SAMPLE TYPE		DRY DENSITY (PCF)	MOISTURE CONTENT (%)	U.S.C.S.	SOIL DESCRIPTION
	BULK	UNDISTURBED				
					SM	TOPSOIL / SLOPE WASH Dark reddish brown, slightly moist, loose, silty sand.
1 2 3	▨				ML	SUBSOIL Grayish brown, moist, stiff, clayey silt
4 5 6 7					SM SW	DECOMPOSED GRANITIC BEDROCK (Ka) Gray, slightly moist, very dense, slightly silty, fine to coarse sand.

EXCAVATION BOTTOM

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FIGURE NO. 4 D

TEST BORING NO. B-8

Date Excavated: 8/1/2016 **Method of Excavation:** Hand Auger
By: JBR **Approximate Surface Elevation:** ±

DEPTH (FEET)	SAMPLE TYPE BULK	SAMPLE TYPE IN PLACE	Dry Density (pcf)	Moisture Content (%)	Maximum Density	Relative Density (%)	U.S.C.S.	SOIL DESCRIPTION
								ALLUVIUM (Qya)
1								Dark brown, slightly moist, loose to medium dense, sand and slightly silty sand. Some roots and rootlets
2								
3								
4								
5								Dark brown to black, slightly moist, loose to medium dense, silty sand.
6								@ 6.5 feet becomes very moist to wet
7								
8								Light grayish brown, moist, loose to medium dense, sand
9								@ 10.5 feet becomes saturated
10								
11								▼
12							SW	DECOMPOSED GRANITIC BEDROCK (Ka) Light grayish brown, dry, very dense, slightly silty fine to coarse sand.
13								
14								EXCAVATION BOTTOM

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PROJECT: Alpine 21
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FIGURE NO. 4E

ALPINE 21- AERIAL PHOTOGRAPH

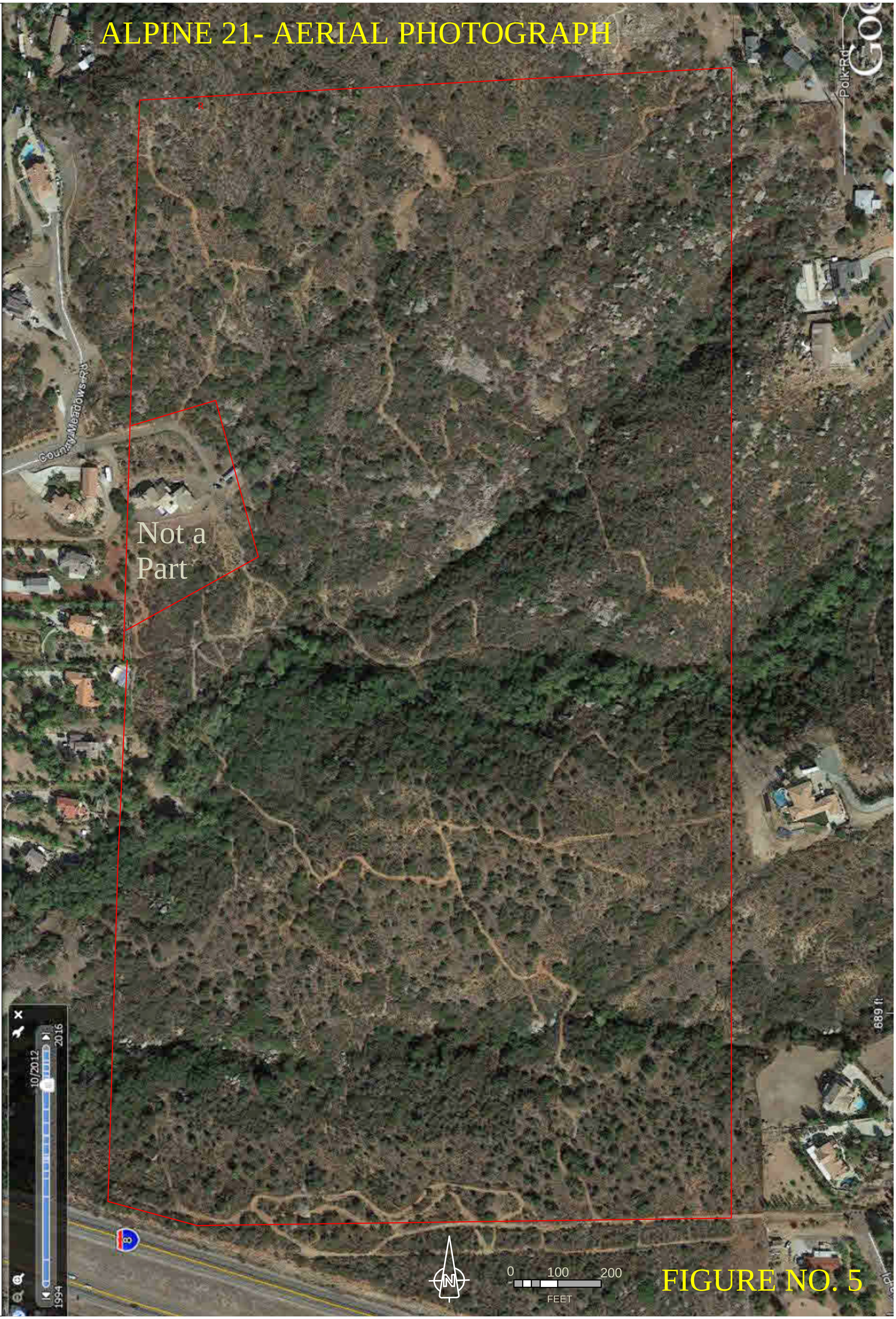
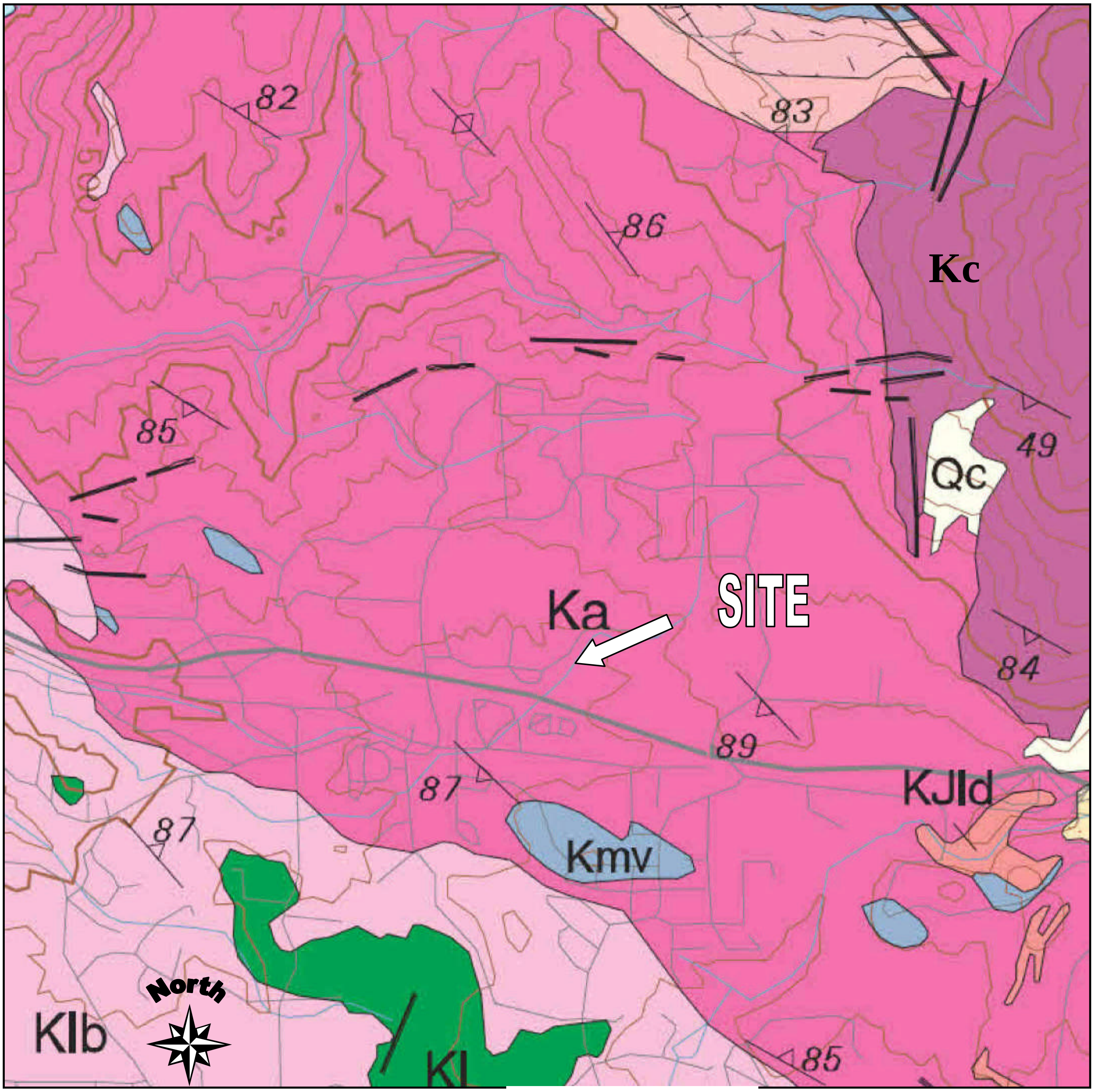


FIGURE NO. 5

GEOLOGIC MAP EXCERPT



LEGEND (Localized)

Excerpt from *Preliminary Geologic Map of the El Cajon 30' x 60' Quadrangle, Southern California (Todd, 2004).*

Ka = Tonalite of Alpine

Klb = Tonalite of Las Bancas

Kc = Cuyamaca Gabbro

Kmv = Metavolcanic

Fault - Solid where well defined; dashed where inferred

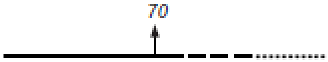
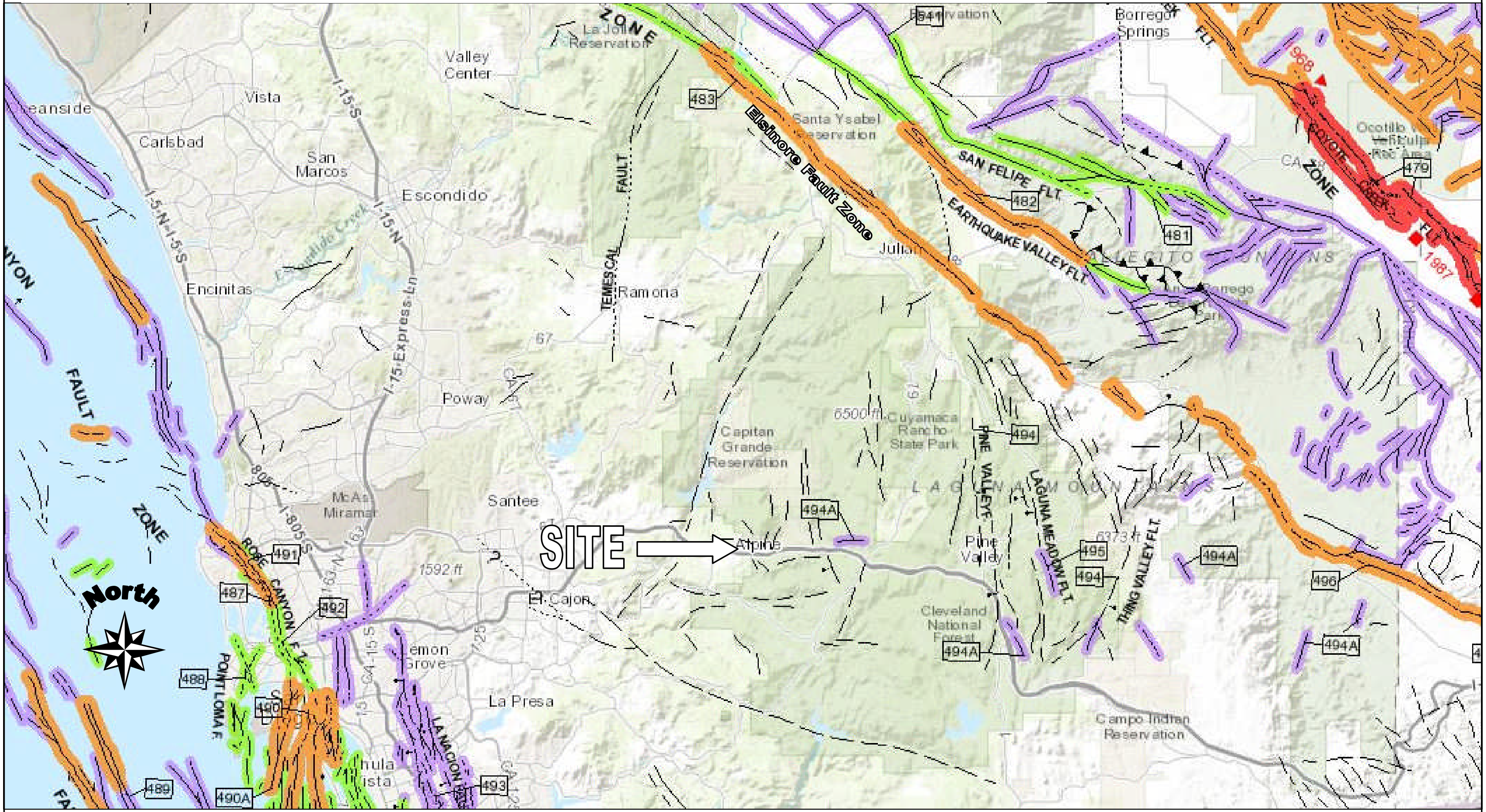


FIGURE NO. 6

FIGURE 7 - Excerpt from: 2010 Fault Activity Map of California, Geologic Data Map No. 6



SUMMARY EXPLANATION

Fault traces on land are indicated by solid lines where well located, by dashed lines where approximately located or inferred, and by dotted lines where concealed by younger rocks or by lakes or bays. Fault traces are queried where continuation or existence is uncertain.

FAULT CLASSIFICATION COLOR CODE (Indicating Recency of Movement)

🟥 Historic Fault (last 200 years)

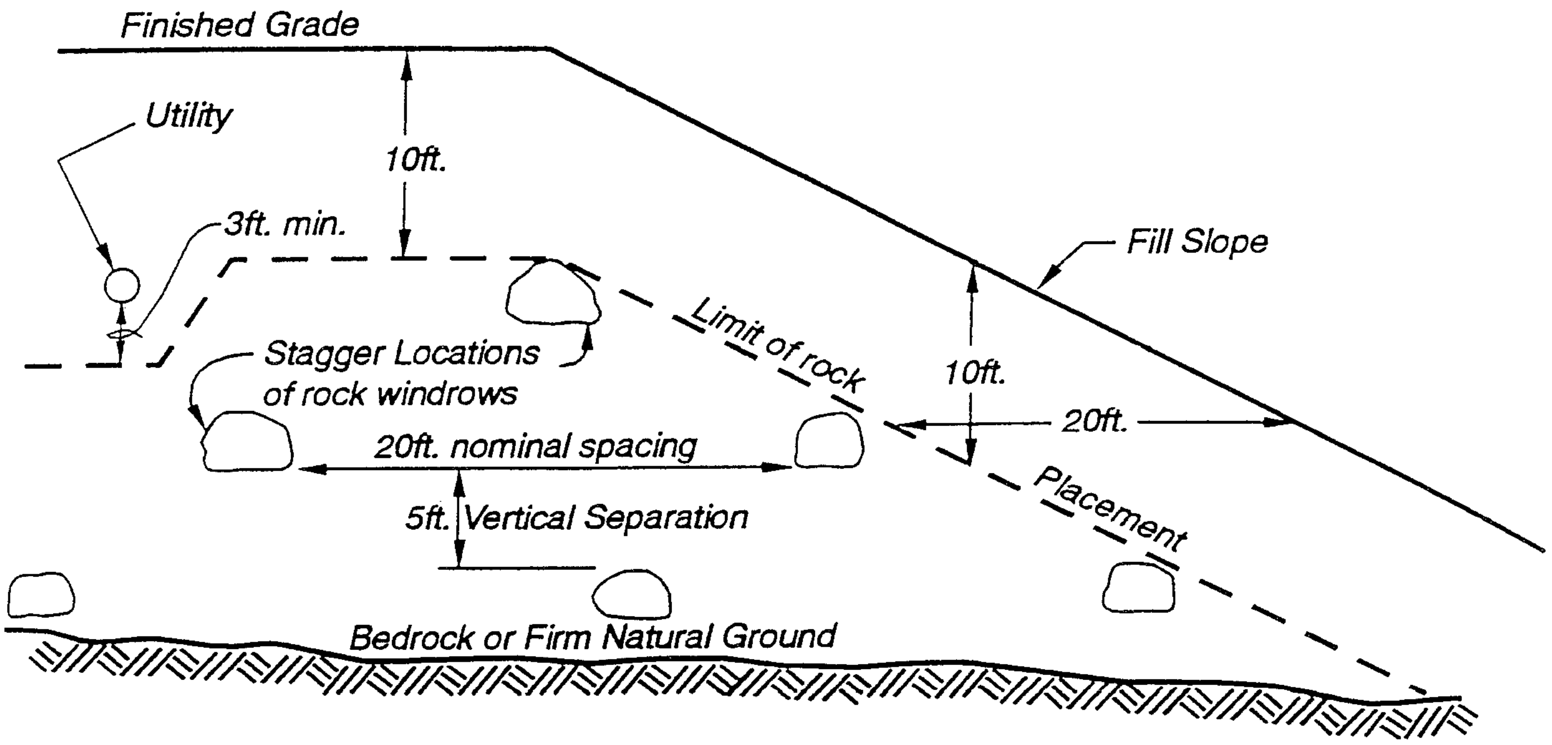
🟧 Holocene fault (during past 11,700 years) without historic record.

🟪 Quaternary fault (age undifferentiated)

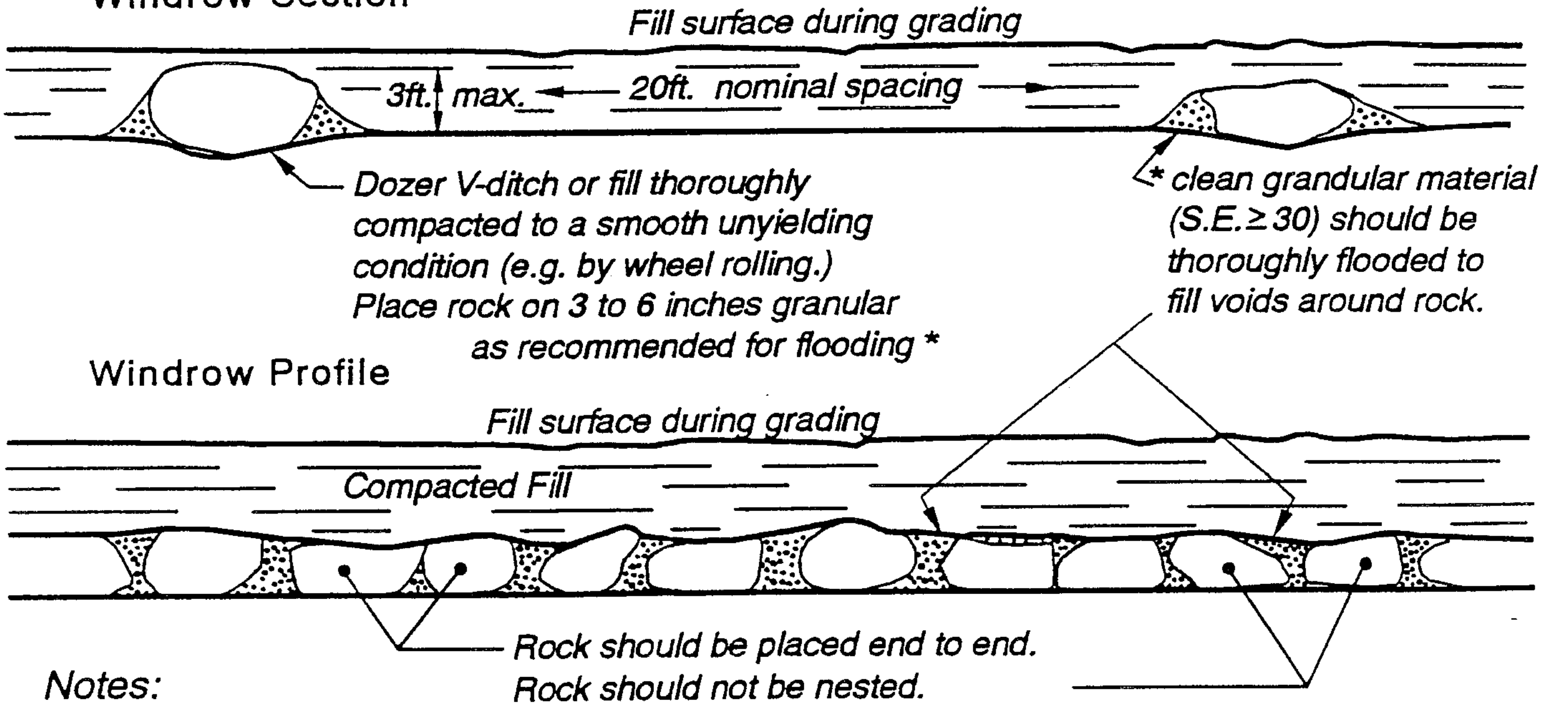
🟩 Late Quaternary fault (during past 700,000 years).

——— — — — .... Pre-Quaternary fault (older that 1.6 million years) or fault without recognized Quaternary displacement.

ROCK DISPOSAL



Windrow Section



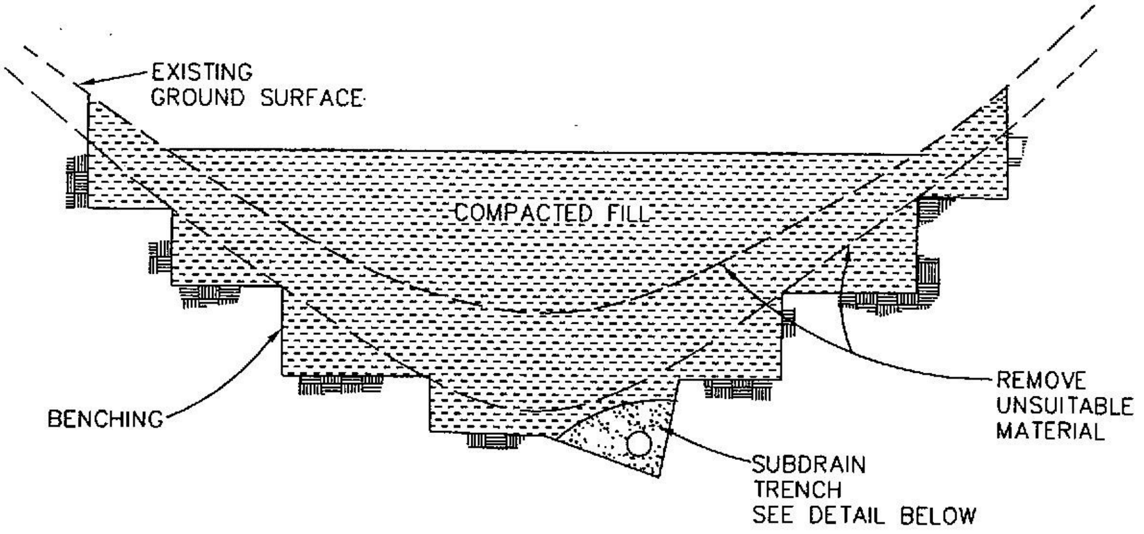
Notes:

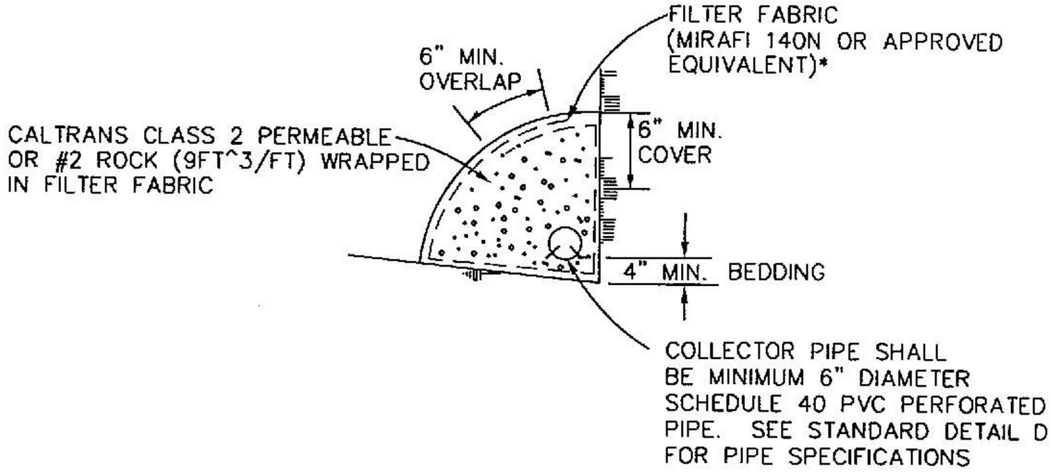
1 - Following placement of rock, flooding of granular material, and placement of compacted fill adjacent to windrow, each windrow should be thoroughly compacted from the surface.

2 - The contractor should provide to the geotechnical consultant plans prepared by survey documenting the location of buried rock.

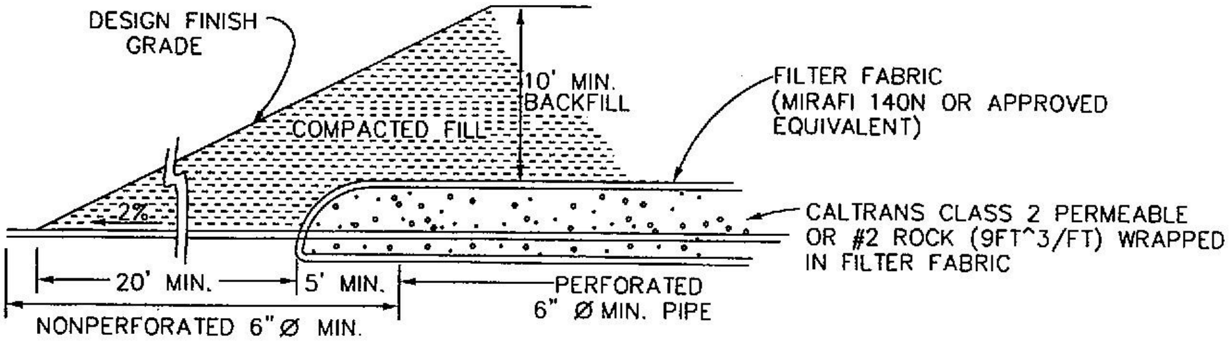
3 - Disposal may be subject to more restrictive requirements by the governing authorities.

FIGURE NO. 8





SUBDRAIN DETAIL



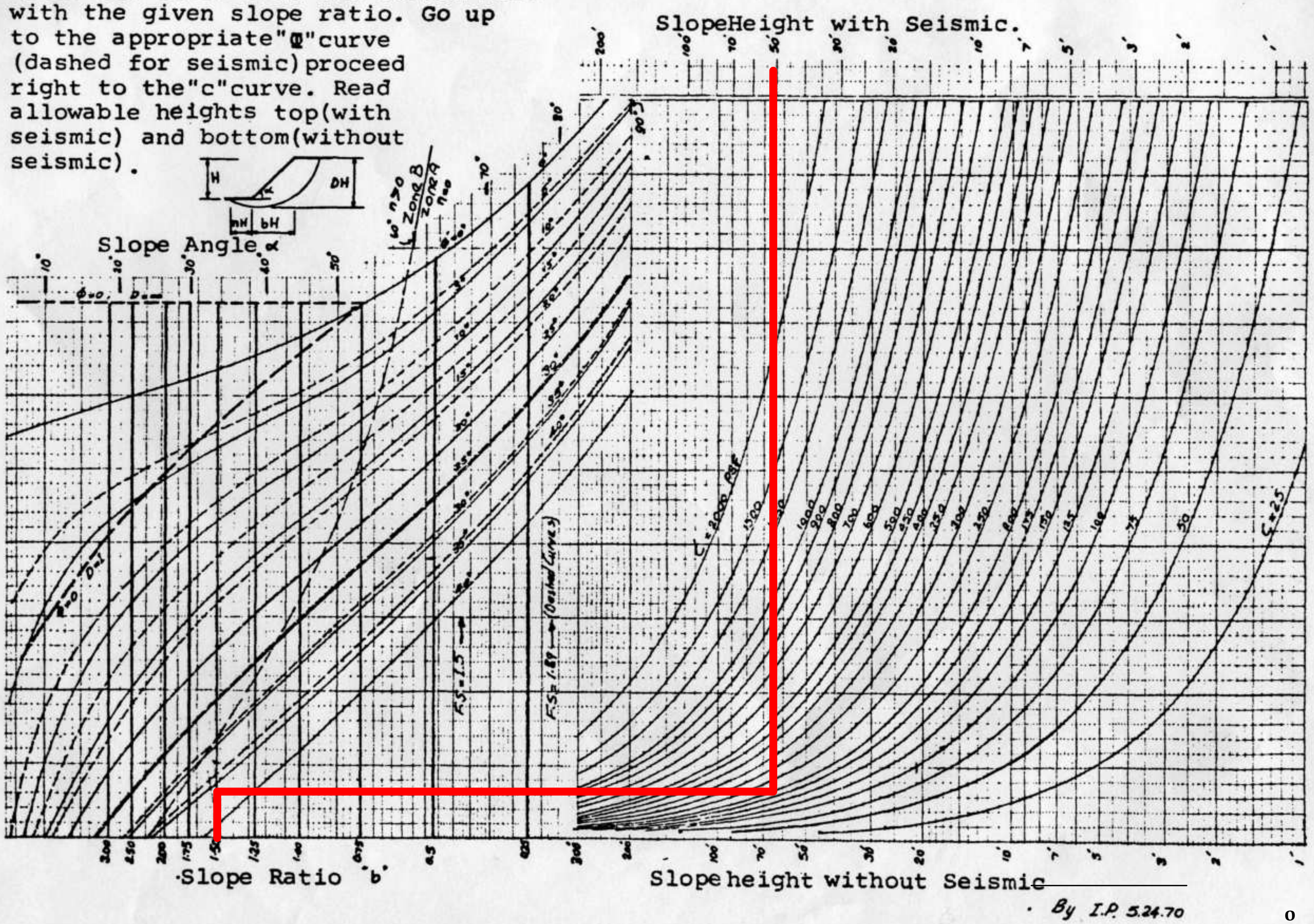
DETAIL OF CANYON SUBDRAIN OUTLET

CANYON SUBDRAINS	**FIGURE NO.** 9

SLOPE DESIGN

Statistical analysis of 255 trial circles reveals that use of a factor of safety of 1.89 and Taylor's charts is not significantly different from the use of a factor of safety of 1.5 and a seismic load of 0.1G .The chart below,is based on factors of safety of 1.5 and 1.89 and Taylor's chart.

Enter the chart from the bottom left with the given slope ratio. Go up to the appropriate"Φ"curve (dashed for seismic)proceed right to the"c"curve. Read allowable heights top(with seismic) and bottom(without seismic).



Slope Stability Charts

Figure No. 10

TYPICAL RETAINING WALL SECTION

(No Scale)

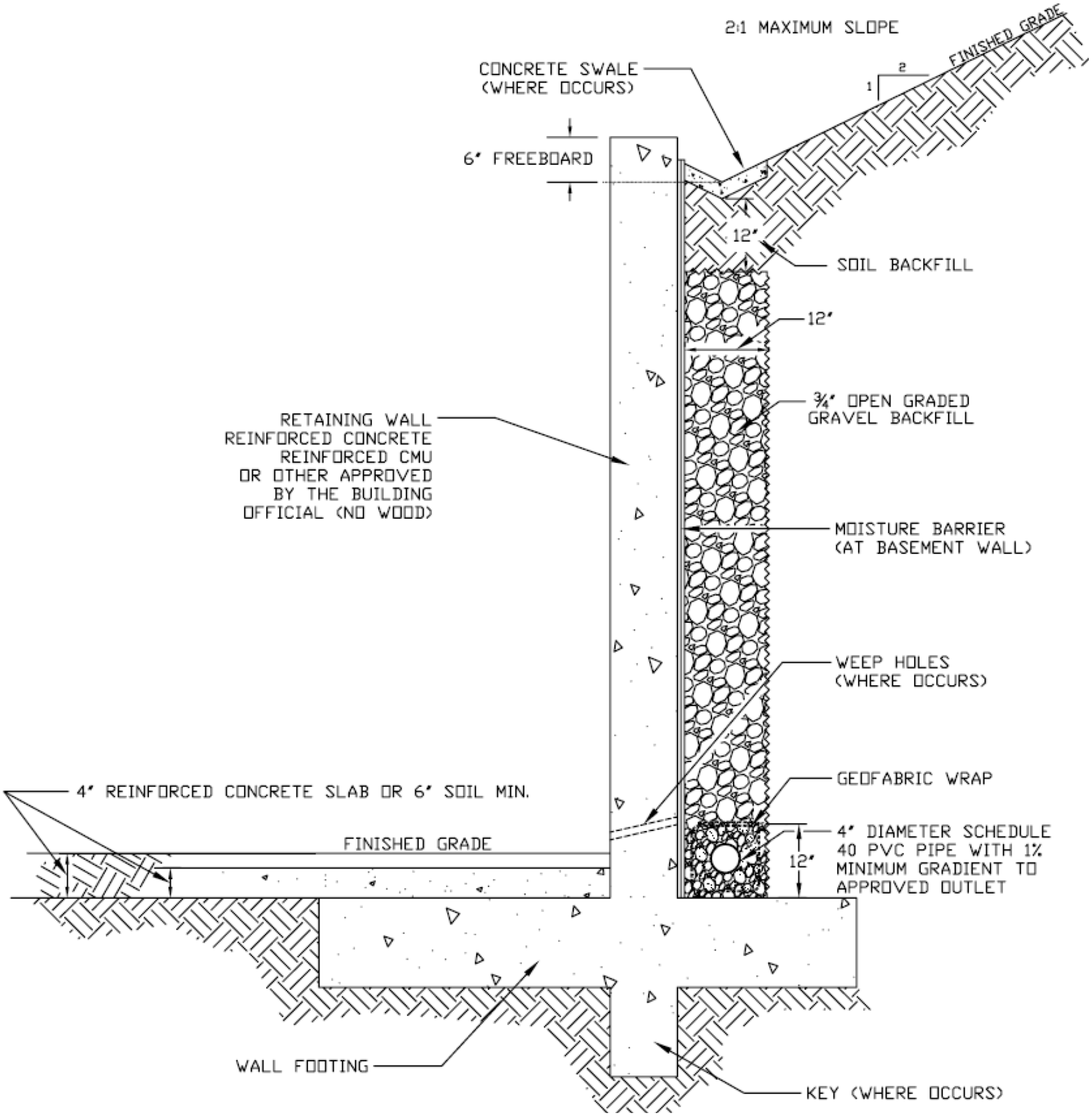
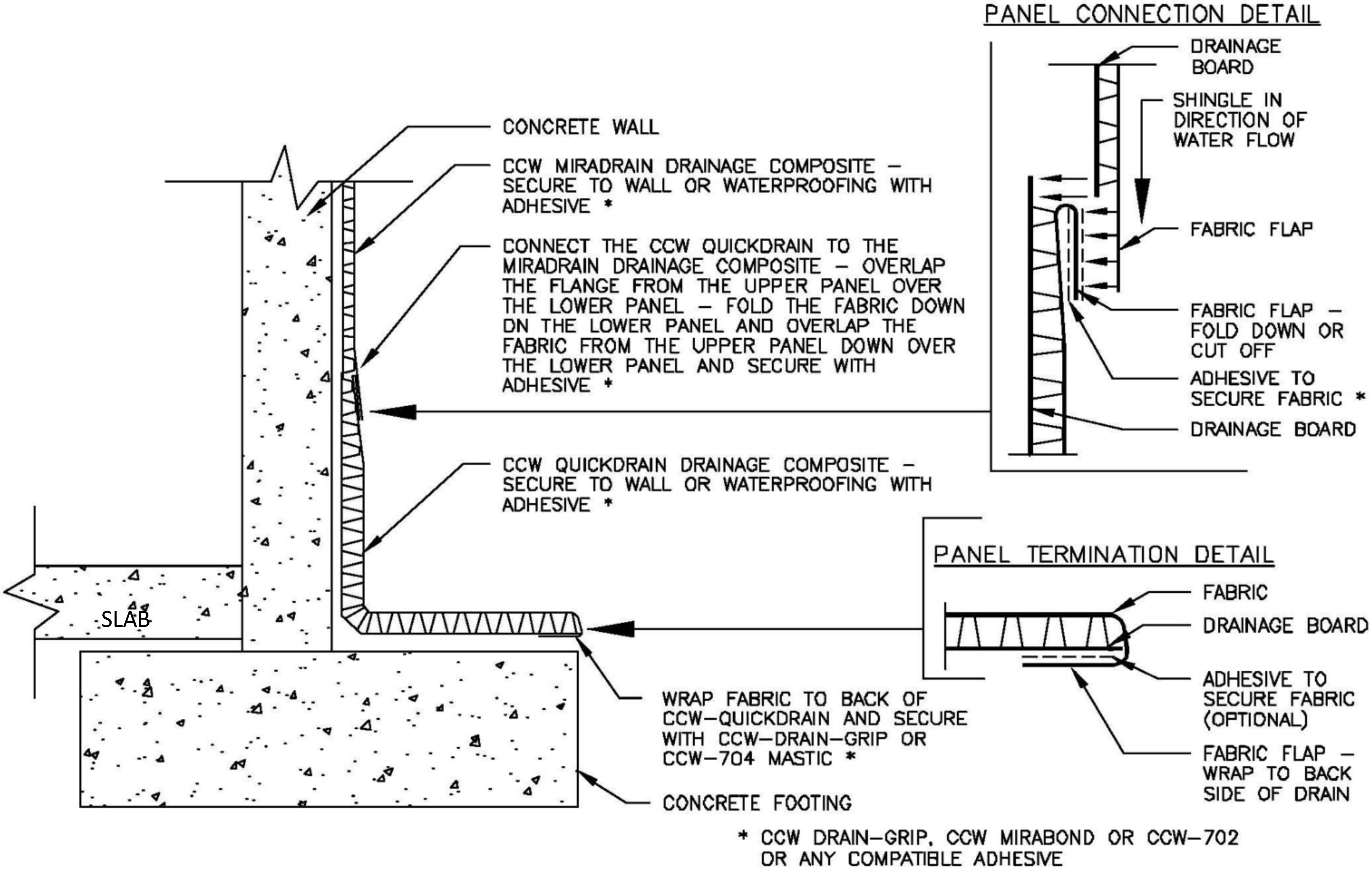


Figure No. 11A

Mira Drain Detail



CONCRETE WALL

CCW MIRADRAIN DRAINAGE COMPOSITE – SECURE TO WALL OR WATERPROOFING WITH ADHESIVE *

CONNECT THE CCW QUICKDRAIN TO THE MIRADRAIN DRAINAGE COMPOSITE – OVERLAP THE FLANGE FROM THE UPPER PANEL OVER THE LOWER PANEL – FOLD THE FABRIC DOWN DN THE LOWER PANEL AND OVERLAP THE FABRIC FROM THE UPPER PANEL DOWN OVER THE LOWER PANEL AND SECURE WITH ADHESIVE *

CCW QUICKDRAIN DRAINAGE COMPOSITE – SECURE TO WALL OR WATERPROOFING WITH ADHESIVE *

WRAP FABRIC TO BACK OF CCW–QUICKDRAIN AND SECURE WITH CCW–DRAIN–GRIP OR CCW–704 MASTIC *

CONCRETE FOOTING

* CCW DRAIN–GRIP, CCW MIRABOND OR CCW–702 OR ANY COMPATIBLE ADHESIVE

CARLISLE

SPREAD FOOTING DETAIL

Figure 11B

Appendix “A”

STANDARD GRADING AND CONSTRUCTION SPECIFICATIONS

Appendix “A”

STANDARD GRADING AND CONSTRUCTION SPECIFICATIONS

These specifications present the usual and minimum requirements for projects on which C.W. La Monte Company is the geotechnical consultant. No deviation from these specifications will be allowed, except where specifically superseded in the preliminary geology and soils report or in other written communication signed by the Soils Engineer or Engineering Geologist of record.

GENERAL

A. The Soils Engineer and Engineering Geologist is the Owner’s or Builders’ representative on the Project. For the purpose of these specifications, participation by the Soils Engineer includes that observation performed by any person or persons employed by, and responsible to, the licensed Civil Engineer signing the soils reports.

B. All clearing, site preparation, or earthwork performed on the project shall be conducted by the Contractor under the supervision of the Soils Engineer.

C. It is the Contractor’s responsibility to prepare the ground surface to receive the fills to the satisfaction of the Soils Engineer and to place, spread, mix, water, and compact the fill in accordance with the specifications of the Soils Engineer. The Contractor shall also remove all material considered unsatisfactory by the Soils Engineer.

D. It is also the Contractor’s responsibility to have suitable and sufficient compaction equipment on the job site to handle the amount of fill being placed. If necessary, excavation equipment will be shut down to permit completion of compaction. Sufficient watering apparatus will also be provided by the Contractor, with due consideration for the fill material, rate of placement, and time of year.

E. A final report shall be issued by the Soils Engineer attesting to the Contractor’s conformance with these specifications.

SITE PREPARATION

A. All vegetation and deleterious material shall be disposed of off site. This removal shall be concluded prior to placing fill.

B. Soil, alluvium, or bedrock materials determined by the Soils Engineer, as being unsuitable for placement in compacted fills shall be removed from the site. The Soils Engineer must approve any material incorporated as a part of a compacted fill.

C. After the ground surface to receive fill has been cleared, it shall be scarified, disced, or bladed by the Contractor until it is uniform and free from ruts, hollows, hummocks, or other uneven features which may prevent uniform compaction.

   The scarified ground surface shall then be brought to optimum moisture, mixed as required, and compacted as specified. If the scarified zone is greater than 12 inches in depth, the excess shall be removed and placed in lifts restricted to 6 inches.

   Prior to placing fill, the ground surface to receive fill shall be inspected, tested as necessary, and approved by the Soils Engineer.

D. Any underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipe lines, or others are to be removed or treated in a manner prescribed by the Soils Engineer and /or governing agency.

E. In order to provide uniform bearing conditions in cut-fill transition lots and where cut lots are partially in soil, colluvium, or un-weathered bedrock materials, the bedrock portion of the lot extending a minimum of 3 feet outside of building lines shall be over excavated a minimum of 3 feet and replaced with compacted fill.

COMPACTED FILLS

A. Any material imported or excavated on the property may be utilized in the fill, provided each material has been determined to be suitable by the Soils Engineer. Roots, tree branches, and other matter missed during clearing shall be removed from the fill as directed by the Soils Engineer.

B. Rock fragments less than 6 inches in diameter may be utilized in the fill, provided:

1. They are not placed in concentrated pockets.
2. There is a sufficient percentage of fine-grained material to surround the rocks.
3. The Soils Engineer shall supervise the distribution of rocks.

C. Rocks greater than 6 inches in diameter shall be taken off site, or placed in accordance with the recommendations of the Soils Engineer in areas designated as suitable for rock disposal.

D. Material that is spongy, subject to decay or otherwise considered unsuitable should not be used in the compacted fill.

E. Representative samples of material to be utilized as compacted fill shall be analyzed by the laboratory of the Soils Engineer to determine their physical properties. If any material other than that previously tested is encountered during grading, the appropriate analysis of this material shall be conducted by the Soils Engineer as soon as possible.

F. Material used in the compaction process shall be evenly spread, watered processed, and compacted in thin lifts not to exceed 6 inches in thickness to obtain a uniformly dense layer. The fill shall be placed and compacted on a horizontal plane, unless otherwise approved by the Soils Engineer.

G. If the moisture content or relative density varies from that required by the Soils Engineer, the Contractor should re-work the fill until the Soils Engineer approves it.

H. Each layer shall be compacted to 90 percent of the maximum density in compliance with the testing method specified by the controlling governmental agency. (In general, ASTM D-1557-91, the five-layer method will be used.)

If compaction to a lesser percentage is authorized by the controlling governmental agency because of a specific land use or expansive soils condition, the area to receive fill compacted to less than 90 percent shall either be delineated on the grading plan or appropriate reference made to the area in the soils report.

H. All fills shall be keyed and benched through all topsoil, colluvium, alluvium or creep material, into sound bedrock or firm material except where the slope receiving fill exceeds a ratio of five horizontal to one vertical, in accordance with the recommendations of the Soils Engineer.

I. The key for hillside fills should be a minimum of 15 feet in width and within bedrock or similar materials, unless otherwise specified in the soil report.

K. Subdrainage devices shall be constructed in compliance with the ordinances of the controlling governmental agency, or with the recommendations of the Soils Engineer or Engineering Geologist.

L. The contractor will be required to obtain a minimum relative compaction of 90 percent out to the finish slope face of fill slopes, buttresses, and stabilization fills. 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, or by any other procedure which produces the required compaction.

M. All fill slopes should be planted or protected from erosion or by other methods specified in the soils report.

N. Fill-over-cut slopes shall be properly keyed through topsoil, colluvium or creep material into rock or firm materials, and the transition shall be stripped of all soil prior to placing fill.

CUT SLOPES

A. The Engineering Geologist shall inspect all cut slopes at vertical intervals not exceeding 10 feet.

B. If any conditions not anticipated in the preliminary report such as perched water, seepage, lenticular or confined strata of a potentially adverse nature, unfavorably inclined bedding, joints or fault planes are encountered during grading, these conditions shall be analyzed by the Engineering Geologist and Soils Engineer, and recommendations shall be made to treat these problems.

C. Cut slopes that face in the same direction as the prevailing drainage shall be protected from slope wash by a non-erodible interceptor swale placed at the top of the slope.

Unless otherwise specified in the soils and geological report, no cut slopes shall be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies.

Drainage terraces shall be constructed in compliance with the ordinances of controlling governmental agencies, or with the recommendations of the Soils Engineer or Engineering Geologist.

GRADING CONTROL

A. Observation of the fill placement shall be provided by the Soils Engineer during the progress of grading.

B. In general, density tests should be made at intervals not exceeding 2 feet of fill height or every 500 cubic yards of fill placement. This criteria will vary, depending on soil conditions and the size of the job. In any event, an adequate number of field density tests shall be made to verily that the required compaction is being achieved.

C. Density tests may also be conducted on the surface material to receive fills as determined by the Soils Engineer.

D. All clean-outs, processed ground to receive fill, key excavations, subdrains, and rock disposals must be inspected and approved by the Soils Engineer or Engineering Geologist prior to placing any fill. It shall be the Contractor’s responsibility to notify the Soils Engineer when such areas are ready for inspection.

CONSTRUCTION CONSIDERATIONS

A. The Contractor shall provide necessary erosion control measures, during grading and prior to the completion and construction of permanent drainage controls.

B. Upon completion of grading and termination of inspections by the Soils Engineer, no further filling or excavating, including that necessary for footings, foundations, large tree wells, retaining walls, or other features shall be performed without the approval of the Soils Engineer or Engineering Geologist.

C. Care shall be taken by the Contractor during final grading to preserve any berms, drainage terraces, interceptor swales, or other devices of permanent nature on or adjacent to the property.

D. In the event that temporary ramps or pads are constructed of uncontrolled fill soils during a future grading operation, the location and extent of the loose fill soils shall be noted by the on-site representative of a qualified soil engineering firm. These materials shall be removed and properly recompacted prior to completion of grading operations.

E. Where not superseded by specific recommendations presented in this report, trenches, excavations, and temporary slopes at the subject site shall be constructed in accordance with section 1541 of Title 8, Construction Safety Orders, issued by OSHA.

APPENDIX " B"

UNIFIED SOIL CLASSIFICATION CHART

SOIL DESCRIPTION

I . COARSE GRAINED: More than half of material is larger than No. 200 sieve size.

GRAVELS: More than half of coarse fraction is larger than No. 4 sieve size but smaller than 3".

	GROUP SYMBOL	TYPICAL NAMES
CLEAN GRAVELS	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
	GP	Poorly graded gravels, gravel sand mixtures, little or no fines
GRAVELS WITH FINES (Appreciable amount of fines)	GM	Silty gravels, poorly graded gravel- sand-silt mixtures
	GC	Clayey gravels, poorly graded gravel sand, clay mixtures.

SANDS: More than half of coarse fraction is smaller than No. 4 sieve size

CLEAN SANDS	SW	Well graded sand, gravelly sands, little or no fines
	SP	Poorly graded sands, gravelly sands, little or no fines
SANDS WITH FINES (Appreciable amount of fines	SM	Silty sands, poorly graded sand and silty mixtures.
	SC	Clayey sands, poorly graded sand and clay **mixtures**

II. FINE GRAINED: More than half of material is smaller than No. 200 sieve size

SILTS AND CLAYS	ML	Inorganic silts and very fine sands, rock flour, sandy silt - or clayey-silt with slight plasticity.
Liquid Limit Less than 50	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silt
Liquid Limit greater than 50	CH	Inorganic clays of high plasticity, fat clays.
	OH	Organic clays of medium to high plasticity.
HIGHLY ORGANIC SOILS	PT	Peat and other highly organic soils.