Appendix D

Preliminary Geotechnical Investigation,
Proposed Commercial Development,
Collier Avenue

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April 25, 2021

JONATHAN L. ZANE ARCHITECTURE
958 N. LA CADENA DRIVE
COLTON, CALIFORNIA 92324

SUBJECT: **PRELIMINARY GEOTECHNICAL INVESTIGATION**
Proposed Commercial Development
COLLIER AVENUE
APN'S 377-190-002, 377-190-003, 377-190-004
LAKE ELSINORE, CALIFORNIA 92530
Work Order No. 0612101.00

Dear Mr. Zane:

Pursuant to your authorization, a preliminary geotechnical investigation was conducted on the subject site in accordance with the 2019 California Building Code, Section 1803.5.11. Attached as **Plate 1**, the **Geotechnical Map** is a reduced image of a Google Earth image, the approximate location of our exploration borings and pertinent geotechnical information.

Scope of Work

The scope of work performed for this study included the following:

1. Onsite observation and documentation of existing site geometry with respect to the location of the proposed Starbucks.

2. Advancement of two (2) exploratory borings to the total depth explored of 51.5.0-ft (B-1) below the ground surface (bgs) for sample recovery for laboratory testing and observation of subsurface conditions.

3. Engineering analysis of test results to develop specifications for grading and preliminary foundation design.

4. Research of Geologic literature to develop design specifications for hazards such as seismic shaking and related effects.

5. Preparation of report of findings, including conclusions and recommendations for grading and minimum foundation design.

Introduction

This investigation has been conducted resulting from a 2019 California Building Code Chapter 18 requirement for preliminary geotechnical investigation being conducted for all projects in Seismic Category D. This investigation will address geotechnical conditions existing on the site as they may pertain to the proposed commercial development on the subject parcel. It is our understanding that the foundations are anticipated to consist of continuous spread and column footings to carry structural loads, otherwise typical light weight commercial construction will be utilized. Contained herein are preliminary recommendations for foundation design for the proposed construction.

Site Description

The proposed Building will be constructed on the northwest portion of the site, south of Collier Avenue in the City of Lake Elsinore, Riverside County, California. The geographical relationships of the site and surrounding area are depicted on our Site Location Map, **Figure 1**.

At the time of our investigation, the site was undeveloped and nearly clear of vegetation. Topographically, the area slopes to the south at approximately 5%. Drainage is accomplished by sheetflow to the south toward Minthorn Street. Overall relief onsite is approximately 15-ft.

Proposed Development

The proposed development consists of a Commercial Building which will be constructed on the northwest portion of the site. Please refer to **Plate 1, Geotechnical Map**, for proposed site geometry and location of the adjacent existing buildings, streets, and proposed Commercial Building development.

Field Work

Field work on the site consisted of observation and logging of two (2) exploratory borings advanced with a Mobile B-60 truck mounted drill rig. Representative bulk and in-situ samples of earth materials were obtained for laboratory testing and observing the conditions of the soils on the site. Subsurface exploration of the subject site was performed on March 31, 2020 and the exploratory boring logs are presented in **Appendix B**. The approximate locations of our exploratory borings are presented on our **Geotechnical Map, Plate 1**. Observation and sampling of the exploratory borings were performed by our field personnel, who logged alluvial soils overlying bedrock to the total depth explored of 51.5-ft bgs (B-1).

Laboratory Testing

The results of laboratory testing are presented in **Appendix C**. It should be noted test results are preliminary and generally representative for the purposes of demonstrating feasibility of design for proposed construction. Additional testing recommended by this report may result in changes of minimum design requirements.

Subsurface Conditions

The USGS Preliminary Geologic Map of the Elsinore 7.5 Minute Quadrangle (Morton, Weber, 2003) indicates the formational earth materials underlying the site to be late Holocene-age young alluvial channel deposits (map symbol Qyv_a) and bedrock composed of Phyllite (Map Symbol – Mzp). A brief description of the geologic units underlying the site that are considered pertinent to proposed development are: "Young alluvial-channel deposits, arenaceous, Fluvial deposits along valley floors. Consists of unconsolidated sand, silt, and clay-bearing alluvium". Materials exposed on site are described below and in more detail in **Appendix B - Exploratory Boring Logs**.

Young Alluvial Channel Deposits (Map Symbol – Qya_a)

Alluvial soils were encountered at shallow depths across the subject site and extended to 30-ft bgs. This unit in the upper 10-ft, for the most part, consists of a brown silty Sand (SM) that can be described as, fine to coarse sand, moist, to very moist, micaceous in part, loose in upper 10-ft. Below 10-ft the Alluvial soils encountered were silty Sands, sandy Silts, sandy Clays, and clayey Sands with occasional 1-2-inch-thick coarse sand layers with minor gravel. The relative density of the Alluvium increased with depth. The silt and clay layers were medium stiff to stiff as measured by sampler penetration blow counts.

Phyllite (Map Symbol – Mzp)

(Mesozoic)—Fissile black phyllite. Commonly has sheen produced by very fine-grained white mica on surface; locally contains small elongate prisms of fine-grained white mica, which may be pseudomorphs after chiastolite bedrock was encountered at a depth of approximately 30 to 35-ft on the northerly portion of the subject site and extended to the full depth explored of 51.5-ft bgs. This unit consists of bedrock that excavates as a grey silty sandy Gravel (SM/GM) that can be described as medium to coarse silty sandy gravel, moist, with angular particles. The bedrock was very dense as measured by sampler penetration blow counts.

Groundwater

Groundwater was not encountered within our exploratory borings, which were advanced to a maximum depth of 51.5.0-ft bgs. Mottling, often indicative of past high groundwater, was observed within the exploratory boring at a depth of 30-ft Bgs at the bedrock-alluvial interface. Regional high groundwater is mapped at greater than 150-ft bgs in the vicinity of the subject site (EMWD, 2004) The historic groundwater in the area has been as shallow as 10-ft (Waring, G.A. 1919).

Minor fluctuations can and will likely occur in moisture or free water content of the soil owing to lake level, rainfall, and irrigation over time.

Excavation Characteristics

We anticipate that the onsite alluvial soils can be excavated with moderate ease to the proposed depths utilizing conventional grading equipment in proper working condition.

Seismicity

There are no potentially active or active faults possibly transecting the site (Morton, Weber, 2003). The subject site is not located within the presently defined boundaries of a State of California Alquist-Priolo Earthquake Fault Zone (Hart, 2000) and a County of Riverside fault hazard zone. The subject site is located in the Elsinore Basin, "The Elsinore Basin is dominated by the Elsinore graben, a down dropped block between the Glen Ivy fault zone and the Wildomar fault zone located to the north and south of Lake Elsinore, respectively. Major faults zones in the Elsinore Basin include the Glen Ivy fault zone, which includes the Glen Ivy fault, the Freeway fault and the Sedco fault, and the Wildomar fault zone, which includes the Wildomar fault, the Rome Hill fault, and the Willard fault.

Active fault zones regional to the site include the Glen Ivy fault, the Wildomar fault, the San Andreas fault (San Bernardino segment), the Elsinore fault (San Jacinto Valley segment), and the San Jacinto, (San Bernardino Segment). The following table lists the known faults that would have the most significant impact on the site:

FAULT	MAXIMUM PROBABLE EARTHQUAKE (MOMENT MAGNITUDE)	SLIP RATE	FAULT TYPE
Elsinore (Glen-Ivy) (3.5-km SW)	6.8	5 mm/year	A
San Andres (San Bernardino) (47-km NE)	7.2	25 mm/year	A
San Jacinto (San Jacinto Valley Segment) (32-km NE)	7.0	24 mm/year	A
San Jacinto (San Bernardino Segment) (38-km NE)	7.0	1 mm/year	B

2019 California Building Code (CBC) -Seismic Parameters:

Based on the geologic setting and soil conditions encountered, the soils underlying the site are classified as "Site Class D, "Stiff Soil Profile", according to the CBC. The seismic parameters according to the CBC are summarized in the USGS Design Maps Summary Report presented in **Appendix E**. The corresponding value for peak ground acceleration from the design response spectrum based on the 2019 CBC seismic parameters is **1.027g**.

SEISMIC EFFECTS

Ground Accelerations

The most significant earthquake to affect the property is a 7.5 Richter magnitude earthquake on the Elsinore fault zone. Based on Section 1803.5.12 of the 2019 California Building Code, peak ground accelerations modified for site class effects (PGA_M) of approximately **1.027g** are possible for the design earthquake. The seismic parameters according to the CBC are summarized in the USGS Design Maps Summary Report presented in **Appendix E**.

Ground Cracks

The risk of surface rupture because of active faulting is considered moderate based on the location of known active faulting near the site (Morton, Weber, 2003). Ground cracks can and do appear on sites for a variety of reasons including, but not limited to, strong seismic shaking, imperfections in subsurface strata (either man-made or natural), and the expansive nature of some soils near the ground surface. Therefore, the possibility of cracks at the ground surface for the life of the project cannot be eliminated.

Landslides

The subject property is located in an area of relatively flat terrain and no landslides have been mapped in the area (Morton, Weber, 2003). The risk of seismically induced landsliding to affect the proposed development is **low**.

Liquefaction

The site is within a State of California designated and mapped liquefaction hazard zone, the site is in a County of Riverside "Very High" liquefaction hazard zone. However, coupled with the absence of shallow groundwater, the indications of groundwater (mottling) at 30-ft Bgs, historic groundwater recorded at 10' Bgs (Waring, 1919), the medium dense to dense nature of the underlying alluvial materials, the shallow depth to bedrock (±30-ft), the very moist to wet condition of the alluvial soils and the recommendations for overexcavation and recompaction of the upper 10-ft of the building pad, it is our opinion that the potential for liquefaction is Low.

Seismically Induced Soil Settlement

The proposed footings are anticipated to be founded in a minimum of 10-ft of medium dense to dense engineered fill soils, underlain by medium dense to dense Alluvial deposits and shallow bedrock. The settlement potential, under seismic loading conditions for these materials following grading, in our opinion, is **Low**.

Seiches and Tsunami

Considering the location of the site in relation to large bodies of water, seiches and tsunamis **are not** considered potential hazards of the site (California Emergency Management Agency, 2021) and are "less than significant", (Draft Program EIR for the Lakeland Village MDP, 2014).

Rockfall Potential

The subject site is in an area of relatively flat terrain that is free of boulder outcroppings. The potential for rockfall is anticipated to be **negligible**.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

General

The development of the site as proposed is both feasible and safe from a geotechnical standpoint provided that the recommendations contained herein are implemented during design and construction.

1. It is our understanding that the proposed Commercial Building will be located in the northeasterly portion of the site as shown on **Plate 1, Geotechnical Map**.

2. Observation of excavations indicates that suitable material for support of fill and/or structures is near the surface on the site. Earth materials on the site are also suitable for use as compacted structural fill.

3. Observation, classification, and testing indicate that the near surface soils have a very low expansion potential (EI = 0) consisting of low plastic silty Sand (SM) and Sand (SP) with gravel. The underlying alluvial material is in interbedded with clayey Sands, sandy Silts and Silts.

4. Based on our exploratory borings, approximately ±30-ft of alluvial soils over bedrock underlie the subject site.

RECOMMENDATIONS

Site Grading

General

Based on our conversation with the developer it our understanding that the Commercial Building will be constructed as shown on **Plate 1, Geotechnical Map**, with access from Collier Avenue and Minthorn Street. Based on our subsurface investigation and recommendations contained herein we anticipate that the proposed building will be founded entirely in engineered fill soils. Owing to the flat nature of the subject site, no fill slopes are anticipated for site development. No retaining walls are indicated to achieve final grades of the proposed structures.

It is important to note that all imported soils must be observed and approved by the soil engineer prior to use as fill to verify compliance with project specifications and consistency with onsite soils with respect to expansion potential and structural contact pressure.

Site Specific Grading

A representative of this firm shall be present to observe the bottoms of all excavations. A representative of this firm shall be present during all fill placement operations to monitor and test as the earth materials are being placed. This observation and testing is intended to assure compliance with the recommendations of this report as well as project specifications as they relate to earthwork construction, County and State ordinances and Table 1705.6 of the 2019 California Building Code.

Within the building pad and in areas where structural fill is to be placed, all construction debris, loose undocumented fill and alluvial soils to a minimum depth of 10-ft below existing grade or 4 -ft below the bottom of any foundation, whichever is deepest, shall be overexcavated to competent earth, i.e., alluvial soils that is free of voids and roots as determined by the soils engineer. After overexcavation the proposed building pad will require recompaction. Overexcavation and recompaction of the pad should extend a minimum of 10-ft outside the building footprint or equal to the depth of overexcavation whichever is deeper. Deep root systems buried utility lines, or deeper areas of disturbance or undocumented fill may require deeper removals and should be evaluated during rough grading operations.

No structural fill shall be placed within the building areas or on any ground without first being observed by a representative of the company providing this report and then providing written certification that the ground is competent and prepared to receive fill.

Onsite soils derived from excavations will be suitable for use as structural fill provided, they are free of large rock (6" or larger) and organic debris or construction debris. Approved fill material should be placed in 6 to 8-inch loose lifts, brought to optimum moisture content, and compacted to a minimum of 90% of the maximum laboratory dry density, as determined by the ASTM D 1557-12 test method. No rocks larger than 6-inches in diameter should be used as fill material as they inhibit the compaction process. Rocks larger than 6-inches may be removed or crushed and used as fill material. Rocks larger than 6-inches that cannot be crushed, organic materials, asphaltic concrete or oil-bearing surface aggregate should be removed from the graded area and in the case of oil-bearing materials, removed and taken to an appropriate dump site that is designed to handle such.

All earthwork should be done in accordance with the specifications contained in **Appendix D**. Additionally, it will be the responsibility of the owner and or the contractor to provide this firm with schedule information for grading activities that require observation and testing. It is preferred that we have a minimum of 48 hours of notice for such.

Slope Construction

Slopes are not anticipated to achieve pad grade, However, cut and fill slopes constructed at a 2:1 (horizontal:vertical) slope ratio, to a maximum vertical height of approximately 10-ft, will be surficially and grossly stable if constructed in accordance with the recommendations presented in this

report and in **Appendix D** of this report. It is assumed that no slopes will be required to achieve pad grade.

A keyway should be established along the toe of any proposed fill slope. The outside edge of the keyway should be founded a minimum of 2-ft into observed and competent formation and inclined into the hillside at a minimum 2% gradient for a minimum width of 12'. The keyway excavations should expose alluvial valley deposits that are free of pinpoint pores and fine roots throughout the bottom area and up a minimum of 2 feet on all sides. Any loose soils or severely weathered formation should be completely removed in the keyway and by benching during rough grade operation.

The importance of proper compaction at the face of slope cannot be overemphasized. In order to achieve proper compaction to the slope face, one or more of the following methods should be employed by the contractor following implementation of typical slope construction guidelines; 1) track walk the slopes at grade, 2) grid roll the slopes, 3) use a combination of sheep foot roller and track walking.

Care should be taken to avoid spillage of loose materials down the face of any slope during grading. Loose fill on the face of the slope will require complete removal prior to shaping and or track walking. Proper seeding and planting of the slopes should follow as soon as practical to inhibit erosion and deterioration of the slope surfaces. Proper moisture control will enhance the long-term stability of the finish slope surface.

Bearing Value and Footing Geometry

A safe allowable bearing value of 1,800 psf for foundations embedded into observed competent fill soils. This value may be increased by 300 psf for each additional foot of width and by 500 psf for each additional foot of depth to a maximum allowable bearing capacity of 2,800 psf. These values may be increased by 33 percent to provide for lateral loads of short duration such as those caused by wind or seismic forces. Continuous footings, for single-story or for two-story or equivalent structures, should have a minimum width of 15-inches and depth of 18-inches into competent engineered fill and conform to the minimum criteria of the 2019 CBC for non-expansive soils (EI=<20). The use of isolated column footings is not discouraged, however, where utilized, should have a minimum embedment of 18-inches below lowest adjacent grade. The minimum distance of the bottom outside edge of all footings and any slope face shall be 5-ft. All footings should be embedded a minimum of 18-inches into observed competent engineered fill, regardless of depth below the adjacent ground surface. All foundations, particularly within and near the top of slopes, shall be extended to sufficient depth to provide a minimum horizontal clearance at the bottom face of the footing of at least H/3 where H is the slope height in feet (2019 CBC, sections 1808A.7.2 and 1808A.7.3).

Settlement

The bearing value recommended above reflects a total settlement of 0.5-inches and a differential settlement of 0.5-inches within a horizontal distance of 20-ft (L/480). Most of this settlement is expected to occur during construction and as the loads are being applied.

Concrete Slabs

All concrete slabs on grade should be 4-inches thick, minimum. They should be underlain by 2-inches of sand or approved non-expansive onsite materials. Imported or approved onsite materials may be utilized for this purpose. Contractors should be advised that when pouring during hot or windy weather conditions, they should provide large slabs with sufficiently deep weakened plane joints to inhibit the development of irregular or unsightly cracks. Also, 4-inch thick slabs should be jointed in panels not exceeding 8-ft in both directions to augment proper crack direction and development.

Moisture Barrier

When the intrusion of moisture through concrete slabs is objectionable, particularly with interior slabs where flooring is moisture sensitive, a vapor barrier should be installed onto the subgrade prior to the pouring of concrete. It should consist of a minimum 10-mil visqueen, protected from puncture with 2-inches of sand above and 2-inches of sand below. This is considered a minimum recommendation as there are other devices that provide as good as or better moisture protection. The project architect and or structural engineer may recommend alternative devices for moisture protection.

Reinforcement

From a Geotechnical standpoint, continuous footings should be reinforced with a minimum of two number 4 steel bar placed at the top and bottom. In no case, should the content of steel in concrete footings be less than the recommended minimums of the appropriate sections of the A.C.I. standards. Slabs should be reinforced with a minimum of number 3 steel bars placed at the center of thickness at 24-inch centers both ways (CBC 2019). These are considered minimums and additional requirements may be imposed by other structural engineering design requirements. In addition, at the completion of grading, testing of the near surface soils may indicate that different or more stringent reinforcing schedule minimums may be appropriate. Careful consideration should be given to the recommendations that will be contained in the final report of compaction test results and foundation design requirements.

Concrete

Based on corrosivity suite testing of the on-site soils, Type II Portland cement concrete can be utilized for the subject site. The percentage of soluble sulfate of the onsite soils is anticipated to be less than **ND (non-detect)**, which equates to a **Negligible** sulfate exposure per American Concrete Institute (ACI), 318, Table 4.3.1 (2005). Soluble sulfate content testing should be conducted within the building pads and subgrade soils at the completion of overexcavation and recompaction to confirm concentration of sulfite ions within the onsite earth materials.

Corrosivity test results indicated a saturated resistivity of **7,200** ohms/cm for the onsite soils, which indicates the onsite soils are **Moderately Corrosive** (NACE International, 1984). Laboratory analysis was performed by (LGC, Geoenviro, 2020). SoCal Professional Engineers does not practice corrosion engineering. If specific information or evaluation relating to the corrosivity of the

onsite or any import soil is required, we recommend that a competent corrosion engineer be retained to interpret or provide additional corrosion analysis and mitigation.

Corrosivity testing should also be conducted within the building pad at the completion of overexcavation and recompaction. SoCal Professional Engineers does not practice corrosion engineering. If specific information or evaluation relating to the corrosivity of the onsite or any import soil is required, we recommend that a competent corrosion engineer be retained to interpret or provide additional corrosion analysis and mitigation.

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

Lateral Loads

The bearing value of the soil may be increased by one third for short duration loading (wind, seismic). Lateral loads may be resisted by passive forces developed along the sides of concrete footings or by friction along the bottom of concrete footings. The value of the passive resistance for level ground may be computed using an equivalent fluid density of 250 pcf for level ground. The total force should not exceed 2,800 psf. A coefficient of friction of .30 may be used for the horizontal soil/concrete interface for resistance of lateral forces. If friction and passive forces are combined, then the passive values should be reduced by one third.

Cut/Fill Transitions

Based on the recommended overexcavation and recompaction of the proposed pad (see "Site Specific Grading" section), it is anticipated that any cut-to-fill transitions will be eliminated.

Oversize Rock

Oversize rock was not encountered during our subsurface investigation of the subject site. If any oversize material is generated during site development, it should be disposed of off-site, utilized in landscaping, or placed in an approved rock fill in accordance with **Appendix D** of this report.

Preliminary Structural Section

We recommend the following preliminary structural section for proposed parking and driveway areas for the subject site. The preliminary design of the pavement sections for the proposed concrete

parking, driveways and asphalt driveways is based on an assumed R-value test of 50. R-value testing should be conducted at the completion of rough grading to verify soils exposed at subgrade, and a final structural section should be recommended at that time. The recommended preliminary pavement sections are:

AREA	TI	PAVEMENT SECTION
Concrete Pavement Driveway	6.0	0.50' (6.0") PCC over 0.33'(4.0")
Concrete Pavement Parking	4.5	0.33'(4.0") PCC over 0.33'(4.0")
Asphalt Pavement Driveway	6.0	0.33'(4.0") AC over 0.5' (6.0") ABII
Asphalt Pavement Parking	4.5	0.25' (3.0") AC over 0.33' (4.0") ABII

AC – Asphalt Concrete
ABII – Class II Aggregate Base
PCC - Portland Cement Concrete
All PCC should be fiber mesh reinforced at a minimum

It is recommended that the subgrade materials be compacted to a depth of 1 foot below subgrade elevation and that both the subgrade materials and the ABII be compacted to 95% relative to the maximum density of the respective materials, as determined by ASTM D1557 laboratory tests. R-Value testing should be conducted on imported soils prior to their approval as structural fill material

Utility Trench Backfill

All trench excavations should be conducted in accordance with Cal-OSHA standards as a minimum. The soils encountered within our exploratory trenches are generally classified as Type "C" soil in accordance with the current CAL/OSHA excavation standards. Based upon a soil classification of Type "C", the temporary excavations should not be inclined steeper than 1.5:1 (h: v) for a maximum depth of 20-ft. For temporary excavations, deeper than 20-ft or for conditions that differ from those described for Type "C" in the CAL/OSHA excavation standards, the project geotechnical engineer should be contacted.

Utility trench backfill should be compacted to a minimum of 90 percent of the maximum dry density determined in laboratory testing by the ASTM D 1557-12 test method. It is our opinion that utility trench backfills consisting of onsite or approved sandy soils can best be placed by mechanical compaction to a minimum of 90 percent of the maximum dry density. The upper 1-ft of utility trench excavations located within pavement areas should be compacted to a minimum of 95 percent of the maximum dry density.

Fine Grading and Site Drainage

Fine grading of areas outside of the structures should be accomplished such that positive drainage exists away from all footings in accordance with 2019 CBC and local governing agency requirements. Run-off should be conducted in a non-erosive manner toward approved drainage devices per approved plans. No run-off should be allowed to concentrate and flow over the tops of slopes.

Construction

SoCal Professional Engineers, or a duly designated representative, should be present during all earthwork construction in accordance with the standard specifications contained at the back of this report, to test and or confirm the conditions encountered during this study. In addition, post earthwork construction monitoring should be conducted at the following stages:

- At the completion of final grading of the building pad so that a finished surface compaction test may be obtained. Moisture content near optimum will necessarily need to be maintained, both to maintain proper compaction and to prevent wind erosion of the pad.

- At the completion of foundation excavations, but prior to the placement of steel and or other construction materials in them. As a requirement of this report, the undersigned must, in writing, certify that the foundations meet the minimum requirements of this report and the building plans for depth and width along with the earth materials being the appropriate moisture content and compaction.

- Backfilling of over deepened footings with earth materials will not be allowed and must be poured with concrete. Consequential changes and differences may exist throughout the earth materials on the site. It may be possible that certain excavations may have to be deepened slightly if earth materials are found to be loose or weak during these observations.

- Any other pertinent post construction activity where soils are excavated or manipulated or relied upon in any way for the performance of buildings or hardscape features.

Supplemental Recommendations

If at any time during grading or construction on this site, conditions are found to be different than those indicated in this report, it is essential that the soil engineer be notified. The soil engineer reserves the right to modify in any appropriate way the recommendations of this report if site conditions are found to be different than those indicated in this report.

- The earth unit exposed at the surface is observed to be loose alluvial soils. It is moderately erosive. It is dense at shallow depths, on the order of 10-ft and water does not percolate well into the onsite compacted alluvial soils consisting of a silty sand.

- Cuts in the compacted building pads to 5-ft, or slightly more will stand vertical for normal time periods associated with construction of backcuts for fill slopes or retaining walls. Time periods for unsupported cuts 5-ft or greater vertical should be limited to 15 days in the non-rainy season and 10 days in the rainy season. Owing to the loose sandy nature of the onsite soil, caving may occur in shallow unsupported trenches outside the compacted building pad.

Construction Monitoring

Observation and testing by SoCal Professional Engineers is necessary to verify compliance with recommendations contained in this report and to confirm that the geotechnical conditions encountered

are consistent with those encountered. SoCal Professional Engineers should conduct construction monitoring during any fill placement and subgrade preparation prior to placement of fill or construction materials.

LIMITATIONS

Our investigation was performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable Geotechnical Engineers and Geologists practicing in this or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

The report is issued with the understanding that it is used only by the owner and it is the sole responsibility of the owner or their representative to ensure that the information and recommendations contained herein are brought to the attention of the architect, engineer, and appropriate jurisdictional agency for the project and incorporated into the plans; and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations contained herein during construction and in the field.

The samples taken and used for testing and the observations made are believed representative; however, soil and geologic conditions can vary significantly between test locations. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by **SoCal Professional Engineers**, or its assigns.

The findings of this report are valid as of the present date. However, changes in the condition of a property can occur with the passage of time, whether due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and revision as changed conditions are identified.

The firm that performed the geotechnical investigation for this project should be retained to provide testing observation services during construction to maintain continuity of geotechnical interpretation and to check that the recommendations presented herein are implemented during site grading, excavation of foundations and construction of improvements.

If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. Selection of another firm to perform any of the recommended activities or failure to retain the undersigned to perform the recommended activities wholly absolves **SoCal Professional Engineers**, the undersigned, and its assigns from all liability arising directly or indirectly from any aspects of this project.

We appreciate the opportunity to be of service. Limitations and conditions contained in reference documents are considered in full force and applicable. If you have any questions, please do not hesitate to call our office.

Respectfully submitted,

SoCal Professional Engineers

KHALED FARAH

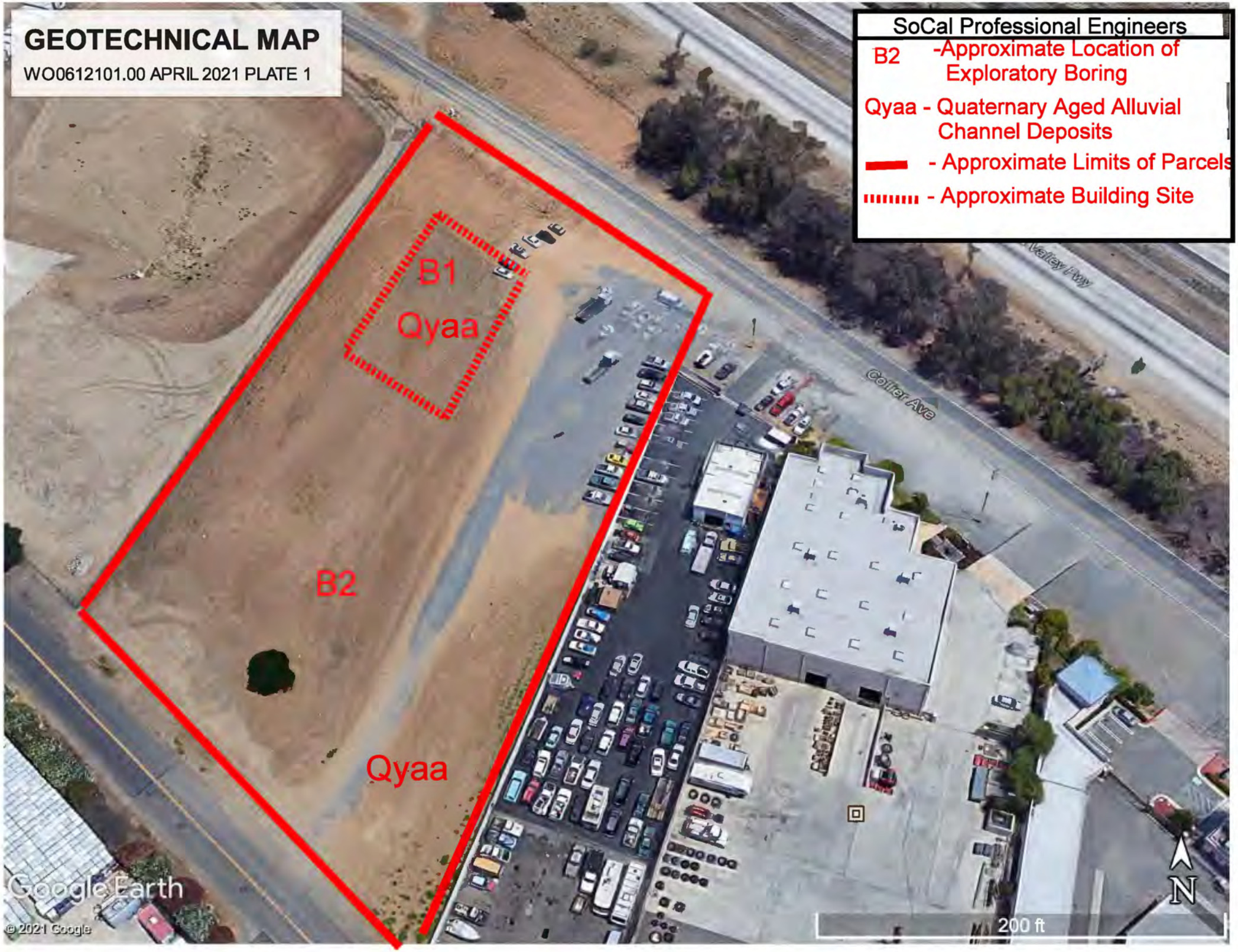
Digitally signed by KHALED FARAH
DN: cn=KHALED FARAH, o=SOCAL PROFESSIONAL ENGINEERS, email=info@socal-pe.com, c=US
Date: 2021.04.27 17:33:12 -07'00'

Khaled S. Farah, RCE 83128
Civil Engineer,

ATTACHMENTS

Figure 1 - Site Location Map
Plate 1 - Geotechnical Map
Appendix A - References
Appendix B - Exploratory Boring Logs
Appendix C - Laboratory Test Results
Appendix D – Standards of Grading
Appendix E – ASCE 7 Hazard Report


SITE MAP MAP
WO0612101.00 APRIL 2021 FIGURE 1
Legend
Aggregate Crusher Specialists Inc
SITE
Collier Ave
W Minthorn St
Tennessee Valley Hwy
Google Earth
© 2021 Google
200 ft
N


GEOTECHNICAL MAP
WO0612101.00 APRIL 2021 PLATE 1
SoCal Professional Engineers
B2 -Approximate Location of Exploratory Boring
Qyaa - Quaternary Aged Alluvial Channel Deposits
- Approximate Limits of Parcels
- Approximate Building Site
B1
Qyaa
B2
Qyaa
Collier Ave
Valley Pwy
Google Earth
© 2021 Google
200 ft
N

APPENDIX A

References

REFERENCES

California Building Standards Commission (CBSC), 2019, "2019 California Building Code, California Code of Regulations, Title 24, Part 2, Volume 2 of 2".

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APPENDIX B

Exploratory Boring Logs

LOGGED BY:JRH	METHOD OF EXCAVATION: MOBILE B60 TRUCK MOUNTED DRILL RIG EQUIPPED W/ 6" HOLLOW STEM AUGERS ELEVATION: ±	DATE OBSERVED:3/31/2020 LOCATION: SEE GEOTECHNICAL MAP

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)	BORING LOG NO._1A____ DESCRIPTION	SOIL TEST
					6.6		VERY DENSE, MOIST, MOTTLED	
		50-2"						
45								
					8.1		**SANDY GRAVEL (GM):** GRAY , COARSE GRAINED, DENSE, MOIST, MICACEOUS	
		50-3"						
50								
					5.1			
		50-3"						
							TOTAL DEPTH 51.5-FT **NO GROUND WATER**	
15								
20								
25								
30								
35								
40								

JOB NO:0612101.00	LOG OF BORING	FIGURE: B-1A

LOGGED BY:JRH	METHOD OF EXCAVATION: Mobile B60 TRUCK MOUNTED DRILL RIG EQUIPPED W/ 6" HOLLOW STEM AUGERS ELEVATION:	DATE OBSERVED:03/31/2021 LOCATION: SEE GEOTECHNICAL MAP

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)	BORING LOG NO._1___ DESCRIPTION	SOIL TEST
				V			**YOUNG ALLUVIALCHANNEL DEPOSITS(Qyaa)**	
				I			**SILTY SAND (SM):** BROWN ,FINE TO COARSE, UNCONSOLIDATED	MAXIMUM DENSITY/OPTIMUM MOISTURE
				I			MOIST AND LOOSE,	CONTENT, EXPANSION,
				I				CORROSIVITY SUITE, SEIVE ANALYSIS
5				Λ	9.1	92.3		27% PASSING #200
							SILTY SAND (SM): RED BROWN ,FINE TO COARSE, LOOSE	
		8					MOIST	
10								
							SILTY SAND (SM): RED BROWN ,FINE TO COARSE,	
		33			11.4	98.6	MOIST AND LOOSE,	
15								
							SILTY SAND (SM): RED BROWN, FINE TO MEDIUM GRAINED, MINOR GRAVEL	36% PASSING #200
					12.1		MOIST, MEDIUM DENSE	
		13						
20								
					10.8		**SILTY SAND (SM):** RED BROWN, FINE GRAINED,	
		9					MOIST, MEDIUM DENSE	
25								
							SANDY SILT(ML): BROWN , FINE GRAINED, MICACOUS	72% PASSING #200
					15.2		STIFF, VERY MOIST,	
		13						
30								
							SANDY GRAVEL (GM): GRAY , COARSE GRAINED, DENSE, MOIST, MOTTLED,	4% PASSING #200
					6.8			
		48						
35								
							SANDY GRAVEL (GM): GRAY , COARSE GRAINED, DENSE, MOIST,	
					5.0			
		50-4"						
40								
							SANDY GRAVEL (GM): GRAY , COARSE GRAINED, DENSE, MOIST, MOTTLED,	

JOB NO:0612101.00	LOG OF BORING	FIGURE: B-1

LOGGED BY:JRH	METHOD OF EXCAVATION: Mobile B60 TRUCK MOUNTED DRILL RIG EQUIPPED W/ 6" HOLLOW STEM AUGERS ELEVATION:	DATE OBSERVED:03/31/2021 LOCATION: SEE GEOTECHNICAL MAP

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)	BORING LOG NO._2____ DESCRIPTION	SOIL TEST
				V			**YOUNG ALLUVIALCHANNEL DEPOSITS(Qyaa)**	
				I			**SILTY SAND (SM):** BROWN ,FINE TO COARSE, UNCONSOLIDATED	
				I			MOIST AND LOOSE,	
5				Λ				
							SILTY SAND (SM): RED BROWN ,FINE TO COARSE, LOOSE	
		12					MOIST	
10								
							SILTY SAND (SM): RED BROWN ,FINE TO COARSE,	
					10.5		MOIST AND LOOSE,	
		18						
15								
							SILTY SAND (SM): RED BROWN, FINE TO MEDIUM GRAINED, MINOR GRAVEL	
					12.1		MOIST, MEDIUM DENSE	
		13						
20							**TOTAL DEPTH - 15.5FT** **NO GROUNDWATER**	
25								
30								
35								
40								

JOB NO:0612101.00	LOG OF BORING	FIGURE: B-2

APPENDIX C

Laboratory Test Results

LABORATORY TESTING

A. Classification

Soils were visually classified according to the Unified Soil Classification System. Classification was supplemented by index tests such as maximum density and optimum moisture content.

B. Expansion Index

An expansion index test was performed on a representative sample of the onsite soils remolded and tested under a surcharge of 144 lb/ft^2, in accordance with ASTM D-4829-11. The test results are presented on **Figure C-1, Table I.**

C. Maximum Density/Optimum Moisture Content

A maximum density/optimum moisture content relationship was determined for typical sample of the onsite soils. The laboratory standards used were ASTM 1557-Method A. The test results are summarized on **Figure C-1, Table II** and laboratory results are presented on **Figure C-2.**

D. Particle Size Determination

Particle size determination, consisting of mechanical analyses (sieve) was performed on representative samples of the onsite soils in accordance with ASTM D 422-63 and CAL TEST 202. The test results are shown on **Figures C-3 & C-4.**

E. Corrosivity Suite

Corrosivity suite testing including resistivity, soluble sulfate content, pH and chloride content were performed on a representative sample of the onsite soils. The laboratory standards used were CTM 643, CTM 417 & CTM 422. The test results are presented on **Figure C-1, Table III**.

TABLE I EXPANSION INDEX		
TEST LOCATION	EXPANSION INDEX	EXPANSION POTENTIAL
B-1 @ 0-5 ft	0	Non-Expansive

TABLE II MAXIMUM DENSITY/OPTIMUM MOISTURE RELATIONSHIP ASTM D 1557		
TEST LOCATION	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)
B-1 @ 0-5 ft	121.5	11.5

TABLE III CORROSIVITY SUITE				
TEST LOCATION	SATURATED RESISTIVITY	pH	CHLORIDE CONTENT	SULFATE CONTENT
B-1 @ 0-5 ft by LGC	7,200	8.7	28 ppm	ND(non-detect) ppm

Figure C-1

COMPACTION TEST REPORT

Curve No.: 2.60

Project No.: 0612101.00
Project: COLLIER

Date: 4/15/2021

Location: B-1
Elev./Depth: 0-5ft
Remarks:

Sample No.

MATERIAL DESCRIPTION

Description: BRN SILTY SAND

Classifications - CL/SC USCS:

AASHTO:

Nat. Moist. =
Liquid Limit =
% > No.4 = %

Sp.G. = 2.65
Plasticity Index =
% < No.200 =

TEST RESULTS	
Maximum dry density =	121.5
Optimum moisture =	11.5

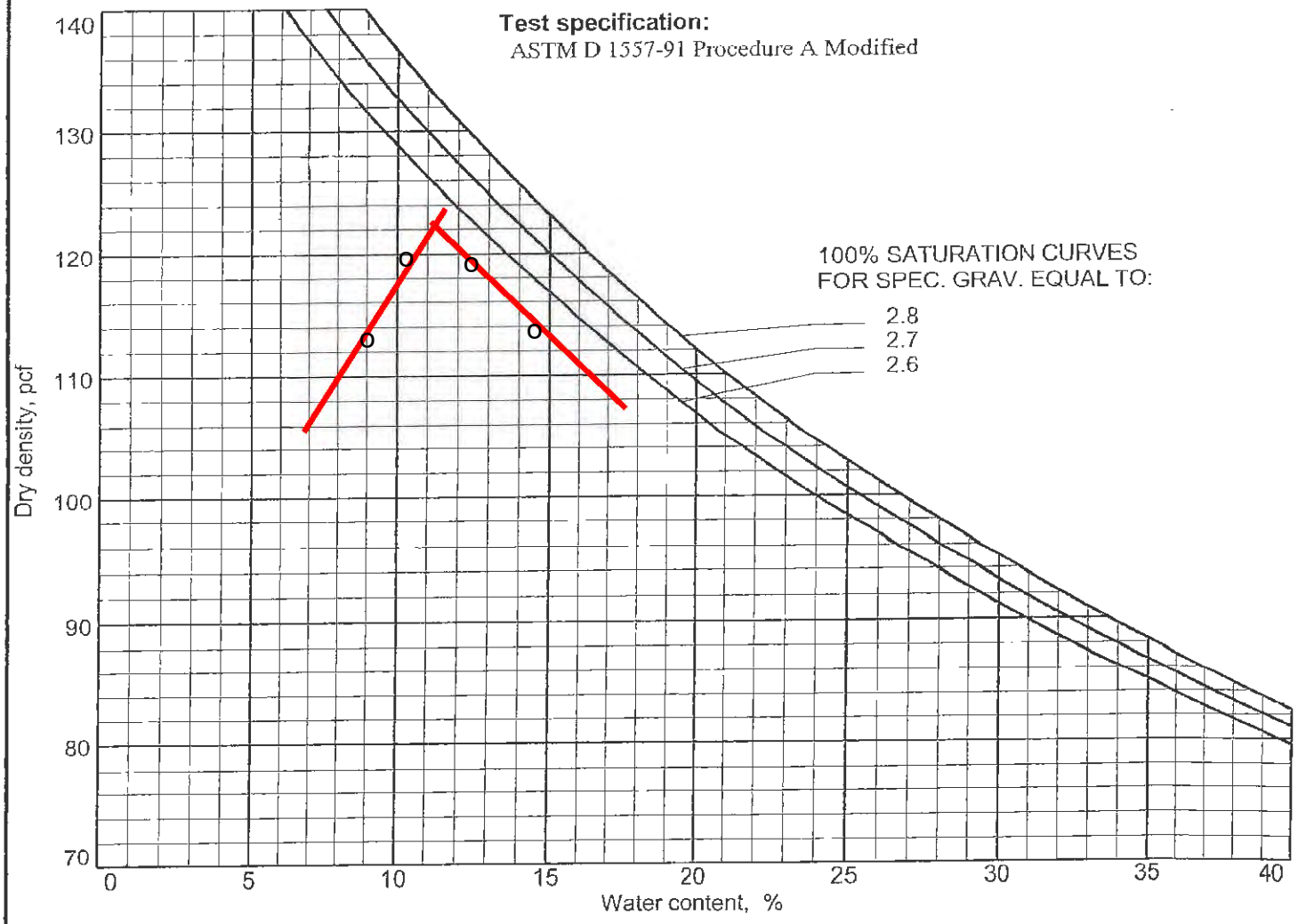
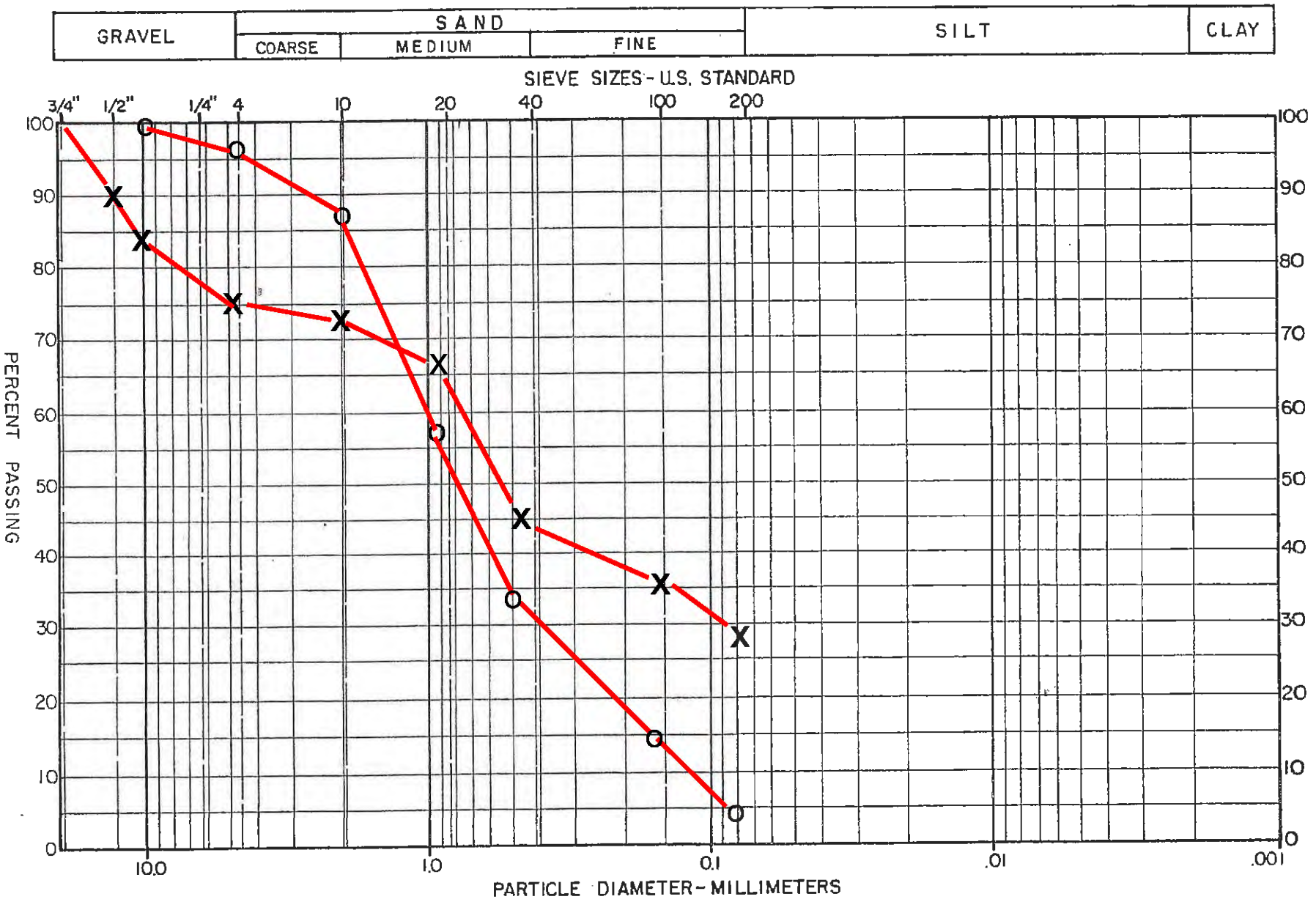


Figure C-2

JOB NO: 0612101.00

GRAIN SIZE DISTRIBUTION

FIGURE NO: C-3

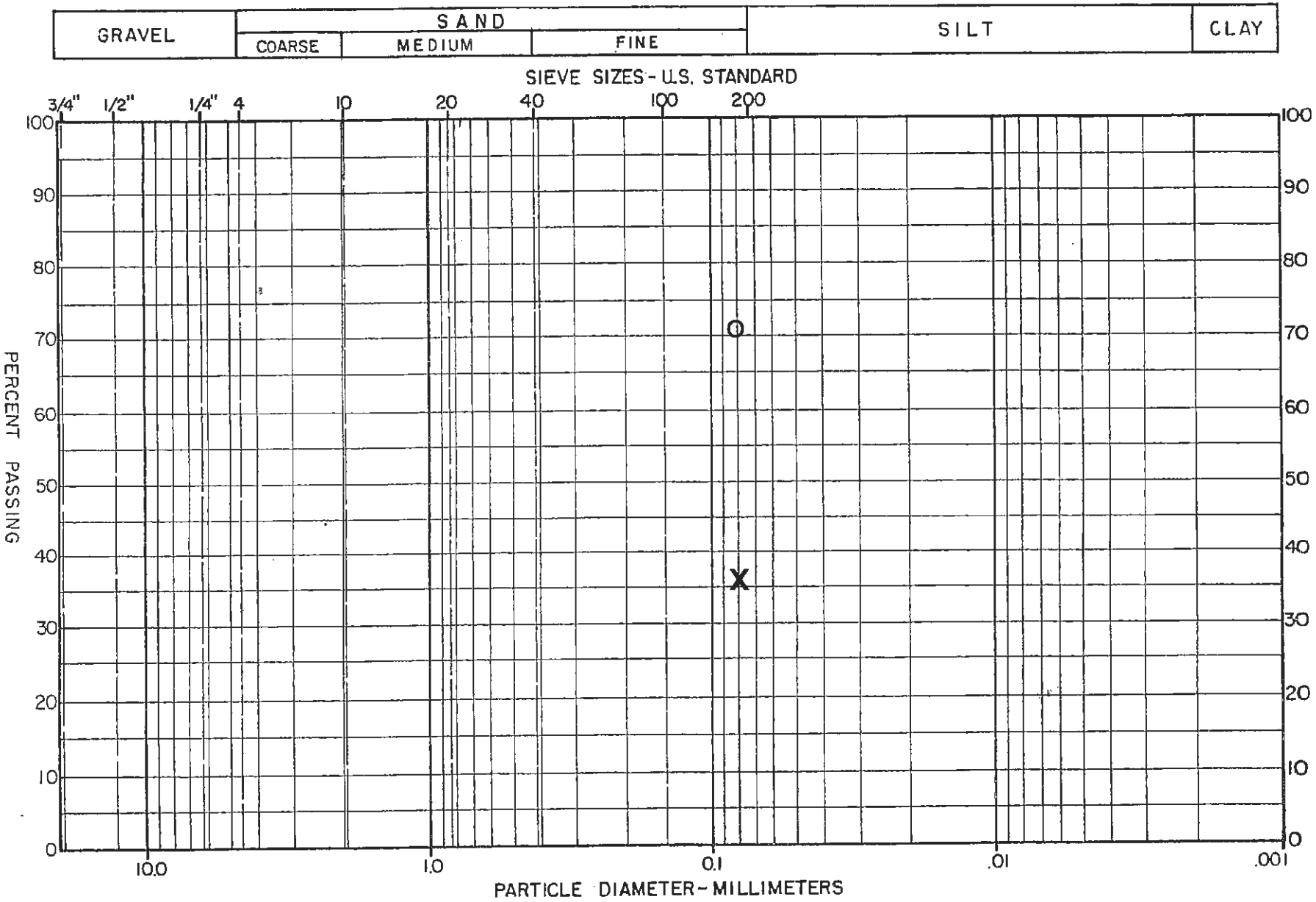


BORING NO.	DEPTH, FT.	SYMBOL	LIQUID LIMIT	PLASTIC INDEX	CLASSIFICATION
B-1	0-5ft	X			SM
B-1	30ft	O			GM

JOB NO: 0612101.00

GRAIN SIZE DISTRIBUTION

FIGURE NO: C-4



BORING NO.	DEPTH, FT.	SYMBOL	LIQUID LIMIT	PLASTIC INDEX	CLASSIFICATION
B-1	15ft	X			SM
B-1	25ft	O			ML

APPENDIX D

Standards of Grading

STANDARD GRADING AND EARTHWORK SPECIFICATIONS

These specifications present **SoCal Professional Engineers,** standard recommendations for grading and earthwork.

No deviation from these specifications should be permitted unless specifically superseded in the geotechnical report of the project or by written communication signed by the Soils Consultant. Evaluations performed by the Soils Consultant during the course of grading may result in subsequent recommendations which could supersede these specifications or the recommendations of the geotechnical report.

1.0 GENERAL

1.1 The Soils Consultant is the Owner's or Developer's representative on the project. For the purpose of these specifications, observations by the Soils Consultant include observations by the Soils Engineer, Soils Engineer, Engineering Geologist, and others employed by and responsible to the Soils Consultant.

1.2 All clearing, site preparation, or earthwork performed on the project shall be conducted and directed by the Contractor under the allowance or the supervision of the Soils Consultant.

1.3 The Contractor should be responsible for the safety of the project and satisfactory completion of all grading. During grading, the Contractor shall remain accessible.

1.4 Prior to the commencement of grading, the Soils Consultant shall be employed for the purpose of providing field, laboratory, and office services for conformance with the recommendations of the geotechnical report and these specifications. It will be necessary that the Soils Consultant provide adequate testing and observations so that he may provide an opinion as to determine that the work was accomplished as specified. It shall be the responsibility of the Contractor to assist the Soils Consultant and keep him apprised of work schedules and changes so that he may schedule his personnel accordingly.

1.5 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes, agency ordinances, these specifications, and the approved grading plans. If, in the opinion of the Soils Consultant, unsatisfactory conditions, such as questionable soil, poor moisture condition, inadequate compaction, adverse weather, etc, are resulting in a quality of work less then required in these specifications, the Soils Consultant will be empowered to reject the work and recommend that construction be stopped until the conditions are rectified.

1.6 It is the Contractor's responsibility to provides safe access to the Soils Consultant for testing and/or grading observation purposes. This may require the excavation of the test pits and/or the relocation of grading equipment.

1.7 A final report shall be issued by the Soils Consultant attesting to the Contractor's conformance with these specifications.

2.0 SITE PREPARTION

2.1 All vegetation and deleterious material shall be disposed of off-site. This removal shall be observed by the Soils Consultant and concluded prior to fill placement.

2.2 Soil, Alluvium or bedrock materials determined by the Soils Consultant as being unsuitable for placement in compacted fills shall be removed from the site or used in open areas as determined by the Soils Consultant. Any material incorporated as a part of a compacted fill must be approved by the Soils Consultant prior to fill placement.

2.3 After the ground surface to receive fill has been cleared, it shall be scarified, disced and/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 twelve inches in depth, the excess shall be removed and placed in lifts not to exceed six inches or less.

Prior to placing fill, the ground surface to receive fill shall be observed, tested, and approved by the soils consultant.

2.4 Any underground structures or cavities 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 Consultant.

2.5 In cut-fill transitions lots and where cut lots are partially in soil, colluvium or unweathered bedrock materials, in order to provide uniform bearing conditions, the bedrock portion of the lot extending a minimum of 5 feet outside of building lines shall be over excavated a minimum of 3 feet and replaced with compacted fill. Greater over excavation could be required as determined by Soils Consultant. Typical details are attached.

3.0 COMPACTED FILLS

3.1 Material to be placed as fill shall be free of organic matter and other deleterious substances, and shall be approved by the Soils Consultant. Soils of poor gradation, expansion, or strength characteristics shall be placed in areas designated by Soils Consultant or shall be mixed with other soils to serve as satisfactory fill material, as directed by the Soils Consultant.

3.2 Rock fragments less than six inches in diameter may be utilized in the fill, provided

- They are not placed or nested in concentrated pockets
- There is sufficient amount of approved soil to surround the rocks
- The distribution of rocks is supervised by the Soils Consultant

3.3 Rocks greater than twelve inches in diameter shall be taken off-site, or placed in accordance with the recommendations of the Soils Consultant, areas designated as suitable for rock disposal (A typical detail for Rock Disposal is attached.)

3.4 Material that is spongy, subject to decay, or otherwise considered unsuitable shall not be used in the compacted fil.

3.5 Representative samples of materials to be utilized as compacted fill shall be analyzed by the laboratory of the Soils Consultant to determine the 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 Consultant before being approved as fill material.

3.6 Material used in the compacting process shall be evenly spread, watered, processed, and compacted in thin lifts not to exceed six 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 Consultant.

3.7 If the moisture content or relative compaction varies from that required by the Soils Consultant, the Contractor shall rework the fill until it has been approved by the Soils Consultant.

3.8 Each layer shall be compacted to at least 90 percent of the maximum density in compliance with the testing method specified by the controlling government agency or ASTM 1557-12, whichever applies.

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

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

3.10 The key for side hill fills shall be a minimum width of 15 feet within bedrock or firm materials, unless otherwise specified in the geotechnical report, (see detail attached.)

3.11 Sub drainage devices shall be constructed in compliance with the ordinances of the controlling governmental agency, or with the recommendations of the Soils Consultant. (Typical Canyon Subdrain details are attached.)

3.12 The contractor will be required to obtain a minimum relative compaction of at least 90 percent out to the finish slope face of fill slopes, buttresses, and stabilization fills. This may be achieved by either over building 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 approved by the Soils Consultant.

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

3.14 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 soils prior to placing fill (see attached detail.)

4.0 CUT SLOPES

4.1 The Soils Consultant shall inspect all cut slopes at vertical intervals exceeding five feet.

4.2 If any conditions not anticipated in the geotechnical report such as perched water, seepage, lenticular or confined strata of a potentially adverse nature, unfavorably inclined bedding, joint or fault planes encountered during grading, these conditions shall be analyzed by the Soils Consultant, and recommendations shall be made to mitigate these problems (Typical details for stabilization of a portion of a cut slope are attached.)

4.3 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.

4.4 Unless otherwise specified in the geotechnical report, no cut sloped shall be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies.

4.5 Drainage terraces shall be constructed in compliance with the ordinances of controlling governmental agencies, or with the recommendations of the Soils Consultant.

5.0 TRENCH BACKFILLS

5.1 Trench excavation shall be inspected prior to structure placement for competent bottom.

5.2 Trench excavations for utility pipes shall be backfilled under the supervision of the Soils Consultant.

5.3 After the utility pipes has been laid, the space under and around the pipe shall be backfilled with clean sand or approved granular soil to a depth of at least one foot over the top of the top of the pipe. The sand backfill shall be uniformly jetted into place before the controlled backfill is placed over the sand.

5.4 The on-site materials, or other soils approved by the Soils Consultant, shall be watered and mixed, as necessary, prior to placement in lifts over the sand backfill.

5.5 The controlled backfill shall be compacted to at least 90 percent of the maximum laboratory density, as determined by the ASTM D1557-12 or the controlling governmental agency.

5.6 Field density tests and inspection of the backfill procedures shall be made by the Soils Consultant during backfilling to see that proper moisture content and uniform compaction is being maintained. The contract shall provide test holes and exploratory pits as required by the Soils Consultant to enable sampling and testing.

6.0 GRADING CONTROL

6.1 Inspection of the fill placement shall be provided by the Soils Consultant during the progress of grading.

6.2 In general, density tests should be made at intervals not exceeding two feet of fill height or every 500 cubic yards of fill placed. 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 verify that the required compaction is being achieved.

6.3 Density tests should be made on the native surface material to receive fill, as required by the Soils Consultant.

6.4 All clean-out, processed ground to received fill, key excavations, subdrains, and rock disposals should be inspected and approved by the Soils Consultant prior to placing any fill. It shall be the Contractor's responsibility to notify the Soils Consultant prior to placing any fill. It shall be the Contractor's responsibility to notify the Soils Consultant when such areas will be ready for inspection.

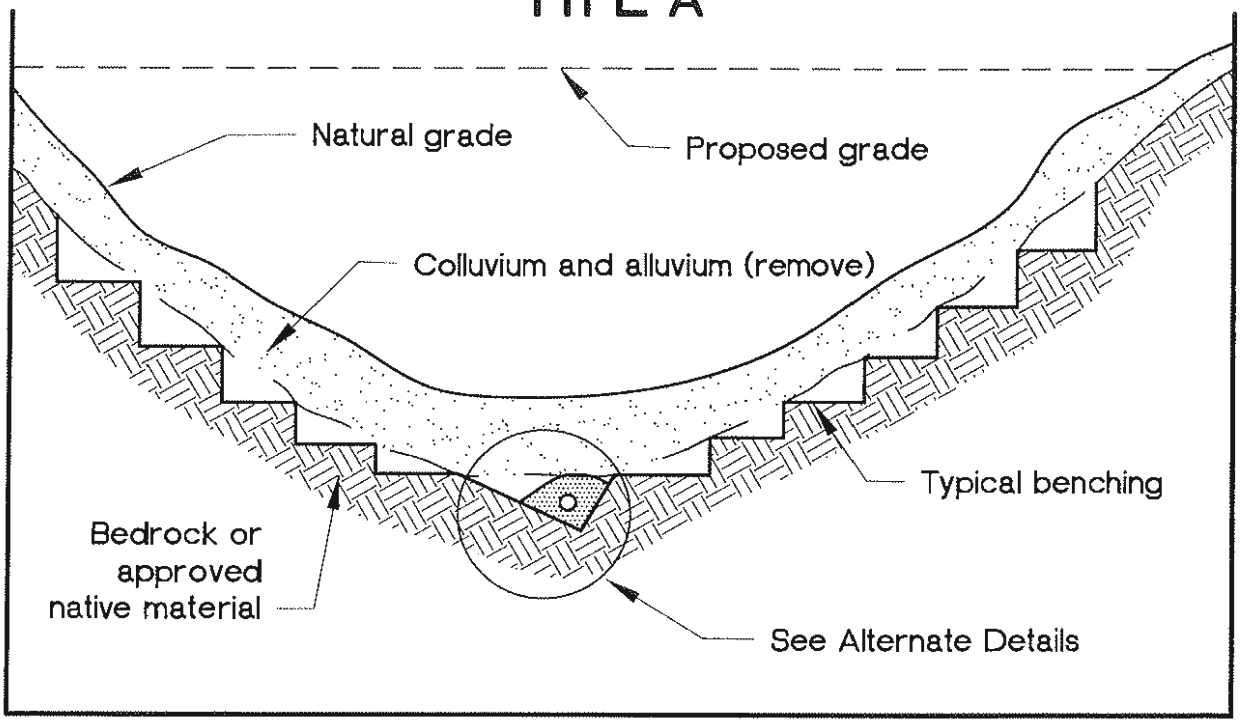
7.0 CONSTRUCTION CONSIDERATIONS

7.1 Erosion control measures, when necessary, shall be provided by the Contractor during grading and prior to the completion and construction of permanent drainage controls.

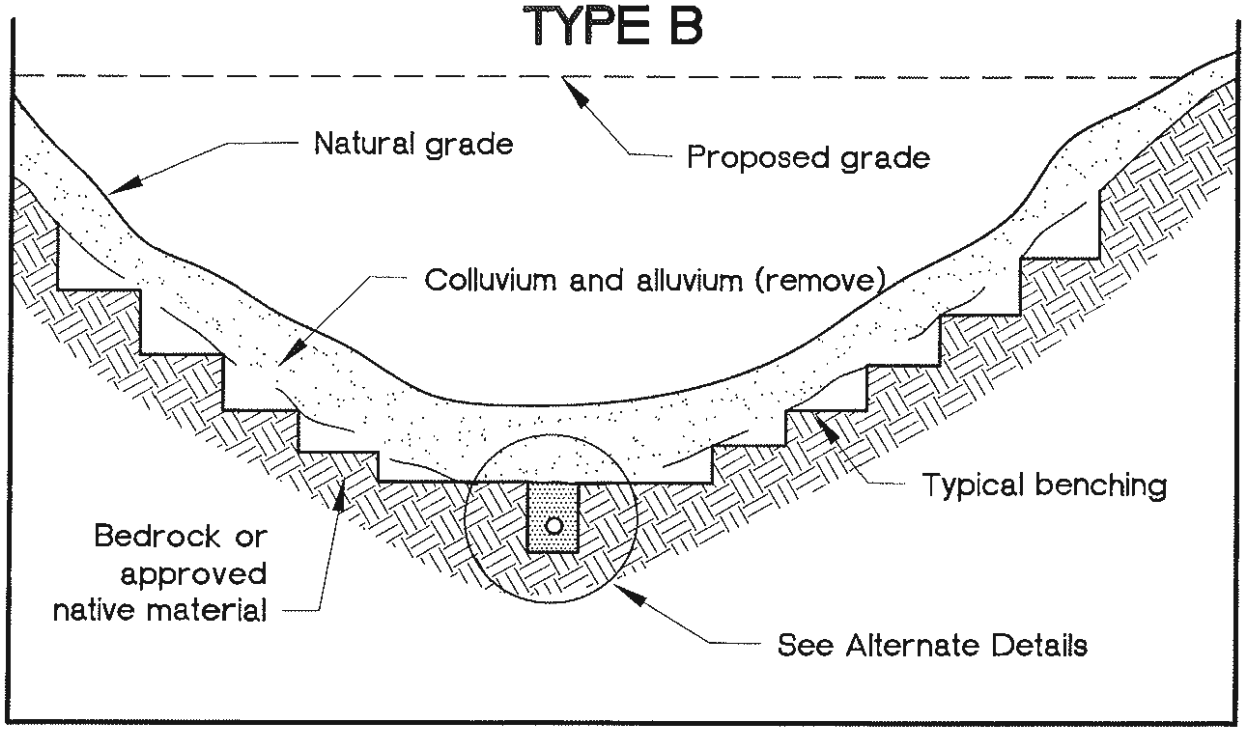
7.2 Upon completion of grading and termination of inspection by the Soils Consultant, no further filling or excavating, including that necessary for the footings foundations, large tree wells, retaining walls, or other features shall be performed without the approval of the Soils Consultant.

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

TYPE A

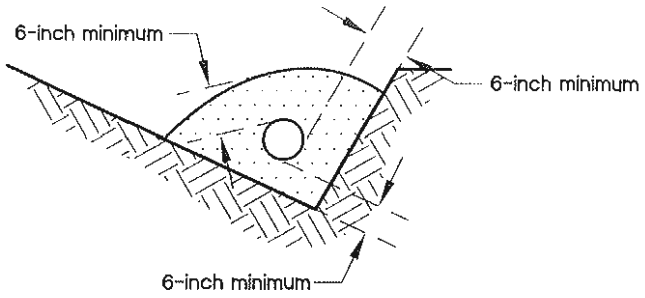


TYPE B

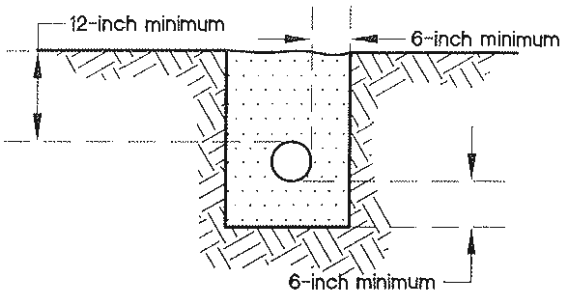


Selection of alternate subdrain details, location, and extent of subdrains should be evaluated by the geotechnical consultant during grading.

SoCal Professional Engineers	CANYON SUBDRAIN DETAIL	Plate 1



A-1



B-1

Filter material: Minimum volume of 9 cubic feet per lineal foot of pipe.

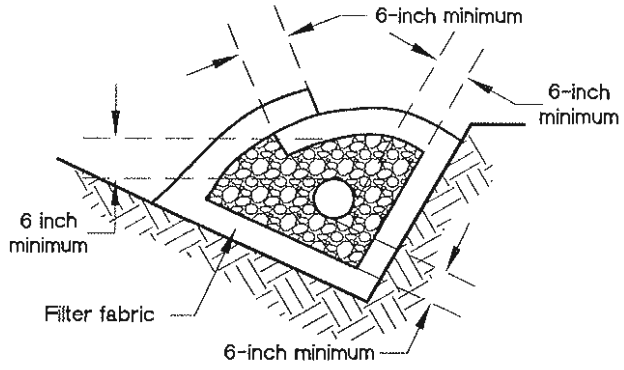
Perforated pipe: 6-inch-diameter ABS or PVC pipe or approved substitute with minimum 8 perforations (¼-inch diameter) per lineal foot in bottom half of pipe (ASTM D-2751, SDR-35, or ASTM D-1527, Schd. 40).

For continuous run in excess of 500 feet, use 8-inch-diameter pipe (ASTM D-3034, SDR-35, or ASTM D-1785, Schd. 40).

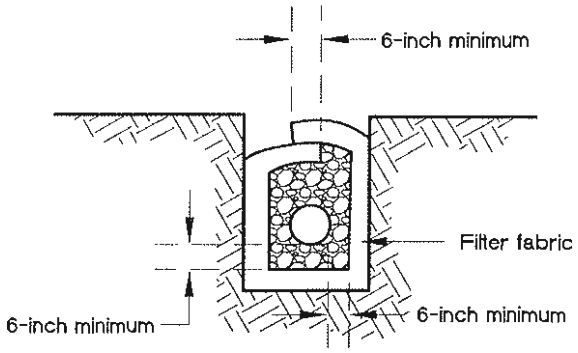
FILTER MATERIAL

Sieve Size	Percent Passing
1 inch	100
¾ inch	90-100
⅜ inch	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

ALTERNATE 1: PERFORATED PIPE AND FILTER MATERIAL



A-2

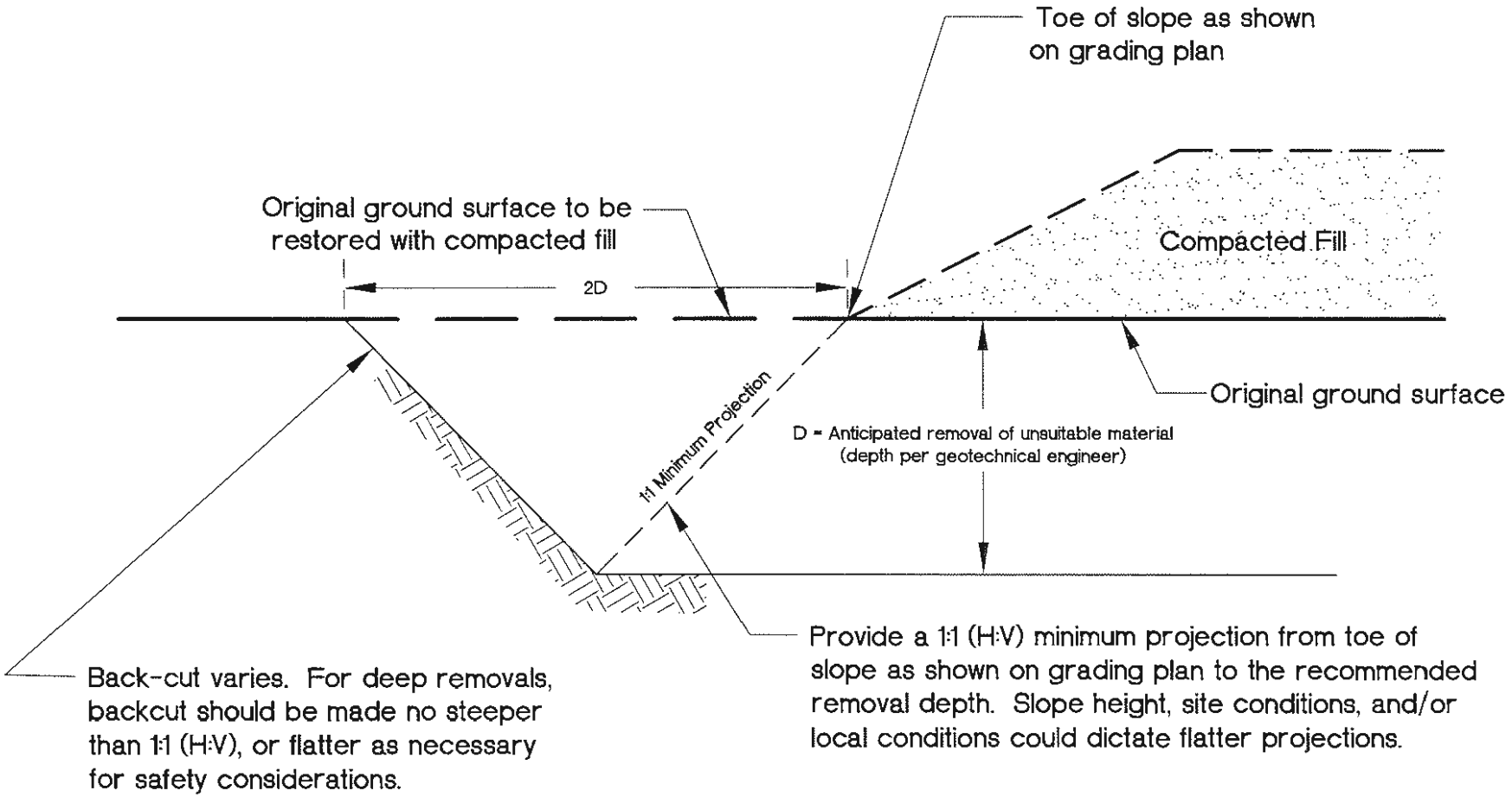


B-2

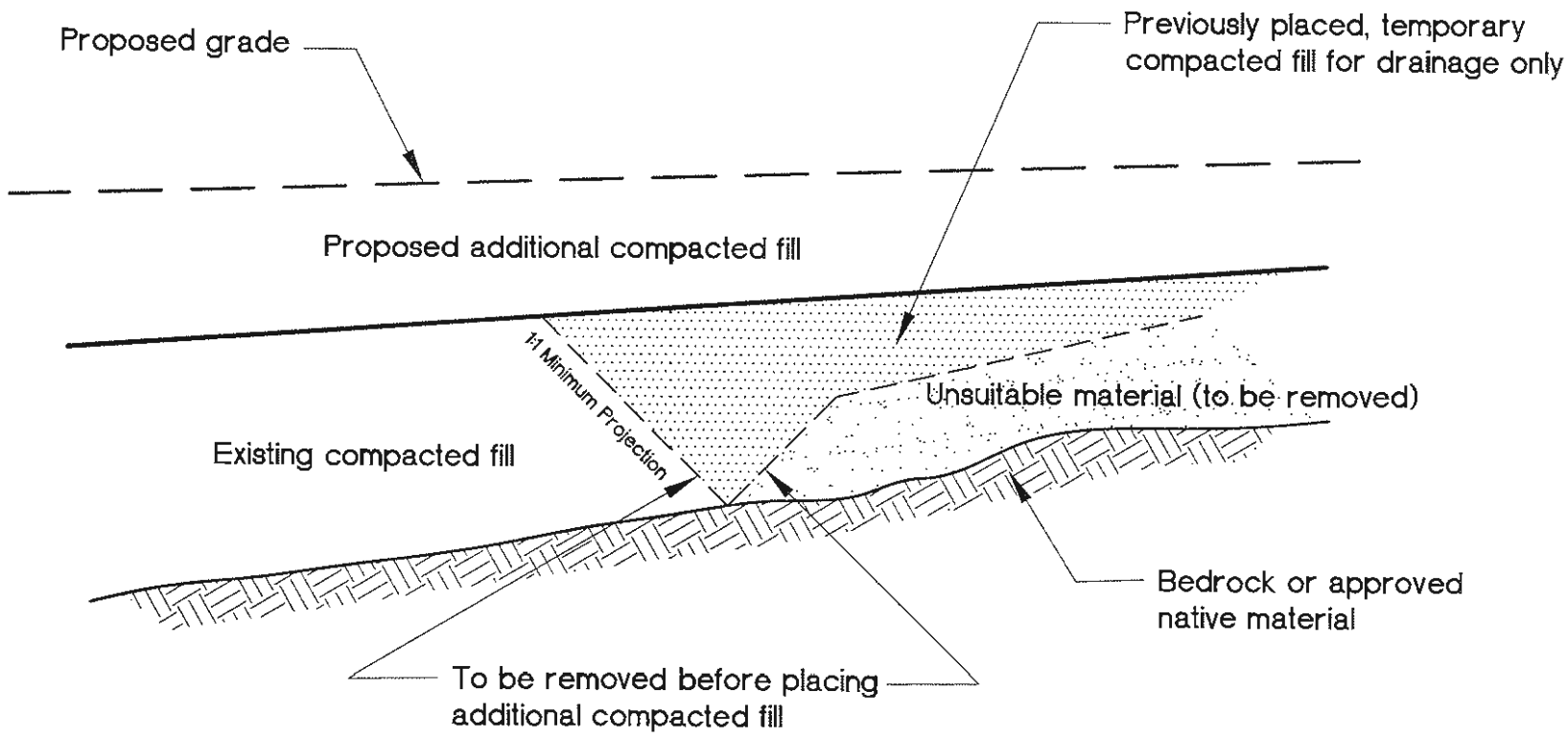
Gravel Material: 9 cubic feet per lineal foot.
Perforated Pipe: See Alternate 1
Gravel: Clean ¾-inch rock or approved substitute.
Filter Fabric: Mirafi 140 or approved substitute.

ALTERNATE 2: PERFORATED PIPE, GRAVEL, AND FILTER FABRIC

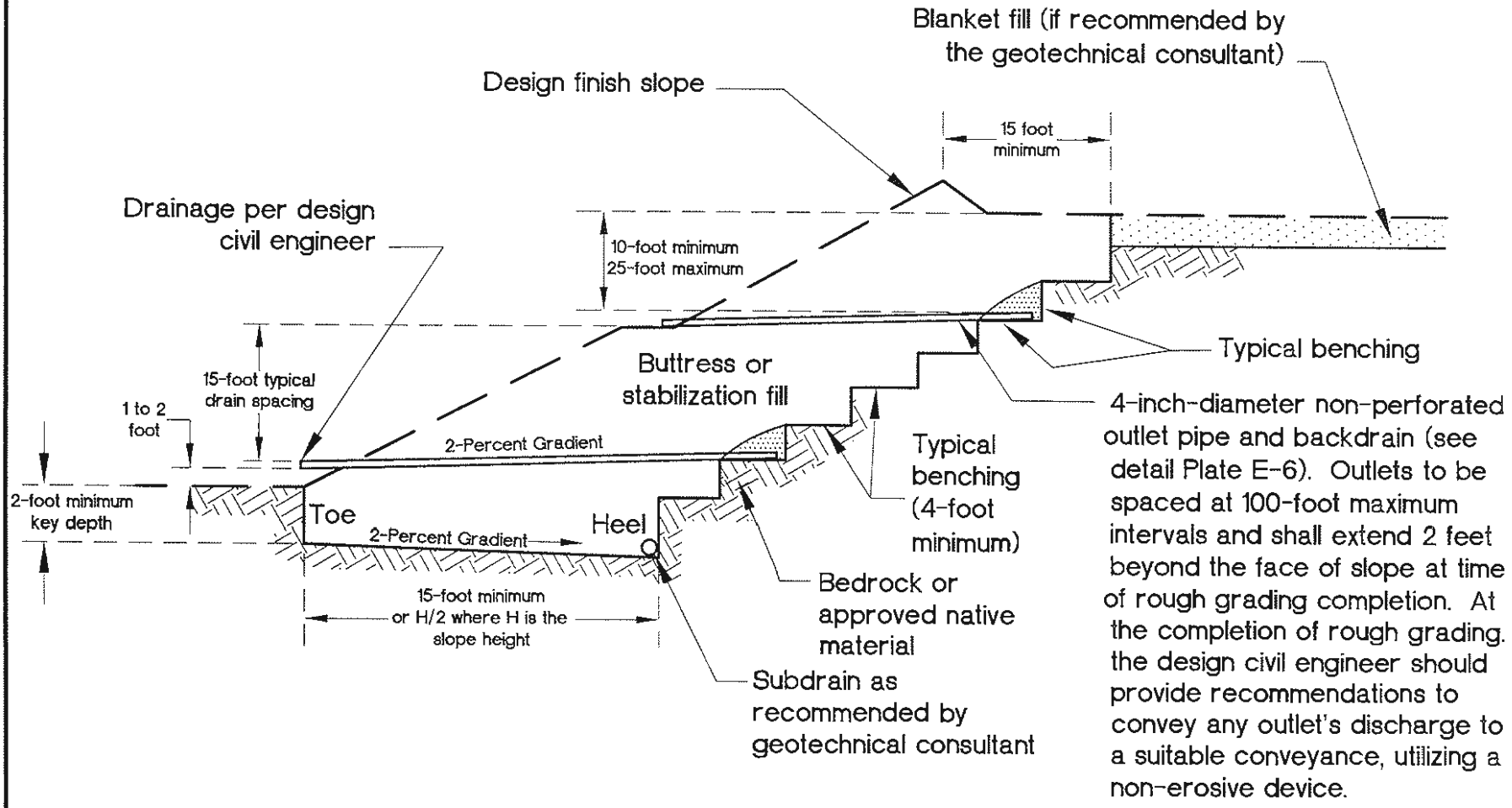
SoCal Professional Engineers	CANYON SUBDRAIN ALTERNATE DETAILS	Plate 2



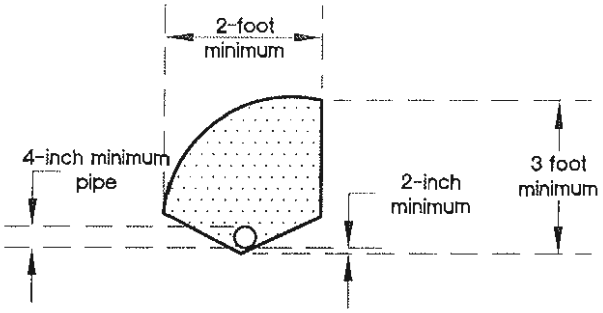
SoCal Professional Engineers	FILL SLOPE TOEING OUT ON FLAT ALLUVIATED CANYON DETAIL	PLATE 3

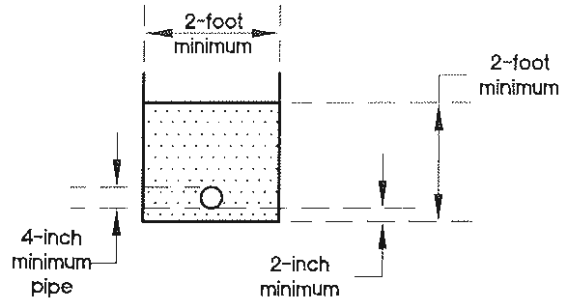


SoCal Professional Engineers	REMOVAL ADJACENT TO EXISTING FILL ADJOINING CANYON FILL DETAIL	Plate 4



SoCal Professional Engineers	TYPICAL STABILIZATION / BUTTRESS FILL DETAIL	Plate 5





Filter Material: Minimum of 5 cubic feet per lineal foot of pipe or 4 cubic feet per lineal feet of pipe when placed in square cut trench.

Alternative in Lieu of Filter Material: Gravel may be encased in approved filter fabric. Filter fabric shall be Mirafi 140 or equivalent. Filter fabric shall be lapped a minimum of 12 inches in all joints.

Minimum 4-Inch-Diameter Pipe: ABS-ASTM D-2751, SDR 35; or ASTM D-1527 Schedule 40, PVC-ASTM D-3034, SDR 35; or ASTM D-1785 Schedule 40 with a crushing strength of 1,000 pounds minimum, and a minimum of 8 uniformly-spaced perforations per foot of pipe. Must be installed with perforations down at bottom of pipe. Provide cap at upstream end of pipe. Slope at 2 percent to outlet pipe. Outlet pipe to be connected to subdrain pipe with tee or elbow.

Notes:
1. Trench for outlet pipes to be backfilled and compacted with onsite soil.
2. Backdrains and lateral drains shall be located at elevation of every bench drain. First drain located at elevation just above lower lot grade. Additional drains may be required at the discretion of the geotechnical consultant.

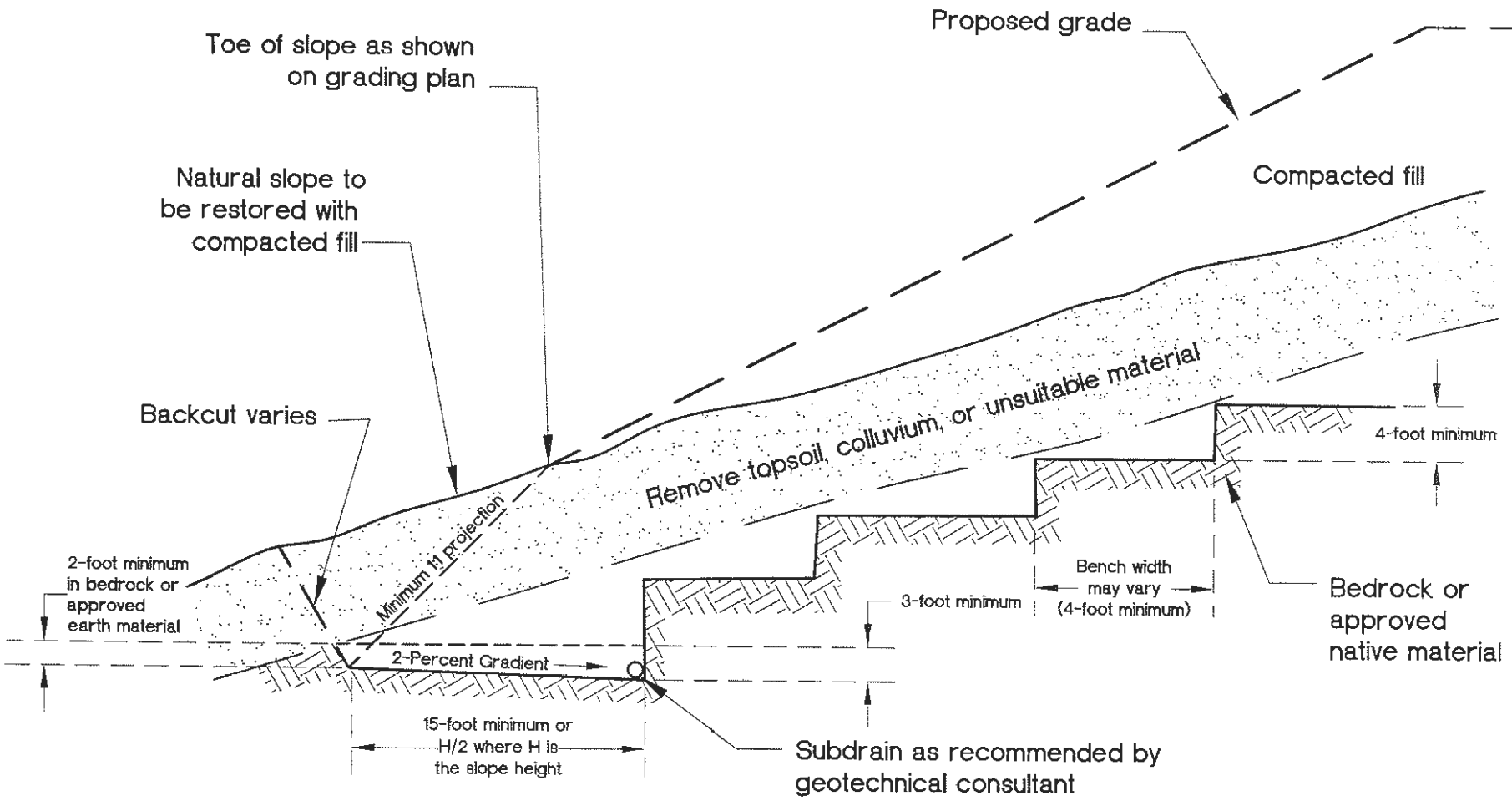
Filter Material shall be of the following specification or an approved equivalent.

Sieve Size	Percent Passing
1 inch	100
¾ inch	90-100
⅜ inch	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

Gravel shall be of the following specification or an approved equivalent.

Sieve Size	Percent Passing
1½ inch	100
No. 4	50
No. 200	8

SoCal Professional Engineers	TYPICAL BUTTRESS SUBDRAIN DETAIL	Plate 6

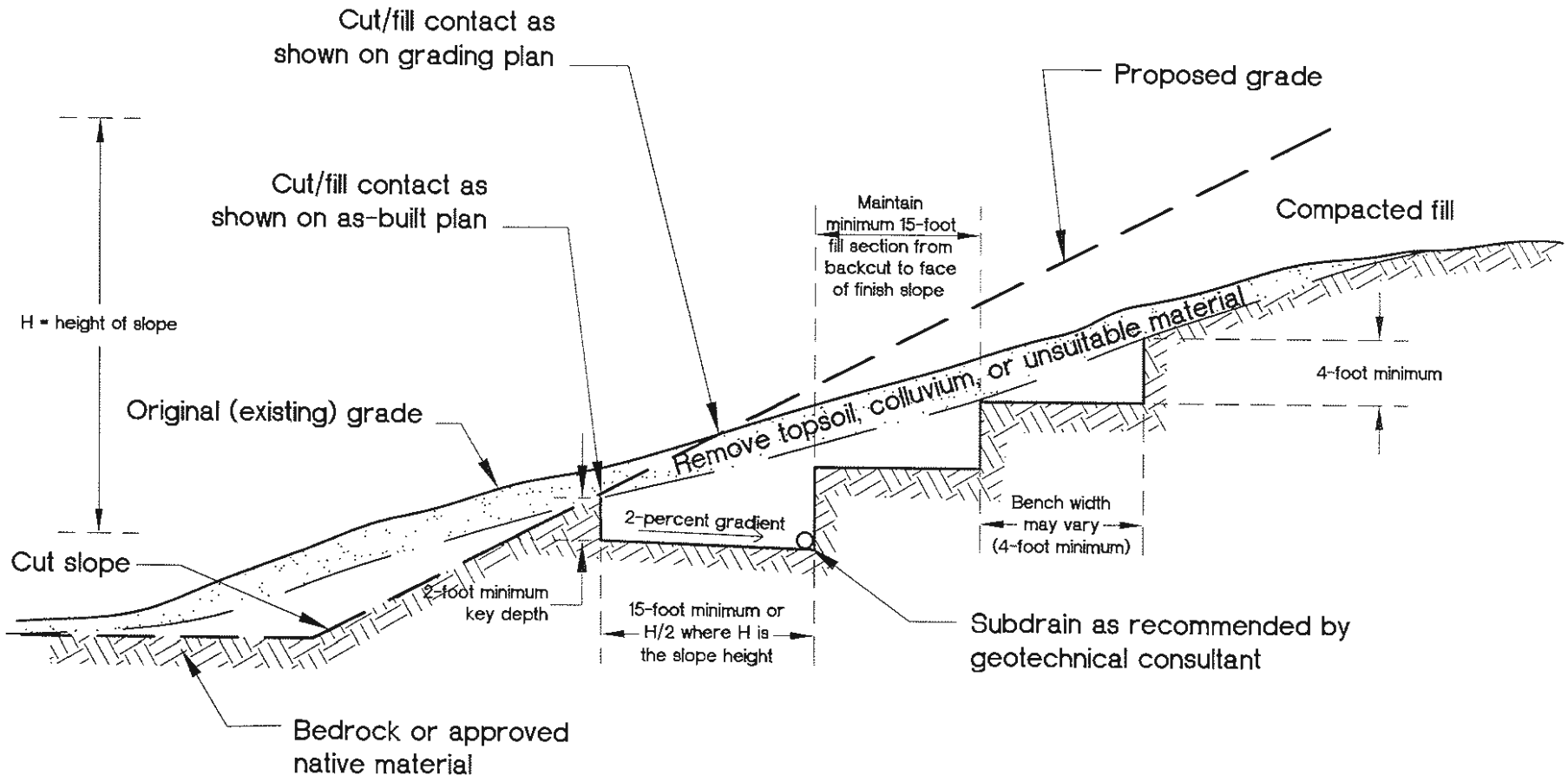


NOTES:

1. Where the natural slope approaches or exceeds the design slope ratio, special recommendations would be provided by the geotechnical consultant.

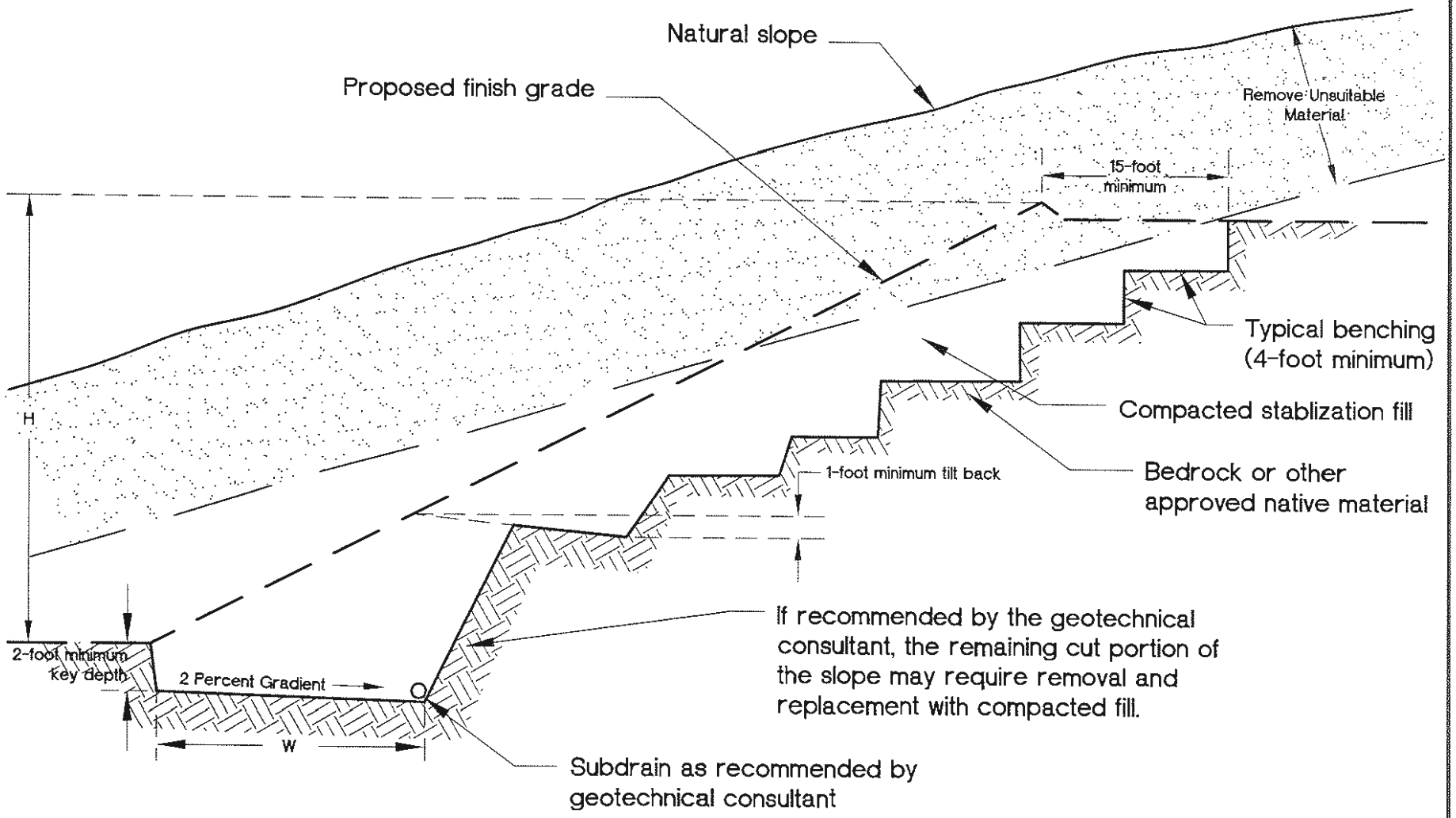
2. The need for and disposition of drains should be evaluated by the geotechnical consultant, based upon exposed conditions.

SoCal Professional Engineers	FILL OVER NATURAL (SIDEHILL FILL) DETAIL	Plate 7



NOTE: The cut portion of the slope should be excavated and evaluated by the geotechnical consultant prior to construction of the fill portion.

SoCal Professional Engineers	FILL OVER CUT DETAIL	Plate 8

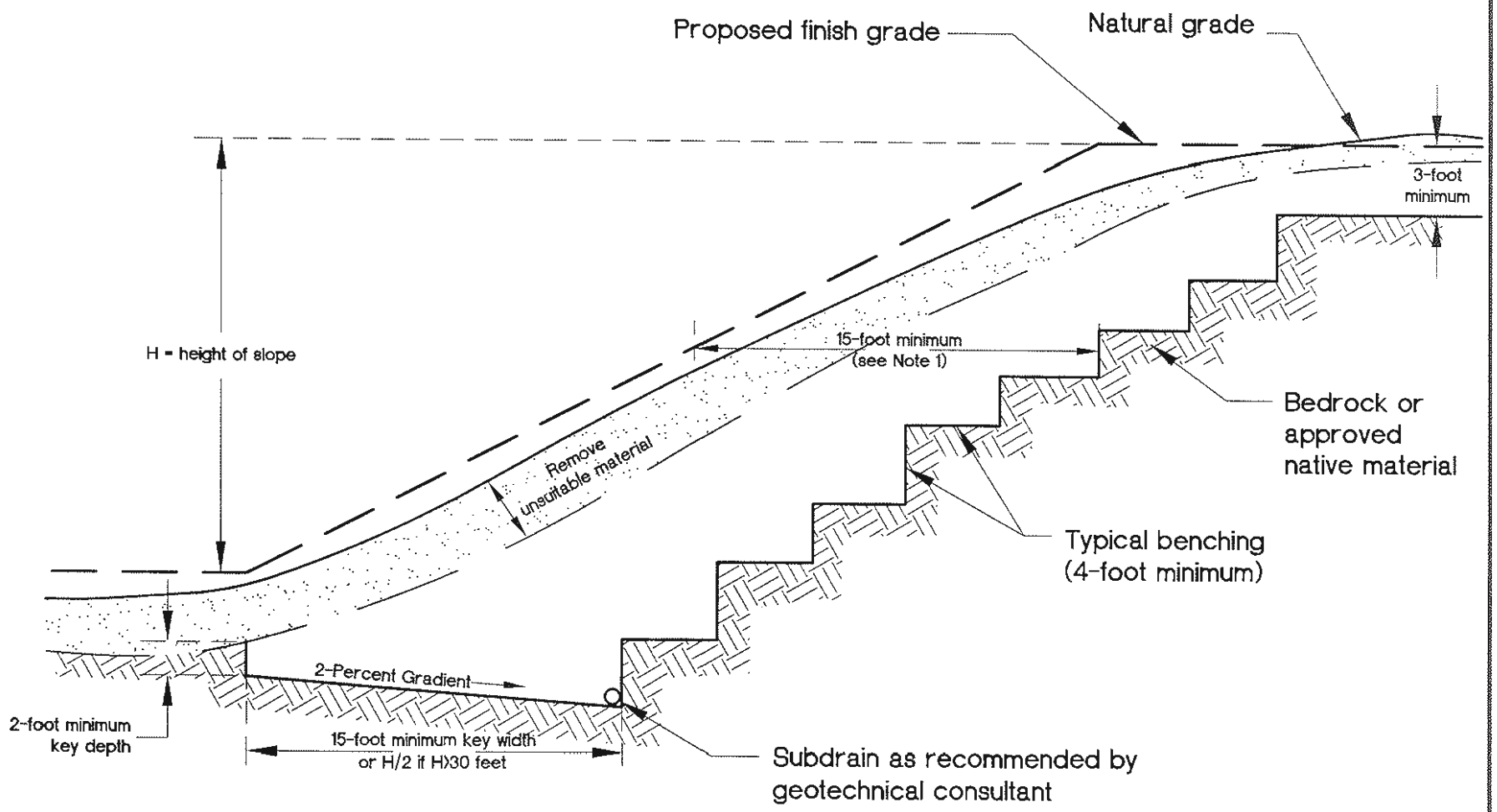


NOTES:

1. Subdrains may be required as specified by the geotechnical consultant.

2. W shall be equipment width (15 feet) for slope heights less than 25 feet. For slopes greater than 25 feet, W shall be evaluated by the geotechnical consultant. At no time, shall W be less than H/2, where H is the height of the slope.

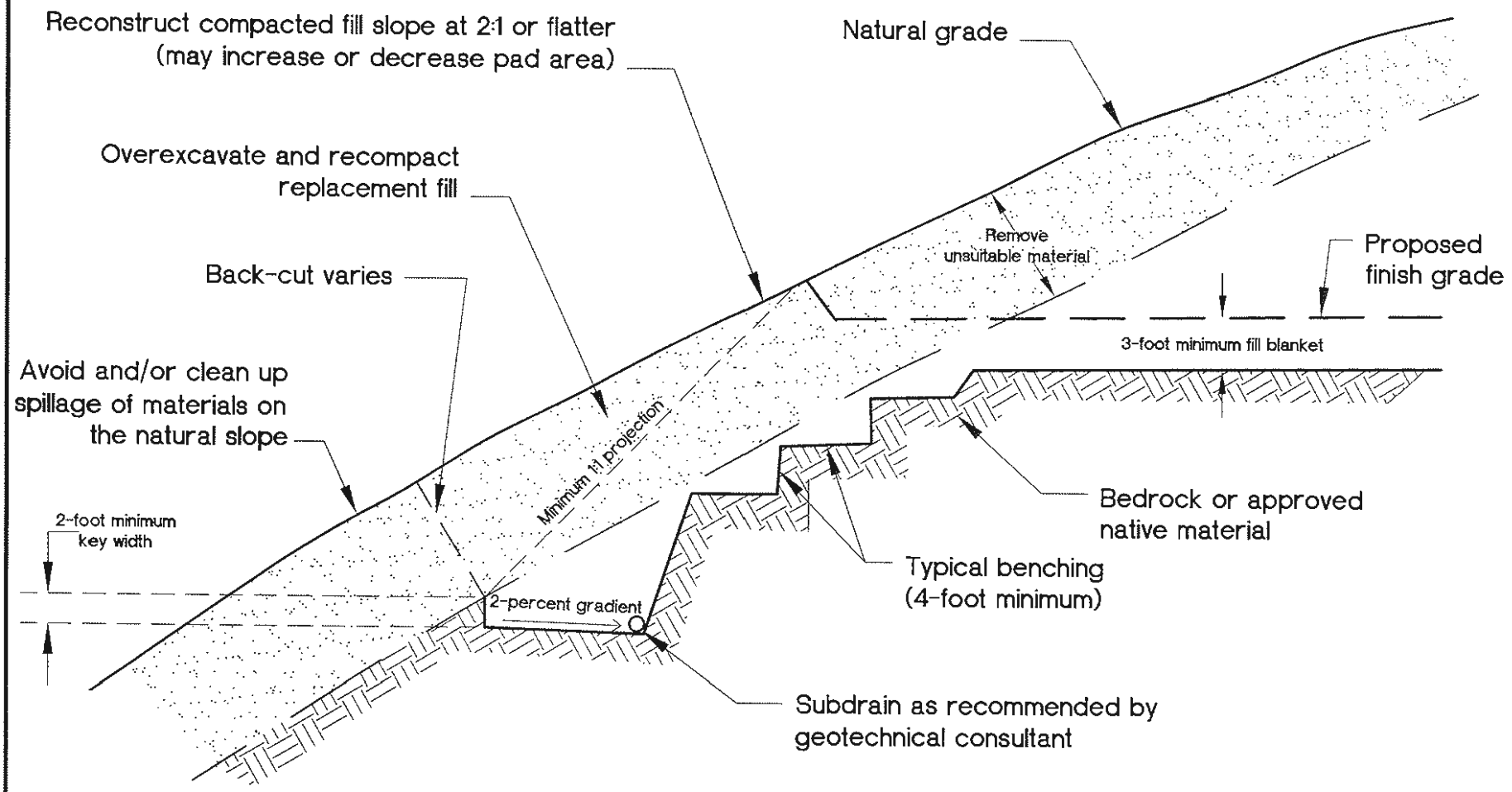
SoCal Professional Engineers	STABLIZATION FILL FOR UNSTABLE MATERIAL EXPOSED IN CUT SLOPE DETAIL	Plate 9



NOTES:

1. 15-foot minimum to be maintained from proposed finish slope face to backcut.
2. The need and disposition of drains will be evaluated by the geotechnical consultant based on field conditions.
3. Pad overexcavation and recompaction should be performed if evaluated to be necessary by the geotechnical consultant.

SoCal Professional Engineers	SKIN FILL OF NATURAL GROUND DETAIL	Plate 10

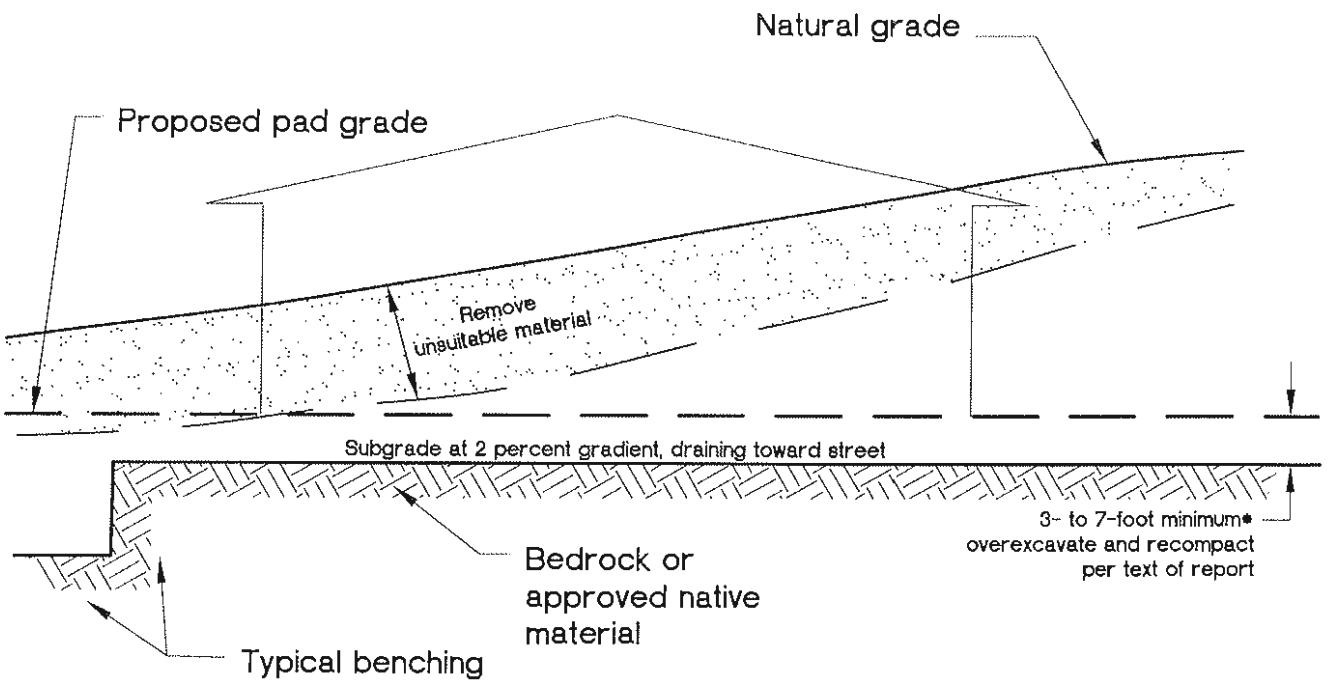


NOTES:

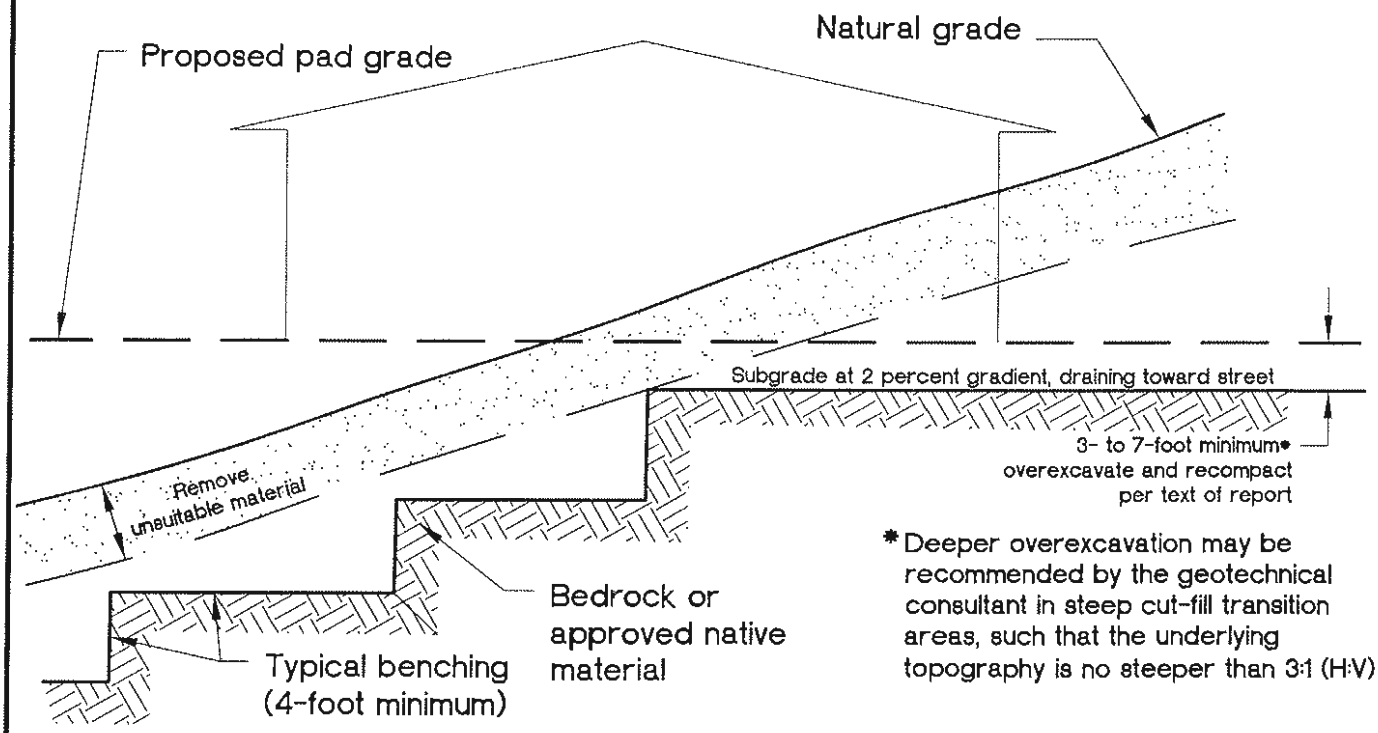
1. Subdrain and key width requirements will be evaluated based on exposed subsurface conditions and thickness of overburden.

2. Pad overexcavation and recompaction should be performed if evaluated necessary by the geotechnical consultant.

SoCal Professional Engineers	DAYLIGHT CUT LOT DETAIL	Plate 11



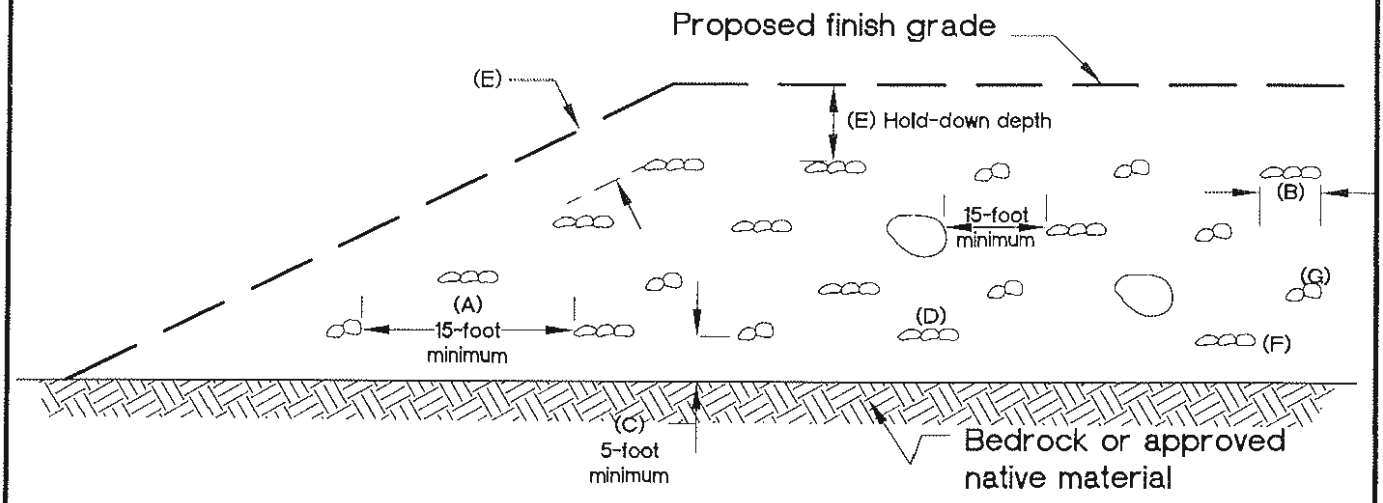
CUT LOT OR MATERIAL-TYPE TRANSITION



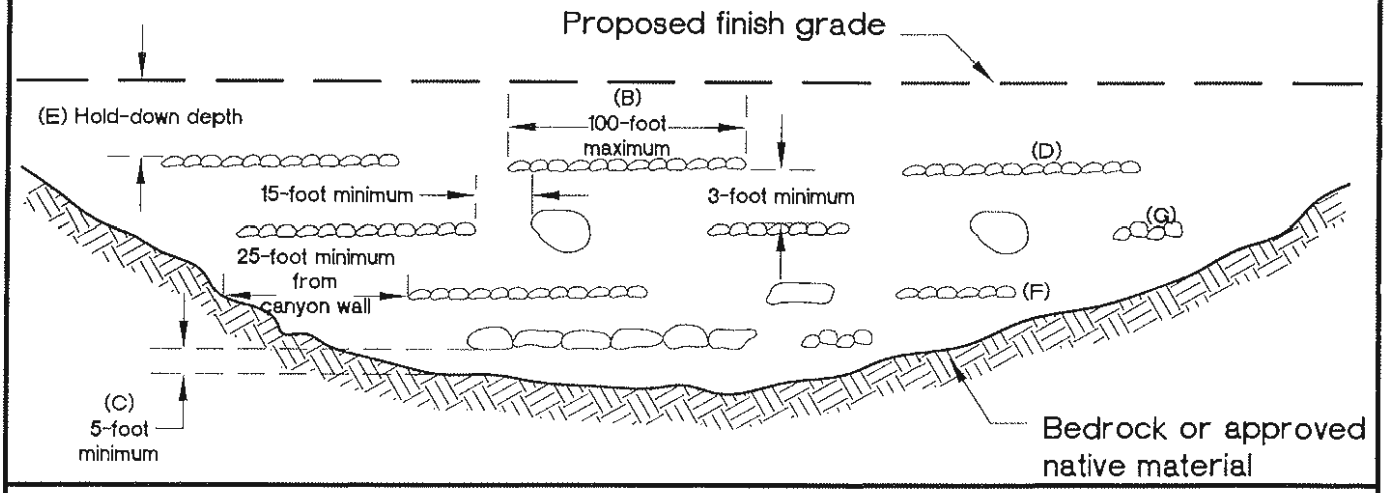
CUT-FILL LOT (DAYLIGHT TRANSITION)

SoCal Professional Engineers	TRANSITION LOT DETAILS	Plate 12

VIEW NORMAL TO SLOPE FACE



VIEW PARALLEL TO SLOPE FACE



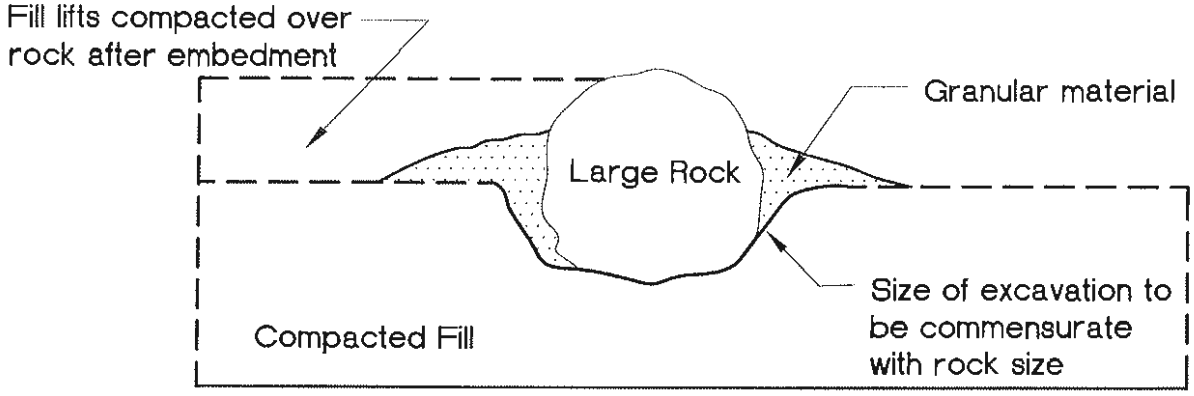
NOTES:

A. One equipment width or a minimum of 15 feet between rows (or windrows).
B. Height and width may vary depending on rock size and type of equipment. Length of windrow shall be no greater than 100 feet.
C. If approved by the geotechnical consultant, windrows may be placed directly on competent material or bedrock, provided adequate space is available for compaction.
D. Orientation of windrows may vary but should be as recommended by the geotechnical engineer and/or engineering geologist. Staggering of windrows is not necessary unless recommended.
E. Clear area for utility trenches, foundations, and swimming pools: Hold-down depth as specified in text of report, subject to governing agency approval.
F. All fill over and around rock windrow shall be compacted to at least 90 percent relative compaction or as recommended.
G. After fill between windrows is placed and compacted, with the lift of fill covering windrow, windrow should be proof rolled with a D-9 dozer or equivalent.

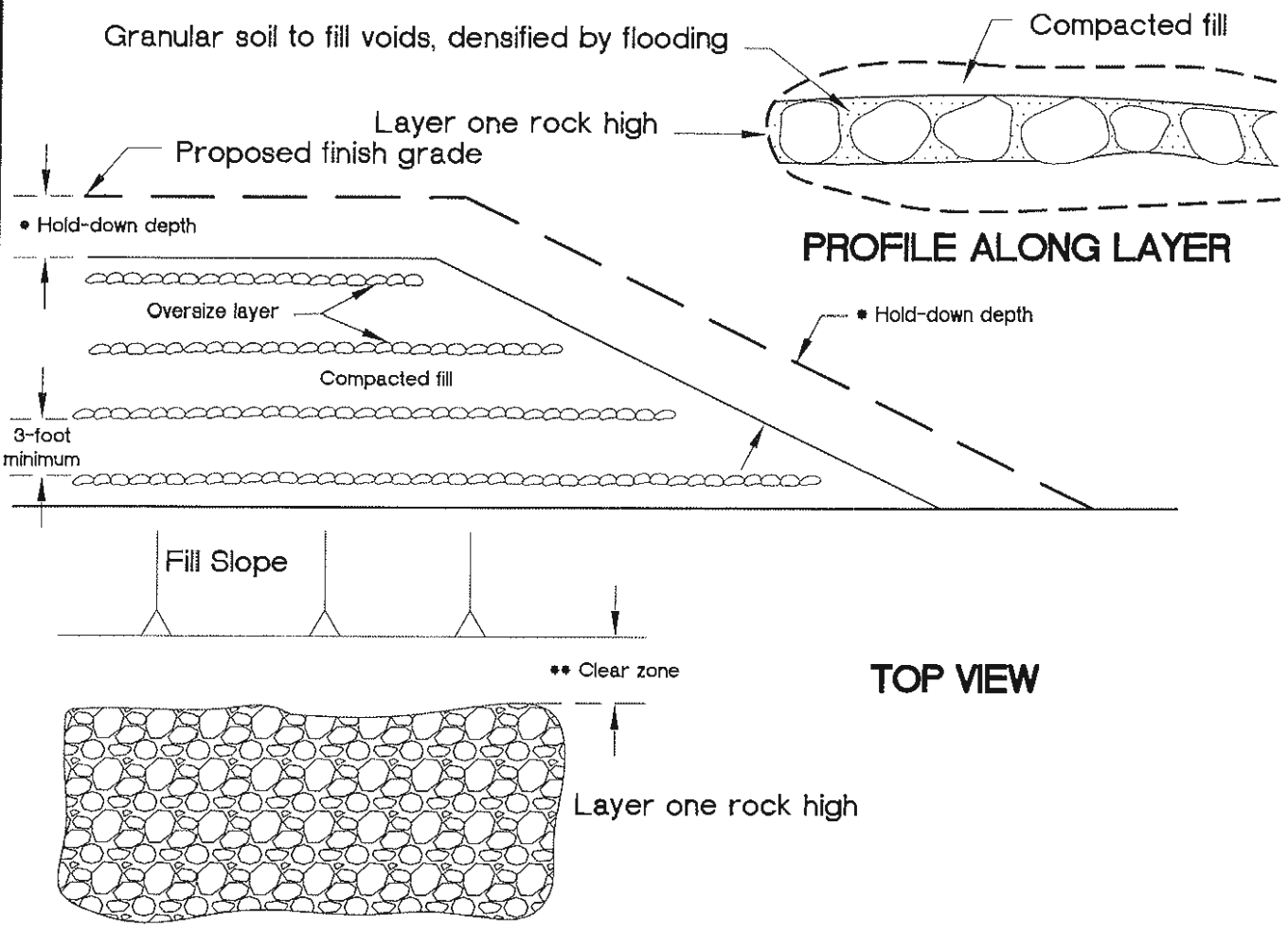
VIEWS ARE DIAGRAMMATIC ONLY AND MAY BE SUPERSEDED BY REPORT RECOMMENDATIONS OR CODE
ROCK SHOULD NOT TOUCH AND VOIDS SHOULD BE COMPLETELY FILLED

SoCal Professional Engineers	OVERSIZE ROCK DISPOSAL DETAIL	Plate 13

ROCK DISPOSAL PITS



ROCK DISPOSAL LAYERS



* Hold-down depth or below lowest utility as specified in text of report, subject to governing agency approval.

** Clear zone for utility trenches, foundations, and swimming pools, as specified in text of report.

VIEWS ARE DIAGRAMMATIC ONLY AND MAY BE SUPERSEDED BY REPORT RECOMMENDATIONS OR CODE

ROCK SHOULD NOT TOUCH AND VOIDS SHOULD BE COMPLETELY FILLED IN

SoCal Professional Engineers	ROCK DISPOSAL DETAIL	Plate 14

APPENDIX E

ASCE 7 Hazard Report

ASCE 7 Hazards Report

Address:
No Address at This Location

Standard:	ASCE/SEI 7-16	**Elevation:**	1282.42 m (NAVD 88)
Risk Category:	II	**Latitude:**	33.682103
Soil Class:	D - Default (see Section 11.4.3)	**Longitude:**	-117.330162

Seismic

Site Soil Class: D - Default (see Section 11.4.3)

Results:

S_S :	2.003	S_{D1} :	N/A
S_1 :	0.721	T_L :	8
F_a :	1.2	PGA :	0.856
F_v :	N/A	PGA_M :	1.027
S_{MS} :	2.404	F_{PGA} :	1.2
S_{M1} :	N/A	I_e :	1
S_{DS} :	1.603	C_v :	1.5

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed: Fri Apr 23 2021

Date Source: USGS Seismic Design Maps

The ASCE 7 Hazard Tool is provided for your convenience, for informational purposes only, and is provided “as is” and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE 7 standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

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