South Shore Testing & Environmental

23811 Washington Ave, Suite C110, #112, Murrieta, CA 92562 E-mail: ss.testing@aol.com
Phone: (951) 239-3008 FAX: (951) 239-3122

September 20, 2021

Mr. Rich Wilson
Trademark Construction Co., Inc.
15916 Bernardo Center Drive
San Diego, CA 92127

SUBJECT: **RESPONSE TO THE CITY OF MENIFEE'S PLAN CHECK 1**
PUBLIC WORKS / ENGINEERING DEPARTMENT
Proposed Multi-Family Residential Development
APN: 339-200-080, 9.92-Acres
NE Corner of Berea and Normandy Roads
City of Menifee, Riverside County, California
Work Order No. 4722001.00UR

Dear Mr. Wilson:

Pursuant to the City of Menifee's Geotechnical Report Review Comments, dated August 26, 2021, this response has been prepared to address the review comments and provide additional information and/or clarification to both the referenced geotechnical report (SS, 2020b) and the onsite stormwater infiltration system investigation (SS, 2020a). This format will address each item on the list, and the City review letter is attached to the back this report for easy reference. This Response Document shall be made inseparable from and a part of the references.

Preliminary Geotechnical Investigation

Item 1.

Page 2, Introduction: The project description referencing a hotel pad has been corrected to refer to the proposed multi-family development. The revised Preliminary Geotechnical Investigation report is included in **Appendix** B of this response letter.

Item 2.

Page 2, Proposed Development: At your request we have added anticipated cuts and fills into the revised Preliminary Geotechnical Investigation report included in **Appendix** B of this response letter.

Item 3.

Page 4, Seismic Parameters: Based on the geologic setting and soil conditions encountered, the soils underlying the site are classified as "Site Class C, "Very dense Soil and Soft Rock", according to the CBC. The seismic parameters according to the ASCE/SEI 7-16 CBC are summarized in the ASCE 7 Hazards Report presented in **Appendix D**. The corresponding value for peak ground acceleration from the design response spectrum based on the ASCE 7 seismic parameters is **0.723g**.

Item 4.

Page 5, Rockfall Potential: The Conceptual Grading Plans (Kolibrien, 2020) indicate a proposed cut slope on the southeast corner of the subject site, which intersects a large boulder outcrop adjacent to the daycare amenities area. We anticipate that large boulders will be exposed within the slope face, which may require removal at that time. We anticipate the boulders located above the slope can be left in-place as, for the most part they are embedded in dense granitic bedrock. Based on our site reconnaissance, we anticipate the rockfall potential for the boulders located on the adjacent property to the east to be **low** The ground surface, in this area, slopes to the northeast and away from the subject site. Rockfall potential should be evaluated again during grading operations by the project Certified Engineering Geologist CEG or his representative. Final recommendations should be determined and mitigated, if necessary, at that time.

Item 5.

General: We have prepared a Geotechnical Map for the subject site including proposed development, the location of previous exploratory trenches (T.H.E., 2003), and our infiltration holes previously excavated at the subject site (SS, 2020a). The Geotechnical Map is attached with both this review letter and our revised preliminary geotechnical report as **Plate** 1.

Item 6.

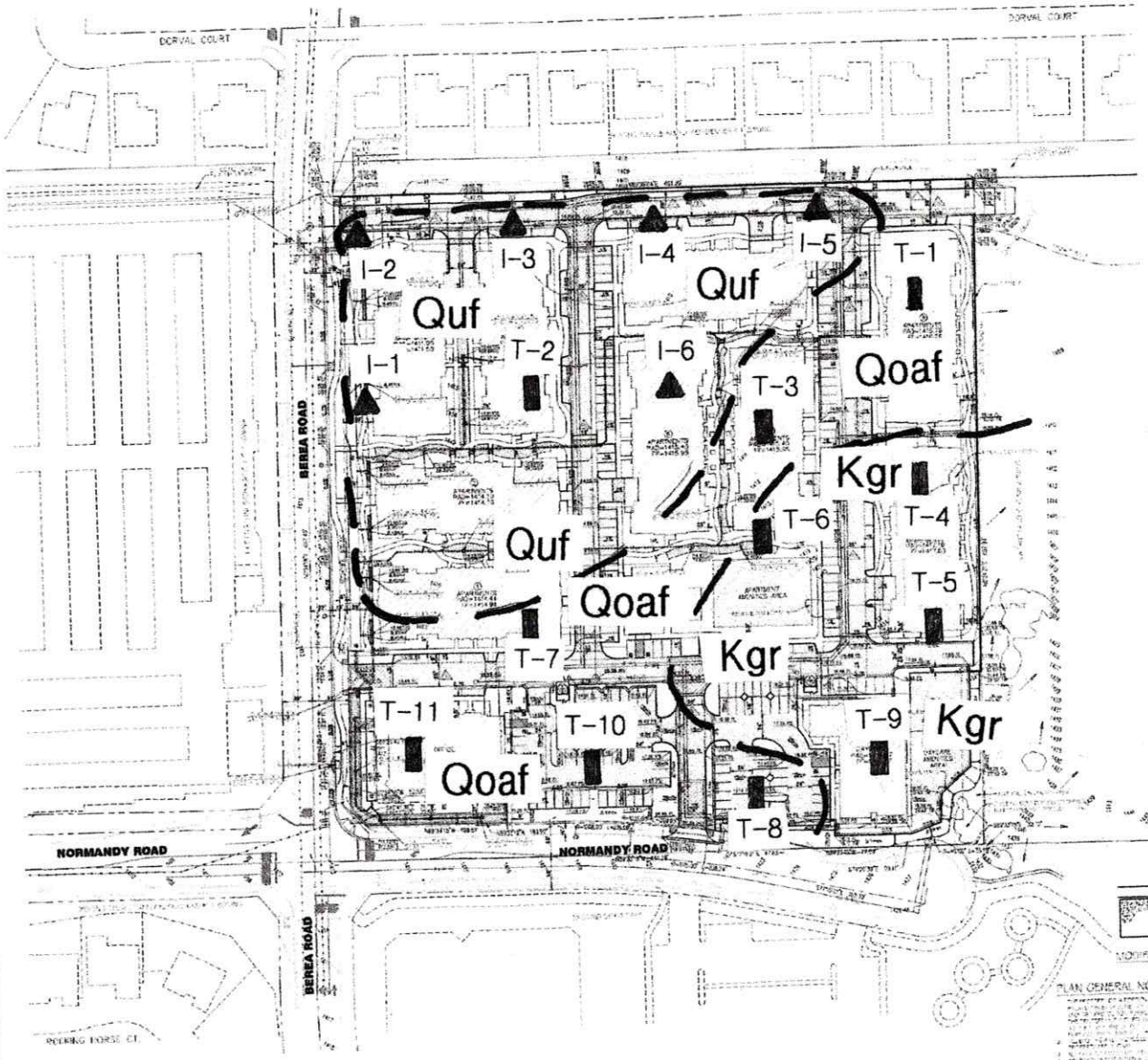
General: Owing to the subject being underlain both at the ground surface on the southerly portion of the site and at shallow depths on the southerly portion of the site by dense granitic bedrock. Medium dense to dense Old alluvial fan deposits overlies the granitic bedrock on the northerly and westerly portions of the subject site. Based on the above, the hydrocollapse potential at the subject site is considered negligible. Our revised Update to Preliminary Geotechnical Investigation report attached as **Appendix B** has been revised to include a hydrocollapse potential section in the Seismic Effects section.

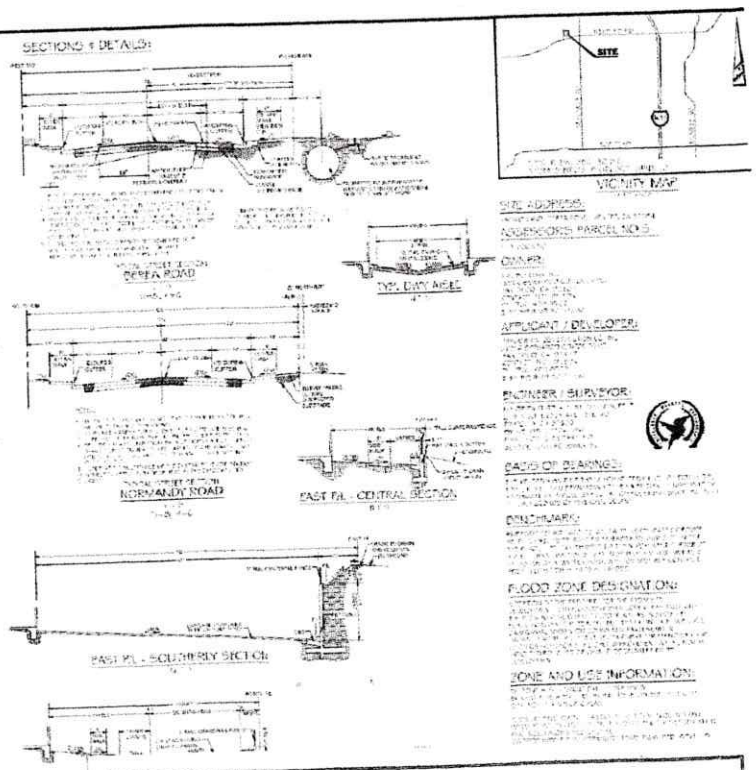
Item 7.

General: The revised Update to Preliminary Geotechnical Report has been modified to include retaining wall design parameters for proposed retaining walls on the south easterly portion of the subject site. No grading plans were available at the time of our update investigation.

CONCEPTUAL GRADING, DRAINAGE & UTILITY PLAN FOR CUP PLN20-016
BOULDERS MENIFEE - A MIXED USE DEVELOPMENT

#	DATE	REVISION





LEGEND

UNITS

Quf	- UNDOCUMENTED FILL
Qoaf	- OLD ALLUVIAL FAN DEPOSITS
Kgr	- GRANITIC BEDROCK

SYMBOLS

T-11	- APPROXIMATE LOCATION OF EXPLORATORY TRENCHES (THE, 2003)
I-6	- APPROXIMATE LOCATION OF EXPLORATORY TRENCHES (SS, 2020)
	- APPROXIMATE LOCATION OF UNIT CONTACTS

PLAN GENERAL NOTES:

HYDROLOGY & WATER QUALITY SUMMARY:

LEGEND:

GRAPHIC SCALE

PREPARED BY:

KOLIBRIEN

SOUTH SHORE TESTING & ENVIRONMENTAL

GEOTECHNICAL MAP
PROPOSED MULTI-FAMILY RESIDENTIAL DEVELOPMENT
APN: 339-200-080, 9.92-ACRES
NE CORNER OF BEREA AND NORMANDY ROADS
CITY OF MENIFEE, RIVERSIDE COUNTY, CALIFORNIA

WORK ORDER: 4722001.00U DATE SEPT. 2021 PLATE: 1 OF 1

SHEET 1 OF 1

Infiltration Investigation

Item 8.

Test Pit Logs: Test Pits No. 1 & 2 have been corrected to reflect the total depth explored of 3-ft below the ground surface. The Test Pit Logs are included in **Appendix C** of this report.

Item 9.

Percolation Test Data Sheets: The diameter of the test holes was 8-inches. The corrected test data sheets are presented in **Appendix C**.

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. We trust that this information will allow for the completion of the review and approval process. Should you have any questions, or require additional information, please do not hesitate to contact our office.

Respectfully Submitted,

South Shore Testing & Environmental

John P. Frey
Project Geologist

William C. Hobbs, RCE 42265
Civil Engineer

ATTACHMENTS

Plate 1 – Geotechnical Map
Appendix A - References
Appendix B – Revised Preliminary Geotechnical Report
Appendix C – Revised Test Pit Logs (SS, 2020a)
Appendix D - ASCE 7 Hazards Report

Appendix E – City of Menifee Public Works/Engineering Department Review Comments

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".

California Geologic Survey, Revised 2018, "Earthquake Fault Zones, A Guide for Government Agencies, Property Owners/Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California", Special Publication 42.

California Division of Mines & Geology, 1997, "Guidelines for Evaluating and Mitigating Seismic Hazards in California", Special Publication 117.

City of Menifee, Public Works/Engineering Department, 2021, "RFP20-014 Boulders Mixed Use Development – Geotechnical Report Review Comments, PC2", dated August 26, 2020.

Coduto, Don, P., 1994, "Foundation Design Principles and Practice", Prentice Hall, pages 637-655.

County of Riverside GIS Website, 2021.

Kolibrian, 2020, "Conceptual Grading, Drainage & Utility Plan for CUP PLN20-016 Boulders Menifee – a Mixed Use Development", Sheet 1 of 1, Scale: 1" = 40'. Dated June 15, 2020.

Morton, D.M.,1991, "Geologic Map of the Romoland 7.5' Quadrangle, Riverside County, California", Scale: 1" = 2,000', U.S.G.S. Open-File Report 90-701.

South Shore Testing and Environmental, 2020a, "Onsite Stormwater Infiltration System Investigation, Proposed Multi-Family Residential Development, APN: 339-200-080, 9.92-Acres, NE Corner of Berea and Normandy Roads, City of Menifee, Riverside County, California", Work Order No. 4722001.01, Dated February 24, 2020.

South Shore Testing and Environmental, 2020b, "Update to Preliminary Geotechnical Investigation & Assumption of Responsibility, Proposed Multi-Family Residential Development, APN: 339-200-080, 9.92-Acres, NE Corner of Berea and Normandy Roads, City of Menifee, Riverside County, California", Work Order No. 4722001.00U, Dated January 13, 2020.

Summa Architecture, December 5, 2019, "Conceptual Site Plan, Boulders Mixed Use, Menifee, CA", Sheet SP, 40-Scale.

T.H.E. Soils Company, Inc., December 15, 2003, "Preliminary Geotechnical Investigation, Proposed Residential Development, ±10-Acre Parcel on the NEC of Newport and Berea Roads, Menifee Area, Riverside County, California", Work Order No. 657301.00.

Weber, F.H., Jr., 1977, Seismic Hazards Related to Geologic Factors, Elsinore and Chino Fault Zones, Northwestern Riverside County, California, DMG Open File Report, 77-4 L.A., 96 pages.

APPENDIX B

Revised Preliminary Geotechnical Report

South Shore Testing & Environmental

23811 Washington Ave, Suite C110, #112, Murrieta, CA 92562 E-mail: ss.testing@aol.com
Phone: (951) 239-3008 FAX: (951) 239-3122

September 20, 2021

Mr. Rich Wilson
Trademark Construction Co., Inc.
15916 Bernardo Center Drive
San Diego, CA 92127

SUBJECT: **UPDATE TO PRELIMINARY GEOTECHNICAL INVESTIGATION & ASSUMPTION OF RESPONSIBILITY**
Proposed Multi-Family Residential Development
APN: 339-200-080, 9.92-Acres
NE Corner of Berea and Normandy Roads
City of Menifee, Riverside County, California
Work Order No. 4722001.00UA

Dear Mr. Wilson:

Pursuant to your authorization, an update to the preliminary geotechnical investigation was conducted for the subject site in accordance with the 2019 California Building Code, Section 1803.5.11. A 40-scale "Conceptual Site Plan" prepared by Summa Architecture, of Bonsall, California, was provided for our investigation, depicting the project site. This report will serve as an assumption of responsibility as to geotechnical engineering at the site for proposed grading and site development. We have reviewed the "Preliminary Geotechnical Investigation" in context of the proposed development to be constructed at this time. As any future construction work proceeds observation and testing must be made by a geotechnical professional.

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 multi-family residential pad.

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

3. Review and update the previous geotechnical report to current site conditions and proposed development and provide 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 multi-family residential development. It is our understanding that the proposed multi-family structures will be typical one- to three-story type V structures. Contained herein also are recommendations for foundation design for the proposed construction.

Site Description

The subject site is a nearly square-shaped, 9.92-acre parcel of land located the northeast corner of Brea and Normandy Roads in the city of Menifee, Riverside County, California. The site is bordered on the north by a flood control channel and an existing single-family residential tract, on the west by Berea Road and a mini-storage facility, on the south by Normandy Road and a park, and on the east by vacant undeveloped land.

Topographically on the subject site, for the most part, consists of low rolling gently sloping terrain with natural gradients of less than 5 percent. The southeast corner of the site consists of a small hill with numerous large unweathered granitic boulders up to 20-ft in diameter. Natural gradients on the hill are approximately 15 percent. Drainage is accomplished by sheetflow to the northwest toward Berea Road and the flood control channel. Vegetation onsite generally consists of a sparse to moderate low dried growth of annual weeds and grasses.

Proposed Development

The proposed development consists of the construction of a multi-family residential development with interior parking and driveways, a 3-story commercial building, a fitness building, a clubhouse, a recreation area, and landscape area. The Conceptual Site Plan depicts the extreme southeast corner of the site, which is underlain by numerous granitic boulders, is to remain vacant and in a relatively natural condition. Foundations are anticipated to consist of continuous spread and isolated column footings to carry structural loads. Typical cut/fill grading techniques are anticipated to establish design grade with proposed maximum fills (northeast corner) and cuts (southeast corner) of approximately 5 and 17-ft, respectively

Subsurface Conditions

The U.S. Geological Survey's Geologic Map of the Romoland 7.5' Quadrangle (Morton, 2003) indicates the formational earth materials underlying the southeast corner of the site to be granitic bedrock, which was encountered at shallow depths on the northerly and westerly portions of the subject site. Morton (2003) has mapped late to middle Pleistocene-age Old alluvial fan deposits

on the northerly portion of the subject site, which extended to a depth of at least 16.2-ft on the northwesterly portion of the subject site (T.H.E., 2003).

Groundwater

Groundwater was not encountered to the maximum depth explored of 16.2-ft below the ground surface (bgs) previously excavated on the northerly portion of the subject site (T.H.E., 2003). Based on historic regional groundwater information (DWR, 1978), regional high groundwater is at least 100-ft bgs on the lower elevations of the subject site. The subject site is underlain at both the ground surface and shallow depths by dense granitic bedrock, which is generally considered non groundwater bearing with groundwater being transferred along fracture and joint systems. Minor fluctuations can and will likely occur in moisture or free water content of the soil owing to rainfall and irrigation over time.

Excavation Characteristics

We anticipate that the Old alluvial fan deposits can be excavated with moderate difficulty utilizing conventional grading equipment (i.e. Caterpillar D-9 bulldozer or equivalent) in proper working condition. We anticipate that the granitic bedrock can be excavated with moderate to extreme difficulty utilizing conventional grading equipment (i.e. Caterpillar D-9 bulldozer or equivalent) in proper working condition. Owing to the variable chemistry of the underlying granitic bedrock and the large unweathered granitic boulders on the southeast corner of the site, localized areas requiring blasting may be encountered.

Seismicity

There are no known active of potentially active faults transecting the site (Morton, 2003), and the site is not located within the presently defined boundaries of either an Alquist-Priolo Earthquake Fault Zone (Hart, 2000) or a County of Riverside fault hazard zone (Riverside County GIS, 2020). Active fault zones regional to the site include the Elsinore fault (Glen Ivy segment), the San Jacinto (San Jacinto Valley segment), the Chino-Central Avenue fault, the San Andreas fault (Southern segment), and the Newport-Inglewood fault, which are located 12-km southwest, 24-km northeast, 37-km northwest, 48.5-km northeast, and 54-km southwest, respectively.

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 segment) (12-km SW)	6.8	5 mm/year	A
San Jacinto (San Jacinto Valley segment) (24-km NE)	6.9	12 mm/year	A
Chino-Central Avenue (37-km NW)	6.7	1 mm/year	A
San Andreas (Southern Segment) (48.5-km NE)	7.2	25 mm/year	A
Newport-Inglewood (54-km SW)	7.1	1.5 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 C, "Very dense Soil and Soft Rock", according to the CBC. The seismic parameters according to the CBC are summarized in the USGS Design Maps Summary Report presented in **Appendix B**. The corresponding value for peak ground acceleration from the design response spectrum based on the 2019 CBC seismic parameters is **0.723g**.

SEISMIC EFFECTS

Ground Accelerations

The most significant earthquake to affect the property is a 6.8 Richter magnitude earthquake on the Elsinore fault (Glen Ivy segment). Based on Section 1803.5.12 of the 2019 California Building Code, peak ground accelerations modified for site class effects (PGA_M) of approximately **0.723g** 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 negligible based on the absence of known active faulting on the site (Morton, 1991 & 2003 and Riverside County GIS website, 2021). 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 minor cracks at the ground surface for the life of the project cannot be fully eliminated.

Landslides

No geomorphic expression of landsliding or slope instability was noted during our site mapping and literature review. The subject site is in an area of relatively flat terrain and low rolling terrain. The risk of seismically induced landsliding to affect the proposed development is low.

Liquefaction

The site is not within either a State of California or County of Riverside designated or mapped liquefaction hazard zone. Therefore, coupled with the absence of shallow groundwater (+100-ft) and the medium dense to dense granitic bedrock underlying the subject site at both the ground surface and shallow depths, it is our opinion that liquefaction is not anticipated, and further analysis appears to be unwarranted at this time. Liquefaction potential is negligible.

Seismically Induced Soil Settlement

The proposed footings are anticipated to be founded medium dense to dense engineered fill materials overlying medium dense Old alluvial fan deposits and dense granitic bedrock. The settlement potential, under seismic loading conditions for these onsite materials, 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.

Rockfall Potential

Most of the subject site is in an area relatively free of large boulder outcroppings. Numerous granitic boulders were observed on the southeast corner of the subject site. We anticipate them to be removed during grading operations. The potential for rockfall is anticipated to be low.

Hydrocollapse Potential

Owing to the subject being underlain both at the ground surface on the southerly portion of the site and at shallow depths on the southerly portion of the site by dense granitic bedrock. Medium dense to dense Old alluvial fan deposits overlies the granitic bedrock on the northerly and westerly portions of the subject site. Based on the above, the hydrocollapse potential at the subject site is considered 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. According to the 40-scale "Conceptual Site Plan", the proposed multi-family residential development will encompass the entire site with access from both Berea and Normandy Roads.

2. 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 previous testing (T.H.E., 2003) indicate that the near surface soils have a very low expansion potential (EI = 14 to 20) consisting of a non-plastic silty Sand (Unified Soil Classification - SM) and sandy Silt (ML).

4. Based on the previous geotechnical report (T.H.E., 2003), the subject site is underlain both at the ground surface on the southerly portion of the site and shallow depth on the northerly portion of the site.

5.

RECOMMENDATIONS

Site Grading

General

Based on the "Conceptual Grading Plan", we anticipate that proposed development will encompass most of the subject site except for the extreme southeast corner of the site. 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 are 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.

Based on the previous subsurface investigation (T.H.E., 2003), complete removal of any undocumented fill, topsoil/colluvial soils, and weathered bedrock by overexcavation and recompaction of the building pads was recommended. Overexcavation within the building pads should extend a minimum of 4-ft bgs or 2-ft below bottom of deepest footing, whichever is greater. Overexcavation should extend a minimum of 5-ft outside the building footprint or equal to the depth of overexcavation, whichever is greater. Overexcavation within the street and parking areas should extend a minimum of 1 to 2-ft bgs, except in areas underlain by granitic bedrock at the ground surface no overexcavation will be required. 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.

Where structural fill is to be placed within the pad areas, the granitic bedrock and/or competent Old alluvial fan deposits should be suitably processed by moisture conditioning to near optimum moisture content, then compacted in the upper 12-inches to the minimum compaction requirement prior to placing fill. No structural fill shall be placed within the building areas 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 waste. 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, concrete, 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 C**. Additionally, it will be the responsibility of the owner and or the grading 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.

It will also be recommended that at the completion of grading, additional testing of engineering characteristics such as expansion potential, corrosivity suite, and ancillary testing should take place to determine final design requirements for foundations, slabs and concrete used.

Slope Construction

Based on the 40-scale Conceptual Grading Plans, cut slopes constructed at 2:1 (h: v) slope ratio to a maximum vertical height of approximately 15-ft are anticipated to be surficially and grossly stable. Fill slopes will be constructed of earth materials generated from the onsite undocumented fill, undifferentiated alluvial/colluvial soils, Old alluvial fan deposits and granitic bedrock. However, owing the relatively flat gently sloping nature of the subject site, fill slopes are anticipated to be less than 3-ft in vertical height. Cut slopes are anticipated to be founded in dense granitic bedrock dense granitic bedrock with no out of slope bedding. Dense unweathered granitic boulders may be exposed within cut slopes and should be evaluated during grading.

Expansive Soils

The onsite soil was reported to have a very low expansion potential with an Expansion Index's (EI's) of 14 and 20 (T.H.E., 2003). Testing of the subgrade soils should be conducted at the completion of grading to evaluate the expansive nature of the subgrade soils and final foundation recommendations made at that time.

Concrete

Based on previous soluble sulfate content testing of the onsite soils (T.H.E., 2003), it is anticipated that, from a corrosivity standpoint, Type II Portland Cement can be used for construction. Test results indicated that the percent soluble sulfates varied from **0.014 to 0.08**, which equates to a **Negligible** sulfate exposure per American Concrete Institute (ACI), 318-14. Additional corrosion testing should be conducted at the completion of grading.

South Shore Testing and Environmental 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.

Bearing Value and Footing Geometry

The following recommendations are considered geotechnical minimums and may be increased by structural requirements. The proposed structures may be supported by conventional continuous/spread footings founded in approved compacted fill soil or dense granitic bedrock. Continuous footings founded in approved compacted fill, for single-story or equivalent structures, should have a minimum width of 12-inches and depth of 12-inches, for two-story or equivalent structures, should have a minimum width of 15-inches and depth of 18-inches, for three-story or equivalent structures, should have a minimum width of 18-inches and depth of 24-inches and conform to the minimum criteria of the 2019 CBC for very low expansive soils (EI's = 14 & 20). The use of isolated column footings is not discouraged, however, where utilized, should have a minimum embedment of 18-inches below lowest soil grade or setback plane. Footings may be designed for a dead plus live load bearing capacity of 2,000-pounds-per-square-foot. This value may be increased by one-third for wind and seismic forces. An increase of 20% may be made for each additional foot of width or depth beyond the minimum requirements but shall not exceed 3,000 psf for vertical loads.

The minimum distance of the bottom outside edge of all footings and any slope face shall be 5-ft. The bottom of footing excavations should be maintained free of loose and disturbed soil. Footing concrete should be placed into a neat excavation.

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 15-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 vapor retarder (vapor barrier) should be installed in accordance with ASTM Specification E 1643-94. 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 18-inch centers both ways (CBC 2016). 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.

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 350 pcf for level ground. The total force should not exceed 3,000 psf. A coefficient of friction of .35 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.

Oversize Rock

Owing to the presence of large unweathered granitic boulders on the southeast corner of the site, oversize rock (i.e. rocks > than 6-inches) is anticipated. If any oversize material is to be 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 C** of this report.

Retaining Wall Parameters

Section 1803.5.12 of the California Building Code, Seismic Category D, indicates this geotechnical report shall provide information for the following: "The determination of dynamic seismic lateral earth pressures on foundation walls and retaining walls supporting more than 6 feet (1.83 m) of backfill height due to design earthquake ground motions." A seismic load of 12H should be used for design for retaining walls having more than 6 feet of backfill.

Table of Retaining Wall Design Pressures

Slope of adjacent ground	Active Pressure	At Rest Pressure	Passive Pressure
LEVEL	35 pcf	53 psf	250 pcf
2:1	55 pcf	83 pcf	150 pcf

The pressures in the preceding table are for retaining walls backfilled with granular and or onsite earth materials (EI $\leq$ 20) and provided with drainage devices such as weep holes or subdrains to prevent the build-up of hydrostatic pressures beyond the design values. It is imperative that all retaining wall backfills be compacted to a minimum of 90% relative compaction to achieve their design strength. Failure to provide proper drainage and minimum compaction may result in pressures against the wall that will exceed the design values indicated above. Surface waters should be directed away from retaining wall backfill areas so as not to intrude into the backfill materials. The upper two feet of backfill materials should consist of cohesive materials to minimize the potential for surface waters to infiltrate into the retaining wall backfill system.

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 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 proposed commercial structures should be accomplished such that positive drainage exists away from all footings in accordance with 2016 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.

Preliminary Structural Section

We recommend the following preliminary structural section for onsite parking and driveways. For preliminary design purposes, the following pavement sections may be considered based on a traffic indexes (T-I's) of 5.5 and 6 and an assumed R-value of 30. R-value testing should be conducted at the completion of precise grading, or after bringing in import soils, to verify soils exposed at subgrade, and a final structural section design should be recommended at that time. The project civil engineer should confirm the traffic indexes.

AREA	TI	PAVEMENT SECTION
Parking Areas	5.0	0.25' (3.0") AC over 0.52' (6.2") ABII
Driveways	6.0	0.27' (3.2") AC over 0.66' (7.9") ABII

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.

Construction

South Shore Testing & Environmental, 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 pads 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 units exposed at the surface and shallow depths is observed to be clayey silty Sand (SM) and granitic bedrock. They are moderately to slightly erosive, respectively. The onsite bedrock units are medium dense to dense at shallow depths, on the order of 2-ft and water does not percolate well into the onsite soils.

- Cuts 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 60 days in the non-rainy season and 30 days in the rainy season.

Grading and Foundation Plan Reviews

Once grading and foundation plans are finalized, both Grading and Foundation Plan reviews should be performed to review plans and confirm that the plans are in general conformance with recommendations presented in this report. Additional subsurface investigation may be required at that time.

Construction Monitoring

Observation and testing by South Shore Testing & Environmental is necessary to verify compliance with recommendations contained in this report and to confirm that the geotechnical conditions encountered are consistent with those encountered. South Shore Testing & Environmental 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 **South Shore Testing & Environmental**, or its assigns.

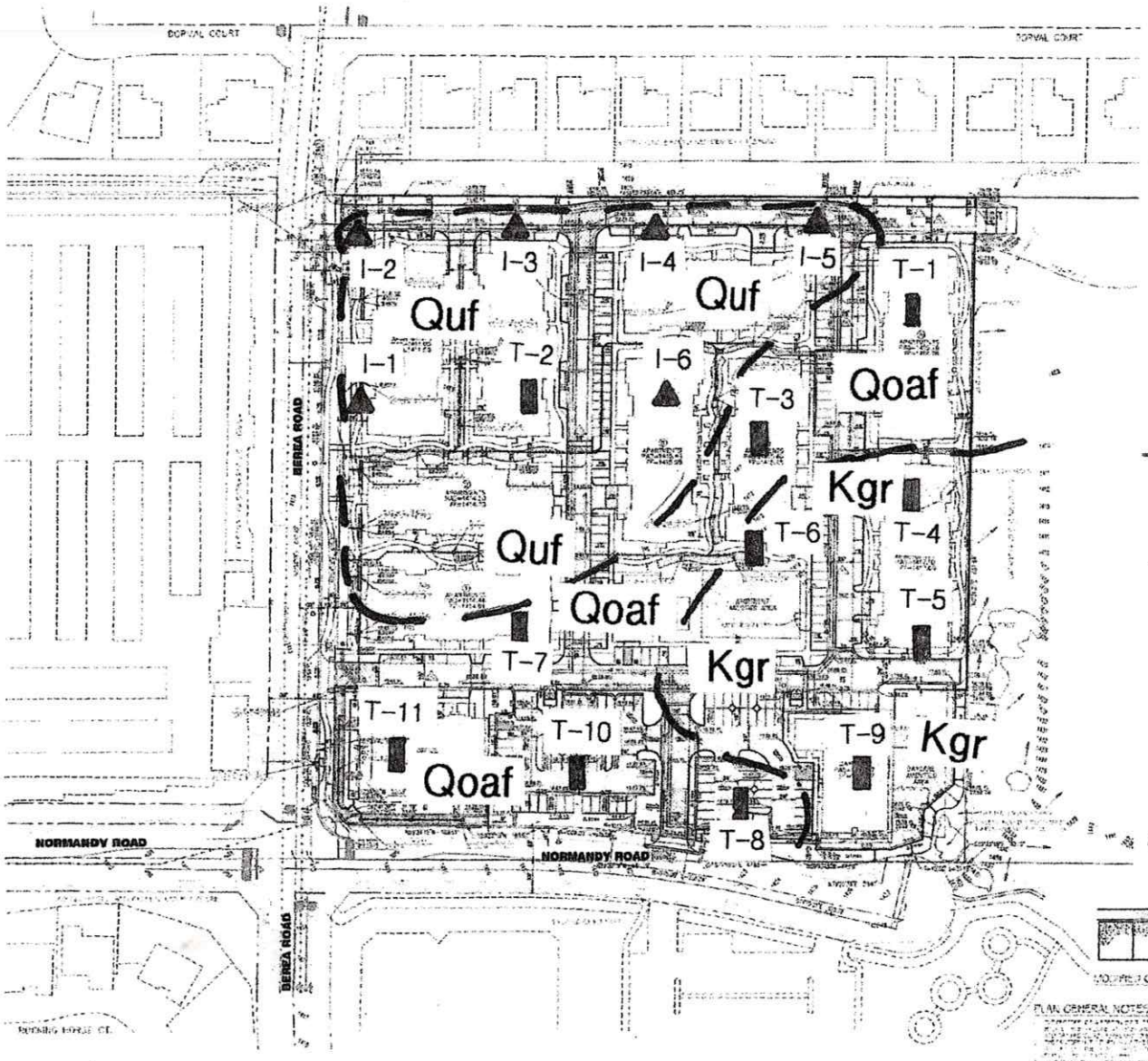
The findings of this report are valid as of the present date. However, changes in the condition of a property can occur with the passage of time, whether due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, 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.

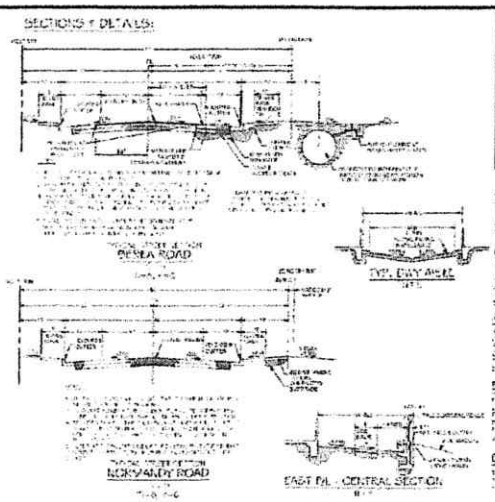
If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. Selection of another firm to perform any of the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

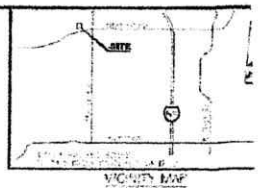
DATE	REVISION

CONCEPTUAL GRADING, DRAINAGE & UTILITY PLAN FOR CUP PLN20-016
BOULDERS MENIFEE - A MIXED USE DEVELOPMENT



SECTIONS / DETAILS:





SITE ADDRESS:
ASSESSOR PARCEL NO.'S:
OWNER:
APPLICANT / DEVELOPER:
ENGINEER / SURVEYOR:
BASIS OF BEARINGS:
BENCHMARK:
FLOOD ZONE DESIGNATION:
ZONE AND USE INFORMATION:

LEGEND

UNITS

Quf	- UNDOCUMENTED FILL
Qoaf	- OLD ALLUVIAL FAN DEPOSITS
Kgr	- GRANITIC BEDROCK

SYMBOLS

T-11	- APPROXIMATE LOCATION OF EXPLORATORY TRENCHES (THE, 2003)
I-6	- APPROXIMATE LOCATION OF EXPLORATORY TRENCHES (SS, 2020)
~	- APPROXIMATE LOCATION OF UNIT CONTACTS

GRAPHIC SCALE

PREPARED BY:

KOLIBRIEN

LEGEND:

HYDROLOGY & WATER QUALITY SUMMARY:

PLAN GENERAL NOTES:

SOUTH SHORE TESTING & ENVIRONMENTAL

GEOTECHNICAL MAP
PROPOSED MULTI-FAMILY RESIDENTIAL DEVELOPMENT
APN: 339-200-080, 9.92-ACRES
NE CORNER OF BEREA AND NORMANDY ROADS
CITY OF MENIFEE, RIVERSIDE COUNTY, CALIFORNIA

WORK ORDER: 4722001.00U DATE SEPT. 2021 PLATE: 1 OF 1

SHEET 1 OF 1

CLOSURE

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,

South Shore Testing & Environmental



John P. Frey
Project Geologist

William C. Hobbs, RCE 42265
Civil Engineer

ATTACHMENTS
Plate 1-Geotechnical Map
Appendix A - References
Appendix B - USGS Design Maps Summary Report
Appendix C – Standards of Grading

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".

California Geologic Survey, Revised 2018, "Earthquake Fault Zones, A Guide for Government Agencies, Property Owners/Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California", Special Publication 42.

California Division of Mines & Geology, 1997, "Guidelines for Evaluating and Mitigating Seismic Hazards in California", Special Publication 117.

California Division of Mines & Geology, 1996, "Probabilistic Seismic Hazard Assessment for the State of California", DMG Open File Report 96-08, USGS Open File Report 96-706.

California Geological Survey, 2006, "California Fault Parameters", California Geologic Survey website - Open-file Report 96-08.

Coduto, Don, P., 1994, "Foundation Design Principles and Practice", Prentice Hall, pages 637-655.

County of Riverside GIS Website, 2020.

Department of Water Resources, 1978, "Water Resources Evaluation of the San Jacinto Area", District Report April 1978.

Hart, E.W., 2000, "Fault-Rupture Hazard Zones in California", California Division of Mines and Geology Special Publication 42, CD-003 (CD-ROM Version).

Jennings, C.W., 1994, Fault Activity Map of California and Adjacent Areas with Locations and Ages of Recent Volcanic Eruptions, California Division of Mines and Geology, Geologic Data Map No. 6.

Morton, D.M.,1991, "Geologic Map of the Romoland 7.5' Quadrangle, Riverside County, California", Scale: 1" = 2,000', U.S.G.S. Open-File Report 90-701.

Summa Architecture, December 5, 2019, "Conceptual Site Plan, Boulders Mixed Use, Menifee, CA", Sheet SP, 40-Scale.

T.H.E. Soils Company, Inc., December 15, 2003, "Preliminary Geotechnical Investigation, Proposed Residential Development, ±10-Acre Parcel on the NEC of Newport and Berea Roads, Menifee Area, Riverside County, California", Work Order No. 657301.00.

APPENDIX B

USGS Design Maps Summary Report

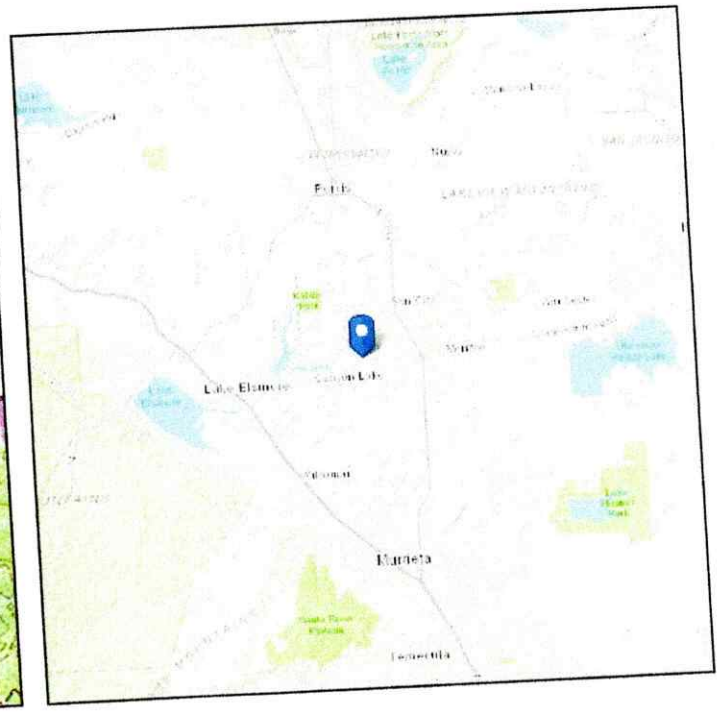
ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class: C - Very Dense Soil and Soft Rock

Elevation: 1411.43 ft (NAVD 88)
Latitude: 33.6856
Longitude: -117.2139





ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

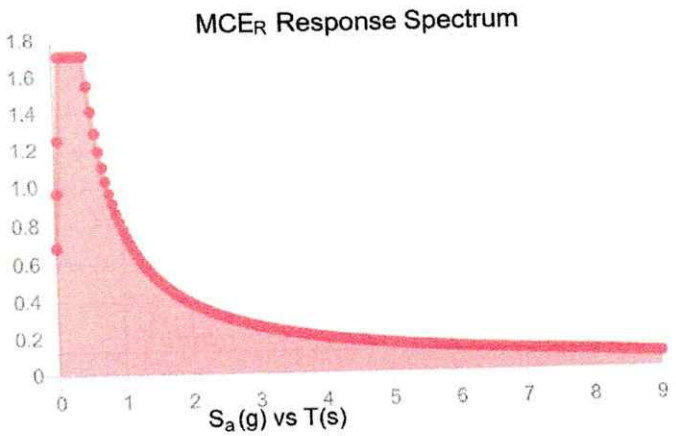
Seismic

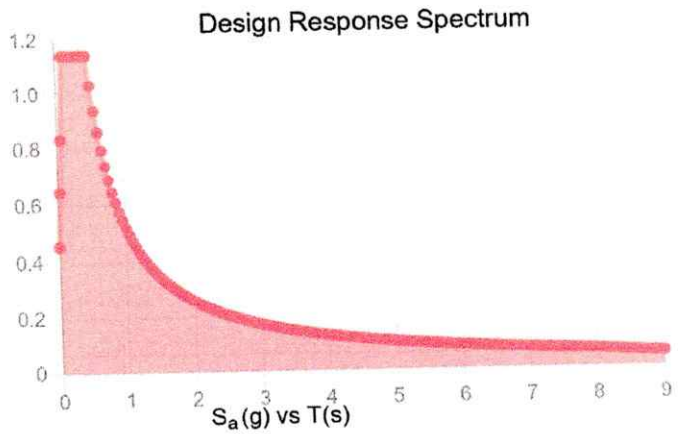
Site Soil Class: C - Very Dense Soil and Soft Rock

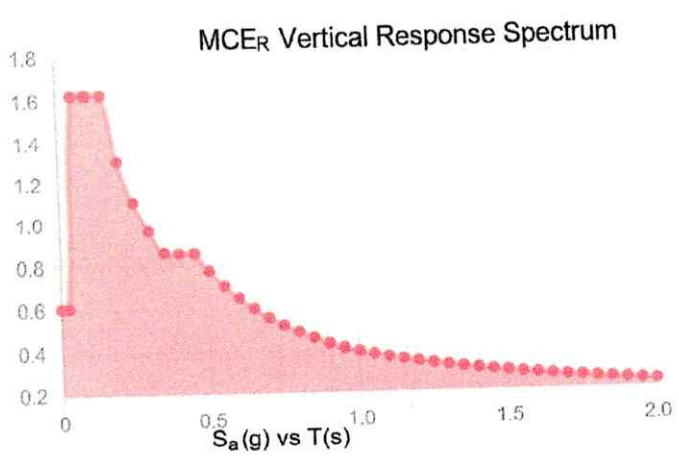
Results:

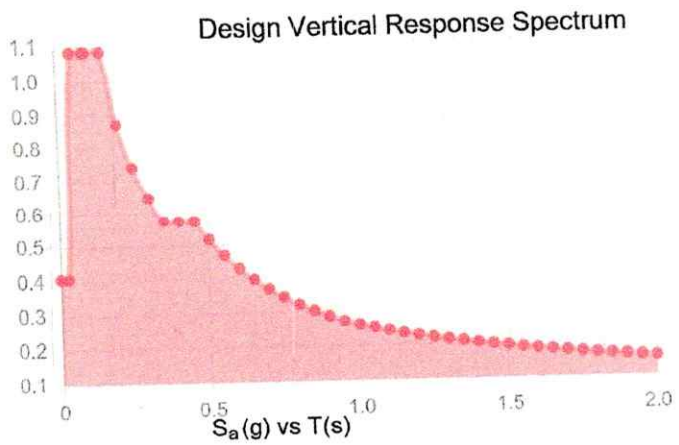
S_S :	1.429	S_{D1} :	0.517
S_1 :	0.527	T_L :	8
F_a :	1.2	PGA :	0.602
F_v :	1.473	PGA_M :	0.723
S_{MS} :	1.715	F_{PGA} :	1.2
S_{M1} :	0.776	I_e :	1
S_{DS} :	1.143	C_v :	1.186

Seismic Design Category D









Data Accessed: Mon Sep 13 2021

Date Source: USGS Seismic Design Maps based on ASCE/SEI 7-16 and ASCE/SEI 7-16 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-16 Ch. 21 are available from USGS.

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.

ASCE does not intend, nor should anyone interpret, the results provided by this Tool to replace the sound judgment of a competent professional, having knowledge and experience in the appropriate field(s) of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the contents of this Tool or the ASCE 7 standard.

In using this Tool, you expressly assume all risks associated with your use. Under no circumstances shall ASCE or its officers, directors, employees, members, affiliates, or agents be liable to you or any other person for any direct, indirect, special, incidental, or consequential damages arising from or related to your use of, or reliance on, the Tool or any information obtained therein. To the fullest extent permitted by law, you agree to release and hold harmless ASCE from any and all liability of any nature arising out of or resulting from any use of data provided by the ASCE 7 Hazard Tool.

APPENDIX C

Standards of Grading

STANDARD GRADING AND EARTHWORK SPECIFICATIONS

These specifications present **South Shore Testing & Environmental,** 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 1557-70, 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.)

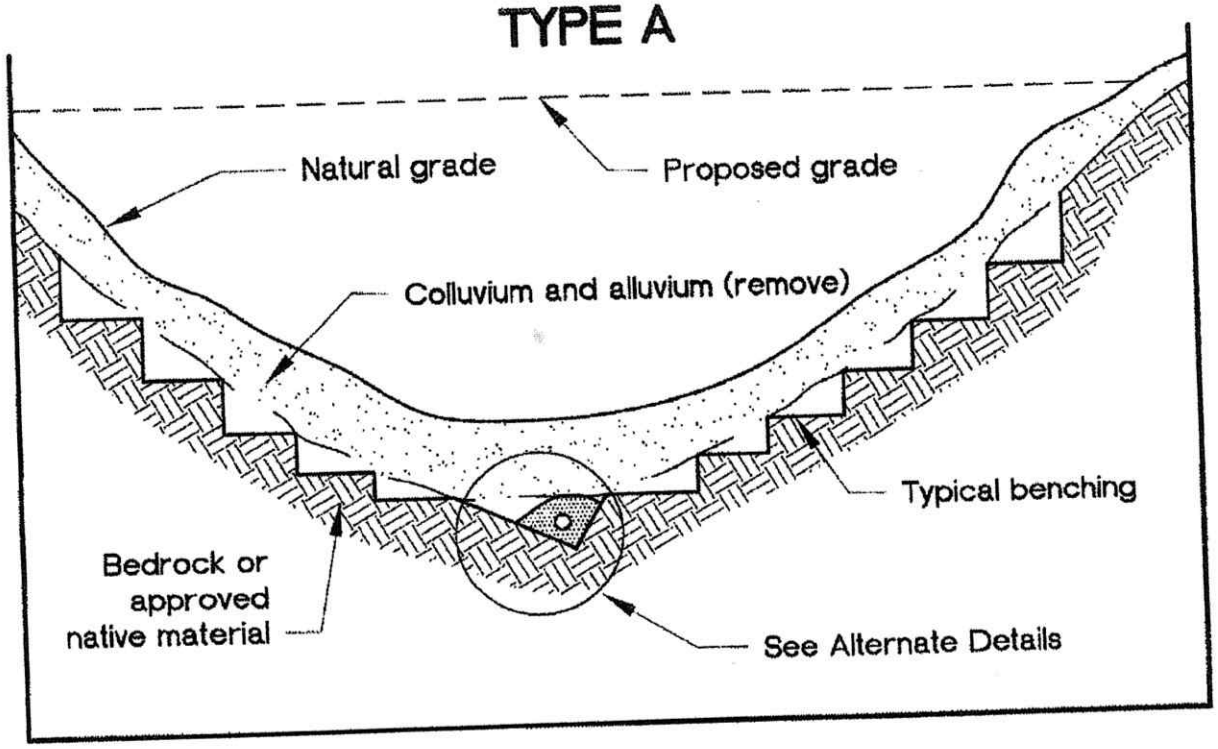
3.11 Sub drainage devices shall be constructed in compliance with the ordinances of the controlling governmental agency, or with the recommendations of the Soils Consultant. (Typical Canyon Subdrain details are attached.)

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.

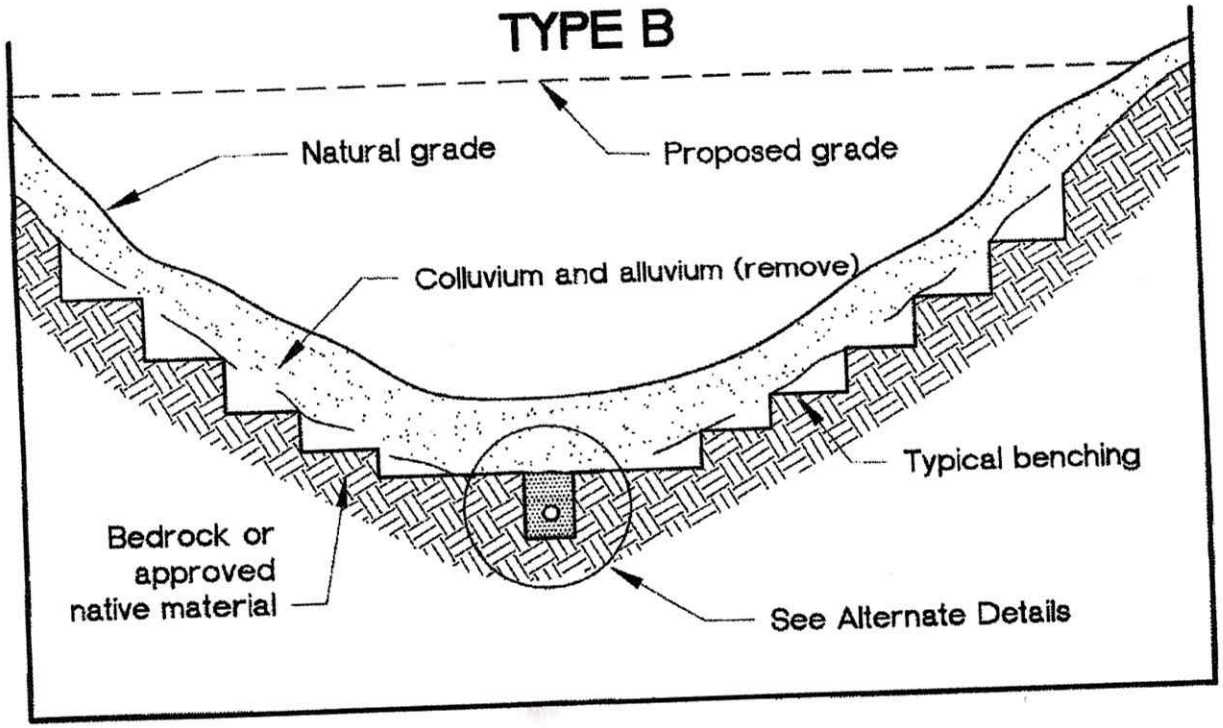
3.13 All fill slopes should be planted or protected from erosion by other methods specified in the Soils report.

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.)

TYPE A

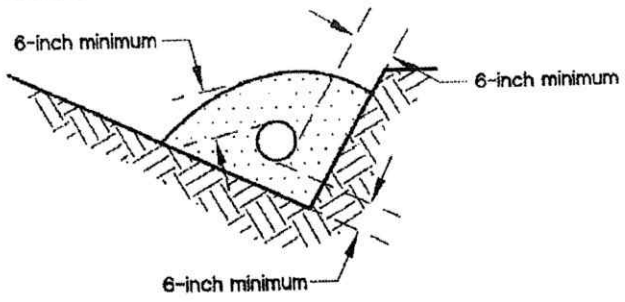


TYPE B

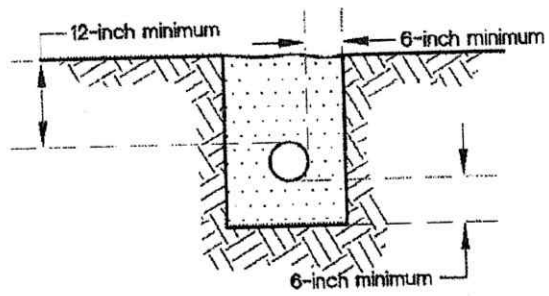


Selection of alternate subdrain details, location, and extent of subdrains should be evaluated by the geotechnical consultant during grading.

SOUTH SHORE TESTING	CANYON SUBDRAIN DETAIL	Plate 1



A-1



B-1

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

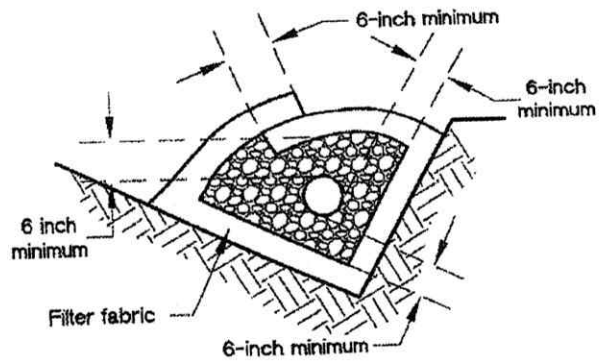
Perforated pipe: 6-inch-diameter ABS or PVC pipe or approved substitute with minimum 8 perforations (¼-inch diameter) per lineal foot in bottom half of pipe (ASTM D-2751, SDR-35, or ASTM D-1527, Schd. 40).

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

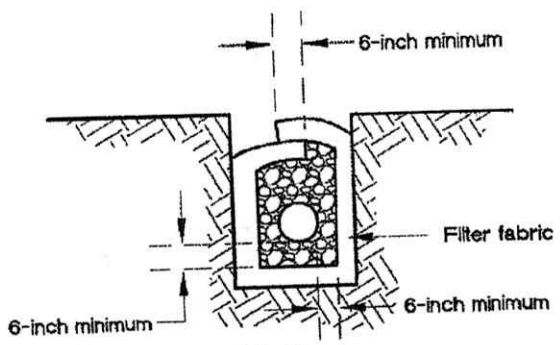
FILTER MATERIAL

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

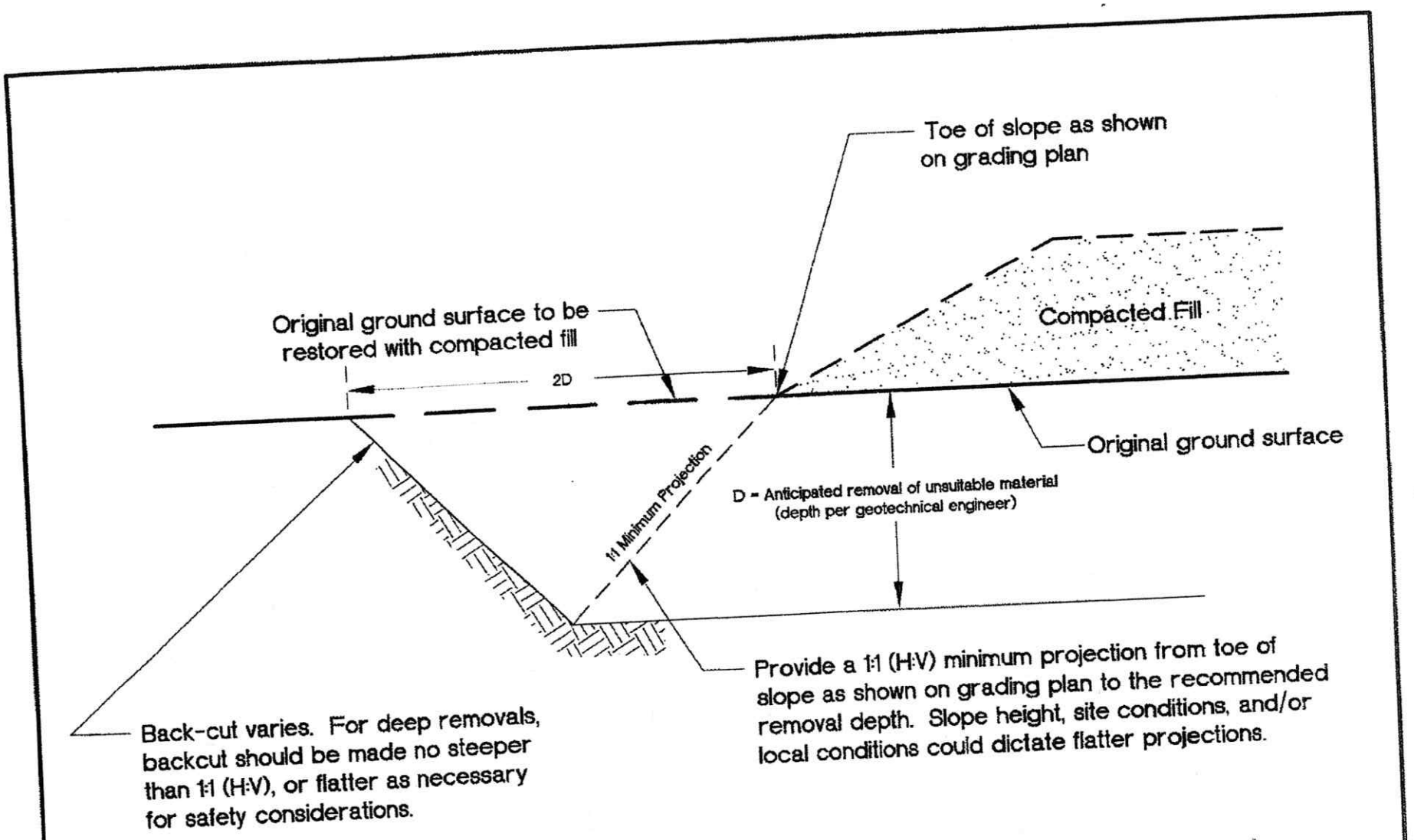


B-2

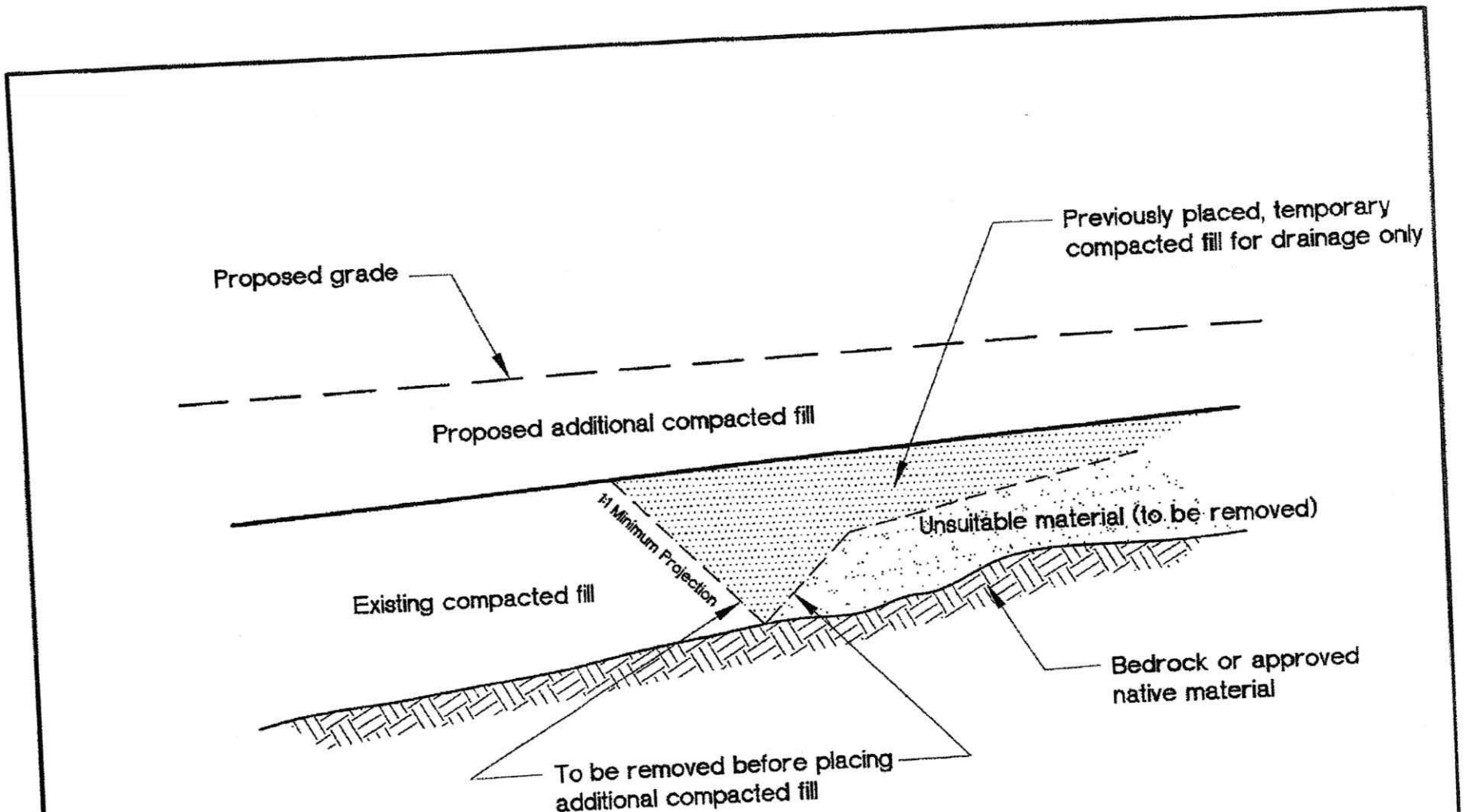
Gravel Material: 9 cubic feet per lineal foot.
Perforated Pipe: See Alternate 1
Gravel: Clean ¾-inch rock or approved substitute.
Filter Fabric: Mirafi 140 or approved substitute.

ALTERNATE 2: PERFORATED PIPE, GRAVEL, AND FILTER FABRIC

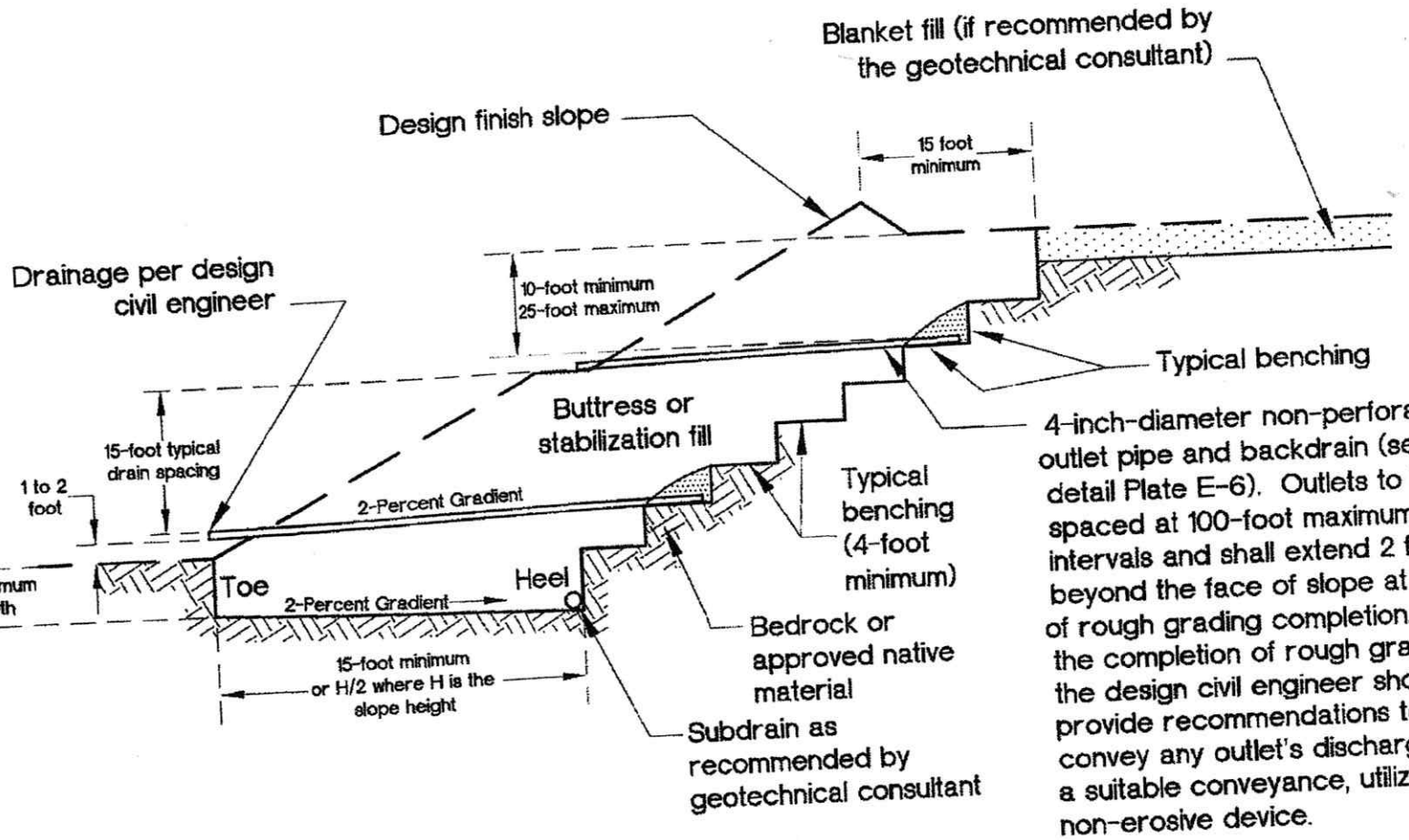
SOUTH SHORE TESTING	CANYON SUBDRAIN ALTERNATE DETAILS	Plate 2



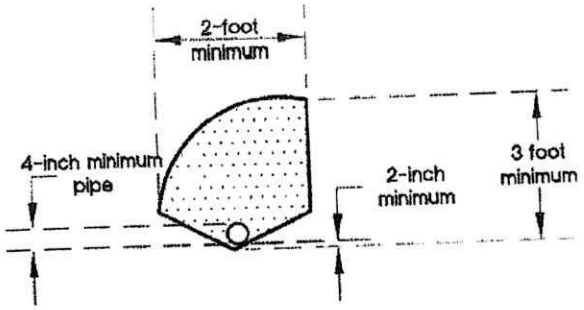
SOUTH SHORE TESTING	FILL SLOPE TOEING OUT ON FLAT ALLUVIATED CANYON DETAIL	PLATE 3

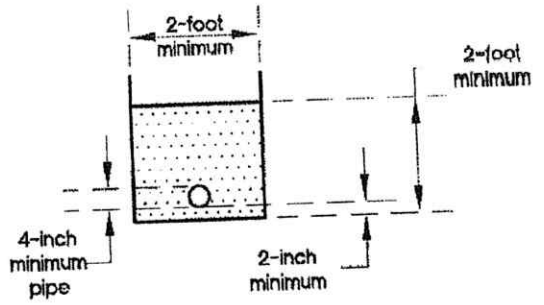


SOUTH SHORE TESTING	REMOVAL ADJACENT TO EXISTING FILL ADJOINING CANYON FILL DETAIL	Plate 4



SOUTH SHORE TESTING	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.

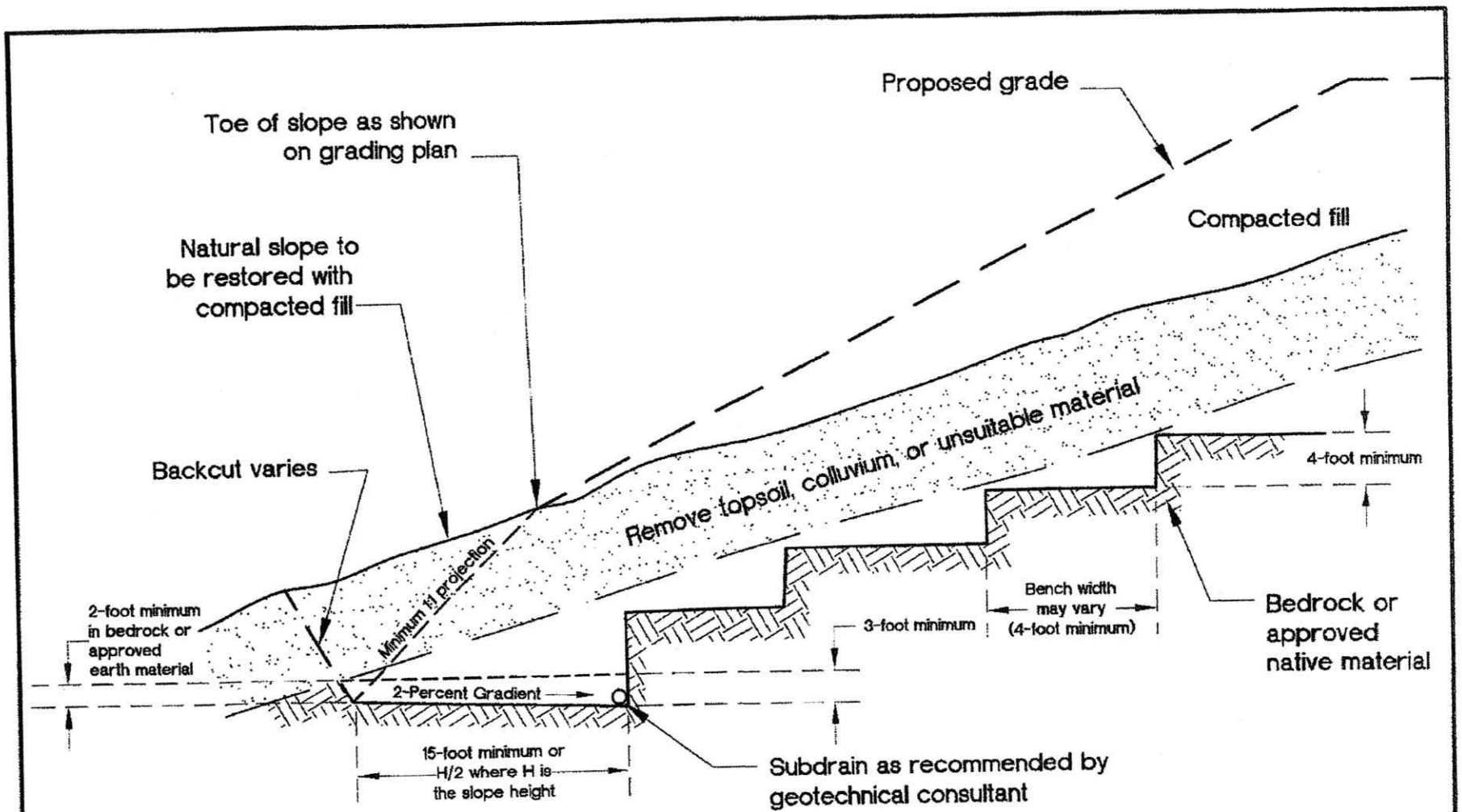
Filter Material shall be of the following specification or an approved equivalent.

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

SOUTH SHORE TESTING	TYPICAL BUTTRESS SUBDRAIN DETAIL	Plate 6

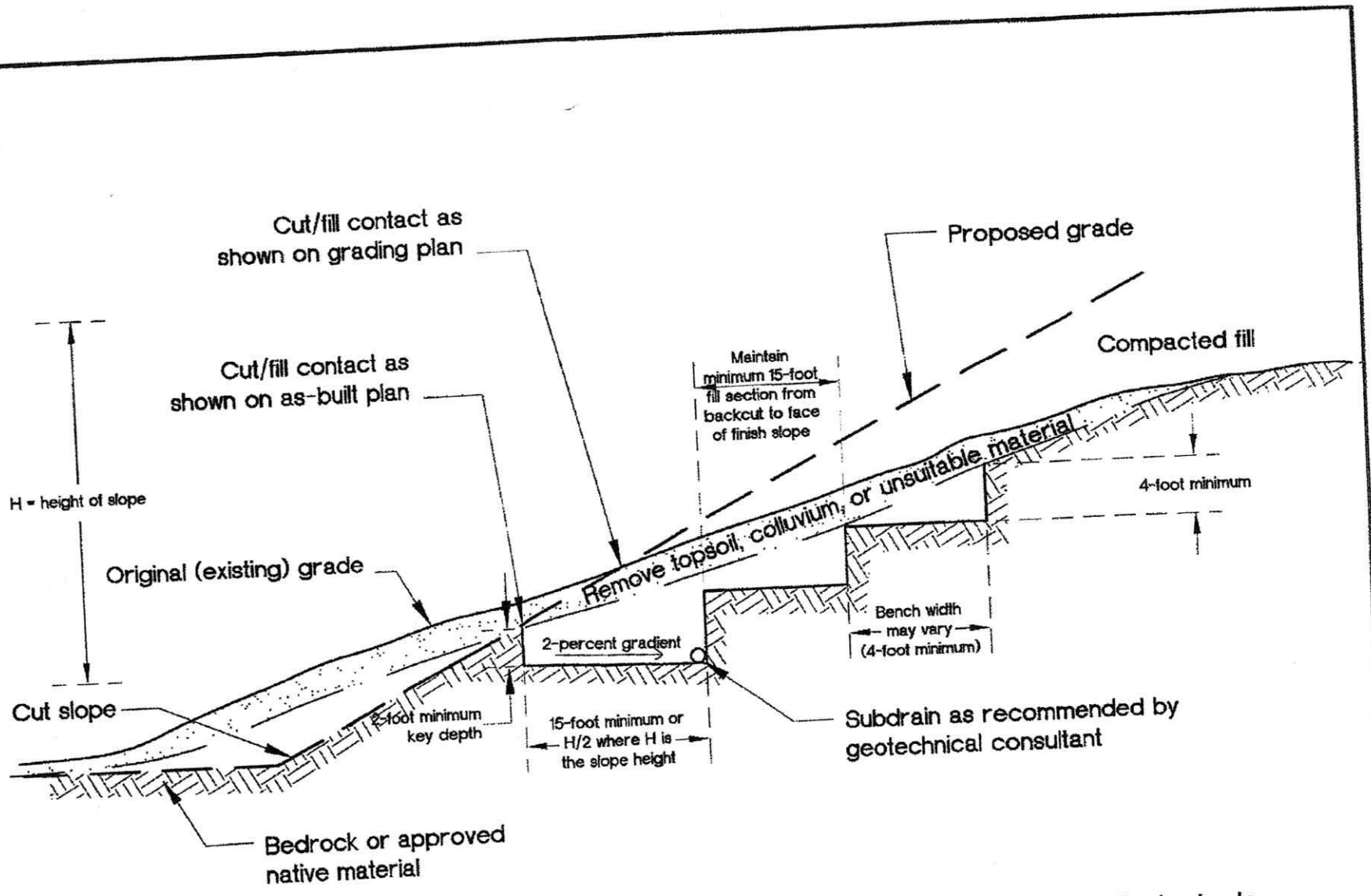


NOTES:

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

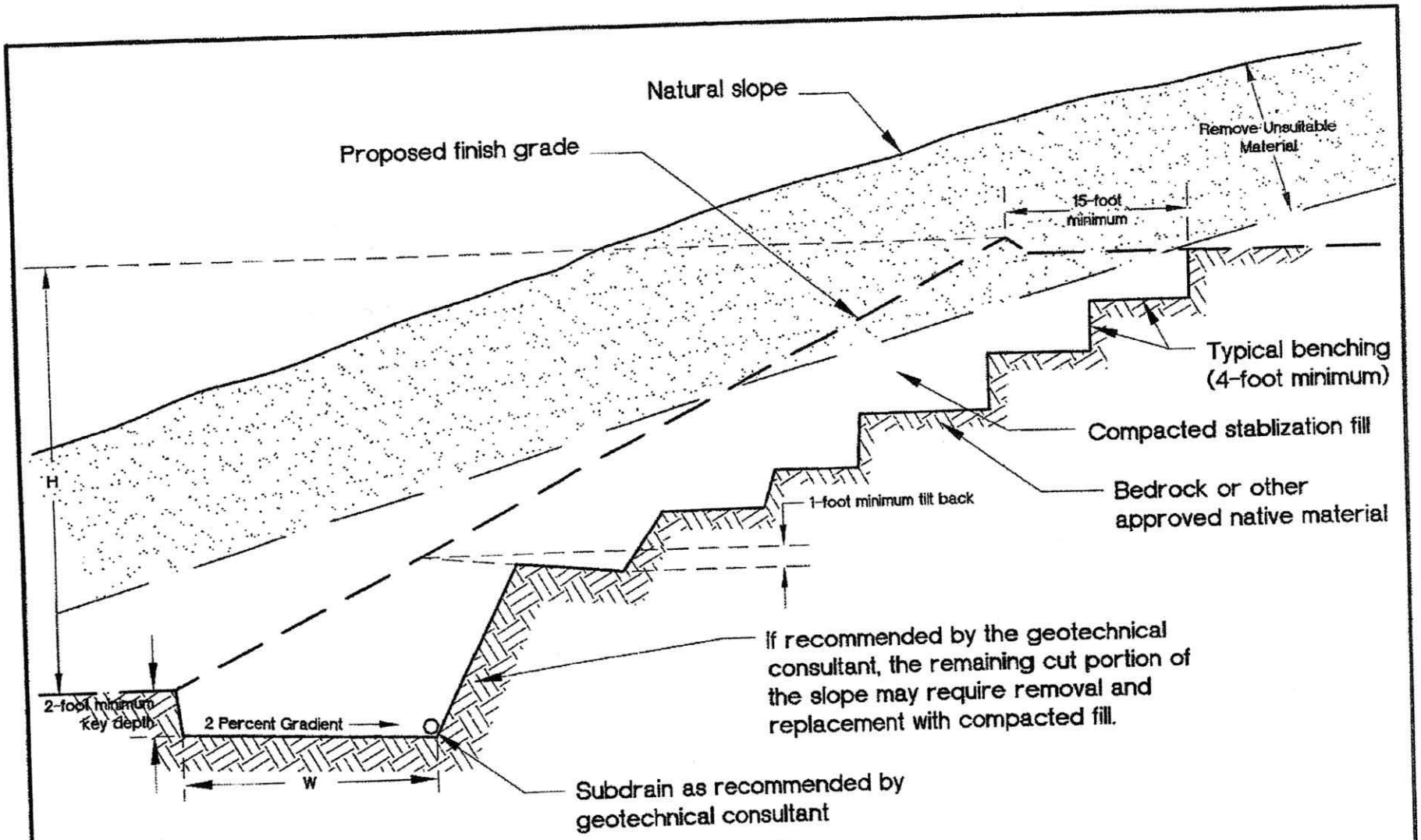
2. The need for and disposition of drains should be evaluated by the geotechnical consultant, based upon exposed conditions.

SOUTH SHORE TESTING	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.

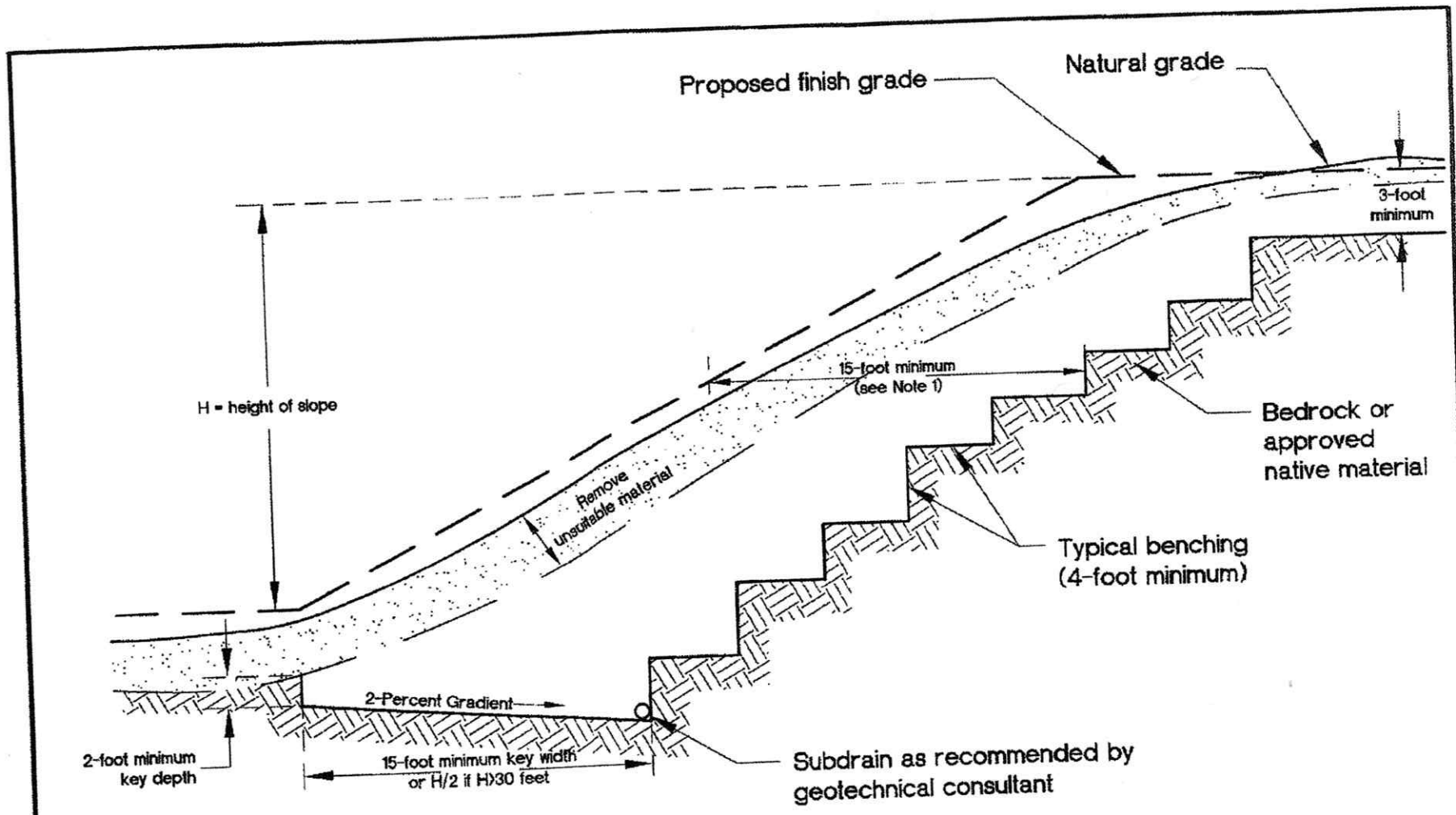
SOUTH SHORE TESTING	FILL OVER CUT DETAIL	Plate 8



NOTES:

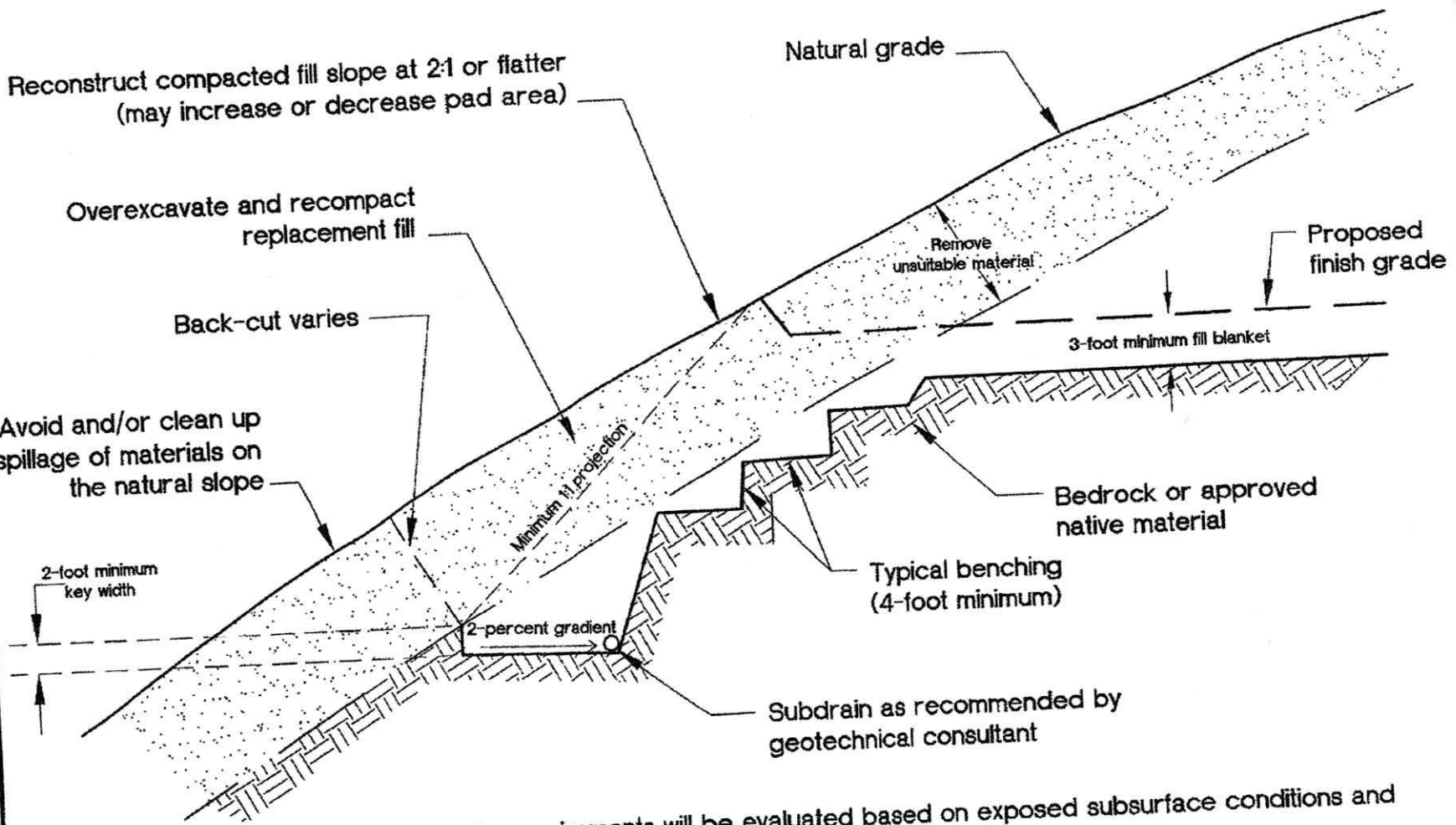
1. Subdrains may be required as specified by the geotechnical consultant.
2. W shall be equipment width (15 feet) for slope heights less than 25 feet. For slopes greater than 25 feet, W shall be evaluated by the geotechnical consultant. At no time, shall W be less than H/2, where H is the height of the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

SOUTH SHORE TESTING	STABLIZATION FILL FOR UNSTABLE MATERIAL EXPOSED IN CUT SLOPE DETAIL	Plate 9



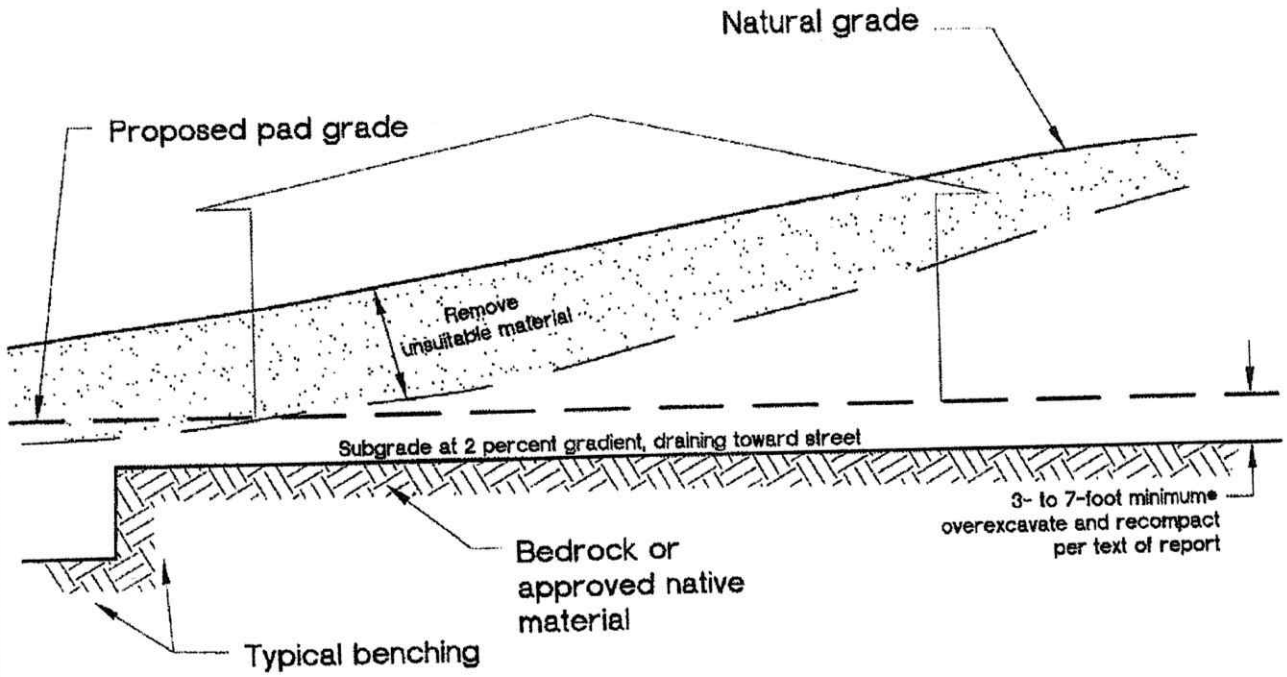
NOTES:
1. 15-foot minimum to be maintained from proposed finish slope face to backcut.
2. The need and disposition of drains will be evaluated by the geotechnical consultant based on field conditions.
3. Pad overexcavation and recompaction should be performed if evaluated to be necessary by the geotechnical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

SOUTH SHORE TESTING	SKIN FILL OF NATURAL GROUND DETAIL	Plate 10

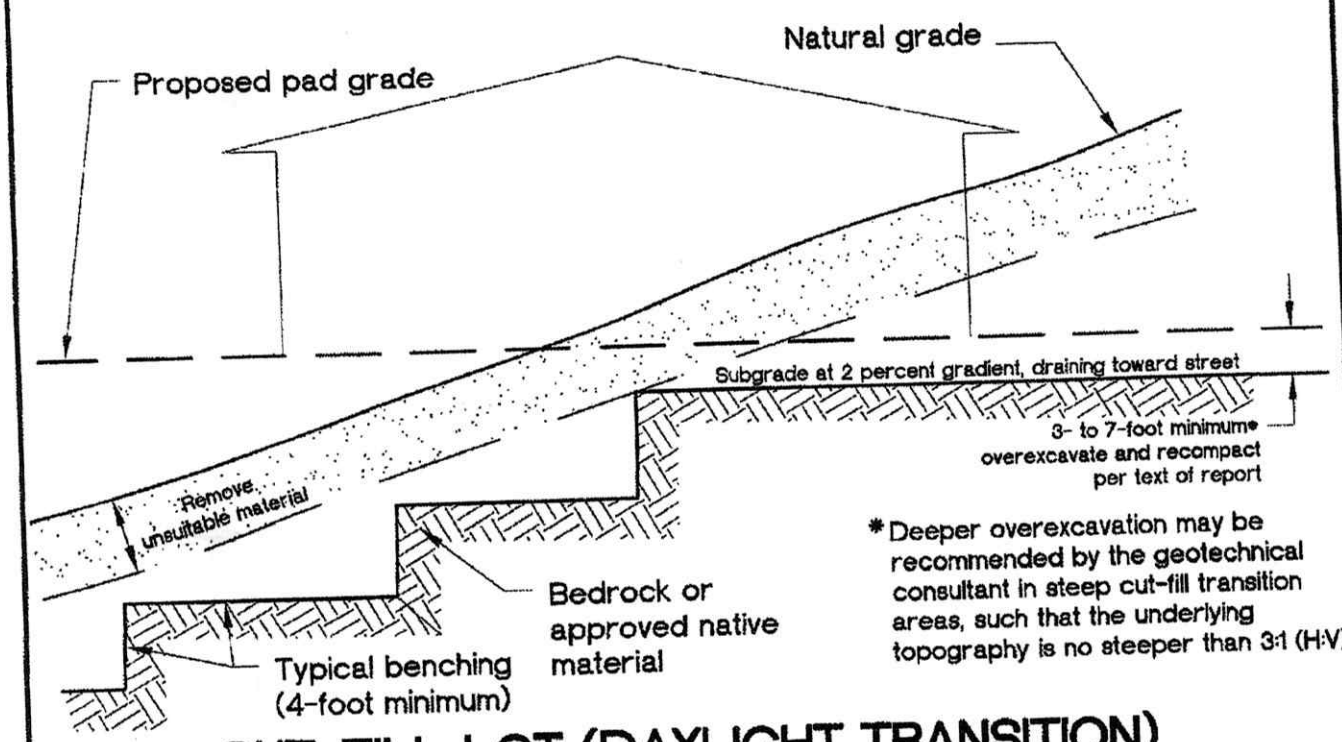


NOTES:
1. Subdrain and key width requirements will be evaluated based on exposed subsurface conditions and thickness of overburden.
2. Pad overexcavation and recompaction should be performed if evaluated necessary by the geotechnical consultant.

SOUTH SHORE TESTING	DAYLIGHT CUT LOT DETAIL	Plate 11



CUT LOT OR MATERIAL-TYPE TRANSITION



CUT-FILL LOT (DAYLIGHT TRANSITION)

SOUTH SHORE TESTING	TRANSITION LOT DETAILS	Plate 12