GEOTECHNICAL INVESTIGATION
PROPOSED VILLAGE PLACE APARTMENTS
521 16TH STREET
RAMONA, CALIFORNIA

Prepared for:

RA BURCH CONSTRUCTION, INC.
ATTENTION: BOB BURCH
P.O. BOX 1590
RAMONA, CALIFORNIA 92065

Prepared by:

CONSTRUCTION TESTING & ENGINEERING, INC.
1441 MONTIEL ROAD, SUITE 115
ESCONDIDO, CALIFORNIA 92026

CTE JOB NO.: 10-13565G MARCH 7, 2017

TABLE OF CONTENTS

FIGURES

APPENDICES

1.0 INTRODUCTION AND SCOPE OF SERVICES

1.1 Introduction

This report presents the results of the geotechnical investigation, performed by Construction Testing and Engineering, Inc. (CTE), and provides conclusions and preliminary recommendations for the proposed improvements at the subject site located at 521 16th Street in Ramona, California. The recent investigation was performed in general accordance with the terms of CTE proposal G-3980A, dated February 1, 2017.

CTE understands that the proposed site improvements include multiple two-story, wood-frame apartment buildings with drive and parking areas, a stormwater retention basin, associated utilities, landscaping, and other ancillary improvements. According to the project grading plan, site work will include raising existing grades up to five feet from current elevations to create the building pads and surrounding areas. Preliminary recommendations for excavations, fill placement, and foundation design for the proposed improvements are presented herein. Reviewed references are provided in Appendix A.

1.2 Scope of Services

The scope of services provided included:

- Review of readily available geologic and geotechnical reports.
- Coordination of utility mark-out and location.
- Obtaining a Boring Permit through the County of San Diego Department of Environmental Health (DEH).

- Excavation of exploratory borings and soil sampling utilizing a limited access, track-mounted drill rig, due to soft site conditions at the time of the field evaluation.
- Laboratory testing of selected soil samples.
- Description of site geology and evaluation of potential geologic hazards.
- Engineering and geologic analysis.
- Preparation of this preliminary geotechnical investigation report.

2.0 SITE DESCRIPTION

The project site is located at 521 16th Street in Ramona, California (Figure 1). The site is currently a grass covered vacant lot with some scattered trees. The site is bounded by 16th Street to the east, an existing apartment complex to the north, Single-family residences to the south, and a small residential farm to the west. A draining channel/creek runs east to west along the northern property line before turning southwest and meeting a shallow pond on the adjacent western property. An old concrete slab was observed along the west-central property boundary.

An abandoned well (or similar) appears to be present along the west-central property boundary. The presumed abandoned well should be further researched and properly abandoned in accordance with the requirements and permitting of the agency having jurisdiction, which is anticipated to be the County of San Diego Department of Environmental Services. CTE or another qualified consultant can be contacted to provide further evaluation of this site feature.

Saturated (from recent rains) and burrowed soils were encountered across the surface of the site necessitating the use of a track-mounted drill rig. The project area generally descends gradually to the west with elevations ranging from approximately 1414 feet msl (above mean sea level) in the southeastern portion of the site to approximately 1410 feet msl in the northwestern portion of the site.

3.0 FIELD INVESTIGATION AND LABORATORY TESTING

3.1 Field Investigation

CTE performed the field investigation on February 17, 2017. The field work consisted of site reconnaissance and excavation of six borings. The borings were advanced to a maximum depth of approximately 20.25 feet below ground surface (bgs). Bulk samples were collected from the cuttings, and relatively undisturbed samples were collected by driving Standard Penetration Test (SPT) and Modified California (CAL) samplers. The Borings were advanced with a CME-75 track-mounted, limited access drill rig equipped with eight-inch-diameter, hollow-stem augers. The approximate locations of the exploratory soil borings are shown on the attached Figure 2.

The soils were logged in the field by a CTE Engineering Geologist and were visually classified in general accordance with the Unified Soil Classification System. The field descriptions have been modified, where appropriate, to reflect laboratory test results. Boring logs, including descriptions of the soils encountered, are included in Appendix B. The approximate locations of the borings are presented on Figure 2.

3.2 Laboratory Testing

Laboratory tests were conducted on selected soil samples for classification purposes, and to evaluate physical properties and engineering characteristics. Laboratory tests included: Expansion Index

(EI), Gradation, 200 Wash, In-Place Moisture and Density, Atterberg Limits, Resistance "R" Value, and Chemical Characteristics. Test descriptions and laboratory test results for the selected soils are included in Appendix C. Some laboratory tests remain pending at the time of issuance of this report. Should the results of pending tests necessitate modifications to the recommendations herein, an updated report or addendum will be issued.

4.0 GEOLOGY

4.1 General Setting

Ramona is located within the Peninsular Ranges physiographic province, which is characterized by northwest-trending mountain ranges, intervening valleys, and predominantly northwest trending regional faults. The region can be further subdivided into the coastal plain area, a central mountain-valley area and the eastern mountain valley area. The project site is located in the eastern portion of the central mountain area. The central-mountain area ranges in elevation from approximately 500 to 5000 feet above mean sea level and is characterized by Cretaceous and Jurassic crystalline ridges and mountains with intermountain basins that are generally underlain with moderate thickness of alluvium and residual soils.

4.2 Geologic Conditions

Based on the regional geologic map prepared by Hernandez, et al. (2007), the near surface geologic unit underlying the site consists of deeply weathered, Cretaceous Japatul Valley Tonalite. Based on the recent explorations, Quaternary Alluvium and Residual Soil overlie the Tonalite at the site. Descriptions of the geologic and soil units encountered are presented below.

4.2.1 Quaternary Alluvium

The Quaternary Alluvium generally consists of loose to very dense, slightly moist to wet, light brown to dark brown, silty, poorly graded, and clayey, sands as well as firm to hard, sandy clays and silts. This unit was found to extend to a maximum encountered depth of 18.5 feet bgs during the investigation. The interpreted depth of alluvium / top of Tonlite bedrock across the site is depicted as depth contours on Figure 2. As shown on Figure 2, the depth of the alluvium is deepest along the northern portion of the site adjacent to existing creek/drainage channel, and thins toward the south across a subsurface granitic bedrock high. However, localized deeper alluvium may be encountered during grading and construction, especially along the northern portion of the property. Alluvium is not considered suitable for support of proposed improvements unless prepared as recommended herein.

4.2.2 Residual Soil

Residual soil was observed overlying the Tonalite in Borings B-5 and B-6. Where observed, these materials generally consist of medium dense to very dense, slightly moist, brown to gray brown, clayey, fine grained sands with silt and trace medium to coarse sands. The top of the residual soil recognized in Borings B-5 and B-6 is at a consistent depth as the top of the weather Tonalite bedrock observed in Borings B-2 and B-3, approximately three to four feet below existing ground surface, indicating that either the residual soil was eroded from the bedrock high (B-2, B-3 area) or was too thin to be recognized based on the sampling interval in the borings. Therefore, it is possible that residual soils could be present further north than shown on Figure 2. Residual soils are not considered suitable for support of proposed improvements unless prepared as recommended herein.

4.2.3 Cretaceous Japatul Valley Tonalite-deeply weathered

Weathered Cretaceous-age Japatul Valley Tonalite (bedrock) was encountered in each of the borings below the alluvium and/or residual soil. As observed in situ, this unit is generally medium to coarse grained, pale gray to white with abundant mafic inclusions, and moderately to strongly foliated. The bedrock generally excavated as dense to very dense, slightly moist, brown to gray and red brown, silty, fine grained sand with clay. The bedrock is anticipated to become less weathered and increasingly difficult to excavate with depth. These materials are anticipated to be suitable for support of proposed compacted fill materials, as recommended herein.

4.3 Groundwater Conditions

During the recent investigation, groundwater was encountered in Borings B-1 and B-4, at a depth of approximately 10.5 and 8.0 feet bgs, respectively. Because of the recent heavy precipitation during the time of our explorations, groundwater levels may have been seasonally elevated. Also, groundwater depths are anticipated to be shallower with closer proximity to the drainage channel to the north and the pond to the west. While groundwater conditions may vary, especially following periods of sustained precipitation or irrigation, it is generally not anticipated to affect the proposed shallow construction activities or the completed improvements if proper site drainage is designed, installed, and maintained as per the recommendations of the project civil engineer. In addition, site plans indicate grading to raise the elevation of the pad, further distancing the groundwater from proposed improvements. However, if or where present at shallower depths during proposed grading, localized diversion of groundwater or stabilization using medium- to high-strength geogrid and/or rock could be necessary.

4.4 Geologic Hazards

Geologic hazards that were considered to have potential impacts to site development were evaluated based on field observations, literature review, and laboratory test results. It appears that the geologic hazards at the site are primarily limited to those caused by shaking from earthquake-generated ground motions. The following paragraphs discuss the geologic hazards considered and their potential risk to the site.

4.4.1 Surface Fault Rupture

Based on the site reconnaissance and review of referenced literature, the site is not within a State of California-designated Alquist-Priolo Earthquake Fault Studies Zone or Local Special Studies Zone and no known active fault traces underlie, or project toward, the site. According to the California Division of Mines and Geology, a fault is active if it displays evidence of activity in the last 11,000 years (Hart and Bryant, revised 2007). Therefore, the potential for surface rupture from displacement or fault movement beneath the proposed improvements is considered to be low.

4.4.2 Local and Regional Faulting

The California Geological Survey (CGS) and the United States Geological Survey (USGS) broadly group faults as “Class A” or “Class B” (Cao, 2003; Frankel et al., 2002). Class A faults are generally identified based upon relatively well-defined paleoseismic activity, and a fault-slip rate of more than 5 millimeters per year (mm/yr). In contrast, Class B faults have comparatively less defined paleoseismic activity and are considered to have a fault-slip rate less than 5 mm/yr. The nearest known Class B fault is the Earthquake Valley Fault, which is approximately 32.2 kilometers northeast of the site (Blake, T.F., 2000). The nearest known Class A fault is the Julian segment of the Elsinore Fault, which is located approximately 23 kilometers northeast of the site.

The site could be subjected to significant shaking in the event of a major earthquake on any of the faults noted above or other faults in the southern California or northern Baja California area.

4.4.3 Liquefaction and Seismic Settlement Evaluation

Liquefaction occurs when saturated fine-grained sands or silts lose their physical strengths during earthquake-induced shaking and behave like a liquid. This is due to loss of point-to-point grain contact and transfer of normal stress to the pore water. Liquefaction potential varies with water level, soil type, material gradation, relative density, and probable intensity and duration of ground shaking. Seismic settlement can occur with or without liquefaction; it results from densification of loose soils.

The site is underlain at shallow depths by dense to very dense Tonalite. In addition, loose surficial soils within proposed improvement areas are to be overexcavated and then compacted as engineered fill. Therefore, the potential for liquefaction or significant seismic settlement at the site is considered to be negligible to low.

4.4.4 Tsunamis, Seiche, and Flooding Evaluation

According to State of California Emergency Management Agency mapping, the site is not located within a tsunami inundation zone based on distance from the coastline and elevation above sea level. Damage resulting from oscillatory waves (seiches) is considered unlikely due to the absence of significant nearby confined bodies of water. According to FEMA (2007), the site is mapped in Zone X, which is determined to be outside the 0.2% annual chance floodplain. However, based on our general observations, in the event of extremely high precipitation, and due to the adjacent creek and pond at the site, localized flooding could occur. However, proposed plans indicate raising the site grades two to five feet, which will further reduce the chance for flooding to affect proposed improvements.

4.4.5 Landsliding

Based on document review, no landslides are mapped in the site area. In addition, landslides or similar associated features were not observed during the recent field exploration at the relatively level site. Based on the investigation findings, landsliding is not considered to be a significant geologic hazard at the site.

4.4.6 Compressible and Expansive Soils

Loose alluvium and shallow residual soils are considered to be potentially compressible. Therefore, these soils should be overexcavated, thoroughly blended or processed, and placed as properly compacted fill as recommended herein, where compacted fill or settlement-sensitive improvements are proposed. Based on the field data, site observations, and laboratory results, the underlying residual soil and bedrock at depth are not considered to be subject to significant compressibility under the proposed loads. Shallow residual soil and bedrock should also be overexcavated and then compacted to provide a more uniform bottom of overexcavation elevation.

Based on observation and laboratory test results, soils at the site are generally anticipated to exhibit low to medium expansion potential (Expansion Index generally less than 70). Therefore, the recommendations provided herein take into consideration the adverse impacts of potentially expansive soils to site development. However, it is anticipated that on the order of five feet of soils will be imported to construct the building pads. Therefore, additional evaluation of near-surface soils should be performed based on field observations during grading activities, and additional modified recommendations could be appropriate.

4.4.7 Corrosive Soils

Chemical testing was performed to evaluate the potential effects that site soils may have on concrete foundations and various types of buried metallic utilities. Soil environments detrimental to concrete generally have elevated levels of soluble sulfates and/or pH levels less than 5.5. According to American Concrete Institute (ACI) Table 318 4.3.1, specific guidelines have been provided for concrete where concentrations of soluble sulfate (SO_4) in soil exceed 0.1 percent by weight. These guidelines include low water: cement ratios, increased compressive strength, and specific cement type requirements.

Based on the representative area Sulfate and pH testing, site soils are anticipated to generally have a negligible corrosion potential to Portland cement concrete improvements.

A minimum resistivity value less than 5,000 ohm-cm, and/or soluble chloride levels in excess of 200 ppm generally indicate a corrosive environment to buried metallic utilities and untreated conduits. Based on the resistivity values of our laboratory tested soils, site materials are anticipated to have a negligible to low corrosion potential for buried uncoated/unprotected metallic conduits.

The results of the testing are presented in the attached Appendix C. However, CTE does not practice corrosion engineering. Therefore, a corrosion engineer or other qualified consultant could be contacted if site specific corrosivity issues are of concern. It is also recommended that additional testing of near surface soils, which are anticipated to consist of unknown imported soils, following preparatory grading.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 General

CTE concludes that the proposed improvements at the site are feasible from a geotechnical standpoint, provided the preliminary recommendations in this report are incorporated into the design and construction of the project. Recommendations for the proposed earthwork and improvements are included in the following sections and Appendix D. However, recommendations in the text of this report supersede those presented in Appendix D should variations exist. These recommendations should either be evaluated as appropriate and/or updated during or following rough grading at the site, which is anticipated to import several feet of unknown soils to raise the site.

5.2 Site Preparation

Prior to grading, the site should be cleared of any existing building materials or improvements that are not to remain. Objectionable materials, such as debris and vegetation, not suitable for structural backfill should be properly disposed of offsite.

Based on site conditions and proposed improvements, the following preliminary recommendations are provided. During or following site rough grading (specifically the import of fill soils to raise the pad elevations by several feet) it is anticipated that all building foundations will bear in competent, compacted fill soils as recommended herein. In the area of the proposed compacted fill and improvements, existing soils should be excavated to a minimum depth of four feet below existing grades, five feet below proposed grades, or to the depth of competent materials, whichever depth is greatest. If encountered, localized areas of loose and potentially compressible material could require overexcavation to deeper elevations, based on conditions observed during grading. It is anticipated that excavations in the northern portion of the site will extend greater than four feet, due to loose and potentially compressible soils. However, due to the presence of shallow groundwater in this area, excavations should extend to competent materials or a maximum of two feet above groundwater, whichever is shallowest. Where feasible, overexcavations should extend at least five feet laterally beyond the limits of the proposed toe of slope created by the fill placement, or to property lines. If applicable, overexcavations adjacent to existing structures should not extend below a 1:1 plane extended down from the bottom of the existing footing outer edge or as recommended during grading based on exposed conditions. Depending on the extent of overexcavation alternating slot excavations may be recommended during earthwork.

Existing below-ground utilities should be redirected around the proposed structure where feasible. Utilities at an elevation to extend through the proposed footings should generally be sleeved and caulked to minimize the potential for moisture migration below the building slabs. Abandoned pipes exposed by grading should be securely capped to prevent moisture from migrating beneath foundation and slab soils or should be filled with minimum two-sack cement/sand slurry.

A CTE geotechnical representative should observe the exposed ground surfaces at the overexcavation bottoms to evaluate the exposed conditions. The exposed subgrades to receive fill should be proof-rolled or scarified a minimum of nine inches, moisture conditioned to a minimum of three percent above optimum, and properly compacted prior to additional fill placement.

If yielding or saturated conditions (pumping) are observed that prohibit compaction of soils with standard equipment, the bottom of the excavations may be stabilized as follows, or by other suitable proposed methods depending on available materials during grading:

- Oversize rock or crushed concrete materials (generally one-foot minus) can be placed and track-rolled into the exposed saturated or yielding subgrade until a firm subgrade is attained. This material should be selectively placed to avoid nesting and/or bridging of the individual concrete particles.
- Following emplacement of the rock materials, the prepared subgrade could require to be overlain with a stabilization geotextile material. Based on previous experience, we typically recommend one of the following: Tensar BX-1200, Tensar TX-160, Hanes TerraGrid RX1200, Mirafi BXG12, or approved equivalent. Geotextile should be installed in general accordance with manufacturer’s recommendations.
- A minimum of 12 inches of granular material should be placed above the geotextile. Based on the availability of site materials and equipment, this material may consist of finely crushed concrete, on-site soils blended with coarse crushed concrete, imported gravel, or Class 2 Aggregate Base. Specific granular material to be used at the base of excavation should be approved by the geotechnical engineer prior to placement. If used, open-graded crushed concrete or imported gravel must be wrapped by a geotechnical filtration/separation fabric in order to minimize migration of fines into the void spaces. Mirafi 140N or similar filter fabric is anticipated to be adequate for separation purposes.

- Granular on-site soils should then be placed in lifts and compacted to the proposed subgrade elevations. These fill materials should be placed and compacted in accordance with recommendations provided in this report.

5.3 Site Excavation

Generally, excavation of site materials may be accomplished with heavy-duty construction equipment under normal conditions. However, based on the subsurface investigation it is anticipated that the Cretaceous Tonalite will become increasingly difficult to excavate with depth. Deeper excavations within the native material could require the use of specialized equipment.

5.4 Fill Placement and Compaction

Granular fill and backfill should be compacted to a minimum relative compaction of 90 percent at a moisture content of at least three percent above optimum, as evaluated by ASTM D 1557. The optimum lift thickness for fill soil will depend on the type of compaction equipment used. Generally, backfill should be placed in uniform, horizontal lifts not exceeding eight inches in loose thickness. Fill placement and compaction should be conducted in conformance with local ordinances.

5.5 Fill Materials

Properly moisture-conditioned very low to medium expansion potential soils derived from the on-site excavations are considered suitable for reuse on the site as compacted fill. If used, these materials should be screened of organics and materials generally greater than three inches in maximum dimension. If encountered during grading, high or very high expansion soils should be blended with granular materials to reduce the Expansion Index to a value generally below 70. Irreducible materials greater than three inches in maximum dimension should generally not be used in shallow fills (within three feet of proposed grades). In utility trenches, adequate bedding should surround pipes.

Imported fill beneath structures, flatwork, and pavements should have an Expansion Index of 50 or less (ASTM D 4829). Imported fill soils for use in structural or slope areas should be evaluated by the geotechnical engineer before being imported to the site.

Retaining wall backfill located within a 45-degree wedge extending up from the heel of the wall should consist of soil having an Expansion Index of 20 or less (ASTM D 4829) with less than 30 percent passing the No. 200 sieve. The upper 12 to 18 inches of wall backfill could consist of lower permeability soils, in order to reduce surface water infiltration behind walls. The project structural engineer and/or architect should detail proper wall backdrains, including gravel drain zones, fills, filter fabric, and perforated drain pipes. A conceptual wall backdrain detail, which may be suitable for use at the site, is provided as Figure 4.

5.6 Temporary Construction Slopes

The following recommended slopes should be relatively stable against deep-seated failure, but may experience localized sloughing. On-site soils are considered Type B and Type C soils with recommended slope ratios as set forth in Table 5.6.

TABLE 5.6 RECOMMENDED TEMPORARY SLOPE RATIOS		
SOIL TYPE	SLOPE RATIO (Horizontal: vertical)	MAXIMUM HEIGHT
B (Cretaceous Tonalite)	1:1 (OR FLATTER)	10 Feet
C (Alluvium and Residual Soil)	1.5:1 (OR FLATTER)	10 Feet

Actual field conditions and soil type designations must be verified by a "competent person" while excavations exist, according to Cal-OSHA regulations. In addition, the above sloping recommendations do not allow for surcharge loading at the top of slopes by vehicular traffic, equipment or materials. Appropriate surcharge setbacks must be maintained from the top of all unshored slopes.

5.7 Foundation and Slab Recommendations

The following recommendations are for preliminary design purposes only. These foundation recommendations should be reevaluated after review of the project grading and foundation plans, and after completion of rough grading of the building pad area, which is anticipated to place several feet of imported soils across the surface of the site. Upon completion of rough pad grading, Expansion Index of near surface soils should be verified, and these recommendations should be updated, as necessary. Lightly loaded upright structures such as flagpoles and other supports may be designed in accordance with current California Building Code or applicable standards assuming code minimum design values or as per the recommendations provided herein.

5.7.1 Shallow Spread Foundations

Foundation recommendations presented herein are based on the generally anticipated low to medium expansion potential of properly blended and moisture conditioned on-site soils (Expansion Index of generally 70 or less). However, imported soils are anticipated to cap the site and lower Expansion Indexes should likely be present across the surface of the site.

Following the recommended preparatory grading, continuous and isolated spread footings are anticipated to be suitable for use at this site. It is anticipated that the proposed footings will be founded entirely in properly compacted fill placed as recommended herein. Footings should not straddle cut-fill interfaces.

Foundation dimensions and reinforcement should be based on an allowable bearing value of 2,500 pounds per square foot for footings founded in suitable fill materials and embedded a minimum of 24 inches below the lowest adjacent rough subgrade elevation. If utilized, continuous footings should be at least 18 inches wide; isolated footings should be at least 24 inches in least dimension. The bearing values may be increased by 250 psf for each additional six-inches of width or depth up to a maximum of 3,500 psf. The above bearing values may also be increased by one third for short duration loading which includes the effects of wind or seismic forces. A 145-pci uncorrected subgrade modulus is also considered suitable for elastic design of foundation improvements.

Minimum footing reinforcement for continuous footings should consist of four No. 5 reinforcing bars; two placed near the top and two placed near the bottom, or as per more stringent requirements provided by the project structural engineer. The structural engineer should design isolated footing reinforcement. Footing excavations should be maintained at, or be brought to, a minimum moisture content of three percent above optimum prior to concrete placement.

5.7.2 Foundation Settlement

The maximum total static settlement is expected to be on the order of one inch and the maximum differential static settlement is expected to be on the order of ½ inch over a distance of approximately 40 feet. Due to the proposed grading at the site and the dense to very dense nature of underlying materials, dynamic settlement is not expected to adversely affect the proposed improvements.

5.7.3 Foundation Setback

Footings for structures should be designed such that the horizontal distance from the face of adjacent slopes to the outer edge of footings is at least 10 feet. In addition, footings should be founded beneath a 1:1 plane extended up from the nearest bottom edge of adjacent trenches and/or excavations. Deepening of affected footings may be a suitable means of attaining the prescribed setbacks.

5.7.4 Interior Concrete Slabs-On-Grade

Concrete slabs should be designed based on the anticipated loading, but should measure at least 4.5 inches in thickness. Minimum slab reinforcement should consist of No. 4 reinforcing bars, placed on maximum 18-inch centers, each way, at or above mid-slab height, but with proper concrete cover.

Slabs subjected to heavier loads or traffic may require thicker slab sections and/or increased reinforcement. A 125-pci subgrade modulus is considered suitable for elastic design of minimally embedded improvements such as slabs-on-grade. Slab on grade subgrade areas should be maintained at a minimum three percent above optimum moisture content or be brought to three percent above optimum moisture content just prior to placement of underlayments or concrete.

In moisture-sensitive floor areas, a suitable vapor retarder of at least 15-mil thickness (with all laps or penetrations sealed or taped) overlying a four-inch layer of consolidated crushed aggregate or gravel (with SE of 30 or more) should be installed, as per the 2013 CBC/Green Building Code. This recommended protection is generally considered typical in the industry. If proposed floor areas or coverings are considered especially sensitive to moisture emissions, additional recommendations from a specialty consultant could be obtained. CTE is not an expert at preventing moisture penetration through slabs. Therefore, a qualified architect or other experienced professional should be contacted if moisture penetration is a more significant concern.

5.8 Seismic Design Criteria

The seismic ground motion values listed in the table below were derived in accordance with the ASCE 7-10 Standard and 2013 CBC. This was accomplished by establishing the Site Class based on the soil properties at the site, and then calculating the site coefficients and parameters using the United States Geological Survey Seismic Design Maps application and site coordinates of 33.0343 degrees latitude and -116.8769 degrees longitude. These values are intended for the design of structures to resist the effects of earthquake ground motions.

TABLE 5.8
SEISMIC GROUND MOTION VALUES

PARAMETER	VALUE	CBC REFERENCE (2013)
Site Class	D	ASCE 7, Chapter 20
Mapped Spectral Response Acceleration Parameter, S_S	1.081	Figure 1613.3.1 (1)
Mapped Spectral Response Acceleration Parameter, S_1	0.401	Figure 1613.3.1 (2)
Seismic Coefficient, F_a	1.068	Table 1613.3.3 (1)
Seismic Coefficient, F_v	1.599	Table 1613.3.3 (2)
MCE Spectral Response Acceleration Parameter, S_{MS}	1.154	Section 1613.3.3
MCE Spectral Response Acceleration Parameter, S_{M1}	0.641	Section 1613.3.3
Design Spectral Response Acceleration, Parameter S_{DS}	0.769	Section 1613.3.4
Design Spectral Response Acceleration, Parameter S_{D1}	0.427	Section 1613.3.4
Peak Ground Acceleration PGA_M	0.445	ASCE 7, Section 11.8.3

5.9 Lateral Resistance and Earth Pressures

Lateral loads acting against retaining walls may be resisted by friction between the footings and the supporting compacted fill soil or passive pressure acting against structures. If frictional resistance is used, an allowable coefficient of friction of 0.30 (total frictional resistance equals the coefficient of friction multiplied by the dead load) is recommended for concrete cast directly against compacted fill. A design passive resistance value of 250 pounds per square foot per foot of depth (with a maximum value of 2,000 pounds per square foot) may be used. The allowable lateral resistance can be taken as the sum of the frictional resistance and the passive resistance, provided the passive resistance does not exceed two-thirds of the total allowable resistance. Retaining walls should not be underlain by uncompacted soils as defined by a 1:1 plane extending downward from the foundation bottom outer edges.

If proposed, retaining walls up to approximately eight feet high and backfilled using granular soils may be designed using the equivalent fluid weights given below.

TABLE 5.9 EQUIVALENT FLUID UNIT WEIGHTS (pounds per cubic foot)		
WALL TYPE	LEVEL BACKFILL	SLOPE BACKFILL 2:1 (HORIZONTAL: VERTICAL)
CANTILEVER WALL (YIELDING)	35	54
RESTRAINED WALL	65	80

Traffic surcharges on retaining walls should generally be equal to 1/3 of the vertical load of the traffic located within ten lateral feet of wall.

Lateral pressures on cantilever retaining walls (yielding walls) due to earthquake motions may be calculated based on work by Seed and Whitman (1970). The total lateral thrust against a properly drained and backfilled cantilever retaining wall above the groundwater level can be expressed as:

$$P_{AE} = P_A + \Delta P_{AE}$$

For non-yielding (or "restrained") walls, the total lateral thrust may be similarly calculated based on work by Wood (1973):

$$P_{KE} = P_K + \Delta P_{KE}$$

Where P_A = Static Active Thrust (determined using Table 5.9)
P_K = Static Restrained Wall Thrust (determined using Table 5.9)
ΔP_{AE} = Dynamic Active Thrust Increment = $(3/8)\ k_h\ \gamma H^2$
ΔP_{KE} = Dynamic Restrained Thrust Increment = $k_h\ \gamma H^2$
k_h = 2/3 Peak Ground Acceleration = 2/3 (PGA_M)
H = Total Height of the Wall
γ = Total Unit Weight of Soil ≈ 135 pounds per cubic foot

The static and increment of dynamic earth pressure in both cases may be applied with a line of action located at H/3 above the bottom of the wall (SEAOC, 2013).

These values assume non-expansive backfill and free-draining conditions. Measures should be taken to prevent moisture buildup behind all retaining walls. Drainage measures should include free-draining backfill materials and sloped, perforated drains. These drains should discharge to an appropriate off-site location. A general or conceptual detail for Retaining Wall Drainage, which may be appropriate for the subject site based on the review of the project structural engineer and architect, is attached as Figure 4. Waterproofing should be as specified by the project architect or the waterproofing specialty consultant.

5.10 Exterior Flatwork

To reduce the potential for cracking in exterior flatwork for non-traffic areas caused by minor movement of subgrade soils and typical concrete shrinkage, it is recommended that such flatwork measure a minimum 4.5 inches thick and be installed with crack-control joints at appropriate spacing as designed by the project architect. Additionally, it is recommended that flatwork be installed with at least No. 3 reinforcing bars on maximum 18-inch centers, each way, at above mid-height of slab but with proper concrete cover, or other reinforcement per the project consultants. Doweling of flatwork joints at critical pathways or similar could also be beneficial in resisting minor subgrade movements.

All subgrades should be prepared according to the earthwork recommendations previously given before placing concrete. Positive drainage should be established and maintained next to all flatwork. Subgrade materials shall be maintained at, or be elevated to, above optimum moisture content prior to concrete placement.

5.11 Pavements

Pavement sections provided are based on an preliminary Resistance “R”-Value results, estimated traffic indices, and the assumption that the upper foot of compacted fill subgrade and overlying aggregate base materials are properly compacted to a minimum 95% relative compaction at a minimum of three percent above optimum moisture content (as per ASTM D 1557). Actual R-Value should be determined following grading of subgrade areas and the pavement sections should be modified, as appropriate.

TABLE 5.11
RECOMMENDED AC OR PCC PAVEMENT SECTION THICKNESSES

Traffic Area	Assumed Traffic Index	Preliminary Subgrade "R"-Value	Asphalt Pavements		Portland Cement Concrete Pavements On Subgrade (INCHES)
			AC Thickness (INCHES)	CalTrans Class II or Crushed Miscellaneous Aggregate Base Thickness (INCHES)	
Auto Parking and Light Drive Areas	5.0	35+	3.0	5.0	6.0
Moderate to Heavy Drive Areas	6.0	35+	3.0	8.0	7.0

Asphalt paved areas should be designed, constructed, and maintained in accordance with, for example, the recommendations of the Asphalt Institute, or other widely recognized authority. Concrete paved areas should be designed and constructed in accordance with the recommendations of the American Concrete Institute or other widely recognized authority, particularly with regard to thickened edges, joints, and drainage. The Standard Specifications for Public Works construction ("Greenbook") or Caltrans Standard Specifications may be referenced for pavement materials specifications.

5.12 Drainage

Surface runoff should be collected and directed away from improvements by means of appropriate erosion-reducing devices, and positive drainage should be established around proposed improvements. Positive drainage should be directed away from improvements and slope areas at a minimum gradient of two percent for a distance of at least five feet. However, the project civil engineer should evaluate the on-site drainage and make necessary provisions to keep surface water from affecting the site.

Generally, CTE recommends against allowing water to infiltrate building pads or adjacent to slopes and improvements. However, it is understood that some agencies are encouraging the use of storm-water cleansing devices. Therefore, if storm water cleansing devices must be used, it is generally recommended that they be underlain by an impervious barrier and that the infiltrate be collected via subsurface piping and discharged off site. If infiltration must occur, water should infiltrate as far away from structural improvements as feasible. Additionally, any reconstructed slopes descending from infiltration basins should be equipped with subdrains to collect and discharge accumulated subsurface water as feasible. Infiltration testing was beyond the scope of CTE's work for this project and infiltration rates for the site supplied by others do not necessarily reflect the observations made by CTE in performing the work for this report.

5.13 Slopes

Based on observed conditions and anticipated soil strength characteristics, cut and fill slopes, if proposed at the site, should be constructed at ratios of 2:1 (horizontal: vertical) or flatter. These fill slope inclinations should exhibit factors of safety greater than 1.5.

Although properly constructed slopes on this site should be grossly stable, the soils will be somewhat erodible. Therefore, runoff water should not be permitted to drain over the edges of slopes unless that water is confined to properly designed and constructed drainage facilities. Erosion-resistant vegetation should be maintained on the face of all slopes. Typically, soils along the top portion of a fill slope face will creep laterally. CTE recommends against building distress-sensitive hardscape improvements within five feet of slope crests.

5.14 Plan Review

CTE should be authorized to review the project grading and foundation plans, prior to commencement of earthwork to identify potential conflicts with the intent of the geotechnical recommendations.

5.15 Construction Observation

The recommendations provided in this report are based on preliminary design information for the proposed construction and the subsurface conditions observed in the exploration areas. The interpolated subsurface conditions should be checked in the field during construction to verify that conditions are as anticipated. Foundation recommendations may be revised upon completion of grading and as-built laboratory test results.

Recommendations provided herein are based on the understanding and assumption that CTE will provide the observation and testing services for the project. All earthwork should be observed and tested to verify that grading activities have been performed according to the recommendations contained within this report. CTE should evaluate all footing trenches before reinforcing steel placement.

6.0 LIMITATIONS OF INVESTIGATION

The field evaluation, laboratory testing, and geotechnical analysis presented in this report have been conducted according to current engineering practice and the standard of care exercised by reputable geotechnical consultants performing similar tasks in this area. No other warranty, expressed or implied, is made regarding the conclusions, recommendations and opinions expressed in this report. Variations may exist and conditions not observed or described in this report may be encountered during construction.

The recommendations presented herein have been developed in order to reduce the potential adverse effects of expansive soils and fill soils. However, even with the design and construction precautions provided, some post-construction heave and soil movement should be anticipated.

The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

CTE's conclusions and recommendations are based on an analysis of the observed conditions. If conditions different from those described in this report are encountered, this office should be notified and additional recommendations, if required, will be provided.

The opportunity to be of service on this project is appreciated. If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Respectfully submitted,
CONSTRUCTION TESTING & ENGINEERING, INC.

Dan T. Math, GE #2665
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
DANIEL T. MATH
No.2665
EXP.12/31/18
GEOTECHNICAL
STATE OF CALIFORNIA

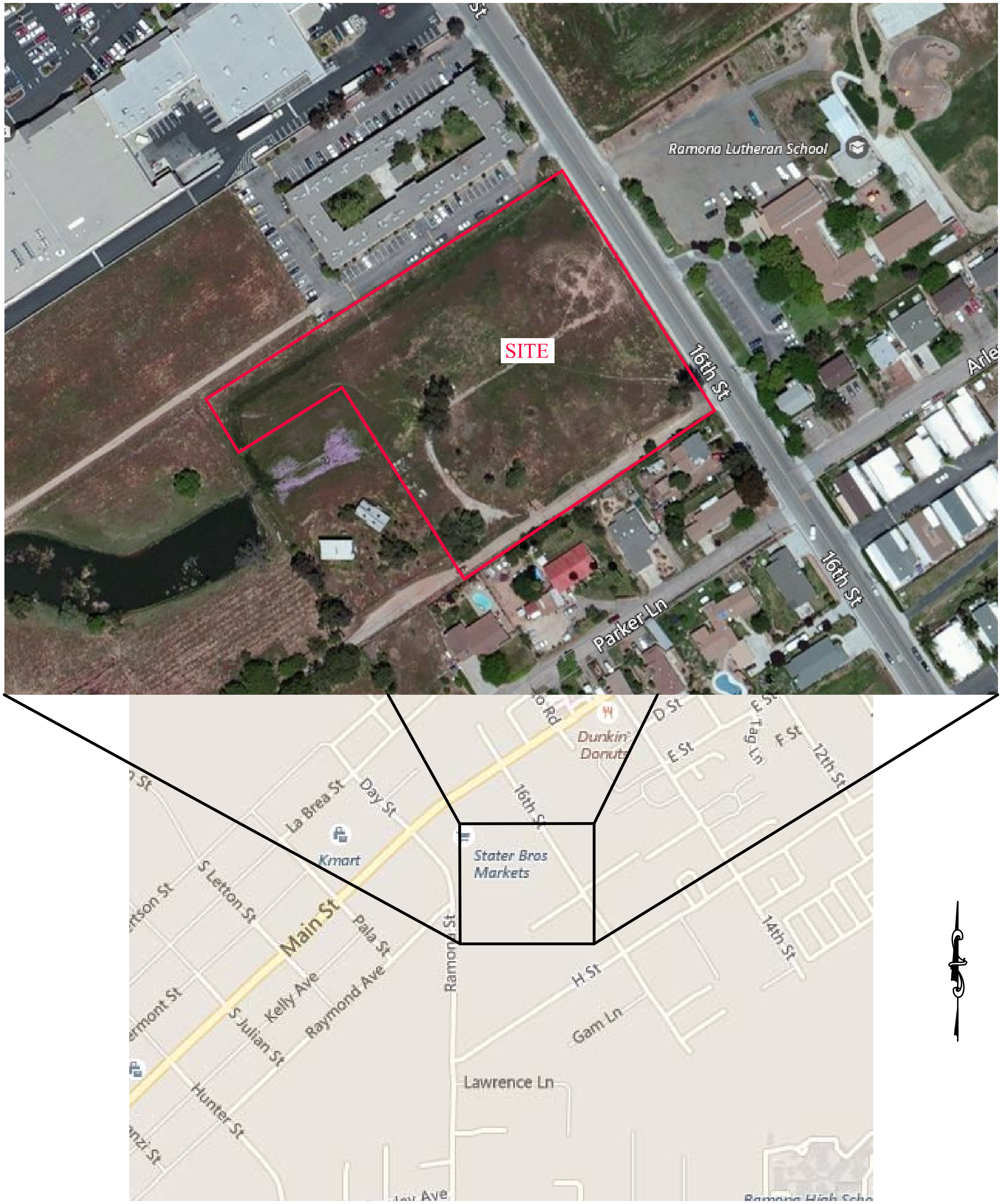
Martin E Siem, CEG #2311
Engineering Geologist

PROFESSIONAL GEOLOGIST
MARTIN E. SIEM
No.2311
CERTIFIED ENGINEERING GEOLOGIST
Exp. 6/30/18
STATE OF CALIFORNIA

Dennis Kilian, CEG #2672
Project Geologist

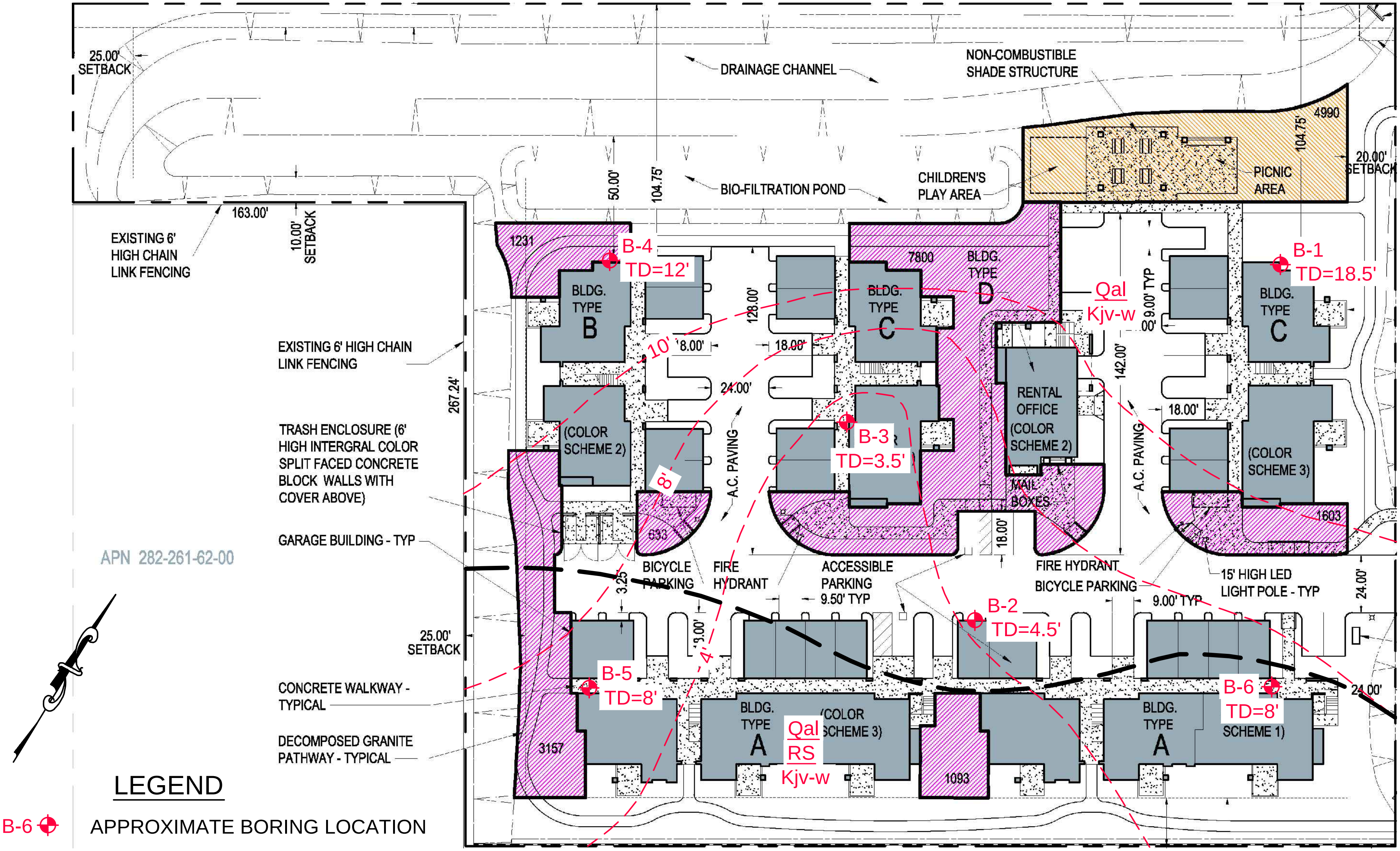
PROFESSIONAL GEOLOGIST
DENNIS A. KILIAN
No.2672
CERTIFIED ENGINEERING GEOLOGIST
Exp. 8/31/18
STATE OF CALIFORNIA

DAK/DTM/MES:nri



CTE INC. Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

SITE INDEX MAP PROPOSED VILLAGE PLACE APARTMENTS 521 16TH STREET RAMONA, CALIFORNIA	SCALE: AS SHOWN	DATE: 3/17
	CTE JOB NO.: 10-13565G	FIGURE: 1



LEGEND

B-6 APPROXIMATE BORING LOCATION

APPROXIMATE GEOLOGIC CONTACT

- 8' - APPROXIMATE DEPTH TO Kjv-w

Qal QUATERNARY ALLUVIUM

RS RESIDUAL SOIL

Kjv-w CRETACEOUS JAPATUL VALLEY TONALITE-DEEPLY WEATHERED

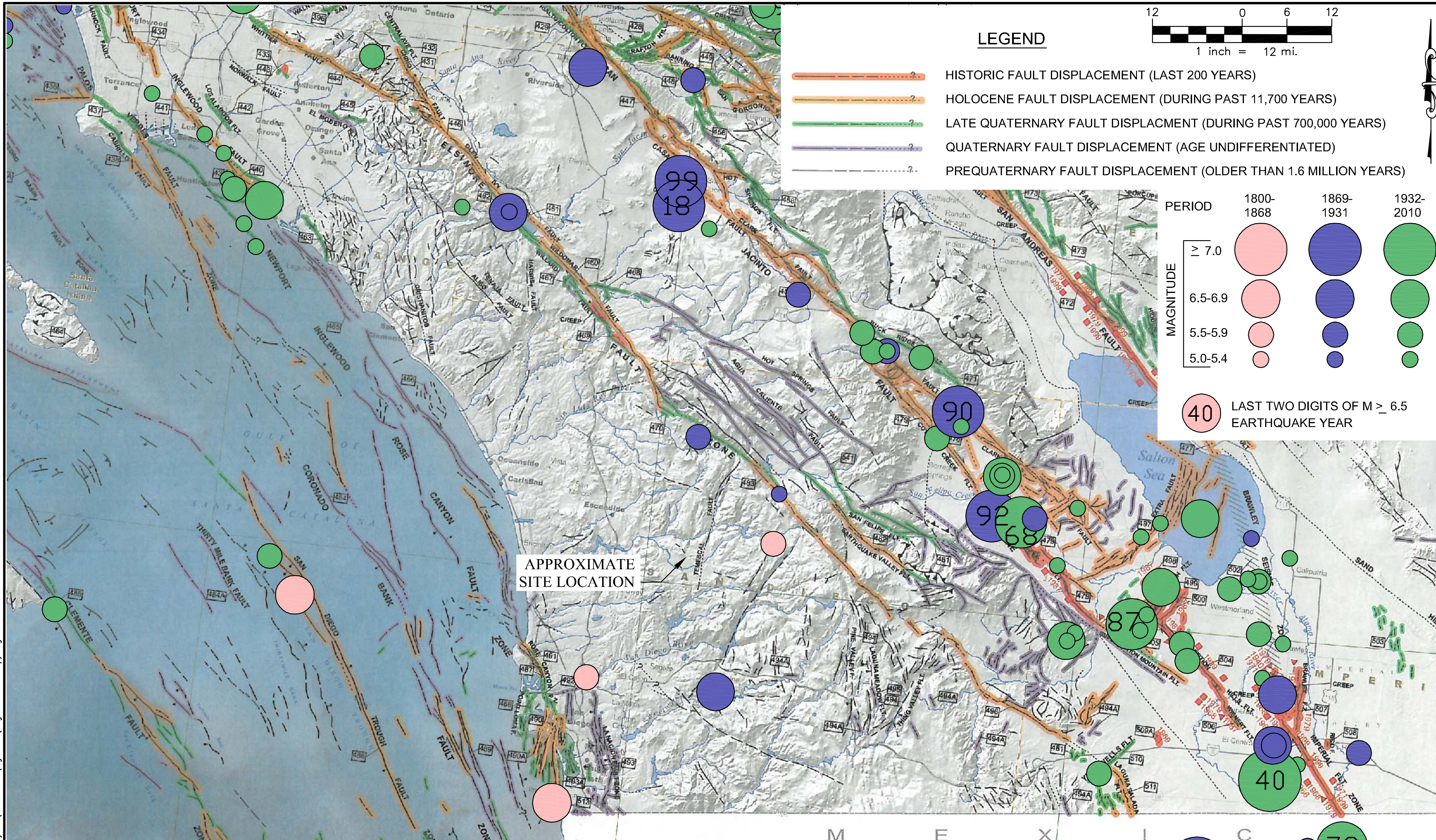
60' 0 30' 60'

CTE INC.
Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

BORING LOCATION/GEOLOGIC MAP

PROPOSED VILLAGE PLACE APARTMENTS
521 16TH STREET
RAMONA, CALIFORNIA

CTE JOB NO: 10-13565G	
SCALE: 1" = 60'	
DATE: 3/17	FIGURE: 2



\\ESC_SERVER\Projects\10-13565G\Figure 3 (Regional Fault Map).dwg

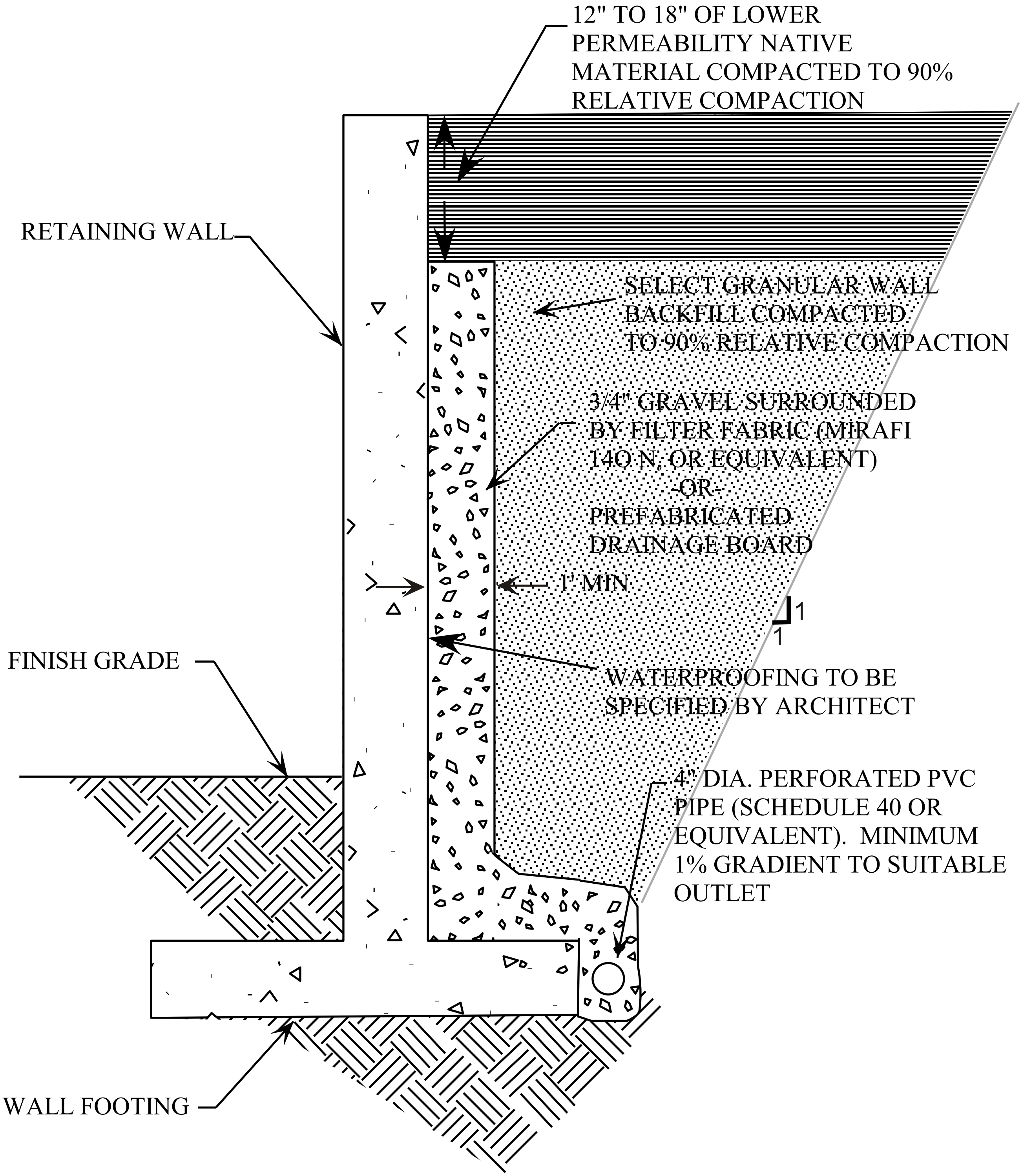
NOTES: FAULT ACTIVITY MAP OF CALIFORNIA, 2010, CALIFORNIA GEOLOGIC DATA MAP SERIES MAP NO. 6;
EPICENTERS OF AND AREAS DAMAGED BY M≥5 CALIFORNIA EARTHQUAKES, 1800-1999 ADAPTED AFTER TOPPOZADA, BRANUM, PETERSEN, HALLSTORM, CRAMER, AND REICHLE, 2000, CDMG MAP SHEET 49
REFERENCE FOR ADDITIONAL EXPLANATION; MODIFIED WITH CISN AND USGS SEISMIC MAPS

CTE INC. Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

REGIONAL FAULT AND SEISMICITY MAP

PROPOSED VILLAGE PLACE APARTMENTS
521 16th STREET
RAMONA, CALIFORNIA

CTE JOB NO:	10-13565G
SCALE:	1 inch = 12 miles
DATE: 3/17	FIGURE: 3



CTE INC. Construction Testing & Engineering, Inc.

Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying

RETAINING WALL DRAINAGE DETAIL

CTE JOB NO:	10-13565G
SCALE:	NO SCALE
DATE: 03/17	FIGURE: 4

APPENDIX A

REFERENCES

REFERENCES

1. American Society for Civil Engineers, 2010, "Minimum Design Loads for Buildings and Other Structures," ASCE/SEI 7-10.

2. ASTM, 2002, "Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort," Volume 04.08

3. Blake, T.F., 2000, "EQFAULT," Version 3.00b, Thomas F. Blake Computer Services and Software.

4. California Building Code, 2013, "California Code of Regulations, Title 24, Part 2, Volume 2 of 2," California Building Standards Commission, published by ICBO, June.

5. California Division of Mines and Geology, CD 2000-003 "Digital Images of Official Maps of Alquist-Priolo Earthquake Fault Zones of California, Southern Region," compiled by Martin and Ross.

6. California Emergency Management Agency/California Geological Survey, "Tsunami Inundation Maps for Emergency Planning.

7. FEMA, 1997, FIRM Flood Insurance Rate Map, San Diego County, California and Incorporated Areas, Panel 1117 of 2375.

8. Frankel, A.D., Petersen, M.D., Mueller, C.S., Haller, K.M., Wheeler, R.L., Leyendecker, E.V., Wesson, R. L., Harmsen, S.C., Cramer, C.H., Perkins, D.M., Rukstales,K.S.,2002, Documentation for the 2002 update of the National Seismic Hazard Maps: U.S. Geological Survey Open-File Report 2002-420, 39p

9. Hart, Earl W., Revised 2007, "Fault-Rupture Hazard Zones in California, Alquist Priolo, Special Studies Zones Act of 1972," California Division of Mines and Geology, Special Publication 42.

10. Hernandez, Janis L., Todd, Victoria R., Busch, Lawrence L., and Tan, Siang S., 2007, "Geologic Map of the San Pasqual 7.5' Quadrangle, San Diego County, California: A Digital Database, Version 1.0", California Geological Survey, scale 1:24,000.

11. Jennings, Charles W., 1994, "Fault Activity Map of California and Adjacent Areas" with Locations and Ages of Recent Volcanic Eruptions.

12. SEAOC, Blue Book-Seismic Design Recommendations, "Seismically Induced Lateral Earth Pressures on Retaining Structures and Basement Walls," Article 09.10.010, October 2013.

13. Seed, H.B., and R.V. Whitman, 1970, "Design of Earth Retaining Structures for Dynamic Loads," in Proceedings, ASCE Specialty Conference on Lateral Stresses in the Ground and Design of Earth-Retaining Structures, pp. 103-147, Ithaca, New York: Cornell University.

14. Wood, J.H. 1973, Earthquake-Induced Soil Pressures on Structures, Report EERL 73-05. Pasadena: California Institute of Technology.

APPENDIX B

EXPLORATION LOGS

Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

DEFINITION OF TERMS

PRIMARY DIVISIONS			SYMBOLS	SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	**GRAVELS** MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS < 5% FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS OR GRAVEL SAND MIXTURES, LITTLE OF NO FINES
		GRAVELS WITH FINES	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, NON-PLASTIC FINES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, PLASTIC FINES
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS < 5% FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES	SM	SILTY SANDS, SAND-SILT MIXTURES, NON-PLASTIC FINES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES, PLASTIC FINES
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	**SILTS AND CLAYS** LIQUID LIMIT IS LESS THAN 50		ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, SLIGHTLY PLASTIC CLAYEY SILTS
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY, SANDY, SILTS OR LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTY CLAYS
HIGHLY ORGANIC SOILS			PT	PEAT AND OTHER HIGHLY ORGANIC SOILS

GRAIN SIZES

BOULDERS	COBBLES	GRAVEL		SAND			SILTS AND CLAYS
		COARSE	FINE	COARSE	MEDIUM	FINE	

12" 3" 3/4" 4 10 40 200

CLEAR SQUARE SIEVE OPENING U.S. STANDARD SIEVE SIZE

ADDITIONAL TESTS

(OTHER THAN TEST PIT AND BORING LOG COLUMN HEADINGS)

MAX- Maximum Dry Density
GS- Grain Size Distribution
SE- Sand Equivalent
EI- Expansion Index
CHM- Sulfate and Chloride Content , pH, Resistivity
COR - Corrosivity
SD- Sample Disturbed

PM- Permeability
SG- Specific Gravity
HA- Hydrometer Analysis
AL- Atterberg Limits
RV- R-Value
CN- Consolidation
CP- Collapse Potential
HC- Hydrocollapse
REM- Remolded

PP- Pocket Penetrometer
WA- Wash Analysis
DS- Direct Shear
UC- Unconfined Compression
MD- Moisture/Density
M- Moisture
SC- Swell Compression
OI- Organic Impurities

FIGURE: BL1

Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	DRILLER:	SHEET: of
CTE JOB NO:	DRILL METHOD:	DRILLING DATE:
LOGGED BY:	SAMPLE METHOD:	ELEVATION:

BORING LEGEND

Depth (Feet)	Bulk Sample	Driven Type	Blows/Foot	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0								Block or Chunk Sample	
								Bulk Sample	
5									
								Standard Penetration Test	
10								Modified Split-Barrel Drive Sampler (Cal Sampler)	
								Thin Walled Army Corp. of Engineers Sample	
15								Groundwater Table	
								Soil Type or Classification Change	
20								? ——— ? ——— ? ——— ? ——— ? ——— ? ——— ? —	
								Formation Change [(Approximate boundaries queried (?)]	
25						"SM"		Quotes are placed around classifications where the soils exist in situ as bedrock	

FIGURE: BL2

Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	Proposed Village Place Apartments	DRILLER:	BAJA	SHEET:	1 of 1
CTE JOB NO:	10-13565G	DRILL METHOD:	LAR-8" Hollow Stem	DRILLING DATE:	2/17.17
LOGGED BY:	DK	SAMPLE METHOD:	Bulk, CAL, SPT	ELEVATION:	~1413'

BORING: B-1

Depth (Feet)	Sample Type	Blows/Foot	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	Bulk				SM		Quaternary Alluvium: Loose to medium dense, moist, brown to red brown, silty fine SAND with trace clay.	CHEM
	Driven	15 31 32			SM		Very dense, slightly moist, light brown, silty fine SAND.	
5	Driven	13 23 34	97.8	23.6	CL		Hard, slightly moist to moist, pale gray brown, fine sandy CLAY with silt.	MD, AL
10	Driven	10 12 16		▼	SM		Medium dense, moist to wet, brown and light brown, silty fine SAND with interbedded medium sand and clayey sand.	GS
15	Driven	8 10 12			SP		Medium dense, wet, brown, poorly graded SAND with silt.	GS
20	Driven	50/3"			SM		Weathered Cretaceous Japatul Valley Tonalite: Excavates as: Very dense, moist, brown to gray brown, silty fine SAND.	
							Total Depth: 20.25' Groundwater at ~10.5' Backfilled with Bentonite	
25								

Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	Proposed Village Place Apartments	DRILLER:	BAJA	SHEET:	1 of 1
CTE JOB NO:	10-13565G	DRILL METHOD:	LAR-8" Hollow Stem	DRILLING DATE:	2/17.17
LOGGED BY:	DK	SAMPLE METHOD:	Bulk, CAL, SPT	ELEVATION:	~1413'

BORING: B-2

Depth (Feet)	Bulk Sample	Driven Type	Blows/Foot	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SM/SC		Quaternary Alluvium: Loose to medium dense, moist, brown silty to clayey fine SAND.	
						SM		Weathered Cretaceous Japatul Valley Tonalite: Excavates as: Very dense, slightly moist, red brown, silty fine SAND with trace clay.	
5			22 50/3"						
10			20 50/3"						
								Total Depth: 10.8' No Groundwater Backfilled with Bentonite	
15									
20									
25									

CTE INC. Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	Proposed Village Place Apartments	DRILLER:	BAJA	SHEET:	1 of 1
CTE JOB NO:	10-13565G	DRILL METHOD:	LAR-8" Hollow Stem	DRILLING DATE:	2/17.17
LOGGED BY:	DK	SAMPLE METHOD:	Bulk, CAL, SPT	ELEVATION:	~1413'

BORING: B-3

Depth (Feet)	Bulk Sample	Driven Type	Blows/Foot	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	Bulk					SM/SC		Quaternary Alluvium: Loose to medium dense, moist, brown silty to clayey fine SAND.	RV
						SM		Weathered Cretaceous Japatul Valley Tonalite: Excavates as: Dense, slightly moist, light brown, silty, fine SAND with trace clay.	
5		CAL	18 14 28						AL, GS
10		SPT	50/5"					Very dense, gray brown.	
15		CAL	50/6"						
								Total Depth: 15.5' No Groundwater Backfilled with Bentonite	
20									
25									

Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	Proposed Village Place Apartments	DRILLER:	BAJA	SHEET:	1 of 1
CTE JOB NO:	10-13565G	DRILL METHOD:	LAR-8" Hollow Stem	DRILLING DATE:	2/17.17
LOGGED BY:	DK	SAMPLE METHOD:	Bulk, CAL, SPT	ELEVATION:	~1412'

BORING: B-4

Depth (Feet)	Bulk Sample	Driven Type	Blows/Foot	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SM		Quaternary Alluvium: Very loose to loose, moist to wet, brown to red brown, silty fine SAND with trace clay.	
5		X	5 9 12			CL		Very stiff, slightly moist, light brown and brown, silty CLAY with sand and interbedded sandy clay/clayey sand.	EI
10		X	2 3 4			SC/SM		Loose, moist to wet, gray brown, fine clayey to silty fine SAND.	WA
15		X	50/3"			SM		Weathered Cretaceous Japatul Valley Tonalite: Excavates as: Very dense, slightly moist, gray brown, silty fine SAND, trace clay.	
20		X	50/3"						
								Total Depth: 20.25' Groundwater at ~8' Backfilled with Bentonite	
25									

CTE INC. Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	Proposed Village Place Apartments	DRILLER:	BAJA	SHEET:	1 of 1
CTE JOB NO:	10-13565G	DRILL METHOD:	LAR-8" Hollow Stem	DRILLING DATE:	2/17.17
LOGGED BY:	DK	SAMPLE METHOD:	Bulk, CAL, SPT	ELEVATION:	~1413'

BORING: B-5

Depth (Feet)	Bulk Sample	Driven Type	Blows/Foot	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SM/SC		Quaternary Alluvium: Loose to medium dense, slightly moist to moist, brown to red brown, silty to clayey fine SAND.	EI
						CL		Residual Soil: Dense to very dense, slightly moist, brown, clay, with trace medium to coarse sands.	
5		X	10 18 50	120.1	13.7				MD, AL
								Weathered Cretaceous Japatul Valley Tonalite: Excavates as:	
10		X	50/6"			SM		Very dense, slightly moist, gray brown, silty fine SAND, trace clay.	
								Total Depth: 10.5' No Groundwater Backfilled with Bentonite	
15									
20									
25									

Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	Proposed Village Place Apartments	DRILLER:	BAJA	SHEET:	1 of 1
CTE JOB NO:	10-13565G	DRILL METHOD:	LAR-8" Hollow Stem	DRILLING DATE:	2/17.17
LOGGED BY:	DK	SAMPLE METHOD:	Bulk, CAL, SPT	ELEVATION:	~1414'

BORING: B-6

Depth (Feet)	Bulk Sample	Driven Type	Blows/Foot	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SM		Quaternary Alluvium: Loose to medium dense, slightly moist to moist, brown, silty fine SAND with clay.	
						SC		Residual Soil: Medium dense, slightly moist, brown to gray brown, clayey fine SAND with silt, trace medium to coarse sands.	
5		X	11 11 16						
								Weathered Cretaceous Japatul Valley Tonalite: Excavates as:	
10		X	50/6"			SM		Very dense, slightly moist, gray brown, silty fine SAND, trace clay.	
								Total Depth: 10.5' No Groundwater Backfilled with Bentonite	
15									
20									
25									

APPENDIX C

LABORATORY METHODS AND RESULTS

APPENDIX C
LABORATORY METHODS AND RESULTS

Laboratory Testing Program
Laboratory tests were performed on representative soil samples to detect their relative engineering properties. Tests were performed following test methods of the American Society for Testing Materials or other accepted standards. The following presents a brief description of the various test methods used.

Classification
Soils were classified visually according to the Unified Soil Classification System. Visual classifications were supplemented by laboratory testing of selected samples according to ASTM D2487. The soil classifications are shown on the Exploration Logs in Appendix B.

Expansion Index
Expansion testing was performed on selected samples of the matrix of the on-site soils according to ASTM D 4829.

Particle-Size Analysis
Particle-size analyses were performed on selected representative samples according to ASTM D 422.

Chemical Analysis
Soil materials were collected with sterile sampling equipment and tested for Sulfate and Chloride content, pH, Corrosivity, and Resistivity.

Atterberg Limits
The procedure of ASTM D4518-84 was used to measure the liquid limit, plastic limit and plasticity index of representative samples.

In-Place Moisture and Density
To determine the moisture and density of in-place site soils, a representative sample was tested for the moisture and density at time of sampling.

Resistance "R"-Value
The resistance "R"-value was determined by the California Materials Method No. 301 for representative subbase soils. Samples were prepared and exudation pressure and "R"-value determined. The graphically determined "R"- value at exudation pressure of 300 psi is the value used for pavement section calculation.

EXPANSION INDEX TEST

ASTM D 4829

LOCATION	DEPTH (feet)	EXPANSION INDEX	EXPANSION POTENTIAL
B-4	5	81	High
B-5	0-5	0	Very Low

200 WASH ANALYSIS

LOCATION	DEPTH (feet)	PERCENT PASSING #200 SIEVE	CLASSIFICATION
B-4	10	37.0	SM/SC

IN-PLACE MOISTURE AND DENSITY

LOCATION	DEPTH (feet)	% MOISTURE	DRY DENSITY
B-1	5	23.8	97.8
B-5	5	13.7	120.1

SULFATE

LOCATION	DEPTH (feet)	RESULTS ppm
B-1	0-5	109.2

CHLORIDE

LOCATION	DEPTH (feet)	RESULTS ppm
B-1	0-5	20.1

p.H.

LOCATION	DEPTH (feet)	RESULTS
B-1	0-5	7.21

RESISTIVITY

CALIFORNIA TEST 424

LOCATION	DEPTH (feet)	RESULTS ohms-cm
B-1	0-5	9170

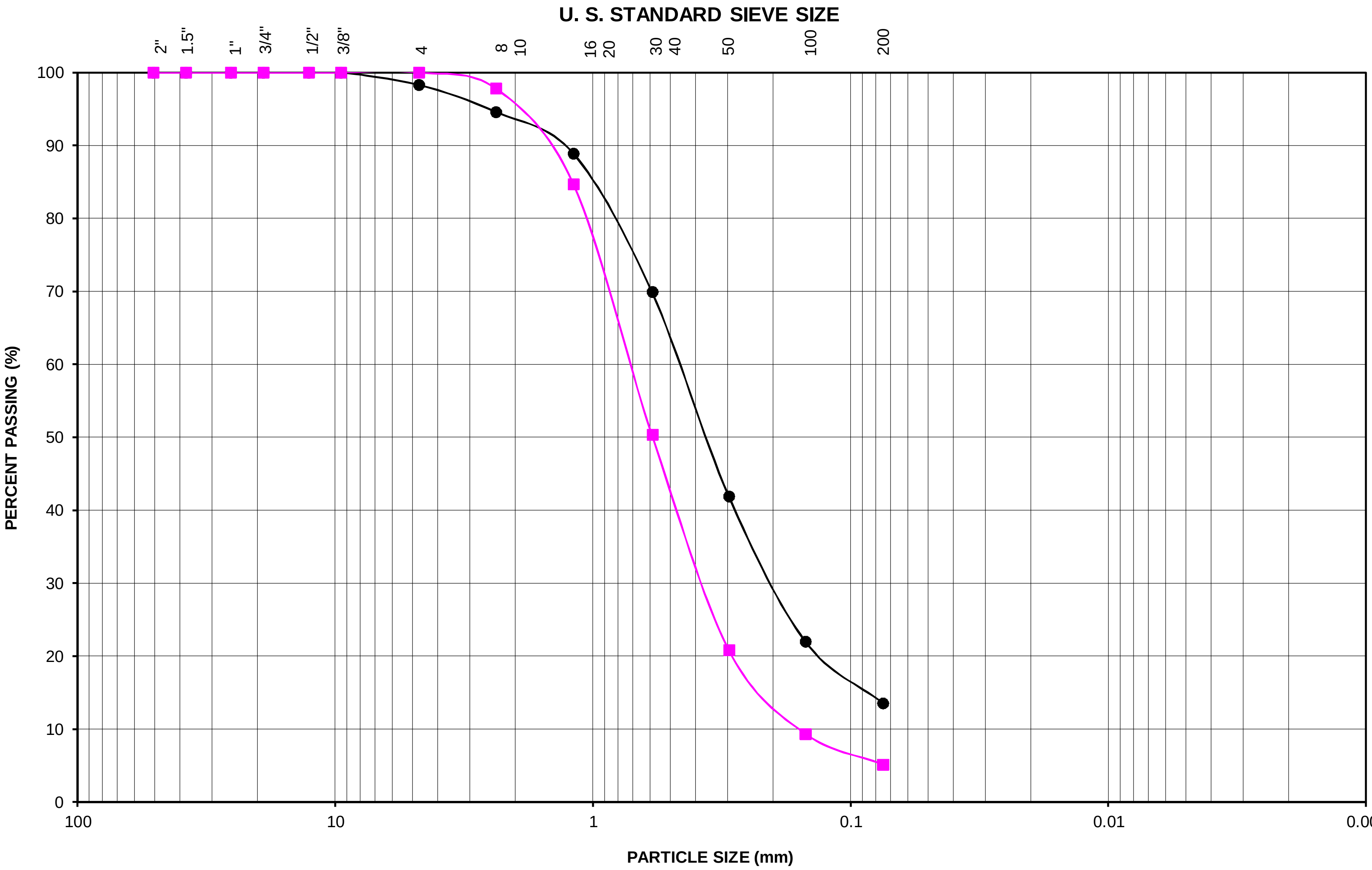
ATTERBERG LIMITS

LOCATION	DEPTH (feet)	LIQUID LIMIT	PLASTICITY INDEX	CLASSIFICATION
B-1	5	46	28	CL
B-5	5	32	20	CL

RESISTANCE "R"-VALUE

CALTEST 301

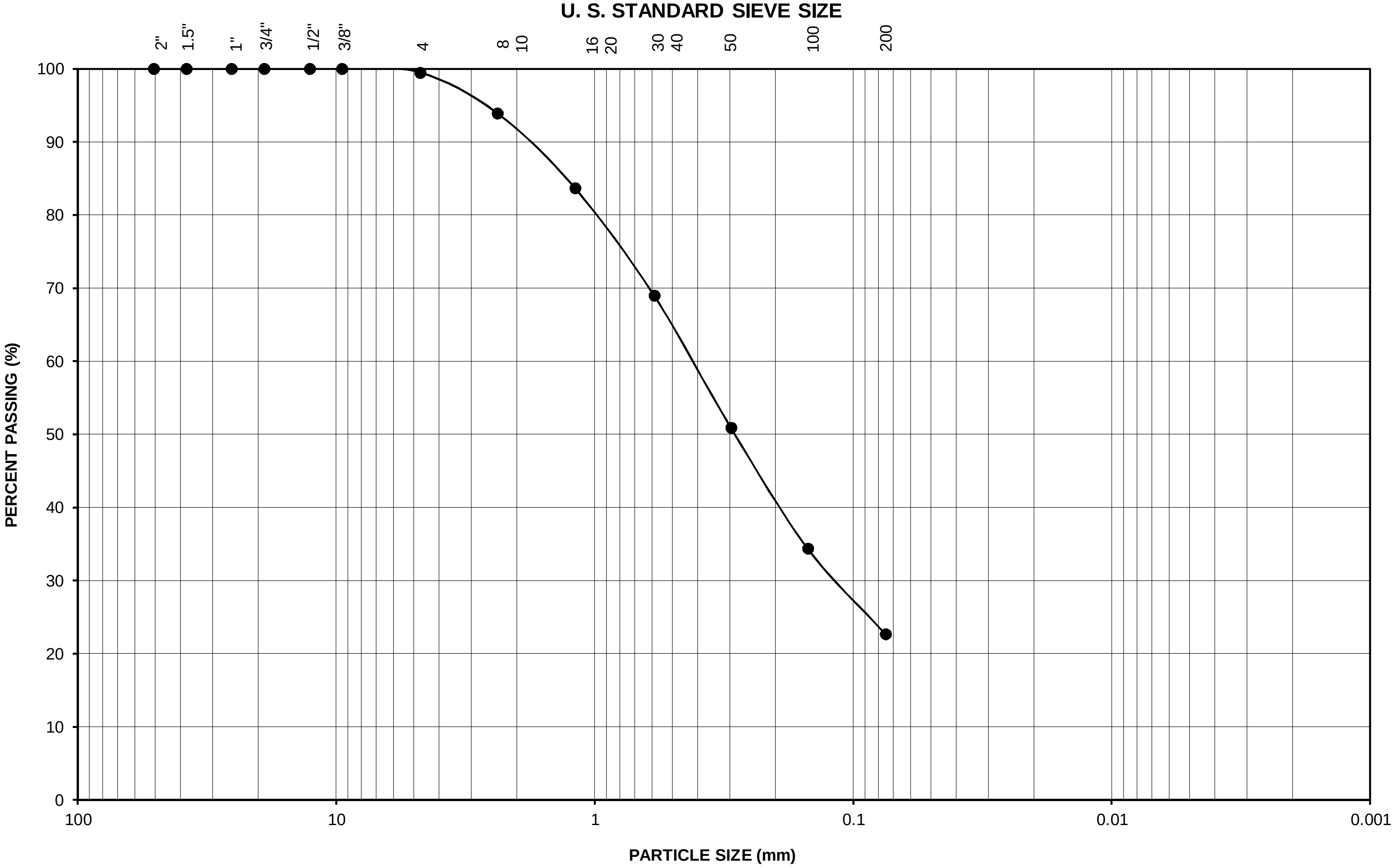
LOCATION	DEPTH (feet)	R-VALUE
B-3	0-5	37



PARTICLE SIZE ANALYSIS

CTE INC.
Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-1	10	●	-	-	SP-SM
B-1	15	■	-	-	SP
CTE JOB NUMBER:		10-13565G		FIGURE:	C-1



PARTICLE SIZE ANALYSIS

CTE INC.
Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-3	5	●	-	-	SM

CTE JOB NUMBER: 10-13565G

FIGURE: C-2

APPENDIX D

STANDARD SPECIFICATIONS FOR GRADING

Section 1 - General

Construction Testing & Engineering, Inc. presents the following standard recommendations for grading and other associated operations on construction projects. These guidelines should be considered a portion of the project specifications. Recommendations contained in the body of the previously presented soils report shall supersede the recommendations and or requirements as specified herein. The project geotechnical consultant shall interpret disputes arising out of interpretation of the recommendations contained in the soils report or specifications contained herein.

Section 2 - Responsibilities of Project Personnel

The geotechnical consultant should provide observation and testing services sufficient to general conformance with project specifications and standard grading practices. The geotechnical consultant should report any deviations to the client or his authorized representative.

The Client should be chiefly responsible for all aspects of the project. He or his authorized representative has the responsibility of reviewing the findings and recommendations of the geotechnical consultant. He shall authorize or cause to have authorized the Contractor and/or other consultants to perform work and/or provide services. During grading the Client or his authorized representative should remain on-site or should remain reasonably accessible to all concerned parties in order to make decisions necessary to maintain the flow of the project.

The Contractor is responsible for the safety of the project and satisfactory completion of all grading and other associated operations on construction projects, including, but not limited to, earth work in accordance with the project plans, specifications and controlling agency requirements.

Section 3 - Preconstruction Meeting

A preconstruction site meeting should be arranged by the owner and/or client and should include the grading contractor, design engineer, geotechnical consultant, owner's representative and representatives of the appropriate governing authorities.

Section 4 - Site Preparation

The client or contractor should obtain the required approvals from the controlling authorities for the project prior, during and/or after demolition, site preparation and removals, etc. The appropriate approvals should be obtained prior to proceeding with grading operations.

Clearing and grubbing should consist of the removal of vegetation such as brush, grass, woods, stumps, trees, root of trees and otherwise deleterious natural materials from the areas to be graded. Clearing and grubbing should extend to the outside of all proposed excavation and fill areas.

Demolition should include removal of buildings, structures, foundations, reservoirs, utilities (including underground pipelines, septic tanks, leach fields, seepage pits, cisterns, mining shafts, tunnels, etc.) and other man-made surface and subsurface improvements from the areas to be graded. Demolition of utilities should include proper capping and/or rerouting pipelines at the project perimeter and cutoff and capping of wells in accordance with the requirements of the governing authorities and the recommendations of the geotechnical consultant at the time of demolition.

Trees, plants or man-made improvements not planned to be removed or demolished should be protected by the contractor from damage or injury.

Debris generated during clearing, grubbing and/or demolition operations should be wasted from areas to be graded and disposed off-site. Clearing, grubbing and demolition operations should be performed under the observation of the geotechnical consultant.

Section 5 - Site Protection

Protection of the site during the period of grading should be the responsibility of the contractor. Unless other provisions are made in writing and agreed upon among the concerned parties, completion of a portion of the project should not be considered to preclude that portion or adjacent areas from the requirements for site protection until such time as the entire project is complete as identified by the geotechnical consultant, the client and the regulating agencies.

Precautions should be taken during the performance of site clearing, excavations and grading to protect the work site from flooding, ponding or inundation by poor or improper surface drainage. Temporary provisions should be made during the rainy season to adequately direct surface drainage away from and off the work site. Where low areas cannot be avoided, pumps should be kept on hand to continually remove water during periods of rainfall.

Rain related damage should be considered to include, but may not be limited to, erosion, silting, saturation, swelling, structural distress and other adverse conditions as determined by the geotechnical consultant. Soil adversely affected should be classified as unsuitable materials and should be subject to overexcavation and replacement with compacted fill or other remedial grading as recommended by the geotechnical consultant.

The contractor should be responsible for the stability of all temporary excavations. Recommendations by the geotechnical consultant pertaining to temporary excavations (e.g., backcuts) are made in consideration of stability of the completed project and, therefore, should not be considered to preclude the responsibilities of the contractor. Recommendations by the geotechnical consultant should not be considered to preclude requirements that are more restrictive by the regulating agencies. The contractor should provide during periods of extensive rainfall plastic sheeting to prevent unprotected slopes from becoming saturated and unstable. When deemed appropriate by the geotechnical consultant or governing agencies the contractor shall install checkdams, desilting basins, sand bags or other drainage control measures.

In relatively level areas and/or slope areas, where saturated soil and/or erosion gullies exist to depths of greater than 1.0 foot; they should be overexcavated and replaced as compacted fill in accordance with the applicable specifications. Where affected materials exist to depths of 1.0 foot or less below proposed finished grade, remedial grading by moisture conditioning in-place, followed by thorough recompaction in accordance with the applicable grading guidelines herein may be attempted. If the desired results are not achieved, all affected materials should be overexcavated and replaced as compacted fill in accordance with the slope repair recommendations herein. If field conditions dictate, the geotechnical consultant may recommend other slope repair procedures.

Section 6 - Excavations

6.1 Unsuitable Materials

Materials that are unsuitable should be excavated under observation and recommendations of the geotechnical consultant. Unsuitable materials include, but may not be limited to, dry, loose, soft, wet, organic compressible natural soils and fractured, weathered, soft bedrock and nonengineered or otherwise deleterious fill materials.

Material identified by the geotechnical consultant as unsatisfactory due to its moisture conditions should be overexcavated; moisture conditioned as needed, to a uniform at or above optimum moisture condition before placement as compacted fill.

If during the course of grading adverse geotechnical conditions are exposed which were not anticipated in the preliminary soil report as determined by the geotechnical consultant additional exploration, analysis, and treatment of these problems may be recommended.

6.2 Cut Slopes

Unless otherwise recommended by the geotechnical consultant and approved by the regulating agencies, permanent cut slopes should not be steeper than 2:1 (horizontal: vertical).

The geotechnical consultant should observe cut slope excavation and if these excavations expose loose cohesionless, significantly fractured or otherwise unsuitable material, the materials should be overexcavated and replaced with a compacted stabilization fill. If encountered specific cross section details should be obtained from the Geotechnical Consultant.

When extensive cut slopes are excavated or these cut slopes are made in the direction of the prevailing drainage, a non-erodible diversion swale (brow ditch) should be provided at the top of the slope.

6.3 Pad Areas

All lot pad areas, including side yard terrace containing both cut and fill materials, transitions, located less than 3 feet deep should be overexcavated to a depth of 3 feet and replaced with a uniform compacted fill blanket of 3 feet. Actual depth of overexcavation may vary and should be delineated by the geotechnical consultant during grading, especially where deep or drastic transitions are present.

For pad areas created above cut or natural slopes, positive drainage should be established away from the top-of-slope. This may be accomplished utilizing a berm drainage swale and/or an appropriate pad gradient. A gradient in soil areas away from the top-of-slopes of 2 percent or greater is recommended.

Section 7 - Compacted Fill

All fill materials should have fill quality, placement, conditioning and compaction as specified below or as approved by the geotechnical consultant.

7.1 Fill Material Quality

Excavated on-site or import materials which are acceptable to the geotechnical consultant may be utilized as compacted fill, provided trash, vegetation and other deleterious materials are removed prior to placement. All import materials anticipated for use on-site should be sampled tested and approved prior to and placement is in conformance with the requirements outlined.

Rocks 12 inches in maximum and smaller may be utilized within compacted fill provided sufficient fill material is placed and thoroughly compacted over and around all rock to effectively fill rock voids. The amount of rock should not exceed 40 percent by dry weight passing the 3/4-inch sieve. The geotechnical consultant may vary those requirements as field conditions dictate.

Where rocks greater than 12 inches but less than four feet of maximum dimension are generated during grading, or otherwise desired to be placed within an engineered fill, special handling in accordance with the recommendations below. Rocks greater than four feet should be broken down or disposed off-site.

7.2 Placement of Fill

Prior to placement of fill material, the geotechnical consultant should observe and approve the area to receive fill. After observation and approval, the exposed ground surface should be scarified to a depth of 6 to 8 inches. The scarified material should be conditioned (i.e. moisture added or air dried by continued discing) to achieve a moisture content at or slightly above optimum moisture conditions and compacted to a minimum of 90 percent of the maximum density or as otherwise recommended in the soils report or by appropriate government agencies.

Compacted fill should then be placed in thin horizontal lifts not exceeding eight inches in loose thickness prior to compaction. Each lift should be moisture conditioned as needed, thoroughly blended to achieve a consistent moisture content at or slightly above optimum and thoroughly compacted by mechanical methods to a minimum of 90 percent of laboratory maximum dry density. Each lift should be treated in a like manner until the desired finished grades are achieved.

The contractor should have suitable and sufficient mechanical compaction equipment and watering apparatus on the job site to handle the amount of fill being placed in consideration of moisture retention properties of the materials and weather conditions.

When placing fill in horizontal lifts adjacent to areas sloping steeper than 5:1 (horizontal: vertical), horizontal keys and vertical benches should be excavated into the adjacent slope area. Keying and benching should be sufficient to provide at least six-foot wide benches and a minimum of four feet of vertical bench height within the firm natural ground, firm bedrock or engineered compacted fill. No compacted fill should be placed in an area after keying and benching until the geotechnical consultant has reviewed the area. Material generated by the benching operation should be moved sufficiently away from the bench area to allow for the recommended review of the horizontal bench prior to placement of fill.

Within a single fill area where grading procedures dictate two or more separate fills, temporary slopes (false slopes) may be created. When placing fill adjacent to a false slope, benching should be conducted in the same manner as above described. At least a 3-foot vertical bench should be established within the firm core of adjacent approved compacted fill prior to placement of additional fill. Benching should proceed in at least 3-foot vertical increments until the desired finished grades are achieved.

Prior to placement of additional compacted fill following an overnight or other grading delay, the exposed surface or previously compacted fill should be processed by scarification, moisture conditioning as needed to at or slightly above optimum moisture content, thoroughly blended and recompacted to a minimum of 90 percent of laboratory maximum dry density. Where unsuitable materials exist to depths of greater than one foot, the unsuitable materials should be over-excavated.

Following a period of flooding, rainfall or overwatering by other means, no additional fill should be placed until damage assessments have been made and remedial grading performed as described herein.

Rocks 12 inch in maximum dimension and smaller may be utilized in the compacted fill provided the fill is placed and thoroughly compacted over and around all rock. No oversize material should be used within 3 feet of finished pad grade and within 1 foot of other compacted fill areas. Rocks 12 inches up to four feet maximum dimension should be placed below the upper 10 feet of any fill and should not be closer than 15 feet to any slope face. These recommendations could vary as locations of improvements dictate. Where practical, oversized material should not be placed below areas where structures or deep utilities are proposed. Oversized material should be placed in windrows on a clean, overexcavated or unyielding compacted fill or firm natural ground surface. Select native or imported granular soil (S.E. 30 or higher) should be placed and thoroughly flooded over and around all windrowed rock, such that voids are filled. Windrows of oversized material should be staggered so those successive strata of oversized material are not in the same vertical plane.

It may be possible to dispose of individual larger rock as field conditions dictate and as recommended by the geotechnical consultant at the time of placement.

The contractor should assist the geotechnical consultant and/or his representative by digging test pits for removal determinations and/or for testing compacted fill. The contractor should provide this work at no additional cost to the owner or contractor's client.

Fill should be tested by the geotechnical consultant for compliance with the recommended relative compaction and moisture conditions. Field density testing should conform to ASTM Method of Test D 1556-00, D 2922-04. Tests should be conducted at a minimum of approximately two vertical feet or approximately 1,000 to 2,000 cubic yards of fill placed. Actual test intervals may vary as field conditions dictate. Fill found not to be in conformance with the grading recommendations should be removed or otherwise handled as recommended by the geotechnical consultant.

7.3 Fill Slopes

Unless otherwise recommended by the geotechnical consultant and approved by the regulating agencies, permanent fill slopes should not be steeper than 2:1 (horizontal: vertical).

Except as specifically recommended in these grading guidelines compacted fill slopes should be over-built two to five feet and cut back to grade, exposing the firm, compacted fill inner core. The actual amount of overbuilding may vary as field conditions dictate. If the desired results are not achieved, the existing slopes should be overexcavated and reconstructed under the guidelines of the geotechnical consultant. The degree of overbuilding shall be increased until the desired compacted slope surface condition is achieved. Care should be taken by the contractor to provide thorough mechanical compaction to the outer edge of the overbuilt slope surface.

At the discretion of the geotechnical consultant, slope face compaction may be attempted by conventional construction procedures including backrolling. The procedure must create a firmly compacted material throughout the entire depth of the slope face to the surface of the previously compacted firm fill intercore.

During grading operations, care should be taken to extend compactive effort to the outer edge of the slope. Each lift should extend horizontally to the desired finished slope surface or more as needed to ultimately established desired grades. Grade during construction should not be allowed to roll off at the edge of the slope. It may be helpful to elevate slightly the outer edge of the slope. Slough resulting from the placement of individual lifts should not be allowed to drift down over previous lifts. At intervals not exceeding four feet in vertical slope height or the capability of available equipment, whichever is less, fill slopes should be thoroughly dozer trackrolled.

For pad areas above fill slopes, positive drainage should be established away from the top-of-slope. This may be accomplished using a berm and pad gradient of at least two percent.

Section 8 - Trench Backfill

Utility and/or other excavation of trench backfill should, unless otherwise recommended, be compacted by mechanical means. Unless otherwise recommended, the degree of compaction should be a minimum of 90 percent of the laboratory maximum density.

Within slab areas, but outside the influence of foundations, trenches up to one foot wide and two feet deep may be backfilled with sand and consolidated by jetting, flooding or by mechanical means. If on-site materials are utilized, they should be wheel-rolled, tamped or otherwise compacted to a firm condition. For minor interior trenches, density testing may be deleted or spot testing may be elected if deemed necessary, based on review of backfill operations during construction.

If utility contractors indicate that it is undesirable to use compaction equipment in close proximity to a buried conduit, the contractor may elect the utilization of light weight mechanical compaction equipment and/or shading of the conduit with clean, granular material, which should be thoroughly jetted in-place above the conduit, prior to initiating mechanical compaction procedures. Other methods of utility trench compaction may also be appropriate, upon review of the geotechnical consultant at the time of construction.

In cases where clean granular materials are proposed for use in lieu of native materials or where flooding or jetting is proposed, the procedures should be considered subject to review by the geotechnical consultant. Clean granular backfill and/or bedding are not recommended in slope areas.

Section 9 - Drainage

Where deemed appropriate by the geotechnical consultant, canyon subdrain systems should be installed in accordance with CTE's recommendations during grading.

Typical subdrains for compacted fill buttresses, slope stabilization or sidehill masses, should be installed in accordance with the specifications.

Roof, pad and slope drainage should be directed away from slopes and areas of structures to suitable disposal areas via non-erodible devices (i.e., gutters, downspouts, and concrete swales).

For drainage in extensively landscaped areas near structures, (i.e., within four feet) a minimum of 5 percent gradient away from the structure should be maintained. Pad drainage of at least 2 percent should be maintained over the remainder of the site.

Drainage patterns established at the time of fine grading should be maintained throughout the life of the project. Property owners should be made aware that altering drainage patterns could be detrimental to slope stability and foundation performance.

Section 10 - Slope Maintenance

10.1 - Landscape Plants

To enhance surficial slope stability, slope planting should be accomplished at the completion of grading. Slope planting should consist of deep-rooting vegetation requiring little watering. Plants native to the southern California area and plants relative to native plants are generally desirable. Plants native to other semi-arid and arid areas may also be appropriate. A Landscape Architect should be the best party to consult regarding actual types of plants and planting configuration.

10.2 - Irrigation

Irrigation pipes should be anchored to slope faces, not placed in trenches excavated into slope faces.

Slope irrigation should be minimized. If automatic timing devices are utilized on irrigation systems, provisions should be made for interrupting normal irrigation during periods of rainfall.

10.3 - Repair

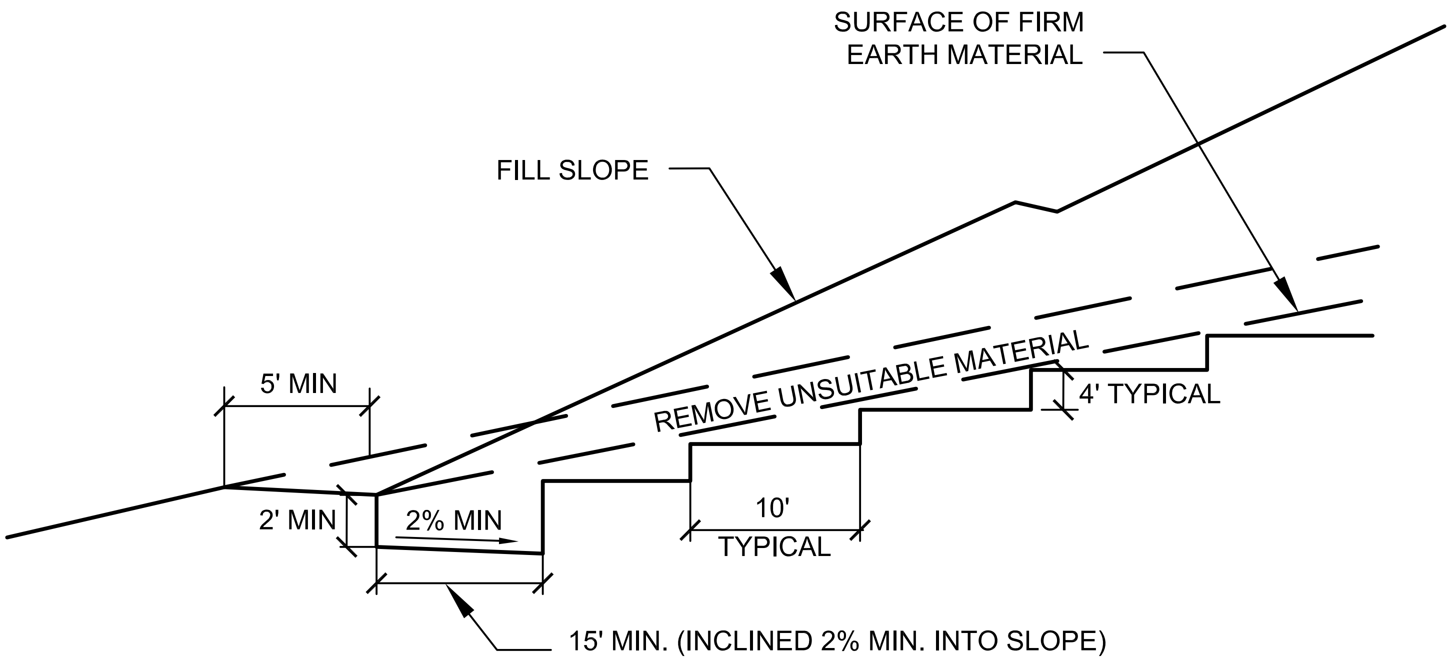
As a precautionary measure, plastic sheeting should be readily available, or kept on hand, to protect all slope areas from saturation by periods of heavy or prolonged rainfall. This measure is strongly recommended, beginning with the period prior to landscape planting.

If slope failures occur, the geotechnical consultant should be contacted for a field review of site conditions and development of recommendations for evaluation and repair.

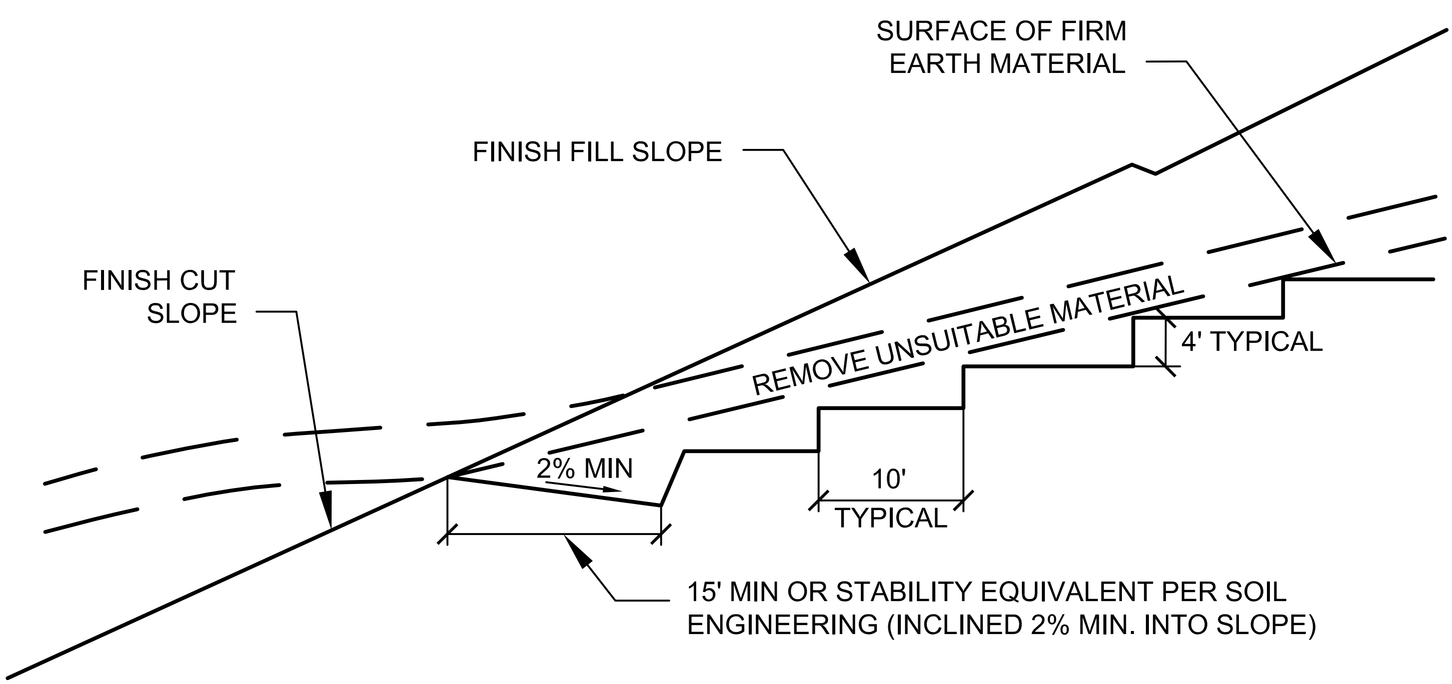
If slope failures occur as a result of exposure to period of heavy rainfall, the failure areas and currently unaffected areas should be covered with plastic sheeting to protect against additional saturation.

In the accompanying Standard Details, appropriate repair procedures are illustrated for superficial slope failures (i.e., occurring typically within the outer one foot to three feet of a slope face).

BENCHING FILL OVER NATURAL

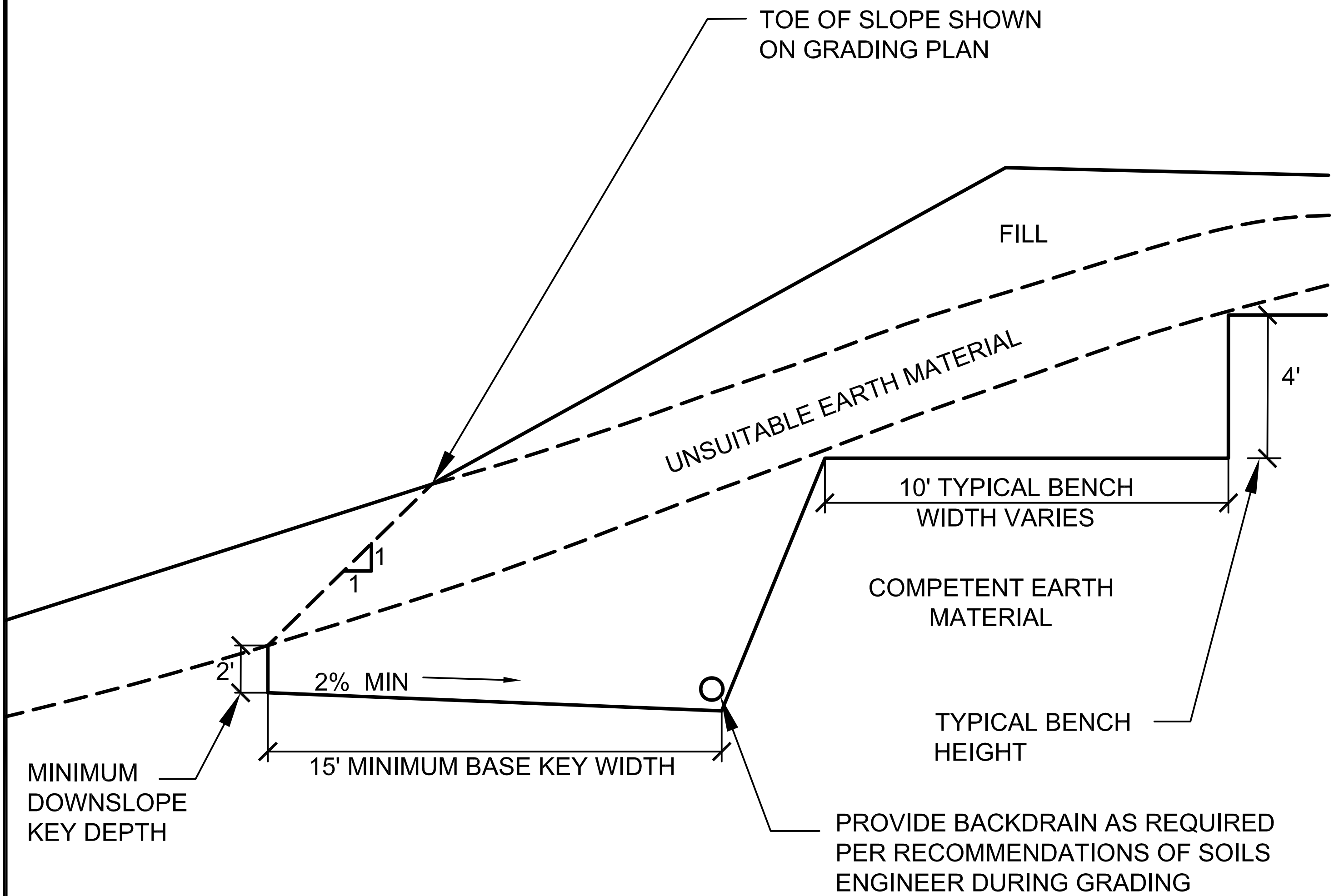


BENCHING FILL OVER CUT



NOT TO SCALE

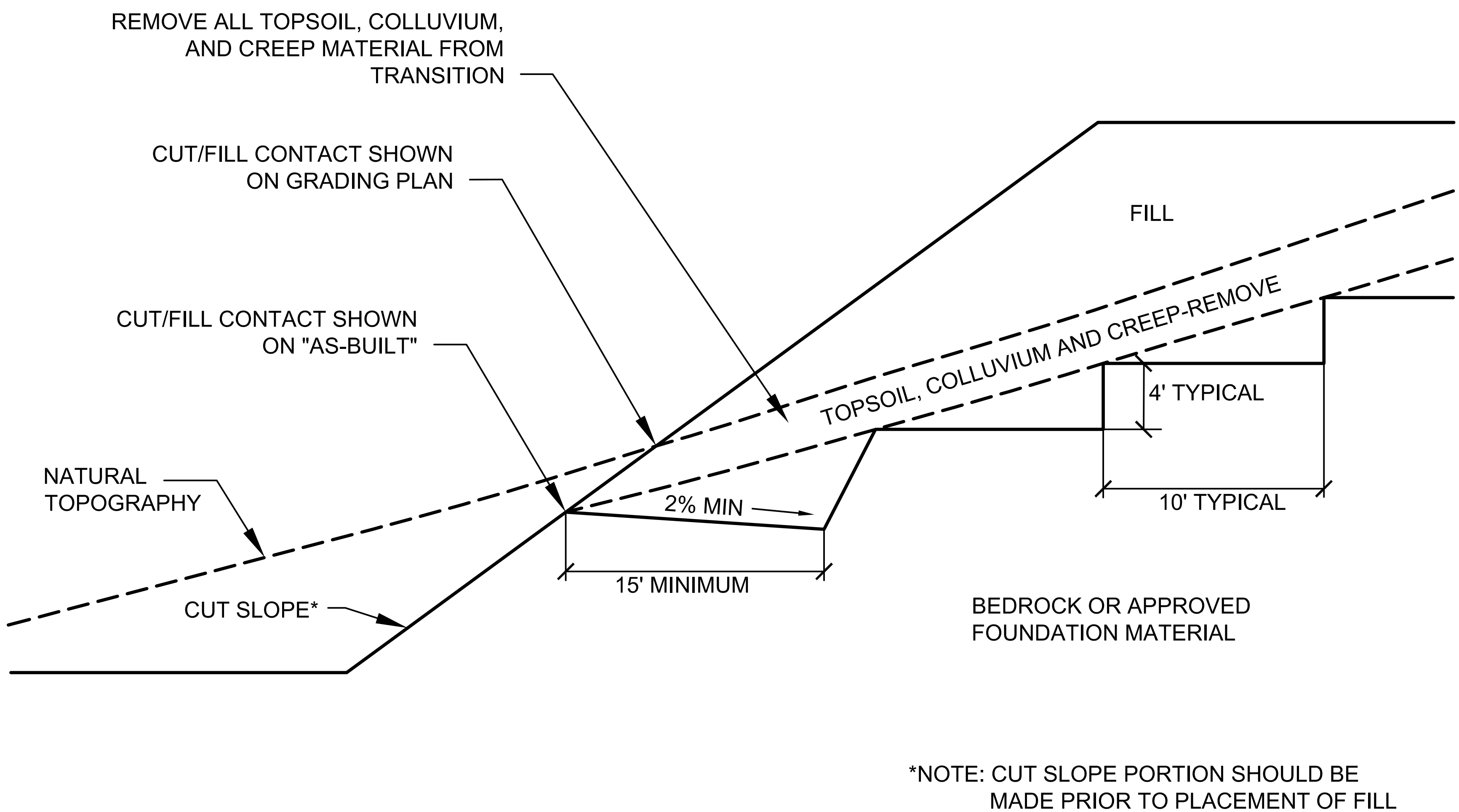
BENCHING FOR COMPACTED FILL DETAIL



WHERE NATURAL SLOPE GRADIENT IS 5:1 OR LESS, BENCHING IS NOT NECESSARY. FILL IS NOT TO BE PLACED ON COMPRESSIBLE OR UNSUITABLE MATERIAL.

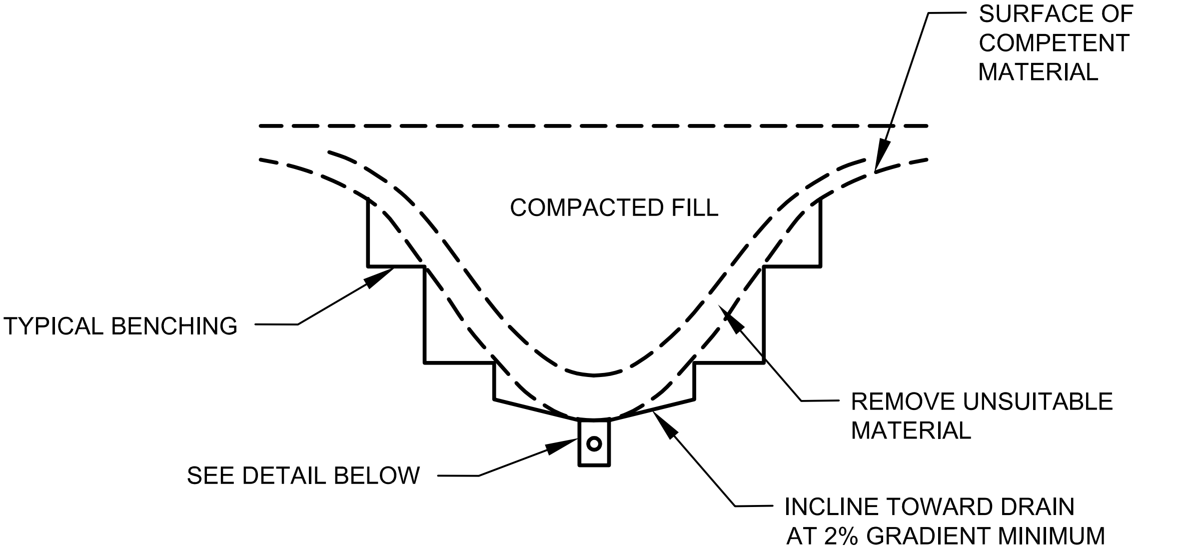
NOT TO SCALE

FILL SLOPE ABOVE NATURAL GROUND DETAIL

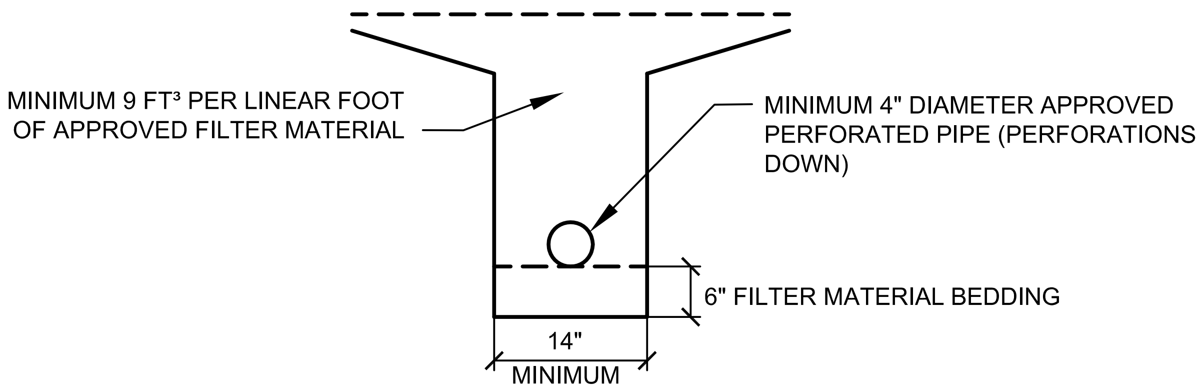


NOT TO SCALE

FILL SLOPE ABOVE CUT SLOPE DETAIL



DETAIL



CALTRANS CLASS 2 PERMEABLE MATERIAL
FILTER MATERIAL TO MEET FOLLOWING
SPECIFICATION OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1"	100
¾"	90-100
⅜"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

APPROVED PIPE TO BE SCHEDULE 40 POLY-VINYL-CHLORIDE (P.V.C.) OR APPROVED EQUAL. MINIMUM CRUSH STRENGTH 1000 psi

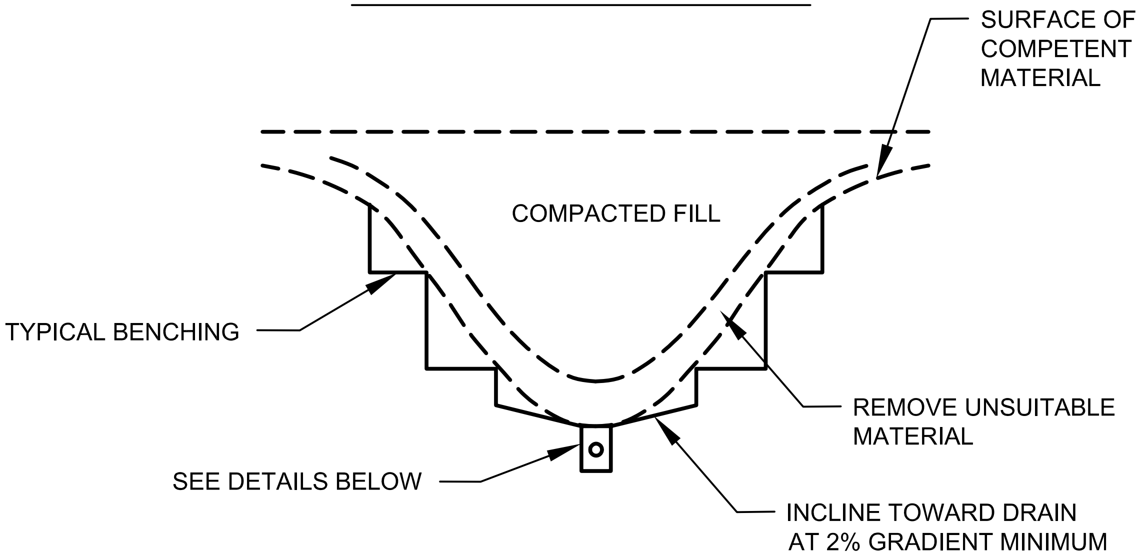
PIPE DIAMETER TO MEET THE FOLLOWING CRITERIA, SUBJECT TO FIELD REVIEW BASED ON ACTUAL GEOTECHNICAL CONDITIONS ENCOUNTERED DURING GRADING

LENGTH OF RUN	PIPE DIAMETER
INITIAL 500'	4"
500' TO 1500'	6"
> 1500'	8"

NOT TO SCALE

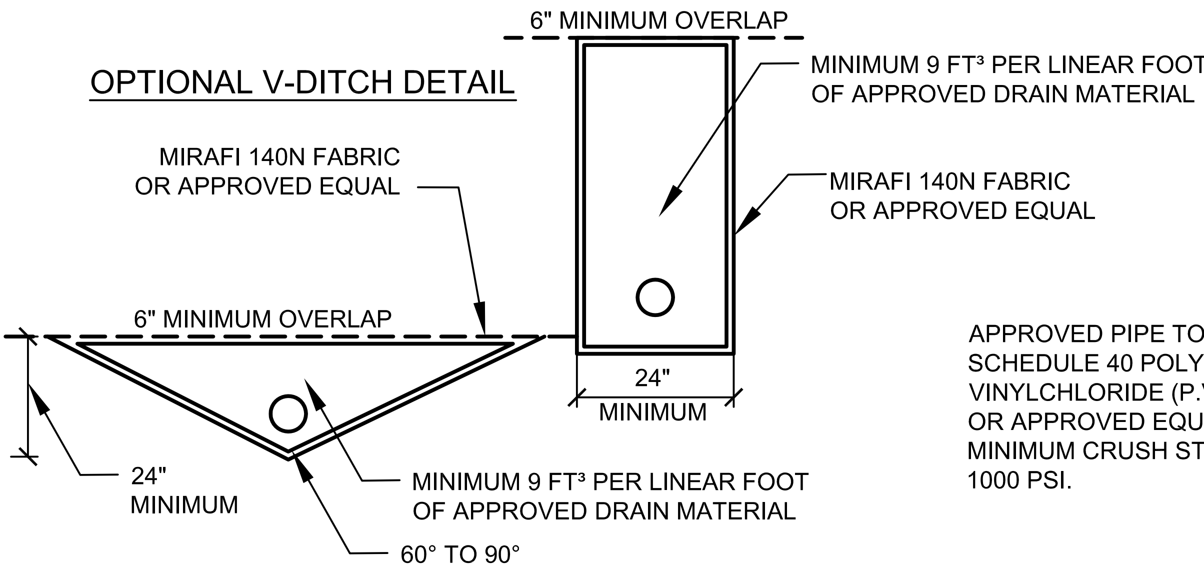
TYPICAL CANYON SUBDRAIN DETAIL

CANYON SUBDRAIN DETAILS



TRENCH DETAILS

OPTIONAL V-DITCH DETAIL



APPROVED PIPE TO BE SCHEDULE 40 POLY-VINYLCHLORIDE (P.V.C.) OR APPROVED EQUAL. MINIMUM CRUSH STRENGTH 1000 PSI.

DRAIN MATERIAL TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1 ½"	88-100
1"	5-40
¾"	0-17
⅜"	0-7
NO. 200	0-3

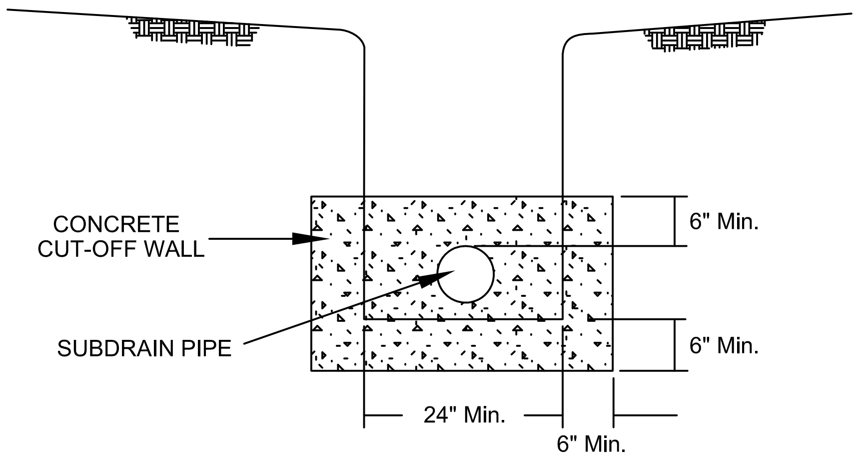
PIPE DIAMETER TO MEET THE FOLLOWING CRITERIA, SUBJECT TO FIELD REVIEW BASED ON ACTUAL GEOTECHNICAL CONDITIONS ENCOUNTERED DURING GRADING

LENGTH OF RUN	PIPE DIAMETER
INITIAL 500'	4"
500' TO 1500'	6"
> 1500'	8"

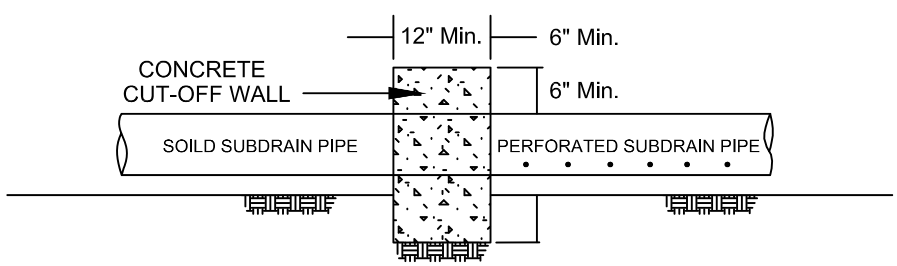
NOT TO SCALE

GEOFABRIC SUBDRAIN

FRONT VIEW



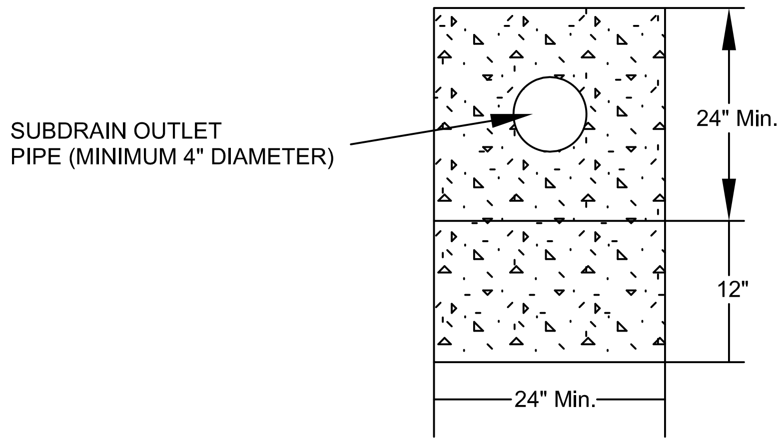
SIDE VIEW



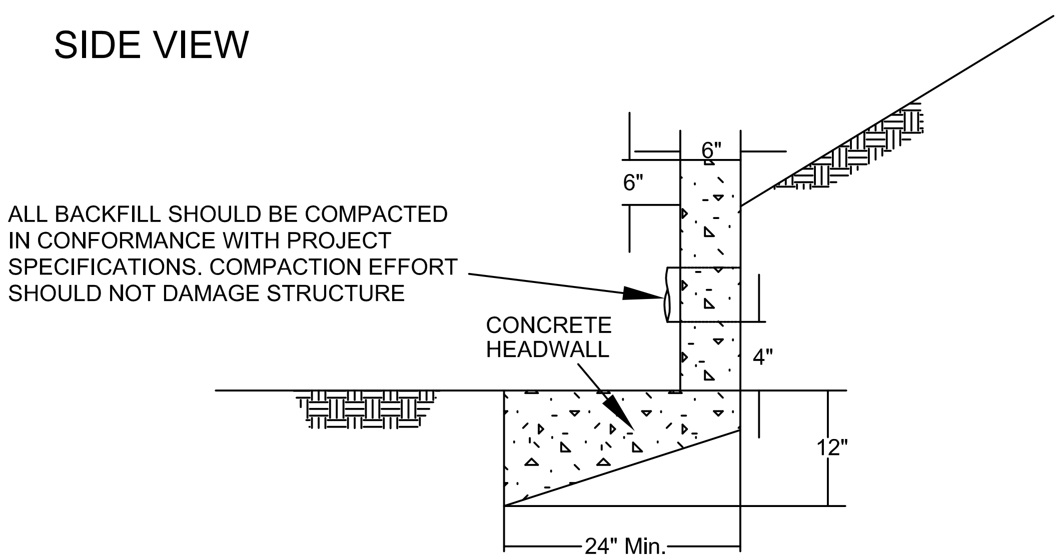
NOT TO SCALE

RECOMMENDED SUBDRAIN CUT-OFF WALL

FRONT VIEW



SIDE VIEW



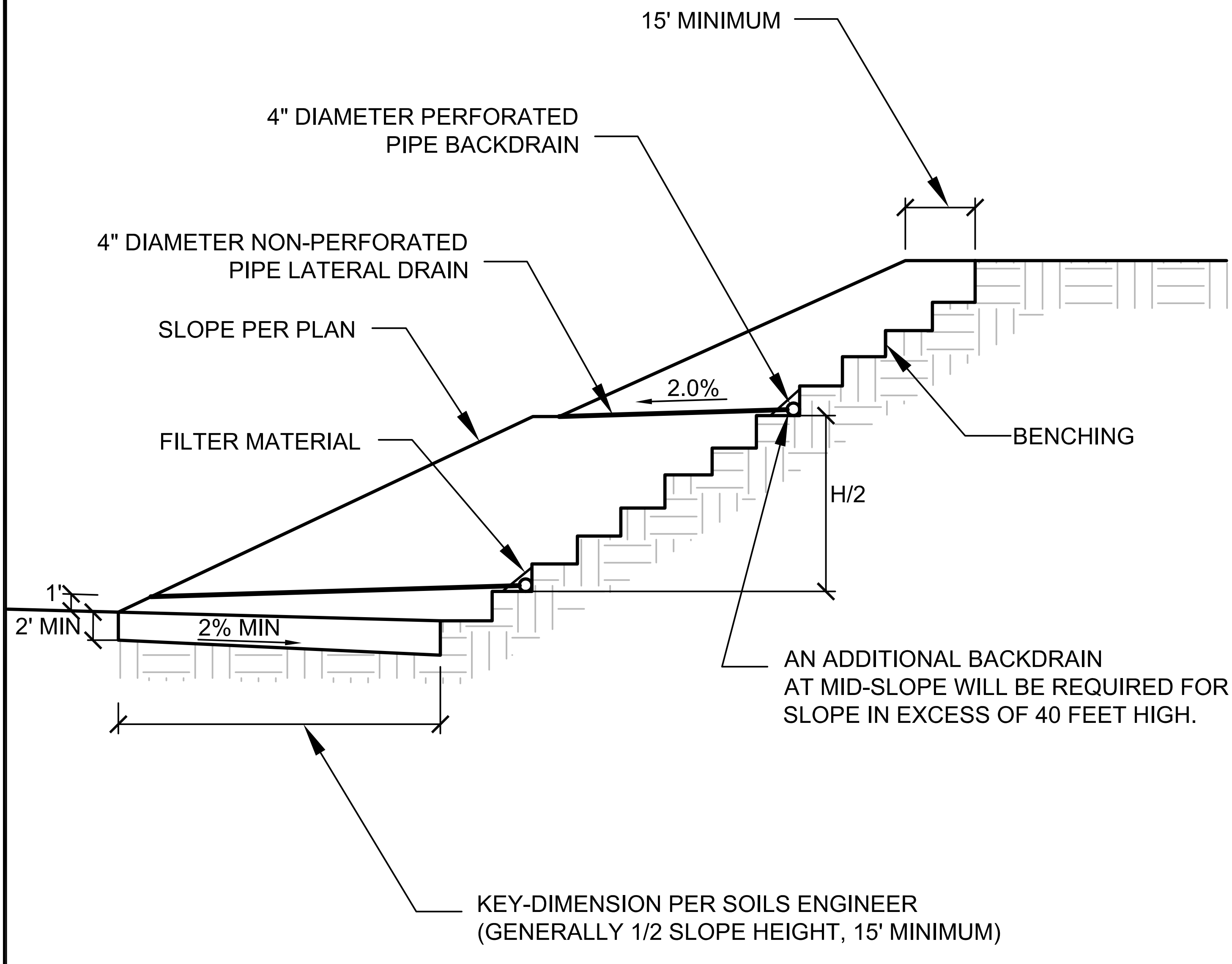
NOTE: HEADWALL SHOULD OUTLET AT TOE OF SLOPE OR INTO CONTROLLED SURFACE DRAINAGE DEVICE

ALL DISCHARGE SHOULD BE CONTROLLED

THIS DETAIL IS A MINIMUM DESIGN AND MAY BE MODIFIED DEPENDING UPON ENCOUNTERED CONDITIONS AND LOCAL REQUIREMENTS

NOT TO SCALE

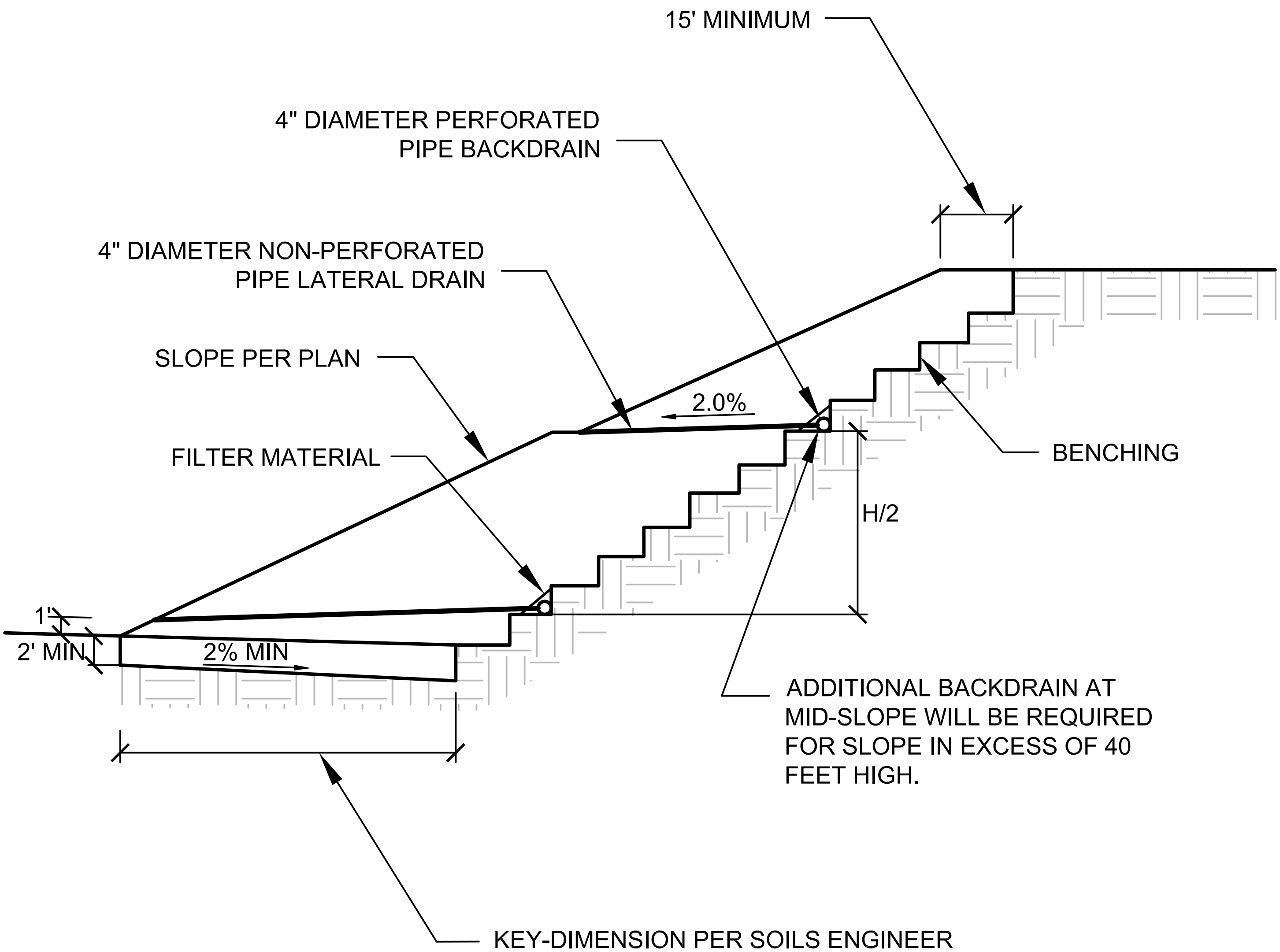
TYPICAL SUBDRAIN OUTLET HEADWALL DETAIL



DIMENSIONS ARE MINIMUM RECOMMENDED

NOT TO SCALE

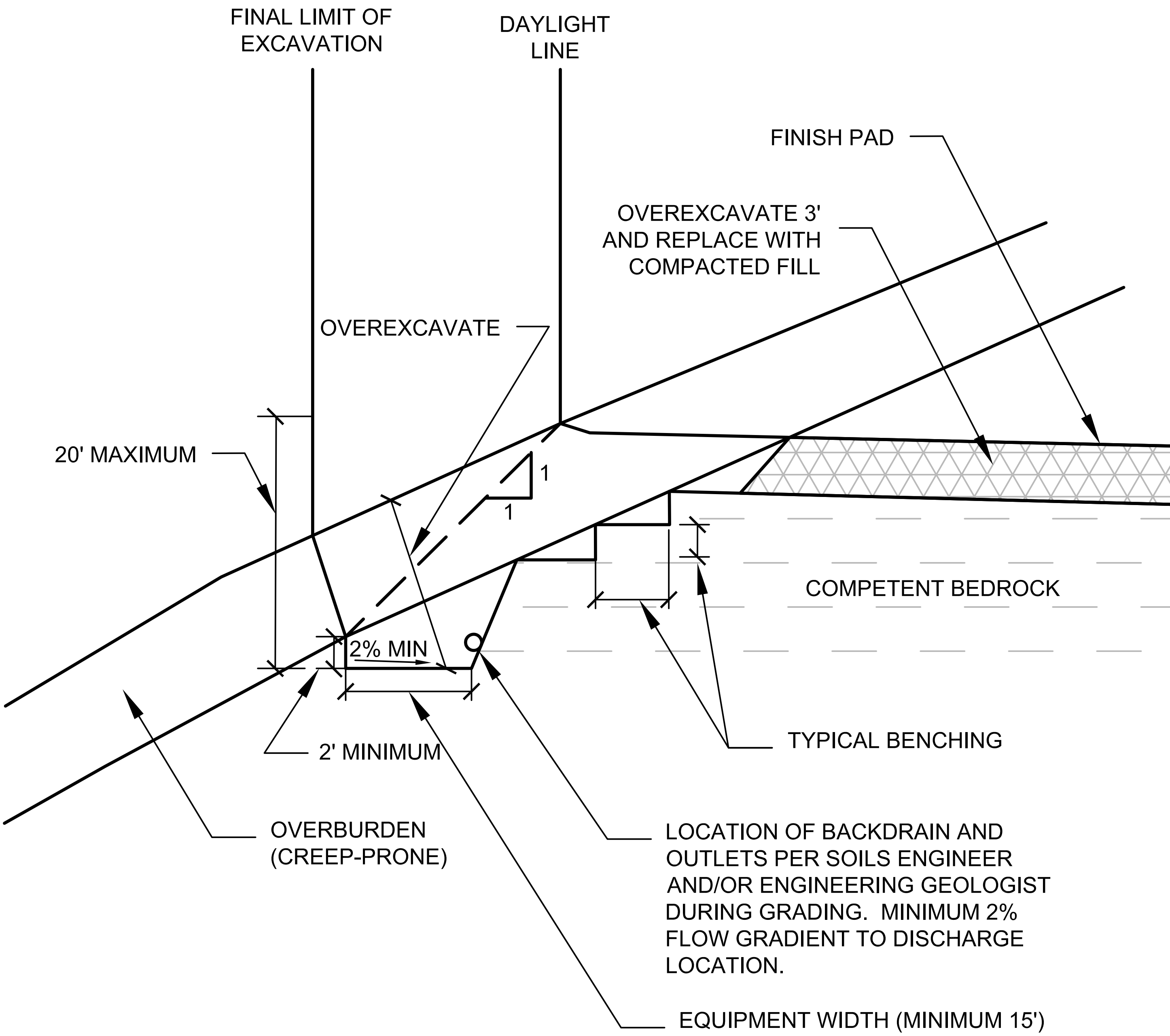
TYPICAL SLOPE STABILIZATION FILL DETAIL



DIMENSIONS ARE MINIMUM RECOMMENDED

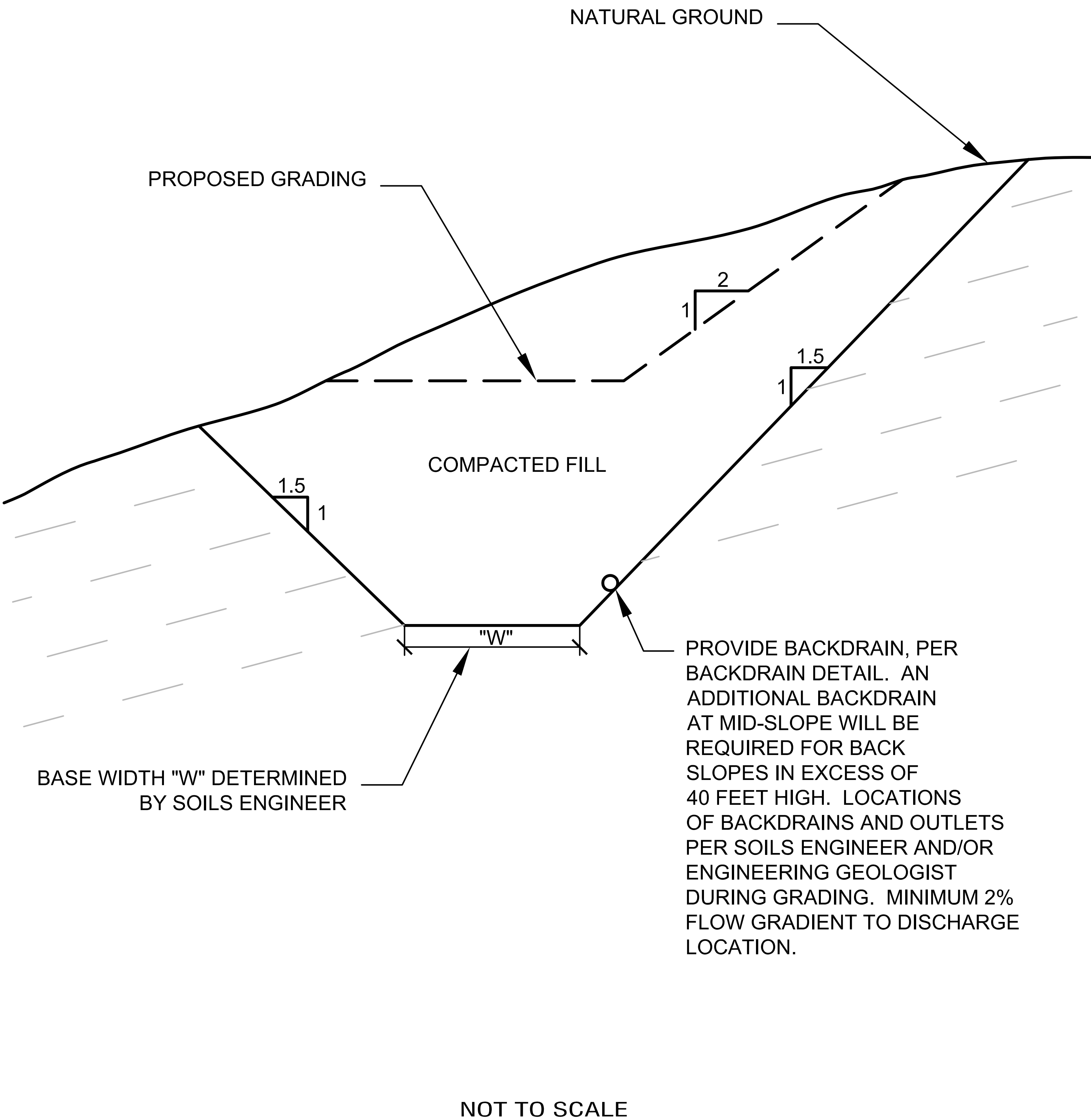
NOT TO SCALE

TYPICAL BUTTRESS FILL DETAIL

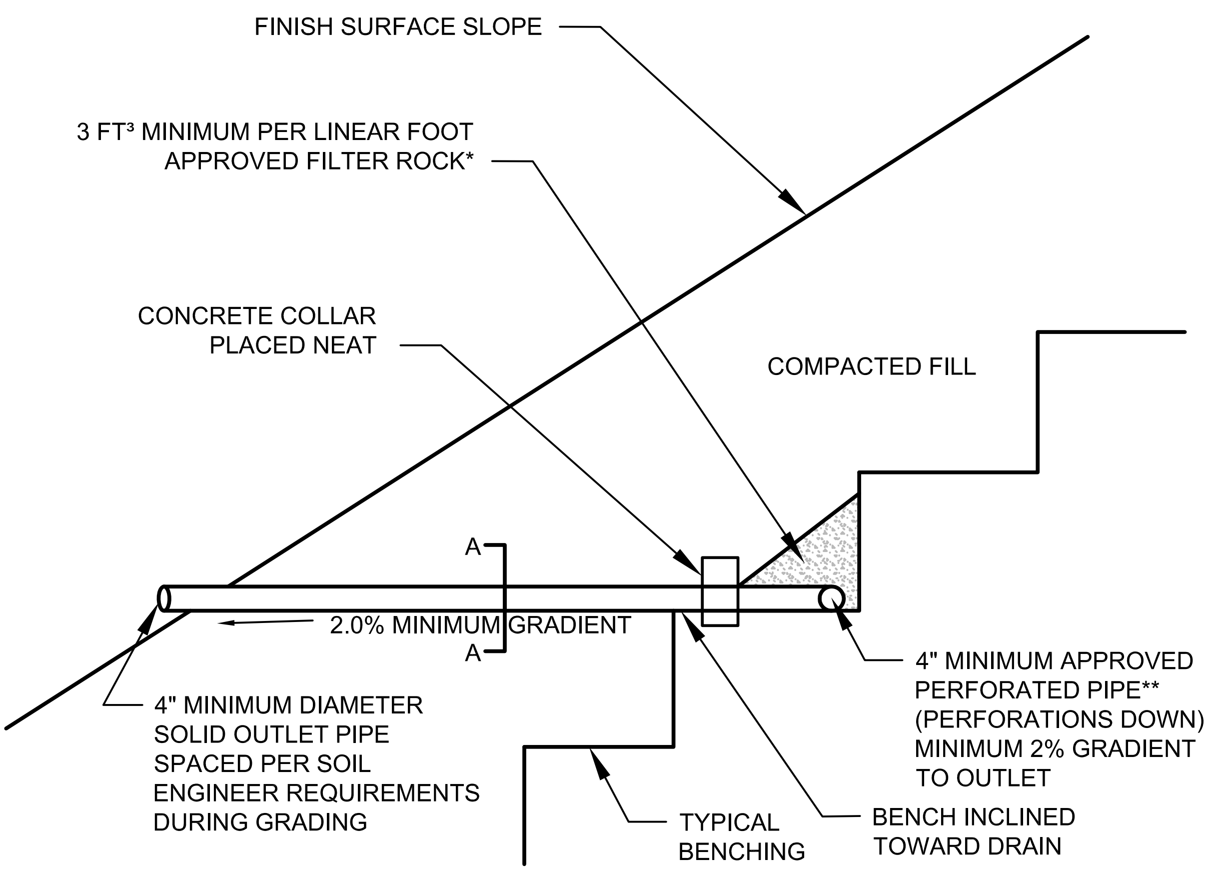


NOT TO SCALE

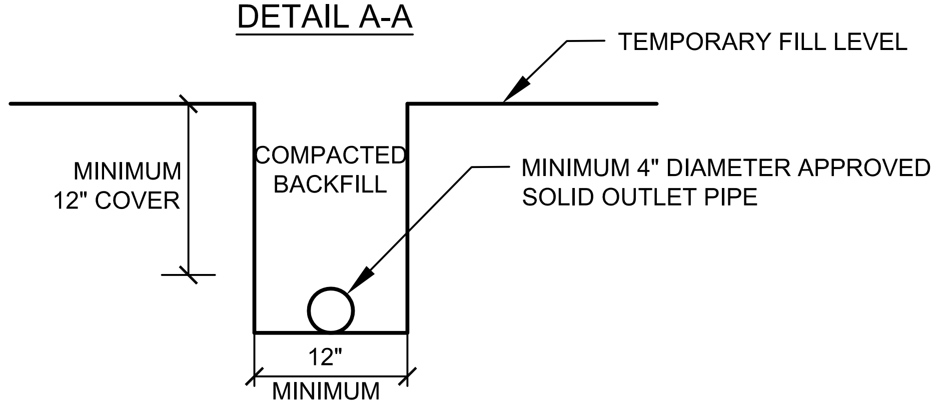
DAYLIGHT SHEAR KEY DETAIL



TYPICAL SHEAR KEY DETAIL



DETAIL A-A



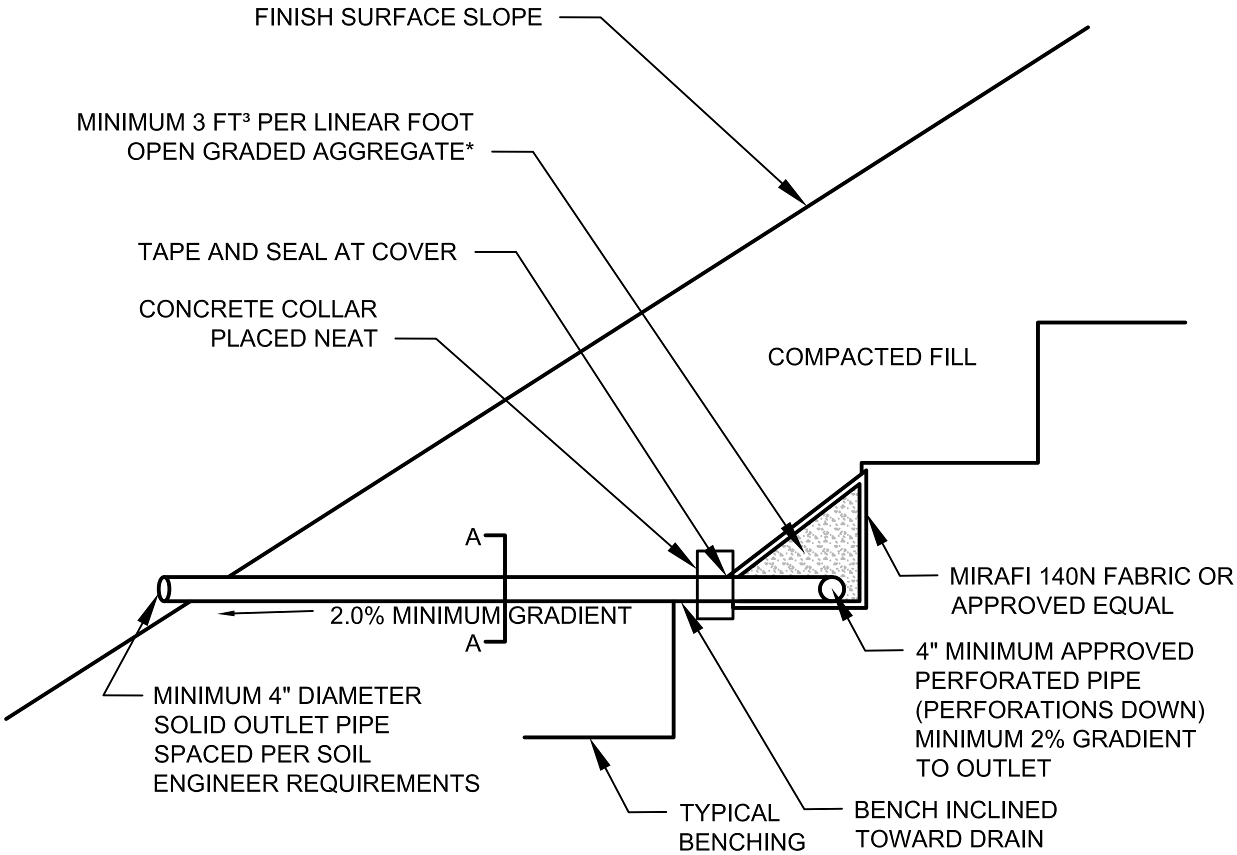
**APPROVED PIPE TYPE:
SCHEDULE 40 POLYVINYL CHLORIDE
(P.V.C.) OR APPROVED EQUAL.
MINIMUM CRUSH STRENGTH 1000 PSI

*FILTER ROCK TO MEET FOLLOWING
SPECIFICATIONS OR APPROVED EQUAL:

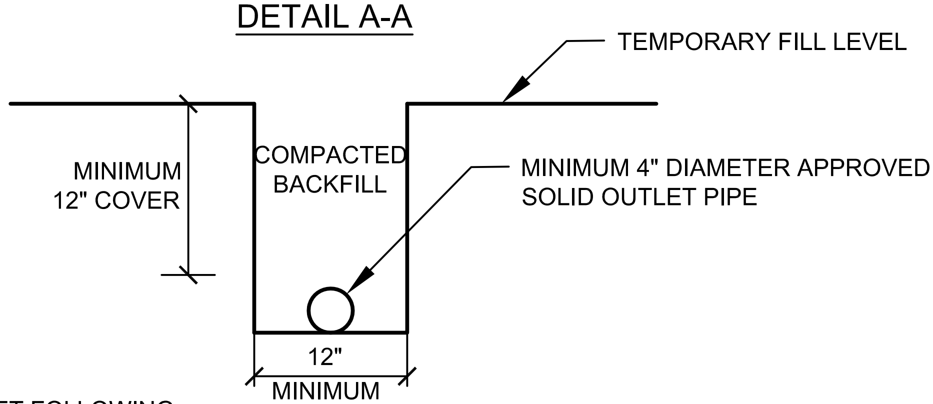
SIEVE SIZE	PERCENTAGE PASSING
1"	100
¾"	90-100
⅜"	40-100
NO. 4	25-40
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

NOT TO SCALE

TYPICAL BACKDRAIN DETAIL



DETAIL A-A

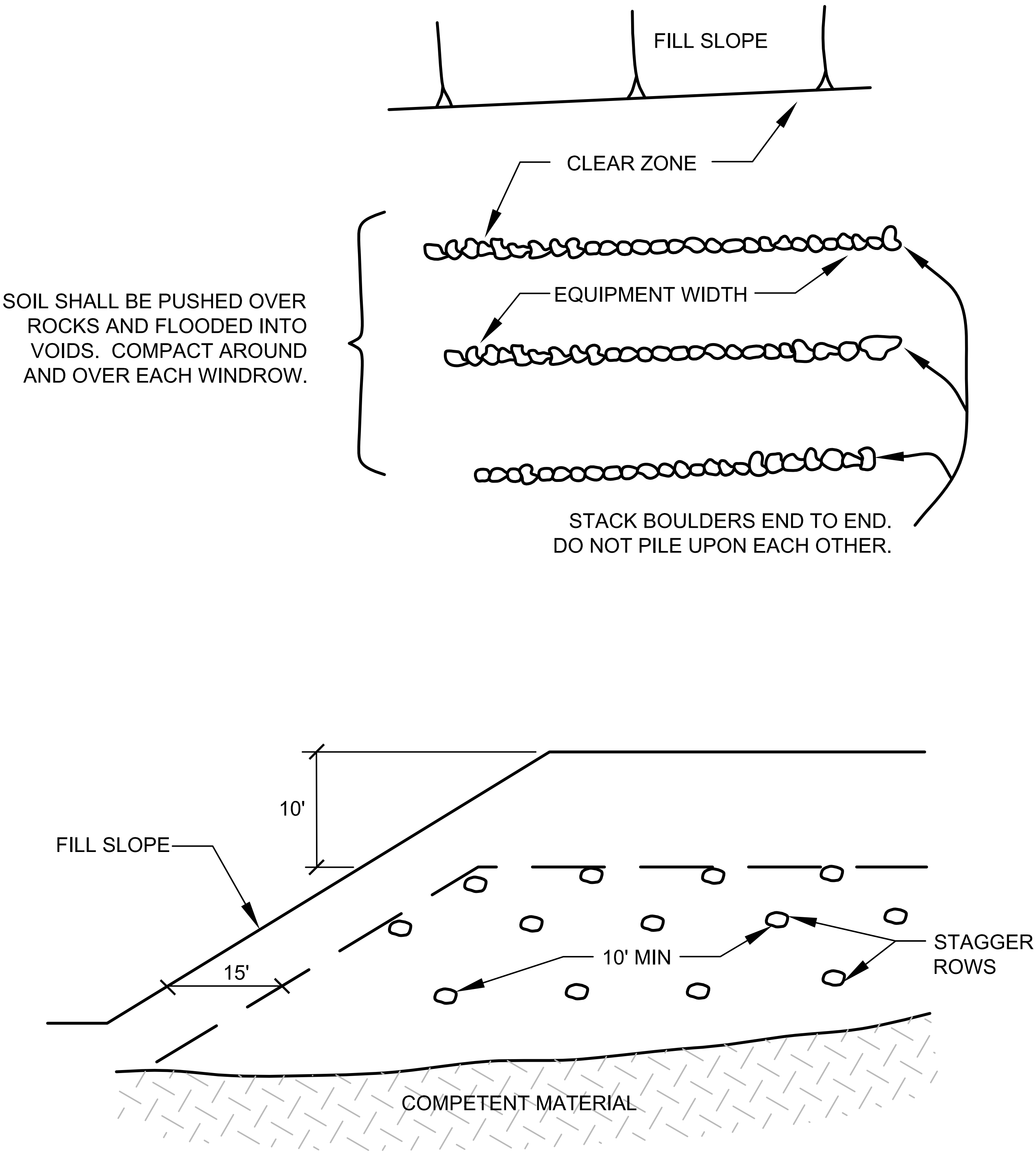


*NOTE: AGGREGATE TO MEET FOLLOWING SPECIFICATIONS OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1 ½"	100
1"	5-40
¾"	0-17
⅜"	0-7
NO. 200	0-3

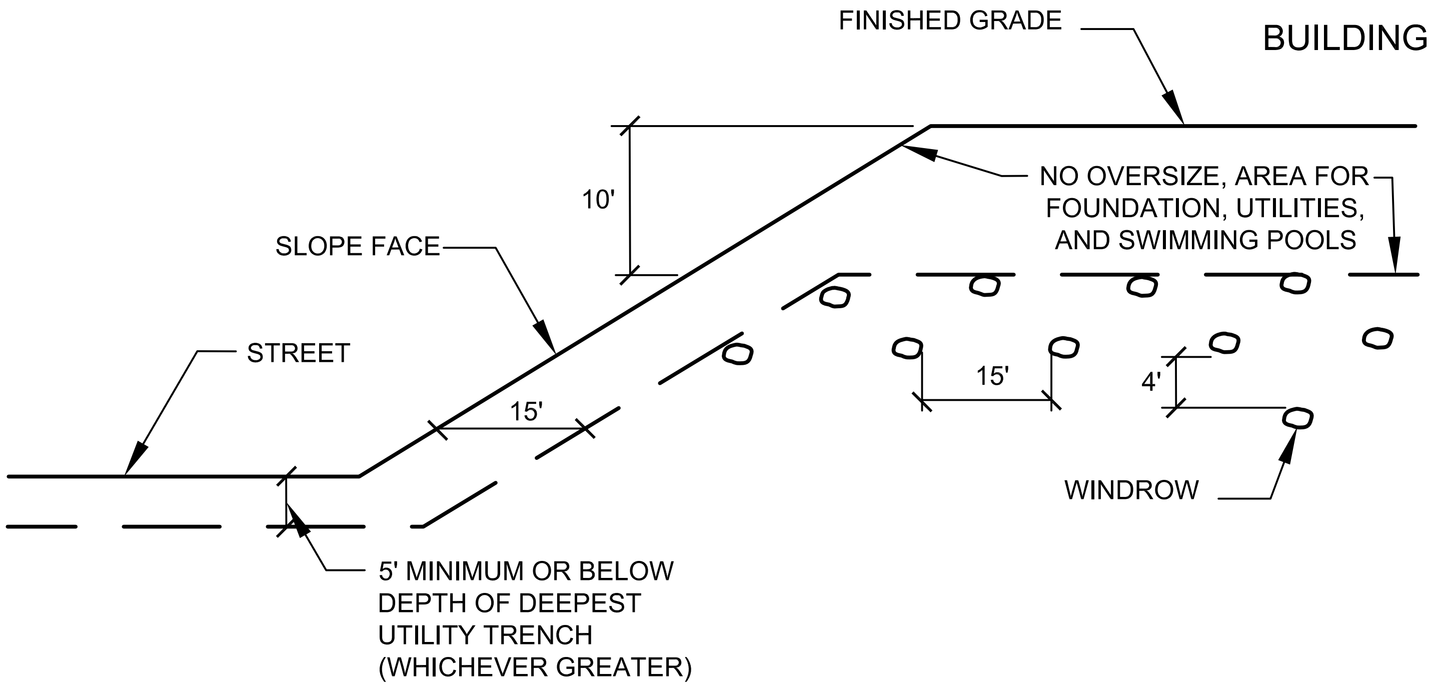
NOT TO SCALE

BACKDRAIN DETAIL (GEOFRABIC)

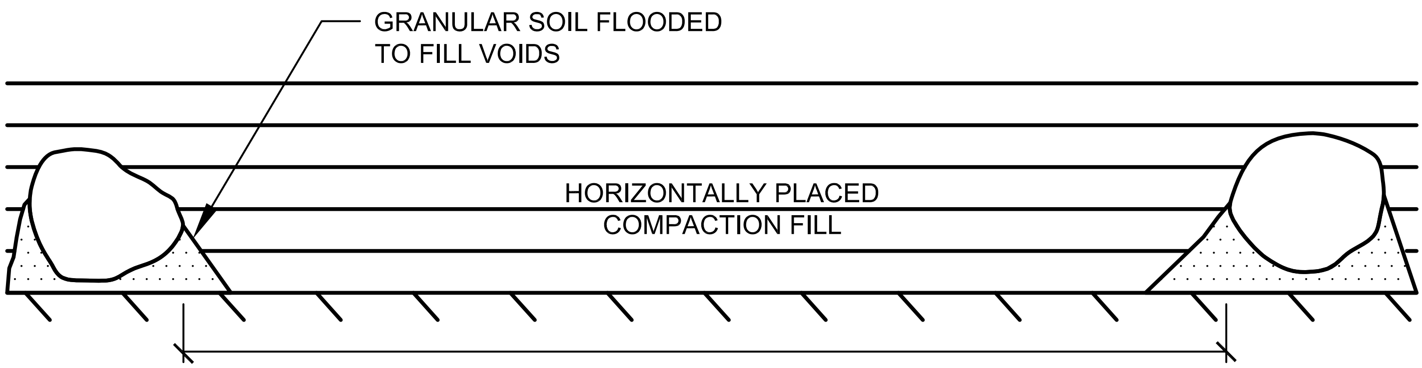


NOT TO SCALE

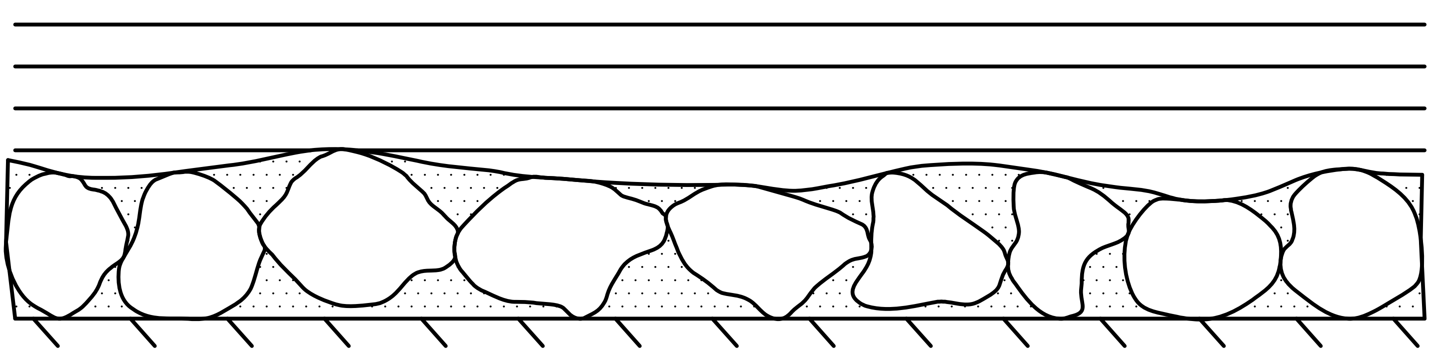
ROCK DISPOSAL DETAIL



TYPICAL WINDROW DETAIL (EDGE VIEW)



PROFILE VIEW

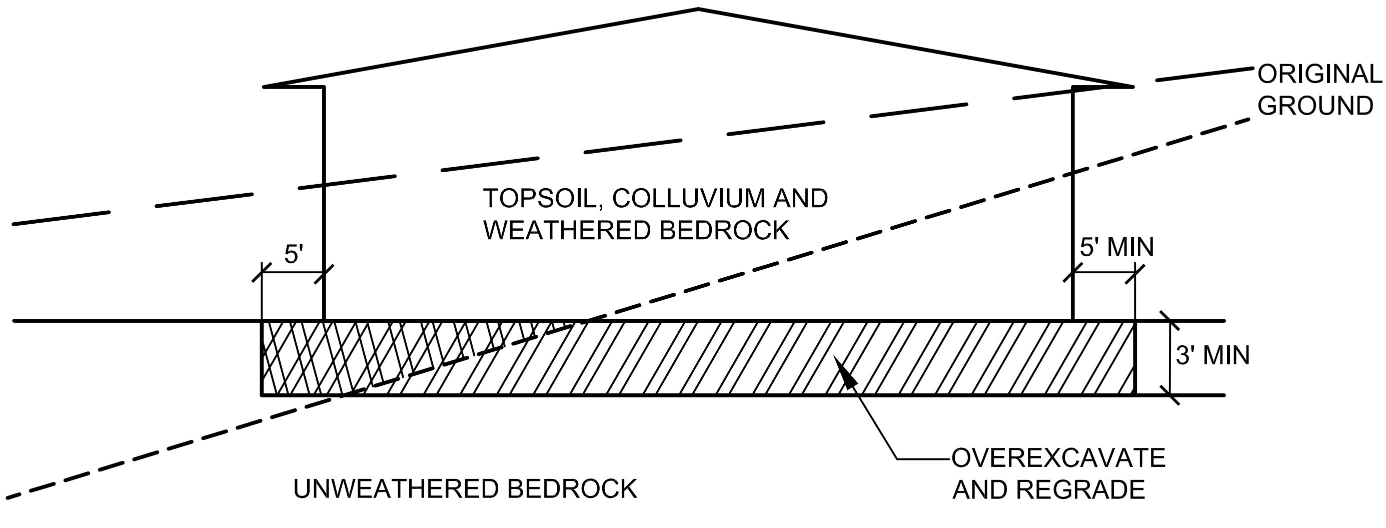


NOT TO SCALE

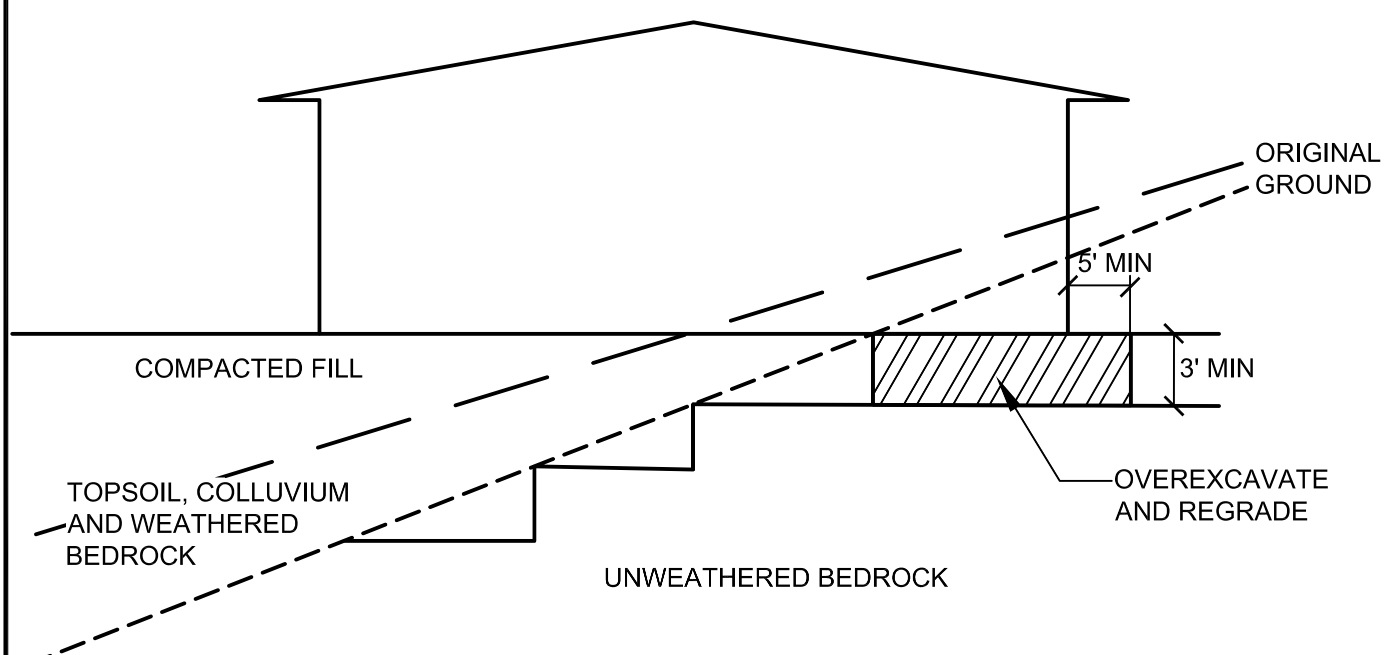
ROCK DISPOSAL DETAIL

GENERAL GRADING RECOMMENDATIONS

CUT LOT



CUT/FILL LOT (TRANSITION)



NOT TO SCALE

TRANSITION LOT DETAIL