Construction Testing & Engineering, Inc.
Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying

4030 Goldfinch Investments
Attention: Mr. Phil Pace or Patti Conners
15635 Paseo Penasco
Escondido, CA 92025

CTE Job No. 10-12385G

Via Email: Phil@philsbbq.net; Patti@philsbbq.net; josh@spearinc.net; eheidelberg@cgs3.com

Subject: Preliminary Geotechnical Recommendations
Proposed Segmental Wall and Roadway at Resque Ranch
Located East of Paseo Penasco at North Margin of Highland Valley Road
County of San Diego, California

Mr. Pace:

Construction Testing and Engineering, Inc. (CTE) is pleased to provide Resque Ranch with preliminary geotechnical recommendations pertinent to a proposed segmental block retaining wall and roadway to be constructed at the site. This work is authorized through CTE proposal G-4231A as executed by Mr. Charles Pace on March 20, 2018.

It is understood these facilities are to connect the Resque Ranch barn and arena with access to Highland Valley Road on the south margin of the site. The proposed segmental block wall supported roadway is to be within a 28 feet wide easement, and to a have a maximum height of 16 feet. General location of the site is shown on attached Figure 1, Site Index Map. The roadway improvements are depicted on the referenced grading plans prepared by Spear and Associates, Inc. References are provided in Appendix A and laboratory test results are in Appendix C (there is no Appendix B). Standard grading recommendations are attached in Appendix D.

1.0 FIELD INVESTIGATION AND OBSERVATIONS

The field investigation was conducted on March 26, 2018 and consisted of two shallow hand pits necessary for observations and sample collection. The field observations in combination with the shallow hand pits indicated that the existing pioneer roadway was composed of two to three feet of fill soil. However, the fill may vary to deeper depths as the proposed grading is implemented. Furthermore, the site is set in an area of oversize rock that could be encountered during grading. Surface observations and the hand pits indicated the roadway fill soils were dry and disturbed by vegetation root growth. Soil samples were collected from the shallow hand pits, along the roadway. Approximate location of the hand pits is shown on Figure 1.

Collected soil samples were tested in CTE's geotechnical laboratory. The testing included a Proctor for maximum dry density and optimum moisture content, gradation and a direct shear test of a remolded sample. Additionally, shear tests and gradations of a slope investigation of the west bounding barn and arena slopes (CTE, October 5, 2016) were accessed for this report. The laboratory test results are presented in Appendix C.

2.0 PRELIMINARY SEGMENTAL WALL PARAMETERS

2.1 Strength and Unit Weight

Provided in Table 2.1 below are modified soil parameters considered suitable for design of the proposed walls. The design internal angle of friction (ϕ) for the reinforced zone is the minimum recommended though on site material exceeds the recommended value. Testing of import soils is recommended to evaluate if such material meets the minimum recommendations below.

TABLE 2.1 MINIM STRENGTH AND UNIT WEIGHT

Soil Zone	Internal Angle of Friction, ϕ (degrees)	Apparent Cohesion, c (psf)	Soil Unit Weight, γ (pcf)
Reinforced Zone	32	0	130
Retained Soil	32	0	130
Foundation	34	0	130

2.2 Wall Drainage

In all cases, the walls should include a foundation drain in accordance with the wall manufacturer's recommendations. If on-site soils proposed for use as backfill in the reinforced zone are anticipated to have low permeability rates "chimney-type" back-drains may also be recommended based on CTE's observations and recommendations during construction. The project civil engineer shall determine necessary surface drainage provisions to prevent sheet flow over or at the bottom of the proposed segmental walls.

2.3 Minimum Grid Length

CTE generally recommends a minimum grid length to wall ratio (L/H) of 0.5 for walls with rock cuts in the retained zone and 0.6 for walls with compacted fill in the retained zone. In both cases, grids should be at least four feet in length.

2.4 Structure Setback

Based upon the attached grading plans it appears that structures are not planned to be in soils supported by the modular block wall. However, CTE recommends that structure foundations not be placed over geogrid reinforcement members or 1.25 times the height of the wall, whichever is greater. It is anticipated the modular block wall will be designed to withstand vehicle loads, to include fire trucks, loaded hay trucks etc. if such are planned to traverse the modular block wall supported roadway.

3.0 GRADING RECOMMENDATIONS

3.1 General

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.

All pavements should conform to the local regulatory requirements for pavement thickness and type. It is noted that portions of the proposed roadway may exceed percent grade for asphaltic pavements; thereby requiring a concrete section.

Review of laboratory strength data as available from the current investigation and a previous stability investigation of the barn and arena west slope generally indicate high values suitable for the proposed segmental block walls. However, one of the three strength values which was collected for a slope stability investigation (CTE, October 5, 2016) yielded unsuitably low strength values (Sample B-1@18.5' with 24.5 angle of friction and 1,270 psf cohesion). As such, selective testing and grading is recommended for slope soils adjacent to the proposed roadway that are anticipated to be utilized for segmental wall backfill.

3.2 Site Preparation

In the roadway area, expansive, surficially eroded, desiccated, burrowed, or otherwise loose or disturbed soils should be excavated to suitable undisturbed soil. Existing undocumented fill should be overexcavated, processed, moisture conditioned, and placed as a compacted engineered fill under the observation and testing of CTE. Required or recommended overexcavation depths may vary and locally deeper removals could be required. However, we anticipate removals of two to three feet below existing grades will be adequate in most areas. CTE personnel should observe and evaluate adequacy of all overexcavations during grading.

3.3 Site Excavation

Existing undocumented fill soil should be excavatable by heavy duty motorized equipment operated by an experienced operator. However, large oversize rock may be encountered in the fill, and may not be suitable for placement within the proposed roadway soils. Excavation of site formation materials may be very difficult due to very dense granitic bedrock. Heavy ripping,

pneumatic hammering and blasting may be necessary to advance excavations into formational materials. Irreducible materials greater than three inches encountered during excavations should generally not be used in shallow fills on the site.

3.4 Fill Placement and Compaction

Areas to receive fills or improvements should be scarified a minimum of six inches, moisture conditioned, and properly compacted. Fill soil should be compacted to a minimum relative compaction of 90 percent at a moisture content of at least two percent above optimum, as evaluated by ASTM D 1557.

Soils within one foot of subgrade and all aggregate base materials should be compacted to at least 95 percent compaction relative to maximum dry density at a moisture content of at least two percent over optimum.

The optimum lift thickness for fill soil depends 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, and observation and testing of CTE.

3.5 Fill Materials

Properly moisture-conditioned very low to low expansion potential soils derived from the on-site excavations are considered suitable for reuse on the site as compacted fill provided they possess the recommended strength value. If used, these materials should be screened of organics and materials generally greater than three inches in maximum dimension. 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 20 or less (ASTM D 4829), with generally less than 30 percent finer than the No. 200 sieve. Imported fill soils for use in structural or slope areas should be evaluated by CTE before being imported to the site.

3.6 Vehicular Pavements

The proposed roadway is anticipated to allow automobiles and moderate to heavy truck traffic. Preliminary pavement sections presented below are based on estimated traffic indices. Compacted engineered fill materials should be prepared as indicated in the previous sections of this report. Subgrade and all aggregate base materials in pavement areas should be compacted to a minimum of 95% relative compaction at a moisture content slightly above optimum. Prior to grading, testing of subgrade soils for Resistance "R"-Value should be performed on proposed

import prior to placement at the site. As built "R" Value testing should be performed to refine the pavement section.

TABLE 3.6
PRELIMINARY RECOMMENDED PAVEMENT THICKNESS

Traffic Area	Assumed Traffic Index	Assumed Subgrade "R"-Value	AC Thickness (inches)	Class II Aggregate Base Thickness (inches)	Full Depth Concrete (inches)
Truck Drive/ Loading Areas	6.5	50+	3.0	6.0	7.0
Auto Parking & Drive Areas	5.0	50+	3.0	4.0	6.0

It is noted that portions of the proposed roadway may exceed asphalt pavement percent grade requirements for the local regulatory authority. As such concrete pavement sections may be required. Concrete pavements should have a modulus of rupture of at least 600 psi. PCC pavement can be constructed with No. 4 reinforcing bars placed at no more than 24 inches on center, each way, at or above mid-pavement height. As an alternative, pavements may be constructed without reinforcement if construction or expansion/contraction joints are spaced no greater than a distance equal to 24 times the pavement thickness, in both directions. Concrete pavement details should be in accordance with, for example, the recommendations of the American Concrete Institute or other widely recognized authority, particularly with regard to thickened edges, joint spacing, doweling, and drainage.

3.6 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 1.6.

TABLE 3.6
RECOMMENDED TEMPORARY SLOPE RATIOS

SOIL TYPE	SLOPE RATIO (Horizontal: vertical)	MAXIMUM HEIGHT
B (Granitic Bedrock)	1:1 (OR FLATTER)	10 Feet
C (Fill and Alluvium)	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,

4.0 CLOSING

This report is prepared in accordance with the ordinary standard of care utilized by reputable geotechnical consultants at this location and time. The report is prepared with the understanding that CTE will review necessary plans, including but not limited to segmental wall plans, for construction of the roadway. Furthermore, this report is conditioned upon CTE's retention for all geotechnical related field activities. CTE should be informed of any variations of this report from actual conditions as CTE may prepare modified recommendations, if considered necessary by CTE.

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.

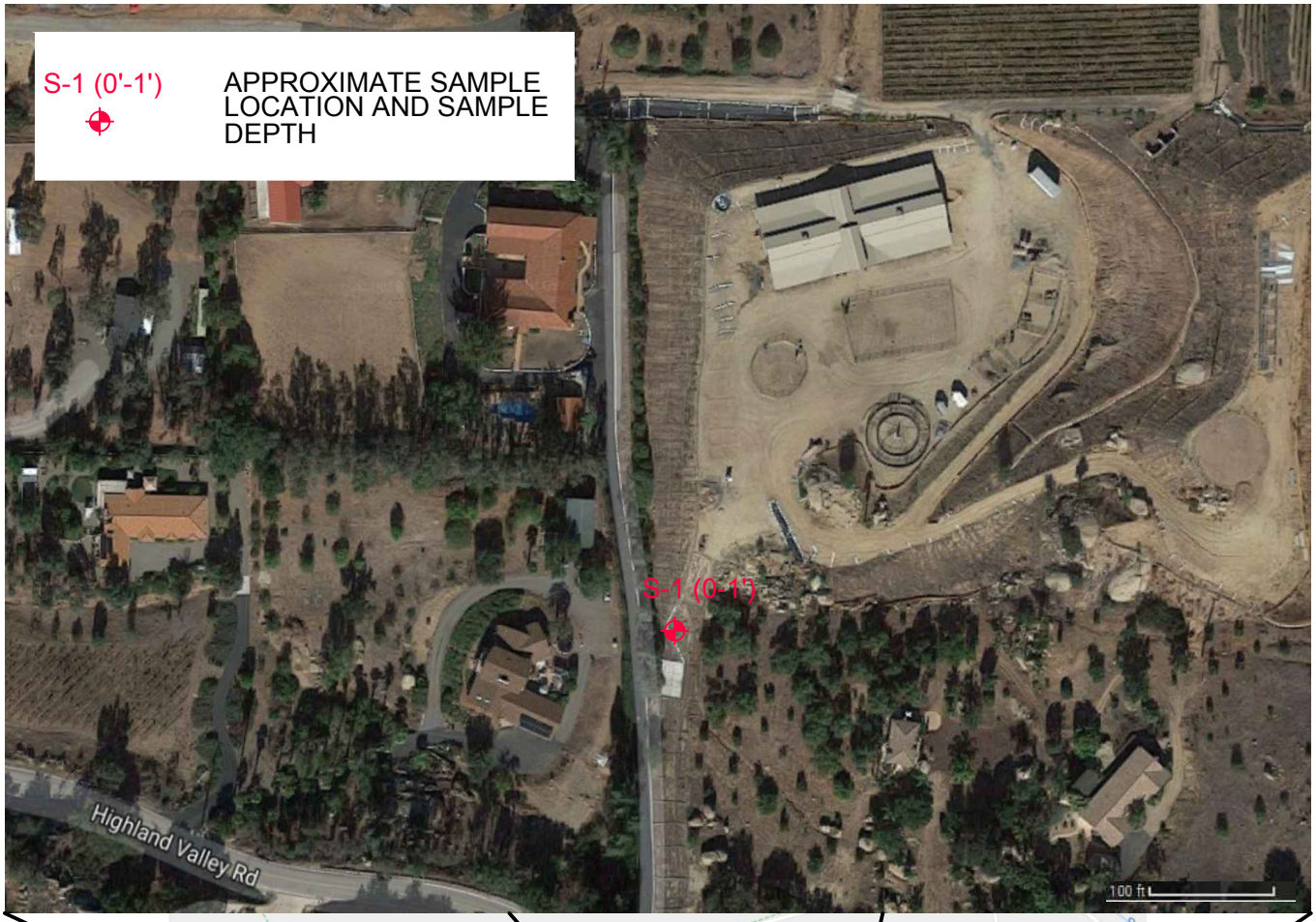
Respectfully submitted,
CONSTRUCTION TESTING & ENGINEERING, INC.

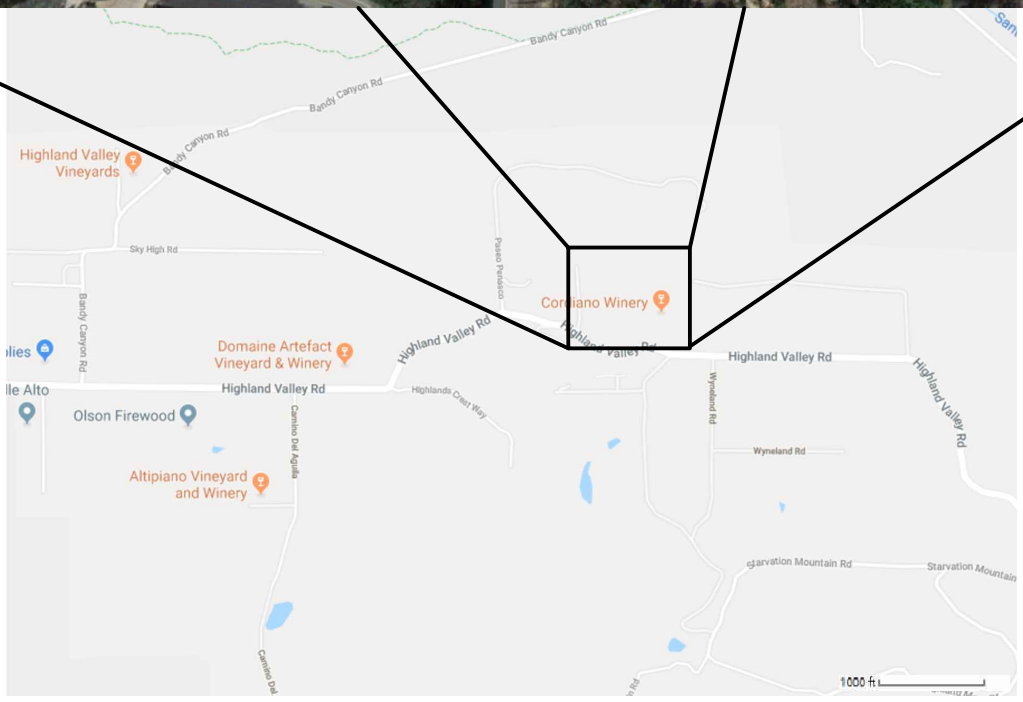
Dan T. Math, GE #2665
Principal Engineer

Gregory F. Rzonca, CEG# 1191
Certified Engineering Geologist

GFR/DTM:nri

Attachments:
Figure 1, Site Index Map
Appendix A, References
Appendix B, There is no Appendix B
Appendix C, Laboratory Results
Appendix D, Standard Specifications for Grading





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SITE INDEX MAP

PROPOSED SEQUENTIAL WALL AND ROADWAY
AT RESQUE RANCH APN 276-030-49
SAN DIEGO COUNTY, CALIFORNIA

SCALE:	DATE:
AS SHOWN	4/18
CTE JOB NO.: 10-12385G	FIGURE: 1

APPENDIX A

REFERENCES

1. Construction Testing and Engineering, Inc., May 20, 2015, “Initial Preliminary Geotechnical Recommendations, Barn and Arena, APNs 276-030-48 and 276-030-49, County of San Diego, California,” CTE project number 10.12385G.

2. Construction Testing and Engineering, Inc., July 31, 2015, “Additional Foundation Recommendations, Barn and Arena, APNs 276-030-48 and 276-030-49, County of San Diego, California,” CTE project number 10.12385G.

3. Construction Testing and Engineering, Inc., October 5, 2016, “Geotechnical Slope Stability Evaluation, Manufactured Slope, Rescue Ranch, East of Paseo Penasco and North of Highland Valley Road, County of San Diego, California,” CTE project number 10.13290G.

4. Construction Testing and Engineering, Inc., June 16, 2015, “Final Report of Testing of Compacted Fill, Barn and Arena, APNs 276-030-48 and 276-030-49, County of San Diego, California,” CTE project number 10.12385G.

5. Spear and Associates, undated, “Grading Plan For: Resque Ranch Highland Valley Road ‘Violation, ’” Sheet 2 of 4 and Sheet 3 of 4.

APPENDIX B

THERE IS NO APPENDIX B

APPENDIX C

LABORATORY TEST RESULTS

APPENDIX C
LABORATORY METHODS AND RESULTS

Laboratory tests were performed on selected soil samples to evaluate their engineering properties. Tests were performed following test methods of the American Society for Testing and Materials, or other accepted standards. The following presents a brief description of the various test methods used. Laboratory results are presented in the following section of this Appendix.

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 D 2487.

Particle-Size Analysis

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

Direct Shear

Direct shear tests were performed on either samples direct from the field or on samples recompacted to a specific density. Direct shear testing was performed in accordance with ASTM D 3080. The samples were inundated during shearing to represent adverse field conditions.

Modified Proctor

Laboratory maximum dry density and optimum moisture content were evaluated according to ASTM D 1557, Method A. A mechanically operated rammer was used during the compaction process.

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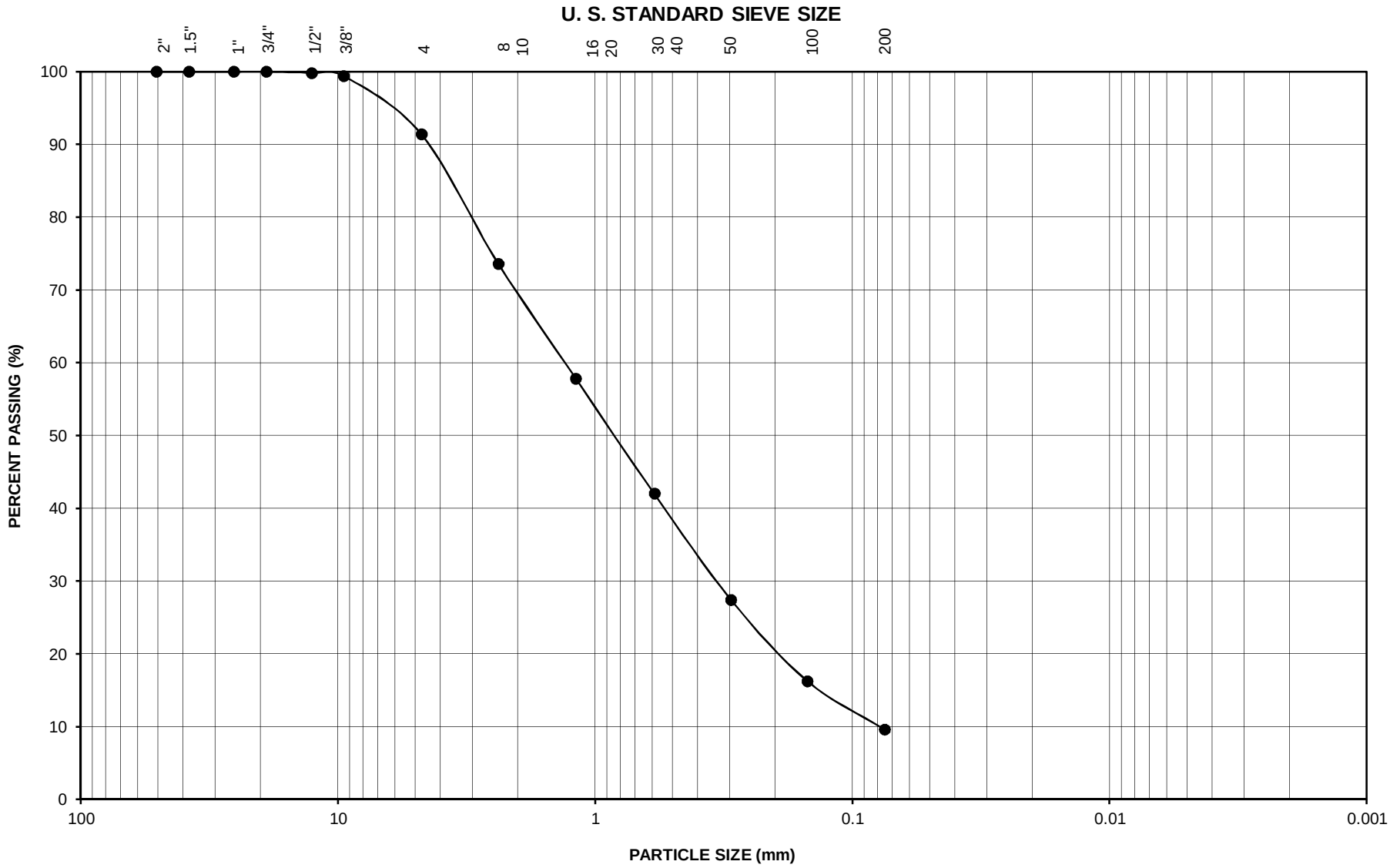
MODIFIED PROCTOR

ASTM D 1557

LOCATION	DEPTH (feet)	MAXIUM DRY DENSITY (PCF)	OPTIMUM MOISTURE (%)
SC-1	0-1	129.8	8.5
SC-1	0-1	132.2 (RC)	7.9 (RC)

RC is Rock Correction



PARTICLE SIZE ANALYSIS

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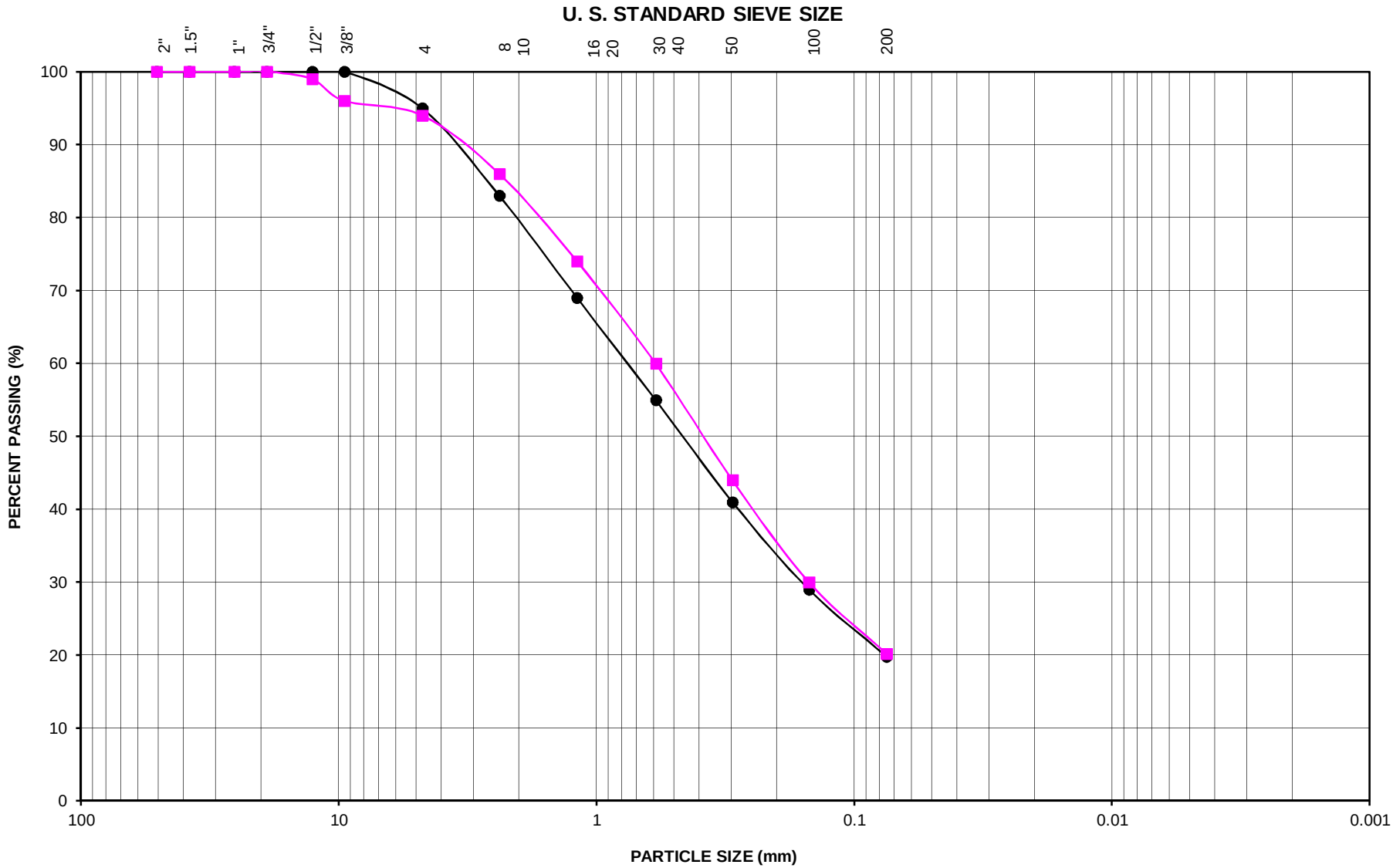
Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
S-1	0-1	●	-	-	

CTE JOB NUMBER: 10-12385G FIGURE: C-1



PARTICLE SIZE ANALYSIS

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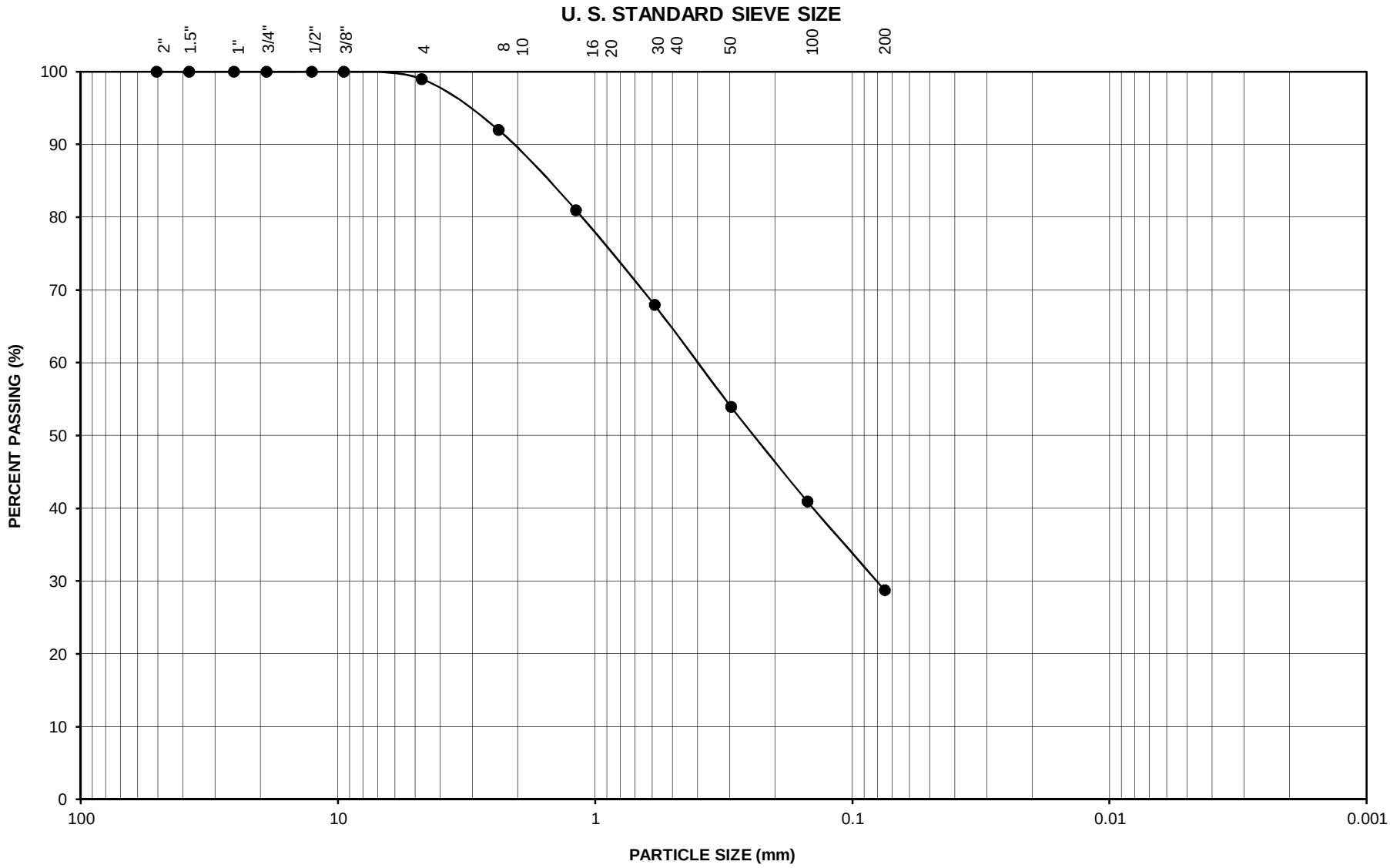
Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-1	5	●	-	-	
B-1	15	■	-	-	

CTE JOB NUMBER: 10-13290G FIGURE: C-1



PARTICLE SIZE ANALYSIS

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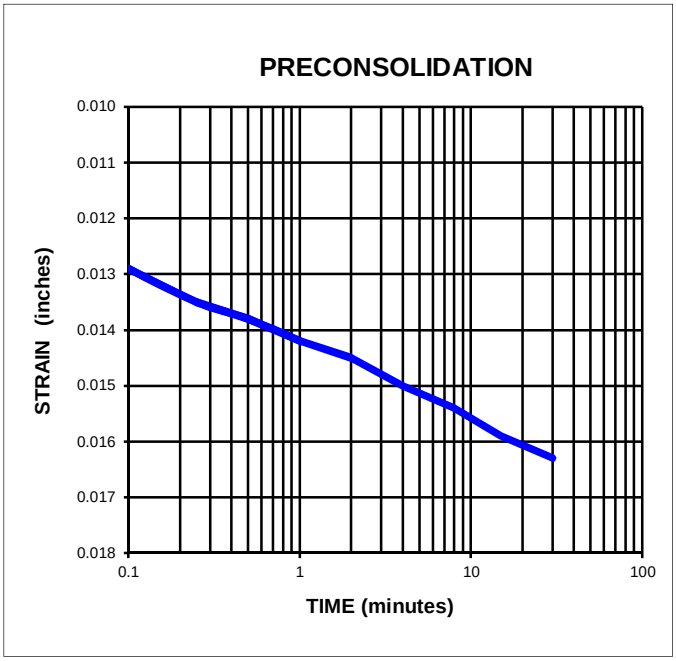
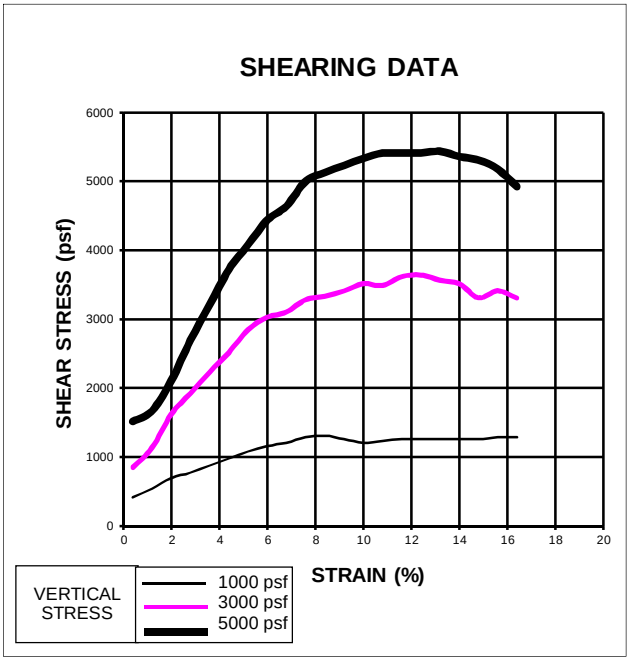
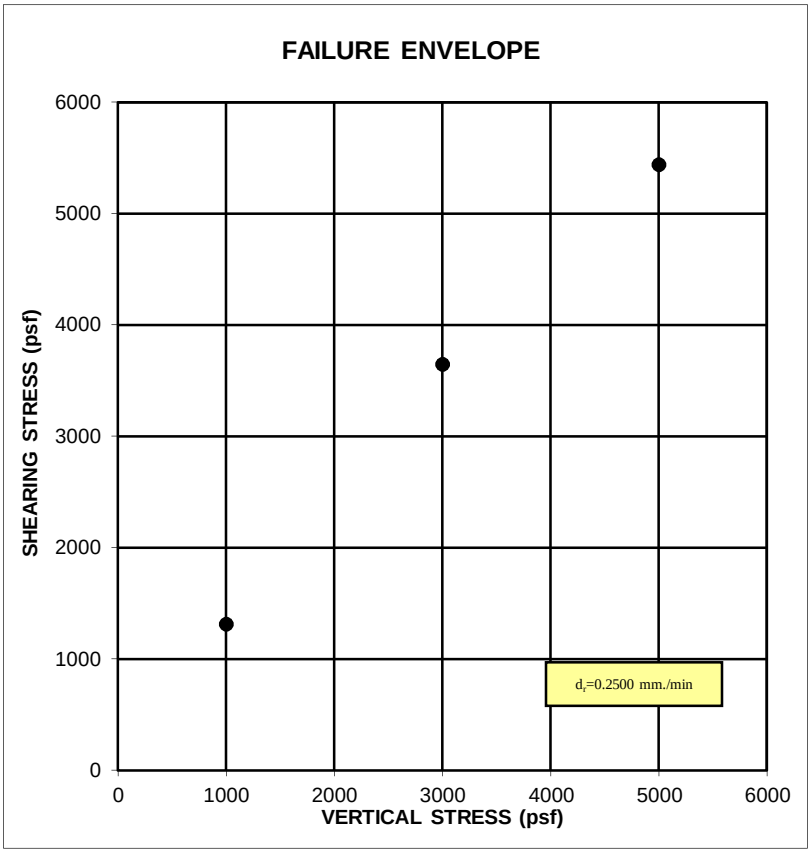
Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-2	18.5	●	-	-	

CTE JOB NUMBER: 10-13290G FIGURE: C-2

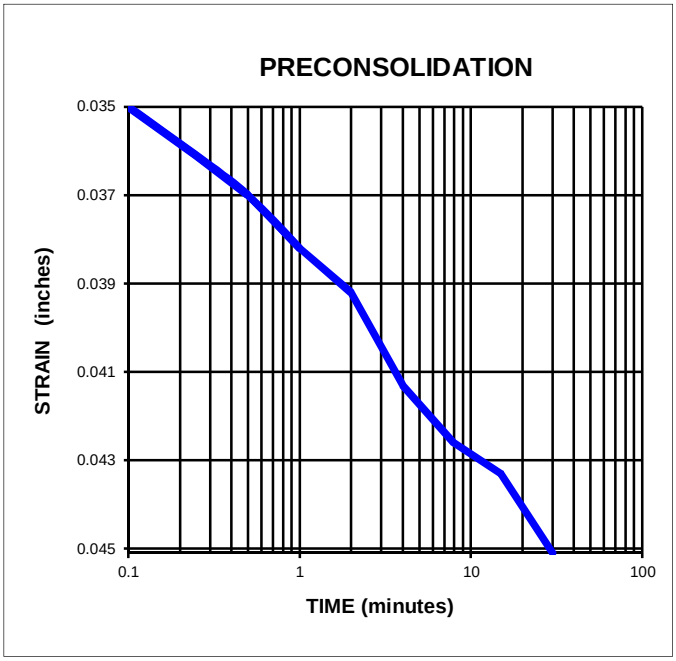


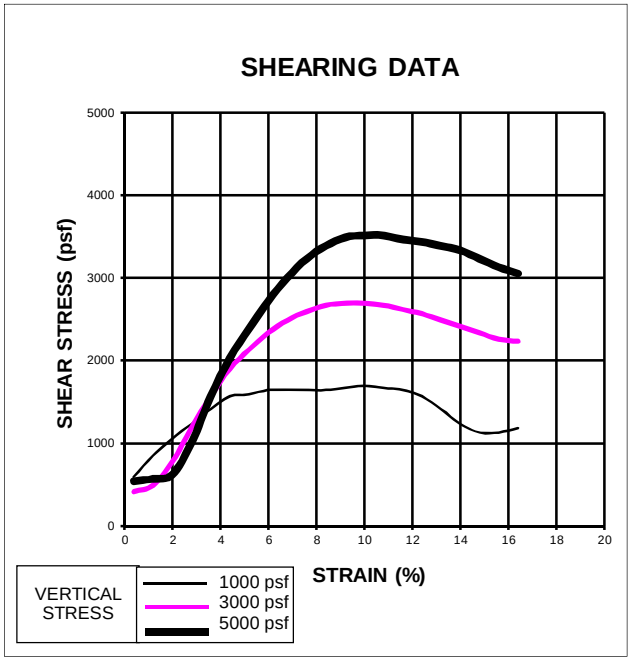


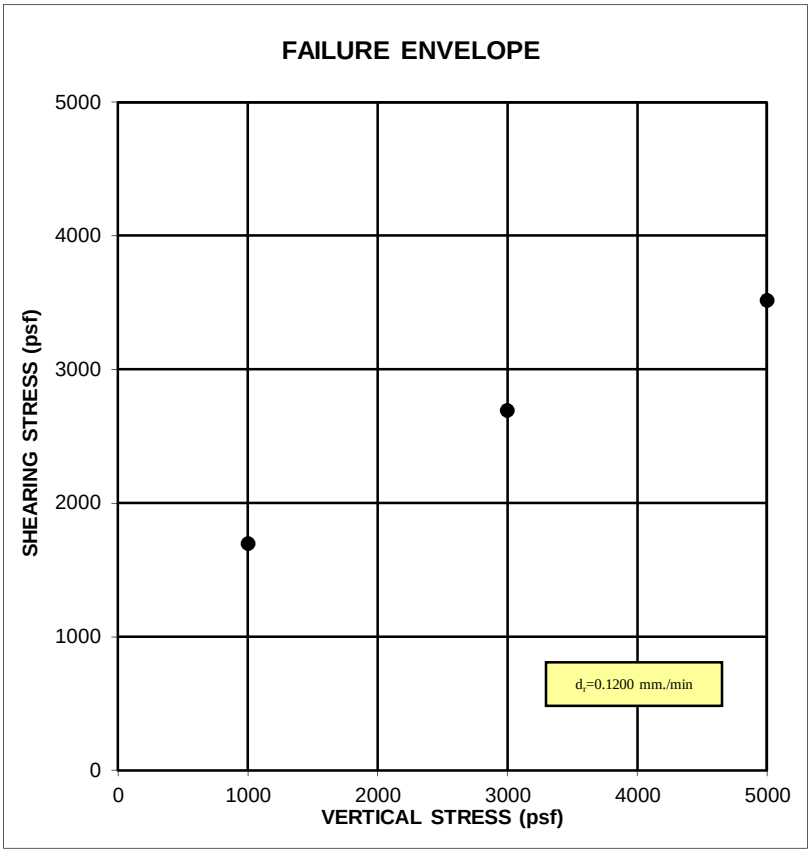


SHEAR STRENGTH TEST - ASTM D3080

Job Name:	ResQue Ranch Manufactured Slope	Initial Dry Density (pcf):	106.2
Project Number:	10-13290G	Sample Date: 8/30/2016	Initial Moisture (%): 6.3
Lab Number:	26609	Test Date: 9/8/2016	Final Moisture (%): 16.8
Sample Location:	B-1 @ 10'	Tested by: Julian Carmona	Cohesion: 360 psf
Sample Description:	Brown SW		Angle Of Friction: 45.9

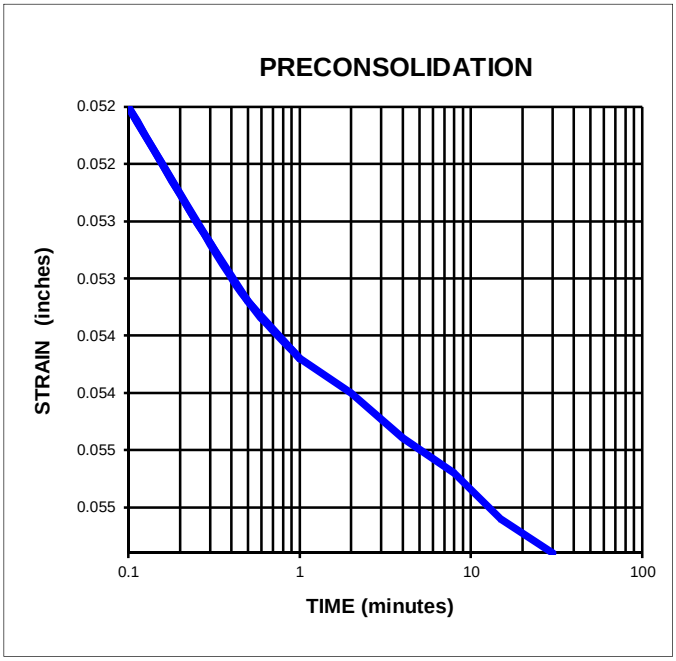


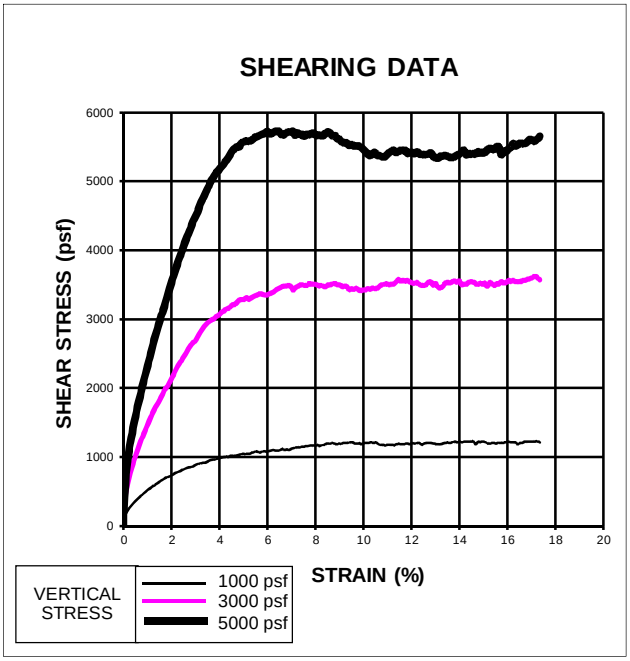


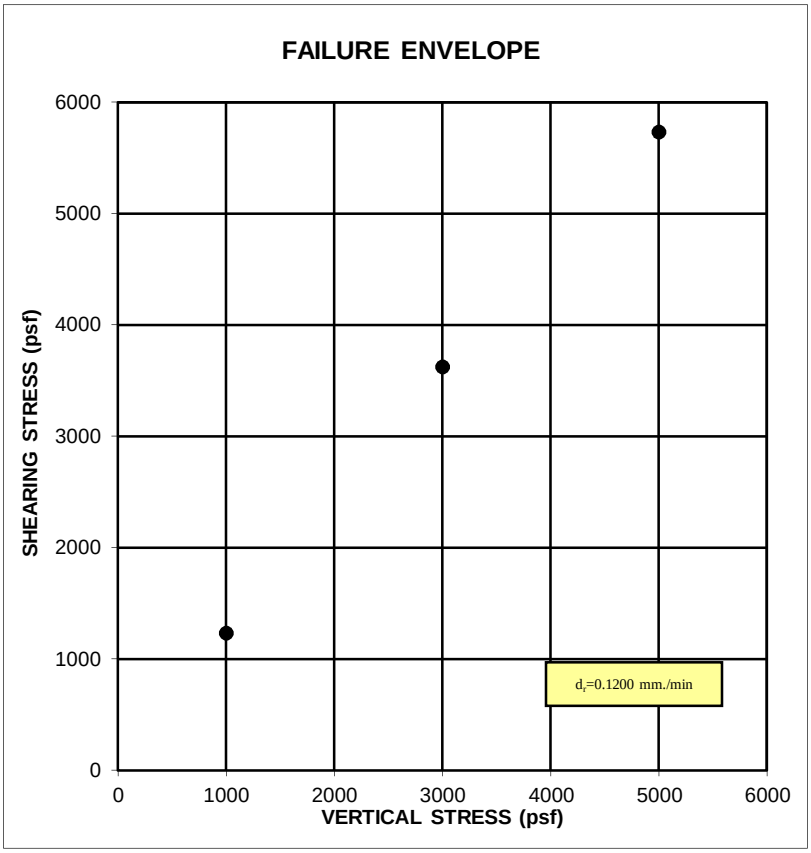


SHEAR STRENGTH TEST - ASTM D3080

Job Name:	ResQue Ranch Manufactured Slope	Initial Dry Density (pcf):	131.6
Project Number:	10-13290G	Sample Date: 8/30/2016	Initial Moisture (%): 8.4
Lab Number:	26609	Test Date: 9/12/2016	Final Moisture (%): 16.2
Sample Location:	B-1 @ 18.5'	Tested by: Julian Carmona	Cohesion: 1270 psf
Sample Description:	Dark Brown SM		Angle Of Friction: 24.5







SHEAR STRENGTH TEST - ASTM D3080

Job Name:	Barn and Arena	Initial Dry Density (pcf):	116.8
Project Number:	10-12385	Sample Date: 3/26/2018	Initial Moisture (%): 8.5
Lab Number:	28283	Test Date: 4/3/2018	Final Moisture (%): 18.4
Sample Location:	N/A	Tested by: JNC	Cohesion: 150 psf
Sample Description:	Moderate brown brown SM w/DG (remolded @ 90%)		Angle Of Friction: 48.4

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

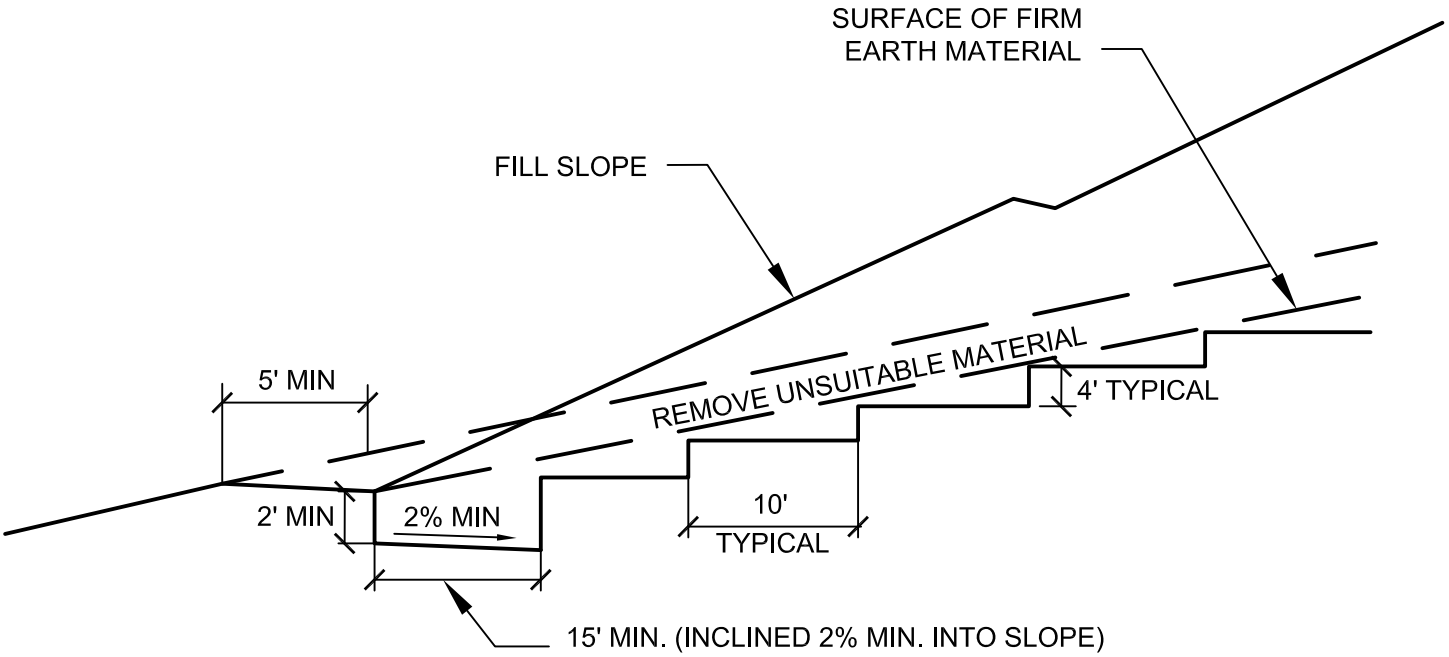
As a precautionary measure, plastic sheeting should be readily available, or kept on hand, to protect all slope areas from saturation by periods of heavy or prolonged rainfall. This measure is strongly recommended, beginning with the period prior to landscape planting.

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.

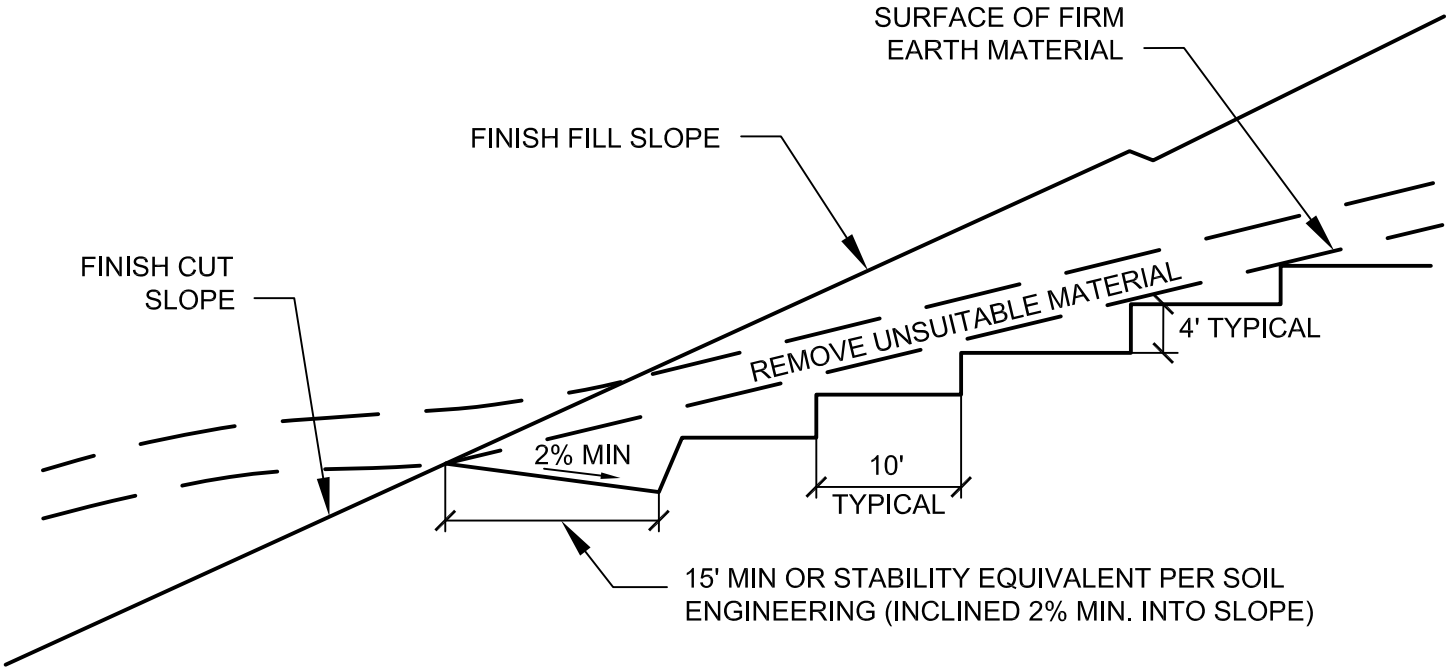
If slope failures occur as a result of exposure to period of heavy rainfall, the failure areas and currently unaffected areas should be covered with plastic sheeting to protect against additional saturation.

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

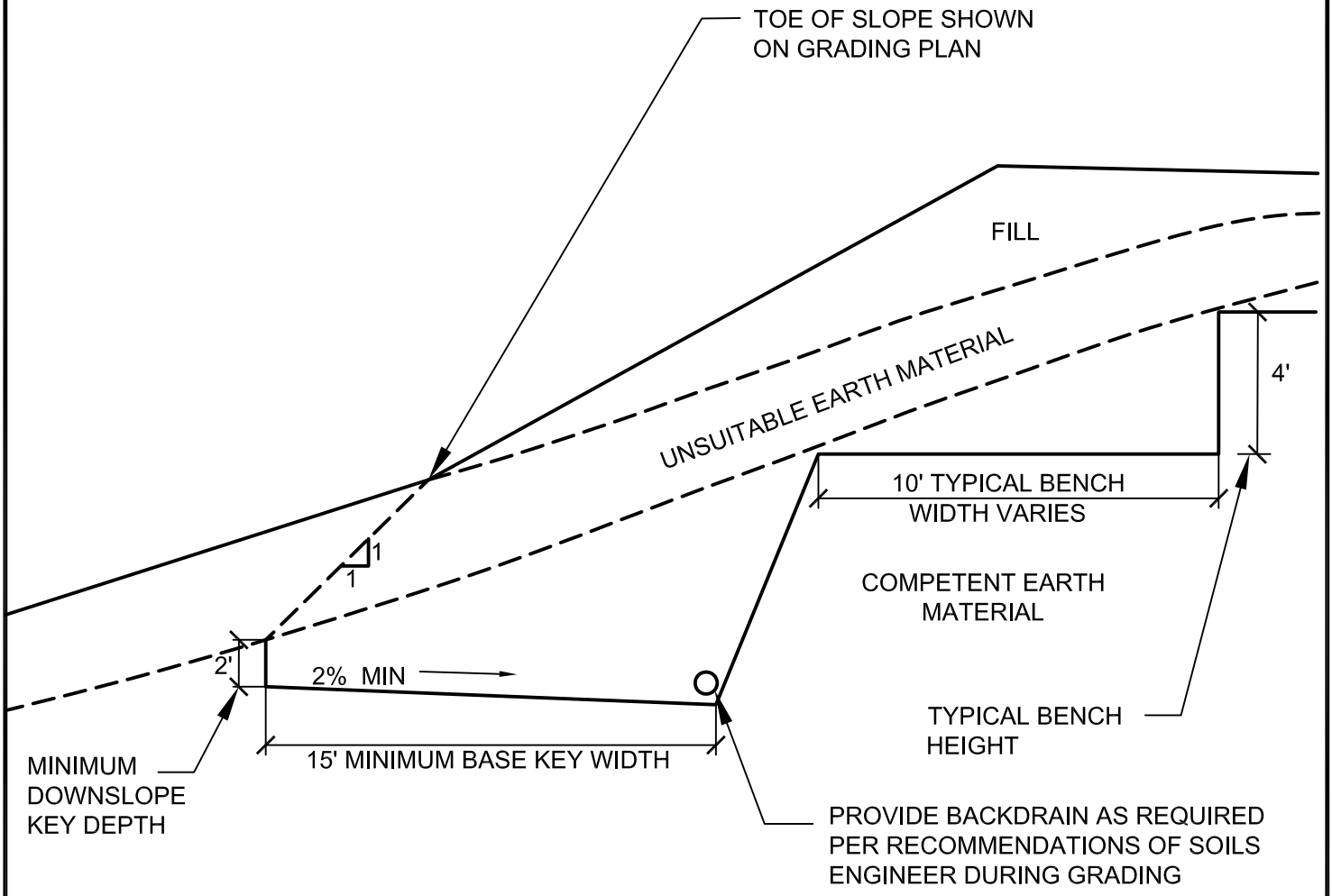


BENCHING FILL OVER CUT



NOT TO SCALE

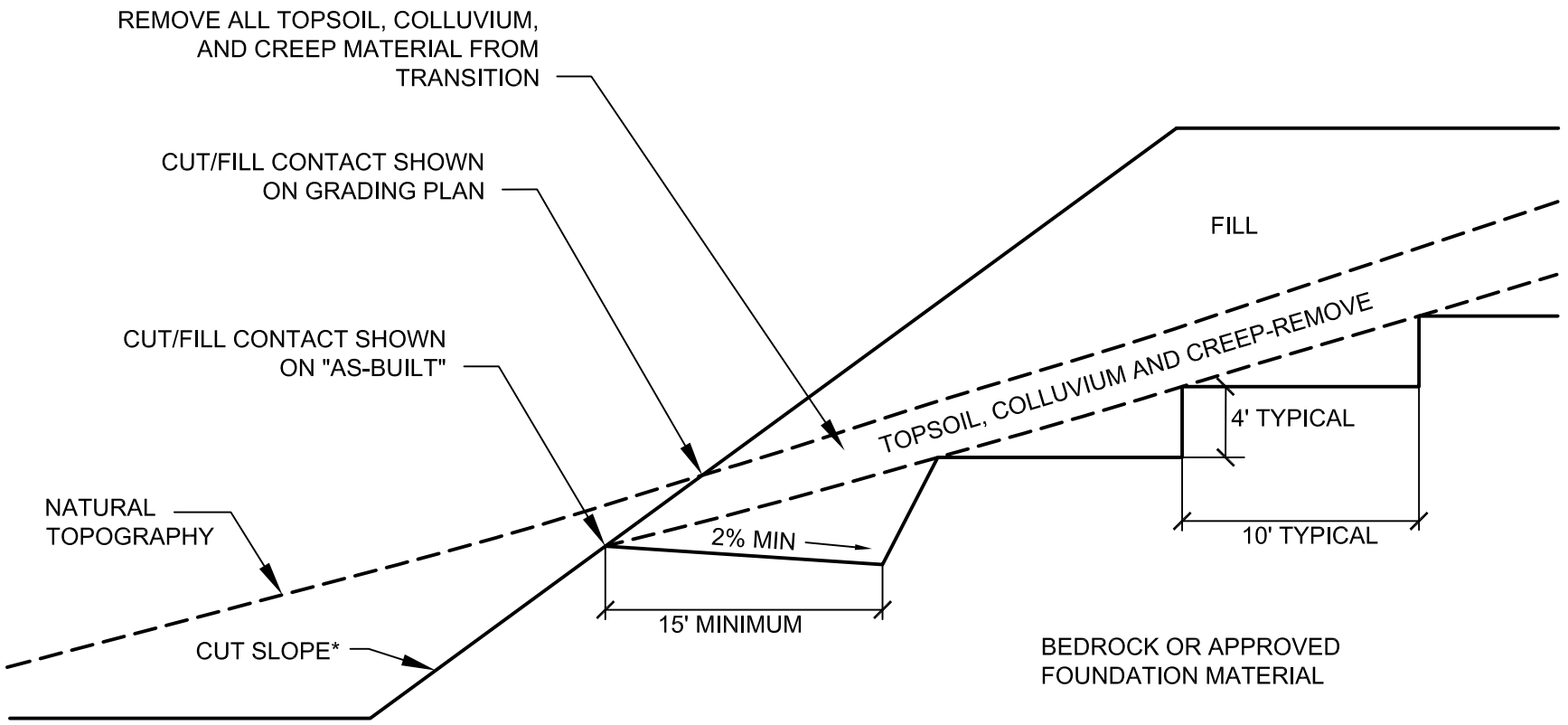
BENCHING FOR COMPACTED FILL DETAIL



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

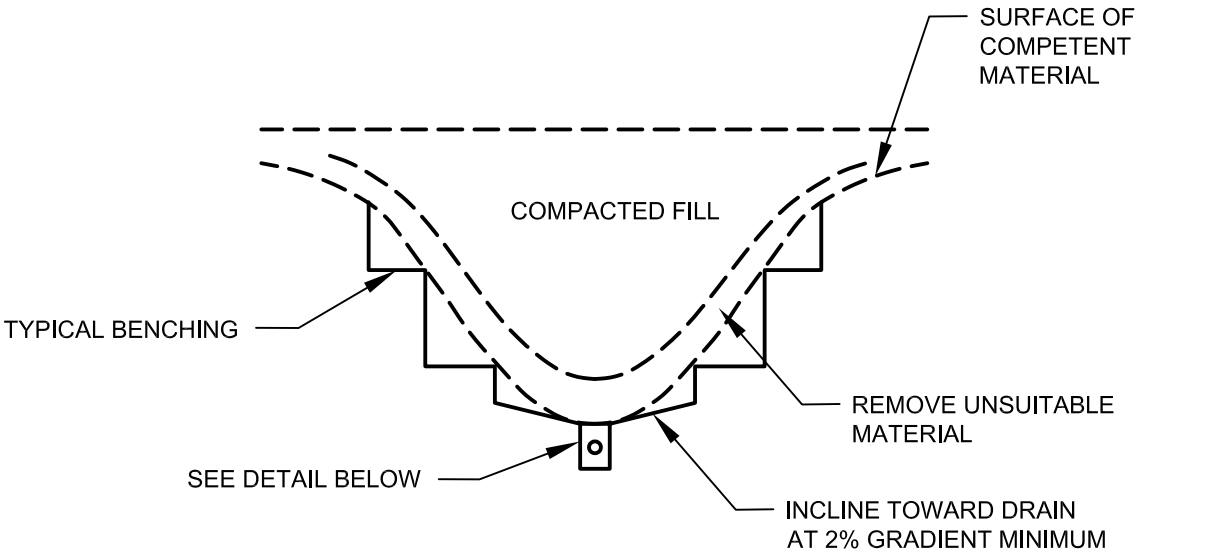
FILL SLOPE ABOVE NATURAL GROUND DETAIL



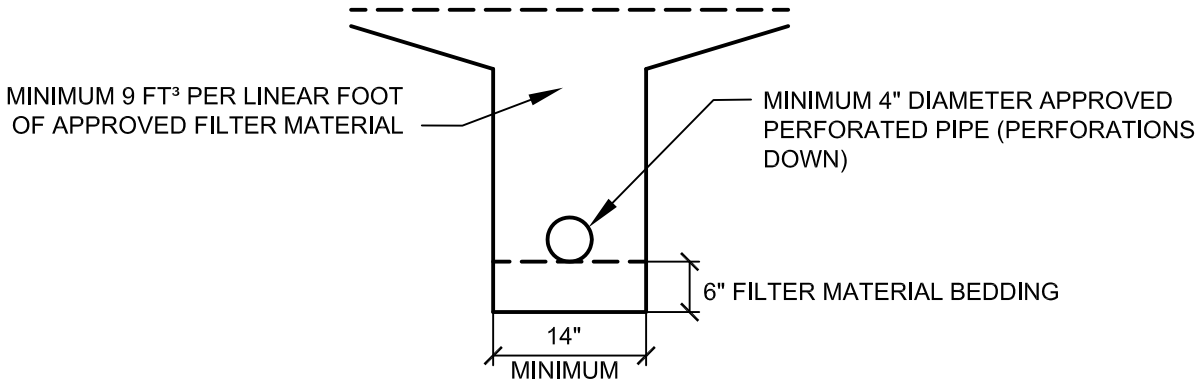
*NOTE: CUT SLOPE PORTION SHOULD BE MADE PRIOR TO PLACEMENT OF FILL

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

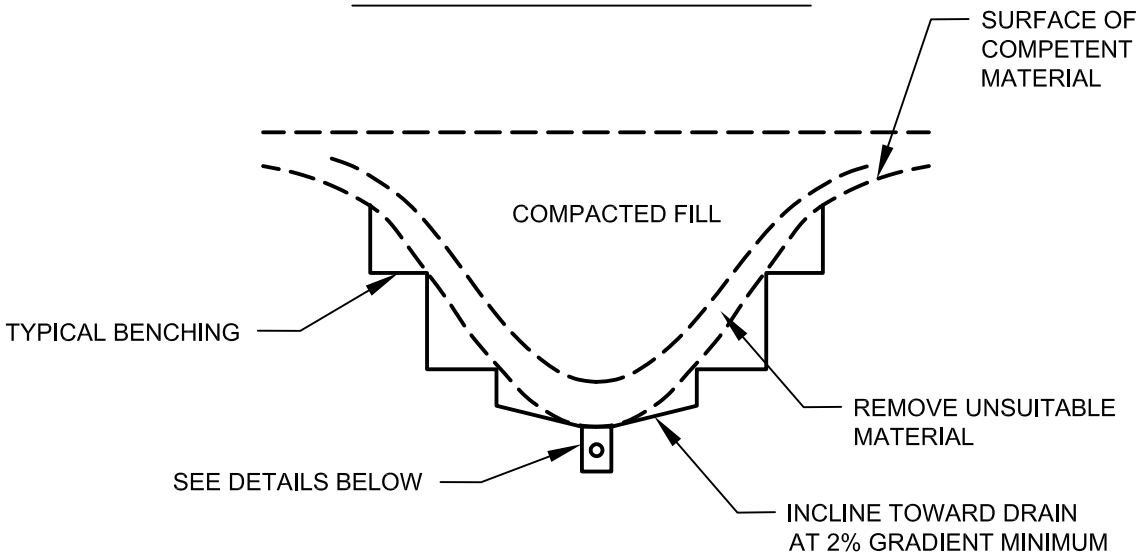
PIPE DIAMETER TO MEET THE FOLLOWING CRITERIA, SUBJECT TO FIELD REVIEW BASED ON ACTUAL GEOTECHNICAL CONDITIONS ENCOUNTERED DURING GRADING

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

NOT TO SCALE

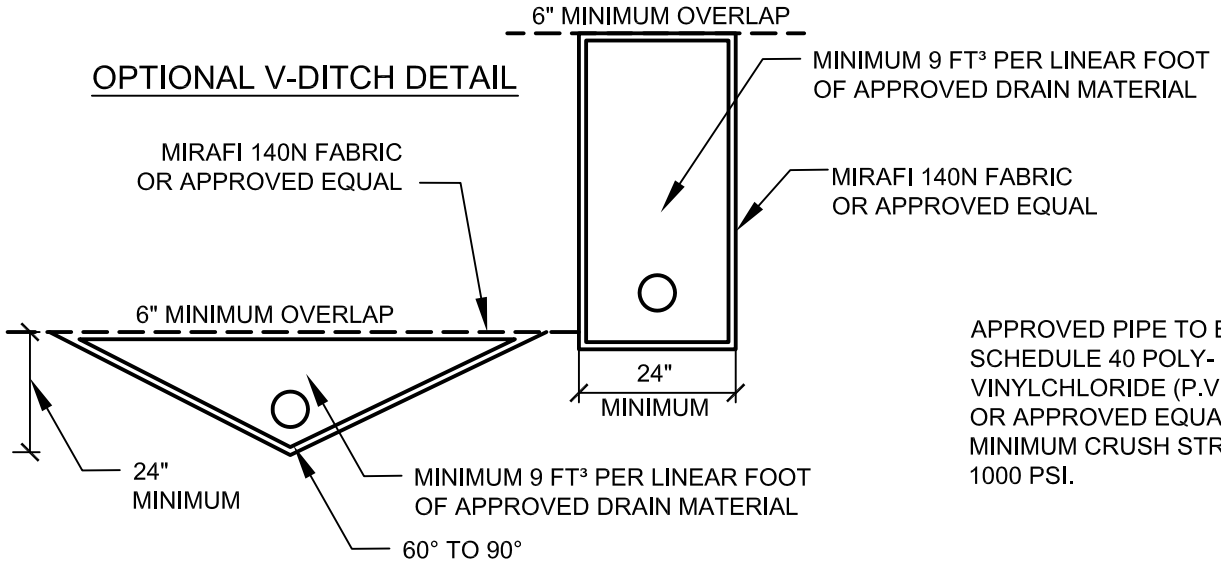
TYPICAL CANYON SUBDRAIN DETAIL

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

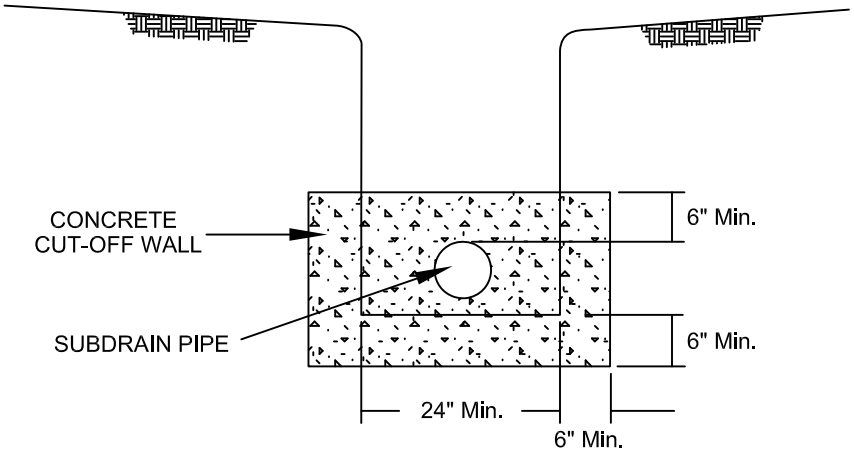
PIPE DIAMETER TO MEET THE FOLLOWING CRITERIA, SUBJECT TO FIELD REVIEW BASED ON ACTUAL GEOTECHNICAL CONDITIONS ENCOUNTERED DURING GRADING

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

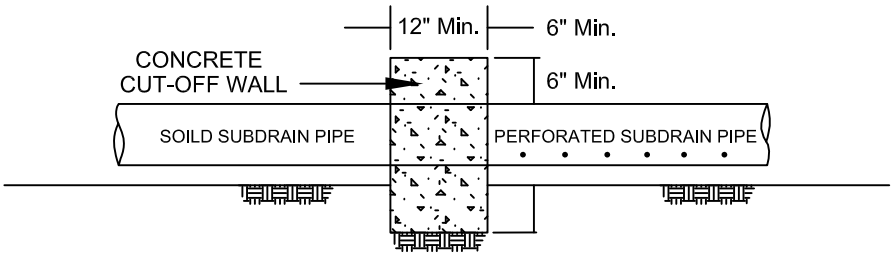
NOT TO SCALE

GEOFABRIC SUBDRAIN

FRONT VIEW



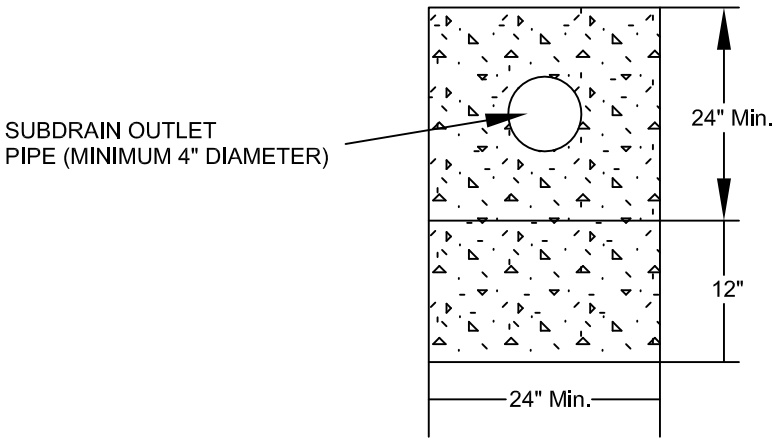
SIDE VIEW



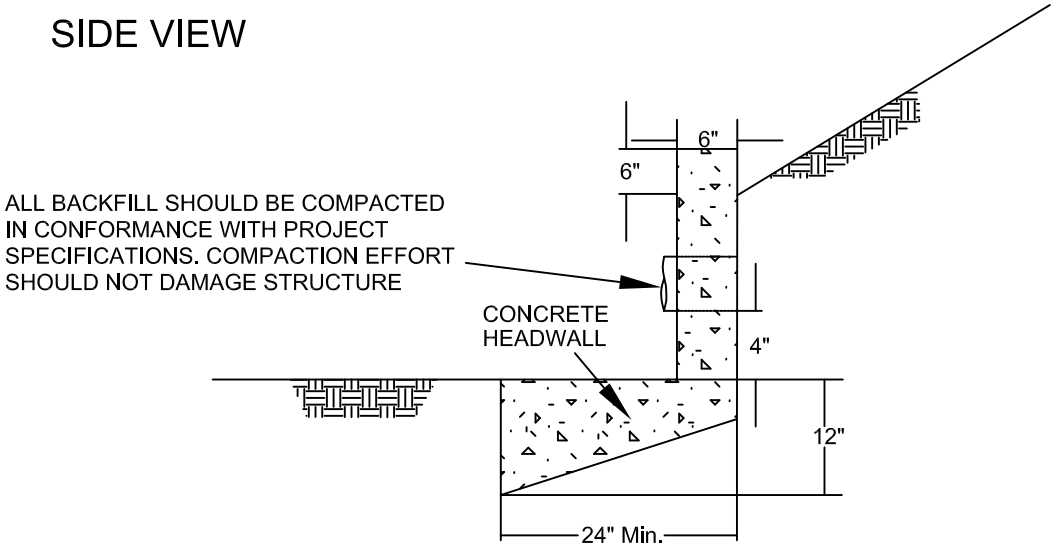
NOT TO SCALE

RECOMMENDED SUBDRAIN CUT-OFF WALL

FRONT VIEW



SIDE VIEW



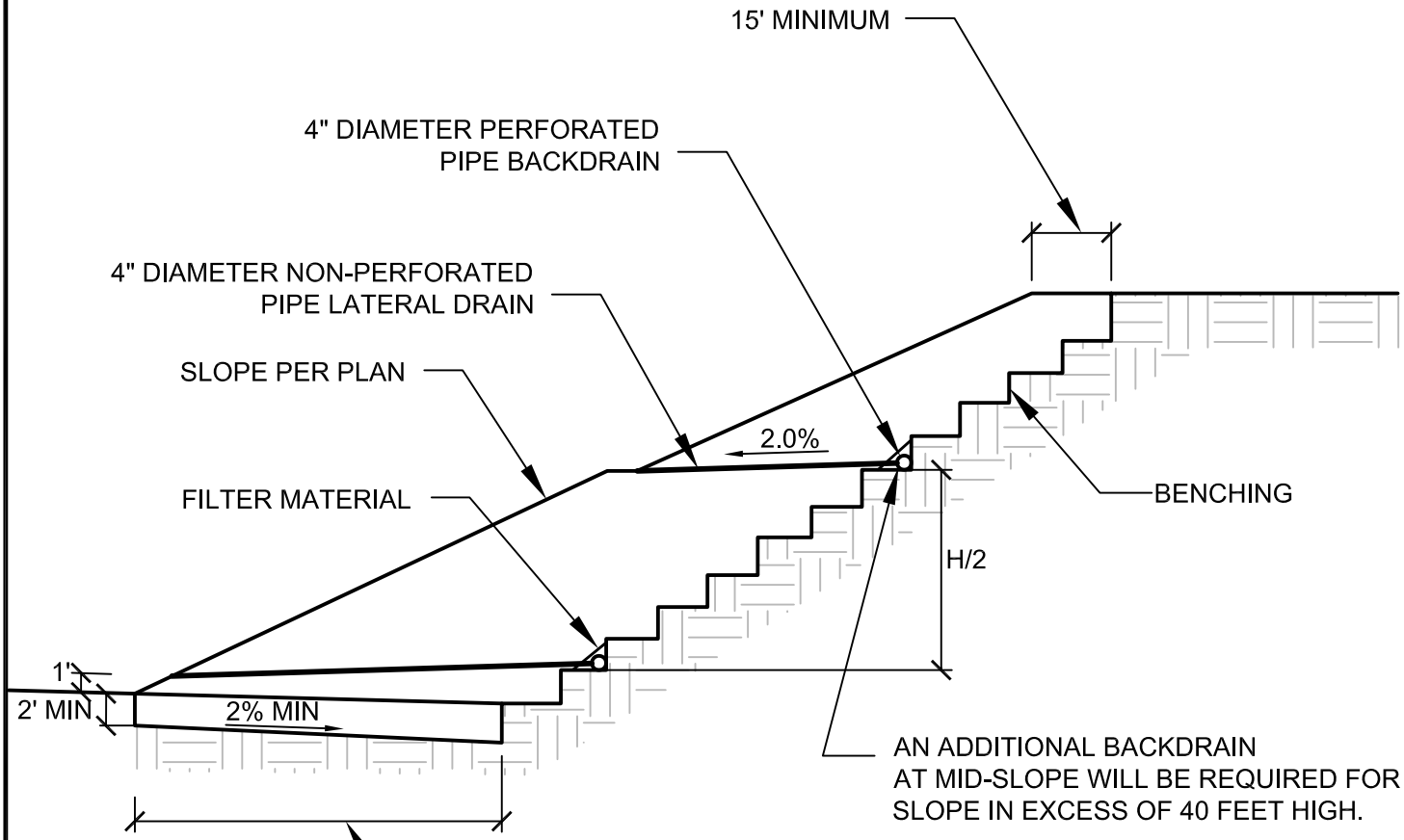
NOTE: HEADWALL SHOULD OUTLET AT TOE OF SLOPE
OR INTO CONTROLLED SURFACE DRAINAGE DEVICE

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

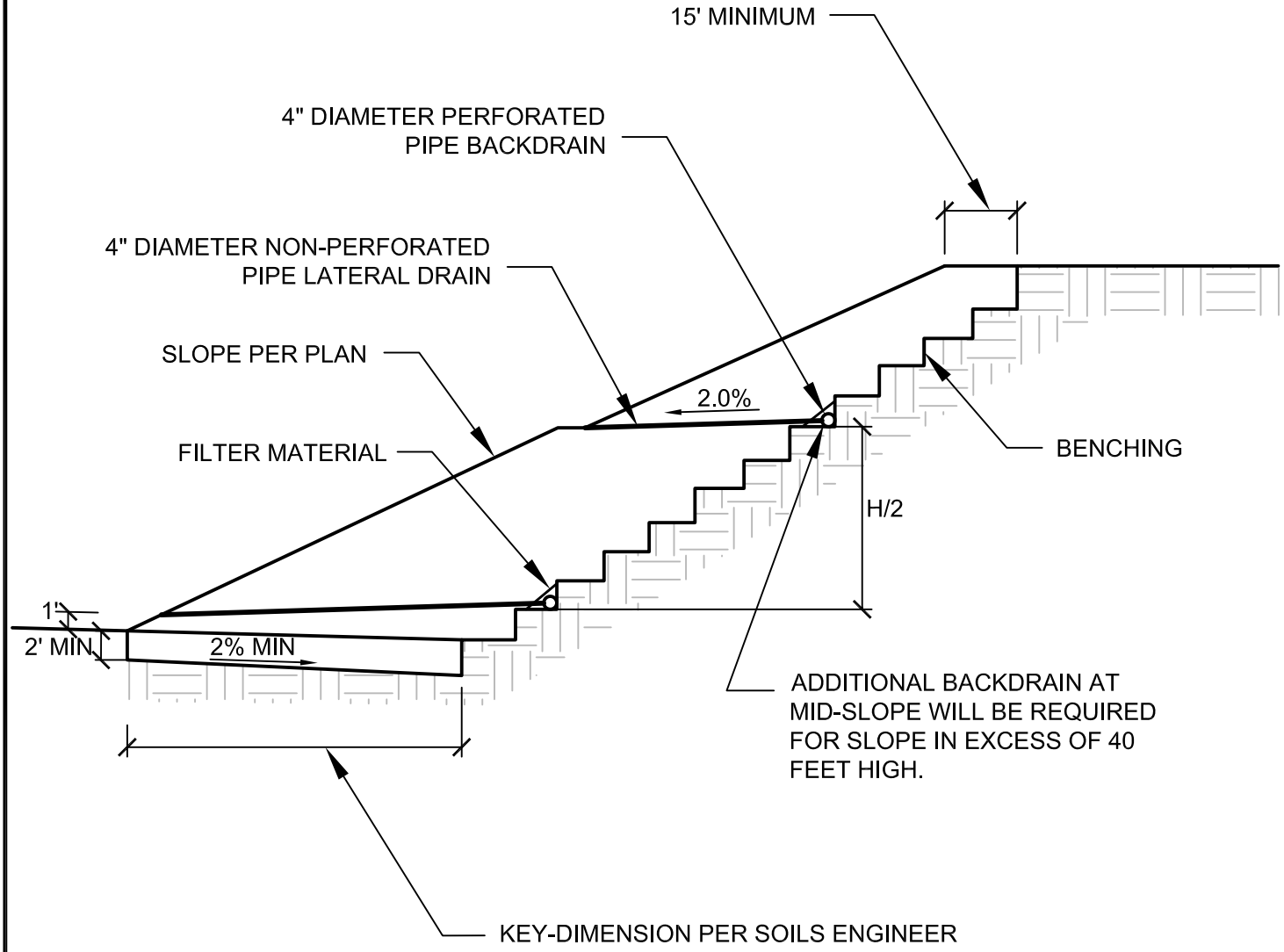
TYPICAL SUBDRAIN OUTLET HEADWALL DETAIL



DIMENSIONS ARE MINIMUM RECOMMENDED

NOT TO SCALE

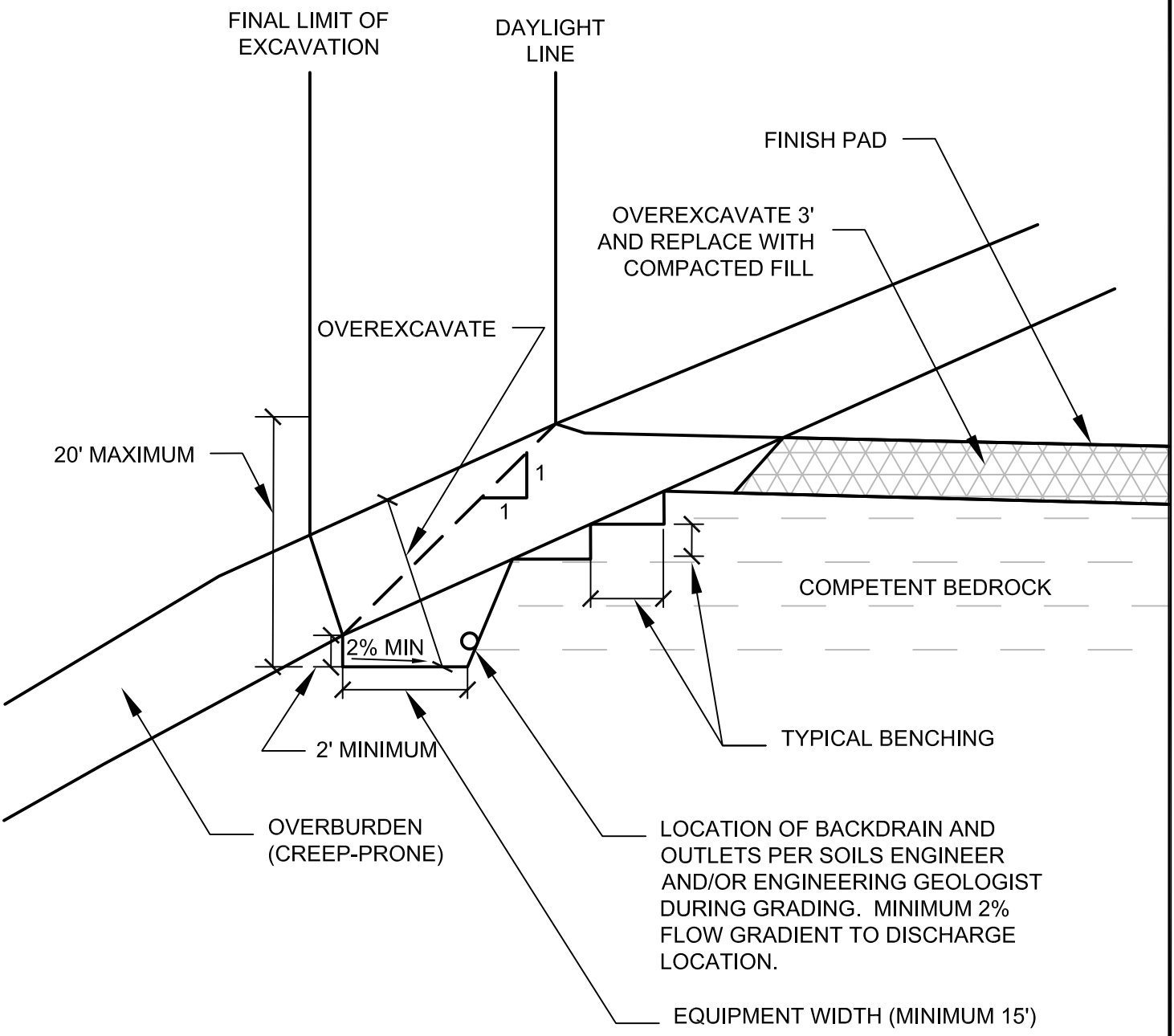
TYPICAL SLOPE STABILIZATION FILL DETAIL



DIMENSIONS ARE MINIMUM RECOMMENDED

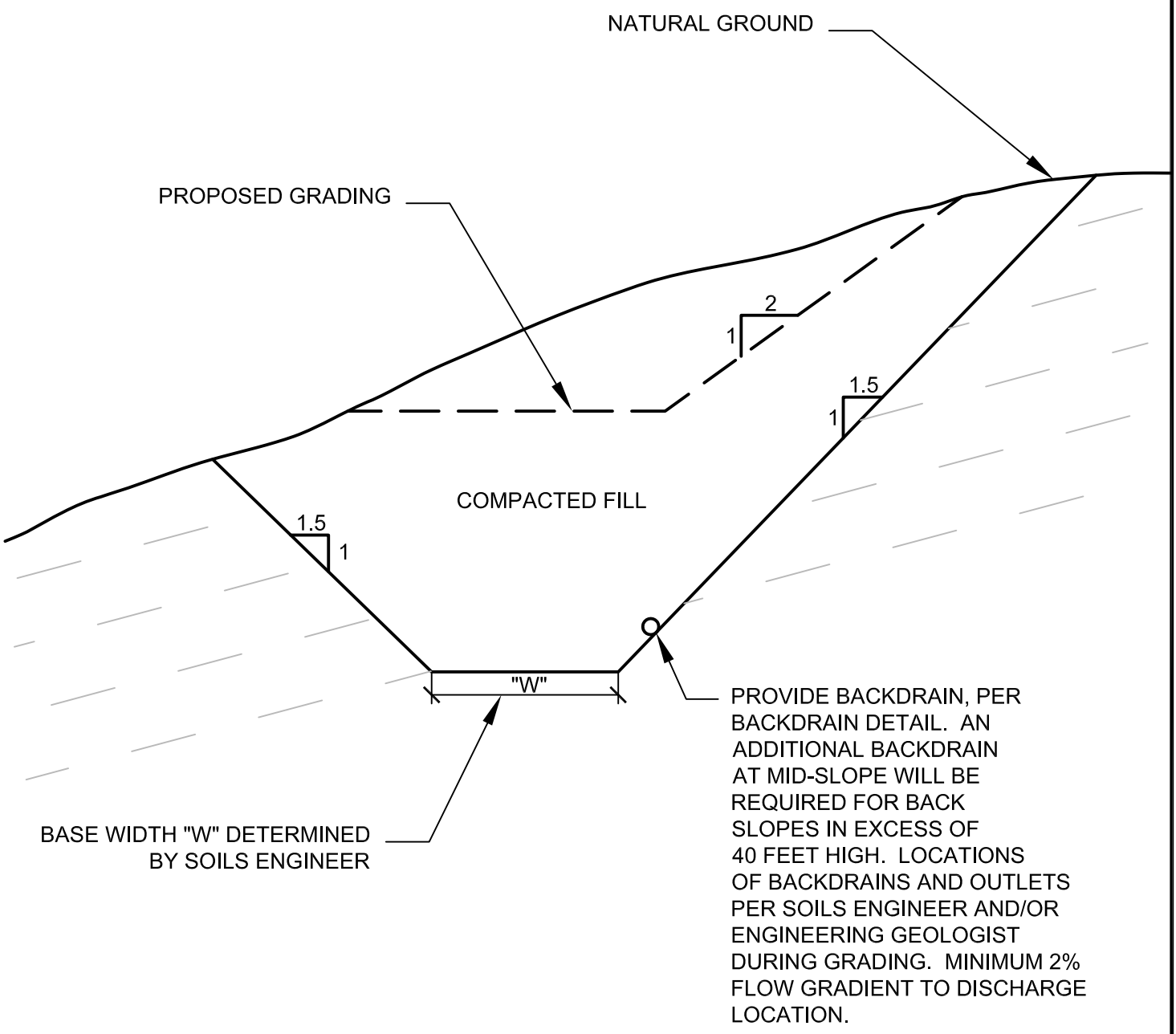
NOT TO SCALE

TYPICAL BUTTRESS FILL DETAIL



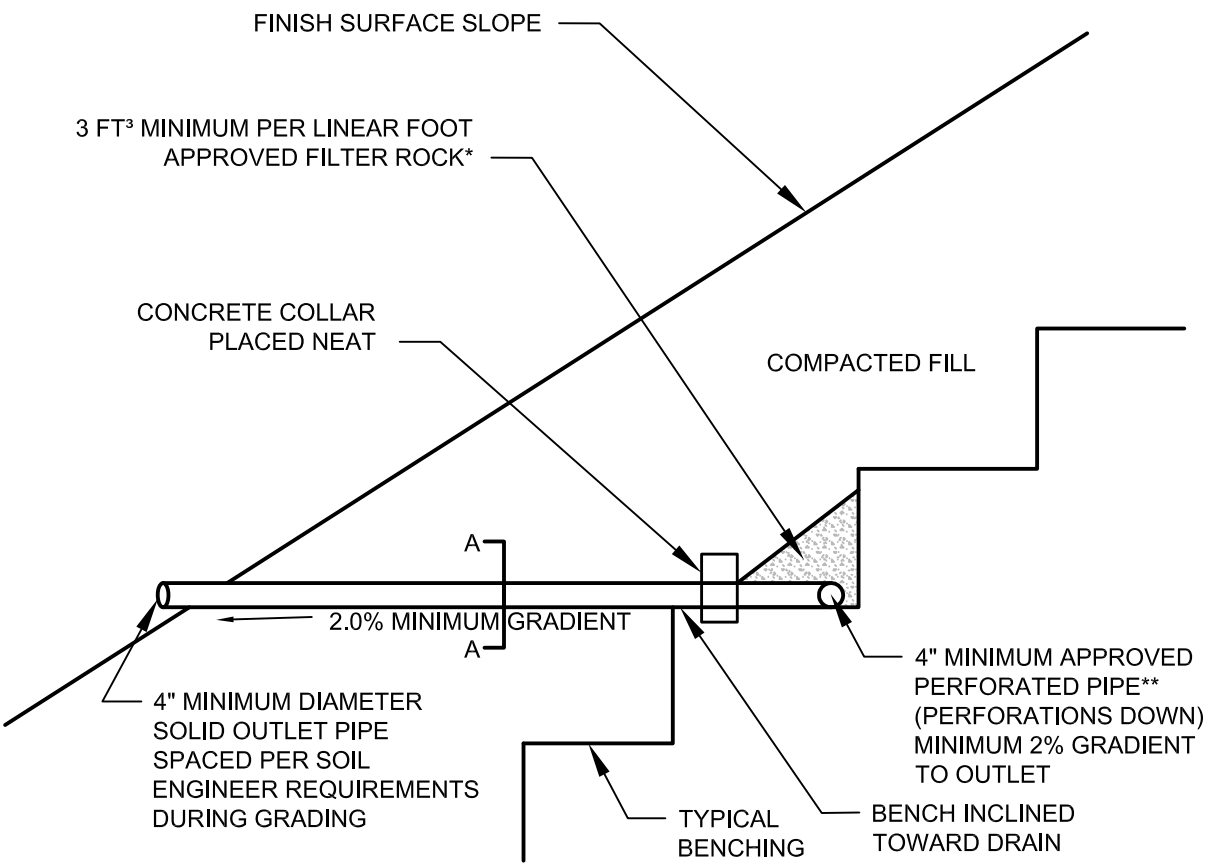
NOT TO SCALE

DAYLIGHT SHEAR KEY DETAIL

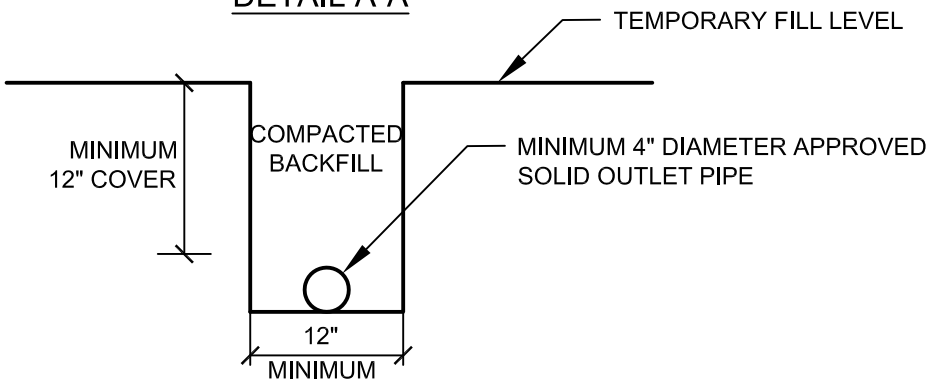


NOT TO SCALE

TYPICAL SHEAR KEY DETAIL



DETAIL A-A



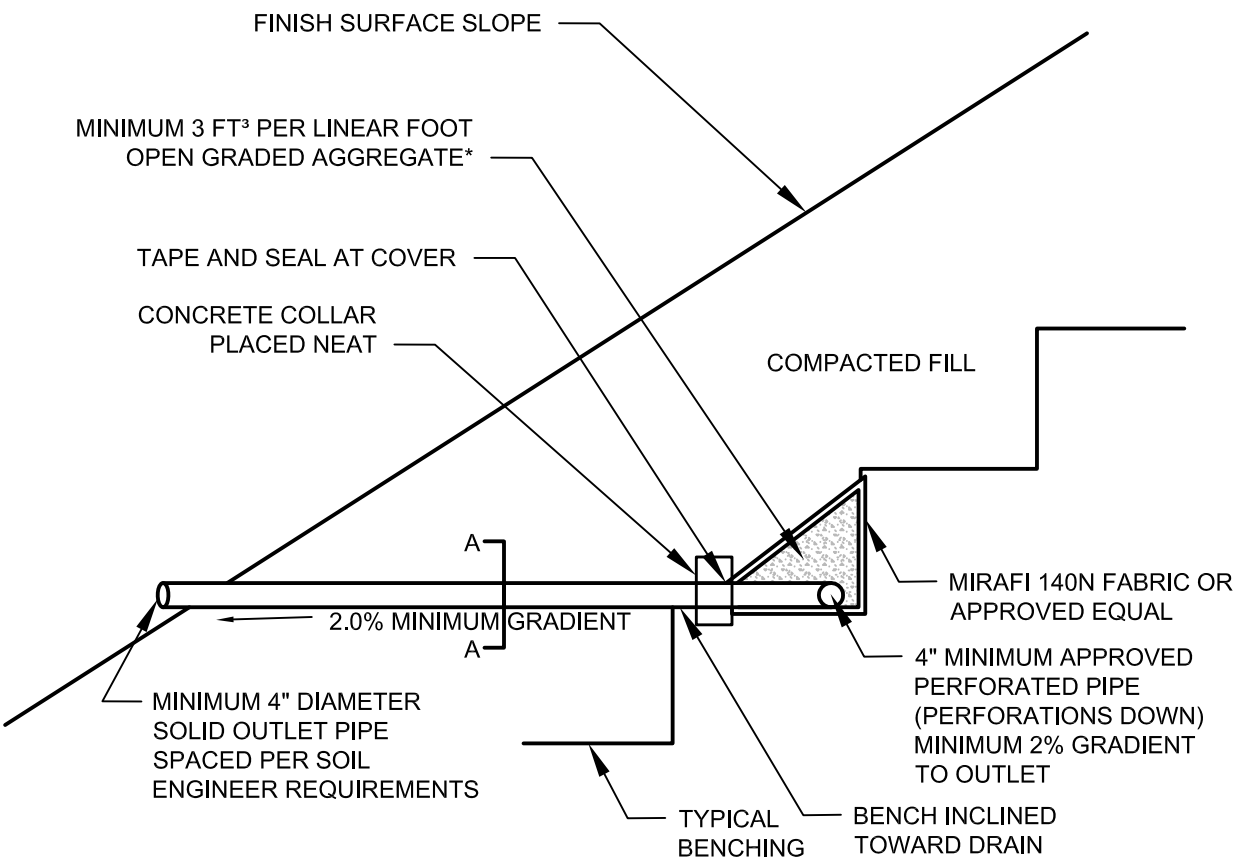
**APPROVED PIPE TYPE:
SCHEDULE 40 POLYVINYL CHLORIDE
(P.V.C.) OR APPROVED EQUAL.
MINIMUM CRUSH STRENGTH 1000 PSI

*FILTER ROCK TO MEET FOLLOWING
SPECIFICATIONS OR APPROVED EQUAL:

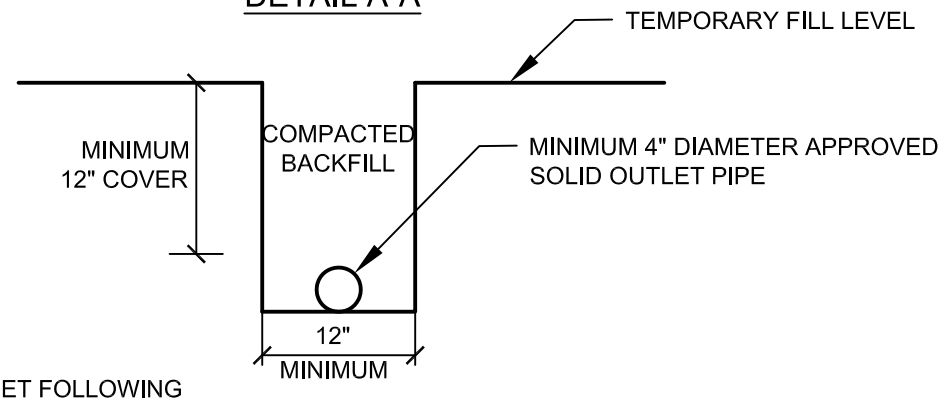
SIEVE SIZE	PERCENTAGE PASSING
1"	100
¾"	90-100
⅜"	40-100
NO. 4	25-40
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

NOT TO SCALE

TYPICAL BACKDRAIN DETAIL



DETAIL A-A

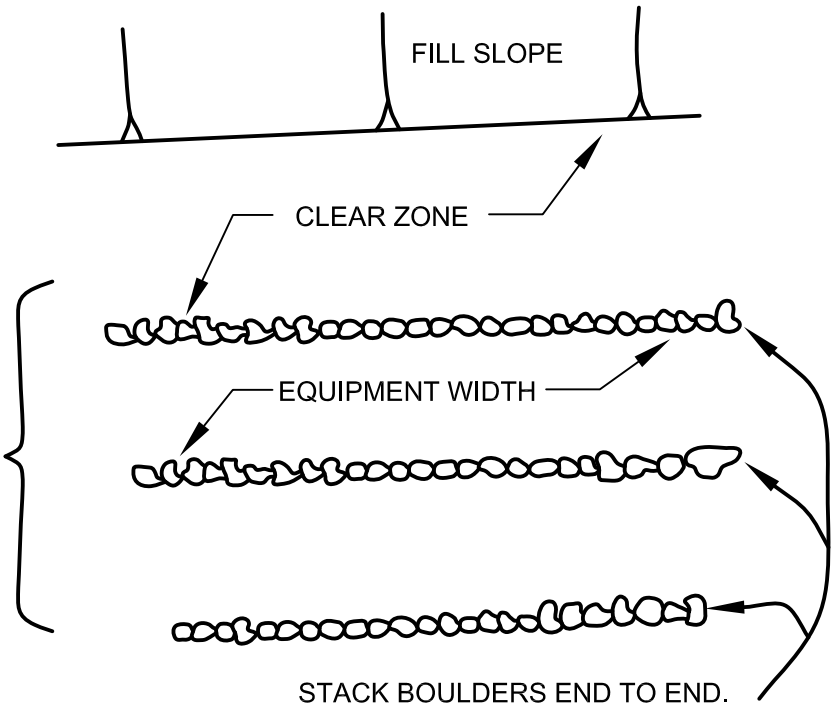


*NOTE: AGGREGATE TO MEET FOLLOWING SPECIFICATIONS OR APPROVED EQUAL:

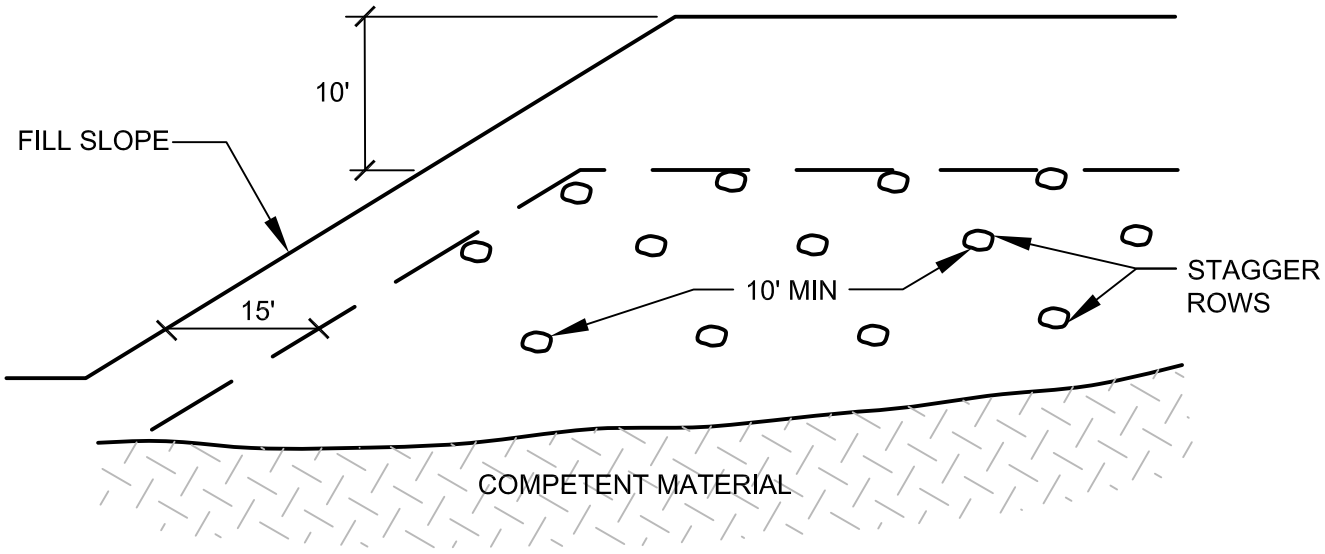
SIEVE SIZE	PERCENTAGE PASSING
1 ½"	100
1"	5-40
¾"	0-17
⅜"	0-7
NO. 200	0-3

NOT TO SCALE

BACKDRAIN DETAIL (GEOFRABIC)

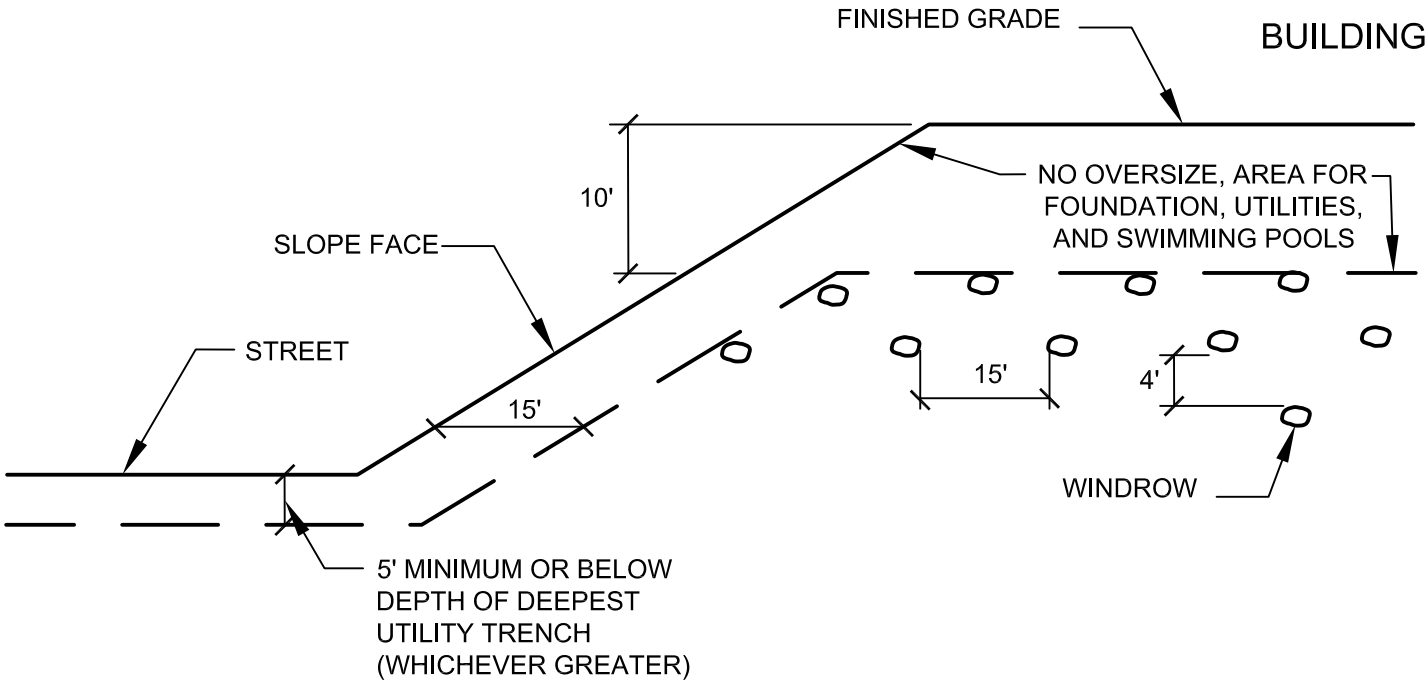


SOIL SHALL BE PUSHED OVER ROCKS AND FLOODED INTO VOIDS. COMPACT AROUND AND OVER EACH WINDROW.

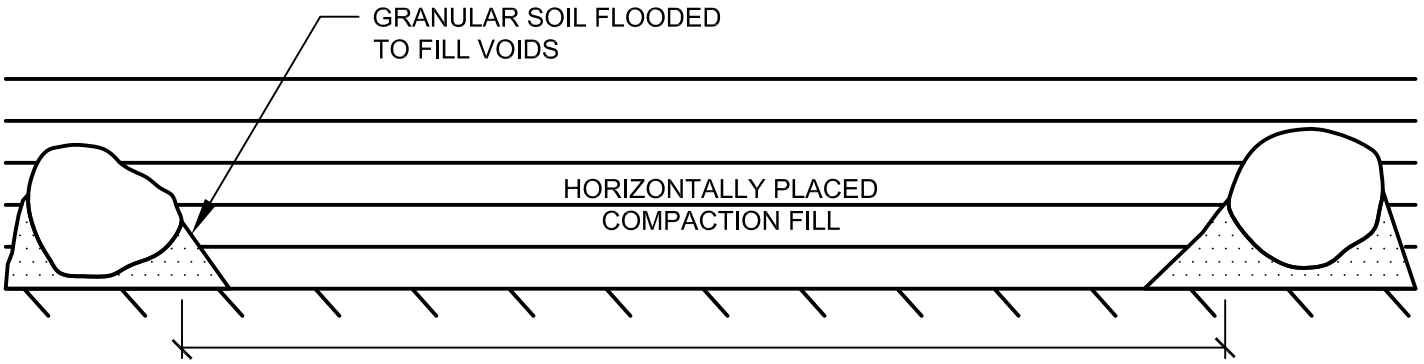


NOT TO SCALE

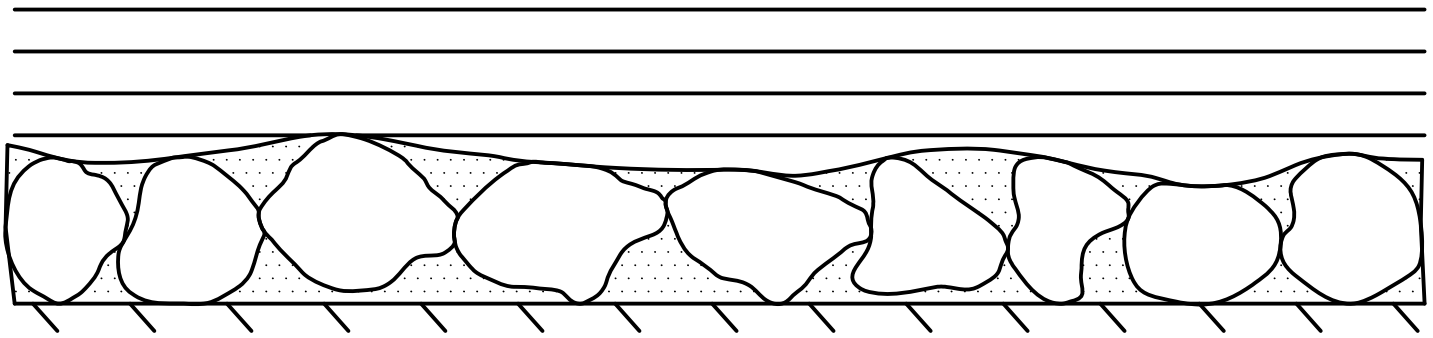
ROCK DISPOSAL DETAIL



TYPICAL WINDROW DETAIL (EDGE VIEW)



PROFILE VIEW

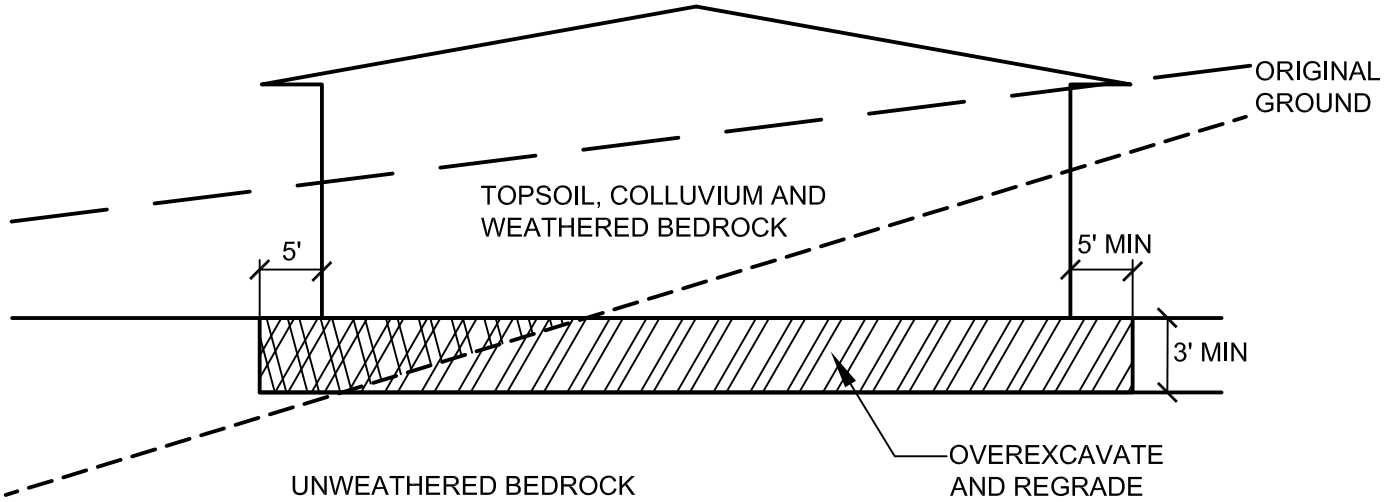


NOT TO SCALE

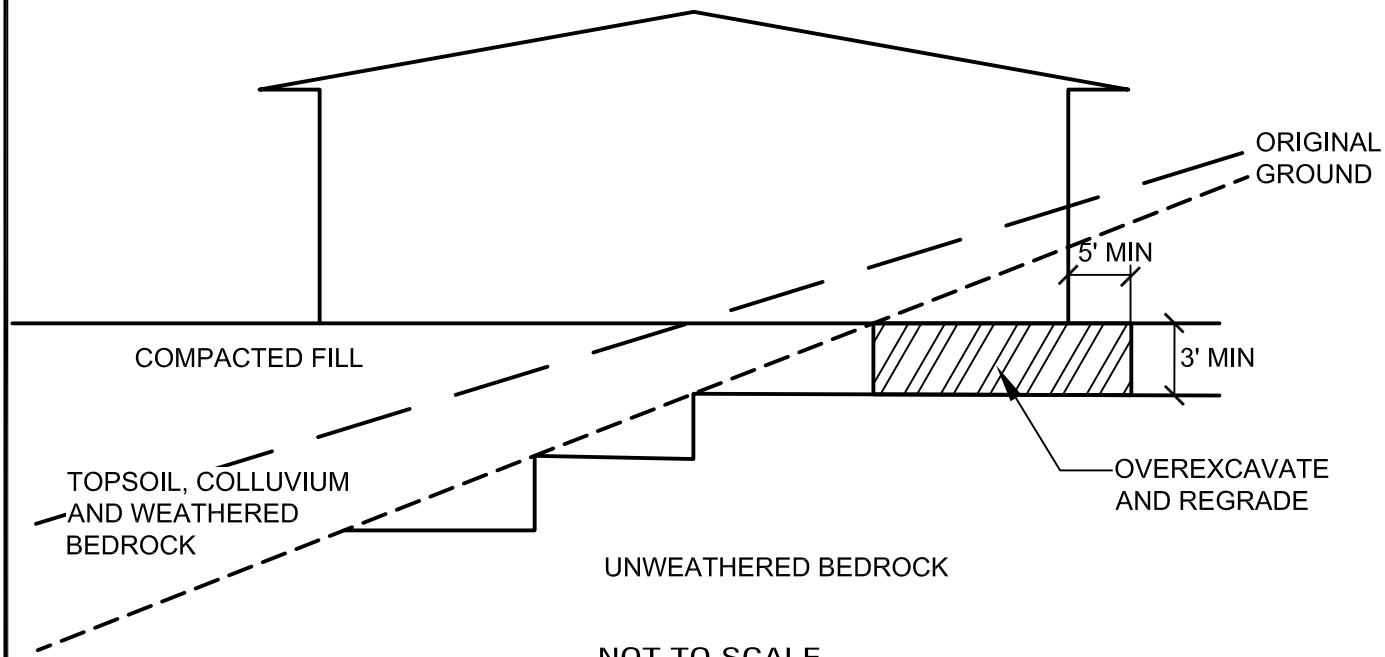
ROCK DISPOSAL DETAIL

GENERAL GRADING RECOMMENDATIONS

CUT LOT



CUT/FILL LOT (TRANSITION)



NOT TO SCALE

TRANSITION LOT DETAIL