# Appendix D –
# Limited Geotechnical Investigation and Update Report

April 20, 2018 CTE Job No. 10-14212G

Olivenhain Hills LLC
Attention: Mr. Udi Melamed
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Encinitas, California 92024
Telephone: (760) 299-3344 Via Email: udi@ermdevelopment.com

Subject: Limited Geotechnical Investigation and Update Report
Proposed 8 Lot Subdivision
Ranch View Terrace
Encinitas, California

Reference: MV Engineering, Inc., 1987, Preliminary Soil and Geotechnical Investigation, Proposed 13 Lot Subdivision, Ranch View Terrace, Encinitas California, Job #1534-87, dated December 30.

Mr. Melamed:

As requested, Construction Testing & Engineering, Inc. (CTE) provides the following limited geotechnical investigation and update to the referenced investigation report. Field work conducted as part of the recent update investigation included seven exploratory borings advanced throughout the areas proposed for structural improvements.

Based on review of the referenced preliminary report and recent site exploration, the information provided appears to be in general compliance with common geotechnical engineering practices. Therefore, recommendations provided in the referenced report are considered applicable for the proposed development except as specifically modified or updated herein. Updated grading, foundation, and retaining wall recommendations, as well as updated seismic loading parameters, are provided in accordance with the requirements of the current California Building Code. CTE reserves the right to further modify the geotechnical recommendations based on the required review of detailed project plans and actual conditions exposed during construction.

The recent borings were advanced with manually operated excavation equipment due to the limited accessibility at the site. The exploratory borings extended to depths ranging from approximately 1.5 to 9.3 feet bgs. A Site Index Map is provided as Figure 1, an Exploration Map is provided as Figure 2, a Regional Fault Map is provided as Figure 3, and a typical Retaining Wall Drainage Detail is provided as Figure 4. The referenced previously performed geotechnical report is provided as Attachment A, Boring Logs are provided as Attachment B, Laboratory Results are provided as Attachment C, and Standard Specifications for Grading are provided as Attachment D.

## 1.0 SITE PREPARATION

Structure foundations should be founded either entirely into dense, competent, formational materials, or entirely into engineered fill materials. Cut/fill transitions should be avoided.

Prior to grading, areas to receive distress sensitive improvements should be cleared of existing debris and deleterious materials. Objectionable materials, such as site debris and vegetation not suitable for structural backfill should be properly disposed of off-site.

In proposed structural improvement areas where foundations will be founded entirely in engineered fill materials, existing soils should be excavated to a minimum depth of 36 inches below the bottom of proposed foundations, or to the depth of dense formational material whichever is greatest. In order to provide relatively uniform conditions under the proposed structure, the depth of fill should also be a minimum of 1/2 the maximum depth of fill beneath the structure footprint. Overexcavation should extend at least five feet laterally beyond the limits of the proposed structural improvements, or the distance resulting from a 1:1 (horizontal: vertical) from the bottom of footing to dense underlying material, whichever is greatest.

In proposed structural improvement areas where foundations will be founded entirely in dense, competent, formational materials, existing soils within the structure footprint should be excavated to a minimum of 12 inches, or to the depth of dense, competent underlying materials, whichever is greatest.

The approximate geologic contact lines provided in Figure 2 may be used to estimate which structures may be founded entirely either in fill or formational materials. Near-surface formational materials are denoted by “Tt” and “Td”. Materials requiring overexcavation and backfill with engineered fill are denoted by “Qya” and “Qppf”. For structures that, based on the current site plan, may span formational materials and materials requiring overexcavation, it may be suitable to deepen footings such that the structure bears entirely into formational materials, or to overexcavate formational materials as described such that the structure bears entirely into engineered fill materials.

If localized areas of loose or unsuitable materials are encountered at the base of the recommended overexcavations, deeper removals to the depth of competent soil may be necessary. Where overexcavation encroaches upon property lines the temporary excavation should generally be sloped at a 1:1 (horizontal to vertical) down to the prescribed overexcavation depth. Depending upon proximity, overexcavation in slots may be recommended by the geotechnical engineer.

A geotechnical representative from CTE should observe the exposed ground surface prior to placement of compacted fill or improvements, to verify the competency of exposed subgrade materials. After approval by this office, the exposed subgrades to receive fill should be scarified a minimum of nine inches, moisture conditioned, and properly compacted prior to fill placement.

## 2.0 FILL PLACEMENT

Following the recommended overexcavation of loose or disturbed soils, the areas to receive fills should be scarified approximately nine inches, moisture conditioned, and properly compacted. Fill and backfill 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. 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 should be observed and tested by a CTE geotechnical representative.

## 3.0 FOUNDATIONS & SLABS-ON-GRADE

Following the recommended preparatory excavation and grading, deepened continuous and spread footings are anticipated to be suitable for use at this site if proposed. It is anticipated that proposed footings will bear entirely in dense, competent, formational materials or into suitable engineered fill materials, as recommended herein. Footings should generally not straddle transitions from cut to fill.

Proposed foundation dimensions and reinforcement should be based on an allowable bearing value of 2,500 pounds per square foot for footings founded in entirely into engineered fill materials or dense, competent, formational materials, and embedded a minimum of 18 inches below the lowest adjacent subgrade elevation. Continuous footings should be at least 15 inches wide; isolated footings should be at least 24 inches in least lateral dimension. The bearing value above may be increased by 250 psf for each additional six inches of embedment up to a maximum static value 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.

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 the project structural engineer. The structural engineer should design isolated footing reinforcement. Footing excavations should be maintained at three percent above optimum moisture content until concrete placement. Foundation excavations that are allowed to desiccate may require presoaking just prior to concrete placement.

Slab-on-grade areas should be maintained at a minimum two percent above optimum moisture content or brought to well above the optimum moisture content just prior to placement of underlayments or concrete.

The maximum total settlement is expected to be on the order of 1.0 inch and the maximum differential settlement is expected to be on the order of 0.5 inch. This differential settlement is generally understood to take place across the width of the structural improvement.

Lightly loaded concrete slabs should be a minimum of 4.5 inches thick. Minimum slab reinforcement should consist of #3 reinforcing bars placed on maximum 18-inch centers, each way, at or above mid-slab height, but with proper cover. More stringent recommendations per the project structural engineer could be provided.

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 aggregate base or gravel (with SE of 30 or more) should be installed. An optional maximum two-inch layer of similar material may be placed above the vapor retarder to help protect the membrane during steel and concrete placement. 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. A qualified architect or other experienced professional should be contacted if moisture penetration is a more significant concern.

Subgrade materials should be maintained or brought to a minimum of two percent or greater above optimum moisture content until slab underlayment and concrete are placed.

## 4.0 LATERAL RESISTANCE AND EARTH PRESSURES

Lateral loads acting against structures may be resisted by friction between the footings and the supporting soil or passive pressure acting against structures. If frictional resistance is used, allowable coefficients of friction of 0.30 (total frictional resistance equals the coefficient of friction multiplied by the dead load) for concrete cast directly against compacted fill is recommended. A design passive resistance value of 300 pounds per square foot per foot of depth (with a maximum value of 1,500 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.

The anticipated retaining walls backfilled using granular soils may be designed using the equivalent fluid unit weights given in Table 3.0 below.

| TABLE 4.0<br>EQUIVALENT FLUID UNIT WEIGHTS ($G_h$)<br>(pounds per cubic foot) | | |
|---|---|---|
| WALL TYPE | LEVEL BACKFILL | SLOPE BACKFILL<br>2:1 (HORIZONTAL:<br>VERTICAL) |
| CANTILEVER WALL<br>(YIELDING) | 35 | 55 |
| RESTRAINED WALL | 55 | 75 |

Lateral pressures on cantilever retaining walls (yielding walls) over six feet high due to earthquake motions may be calculated based on work by Seed and Whitman (1970). The total lateral earth pressure 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 earth pressure may be similarly calculated based on work by Wood (1973):

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

Where $P_A/b$ = Static Active Earth Pressure = $G_h H^2/2$

$P_K/b$ = Static Restrained Wall Earth Pressure = $G_h H^2/2$

$\Delta P_{AE}/b$ = Dynamic Active Earth Pressure Increment = $(3/8)\ k_h\ \gamma H^2/2$

$\Delta P_{KE}/b$ = Dynamic Restrained Earth Pressure Increment = $k_h\ \gamma H^2/2$

$b$ = unit length of wall (usually 1 foot)

$k_h = 2/3\ PGA_m$ ($PGA_M$ Table 5.0)

$G_h$ = Equivalent Fluid Unit Weight (given previously in Table 4.0)

H = Total Height of the retained soil

$\gamma$ = 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. Figure 4 shows a conceptual wall backdrain detail that may or may not be suitable for walls at the subject site. Any waterproofing should be as specified by the project architect.

## 5.0 SEISMIC GROUND MOTION VALUES

The seismic ground motion values listed in the table below were derived in general accordance with the ASCE 7-10. This was accomplished by establishing the Site Class based on the soil properties at the site, and calculating the site coefficients and parameters using the United States Geological Survey Seismic Design Maps application and approximate site coordinates of 33.0445 degrees north latitude and -117.2386 degrees west longitude. These values are intended for the design of structures to resist the effects of earthquake ground motions.

TABLE 5.0
SEISMIC GROUND MOTION VALUES (2016 CBC/ASCE 7-10)

| PARAMETER | VALUE | REFERENCE |
|---|---|---|
| Site Class | C | CBC REFERENCE (2016) |
| Mapped Spectral Response Acceleration Parameter, $S_S$ | 1.051 | ASCE 7, Chapter 20 |
| Mapped Spectral Response Acceleration Parameter, $S_1$ | 0.406 | Figure 1613.3.1 (1) |
| Seismic Coefficient, $F_a$ | 1.000 | Figure 1613.3.1 (2) |
| Seismic Coefficient, $F_v$ | 1.394 | Table 1613.3.3 (1) |
| MCE Spectral Response Acceleration Parameter, $S_{MS}$ | 1.051 | Table 1613.3.3 (2) |
| MCE Spectral Response Acceleration Parameter, $S_{M1}$ | 0.566 | Section 1613.3.3 |
| Design Spectral Response Acceleration, Parameter $S_{DS}$ | 0.701 | Section 1613.3.3 |
| Design Spectral Response Acceleration, Parameter $S_{D1}$ | 0.377 | Section 1613.3.4 |
| Peak Ground Acceleration $PGA_M$ | 0.415 | Section 1613.3.4 |

## 6.0 CORROSIVE SOILS

Testing of representative site soils was performed to evaluate the potential corrosive effects on concrete foundations and 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 the 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 0.10 percent by weight. These guidelines include low water: cement ratios, increased compressive strength, and specific cement type requirements. A minimum resistivity value less than approximately 5,000 ohm-cm and/or soluble chloride levels in excess of 200 ppm generally indicate a corrosive environment for buried metallic utilities and untreated conduits.

Chemical test results indicate that near-surface soils at the site generally present a negligible corrosion potential for Portland cement concrete. Based on resistivity testing, the site soils have been interpreted to have a moderate corrosivity potential to buried metal improvements.

Based on the results of the limited testing performed, it is likely prudent to utilize plastic piping and conduits where buried and feasible. However, CTE does not practice corrosion engineering. Therefore, if corrosion of metallic or other improvements is of more significant concern, a qualified corrosion engineer could be consulted.

## 7.0 LIMITATIONS

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 during construction, this office should be notified and additional recommendations, if required, will be provided.

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

Respectfully submitted,

CONSTRUCTION TESTING & ENGINEERING, INC.

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Principal Engineer

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Project Engineer

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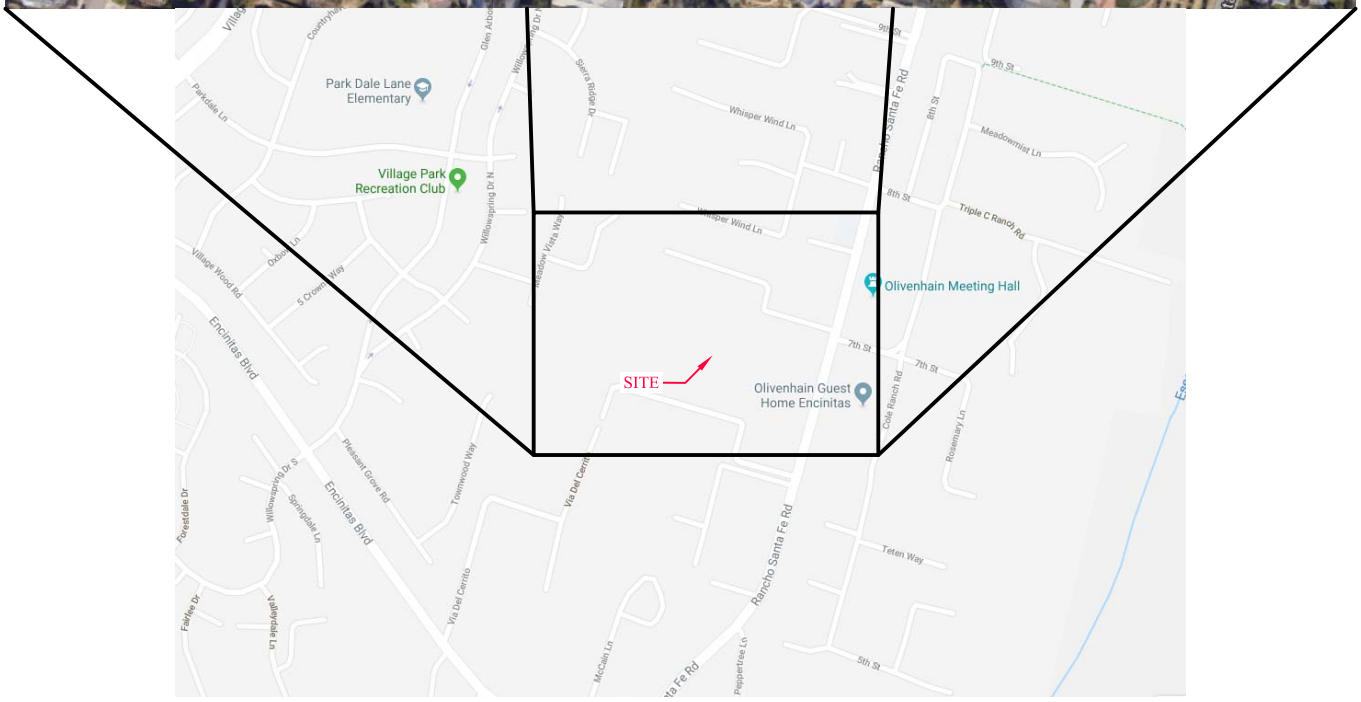
Project Geologist

AJB/JFL/DTM:nri

Figure 1 Site Index Map
Figure 2 Exploration Location Map
Figure 3 Regional Fault and Seismicity Map
Figure 4 Retaining Wall Drainage Detail

Attachment A Preliminary Soil and Geotechnical Investigation, Proposed 13 Lot Subdivision, Ranch View Terrace, Encinitas California, Job #1534-87, dated December 30, 1987
Attachment B Boring Logs
Attachment C Laboratory Results
Attachment D Standard Specifications for Grading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# SITE INDEX MAP

RANCH VIEW TERRACE, 8 LOTS
RANCH VIEW TERRACE
ENCINITAS, CALIFORNIA

| SCALE: | DATE: |
|---|---|
| AS SHOWN | 4/18 |
| CTE JOB NO.: | FIGURE: |
| 10-14212G | 1 |

## LEGEND

TP-1 — APPROXIMATE TEST PIT LOCATION (MV ENGINEERING, 1987)

B-1 — APPROXIMATE HAND AUGER BORING LOCATION (CTE 2018)

Tt — TERTIARY TORREY SANDSTONE

Td — TERTIARY DEL MAR FORMATION

Qya — QUATERNARY YOUNG ALLUVIUM

Qppf — QUATERNARY PREVIOUSLY PLACED FILL

—?— APPROXIMATE GEOLOGIC CONTACT QUERIED WHERE UNCERTAIN



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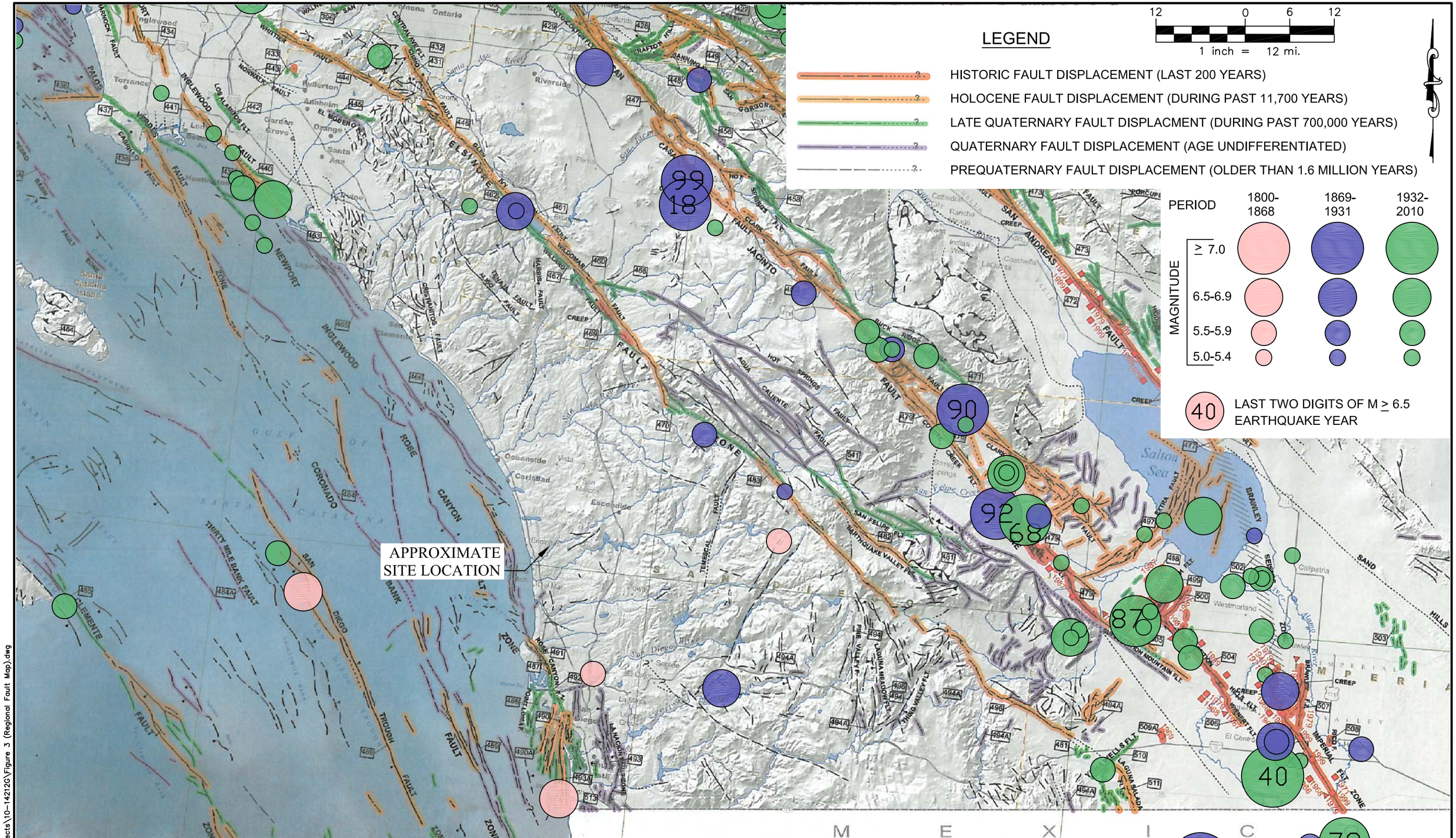
# EXPLORATION LOCATION MAP

RANCH VIEW TERRACE, 8 LOTS
RANCH VIEW TERRACE
ENCINITAS, CALIFORNIA

| | |
|---|---|
| CTE JOB NO: | 10-14212G |
| SCALE: | 1" ~ 100' |
| DATE: | 4/18 |
| FIGURE: | 2 |

\\Esc_server\projects\10-14212G\Fig 2 Exploration.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

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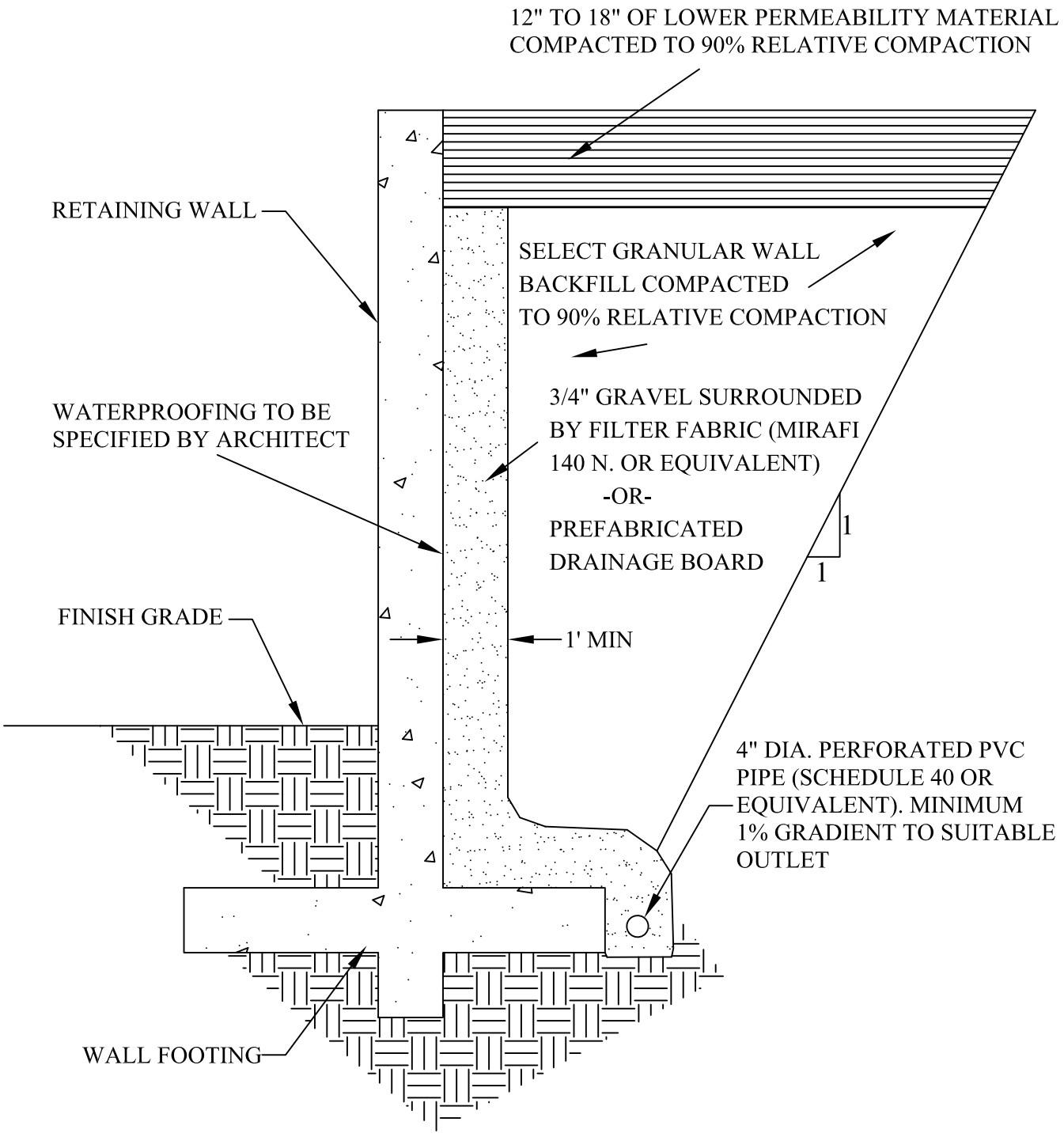
# REGIONAL FAULT AND SEISMICITY MAP

RANCH VIEW TERRACE, 8 LOTS
RANCH VIEW TERRACE
ENCINITAS, CALIFORNIA

CTE JOB NO: 10-14212G
SCALE: 1 inch = 12 miles
DATE: 4/18
FIGURE: 3

\\Esc_server\projects\10-14212G\Figure 3 (Regional Fault Map).dwg




*CONCEPTUAL DRAWING

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**RETAINING WALL DRAINAGE DETAIL**

| SCALE: | DATE: |
|---|---|
| NO SCALE | 4/18 |
| CTE JOB NO.: | FIGURE: |
| 10-14212G | 4 |

ATTACHMENT A
PRELIMINARY SOIL AND GEOTECHNICAL INVESTIGATION, PROPOSED 13 LOT SUBDIVISION, RANCH VIEW TERRACE, ENCINITAS CALIFORNIA, JOB #1534-87, DATED DECEMBER 30, 1987

# PRELIMINARY SOIL AND GEOTECHNICAL INVESTIGATION PROPOSED 13 LOT SUBDIVISION RANCH VIEW TERRACE ENCINITAS, CALIFORNIA

DECEMBER 30, 1987

PREPARED FOR:

MR. BILL BUCK
2923 CANONITA DRIVE
FALLBROOK, CALIFORNIA 92028

JOB #1534-87

**MV ENGINEERING, INC.**
2450 Vineyard Avenue, #102
Escondido, California 92025-1330
619/743-1214

Job #1534-87

December 30, 1987

Mr. Bill Buck
2923 Canonita Drive
Fallbrook, California 92028

Preliminary Soil and Geotechnical Investigation, Proposed 13 Lot Subdivision, Ranch View Terrace, Encinitas, California

Pursuant to your request, MV Engineering, Inc. has performed an investigation of the surface and subsurface soil and geologic conditions at the subject site.

The enclosed report has been prepared to present the results of our preliminary soil investigation. This report includes the results of our field investigation, laboratory analyses, and our summary of findings and recommendations for site development as understood.

From a geotechnical standpoint, it is our opinion that the site is suitable for the proposed development provided the recommendations presented in this report are incorporated into the design and construction of the project.

Thank you for choosing MV Engineering, Inc. If you have any questions concerning this report, please do not hesitate to call us. Reference to our Job #1534-87 will expedite our response to your inquiries.

We appreciate this opportunity to be of service to you.

MV ENGINEERING, INC.

Ralph M. Vinje
GE #863

REGISTERED PROFESSIONAL ENGINEER
RALPH MALCOLM VINJE
No. 863
Exp. 12-31-89
GEOTECHNICAL
STATE OF CALIFORNIA

RMV/jm

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## APPENDIX



## APPENDIX "A"

PRELIMINARY SOIL AND GEOTECHNICAL INVESTIGATION
PROPOSED 13 LOT SUBDIVISION
RANCH VIEW TERRACE
ENCINITAS, CALIFORNIA

## I. GENERAL INFORMATION

A Preliminary Soil and Geotechnical Investigation has been prepared for the above-mentioned site located west of Rancho Santa Fe Road in Olivenhain (see vicinity map, Plate 1). The site is legally described as a Portion of Block 94 of Colony Olivenhain of Map No. 326, in the City of Encinitas, County of San Diego, State of California. The Assessor's Parcel Number is 265-331-26 and 49.

It is understood that the site will be used for a 13 lot single family residential subdivision. Detailed grading plans are unavailable; however, it is assumed that individual lots will be developed by minor cut/fill grading.

## II. PURPOSE OF INVESTIGATION

The purpose of this investigation is to determine the following:

1 - the existing soil conditions;

2 - the presence and effect of any expansive soil;

3 - the allowable soil bearing pressures;

4 - the presence of existing fill or ground water;

5 - the geologic conditions and obvious geologic hazards;

6 - any construction problems that can be anticipated, and to make appropriate foundation recommendations.

## III. FIELD INVESTIGATION

### A. Surface Conditions

The site is a rectangularly shaped parcel consisting of 8.45 acres. The dimensions and orientation are shown on the enclosed Geotechnical Map, Plate 1. The ground surface throughout the site is irregular and includes near-vertical bluffs, "badlands" topography, and more gentle terrain with intervening canyons. There are existing earthen berm/dams located at the base of the hillside and flow line. The ground surface is covered with large bushes, brush, grass, weeds and eucalyptus trees.

B. Field Work

Geotechnical conditions were determined from geologic mapping of available exposures and the excavation of five exploratory backhoe trenches. Access to the western portion of the site with the backhoe was restricted by the steep terrain and the soft, wet and loose condition of the alluvial soils. The test pits were dug on December 9, 1987 in the subject area as shown on Plate 1. The pits were entered and inspected by a staff geologist from this office. Samples of the soils were obtained from the test pit excavations and taken to the laboratory for testing. Logs of the test pits are enclosed herein.

Samples of the soils were visually classified by field identification procedure in accordance with the Unified Soil Classification. A simplified version of the Unified Soil Classification is included in the Appendix of this report.

C. Subsurface Conditions

Geologically the site is underlain by light colored sandstone units with minor siltstone and cobble interbeds. The exposed rocks chiefly occur in a moderately well cemented to friable condition. Well developed exposures were noted throughout the site including within the "badland" areas along the western margin.

The exposed formational rocks at the site are moderately well bedded rocks which occur in a near flat-lying condition. Low angle dips chiefly in a westerly direction are attributed to modest folding. Steeper dips are local features which represent cross-bedding. Landslides or other forms of slope instability were not in evidence on the property.

The fill soils encountered on the site consist of the reworked native soils. On site excavations are expected to generate sandy soils.

There are essentially two soil types based on engineering properties as described on the logs which were encountered during the investigation. The soil types are referred to later as Soil Types 1 and 2.

SOIL TYPES

| Soil Type | Soil Description | Unified Soil Classification |
|---|---|---|
| 1 | Tan fine grained silty sand | SM |
| 2 | Orange fine grained silty sand | SM |

No ground water was encountered during the investigation.

D. Geologic Hazards

Faults or significant shear zones were not exposed during our field study. As with most areas of Southern California, the study property lies within a seismically active zone. Distant faults including the Elsinore Fault approximately twenty-five miles to the northeast and unnamed offshore faults will periodically affect the property.

It is believed the greatest geologic hazard would be from earth shaking in the event of an earthquake.

## IV. TESTS AND RESULTS

A. Maximum Density Tests

Two laboratory compaction tests were made on Soil Types 1 and 2 (one each) to determine the maximum dry density and optimum moisture content as specified by ASTM D-1557, Method A. This test uses the minus #4 sieve soil in a 4-inch diameter, 4-inch high cylindrical mold. The sample is formed with a 10 pound hammer falling 18 inches for 25 blows on each of 5 layers. The results follow below.

| Location | Soil Type | Soil Description | Maximum Dry Density(pcf) | Optimum Moisture Content(%) |
|---|---|---|---|---|
| TP 1@2 | 1 | Tan fine grained silty sand | 112.5 | 14.0 |
| TP 2@6 | 2 | Orange fine grained silty sand | 122.8 | 11.5 |

TP = Test Pit

These results may be used during the grading where applicable.

B. Field Density Tests

Moisture contents and densities were determined on twenty-four paraffin coated undisturbed samples using the water displacement method. The results are presented on the logs at the corresponding locations. The relative compaction/density noted on the logs is defined as the ratio of the field dry density to the laboratory maximum dry density.

C. Expansion Test

One expansion test was made on a representative sample of Soil Type 2. The soil was remolded to 90% of the maximum dry density in a 2½-inch diameter, 1-inch high ring mold. The sample was instrumented, loaded with 1 psi and submerged in water. The ratio of the change in height from the air dry to the saturated condition is defined as the percent expansion. The results are presented below.

| | Soil | Initial | | Air Dry | | Saturated | | Expansion |
|---|---|---|---|---|---|---|---|---|
| Location | Type | $\omega$ | $\gamma_o$ | $\omega$ | $\gamma_o$ | $\omega$ | $\gamma_o$ | (%) |
| TP 2@6 | 2 | 9.4 | 111.5 | 4.7 | 111.7 | 12.5 | 109.6 | 1.9 |

TP = Test Pit - $\omega$ = Moisture Content (%) - $\gamma_o$ = Dry Density (pcf)

D. Direct Shear Tests

Two direct shear tests were performed on representative samples of Soil Types 1 and 2 for strength parameters in the lateral load and bearing capacity calculations. Three specimens of each soil were prepared by molding them in 2½-inch diameter, 1-inch high rings to 90% of the maximum dry density and optimum moisture content and soaked overnight. The specimens were loaded with normal loads of 1, 2 and 3 KSF respectively and sheared to failure in an undrained shear. The results are presented in the next section.

## V. BEARING CAPACITY

The values of internal friction and apparent cohesion derived from the direct shear tests were used in the Terzaghi Formula in accordance with the procedure outlined in Reference 2, page 223, to compute the allowable bearing capacity.

Terzaghi Formula:

$$\text{Bearing Capacity} = 2/3cN'_c + \gamma D_f N'_q + 1/2\,\gamma B N_\gamma'$$

Assumptions: (for a one-story structure)

Depth of Footings, $D_f$ = 12"

Width of Continuous Footing, B = 12"

$N_c'$ $N_q'$ $N_\gamma'$ = dimensionless parameters, Ref. 1, Fig. 75

Factor of Safety = 3

ALLOWABLE BEARING CAPACITY

| Location | Soil Type | Wet Density (pcf) | Angle of Int.Fric. Ø, (o) | Apparent Cohesion C, (psf) | Bearing Capacity (psf) |
|---|---|---|---|---|---|
| TP 1@2 | 1 | 114.2 | 36 | 40 | 1044 |
| TP 2@6 | 2 | 121.4 | 37 | 37 | 1570 |

## VI. LATERAL LOAD PARAMETERS

The lateral load parameters to be used in design of the retaining and restraining walls (using level backfills) are derived from the friction angle Ø, obtained from the direct shear test using the following formulas:

A. Active Pressure Coefficient, $Ka = \frac{1 - \sin \phi}{1 + \sin \phi}$

B. At Rest Pressure Coefficient, $Ko = 1 - \sin \phi$

C. Passive Pressure Coefficient, $Kp = 1/Ka$

The equivalent fluid pressures are obtained by the formulas:

Peq. = z Ka $\gamma$ (psf, active)

Peq. = z Ko $\gamma$ (psf, at rest)

Peq. = z Kp $\gamma$ (psf, passive)

Where z = 1', and $\gamma$ = wet density (pcf).

| | SOIL TYPES 1 | 2 |
|---|---|---|
| Active Pressure Coefficient, Ka = | 0.26 | 0.25 |
| At Rest Pressure Coefficient, Ko = | 0.41 | 0.40 |
| Passive Pressure Coefficient, Kp = | 3.85 | 4.02 |
| Active Pressure (psf) = | 30 | 30 |
| At Rest Pressure (psf) = | 47 | 48 |
| Passive Pressure (psf) = | 440 | 488 |
| As applicable where wet density (pcf) = | 114.2 | 121.4 |
| and for Ø = | 36° | 37° |

Recommended design values based on anticipated conditions are found in Section VII, Conclusions and Recommendations.

## VII. CONCLUSIONS AND RECOMMENDATIONS

Based on the foregoing investigation, development of the subject property is feasible from a geotechnical viewpoint. Landslides or other forms of geologic instability were not in evidence at the site. The most significant geologic hazard in the area is thought to be ground shaking during an earthquake event. Buildings should be designed in accordance with the latest Uniform Building Code Seismic Zone IV specifications. Liquefaction or other forms of seismic ground failure is not expected at the site provided the recommendations given below are implemented.

Formational rocks beneath the hillside areas of the property are non-expansive units which will adequately support site improvements. Fill and alluvial soils are currently in a loose condition and not suitable for the support of structures. The recommendations given below should be utilized for future planning and implemented in the preparation of formal development plans.

Subdrains may be deemed necessary in specific areas and will be designed by MV Engineering, Inc. once the finalized development plans are made available.

1. Graded slopes should be designed at 2:1 (horizontal to vertical) gradients for overall gross slope stability.

2. It is recommended that the preparation of the native soil and any grading should be completed in accordance with the enclosed "Specifications for Construction of Controlled Fills" except if superseded by the following recommendations.

3. It is recommended that any septic tanks or large buried objects detected during the grading be removed. The voids should be filled with compacted soil and tested by the soil engineer or his representative in charge.

4. The cut portions of any transition lots shall be undercut a minimum depth of three feet below the proposed pad grade or to a minimum depth of twelve inches below the bottom of the footing, whichever is greater, and replaced as structural fill. This precaution will decrease the potential of cracking of the slab along the cut/fill transition line.

5. All underground utility trenches should be compacted to a minimum of 90% of the maximum dry density of the soil unless otherwise specified by the respective agencies. Care should be taken not to crush the utilities or pipes during the compaction of the soil.

6. In the absence of detailed grading plans, specific removal/grading recommendations cannot be provided at this time; however, fill and alluvial soils beneath planned improvement areas should be removed to underlying formational rock prior to building or grading. Removal depths may be estimated from the enclosed test pit logs.

7. Due to the lack of a grading plan specific foundation and slab recommendations for each lot cannot be given until the finish grading has been completed. Anticipated recommendations are given below for the low expansive Soil Type 1 and 2. Each lot should be inspected individually during and after the rough grading in order to determine which of the following recommendations will be appropriate for the specific soils. In cases where there is a mixture of two or more soil types, additional testing will be required in order to determine the appropriate foundation recommendations.

Individual lot development plans should be submitted to this office for review. In some cases, additional field work will be necessary to provide detailed development recommendations which are consistent with specific plans.

8. Foundation recommendations for Soil Type 1 and 2 are listed below.

A. It is recommended that normal concrete wall footings be used in accordance with the Uniform Building Code design (i.e. 12 inches wide by 12 inches deep and 15 inches wide by 18 inches deep for one-and two-story structures respectively, minimum depths, measured from the lowest adjacent ground surface).

B. Use two #4 reinforcing rods in the footings. Place one rod 3 inches from the top and the other rod 3 inches from the bottom of the footing.

C. Use 6x6/10x10 welded wire mesh placed mid-height in all slabs. Use 3½ inch minimum thick slabs and a minimum of 4 inches of clean sand under all slabs. A plastic moisture barrier is optional. If the moisture barrier is used, it should be placed mid-height in the sand. Provide weakened plane joints spaced 12 feet on center each way for all slabs.

D. Our tests and calculations indicate an allowable bearing capacity of 1044 and 1570 psf for one-story continuous and isolated footings for Soil Type 1 and 2 respectively. Experience and good engineering practices would limit both of these values to 1000 psf.

This value is to be verified at completion of grading by the soils engineer or his representative.

E. The following lateral design loads should be used for their respective soil types.

| | Soil Types | | |
|---|---|---|---|
| | 1 | 2 | |
| Active Pressure = | 30 | 30 | (psf) |
| At Rest Pressure = | 47 | 48 | (psf) |
| Passive Pressure = | 440 | 488 | (psf) |

Use a coefficient of friction of 0.35 for concrete on soil.

These recommendations assume a drained and level backfill condition as well as a granular non-expansive type of backfill material.

9. Due to the erodible nature of the on-site soils, fill slopes should be compacted to a minimum of 90% of the laboratory maximum value. Overfilling and cutting back to the design configuration is recommended for smaller slopes. Larger slopes should be backrolled at minimum vertical increments of three feet and sealed at the completion of grading. Slope tests will be taken to verify the compaction recommendation.

10. If any import soil is needed to complete grading, the soil should be granular and non-expansive. The soil must be examined and approved by the soils engineer or his representative prior to the delivery of the soil to the site. Revised footing recommendations should be anticipated.

11. This office should be notified to inspect the footing trenches after they are dug to verify the foundation conditions.

12. Caution should be used during the grading so that the existing adjacent structures/improvements are not distressed by the removals. Appropriate set backs will be required and should be anticipated.

13. During the grading a cobble soil mixture may be generated by the excavations. It is recommended that the soil is mixed well and extra water is used. Compact the soil to 90% of the maximum dry density as specified by ASTM 1557-70.

14. Footings located on or adjacent to the top of slopes should be extended to a sufficient depth to provide a minimum horizontal distance of 5.0 feet between the bottom edge of the footing and the face of the slope.

15. If any boulders are encountered during the grading they should be removed and the voids filled with soil that has been compacted to not less than 90% of the maximum dry density and optimum moisture content. No rocks larger than 12 inches in diameter shall be placed in the fill within three feet from finish grade.

16. During the course of our investigation, test pits were dug to various depths. After logging and sampling of the test pits, they were backfilled, rolled and tamped. This backfilling process does not acquire the necessary compaction for the support of any future overlying structures or pavement. Therefore, during the grading of the site, the test pits should be re-excavated and backfilled to not less than 90% of the maximum dry density for the soil. The approximate locations of the test pits are shown on the Test Pit Location Map, Plate 1.

17. Finish grading should direct and maintain drainage away from all slopes and buildings.

18. It is recommended that a pre-grading meeting be held between the owner, grading contractor and a representative of this firm to discuss the operation and to arrange a testing schedule.

19. Finalized development plans should incorporate these recommendations and be reviewed and approved by this office. If the finalized development plans significantly change or if they were not available at the time of this investigation, further investigation and engineering by this firm will be required.

## VIII. LIMITATIONS

Our conclusions and recommendations have been based on all available data obtained from our field investigation and laboratory analyses, as well as our experience with the soils and formational materials

located in the general area. Of necessity, we must assume a certain degree of continuity between exploratory excavations and/or natural exposures. It is necessary therefore, that all observations, conclusions, and recommendations be verified during the grading operation. In the event discrepancies are noted, we should be notified immediately so that an inspection can be made and additional recommendations issued, if required.

The recommendations made in this report are applicable to the site at the time this report was prepared. It is the responsibility of the owner/developer to insure that these recommendations are carried out in the field.

The firm of MV Engineering, Inc. shall not be held responsible for changes to the physical conditions of the property such as addition of fill soils or changing drainage patterns which occur subsequent to issuance of this report.

This report should be considered valid for a period of one year and is subject to review by our firm following that time. If significant modifications are made to your tentative development plan, especially with respect to the height and location of cut and fill slopes, this report must be presented to us for review and possible revision.

Once again, should any questions arise concerning this report, please do not hesitate to contact this office. Reference to our Job #1534-87 will expedite response to your inquiries.

We appreciate this opportunity to be of service to you.

MV ENGINEERING, INC.

Ralph M. Vinje
GE #863

REGISTERED PROFESSIONAL ENGINEER
RALPH MALCOLM VINJE
No. 863
Exp. 12-31-89
GEOTECHNICAL
STATE OF CALIFORNIA

RMV/jm

Reference:

1. Terzaghi and Peck, 1948, "Soil Mechanics in Engineering Practice", John Wiley & Son, N.Y.

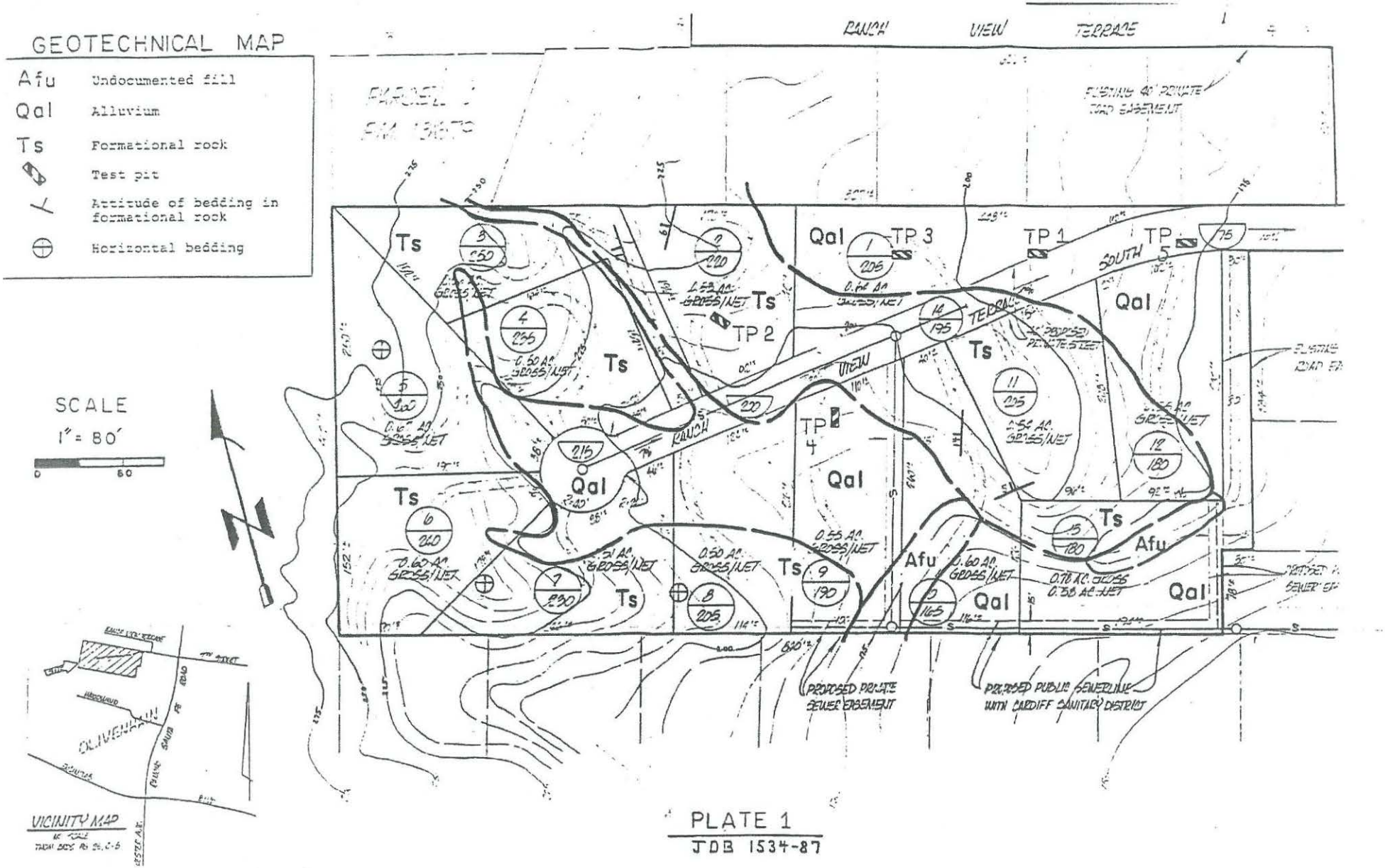


PLATE 1

JOB 1534-87

| PRIMARY DIVISIONS | | | GROUP SYMBOL | 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 (LESS THAN 5% FINES) | GW | Well graded gravels, gravel-sand mixtures, little or no fines. |
| | | | GP | Poorly graded gravels or gravel-sand mixtures, little or no fines. |
| | | GRAVEL 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 (LESS THAN 5% FINES) | SW | Well graded sands, gravelly sands, little or no fines. |
| | | | SP | Poorly graded sands or 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 and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity. |
| | | | CL | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. |
| | | | OL | Organic silts and organic silty clays of low plasticity. |
| | SILTS AND CLAYS 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 silts. |
| HIGHLY ORGANIC SOILS | | | PT | Peat and other highly organic soils. |

**GRAIN SIZES**

| U.S. STANDARD SERIES SIEVE | | | | CLEAR SQUARE SIEVE OPENINGS | | |
|---|---|---|---|---|---|---|
| 200 | 40 | 10 | 4 | 3/4" | 3" | 12" |

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

**RELATIVE DENSITY**

| SANDS, GRAVELS AND NON-PLASTIC SILTS | BLOWS/FOOT |
|---|---|
| VERY LOOSE | 0 - 4 |
| LOOSE | 4 - 10 |
| MEDIUM DENSE | 10 - 30 |
| DENSE | 30 - 50 |
| VERY DENSE | OVER 50 |

**CONSISTENCY**

| CLAYS AND PLASTIC SILTS | STRENGTH | BLOWS/FOOT |
|---|---|---|
| VERY SOFT | 0 - ¼ | 0 - 2 |
| SOFT | ¼ - ½ | 2 - 4 |
| FIRM | ½ - 1 | 4 - 8 |
| STIFF | 1 - 2 | 8 - 16 |
| VERY STIFF | 2 - 4 | 16 - 32 |
| HARD | OVER 4 | OVER 32 |

1. Blow count, 140 pound hammer falling 30 inches on 2 inch O.D. split spoon sampler (ASTM D-1586)
2. Unconfined compressive strength per SOILTEST pocket penetrometer CL-700

△ = undisturbed chunk sample

□ = disturbed sample

○ = sand cone test

| $^{2}4_{6}$ = Standard Penetration Test (SPT) (ASTM D-1586) with blow counts per 6 inches

‖ 4 = California Sampler with blow counts per 12 inches

MV ENGINEERING, INC.

# KEY TO EXPLORATORY BORING LOGS
## Unified Soil Classification System (ASTM D-2487)

Bill Buck
Ranch View Terrace, Encinitas

| PROJECT NO. | DATE | Plate 2 KEY |
|---|---|---|
| 1534-87 | 12/30/87 | |

| ELEVATION 195 | LOGGED BY SM |
|---|---|
| DEPTH TO GROUND WATER N/E | BORING DIAMETER 36" | DATE DRILLED 12/9/87 |

| DEPTH (FEET) | DESCRIPTION AND CLASSIFICATION | SOIL CLASSIFICATION | SAMPLE TYPE / PENETRATION RESISTANCE | (MISC.) | WATER CONTENT (%) | DRY DENSITY (PCF) | RELATIVE DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | | |
| 1 | ALLUVIUM: (Qal): Tan, fine grained silty sand. Moist, very loose to loose, rootlets. | | | | | | |
| 2 | Soil Type 1 | SM | △□ | | 3.3 | 106.9 | 95.0 |
| | Becomes dry and firms at 2½'. | | | | | | |
| 3 | Rootlets throughout. | | | | | | |
| 4 | Dry, moderately firm. | | △ | | 3.2 | 111.1 | 98.7 |
| 5 | @ 5'8" interbed of porous dark brown sand with rootlets. | | | | | | |
| 6 | Continued dry, moderately firm. | | △ | | 5.1 | 104.6 | 93.0 |
| 7 | Moderately cemented. | | | | | | |
| 8 | @ 8' moist, firm, slight clay content, cemented. | | △ | | 3.4 | 120.2 | 100+ |
| 9 | | | | | | | |
| 10 | | | △ | | 8.7 | 103.8 | 92.3 |
| 11 | Continued moist, trace clays. Moderately firm, moderately cemented. | | | | | | |
| 12 | | | △ | | 11.9 | 98.2 | 87.3 |
| | Bottom @ 12' | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |

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EXPLORATORY BORING LOG

Bill Buck
Ranch View Terrace, Encinitas

| PROJECT NO. | PLATE | |
|---|---|---|
| 1534-87 | 3 | TP 1 |

| DRILL RIG | BACKHOE | SURFACE ELEVATION | 210 ± | LOGGED BY | SM |
|---|---|---|---|---|---|
| DEPTH TO GROUND WATER | N/E | BORING DIAMETER | 36" | DATE DRILLED | 12/9/87 |

| DEPTH (FEET) | DESCRIPTION AND CLASSIFICATION | SOIL CLASSIFICATION | SAMPLE TYPE / PENETRATION RESISTANCE | (MISC.) | WATER CONTENT (%) | DRY DENSITY (PCF) | RELATIVE DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| 0 | TOPSOIL: Tan, fine grained silty sand. moist, very loose, rootlets top 14". | | | | | | |
| 1 | | | | | | | |
| 2 | Dry, moderately loose at 2'. Soil Type 1 | SM | △ | | 2.7 | 90.9 | 80.8 |
| 3 | FORMATIONAL ROCK: (Ts) Sandstone. Fine grain, silty, tan. Scattered cobbles (rounded to subangular). | | | | | | |
| 4 | Dry, firm, moderately cemented. Scattered rootlets. | | △ | | 3.6 | 95.2 | 84.6 |
| 5 | Soil Type 1 | SM | | | | | |
| 6 | SANDSTONE. Fine grain, silty, Orange color. Moist, well cemented, scattered rounded pebbles and cobbles, rootlets, trace clays. | | △□ | | 3.8 | | |
| 7 | @ 7' interbeds of dark brown clayey sandstone. Horizontal structure. | SM | | | | | |
| 8 | Slow digging at bottom. Soil Type 2 Bottom @ 7½' | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |

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EXPLORATORY BORING LOG

Bill Buck
Ranch View Terrace, Encinitas

| PROJECT NO. | PLATE | |
|---|---|---|
| 1534-87 | 4 | TP 2 |

| DRILL RIG BACKHOE | SURFACE ELEVATION 205 ± | LOGGED BY SM |
|---|---|---|
| DEPTH TO GROUND WATER N/E | BORING DIAMETER 36" | DATE DRILLED 12/9/87 |

| DEPTH (FEET) | DESCRIPTION AND CLASSIFICATION | SOIL CLASSIFICATION | SAMPLE TYPE / PENETRATION RESISTANCE | (MISC.) | WATER CONTENT (%) | DRY DENSITY (PCF) | RELATIVE DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | | |
| 1 | ALLUVIUM: (Qal): Tan fine grained silty sand. Moist, very loose top 18". Roots. | | | | | | |
| 2 | | | △ | | 3.7 | 89.0 | 79.1 |
| 3 | | | | | | | |
| 4 | From 4' soil is firm. | | △ | | 2.7 | 95.6 | 85.0 |
| 5 | | | | | | | |
| 6 | Continued dry, moderately loose to firm @ 6'. | | △ | | 2.8 | 96.3 | 85.6 |
| 7 | Scattered rootlets. | | | | | | |
| 8 | Slightly moist @ 8'. | | △ | | 5.6 | 95.5 | 84.9 |
| 9 | | | | | | | |
| 10 | | | △ | | 4.2 | 95.4 | 84.8 |
| 11 | Moderately dry, firm, poorly to moderately cemented. Soil Type 1 | SM | | | | | |
| 12 | FORMATIONAL ROCK (Ts): Sandstone. Fine grain, silty, orange color. Moist, moderately cemented. | | △ | | 6.0 | 93.7 | 76.3 |
| 13 | | | | | | | |
| 14 | Firm, moist, moderately cemented. Soil Type 2 | SM | △ | | 6.1 | 100.1 | 81.5 |
| | Bottom @ 14' | | | | | | |

EXPLORATORY BORING LOG

Bill Buck
Ranch View Terrace, Encinitas

| DRILL RIG BACKHOE | SURFACE ELEVATION 190 ± | LOGGED BY SM |
|---|---|---|
| DEPTH TO GROUND WATER N/E | BORING DIAMETER 36" | DATE DRILLED 12/9/87 |

| DEPTH (FEET) | DESCRIPTION AND CLASSIFICATION | SOIL CLASSIFICATION | SAMPLE TYPE / PENETRATION RESISTANCE | (MISC.) | WATER CONTENT (%) | DRY DENSITY (PCF) | RELATIVE DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | | |
| 1 | ALLUMIUM (Qal): Tan, fine grained silty sand. Moist, very loose top 2'. | | | | | | |
| 2 | Dry, very loose @ 2' Soil Type 1 | SM | | | | | |
| 3 | Root 3" diameter. | | | | | | |
| 4 | Firms slightly @ 4½'. | | | | | | |
| 5 | | | △ | | 6.7 | 90.7 | 80.7 |
| 6 | Scattered rootlets. | | | | | | |
| 7 | Moist, very loose. | | △ | | 10.0 | 82.5 | 73.4 |
| 8 | | | | | | | |
| 9 | Firms slightly @ 8½' | | | | | | |
| 10 | Moist, weakly to moderately cemented, trace clays, moderately loose. | | △ | | 6.0 | 89.5 | 79.5 |
| 11 | | | | | | | |
| 12 | FORMATIONAL ROCK (Ts): Sandstone. Fine grain, silty, tan color. | | △ | | 7.2 | 92.8 | 82.5 |
| 13 | Moist, firm, weakly to Moderately cemented. Soil Type 1 | SM | | | | | |
| 14 | Bottom @ 13' | | | | | | |

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EXPLORATORY BORING LOG

Bill Buck
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| PROJECT NO. | PLATE | |
|---|---|---|
| 1534-07 | 6 | TP 4 |

| DRILL RIG BACKHOE | SURFACE ELEVATION 180 ± | LOGGED BY SM |
|---|---|---|
| DEPTH TO GROUND WATER N/E | BORING DIAMETER 36" | DATE DRILLED 12/9/87 |

| DEPTH (FEET) | DESCRIPTION AND CLASSIFICATION | SOIL CLASSIFICATION | SAMPLE TYPE / PENETRATION RESISTANCE | (MISC.) | WATER CONTENT (%) | DRY DENSITY (PCF) | RELATIVE DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | | |
| 1 | ALLUVIUM: (Qal): Tan fine grained silty sand. Moist, very loose, top 18". Rootlets. | | | | | | |
| 2 | Firm @ 2'. Dry. | | △ | | 4.4 | 97.1 | 86.3 |
| 3 | | | | | | | |
| 4 | Dry, firm. | | △ | | 5.9 | 96.9 | 86.2 |
| 5 | Cobble lense @ 5'. Soil Type 1 | SM | | | | | |
| 6 | FORMATIONAL ROCK (Ts): Sandstone. Fine grain, silty, tan color. | | △ | | 6.1 | 94.0 | 83.6 |
| 7 | Moderately to well cemented. Very firm, breaks up blocky, dry. Iron oxide staining. | | | | | | |
| 8 | Soil Type 1 | SM | △ | | 8.0 | 106.8 | 94.9 |
| 9 | Bottom @ 8½' | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |

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EXPLORATORY BORING LOG

Bill Buck
Ranch View Terrace, Encinitas

| PROJECT NO. | PLATE | |
|---|---|---|
| 1534-87 | 7 | TP 5 |

APPENDIX "A"

# SPECIFICATIONS
# FOR
# CONSTRUCTION OF CONTROLLED FILLS

## GENERAL DESCRIPTION

The construction of controlled fills shall consist of an adequate preliminary soil investigation, clearing, removal of existing structures and foundations, preparation of land to be filled, excavation of earth and rock from cut area, compaction and control of the fill, and all other work necessary to complete the grading of the filled areas to conform with the lines, grades, and slopes as shown on the accepted plans.

## CLEARING AND PREPARATION OF AREAS TO BE FILLED

A. All fill control projects shall have a preliminary soil investigation or a visual examination, depending upon the nature of the job, by a qualified soil engineer prior to grading.

B. All timber, trees, brush, vegetation, and other rubbish shall be removed, piled and burned or otherwise disposed of to leave the prepared areas with a finished appearance, free from unsightly debris.

C. Any soft, swampy or otherwise unsuitable areas shall be corrected by drainage or removal of compressible material, or both, to the depths indicated on the plans or as directed by the soil engineer.

D. The natural ground which is determined to be satisfactory for the support of the filled ground shall then be plowed or scarified to a depth of at least six inches (6") or deeper as specified by the soil engineer, and until the surface is free from ruts, hummocks, or other uneven features which would tend to prevent uniform compaction by the equipment to be used.

E. No fill shall be placed until the prepared native ground has been approved by the soil engineer.

F. Where fills are made on hillsides with slopes greater than 5 (horizontal) to 1 (vertical), horizontal benches shall be cut into firm, undisturbed, natural ground at the elevation of the toe stake. The soil engineer shall determine the width and frequency of all succeeding benches, which will vary with the soil conditions and the steepness of slope.

G. After the natural ground has been prepared, it shall be brought to the proper moisture content and compacted to not less than 90% of maximum density, ASTM D-1557-64T.

H. Expansive soils may require special compaction specifications as directed in the preliminary soil investigation by the soil engineer.

I. The cut portions of building pads in which rock-like material exists may require excavation and recompaction for density compatibility with the fill as directed by the soil engineer.

MATERIALS

The fill soils shall consist of select materials, graded so that at least 40 percent of the material passes the No. 4 sieve. The material may be obtained from the excavation, a borrow pit, or by mixing soils from one or more sources. The material used shall be free from vegetable matter and other deleterious substances, and shall not contain rocks or lumps greater than six inches (6") in diameter. If excessive vegetation, rocks or soils with unacceptable physical characteristics are encountered, these materials shall be disposed of in waste areas designated on the plans or as directed by the soil engineer. If soils are encountered during the grading operation which were not reported in the preliminary soil investigation, further testing will be required to ascertain their engineering properties. Any special treatment recommended in the preliminary or subsequent soil reports not covered herein shall become an addendum to these specifications.

No material of a perishable, spongy or otherwise unstable nature shall be used in the fills.

PLACING, SPREADING AND COMPACTION FILL MATERIAL

A. The selected fill material shall be placed in layers which shall not exceed six inches (6") when compacted. Each layer shall be spread evenly and shall be thoroughly blade-mixed during the spreading to insure uniformity of material and moisture in each layer.

B. When the moisture content of the fill material is below that specified by the soil engineer, water shall be added until the moisture content is near optimum as determined by the soil engineer to assure thorough bonding during the compaction process. This is to take place even if the proper density has been achieved without proper moisture.

C. When the moisture content of the fill material is above that specified by the soil engineer, the fill material shall be aerated by blading and scarifying or other satisfactory methods until the moisture content is near optimum as determined by the soil engineer.

D. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to not less than the specified maximum density in accordance with ASTM D-1557-64T. Compaction shall be by means of tamping or sheepsfoot rollers, multiple-wheel pneumatic-tired rollers, or other types of rollers. Rollers shall be of such design that they will be able to compact the fill to the specified density. Rolling each layer shall be continuous over its entire area and the rollers shall make sufficient passes to obtain the desired density. The entire area to be filled shall be compacted to the specified density.

E. Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compaction operations shall be continued until the slopes are stable but not too dense for planting and until there is no appreciable amount of loose soil on the slopes. Compacting of the slopes shall be accomplished by backrolling the slopes in increments of three to five feet (3' - 5') in elevation gain or by other methods producing satisfactory results.

If the method of achieving the required slope compaction selected by the contractor fails to produce the necessary results, the contractor shall rework or rebuild such slopes until the required degree of compaction is obtained.

F. Field density tests shall be made by the soil engineer for approximately each foot in elevation gain after compaction, but not to exceed two feet (2') in vertical height between tests.

The soil engineer shall be notified to test the fill at regular intervals. If the tests have not been made, after three feet of compacted fill has been placed, the contractor shall stop work on the fill until tests are made.

The location of the tests shall be spaced to give the best possible coverage and shall be taken no farther than 100 feet apart. Tests shall be taken on corner and terrace lots for each two feet (2') in elevation gain. The soil engineer may take additional tests as considered necessary to check on the uniformity of compaction. Where sheepsfoot rollers are used, the test shall be taken in the compacted material below the disturbed surface. No additional layers of fill shall be spread until the field density tests indicate that the specified density has been obtained.

G. The fill operation shall be continued in six-inch (6") compacted layers, as specified above, until the fill has been brought to the finished slopes and grades as shown on the accepted plans.

## SUPERVISION

Supervision by the soil engineer shall be made during the filling and compacting operations so that he can certify that the fill was made in accordance with accepted specifications.

The specifications and soil testing of subgrade and basegrade material for roads or other public property shall be done in accordance with specifications of the governing agency.

It should be understood that the contractor shall supervise and direct the work and shall be responsible for all construction means, methods, techniques, sequences and procedures. The contractor will be solely and completely responsible for conditions at the job site, including safety of all persons and property during the performance of the work. Intermittent or continuous inspection by the soil engineer is not intended to include review of the adequacy of the contractor's safety measures in, on or near the construction site.

## SEASONAL LIMITS

No fill material shall be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, grading shall not be resumed until field tests by the soil engineer indicate that the moisture content and density of the fill are as previously specified. In the event that, in the opinion of the engineer, soils unsatisfactory as foundation material are encountered, they shall not be incorporated in the grading and disposition will be made at the engineer's discretion.

# UNIFIED SOIL CLASSIFICATION

| Identifying Criteria | Group Symbol | Soil Description |
|---|---|---|
| I. COARSE GRAINED (more than 50% larger than #200 sieve) | | |
| Gravels (more than 50% larger than #4 sieve but smaller than 3") Non-plastic | GW | Gravel, well-graded gravel-sand mixture, little or no fines. |
| | GP | Gravel, poorly graded, gravel-sand mixture, little or no fines. |
| | GM | Gravel, silty, poorly graded, gravel-sand-silt mixtures. |
| | GC | Gravel, clayey, poorly graded, gravel-sand-clay mixtures. |
| Sands (more than 50% smaller than #4 sieve) Non-plastic | SW | Sand, well-graded, gravelly sands, little or no fines. |
| | SP | Sand, poorly graded, gravelly sands, little or no fines. |
| | SM | Sand, silty, poorly graded, sand-silt mixtures. |
| | SC | Sand, clayey, poorly graded, sand-clay mixtures. |
| II. FINE GRAINED (more than 50% smaller than #200 sieve) | | |
| Liquid Limit less than 50 | ML | Silt, inorganic silt and fine sand, sandy silt or clayey-silt-sand mixtures with slight plasticity. |
| | CL | Clay, inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. |

| | | | |
|---|---|---|---|
| II. | FINE GRAINED - con't. | | |
| | Liquid Limit greater than 50 | OL | Silt, organic, silts and organic silt-clays of low plasticity. |
| | | MH | Silt, inorganic, silts micaceous or dictomaceous fine, sandy or silty soils, elastic silts. |
| | | CH | Clay, inorganic, clays of medium to high plasticity, fat clays. |
| | | OH | Clay, organic, clays of medium to high plasticity. |
| III. | HIGHLY ORGANIC SOILS | PT | Peat, other highly organic swamp soils. |

ATTACHMENT B
BORING LOGS

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# 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

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

| Depth (Feet) | Bulk Sample | Driven Type | Blows/Foot | Dry Density (pcf) | Moisture (%) | U.S.C.S. Symbol | Graphic Log | BORING LEGEND | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DESCRIPTION | |

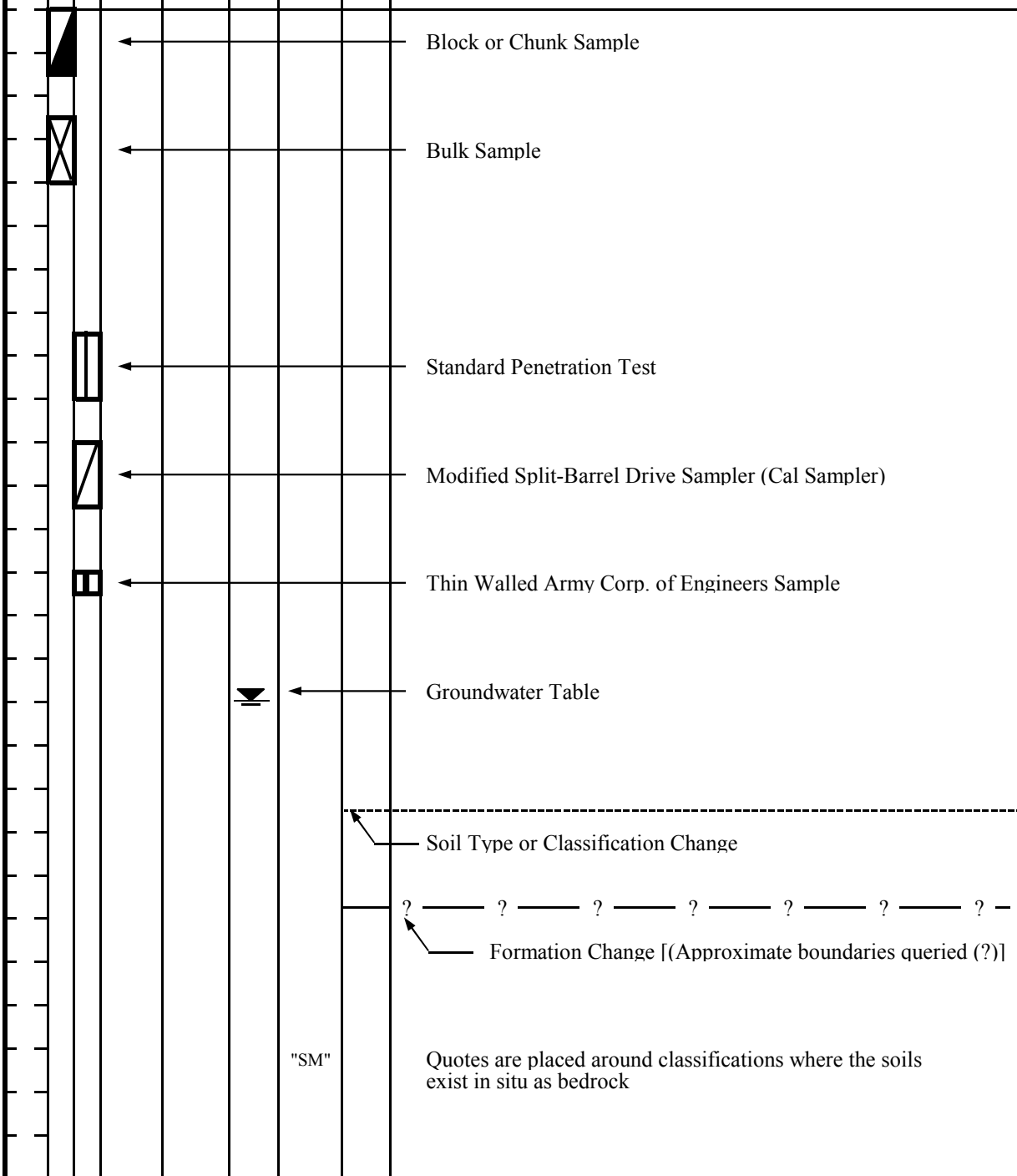


FIGURE: BL2

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| | | | | | |
|---|---|---|---|---|---|
| PROJECT: | RANCH VIEW TERRACE, 8 LOTS | EXCAVATOR: | AJB | | |
| CTE JOB NO: | 10-14212G | EXCAVATION METHOD: | HAND AUGER | EXCAVATION DATE: | 3/30/2018 |
| LOGGED BY: | AJB | SAMPLING METHOD: | BULK | ELEVATION: | ~176 FEET |

# BORING LOG B-1

| Dry Density (pcf) | Moisture (%) | U.S.C.S. Symbol | Graphic Log | Depth (Feet) | Sample Type: Bulk | Sample Type: Driven | DESCRIPTION | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|
| | | SM | | 0 | | | **QUATERNARY YOUNG ALLUVIAL FLOOD PLAIN DEPOSITS:** Loose, slightly moist, brown to yellowish brown, silty fine grained SAND. | |
| | | | | | | | Becomes medium dense | CHM |
| | | | | 5 | | | | |
| | | | | 10 | | | Total Depth: 9.3' No Groundwater Encountered | |
| | | | | 15 | | | | |

FIGURE: B-1

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| | | | | | |
|---|---|---|---|---|---|
| PROJECT: | RANCH VIEW TERRACE, 8 LOTS | EXCAVATOR: | AJB | | |
| CTE JOB NO: | 10-14212G | EXCAVATION METHOD: | HAND AUGER | EXCAVATION DATE: | 3/30/2018 |
| LOGGED BY: | AJB | SAMPLING METHOD: | BULK | ELEVATION: | ~210 FEET |

# BORING LOG B-2

| Dry Density (pcf) | Moisture (%) | U.S.C.S. Symbol | Graphic Log | Depth (Feet) | Sample Type: Bulk | Sample Type: Driven | DESCRIPTION | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|
| | | SC | | 0 | | | **RESIDUAL SOIL**: Loose to medium dense, moist, reddish brown, clayey fine graiend SAND, oxidized. | |
| | | "SM" | | | | | **TERTIARY TORREY SANDSTONE**: Dense to very dense, slightly moist, light yellowish brown, silty fine grained SANDSTONE, oxidized interbeds. | |
| | | | | 5 | | | Total Depth: 1.5'<br>No Groundwater Encountered | |
| | | | | 10 | | | | |
| | | | | 15 | | | | |

FIGURE: B-2

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| | | | | | |
|---|---|---|---|---|---|
| PROJECT: | RANCH VIEW TERRACE, 8 LOTS | EXCAVATOR: | AJB | | |
| CTE JOB NO: | 10-14212G | EXCAVATION METHOD: | HAND AUGER | EXCAVATION DATE: | 3/30/2018 |
| LOGGED BY: | AJB | SAMPLING METHOD: | BULK | ELEVATION: | ~167 FEET |

# BORING LOG B-3

| Dry Density (pcf) | Moisture (%) | U.S.C.S. Symbol | Graphic Log | Depth (Feet) | Sample Type: Bulk | Sample Type: Driven | DESCRIPTION | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|
| | | | | 0 | | | | |
| | | "CL" | | | | | **RESIDUAL SOIL:** Stiff, slightly moist, reddish olive, fine grained sandy CLAY, oxidized, roots. | |
| | | | | | | | **TERTIARY DEL MAR FORMATION** Very stiff, moist, reddish olive, fine grained sandy CLAYSTONE, oxidized mottling. | |
| | | "SC" | | | | | Dense, slightly moist, light olive, clayey fine grained SANDSTONE, oxidized mottling. | |
| | | | | 5 | | | | |
| | | | | | | | Total Depth: 4.2' (Refusal in dense formation)<br>No Groundwater Encountered | |
| | | | | 10 | | | | |
| | | | | 15 | | | | |

FIGURE: B-3

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| | | | | | |
|---|---|---|---|---|---|
| PROJECT: | RANCH VIEW TERRACE, 8 LOTS | EXCAVATOR: | AJB | | |
| CTE JOB NO: | 10-14212G | EXCAVATION METHOD: | HAND AUGER | EXCAVATION DATE: | 3/30/2018 |
| LOGGED BY: | AJB | SAMPLING METHOD: | BULK | ELEVATION: | ~166 FEET |

# BORING LOG B-4

| Dry Density (pcf) | Moisture (%) | U.S.C.S. Symbol | Graphic Log | Depth (Feet) | Sample Type: Bulk | Sample Type: Driven | DESCRIPTION | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|
| | | SC | | 0 | | | **QUATERNARY YOUNG ALLUVIAL FLOOD PLAIN DEPOSITS:** Loose, slightly moist, light yellowish brown, silty fine grained SAND, friable. | |
| | | "SM" | | | | | **TERTIARY TORREY SANDSTONE:** Dense to very dense, slightly moist, light yellowish gray, silty fine grained SANDSTONE, oxidized. | |
| | | | | 5 | | | Total Depth: 2.7' (Refusal in dense formation)<br>No Groundwater Encountered | |
| | | | | 10 | | | | |
| | | | | 15 | | | | |

FIGURE: B-4

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| | | | | | |
|---|---|---|---|---|---|
| PROJECT: | RANCH VIEW TERRACE, 8 LOTS | EXCAVATOR: | AJB | | |
| CTE JOB NO: | 10-14212G | EXCAVATION METHOD: | HAND AUGER | EXCAVATION DATE: | 3/30/2018 |
| LOGGED BY: | AJB | SAMPLING METHOD: | BULK | ELEVATION: | ~183 FEET |

# BORING LOG B-5

| Dry Density (pcf) | Moisture (%) | U.S.C.S. Symbol | Graphic Log | Depth (Feet) | Sample Type: Bulk | Sample Type: Driven | DESCRIPTION | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|
| | | SM | | 0 | | | **QUATERNARY YOUNG ALLUVIAL FLOOD PLAIN DEPOSITS:** Loose, slightly moist, yellowish brown, silty fine grained SAND, friable. | |
| | | | | 5 | | | Total Depth: 5.0'<br>No Groundwater Encountered | |
| | | | | 10 | | | | |
| | | | | 15 | | | | |

FIGURE: B-5

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| | | | | | |
|---|---|---|---|---|---|
| PROJECT: | RANCH VIEW TERRACE, 8 LOTS | EXCAVATOR: | AJB | | |
| CTE JOB NO: | 10-14212G | EXCAVATION METHOD: | HAND AUGER | EXCAVATION DATE: | 3/30/2018 |
| LOGGED BY: | AJB | SAMPLING METHOD: | BULK | ELEVATION: | ~195 FEET |

# BORING LOG B-6

| Dry Density (pcf) | Moisture (%) | U.S.C.S. Symbol | Graphic Log | Depth (Feet) | Sample Type: Bulk | Sample Type: Driven | DESCRIPTION | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|
| | | SM | | 0 | | | **QUATERNARY YOUNG ALLUVIAL FLOOD PLAIN DEPOSITS:** Loose, slightly moist, yellowish brown, silty fine grained SAND, friable. | |
| | | | | 5 | | | Total Depth: 5.0'<br>No Groundwater Encountered | |
| | | | | 10 | | | | |
| | | | | 15 | | | | |

FIGURE: B-6

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| | | | | | |
|---|---|---|---|---|---|
| PROJECT: | RANCH VIEW TERRACE, 8 LOTS | EXCAVATOR: | AJB | | |
| CTE JOB NO: | 10-14212G | EXCAVATION METHOD: | HAND AUGER | EXCAVATION DATE: | 3/30/2018 |
| LOGGED BY: | AJB | SAMPLING METHOD: | BULK | ELEVATION: | ~212 FEET |

# BORING LOG B-7

| Dry Density (pcf) | Moisture (%) | U.S.C.S. Symbol | Graphic Log | Depth (Feet) | Sample Type: Bulk | Sample Type: Driven | DESCRIPTION | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|
| | | SM "SM" | | 0 | | | **RESIDUAL SOIL:** Loose to medium dense, moist, reddish brown, silty fine graiend SAND, oxidized. | |
| | | | | 5 | | | **TERTIARY TORREY SANDSTONE:** Dense to very dense, slightly moist, light yellowish brown, silty fine grained SANDSTONE with trace gravel, oxidized interbeds. | |
| | | | | 10 | | | Total Depth: 3.0' (Refusal on gravel)<br>No Groundwater Encountered | |
| | | | | 15 | | | | |

FIGURE: B-7

# ATTACHMENT C

# LABORATORY RESULTS

# ATTACHMENT 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.

### Chemical Analysis

Soil materials were collected and tested for Sulfate and Chloride content, pH, and Resistivity.

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## SULFATE

CALIFORNIA TEST 417

| LOCATION | DEPTH (feet) | RESULTS ppm |
|---|---|---|
| B-1 | 0-9.25 | 14.2 |

## CHLORIDE

CALIFORNIA TEST 422

| LOCATION | DEPTH (feet) | RESULTS ppm |
|---|---|---|
| B-1 | 0-9.25 | 81 |

## p.H.

CALIFORNIA TEST 643

| LOCATION | DEPTH (feet) | RESULTS |
|---|---|---|
| B-1 | 0-9.25 | 7.31 |

## RESISTIVITY

CALIFORNIA TEST 643

| LOCATION | DEPTH (feet) | RESULTS ohms-cm |
|---|---|---|
| B-1 | 0-9.25 | 2455 |

ATTACHMENT 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

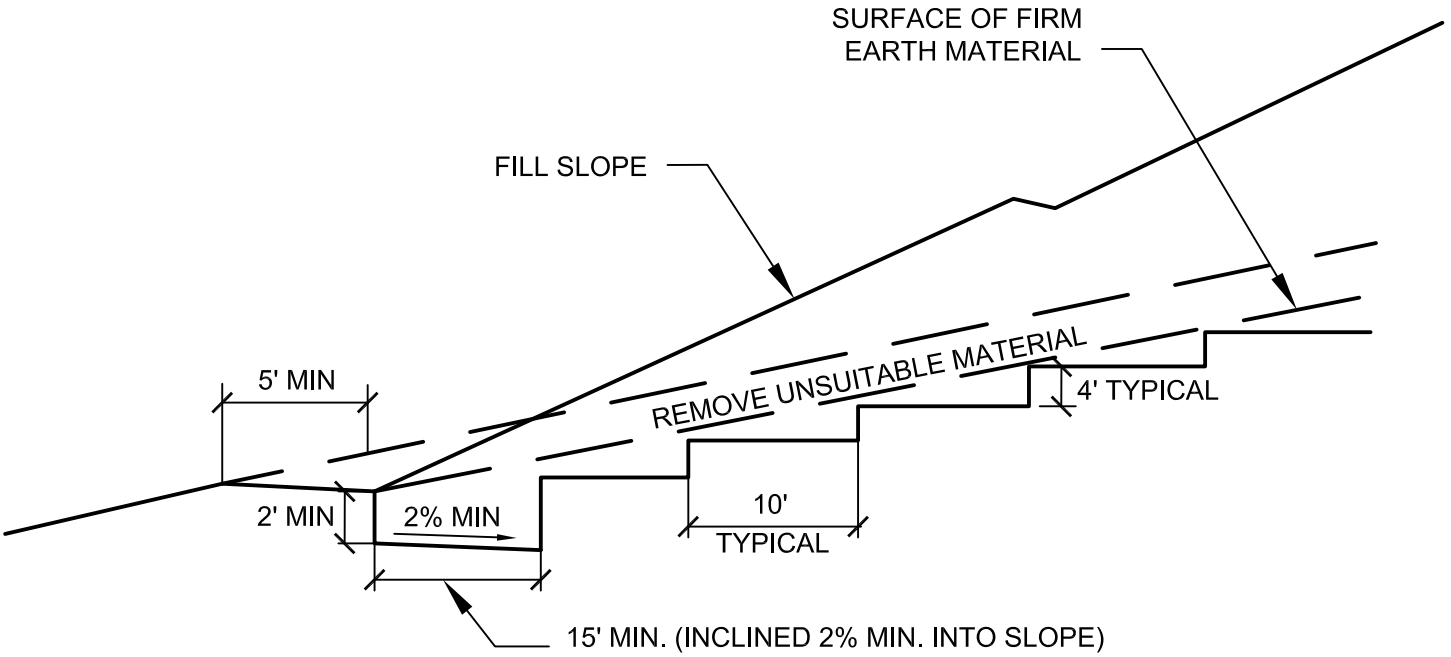
As a precautionary measure, plastic sheeting should be readily available, or kept on hand, to protect all slope areas from saturation by periods of heavy or prolonged rainfall. This measure is strongly recommended, beginning with the period prior to landscape planting.

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.

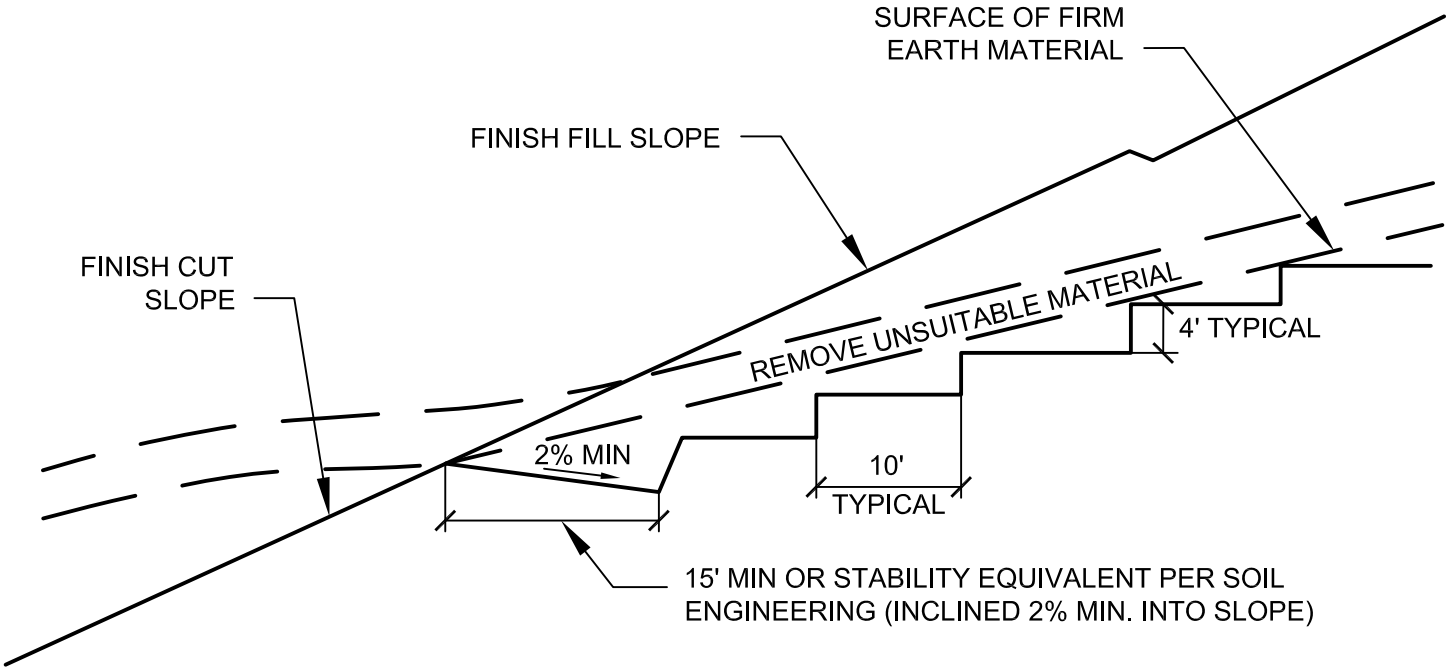
If slope failures occur as a result of exposure to period of heavy rainfall, the failure areas and currently unaffected areas should be covered with plastic sheeting to protect against additional saturation.

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

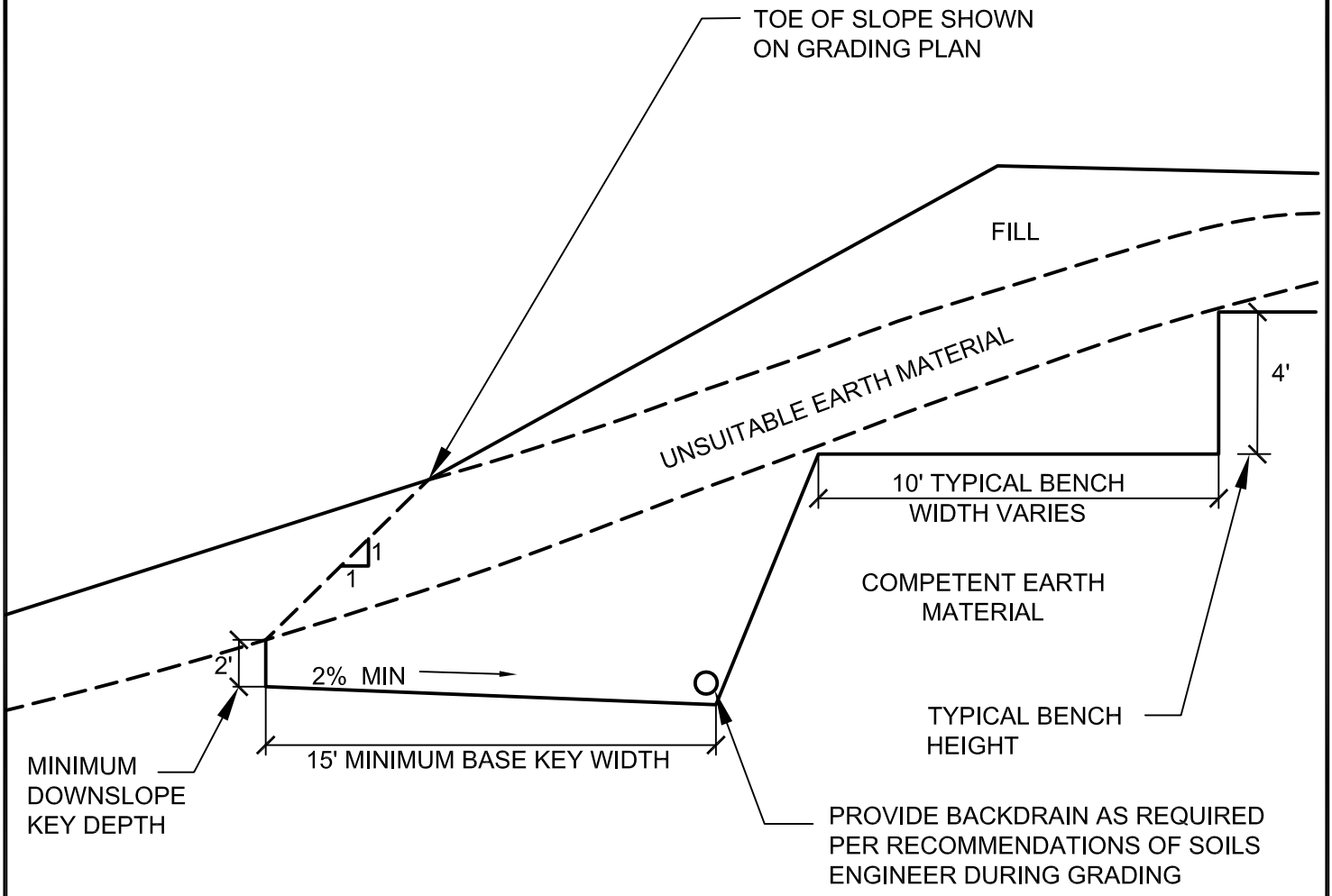



## BENCHING FILL OVER CUT




NOT TO SCALE

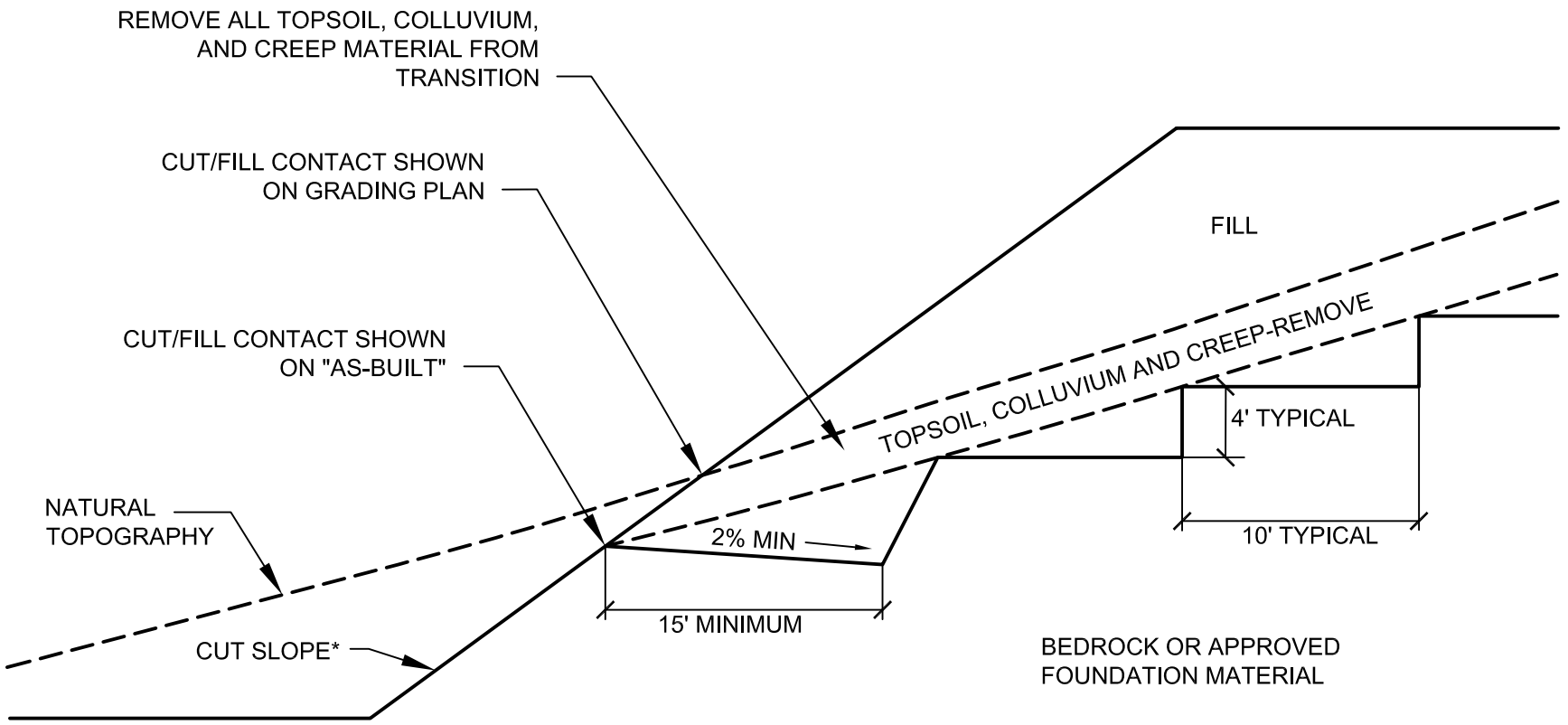
# BENCHING FOR COMPACTED FILL DETAIL




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

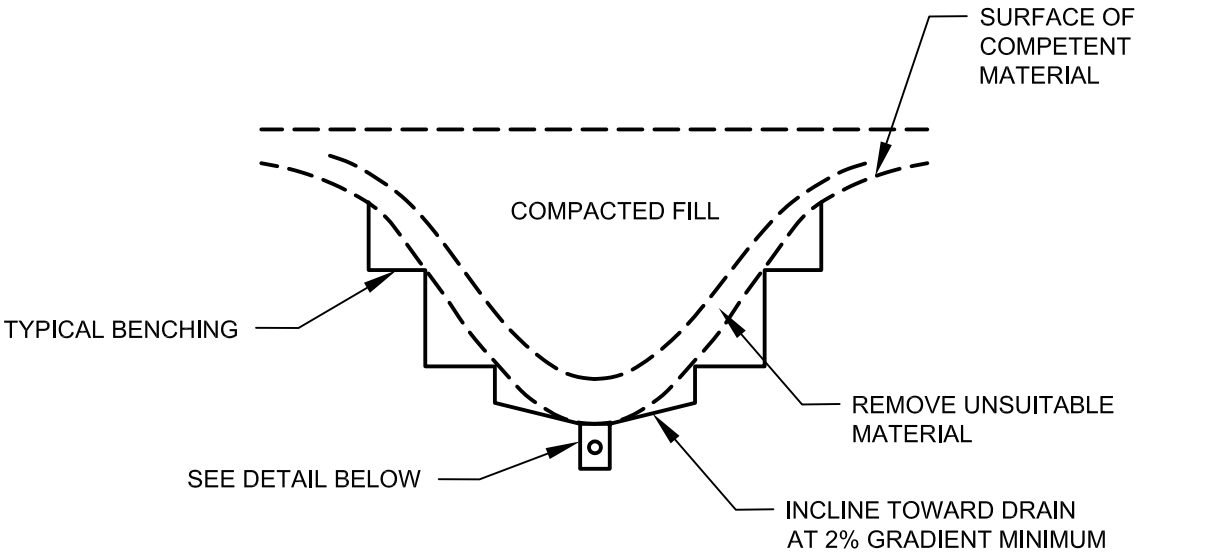
# FILL SLOPE ABOVE NATURAL GROUND DETAIL



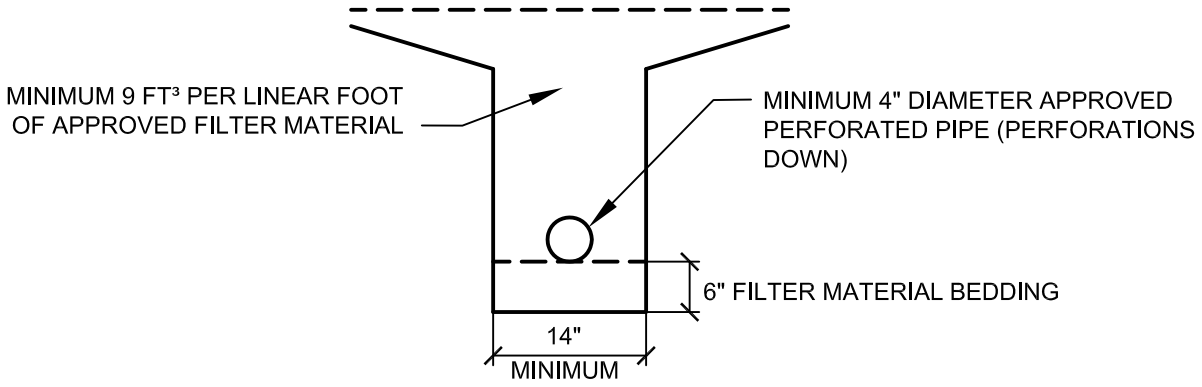

*NOTE: CUT SLOPE PORTION SHOULD BE MADE PRIOR TO PLACEMENT OF FILL

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

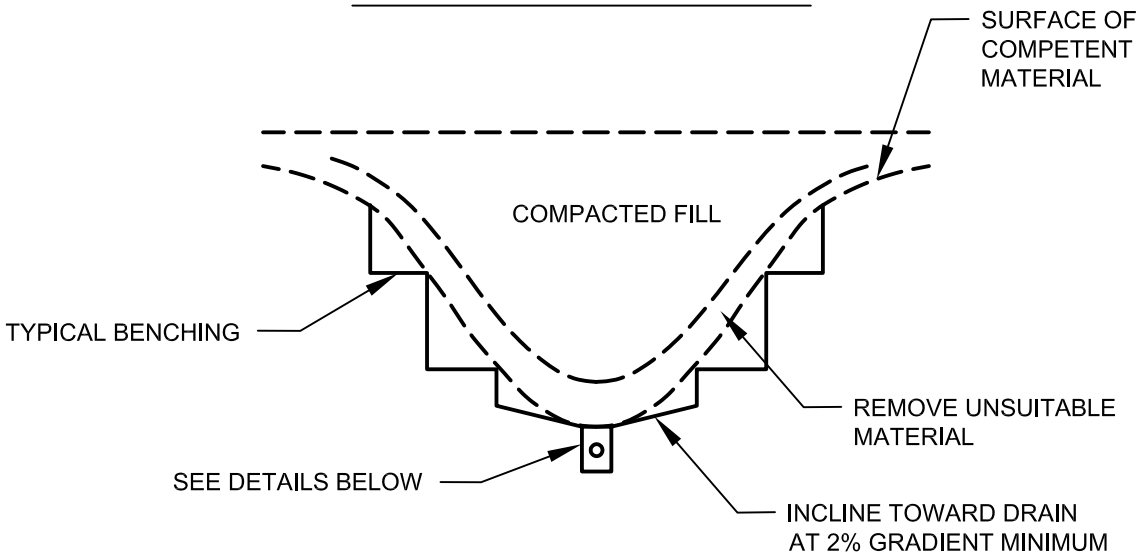
PIPE DIAMETER TO MEET THE FOLLOWING CRITERIA, SUBJECT TO FIELD REVIEW BASED ON ACTUAL GEOTECHNICAL CONDITIONS ENCOUNTERED DURING GRADING

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

NOT TO SCALE

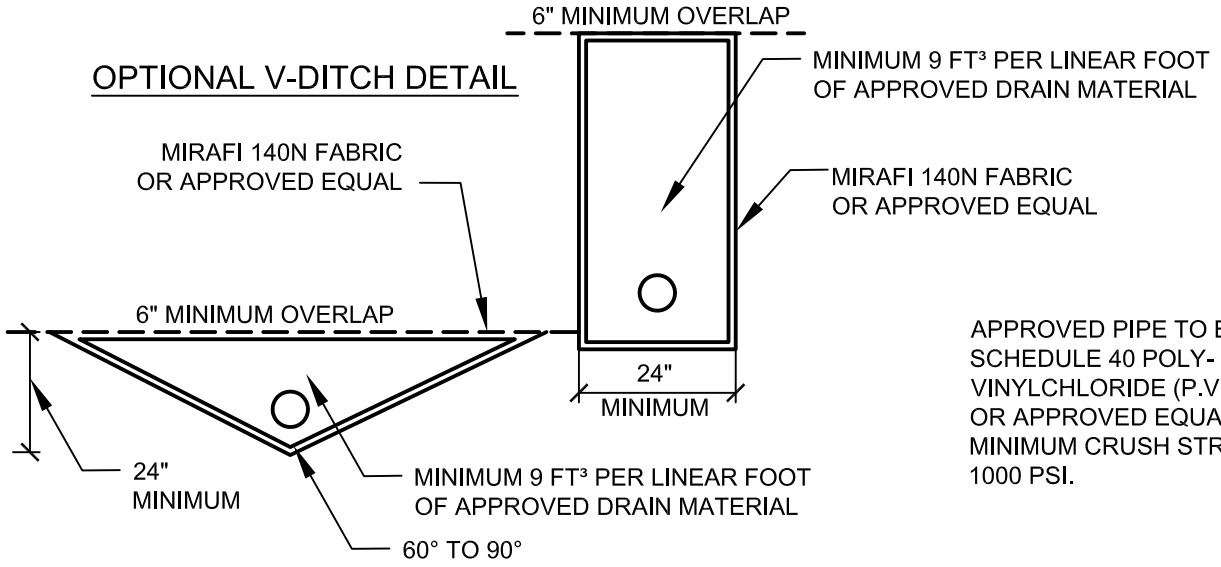
# TYPICAL CANYON SUBDRAIN DETAIL

## 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 |

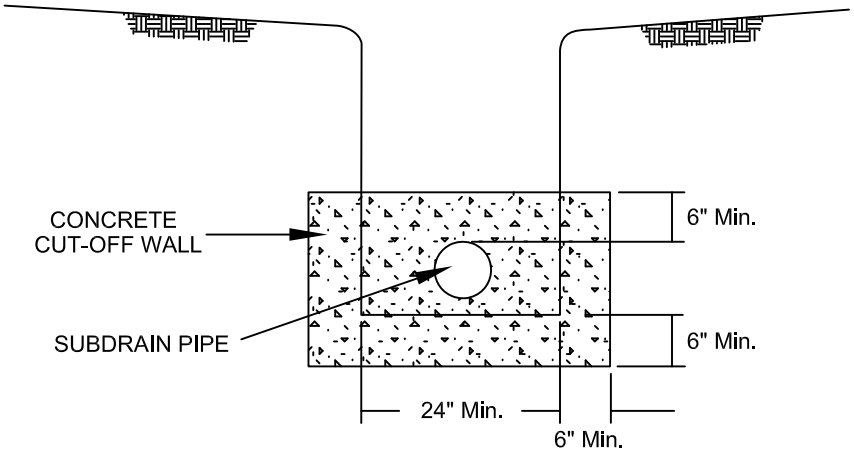
PIPE DIAMETER TO MEET THE FOLLOWING CRITERIA, SUBJECT TO FIELD REVIEW BASED ON ACTUAL GEOTECHNICAL CONDITIONS ENCOUNTERED DURING GRADING

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

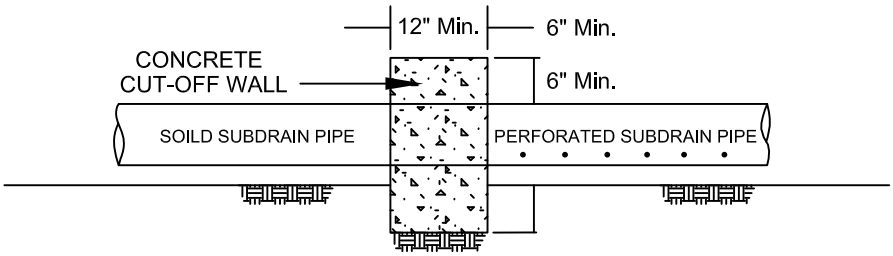
NOT TO SCALE

# GEOFABRIC SUBDRAIN

FRONT VIEW



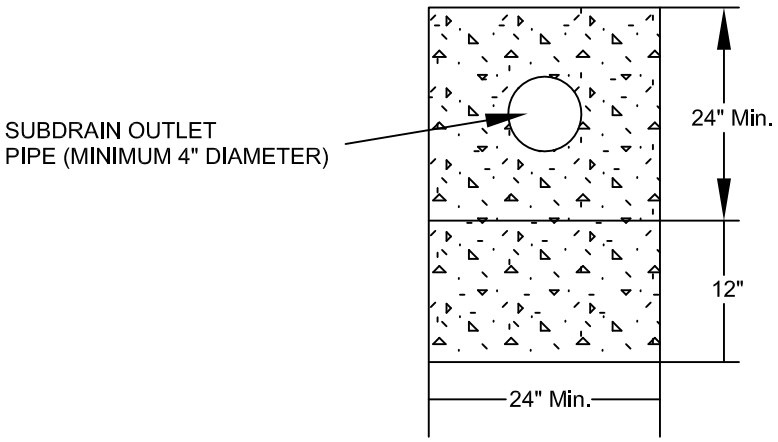

SIDE VIEW



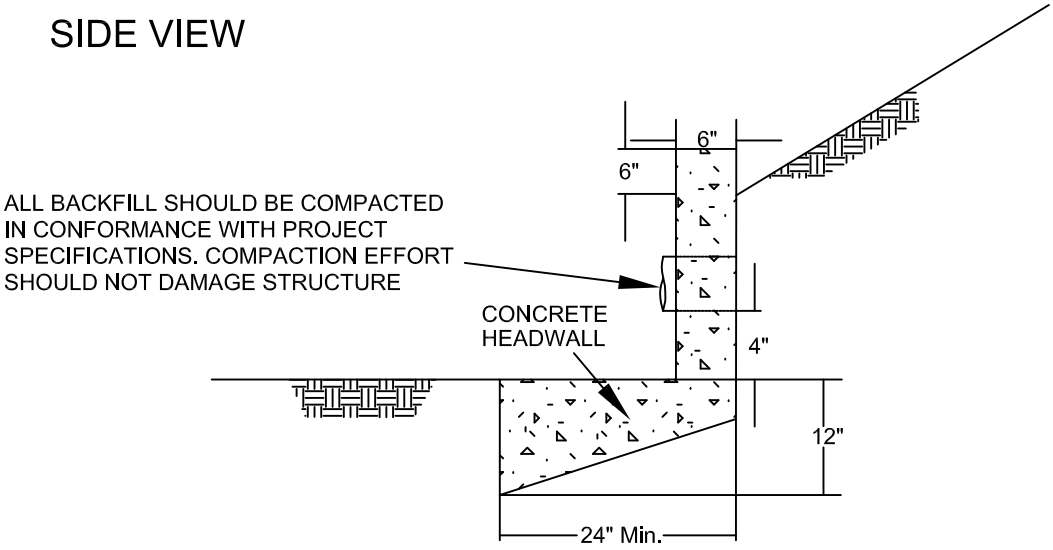

NOT TO SCALE

# RECOMMENDED SUBDRAIN CUT-OFF WALL

## FRONT VIEW




## SIDE VIEW



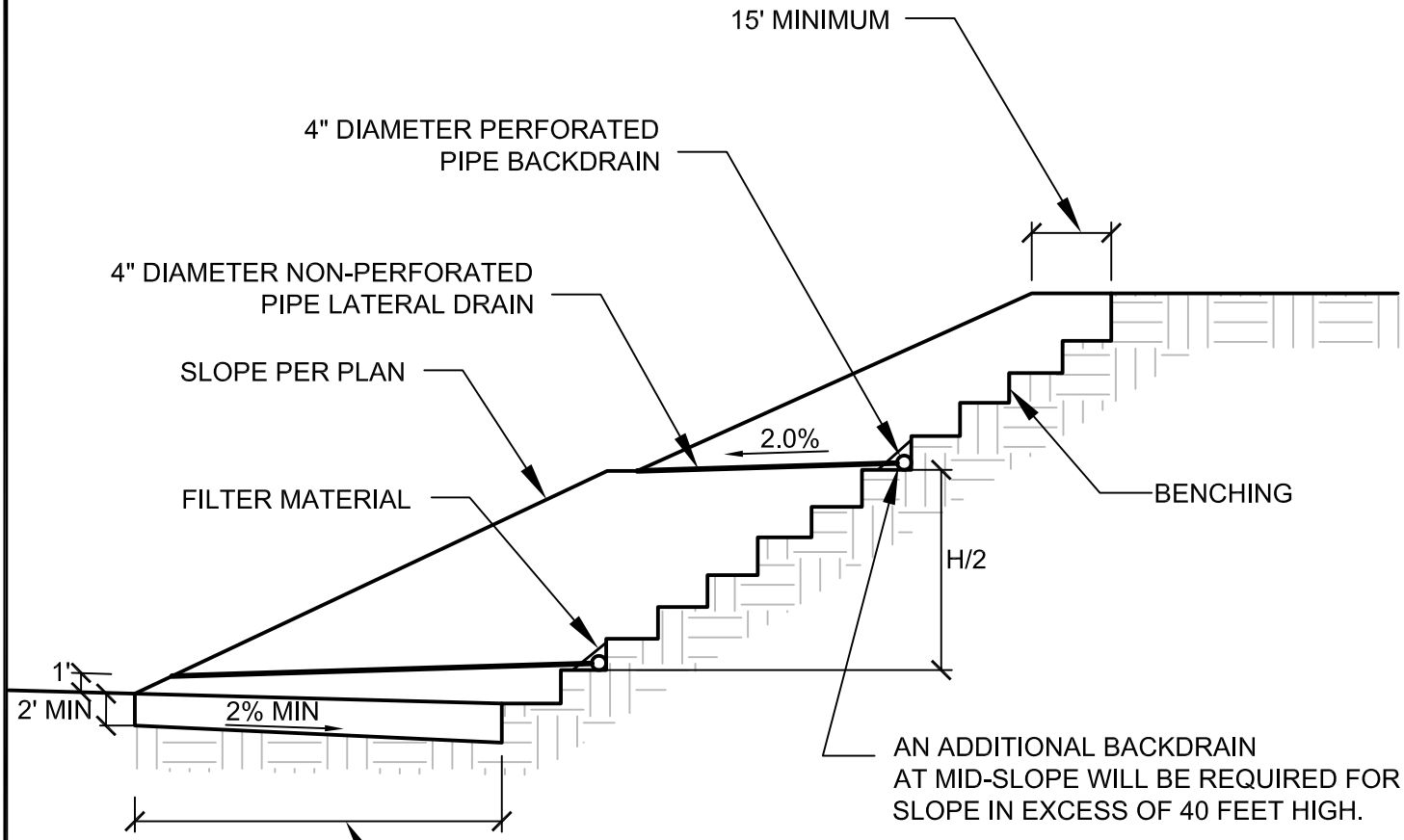

NOTE: HEADWALL SHOULD OUTLET AT TOE OF SLOPE
OR INTO CONTROLLED SURFACE DRAINAGE DEVICE

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

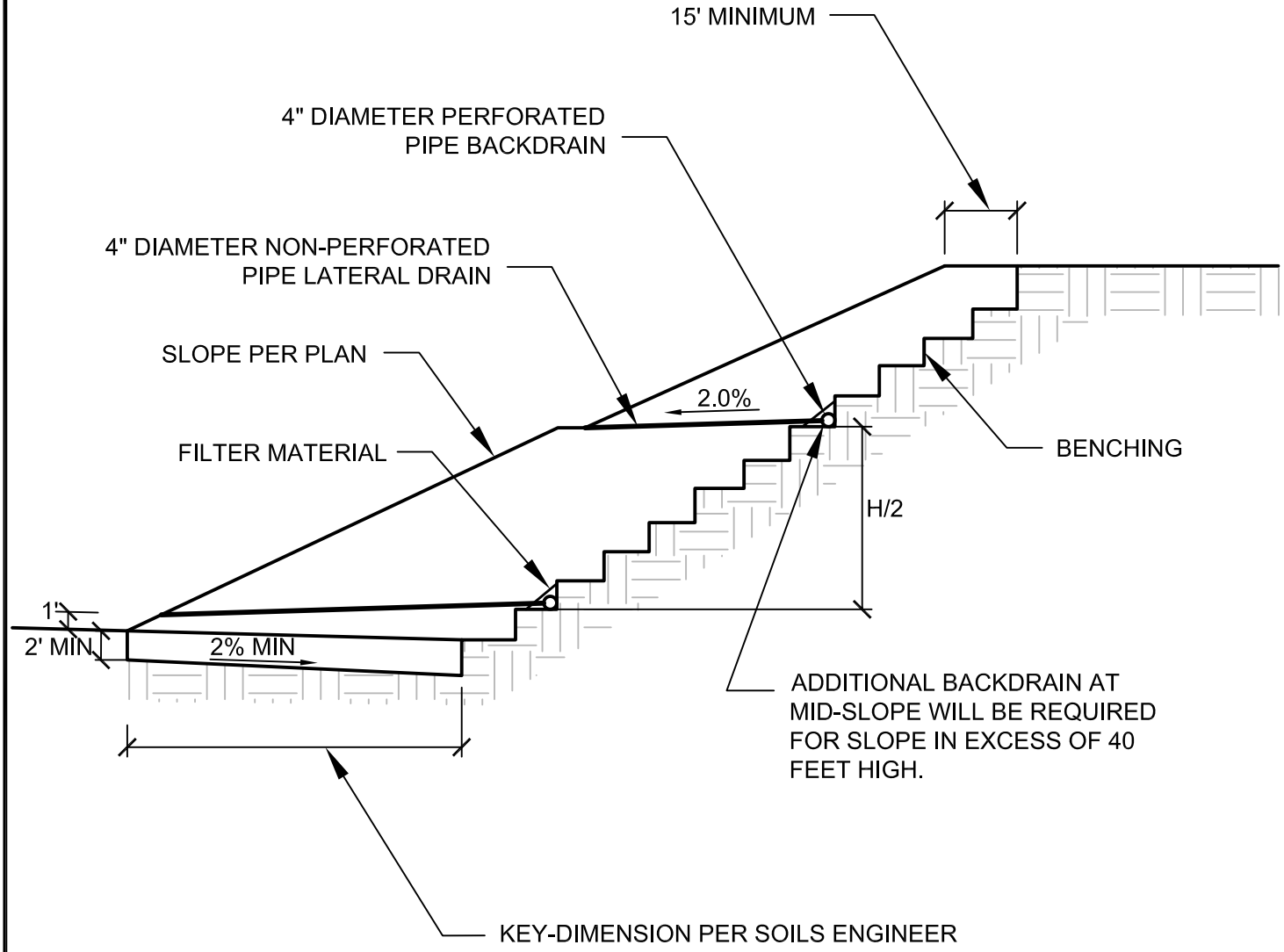
# TYPICAL SUBDRAIN OUTLET HEADWALL DETAIL




DIMENSIONS ARE MINIMUM RECOMMENDED

NOT TO SCALE

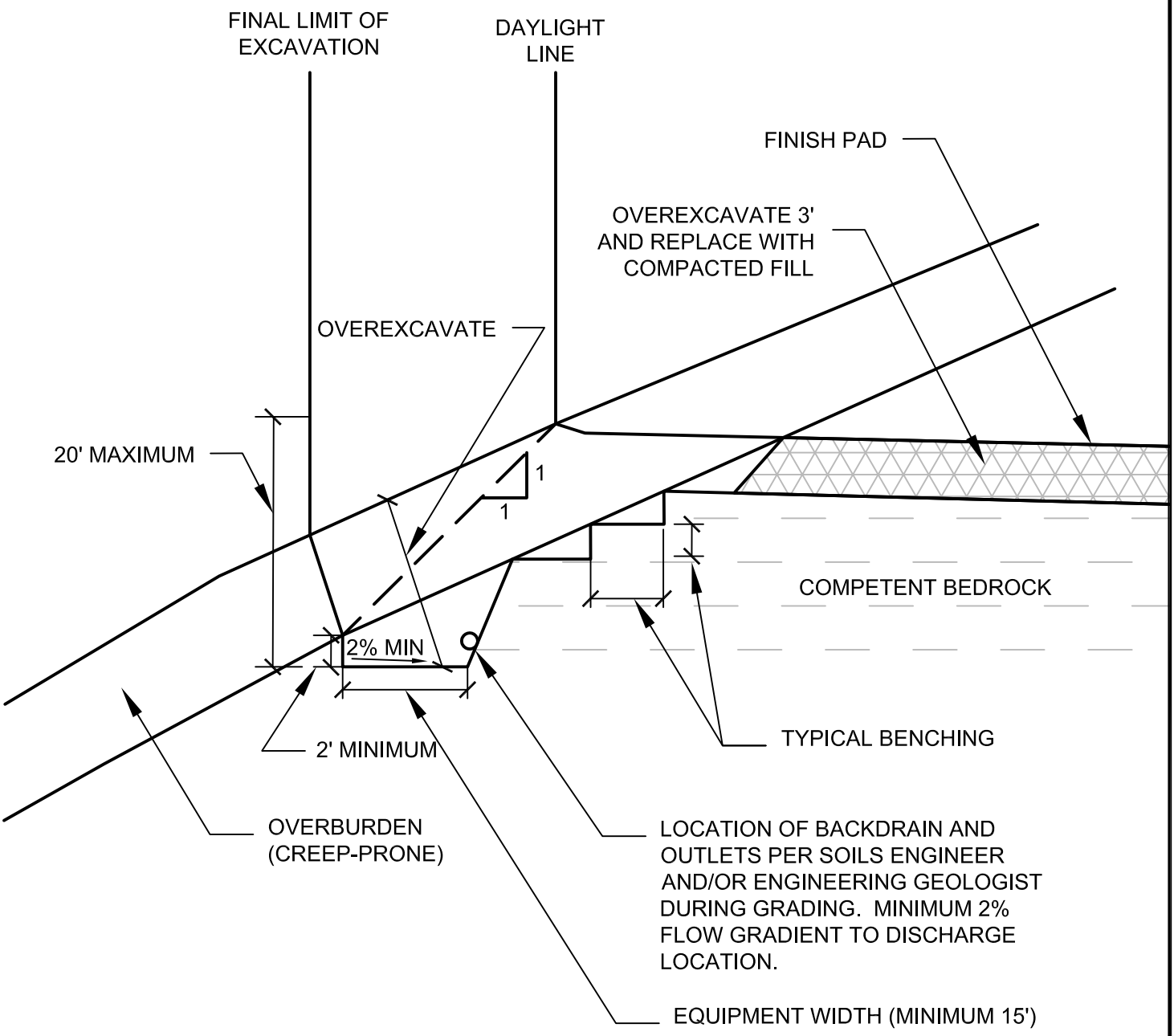
# TYPICAL SLOPE STABILIZATION FILL DETAIL




DIMENSIONS ARE MINIMUM RECOMMENDED

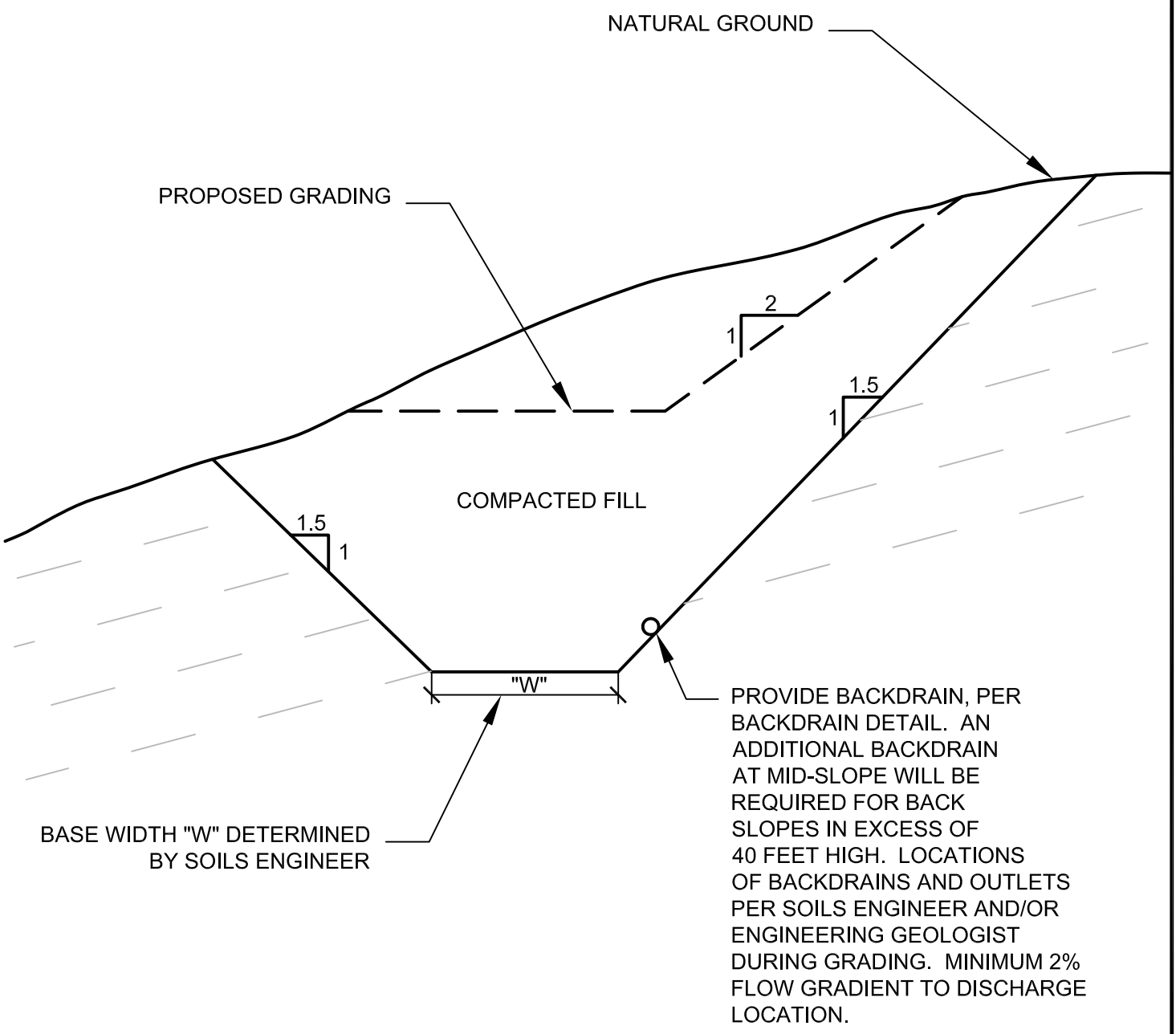
NOT TO SCALE

# TYPICAL BUTTRESS FILL DETAIL



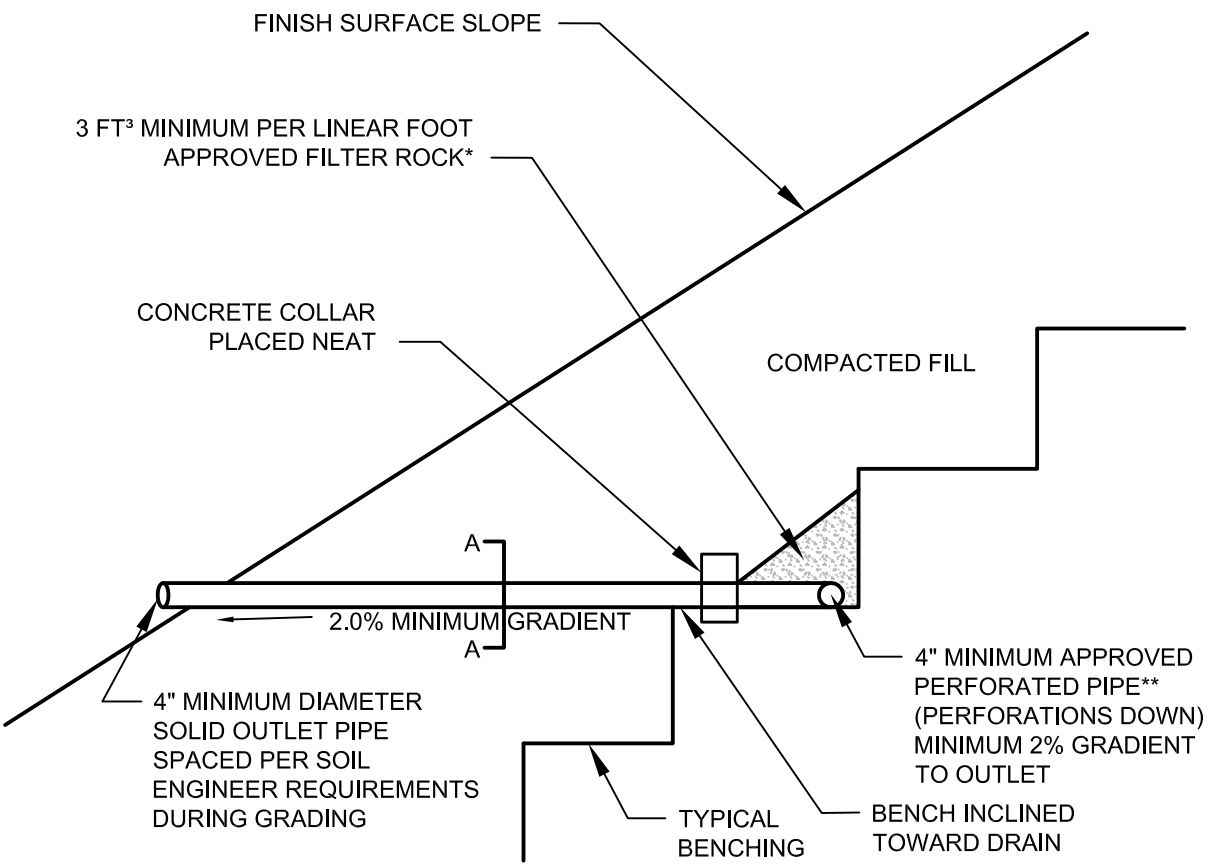

NOT TO SCALE

# DAYLIGHT SHEAR KEY DETAIL

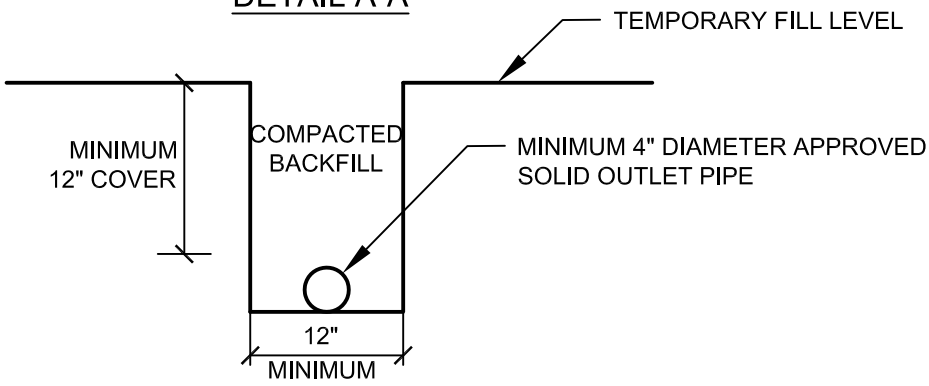



NOT TO SCALE

# TYPICAL SHEAR KEY DETAIL




DETAIL A-A



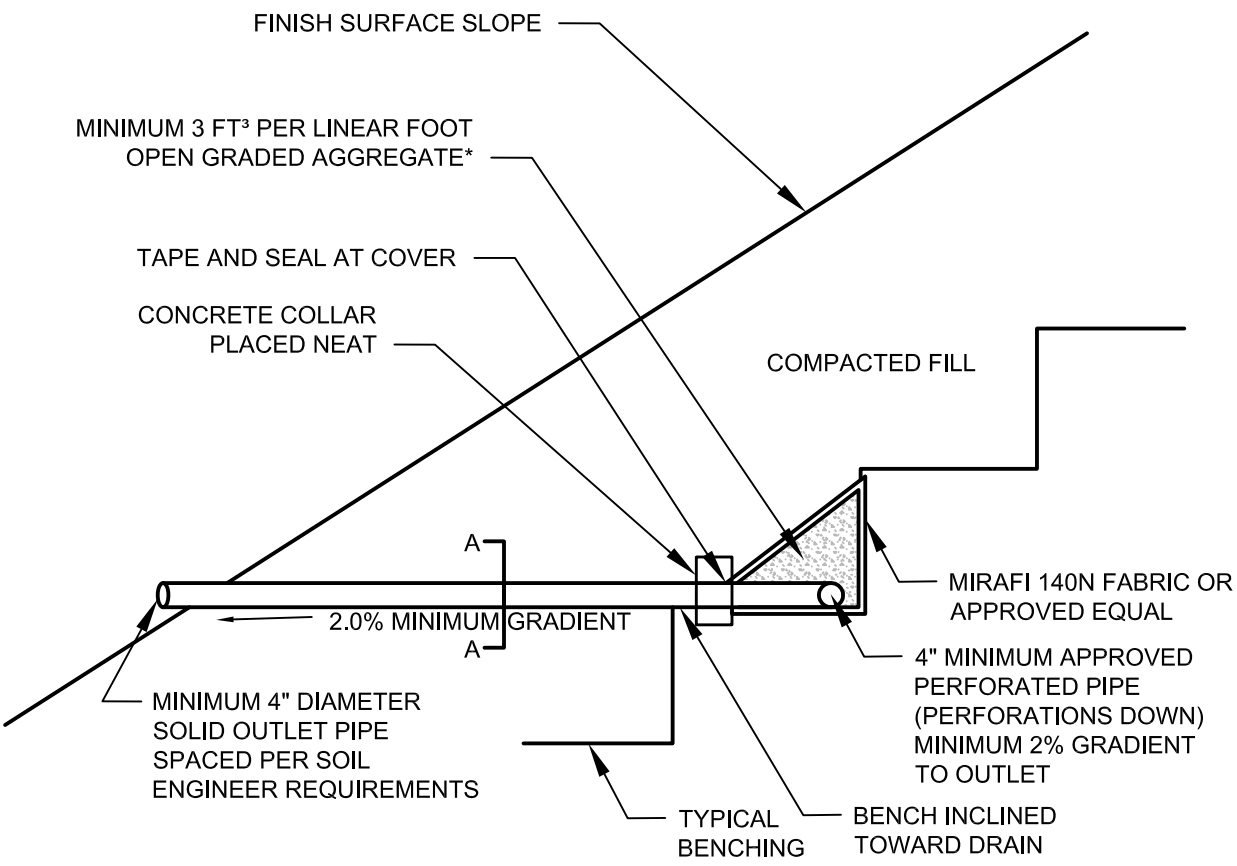

**APPROVED PIPE TYPE:
SCHEDULE 40 POLYVINYL CHLORIDE
(P.V.C.) OR APPROVED EQUAL.
MINIMUM CRUSH STRENGTH 1000 PSI

*FILTER ROCK TO MEET FOLLOWING
SPECIFICATIONS OR APPROVED EQUAL:

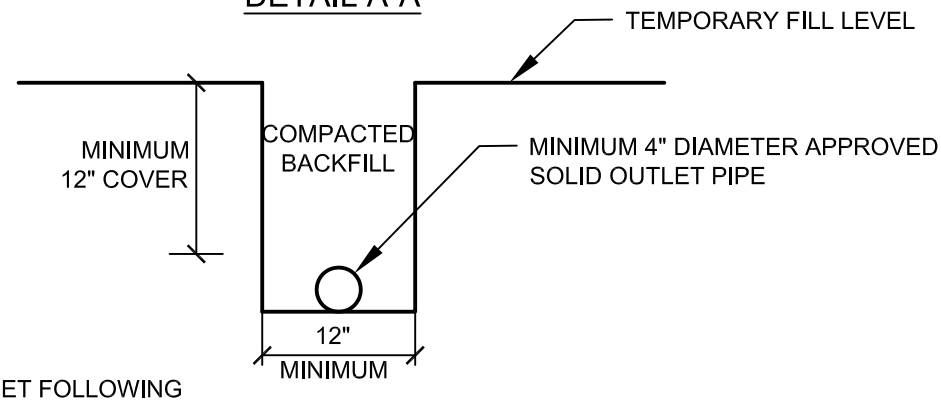
| SIEVE SIZE | PERCENTAGE PASSING |
|---|---|
| 1" | 100 |
| ¾" | 90-100 |
| ⅜" | 40-100 |
| NO. 4 | 25-40 |
| NO. 30 | 5-15 |
| NO. 50 | 0-7 |
| NO. 200 | 0-3 |

NOT TO SCALE

# TYPICAL BACKDRAIN DETAIL




## DETAIL A-A

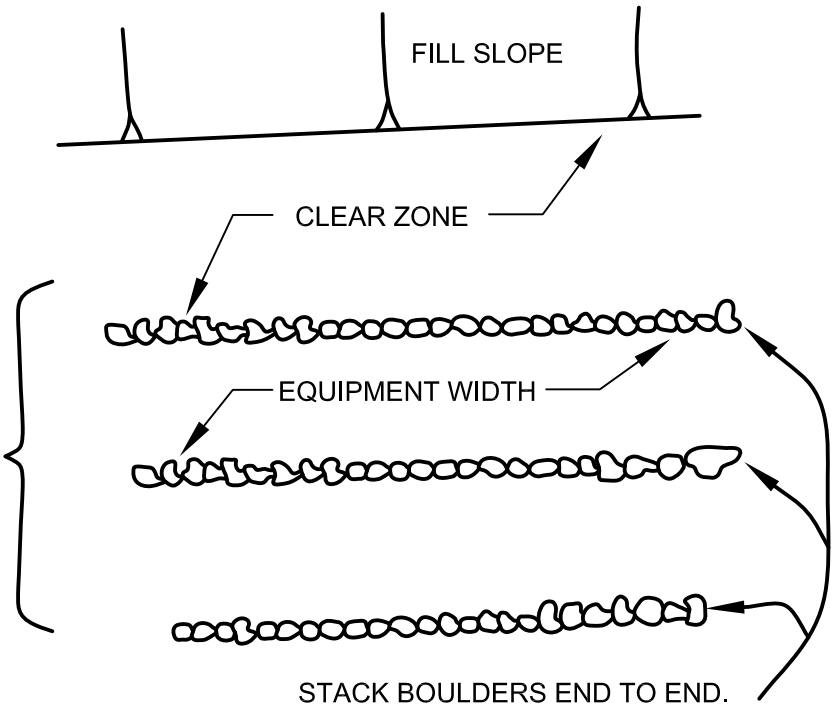



*NOTE: AGGREGATE TO MEET FOLLOWING SPECIFICATIONS OR APPROVED EQUAL:

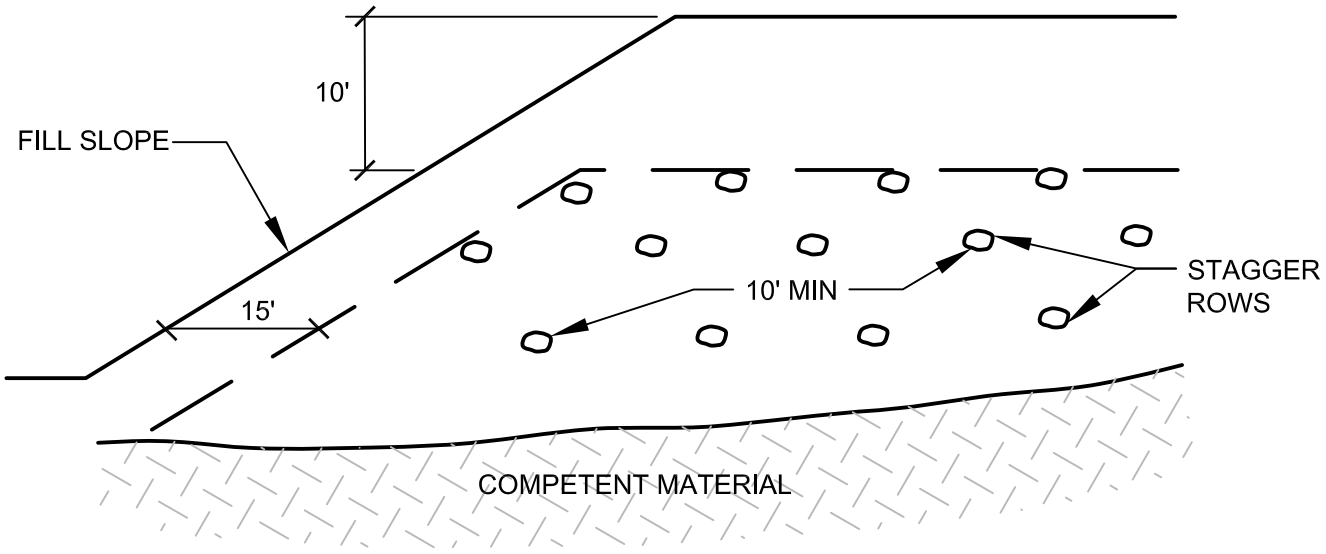
| SIEVE SIZE | PERCENTAGE PASSING |
|---|---|
| 1 ½" | 100 |
| 1" | 5-40 |
| ¾" | 0-17 |
| ⅜" | 0-7 |
| NO. 200 | 0-3 |

NOT TO SCALE

# BACKDRAIN DETAIL (GEOFRABIC)

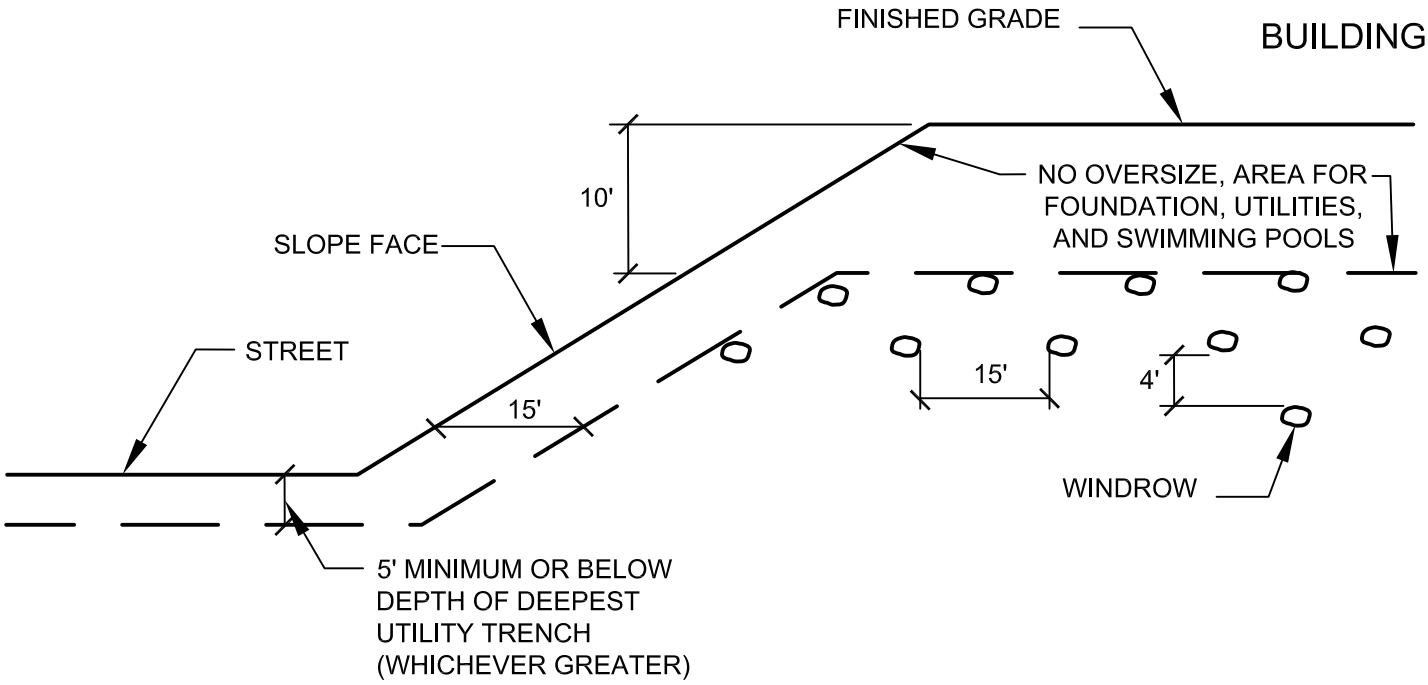



SOIL SHALL BE PUSHED OVER ROCKS AND FLOODED INTO VOIDS. COMPACT AROUND AND OVER EACH WINDROW.

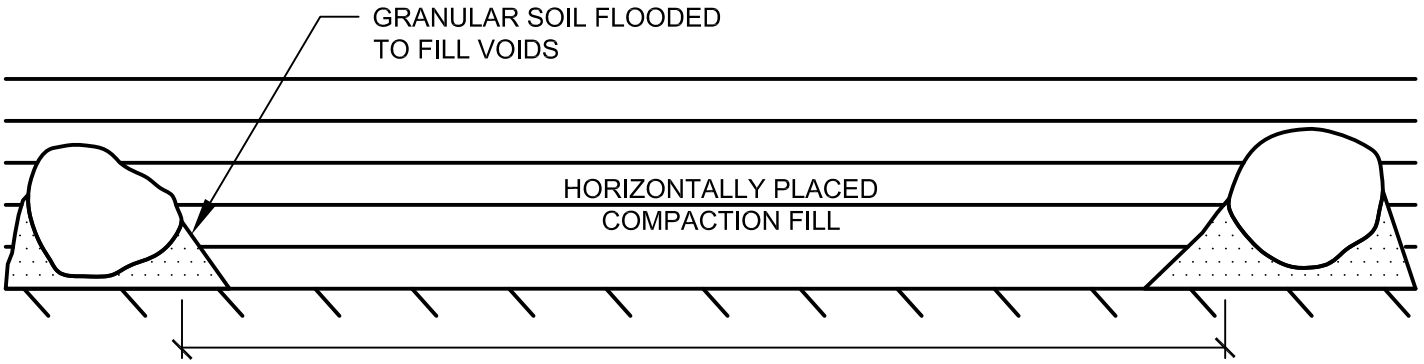



NOT TO SCALE

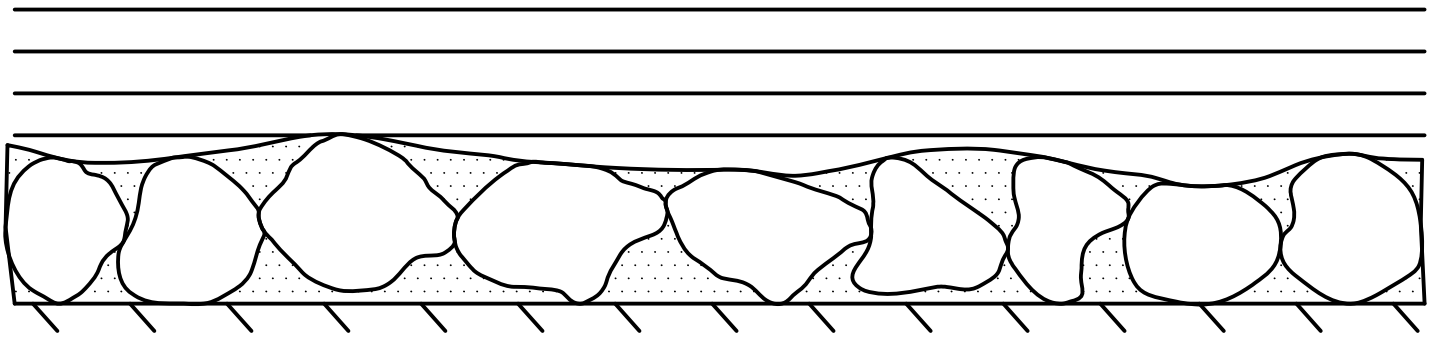
# ROCK DISPOSAL DETAIL




TYPICAL WINDROW DETAIL (EDGE VIEW)




PROFILE VIEW

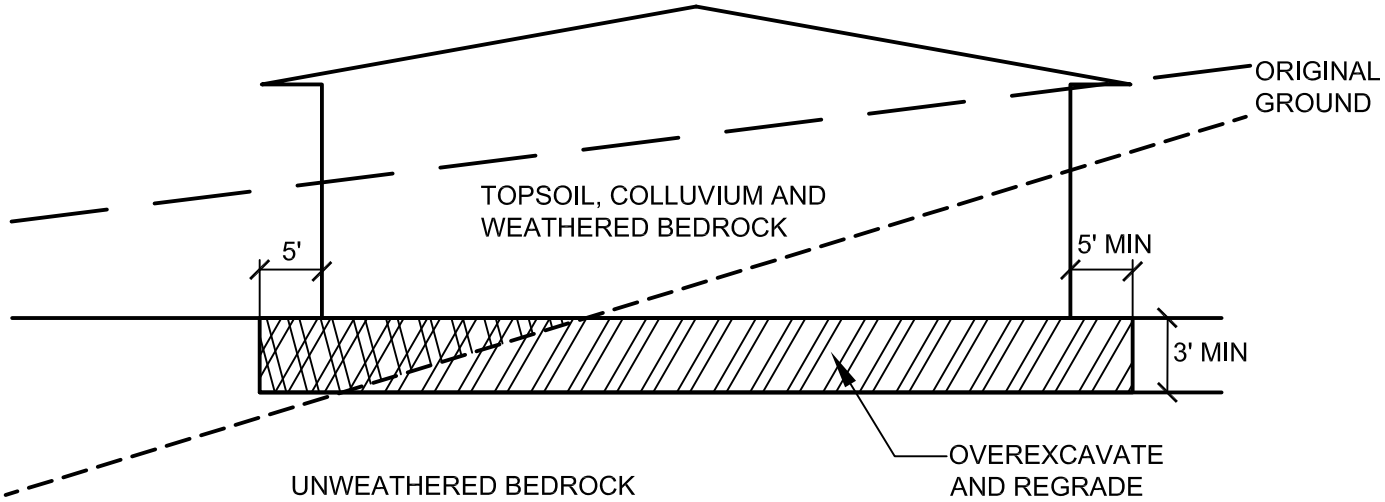


NOT TO SCALE

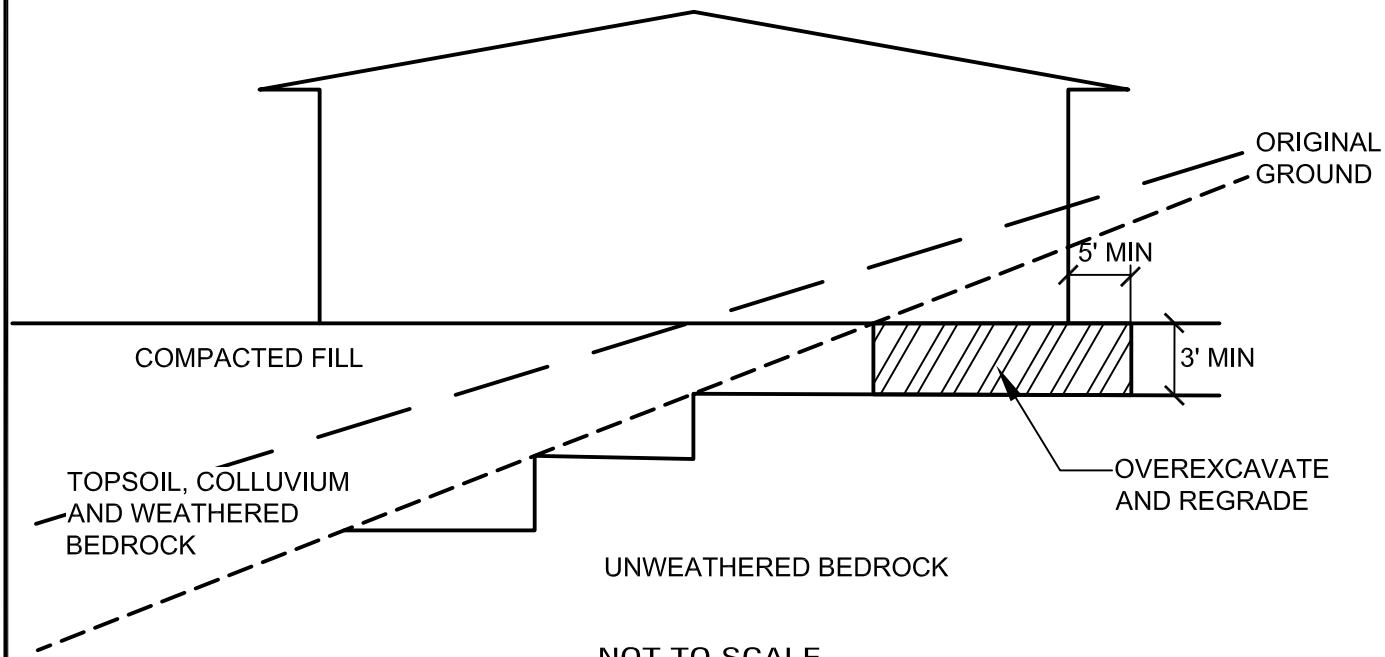
# ROCK DISPOSAL DETAIL

GENERAL GRADING RECOMMENDATIONS

CUT LOT




CUT/FILL LOT (TRANSITION)




NOT TO SCALE

# TRANSITION LOT DETAIL

August 19, 2019 CTE Job No. 10-14212G

Olivenhain Hills LLC
Attention: Mr. Udi Melamed
745 Cole Ranch Road
Encinitas, California 92024
Telephone: (760) 299-3344 Via Email: udi@ermdevelopment.com

Subject: Response to City of Encinitas Comments
Proposed 9 Lot Subdivision (The Sanctuary)
Ranch View Terrace
Encinitas, California

References: At end of document

Mr. Melamed:

As requested, Construction Testing & Engineering, Inc. (CTE) provides the following response to the referenced comments from the City of Encinitas.

## ATTACHMENT C COMMENTS & RESPONSES

**City Comment #7** of Attachment C "Engineering (Grading, Storm Water, ETC.) Comments" from the City of Encinitas states "Provide an update soils report based on the currently proposed project with adequate sampling at relevant locations. The previous report was based on the previous project and took sampling in key locations relevant to the previous project."

**CTE Response # 7:** Based on review of the revised project plans, the structural improvements are concentrated in the eastern portion of the site. This portion of the site was adequately mapped and evaluated due to numerous formational exposures combined with explorations and evaluation of geomorphology. The recommendations provided in the referenced geotechnical documents are suitable for the new location of the proposed improvements. A revised Figure 2 Exploration Location Map is provided herewith.

**City Comment #9** of Attachment C "Engineering (Grading, Storm Water, ETC.) Comments" from the City of Encinitas states "The SWQMP references that percolation testing was conducted. Provide percolation testing consistent with the Encinitas BMP Design Manual standards in the location and depth of the proposed bioretention basins. Due to the adverse drainage condition and lack of stormdrain system, perc testing should extend deeper to find a permeable layer for infiltration if not found at a shallow depth."

**CTE Response #9:** Please see CTE Response #3 in Attachment F Comments & Responses section herein.

## ATTACHMENT F COMMENTS & RESPONSES

**City Comment #2** of Attachment F "Geotechnical Comments" from the City of Encinitas states "In the "Limited Geotechnical Investigation and Update Report" it is not made clear that all "Quaternary Young Alluvial Flood Plain Deposits" should be removed and replaced as compacted fill as recommended by the original geotechnical report for the project. These deposits are loose, compressible and have a potential for settlement under additional loads and for hydro consolidation. Hydro consolidation was not addressed in either geotechnical report. The recommended site preparation is not accepted without additional justification through laboratory testing (consolidation testing, in-place density testing, etc.)."

**CTE Response #2:** As stated previously (CTE, 2018 & 2019), CTE's site preparation recommendations in the referenced geotechnical update letter (Section 1.0) for foundations in engineered fill is "existing soils should be excavated to a minimum depth of 36 inches below the bottom of proposed foundations, or to the depth of dense formational material, whichever is greatest." Later in Section 1.0 CTE defines formational materials as Tertiary Torrey Sandstone (Tt) and Tertiary Del Mar Formation (Td). CTE also defines, in Section 1.0, materials requiring overexcavation and backfill with engineered fill as Quaternary Young Alluvium (Qya) and Quaternary Previously Placed Fill (Qppf). Therefore, CTE's aforementioned recommendation for foundations in engineered fill should be interpreted as recommending for, at a minimum, the full depth removal of Qya and Qppf materials. These recommended removals should occur within the footprint of structures (and a minimum lateral distance of five feet) and other distress sensitive improvements.

**City Comment #3** of Attachment F "Geotechnical Comments" from the City of Encinitas states "The Tentative Map for the project shows a bioretention basin in the southern portions of lot 5 and lot 2. The percolation tests P-2 through P-4 (Area of Bioretention basin Area) and P-5 (permeable Paver Area) indicates that the soils do not have a percolation rate suitable for infiltration. These areas also do not meet the city requirements for partial infiltration. Were these facts taken into account for the basin design and does it meet City of Encinitas requirements?

**CTE Response #3:** Based on the City of Encinitas comments provided in the 2nd Review Cycle Comments, CTE performed additional percolation testing to help verify infiltration characteristics at the revised proposed stormwater infiltration locations. Revised proposed infiltration locations include a stormwater retention basin in the northeast corner of the site (near the proposed entrance driveway) and another along the southern property line (PL) of the site, as shown in the revised Figure 2 provided herewith. Updated percolation testing results and a revised Worksheet C.4-1 are provided in Attachment A. An updated summary table is provided herein as Table 1.

TABLE 1

SUMMARY OF RESULTS OF PERCOLATION TESTING WITH FACTOR OF SAFETY APPLIED

| Test Location | Test Depth (inches) | Case | Soil Type* (USCS Classification) | Percolation Rate (inches per hour) | Infiltration Rate (inches per hour) | Infiltration Rate with FOS of 2 Applied (inches per hour) |
|---|---|---|---|---|---|---|
| P-1 | 39.8 | I | Qya | 1.625 | 0.272 | 0.136 |
| P-2 | 62.3 | I | Qya | 0.625 | 0.093 | 0.047 |
| P-3 | 36.3 | I | Td | 0.125 | 0.018 | 0.009 |
| P-4 | 54.0 | I | Td | 0.500 | 0.091 | 0.045 |
| P-5 | 62.5 | I | Tt | 0.500 | 0.077 | 0.039 |
| P-6 | 105.0 | I | Qya/Tt | 0.125 | 0.016 | 0.008 |
| P-7 | 64.0 | I | Qya | 2.625 | 0.430 | 0.215 |
| P-8 | 112.0 | I | Qya | 0.125 | 0.020 | 0.010 |

Based on percolation testing results to date, the Quaternary Young Alluvium (Qya) materials appear most suited for infiltration, however potentially suitable infiltration locations appear to be limited to the area west of percolation test P-1 and in the location of percolation tests P-6 and P-7. Both of the aforementioned areas appear suitable for partial infiltration. Tertiary Torrey Sandstone Formation (Tt) and Tertiary Del Mar Formation (Td) materials do not appear favorable for infiltration, and favorability is not anticipated to increase with depth due to the anticipated increasing density of these materials with depth.

For the proposed stormwater basin along the southern PL of the property (characterized by percolation tests P-1 to P-4 & P-8), due to its proximity to the PL and the presence of down-gradient properties, CTE recommends that the basin be fully lined with an impermeable liner and infiltrate be collected via subdrain and discharged to a suitable offsite location. For the proposed stormwater basin in the northeastern portion of the property, partial infiltration appears suitable. As such, CTE generally recommends that the sides of the basin be lined with an impermeable liner (with the bottom of basin left open) and an appropriate emergency overflow drain installed. The lining should extend to the maximum depth of utility trench bottoms, toe of slope elevation (if slopes are proposed), and foundation excavations within 100 feet of the proposed basin.

This letter is subject to the same limitations as other CTE geotechnical documents issued for this project.

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

Respectfully submitted,

CONSTRUCTION TESTING & ENGINEERING, INC.



Colm J. Kenny, RCE #84406
Senior Engineer

Jay F. Lynch, CEG #1890
Principal Engineering Geologist

CJK/JFL/AJB:cjk

ATTACHMENTS

Figure 2 Exploration Location Map (Revised)

Attachment A Percolation Test Data (Revised)

References:

City of Encinitas 2nd Review Cycle Comments
Case No. 18-198 TM/DR
Dated July 23, 2019

Percolation Test Results and Infiltration Rates
Proposed 8 Lot Subdivision
Ranch View Terrace
Encinitas, California
CTE Job No. 10-14212G, dated June 21, 2018

Limited Geotechnical Investigation and Update Report
Proposed 8 Lot Subdivision
Ranch View Terrace, Encinitas, California
CTE Job No. 10-14212G, dated April 20, 2018

Preliminary Soil and Geotechnical Investigation
Proposed 13 Lot Subdivision
Ranch View Terrace
Encinitas California
MVE, Inc., Job #1534-87, dated December 30, 1987

## LEGEND

TP-1 — APPROXIMATE TEST PIT LOCATION (MV ENGINEERING, 1987)

B-1 — APPROXIMATE HAND AUGER BORING LOCATION (CTE 2018)

Tt — TERTIARY TORREY SANDSTONE

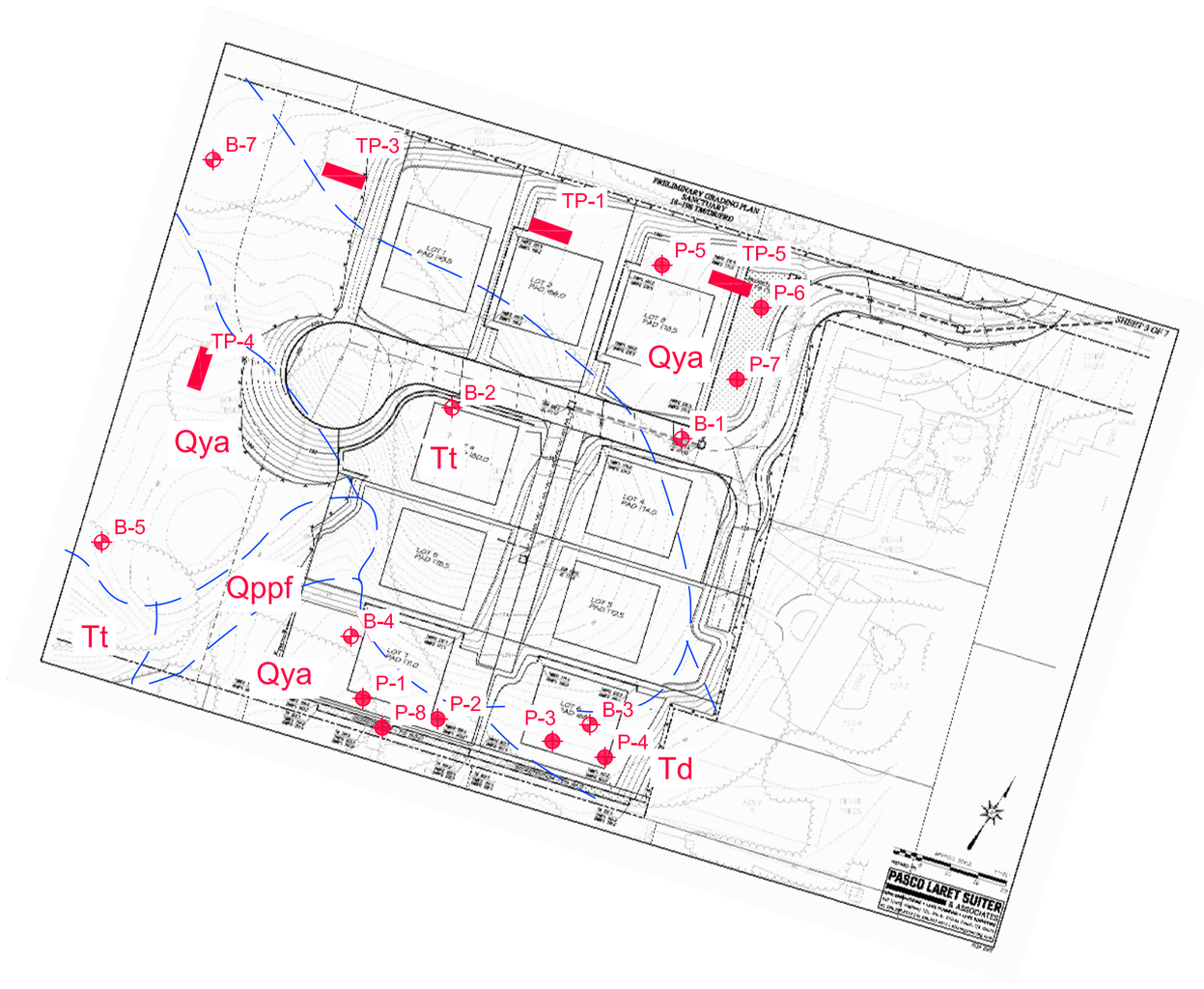
Td — TERTIARY DEL MAR FORMATION

Qya — QUATERNARY YOUNG ALLUVIUM

Qppf — QUATERNARY PREVIOUSLY PLACED FILL

? — APPROXIMATE GEOLOGIC CONTACT QUERIED WHERE UNCERTAIN

P-1 — APPROXIMATE PERCOLATION TEST LOCATION

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# PERCOLATION TEST LOCATION MAP

THE SANCTUARY
RANCH VIEW TERRACE
ENCINITAS, CALIFORNIA

| CTE JOB NO: | |
|---|---|
| 10-14212G | |
| SCALE: 1" ~ 100' | |
| DATE: 9/19 | FIGURE: 2 |

\\Esc_server\projects\10-14000 to 10-14999 Projects\10-14212G\Perc\Fig 2 Perc 9-19.dwg

**ATTACHMENT A**

PERCOLATION TEST DATA (REVISED)

C.1 Percolation Methodology and Field Data

Percolation testing was performed in accordance with SD DEH Case I and III methods, which are performed when presoak water remains in the test hole overnight and when presoak water infiltrates through the hole overnight, respectively. The presoak duration for all of the recent tests ranged from approximately 20 to 24 hours, which is within the SD DEH 15 to 30 hour presoak range. The approximate percolation test and boring locations are presented on Figure 2. Results of the recent percolation testing are presented in the table below.

| **Project:** | **Ranch View Terrace** | | | | | | |
|---|---|---|---|---|---|---|---|
| **Project No.:** | **10-14212** | | | | | Tables C-1 to C-5 | |
| **Percolation Field Data and Calculated Rates** | | | | | | | |
| **P-1** | | | | | **Total Depth:** | **39.75** | **inches** |
| Time | Test Interval Time (minutes) | Test Refill Depth /Inches | Water Level Initial/Start Depth /Inches | Water Level End/Final Depth /Inches | Incremental Water Level Change (inches) | Percolation Rate inches/minutes | Percolation Rate inches/hour |
| 10:05 | Initial | None | 31.31 | initial | - | | |
| 10:35 | 30 | 31.50 | 31.31 | 33.25 | 1.94 | 0.06 | 3.88 |
| 11:05 | 30 | 31.25 | 31.50 | 33.00 | 1.50 | 0.05 | 3.00 |
| 11:35 | 30 | 30.44 | 31.25 | 32.19 | 0.94 | 0.03 | 1.88 |
| 12:05 | 30 | NO | 30.44 | 31.50 | 1.06 | 0.04 | 2.13 |
| 12:35 | 30 | 31.38 | 31.50 | 32.63 | 1.13 | 0.04 | 2.25 |
| 13:05 | 30 | NO | 31.38 | 32.19 | 0.81 | 0.03 | 1.63 |
| 13:35 | 30 | 31.88 | 32.19 | 33.06 | 0.88 | 0.03 | 1.75 |
| 14:05 | 30 | NO | 31.88 | 32.69 | 0.81 | 0.03 | 1.63 |

| P-2 | | | | | Total Depth: | 62.25 | inches |
|---|---|---|---|---|---|---|---|
| Time | Test Interval Time | Test Refill | Water Level Initial/Start | Water Level End/Final | Incremental Water Level Change | Percolation Rate | Percolation Rate |
| | (minutes) | Depth /Inches | Depth /Inches | Depth /Inches | (inches) | inches/minutes | inches/hour |
| 10:06 | Initial | None | 52.25 | initial | - | | |
| 10:36 | 30 | NO | 52.25 | 52.88 | 0.63 | 0.02 | 1.25 |
| 11:06 | 30 | NO | 52.88 | 53.50 | 0.63 | 0.02 | 1.25 |
| 11:36 | 30 | NO | 53.50 | 53.63 | 0.13 | 0.00 | 0.25 |
| 12:06 | 30 | NO | 53.63 | 53.94 | 0.31 | 0.01 | 0.63 |
| 12:36 | 30 | 52.75 | 53.94 | 54.31 | 0.38 | 0.01 | 0.75 |
| 13:06 | 30 | NO | 52.75 | 53.31 | 0.56 | 0.02 | 1.13 |
| 13:36 | 30 | NO | 53.31 | 53.56 | 0.25 | 0.01 | 0.50 |
| 14:06 | 30 | NO | 53.56 | 53.88 | 0.31 | 0.01 | 0.63 |

| P-3 | | | | | Total Depth: | 36.25 | inches |
|---|---|---|---|---|---|---|---|
| Time | Test Interval Time | Test Refill | Water Level Initial/Start | Water Level End/Final | Incremental Water Level Change | Percolation Rate | Percolation Rate |
| | (minutes) | Depth /Inches | Depth /Inches | Depth /Inches | (inches) | inches/minutes | inches/hour |
| 10:07 | Initial | None | 26.75 | initial | - | | |
| 10:37 | 30 | NO | 26.75 | 26.88 | 0.13 | 0.00 | 0.25 |
| 11:07 | 30 | NO | 26.88 | 26.88 | 0.00 | 0.00 | 0.00 |
| 11:37 | 30 | NO | 26.88 | 26.94 | 0.06 | 0.00 | 0.13 |
| 12:07 | 30 | NO | 26.94 | 26.94 | 0.00 | 0.00 | 0.00 |
| 12:37 | 30 | NO | 26.94 | 27.00 | 0.06 | 0.00 | 0.13 |
| 13:07 | 30 | NO | 27.00 | 27.00 | 0.00 | 0.00 | 0.00 |
| 13:37 | 30 | NO | 27.00 | 27.06 | 0.06 | 0.00 | 0.13 |
| 14:07 | 30 | NO | 27.06 | 27.13 | 0.06 | 0.00 | 0.13 |

| P-4 | | | | | Total Depth: | 54 | inches |
|---|---|---|---|---|---|---|---|
| Time | Test Interval Time | Test Refill | Water Level Initial/Start | Water Level End/Final | Incremental Water Level Change | Percolation Rate | Percolation Rate |
| | (minutes) | Depth /Inches | Depth /Inches | Depth /Inches | (inches) | inches/minutes | inches/hour |
| 10:08 | Initial | None | 46.75 | initial | - | | |
| 10:38 | 30 | NO | 46.75 | 47.00 | 0.25 | 0.01 | 0.50 |
| 11:08 | 30 | NO | 47.00 | 47.13 | 0.13 | 0.00 | 0.25 |
| 11:38 | 30 | NO | 47.13 | 47.38 | 0.25 | 0.01 | 0.50 |
| 12:08 | 30 | NO | 47.38 | 47.56 | 0.19 | 0.01 | 0.38 |
| 12:38 | 30 | NO | 47.56 | 47.88 | 0.31 | 0.01 | 0.63 |
| 13:08 | 30 | 46.88 | 47.88 | 48.06 | 0.19 | 0.01 | 0.38 |
| 13:38 | 30 | NO | 46.88 | 47.13 | 0.25 | 0.01 | 0.50 |
| 14:08 | 30 | NO | 47.13 | 47.38 | 0.25 | 0.01 | 0.50 |

| P-5 | | | | | Total Depth: | 62.5 | inches |
|---|---|---|---|---|---|---|---|
| Time | Test Interval Time | Test Refill | Water Level Initial/Start | Water Level End/Final | Incremental Water Level Change | Percolation Rate | Percolation Rate |
| | (minutes) | Depth /Inches | Depth /Inches | Depth /Inches | (inches) | inches/minutes | inches/hour |
| 10:10 | Initial | None | 0.00 | initial | - | | |
| 10:40 | 30 | NO | 0.00 | 53.88 | 53.88 | 0.00 | 0.24 |
| 11:10 | 30 | NO | 53.88 | 54.25 | 0.38 | 0.01 | 0.75 |
| 11:40 | 30 | NO | 54.25 | 54.44 | 0.19 | 0.01 | 0.38 |
| 12:10 | 30 | NO | 54.44 | 54.63 | 0.19 | 0.01 | 0.38 |
| 12:40 | 30 | NO | 54.63 | 54.88 | 0.25 | 0.01 | 0.50 |
| 13:10 | 30 | 53.94 | 54.88 | 55.00 | 0.13 | 0.00 | 0.25 |
| 13:40 | 30 | NO | 53.94 | 54.19 | 0.25 | 0.01 | 0.50 |
| 14:10 | 30 | NO | 54.19 | 54.44 | 0.25 | 0.01 | 0.50 |

| P-6 | | | | | Total Depth: | 105 | inches |
|---|---|---|---|---|---|---|---|
| Time | Test Interval Time | Test Refill | Water Level Initial/Start | Water Level End/Final | Incremental Water Level Change | Percolation Rate | Percolation Rate |
| | (minutes) | Depth /Inches | Depth /Inches | Depth /Inches | (inches) | inches/minutes | inches/hour |
| 6:30 | Initial | None | 94.00 | initial | - | | |
| 7:00 | 30 | NO | 94.00 | 94.50 | 0.50 | 0.02 | 1.00 |
| 7:30 | 30 | NO | 94.50 | 94.50 | 0.00 | 0.00 | 0.00 |
| 8:00 | 30 | NO | 94.50 | 94.56 | 0.06 | 0.00 | 0.13 |
| 8:30 | 30 | NO | 94.56 | 94.63 | 0.06 | 0.00 | 0.13 |
| 9:00 | 30 | NO | 94.63 | 94.75 | 0.13 | 0.00 | 0.25 |
| 9:30 | 30 | NO | 94.75 | 94.88 | 0.13 | 0.00 | 0.25 |
| 10:00 | 30 | NO | 94.88 | 95.00 | 0.13 | 0.00 | 0.25 |
| 10:30 | 30 | NO | 95.00 | 95.06 | 0.06 | 0.00 | 0.13 |
| **P-7** | | | | | **Total Depth:** | **64** | **inches** |
| Time | Test Interval Time | Test Refill | Water Level Initial/Start | Water Level End/Final | Incremental Water Level Change | Percolation Rate | Percolation Rate |
| | (minutes) | Depth /Inches | Depth /Inches | Depth /Inches | (inches) | inches/minutes | inches/hour |
| 6:32 | Initial | None | 56.00 | initial | - | | |
| 7:02 | 30 | 55.75 | 56.00 | 58.50 | 2.50 | 0.08 | 5.00 |
| 7:32 | 30 | 55.63 | 55.75 | 57.88 | 2.13 | 0.07 | 4.25 |
| 8:02 | 30 | 56.00 | 55.63 | 57.50 | 1.88 | 0.06 | 3.75 |
| 8:32 | 30 | 55.75 | 56.00 | 57.50 | 1.50 | 0.05 | 3.00 |
| 9:02 | 30 | 56.00 | 55.75 | 57.25 | 1.50 | 0.05 | 3.00 |
| 9:32 | 30 | 56.00 | 56.00 | 57.44 | 1.44 | 0.05 | 2.88 |
| 10:02 | 30 | 55.69 | 56.00 | 57.88 | 1.88 | 0.06 | 3.75 |
| 10:32 | 30 | NO | 55.69 | 57.00 | 1.31 | 0.04 | 2.63 |

| P-8 | | | | | Total Depth: | 112 | inches |
|---|---|---|---|---|---|---|---|
| Time | Test Interval Time (minutes) | Test Refill Depth /Inches | Water Level Initial/Start Depth /Inches | Water Level End/Final Depth /Inches | Incremental Water Level Change (inches) | Percolation Rate inches/minutes | Percolation Rate inches/hour |
| 6:35 | Initial | None | 103.50 | initial | - | | |
| 7:05 | 30 | NO | 103.50 | 103.75 | 0.25 | 0.01 | 0.50 |
| 7:35 | 30 | NO | 103.75 | 103.75 | 0.00 | 0.00 | 0.00 |
| 8:05 | 30 | NO | 103.75 | 103.88 | 0.13 | 0.00 | 0.25 |
| 8:35 | 30 | NO | 103.88 | 104.00 | 0.13 | 0.00 | 0.25 |
| 9:05 | 30 | NO | 104.00 | 104.06 | 0.06 | 0.00 | 0.13 |
| 9:35 | 30 | NO | 104.06 | 104.13 | 0.06 | 0.00 | 0.13 |
| 10:05 | 30 | NO | 104.13 | 104.13 | 0.00 | 0.00 | 0.00 |
| 10:35 | 30 | NO | 104.13 | 104.19 | 0.06 | 0.00 | 0.13 |

C.2 Calculated Infiltration Rates

As per the County of San Diego BMP design documents (February 2016) infiltration rates are to be evaluated through the Porchet Method. CTE utilized the Porchet Method through guidance of the County of Riverside (2011). The intent of the infiltration rate is to take into account bias inherent in percolation test bore hole sidewall infiltration as would not occur at a basin bottom where such sidewalls are not present.

The infiltration rate (It) is derived by the equation:

$$I_t = \frac{\Delta H\ \pi r2\ 60}{\Delta t(\pi r2 + 2\pi r H_{avg})} = \frac{\Delta H\ 60\ r}{\Delta t(r + 2H_{avg})}$$

Where:

$I_t$ = tested infiltration rate, inches/hour
$\Delta H$ = change in head over the time interval, inches
$\Delta t$ = time interval, minutes
* r = effective radius of test hole
$H_{avg}$ = average head over the time interval, inches

## Percolation Rate Conversion P-1

| | | Inches |
|---|---|---|
| Time Interval, | $\Delta t =$ | 30 |
| Final Depth of Water, | $D_f =$ | 32.69 |
| Test Hole Radius, | $r =$ | 3 |
| Initial Depth to Water, | $D_0 =$ | 31.88 |
| Total Depth of Test Hole, | $D_T =$ | 39.75 |

| | | |
|---|---|---|
| $H_o =$ | 7.875 | in |
| $H_f =$ | 7.0625 | in |
| $\Delta H = \Delta D =$ | 0.8125 | in |
| $H_{avg} =$ | 7.46875 | in |
| $I_t =$ | 0.272 | in/hr |

## Percolation Rate Conversion P-2

| | | Inches |
|---|---|---|
| Time Interval, | $\Delta t =$ | 30 |
| Final Depth of Water, | $D_f =$ | 53.88 |
| Test Hole Radius, | $r =$ | 3 |
| Initial Depth to Water, | $D_0 =$ | 53.56 |
| Total Depth of Test Hole, | $D_T =$ | 62.25 |

| | | |
|---|---|---|
| $H_o =$ | 8.6875 | in |
| $H_f =$ | 8.375 | in |
| $\Delta H = \Delta D =$ | 0.3125 | in |
| $H_{avg} =$ | 8.53125 | in |
| $I_t =$ | 0.093 | in/hr |

## Percolation Rate Conversion P-3

| | | Inches |
|---|---|---|
| Time Interval, | $\Delta t =$ | 30 |
| Final Depth of Water, | $D_f =$ | 27.13 |
| Test Hole Radius, | $r =$ | 3 |
| Initial Depth to Water, | $D_0 =$ | 27.06 |
| Total Depth of Test Hole, | $D_T =$ | 36.25 |

| | | |
|---|---|---|
| $H_o =$ | 9.1875 | in |
| $H_f =$ | 9.125 | in |
| $\Delta H = \Delta D =$ | 0.0625 | in |
| $H_{avg} =$ | 9.15625 | in |
| $I_t =$ | 0.018 | in/hr |

## Percolation Rate Conversion P-4

| | | Inches |
|---|---|---|
| Time Interval, | $\Delta t =$ | 30 |
| Final Depth of Water, | $D_f =$ | 47.38 |
| Test Hole Radius, | $r =$ | 3 |
| Initial Depth to Water, | $D_0 =$ | 47.13 |
| Total Depth of Test Hole, | $D_T =$ | 54 |

| | | |
|---|---|---|
| $H_o =$ | 6.875 | in |
| $H_f =$ | 6.625 | in |
| $\Delta H = \Delta D =$ | 0.25 | in |
| $H_{avg} =$ | 6.75 | in |
| $I_t =$ | 0.091 | in/hr |

## Percolation Rate Conversion P-5

| | | Inches |
|---|---|---|
| Time Interval, | $\Delta t =$ | 30 |
| Final Depth of Water, | $D_f =$ | 54.44 |
| Test Hole Radius, | $r =$ | 3 |
| Initial Depth to Water, | $D_0 =$ | 54.19 |
| Total Depth of Test Hole, | $D_T =$ | 62.5 |

| | | |
|---|---|---|
| $H_o =$ | 8.3125 | in |
| $H_f =$ | 8.0625 | in |
| $\Delta H = \Delta D =$ | 0.25 | in |
| $H_{avg} =$ | 8.1875 | in |
| $I_t =$ | 0.077 | in/hr |

## Percolation Rate Conversion P-6

| | | Inches |
|---|---|---|
| Time Interval, | $\Delta t =$ | 30 |
| Final Depth of Water, | $D_f =$ | 95.06 |
| Test Hole Radius, | $r =$ | 3 |
| Initial Depth to Water, | $D_0 =$ | 95.00 |
| Total Depth of Test Hole, | $D_T =$ | 105 |

| | | |
|---|---|---|
| $H_o =$ | 10 | in |
| $H_f =$ | 9.9375 | in |
| $\Delta H = \Delta D =$ | 0.0625 | in |
| $H_{avg} =$ | 9.96875 | in |
| $I_t =$ | 0.016 | in/hr |

## Percolation Rate Conversion P-7

| | | Inches |
|---|---|---|
| Time Interval, | $\Delta t =$ | 30 |
| Final Depth of Water, | $D_f =$ | 57.00 |
| Test Hole Radius, | $r =$ | 3 |
| Initial Depth to Water, | $D_0 =$ | 55.69 |
| Total Depth of Test Hole, | $D_T =$ | 64 |

| | | |
|---|---|---|
| $H_o =$ | 8.3125 | in |
| $H_f =$ | 7 | in |
| $\Delta H = \Delta D =$ | 1.3125 | in |
| $H_{avg} =$ | 7.65625 | in |
| $I_t =$ | 0.430 | in/hr |

## Percolation Rate Conversion P-8

| | | Inches |
|---|---|---|
| Time Interval, | $\Delta t =$ | 30 |
| Final Depth of Water, | $D_f =$ | 104.19 |
| Test Hole Radius, | $r =$ | 3 |
| Initial Depth to Water, | $D_0 =$ | 104.13 |
| Total Depth of Test Hole, | $D_T =$ | 112 |

| | | |
|---|---|---|
| $H_o =$ | 7.875 | in |
| $H_f =$ | 7.8125 | in |
| $\Delta H = \Delta D =$ | 0.0625 | in |
| $H_{avg} =$ | 7.84375 | in |
| $I_t =$ | 0.020 | in/hr |

**Worksheet C.4-1: Categorization of Infiltration Feasibility Condition**

| Categorization of Infiltration Feasibility Condition | | Worksheet C.4-1 | |
|---|---|---|---|
| Part 1 - Full Infiltration Feasibility Screening Criteria<br>Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated? | | | |
| Criteria | Screening Question | Yes | No |
| 1 | Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D. | | X |
| Provide basis: The NRCS soils across the site are all Type D soils with very high surface runoff. The site soils are consistent with the NRCS mapped soil types based on site explorations and percolation testing. Three soil types were present in the area of the proposed stormwater BMPs, Quaternary Young Alluvium, Tertiary Torrey Sandstone, and Tertiary Del Mar Formation.<br><br>Five percolation tests were completed within the Alluvium. The calculated infiltration rates (with an applied factor of safety of two) ranged from a low of 0.008 in Test P-6 (just above the underlying Torrey Sandstone Formation) to a high of 0.215 inches per hour in Test P-7. Two percolation tests were completed within the Del Mar Formation. The calculated infiltration rates (with an applied factor of safety of two) ranged from a low of 0.009 in Test P-3 to a high of 0.045 inches per hour in Test P-4. One percolation test was completed within the Torrey Sandstone. The calculated infiltration rate (with an applied factor of safety of two) was 0.039 in Test P-5.<br>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability. | | | |
| 2 | Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2. | | X |
| Provide basis: Due to the general minimal permeability of the geologic units encountered at the site, surface water would likely migrate laterally or mound locally. This could result in the water migrating into utility trench backfill, building up behind proposed retaining walls, or saturating toes of slopes and down gradient and nearby foundations or other improvement areas. The potential adverse effects of mounding are anticipated to be minimized somewhat by installation of an impermeable liner on the sidewalls and bottom of the proposed basin where partial infiltration is proposed. Lining the sides and bottom of the BMP with impermeable liner is recommended to mitigate lateral migration of infiltrate. The lining should extend to the maximum depth of utility trench bottoms, toe of slope elevation (if slopes are proposed), and foundation excavations within 100 feet of the proposed basin.<br><br>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability. | | | |

| Worksheet C.4-1 Page 2 of 4 | | | |
|---|---|---|---|
| Criteria | Screening Question | Yes | No |
| 3 | Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3. | X | |
| Provide basis: Groundwater is anticipated to be deeper than at least 10 feet below the bottom of the planned basin bottoms. Infiltration at the site is not anticipated to increase the risk of groundwater contamination. According to Geotracker online (a State of California on line resource for listings of regulated contaminated sites), there are no open LUST cases in the site area that could impact the site. An enrolled DTSC site ("Irrigated Lands Regulatory Program") is located immediately southeast of the site. However, no information on cleanup status or remediation was available from Geotracker. The proposed development is not industrial and capture of surface waters is not anticipated to increase the risk of groundwater contamination.<br><br>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability. | | | |
| 4 | Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3. | X | |
| Provide basis: Infiltration at the site is not anticipated to cause potential water balance issues and not anticipated to change the seasonality of ephemeral streams. The site and up-gradient properties are not known contaminated sites according to Geotracker, a State of California on line resource for listings of regulated contaminated sites and site development is not industrial. Lining the basins as recommended in Item 1 above is anticipated to minimize the lateral migration of infiltrate. Site discharge is not anticipated to be contaminated or affect surface waters.<br><br>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability. | | | |
| Part 1 Result* | If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration<br><br>If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2 | | No Full |

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

| Worksheet C.4-1 Page 3 of 4 | | | |
|---|---|---|---|
| Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria<br>Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated? | | | |
| Criteria | Screening Question | Yes | No |
| 5 | Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D. | X | |
| Provide basis: CTE understands an appreciable rate to be 0.05 inches per hour or greater. An infiltration rate (with FOS of 2 applied) of 0.136 in/hr was recorded for Test P-1 and 0.215 in/hr was recorded for Test P-7. Additionally, infiltration rates of 0.047 in/hr, 0.045 in/hr, and 0.039 in/hr were recorded for Tests P-2, P-4 and P-5, respectively. While these values are below 0.05 in/hr, some infiltration was observed.<br><br>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates. | | | |
| 6 | Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2. | X | |
| Provide basis: See Question 2, Part 1. Sidewalls of the proposed bio-retention BMP basin in the northeastern portion of the site should be lined with an impermeable liner to mitigate the potential for lateral migration of infiltrate and saturation. At a minimum the lining should extend to the maximum depth of utility trench bottoms, toe of slope elevation (if slopes are proposed), and foundation excavations within 100 feet of the proposed basin.<br><br>If re-introduced, the currently-removed bio-retention BMP basin located along the southern PL of the site should be fully lined with an impermeable liner, and infiltrate collected via a subdrain and discharged to an appropriate offsite location, in order to minimize the risk of infiltrate migrating and detrimentally impacting offsite and down-gradient properties adjacent to the site.<br><br>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates. | | | |

| Worksheet C.4-1 Page 4 of 4 | | | |
|---|---|---|---|
| Criteria | Screening Question | Yes | No |
| 7 | Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3. | X | |
| Provide basis: Groundwater is anticipated to be deeper than at least 10 feet below the bottom of the planned basin bottoms. Infiltration at the site is not anticipated to increase the risk of groundwater contamination. According to Geotracker online (a State of California on line resource for listings of regulated contaminated sites), there are no open LUST cases in the site area that could impact the site. An enrolled DTSC site ("Irrigated Lands Regulatory Program") is located immediately southeast of the site. However, no information on cleanup status or remediation was available from Geotracker. The proposed development is not industrial and capture of surface waters is not anticipated to increase the risk of groundwater contamination.<br><br>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates. | | | |
| 8 | Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3. | X | |
| Provide basis: Infiltration at the site is not anticipated to cause potential water balance issues and not anticipated to change the seasonality of ephemeral streams. The site and up-gradient properties are not known contaminated sites according to Geotracker, a State of California on line resource for listings of regulated contaminated sites and site development is not industrial. Lining the basins as recommended in Item 1 above is anticipated to minimize the lateral migration of infiltrate. Site discharge is not anticipated to be contaminated or affect surface waters.<br><br>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates. | | | |
| Part 2 Result* | If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.<br>If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration. | | Partial |

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings

November 24, 2020 CTE Job No. 10-14212G

Olivenhain Hills LLC
Attention: Mr. Udi Melamed
745 Cole Ranch Road
Encinitas, California 92024
Telephone: (760) 299-3344 Via Email: udi@ermdevelopment.com

Subject: Report of Geologic Mapping
Proposed 9 Lot Subdivision (The Sanctuary)
Ranch View Terrace
Encinitas, California

Reference: Construction Testing and Engineering
Limited Geotechnical Investigation and Update Report
Proposed 8 Lot Subdivision
Ranch View Terrace, Encinitas, California
CTE project 10.14212G, Dated April 20, 2018

Mr. Melamed:

Construction Testing and Engineering, Inc. (CTE) is pleased to present the results of geologic mapping within the limits of proposed development at the Ranch View Terrace (The Sanctuary). Location of the site is shown on attached Figure 1, Site Index Map. This geologic mapping report was authorized by Mr Udi Melamed on November 5, 2020 through CTE proposal E-0628 dated November 3, 2020. The purpose of this report is to present the attached Geologic Map that depicts the limit of fill within the subject proposed nine lot subdivision.

The geologic mapping was conducted on November 13, 2020. The mapping was based upon observation of surficial conditions. The attached Geologic Map, Figure 2, presents the surficial distribution of these units. Following is a presentation of the observed units.

Quaternary Undocumented Fill: This unit was composed of clayey to silty sand. It was noted by irregular surface topography that formed a berm at the location of Lot 9 that trailed across the northeast corners of Lot 7 and Lot 8. It appears this area was a former stock pond with associated berm leading to the northwest where an apparent intermittent stream was formerly located.

Quaternary Younger Alluvium: This unit was noted by subdued and plain like topography on the north portion of the northeast portion of the property. It supported volunteer growth to include ice plant. At the ground surface it was exposed as a clayey to silty sand.

Tertiary Torrey Sandstone: The formation was composed of weakly cemented and sparsely bedded sandstone. It forms the sloping hillside portions on the southwest margin of the proposed development.

The field evaluation presented in this report has been conducted according to current environmental practice and the standard of care exercised by reputable consultants performing similar tasks in this area. No other warranty, expressed or implied, is made regarding this report. Variations may exist and conditions not observed or described in this report may be present. CTE should be notified of possible variations so that CTE may re-evaluate the findings of this report.

CTE appreciates this opportunity to be of service on this project. If there are any questions regarding this report, please do not hesitate to contact the undersigned.

Respectfully submitted,

CONSTRUCTION TESTING & ENGINEERING, INC.

Dan T. Math, RCE #61013
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
DANIEL T. MATH
No.61013
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CERTIFIED ENGINEERING GEOLOGIST
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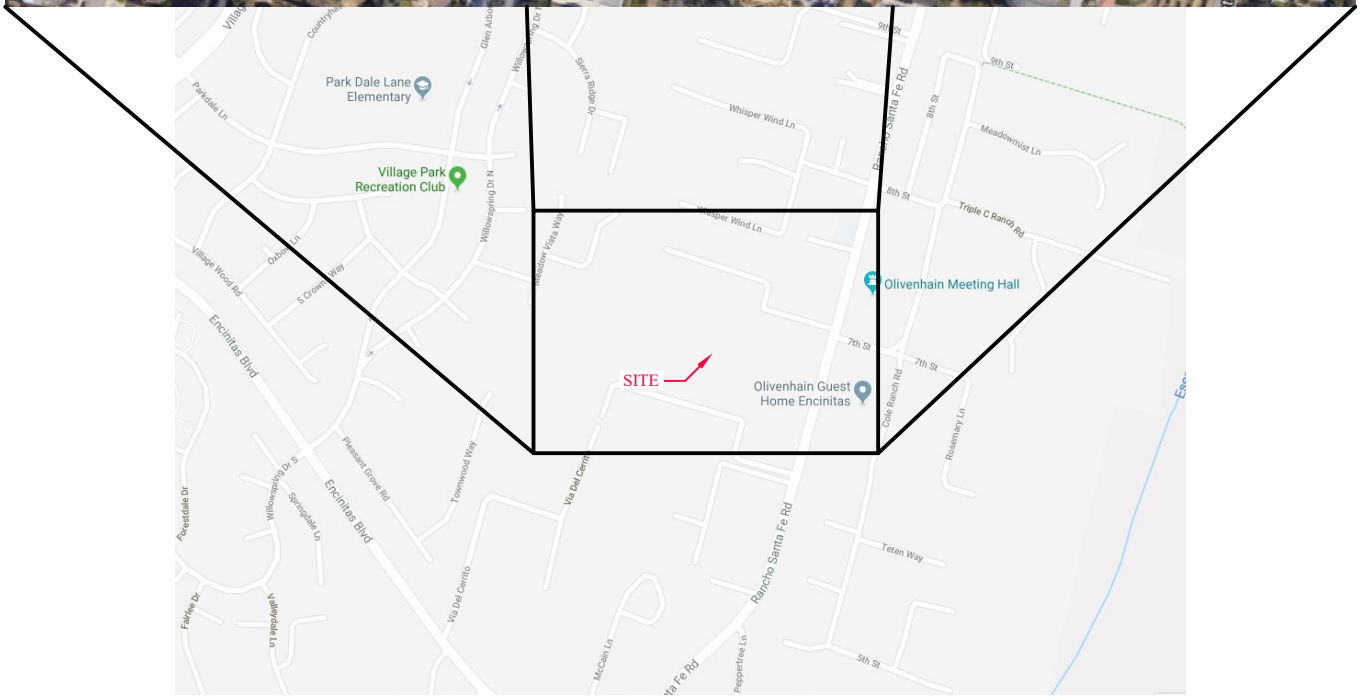
STATE OF CALIFORNIA

GFR/DTM:ach

Attachments
Figure 1 Site Index Map
Figure 2 Geologic Map

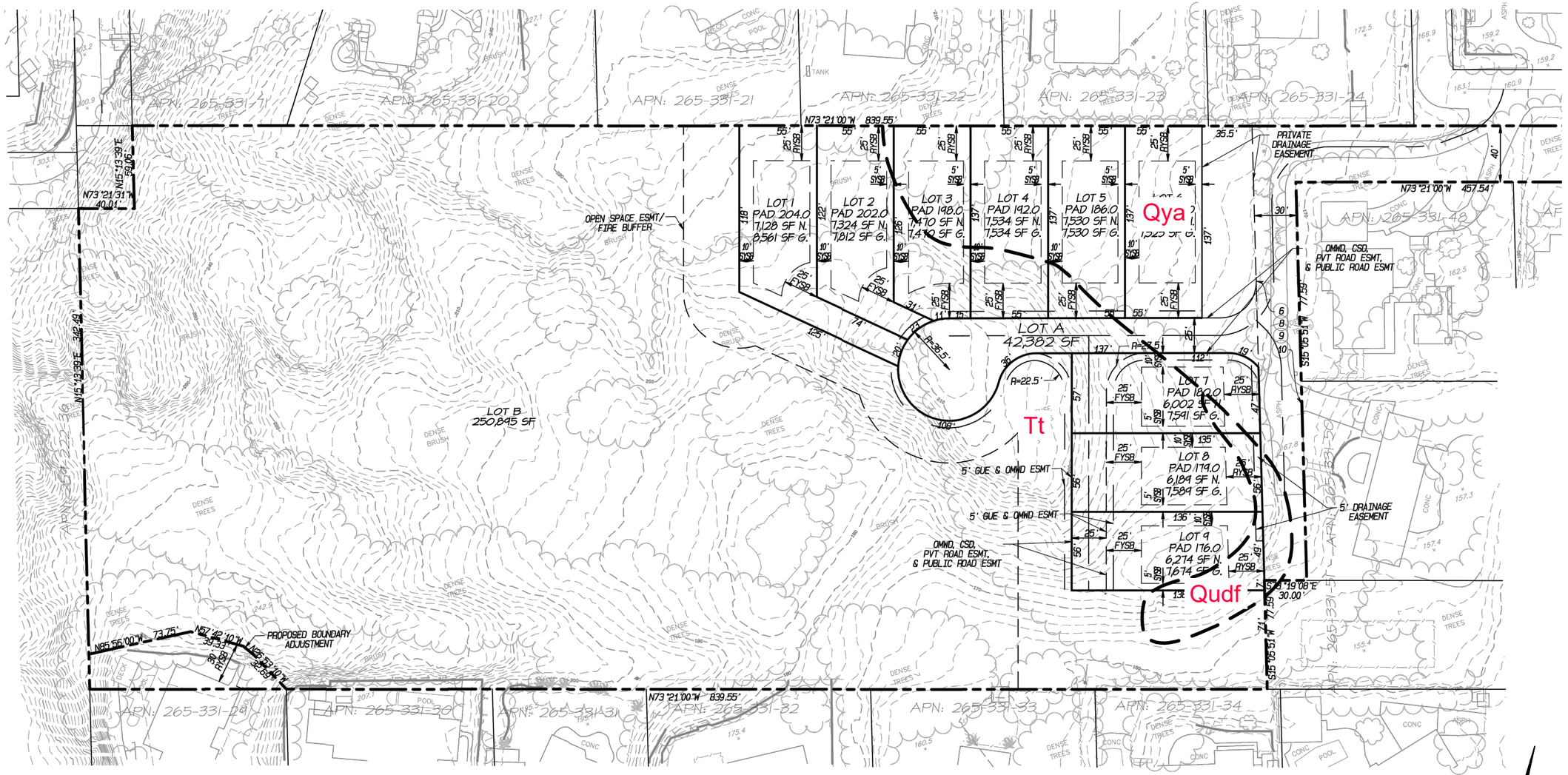




CTE INC. Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

# SITE INDEX MAP

RANCH VIEW TERRACE, 8 LOTS
RANCH VIEW TERRACE
ENCINITAS, CALIFORNIA

| SCALE: | DATE: |
|---|---|
| AS SHOWN | 11/20 |
| CTE JOB NO.: | FIGURE: |
| 10-14212G | 1 |




## LEGEND

| | |
|---|---|
| Qudf | QUATERNARY UNDOCUMENTED FILL |
| Qya | QUATERNARY YOUNG ALLUVIUM |
| Tt | TERTIARY TORREY SANDSTONE |
| | APPROXIMATE GEOLOGIC CONTACT |

## GRAPHIC SCALE

80' 0 40' 80'

1 inch = 80 ft.

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# GEOLOGIC MAP

NINE LOTS ONLY
RANCH VIEW TERRACE
ENCINITAS, CALIFORNIA

| | |
|---|---|
| CTE JOB NO: | 10-14212G |
| SCALE: | 1" = 80' |
| DATE: 11/20 | FIGURE: 2 |

S:\Projects\10-14000 to 10-14999 Projects\10-14212G\Update Map\Figure 2 Geologic Map.dwg