Appendix I

GeoMat Soil Investigations Report

November 4, 2021

Project No.: 21216-01

TO: Woodard Group
3585 Main Street
Suite 205
Riverside, California 92501

SUBJECT: Preliminary Soil Investigation Report, Proposed Warehouse Building, 340 W. Valley Boulevard, Colton, California

In accordance with your authorization, GeoMat Testing Laboratories, Inc. (GeoMat) is pleased to present our Preliminary Soil Investigation Report for the proposed building at 340 W. Valley Boulevard, Colton, California. The accompanying report presents a summary of our findings, recommendations and limitation of work for the proposed site development.

The primary purpose of this investigation and report is to provide an evaluation of the existing geotechnical conditions at the site as they relate to the design and construction of the proposed development. More specifically, this investigation was to address geotechnical conditions for the preliminary design of the foundations for the proposed building.

Based on the results of our investigation, the proposed development is feasible from a geotechnical standpoint and it is our professional opinion that the proposed development will not be subject to a hazard from settlement, slippage, or landslide, provided the recommendations of this report are incorporated into the proposed development. It is also our opinion that the proposed development will not adversely affect the geologic stability of the site or adjacent properties provided the recommendations contained in this report are incorporated into the proposed construction.

We appreciate the opportunity to assist you and look forward to future projects. If you should have any questions regarding this report, please do not hesitate to call our office. We appreciate this opportunity to be of service.

Submitted for GeoMat Testing Laboratories, Inc.

REGISTERED PROFESSIONAL ENGINEER HAYTHAM NABILSI GE 2375 EXP. 12/31/22 GEOTECHNICAL STATE OF CALIFORNIA

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1.0 INTRODUCTION

1.1 EXISTING SITE CONDITIONS

The subject site is located on the northwest corner of West "J" Street and N. Pennsylvania Avenue, in the City of Colton, California. The site is generally bordered by a paved alley to the north, Pennsylvania Avenue on the east, "J" Street on the south, and a residential property to the west. Access on site can be made from either "J" Street, Pennsylvania Avenue, or the paved alleyway. The geographical relationship of the site and surrounding vicinity is shown on the site Locations Map, Figure 1.

The site is flat and square in shape, measuring approximately 150 feet wide and 175 feet wide. The site is vacant, covered mostly in light seasonal grasses and debris from the recent demolition of the single-family residential structures that occupied the eastern section of the site. Underground utilities appear to still be in-ground.

1.2 PROPOSED DEVELOPMENT

According to the Site Plan, prepared by Volbeda & Garrido Design Consultants & Architects (Sheet C-1, August 4, 2021), the site is proposed for a 7000 sq. ft. open warehouse on the western section of the lot and associated concrete paved parking spaces and drive lanes, and concrete hardscape. No structural details or foundation plans were provided for our review at the time of this report. We assume that the building will be supported on shallow concrete foundation with slab-on-grade. Continuous wall loads will not exceed 2 kips per linear foot and isolated column loads of up to 18 kips.

Once the design phase and foundation loading configuration proceeds to a more finalized plan, the recommendations within this report should be reviewed and revised, if necessary. Any changes in the design, location or elevation of any structure, as outlined in this report, should be reviewed by this office. GeoMat should be contacted to determine the necessity for review and possible revision of this report.

1.3 FIELD WORK

Two exploratory boreholes were drilled up to 20 feet below ground surface on October 30, 2021 utilizing a CME-45 mobile drill rig equipped with 6-inch diameter hollow stem augers, refer to Plate 1 for borehole locations. Relatively undisturbed samples were obtained utilizing the California Ring Sampler (ASTM D 1587). Additional representative samples have been recovered with the SPT (Standard Penetration Test, ASTM D 1586) sampler. Bulk samples were also collected from the auger cuttings during drilling. The samples were collected in plastic bags, tied, and tagged for the location and depth. The geotechnical boring logs are presented in Appendix B and may include a description and classification of each stratum, sample locations, blow counts, groundwater conditions encountered during drilling, results from selected types of laboratory tests, and drilling information.

1.4 LABORATORY TESTING

Laboratory tests were performed on selected soil samples. The tests consisted primarily of the following:

- Moisture Content (ASTM D2216)
- Dry Density (ASTM D2937)
- Sieve Analysis (ASTM C136)
- Direct Shear (ASTM D3080)
- Soluble Sulfate Content (Extinction/Turbidimetric Method)

The soil classifications are in conformance with the Unified Soil Classifications System (USCS), as outlined in the Classification and Symbols Chart (Appendix B). A summary of our laboratory testing, ASTM designation, and graphical presentation of test results is presented in Appendix C.

2.0 GEOTECHNICAL CONDITIONS

2.1 REGIONAL GEOLOGIC FINDINGS

Based on the Geologic Map of the San Bernardino North/North ½ of San Bernardino South quadrangles (Dibblee Foundation Map DF-127) the site is located in an area mapped as young alluvial fan deposits (Qa), see Figure 2. Alluvium is weathered bedrock material and sediments that have been eroded from natural slopes and deposited in generally flat lying areas.

2.2 SUBSURFACE CONDITIONS

Detailed logs of the exploratory excavations are presented in Appendix B of this report. The earth materials encountered within the exploratory excavations are generally described below.

2.2.1 Artificial Fill

Artificial (man-placed) fill was encountered in both of our exploratory boreholes within the upper 4 feet of soil onsite. This fill generally consists of loose, dry to slightly moist silty sand (USCS "SM") with few to some gravel.

2.2.2 Alluvium

Underlying the fill material was younger alluvium consisting of well-graded sand with silt (USCS "SW-SM") and silt with sand (USCS "ML"). The sand was found to be dry to slightly moist, contain few to some gravel, and loose medium dense. The silt material was moist and very firm.

2.3 GROUNDWATER

Groundwater study is not within the scope of our work. Groundwater was not encountered in our exploratory borings excavated onsite to a depth of 20 feet below ground surface.

A contour map showing minimum depths to ground water in the Santa Ana River Valley Region was constructed by the United States Geological Survey (USGS) and subsequently, a report (USGS Map MF-1802) was published in 1985. The map was constructed by contouring the shallowest water level measurements reported to the California Department of Water Resources (CDWR) for the period from 1973-1979. Based on our review of the map, the minimum depth to ground water in the general project site area, during this period, was indicated to be around 100 feet below ground surface.

Please note that the potential for rain or irrigation water locally seeping through from elevated areas and showing up near grades cannot be precluded. Our experience indicates that surface or near-surface groundwater conditions can develop in areas where groundwater conditions did not exist prior to site development, especially in areas where a substantial increase in surface water infiltration results from landscape irrigation. Fluctuations in perched water elevations are likely to occur in the future due to variations in precipitation, temperature, consumptive uses, and other factors including mounding of perched water over bedrock or natural soil. Mitigation for nuisance shallow seeps moving from elevated lower areas will be needed if encountered. These mitigations may include subdrains, horizontal drains, toe drains, french drains, heel drains or other devices.

2.4 EXPANSIVE SOIL

Expansive soils are characterized by their ability to undergo significant volume changes (shrink or swell) due to variations in moisture content. Changes in soil moisture content can result from precipitation, landscape irrigation, utility leakage, roof drainage, perched groundwater, drought, or other factors and may result in unacceptable settlement or heave of structures or concrete slabs supported on grade.

Based on laboratory classification, the upper foundation soil onsite is expected to have a very low expansion potential (EI<20), as defined in ASTM D4829. This would require verification subsequent to completion of new footing excavations.

2.5 CORROSIVE SOIL

To preliminarily assess the sulfate exposure of concrete in contact with the site soils, a representative soil sample was tested for water-soluble sulfate content. The test results suggest the site soils have a negligible potential for sulfate attack (less than 0.015 percent) based on commonly accepted criteria. We recommend following the procedures provided in ACI 318-19, Section 19.3, Table 19.3.2.1 for exposure "S0". We recommend Type II cement for all concrete work in contact with soil.

Ferrous metal pipes should be protected from potential corrosion by bituminous coating, etc. We recommend that all utility pipes be nonmetallic and/or corrosion resistant. Recommendations should be verified by soluble sulfate and corrosion testing of soil samples obtained from specific locations at the completion of rough grading.

2.6 SEISMIC DESIGN PARAMETERS

Based on current standards, the proposed development is expected to be designed in accordance with the requirements of the 2019 California Building Code (CBC). The 2019 California Building Code (CBC) provides procedures for earthquake resistant structural design that include considerations for on-site soil conditions, occupancy, and the configuration of the structure including the structural system and height.

Based on the soils encountered in the exploratory borehole within the subject site and with consideration of the geologic units mapped in the area, it is our opinion that the site soil profile corresponds to Site Class D in accordance with Section 1613.2.2 of the California Building Code (CBC 2019) and Chapter 20 of ASCE/SEI 7-16.

We have downloaded the seismic design parameters in accordance with the provisions of the current California Building Code (CBC, 2019) and ASCE/SEI 7-16 Standard using the Structural Engineers Association of California, OSHPD Seismic Design Maps Web Application (https://seismicmaps.org). The mapped seismic parameters are attached to this report in Appendix D.

The 2019 CBC is based on the guidelines contained within ASCE 7-16 which stipulates that where S_1 is greater than 0.2 times gravity (g) for Site Class D, a ground motion hazard analysis is needed unless the seismic response coefficient (C_s) value will be calculated as outlined in Section 11.4.8, Exception 2. Assuming the C_s value will be calculated as outlined in Section 11.4.8, Exception 2, we recommend the following seismic design parameters.

Parameter	ASCE 7-16	2019 CBC	Coefficient	Value
0.2-second Period MCE	Figure 22-1	Figure 1613.2.1(1)	S_S	2.178
1.0-second Period MCE_R	Figure 22-2	Figure 1613.2.1(2)	S_1	0.868
Soil Site Class	Figure 20.3-1	Section 1613.2.2	Site Class	D
Site Coefficient	Figure 11.4-1	Section 1613.2.3(1)	F_a	1.200
Site Coefficient	Figure 11.4-2	Section 1613.2.3(2)	F_v	1.700 *
Adjusted MCE Spectral Response Parameters	Equation 11.4-1	Equation 16-36	S_{MS}	2.614
	Equation 11.4-2	Equation 16-37	S_{M1}	1.476 *
Design Spectral Acceleration Parameters	Equation 11.4-3	Equation 16-38	S_{DS}	1.742
	Equation 11.4-4	Equation 16-39	S_{D1}	0.984 *

*The values provided are valid provided the requirements in Exception Note No. 2 in Section 11.4.8 of ASCE 7-16 are met. If not, a site specific ground motion hazard analysis will be required.

2.7 GEOLOGIC HAZARDS

2.7.1 Surface Fault Rupture

There are no mapped active or potentially active faults with surface expression that trend through or adjacent to the subject property, according to those references cited herein. The site does not lie within a designated Alquist-Priolo Earthquake Fault Zone (CDMG, 2000). According to the California Department of Conservation, Fault Activity Map of California 2010, the site is located approximately 0.90 miles west of the San Jacinto fault zone, see Figure 3.

The subject site, as is the case with most of the tectonically-active California area, will be periodically subject to moderate to intense earthquake-induced ground shaking from nearby faults. Significant damage can occur to the site and structural improvements during a strong seismic event. Neither the location nor magnitude of earthquakes can accurately be predicted at this time.

2.7.2 Liquefaction Potential & Seismic Settlement

Liquefaction is a soil strength and stiffness loss phenomenon that typically occurs in loose, saturated cohesionless soils as a result of strong ground shaking during earthquakes. The potential for liquefaction at a site is usually determined based on the results of a subsurface geotechnical investigation and the groundwater conditions beneath the site. Hazards to buildings associated with liquefaction include bearing capacity failure, lateral spreading, and differential settlement of soils below foundations, which can contribute to structural damage or collapse.

According to the City of Colton, General Plan, 2018 Safety Element, the site is not located in an area considered to be susceptible to liquefaction. Therefore, the potential for liquefaction associated ground deformation (seismic settlement and differential compaction) beneath the site is considered very low.

2.7.3 Slope Stability & Seismic Induced Landslides

The site and the surrounding properties are flat and not prone to slope instability hazards, such as landslides.

3.0 TENTATIVE RECOMMENDATIONS

3.1 GENERAL EARTHWORK RECOMMENDATIONS

The following recommendations are provided regarding aspects of the anticipated earthwork construction. These recommendations should be considered subject to revision based on additional geotechnical evaluation of the conditions observed by the Geotechnical Engineer during grading operations. All grading should be performed in accordance with our General Earthwork and Grading Specifications presented in Appendix E except as modified within the text of this report.

3.1.1 Site Clearing, Grubbing and Fill Removal

All debris, undocumented fill, abandoned utility lines, roots, irrigation appurtenances, underground structures, septic tanks, deleterious materials, etc., should be removed and hauled offsite. Cavities created during site clearance should be backfilled in a controlled manner.

3.1.2 Building Pad Preparation

In order to provide adequate support for the proposed structures, the building pad should be overexcavated to a depth of at least 5 feet below existing grade. The lateral extent of overexcavation should be at least 5 feet, where achievable.

Once the bottom of the excavation is observed by a representative of this firm to be in competent native soil, the bottom of the overexcavation should be scarified, moisture conditioned, and recompacted to at least 90 percent of the maximum dry density, as determined by ASTM D1557 Test Method; prior to placement of fill. Deeper overexcavation, especially to remove loose soils, fill, or deleterious material, may be required depending upon field observations of excavation bottom by the soil engineer or his representative.

3.1.3 Trench Backfill

All utility trench backfills should be mechanically compacted to the minimum requirements of at least 90 percent relative compaction. Onsite soils derived from trench excavations can be used as trench backfill except for deleterious materials. Soils with sand equivalent greater than 30 may be utilized for pipe bedding and shading. Pipe bedding should be required to provide uniform support for piping. Excavated material from footing trenches should not be placed in slab-on-grade areas unless properly compacted and tested.

3.1.4 Compacted Fills/Imported Soils

Any soil to be placed as fill, whether presently onsite or import, should be approved by the soil engineer or his representative prior to their placement. All onsite soils to be used as fill should be cleansed of any roots, or other deleterious materials. Rocks larger than 12-inches in diameter should be removed from soil to be used as compacted fill.

All fills should be placed in 6- to 8-inch loose lifts, thoroughly watered, or aerated to near optimum moisture content, mixed and compacted to at least 90 or 95 percent relative compaction depending on the material (subgrade soil or aggregate base) and application (pavement subgrade, building pad, etc.). This is relative to the maximum dry density determined by ASTM D1557 Test Method.

Any imported soils should be sandy (preferably USCS "SM" or "SW", and very low in expansion potential) and approved by the soil engineer. The soil engineer or his representative should observe the placement of all fill and take sufficient tests to verify the moisture content and the uniformity and degree of compaction obtained.

3.2 TEMPORARY EXCAVATIONS

All excavation slopes and shoring systems should meet the minimum requirements of the Occupational Safety and Health (OSHA) Standards. Maintaining safe and stable slopes on excavations is the responsibility of the contractor and will depend on the nature of the soils and groundwater conditions encountered and his method of excavation. Excavations during construction should be carried out in such a manner that failure or ground movement will not occur. The contractor should perform any additional studies deemed necessary to supplement the information contained in this report for the purpose of planning and executing his excavation plan.

3.2.1 Cal/OSHA Soil Type

The subsurface soil expected to be encountered during site development may be classified as "Soil Type C" per the California Occupational Safety and Health Administration (Cal/OSHA).

3.2.2 Excavation Characteristics

The onsite soil is generally composed of medium dense clayey sand and firm sandy lean clay which is not expected to exhibit difficult excavation resistance for typical grading equipment in good working condition. However, the site is underlain by relatively shallow bedrock which may exhibit difficult excavation resistance for smaller equipment like rubber tire backhoes.

3.2.3 Safe Vertical Cuts

Temporary un-surcharged excavations of 4 feet high may be made at a vertical gradient for short periods of time. Temporary un-surcharged excavations greater than 4 feet may be trimmed back at 1.5H:1V gradients to a maximum height of 12 feet. Exposed excavation conditions should be verified by the project geotechnical engineer during construction. No excavations should take place without the direct supervision of the project geotechnical engineer. If potentially unstable soil conditions are encountered, modifications of slope ratios for temporary cuts may be required.

3.2.4 Excavation Setbacks

No excavations should be conducted, without special considerations, along property lines, public right-of-ways, or existing foundations, where the excavation depth will encroach within the "zone of influence". The "zone of influence" of the existing footings, property lines, or public right-of-way may be assumed to be below a 45-degree line projected down from the bottom edge of the footing, property line, or right-of-way.

3.3 FOUNDATION RECOMMENDATIONS

The proposed building may be supported on conventional shallow foundation systems deriving support in compacted fill. All foundation excavations must be observed and approved by the Geotechnical Engineer's representative, prior to placing steel reinforcement or concrete.

3.3.1 Bearing Capacity

Spread, continuous, or pad-type foundations carried at least 18-inches below the lowest adjacent grade may be designed to impose a net dead-plus-live load pressure of 2000 psf. A one-third increase may be used for wind or seismic loads.

3.3.2 Lateral Resistance

Resistance to lateral footing will be provided by passive earth pressure and base friction. For footings bearing against firm native material, passive earth pressure may be considered to be developed at a rate of 265 psf per foot of depth to a maximum of 2000 psf. Base friction may be computed at 0.40 times the normal load. If passive earth pressure and friction are combined to provide required resistance to lateral forces, the value of the passive pressure should be reduced to two-thirds the value.

3.3.3 Settlement

The onsite soils below the foundation depth have relatively high strengths and will not be subject to significant stress increases from foundations of the new structure. Therefore, estimated total long-term static and seismic settlement between similarly loaded adjacent foundation systems should not exceed 1-inch. The structures should be designed to tolerate a differential settlement on the order of 1/2-inch over a 30-foot span.

3.3.4 Reinforcement

Footing reinforcement should be determined by the structural engineer; however, minimum reinforcement should be at least two No. 4 reinforcing bars, top and bottom. Reinforcement and size recommendations presented in this report are considered the minimum necessary for the soil conditions present at the foundation level and are not intended to supersede the design of the project structural engineer or criteria of the governing agencies for the project.

3.4 SLABS-ON-GRADE

Slabs-on-grade should be at least 5-inches thick. Slab-on-grade reinforcement should be at least No. 4 bars at 16-inches on-center both ways, properly centered in mid thickness of slabs. The structural engineer should design the actual slab thickness and reinforcement based on structural load requirements.

3.4.1 Modulus of Subgrade Reaction

A coefficient of vertical subgrade reaction (K_V) of 150 psi/in may be assumed for the building pad compacted fill soils. The modulus of subgrade reaction was estimated based on the NAVFAC 7.1 design charts. This value is for a small loaded area (1 sq. ft or less) such as for wheel loads or point loads and should be adjusted for larger loaded areas, as necessary.

3.4.2 Capillary Break & Vapor Membrane

If vinyl or other moisture-sensitive floor coverings are planned, we recommend that the floor slab in those areas be underlain by a vapor membrane and capillary break consisting of a minimum 10-mil vapor-retarding membrane over a 4-inch thick layer of clean sand. The 4-inch thick layer of sand should be placed between the subgrade soil and the membrane to decrease the possibility of damage to the membrane.

3.4.3 Slab Curling Precautions

A low-slump concrete should be used to minimize possible curling of the slab. Additionally, a layer of sand may be placed over the vapor retarding membrane to reduce slab curling. If this sand bedding is used, care should be taken during the placement of the concrete to prevent displacement of the sand. However, the need for sand and/or the thickness of sand above the moisture vapor barrier should be specified by the structural engineer or concrete contractor. The selection of sand above the barrier is not a geotechnical engineering issue and hence outside our purview.

3.4.4 Subgrade Exposure

Construction activities and exposure to the environment can cause deterioration of the prepared subgrade. Therefore, we recommend that our field representative observe the condition of the final subgrade soils immediately prior to slab-on-grade construction, and, if necessary, perform further density and moisture content tests to determine the suitability of the final prepared subgrade.

Additionally, the slab subgrade should be moisture conditioned to 2 to 4 percent above the optimum moisture content, to a depth of 12 inches. The moisture content of the floor slab subgrade soils should be verified by the geotechnical engineer within 24 hours prior to placing the vapor retarding membrane.

3.5 RETAINING WALLS

If proposed, the following lateral earth pressures, in conjunction with the lateral resistance parameters provided in the Foundation Recommendations section of this report, may be used for the design of retaining walls with free draining compacted backfills. If passive earth pressure and friction are combined to provide required resistance to lateral forces, the value of the passive pressure should be reduced to two-thirds the following recommendations.

Lateral Earth Pressure Condition	Soil Backfill Condition	Equivalent Fluid Pressure (pcf)
Active Case (Drained)	Level	36
At-Rest Case (Drained)	Level	56
Unit Soil Weight	120 pcf	

3.5.1 Seismic Earth Pressure

Retaining walls exceeding 6 feet in height shall be designed to resist the additional earth pressure caused by seismic ground shaking. A seismic load of 33 pcf should be used for design of walls that support more than 6 feet of backfill in accordance with Section 1803.5.12 of the 2019 CBC. This incremental pseudo-static pressure was calculated using the methods recommended in NAVFAC 7.2 and a horizontal coefficient equal to one-half of two-thirds PGA_M.

The seismic load is applied as an equivalent fluid pressure along the height of the wall and the calculated loads result in a maximum load exerted at the base of the wall and zero at the top of the wall. When using the load combination equations from the building code, the seismic earth pressure should be combined with the lateral active earth pressure for analyses of restrained basement walls under seismic loading conditions.

3.5.2 Surcharge Loading

Retaining walls should also be designed to resist any lateral surcharges due to the traffic, nearby buildings, construction loads, etc. Surcharge loads within a 1H:1V plane extending up from the base of the wall should be included in the design lateral pressures by multiplying the associated lateral earth pressure coefficient (see table above) with the applied surcharge load. This surcharge load should be applied as a uniform load along the height of the wall. Additional static lateral pressures due to other surcharge loadings in the vicinity of the wall can be estimated using the guidelines provided in Plate 2.

3.5.3 Waterproofing

The backfilled side of all retaining walls should be coated with an approved waterproofing compound or covered with a similar material to inhibit migration of moisture through the walls. It is recommended that the waterproofing system should be inspected and approved by the project civil engineer. The use of a water-stop should be considered for all concrete joints. We recommend contacting a waterproofing professional/consultant for specific recommendations for placement, sealing and protection of below grade walls.

3.5.4 Drainage and Backfill

We recommend drainage for retaining walls to be provided in accordance with Plate 3 of this report. The backdrain pipe should be connected to a system of closed pipe(s) (non-perforated) that lead to the storm runoff discharge facilities. Retaining wall backdrain must be observed by GeoMat Testing Laboratories prior to wall backfill.

The above earth pressures assume that sufficient drainage will be provided behind the walls to prevent the build-up of hydrostatic pressures from surface and subsurface water infiltration. Back-cut distance for conventional retaining walls should be at least 18 inches to facilitate compaction.

All retaining wall backfill must be compacted to at least 90 percent relative compaction (ASTM D-1557), utilizing equipment that will not damage the wall. Maximum precautions should be taken when placing drainage materials and during backfilling. Onsite soils may be used as backfill.

3.6 PAVEMENT RECOMMENDATIONS

3.6.1 Subgrade Preparation

Pavement subgrade should be graded and prepared to provide at least 18 inches of compacted fill. The subgrade for pavement support must be firm, unyielding, and uniform with no abrupt horizontal changes in degree of support. Soft spots, if encountered, should be excavated and recompacted with the same type of soil as found in adjacent subgrade.

3.6.2 Aggregate Base

The aggregate base should conform to Caltrans Class 2 Aggregate Base or the Standard Specifications for Public Works for Crushed Miscellaneous Base, should be firm and unyielding, and without pumping conditions prior to placement of pavement. Aggregate base should be compacted to at least 95 percent of the maximum dry density as determined by ASTM D1557.

3.6.3 Pavement Design

The following recommended pavement section is based on the following assumed Traffic Index and R-value. The minimum recommended asphalt concrete (AC) pavement thickness is as follows:

Pavement Use	Assumed Traffic Index (TI)	R-Value (Assumed)	Minimum Recommended Pavement Section		Full AC Pavement Section (No Base)
			AC	AB	
Flexible Pavement-Parking Stalls	4	50	2.5”	4.0”	4.0”
Flexible Pavement-Driveways	5	50	3.0”	4.0”	4.5”
Concrete Pavement	--	--	--	--	6.0”

AC: Asphalt Concrete, AB: Aggregate Base.

Concrete pavement should be air entrained Portland Cement Concrete Pavement and must have a minimum 28-day flexural strength of 450 psi (compressive strength of approximately 3500 psi). Joint design and spacing should be in accordance with ACI recommendations. Construction joints should contain dowels or be tongue and grooved to provide load transfer. Tie bars are recommended on the joints adjacent to unsupported edges. Maximum joint spacing in feet should not exceed 2 to 3 times the thickness in inches. Joint sealing with a quality silicone sealer is recommended to prevent water from entering the subgrade allowing pumping and loss of support.

Final pavement design recommendations should be based on laboratory test results of representative pavement subgrade soils upon the completion of rough grading.

3.7 STORMWATER INFILTRATION

Infiltration testing was conducted utilizing the shallow percolation test method at depths of approximately 60 inches below existing ground surface. The infiltration testing was performed in general accordance with the guidelines published in The County of San Bernardino Areawide Stormwater Program, Technical Guidance Document for Water Quality Management Plans. Refer to Appendix F for field infiltration test data.

Test No.	Test Depth Below Ground Surface	Adjusted Infiltration Rate (in/hr)
P-1	60”	2.48
P-2	60”	2.41
P-3	60”	3.09
P-4	60”	1.90

The raw percolation rate is the rate of water infiltration in the horizontal and vertical direction. This percolation rate is adjusted using the “Porchet Method” to obtain the adjusted water infiltration rate in the vertical direction only.

Long-term infiltration rates may be reduced significantly by factors such as soil variability and inaccuracy in the infiltration rate measurement. Safety factors for operating the system, maintenance, siltation, biofouling, etc. should also be considered by the design civil engineer at his discretion. Minimum safety factor required by the County of San Bernardino for Suitability Assessment is as follows:

WORKSHEET H: FACTOR OF SAFETY AND DESIGN INFILTRATION RATE AND WORKSHEET					
FACTOR CATEGORY		FACTOR DESCRIPTION	ASSIGNED WEIGHT (W)	FACTOR VALUE (V)	PRODUCT P=WXV
A	SUITABILITY ASSESSMENT	Soil Assessment Method	0.25	1	0.25
		Predominent Soil Texture	0.25	1	0.25
		Site Soil Variability	0.25	1	0.25
		Depth to Groundwater or Impervious Layer	0.25	1	0.25
		SUITABILITY ASSESSMENT SAFETY FACTOR, $S_A = \sum P$			1.0

The infiltration system must be located such that the closest distance between an adjacent foundation is at least 10 feet in all directions from the zone of saturation. The zone of saturation may be assumed to project downward from the discharge of the infiltration facility at a gradient of 1H:1V. Additional property line or foundation setbacks may be required by the governing jurisdiction and should be incorporated into the stormwater infiltration system design as necessary.

If applicable, 4- to 6-inch diameter observation well(s), with locking cap, extending vertically into the system’s bottom is suggested as an observation point. Observation well(s) should be checked regularly and after large storm event. Once performance stabilizes, frequency of monitoring may be reduced.

GeoMat Testing Laboratories should observe the subgrade of excavation. Additional laboratory testing including but not limited to grain size analysis, sand equivalent, sulfate content, etc. should be conducted during construction.

3.8 SITE DRAINAGE

Positive drainage should be provided and maintained for the life of the project around the perimeter of all structures (including slopes and retaining walls) and all foundations toward streets or approved drainage devices to minimize water infiltrating into the underlying natural and engineered fill soils. In addition, finish subgrade adjacent to exterior footings should be sloped down (at least 2%) and away to facilitate surface drainage. Perimeter water collection devices may be installed around the structure to collect roof/irrigation/natural drainage. Roof drainage should be collected and directed away from foundations via nonerosive devices. Over the slope drainage must not be permitted. Water, either natural or by irrigation, should not be permitted to pond or saturate the foundation soils. Planter areas and large trees adjacent to the foundations are not recommended. All planters and terraces should be provided with drainage devices. Internal drainage should be directed to approved drainage collection devices. Location of drainage device should be in accordance with the design civil engineer’s drainage and erosion control recommendations. The owner should be made aware of the potential problems, which may develop when drainage is altered through construction of retaining walls, patios and other devices. Ponded water, leaking irrigation systems, over watering or other conditions which could lead to ground saturation should be avoided. Surface and subsurface runoff from adjacent properties should be controlled. Area drainage collection should be directed through approved drainage devices. All drainage devices should be properly maintained.

4.0 ADDITIONAL SERVICES

Plan Reviews

The recommendations provided in this report are based on preliminary information and subsurface conditions as interpreted from limited exploratory boreholes at the site. We should be retained to review the final project plans to revise our conclusions and recommendations, as necessary. Professional fees will apply for each review.

Our conclusions and recommendations should also be reviewed and verified during site grading and revised accordingly if exposed geotechnical conditions vary from our preliminary findings and interpretations.

Additional Observation and/or Testing

GeoMat Testing Laboratories, Inc. should observe and/or test at the following stages of construction.

- During overexcavation and compaction operations.
- During any placement of compacted fill.
- Following footing excavation and prior to placement of footing materials.
- During wetting of slab subgrade and prior to placement of slab materials.
- During all trench/wall backfill.
- When any unusual conditions are encountered.

Final Report of Compaction During Grading

A final report of compaction control should be prepared subsequent to the completion of grading. The report should include a summary of work performed, laboratory test results, and the results and locations of field density tests performed during grading.

5.0 GEOTECHNICAL RISK

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. The analytical tools which geotechnical engineers use are generally empirical and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free and, more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as planned.

The engineering recommendations presented in the preceding sections constitute GeoMat Testing Laboratories professional estimate of those measures that are necessary for the proposed development to perform according to the proposed design based on the information generated and referenced during this evaluation, and GeoMat Testing Laboratories experience in working with these conditions.

6.0 LIMITATION OF INVESTIGATION

This report was prepared for the exclusive use on the new construction. The use by others, or for the purposes other than intended, is at the user's sole risk.

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

The field and laboratory test data are believed representative of the site; however, soil conditions can vary significantly. As in most projects, conditions revealed during construction may be at variance with preliminary findings. If this condition occurs, the possible variations must be evaluated by the Project Geotechnical Engineer and adjusted as required or alternate design recommended.

This report is issued with the understanding that it is the responsibility of the owner, or his representative, to ensure that the information and recommendations contained herein are brought to the attention of the engineer for the development and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractor carry out such recommendations in the field.

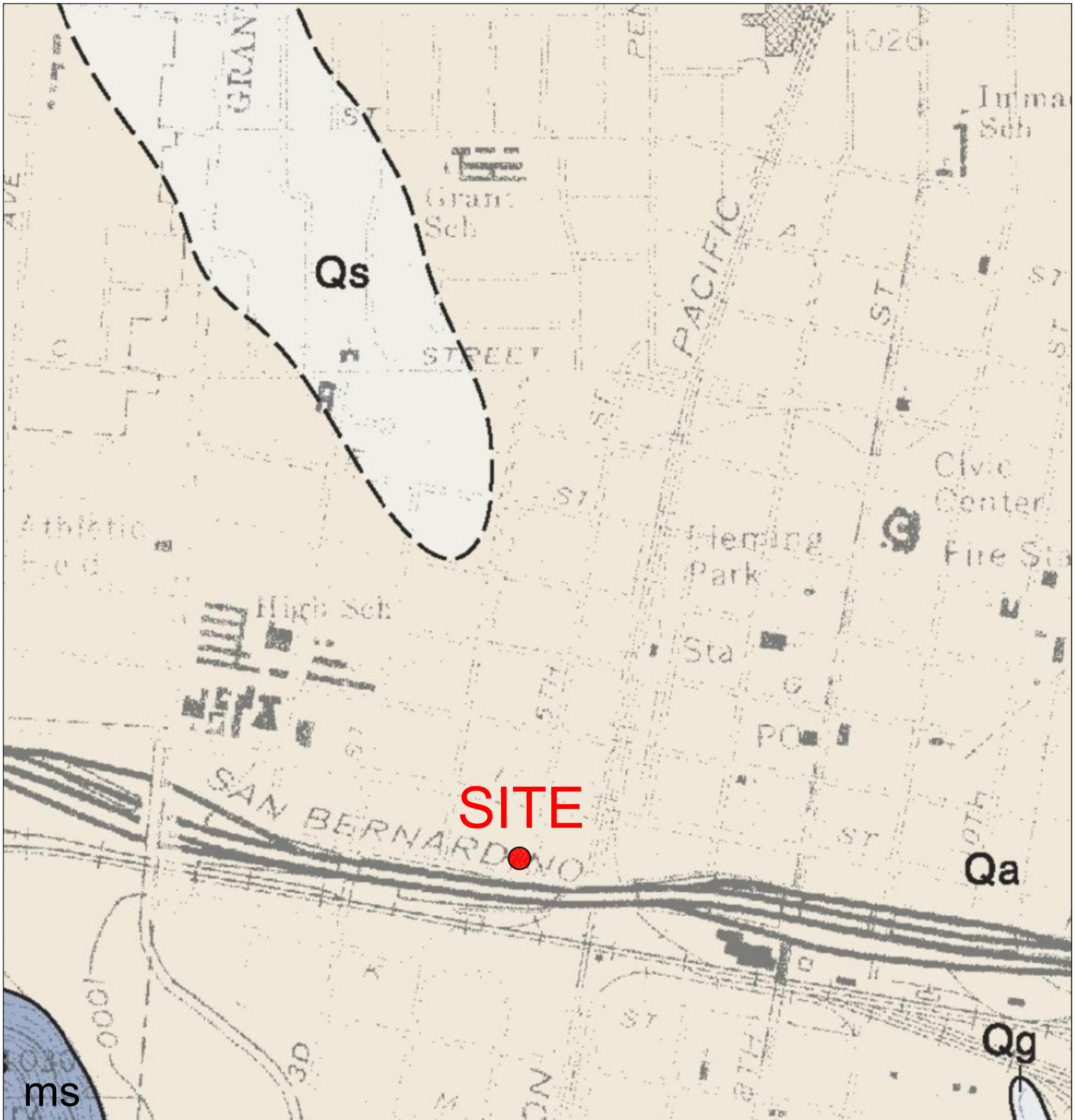
This firm does not practice or consult in the field of safety engineering. We do not direct the contractor's operations, and we cannot be responsible for other than our own personnel on the site; therefore, the safety of others is the responsibility of the contractor. The contractor should notify the owner if he considers any of the recommended actions presented herein to be unsafe.

The findings, conclusions, and recommendations presented herein are based on our understanding of the proposed development and on subsurface conditions observed during our site work, and are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge.

USGS, THE NATIONAL MAP, US TOPO, SAN BERNARDINO SOUTH, 2018

ALL LOCATIONS ARE APPROXIMATE

geomat GeoMat Testing Laboratories, Inc. 9980 Indiana Avenue, Suite 14, Riverside, California	DWN BY:	AM	PROJECT: PRELIMINARY SOIL INVESTIGATION REPORT 340 W. VALLEY BOULEVARD COLTON, CALIFORNIA	DATE:	NOVEMBER 2021
	CHK'D BY:	MN		PROJECT NO.:	21216-01
	DATUM:	--	TITLE: SITE LOCATION MAP	FIGURE NO.:	Figure 1
	PROJECTION:	--			
	SCALE:	1" = 1/4 MILE			
	REV. NO.:	--			



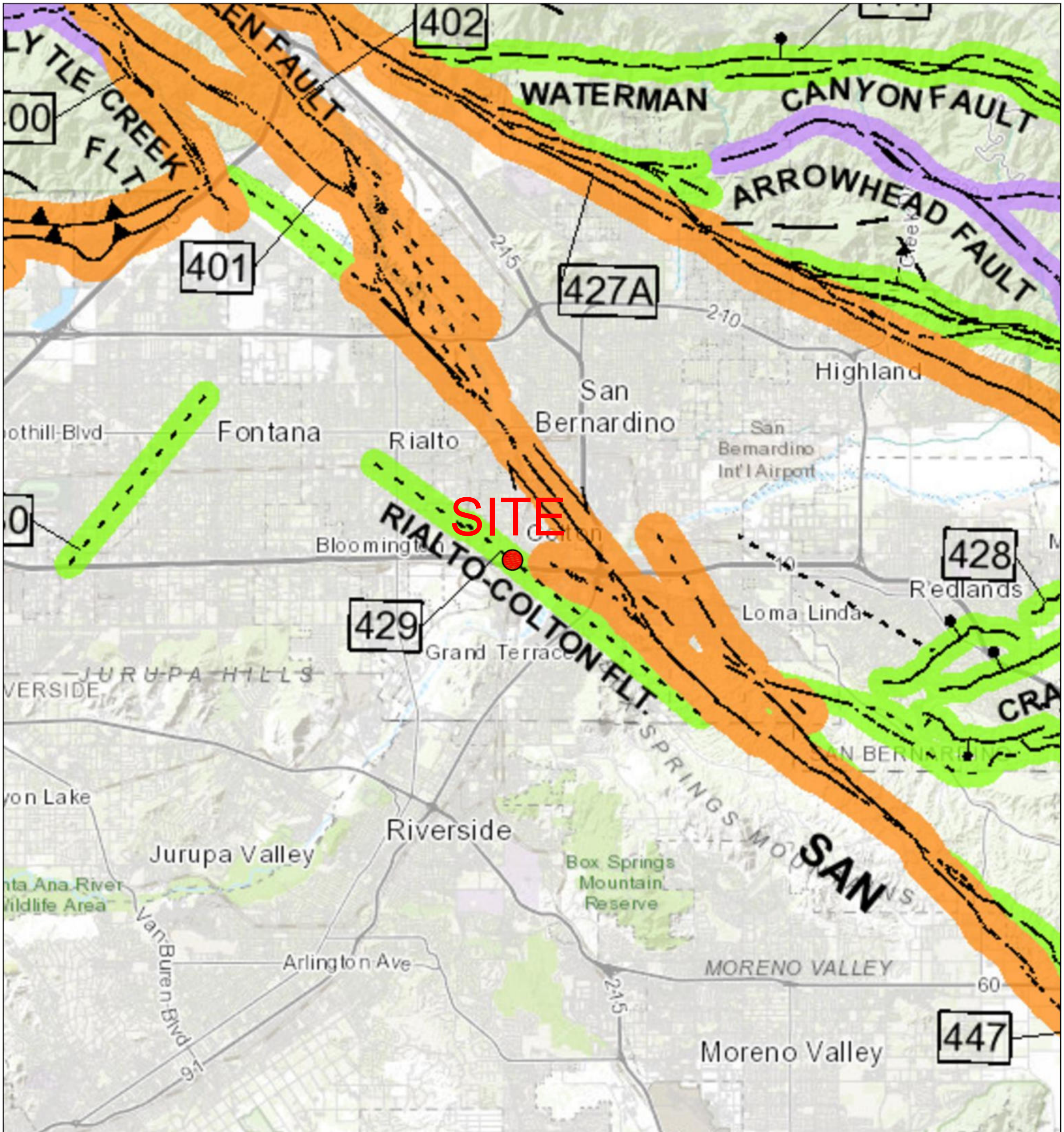
LEGEND:

Qa: Alluvial fan gravel and sand of valley areas
Qg: Alluvial gravel and sand of stream channels
Qs: Drift sand
ms: Biotite schist

REFERENCE MAP:

Dibblee, T.W. and Minch, J.A., 2004, Geologic map of the San Bernardino North/north 1/2 of San Bernardino South quadrangles, San Bernardino and Riverside County, California, Dibblee Geological Foundation, Dibblee Foundation Map DF-127, 1:24,000.

GeoMat Testing Laboratories, Inc. 9980 Indiana Avenue, Suite 14, Riverside, California	DWN BY: AM	PROJECT: PRELIMINARY SOIL INVESTIGATION REPORT 340 W. VALLEY BOULEVARD COLTON, CALIFORNIA	DATE: NOVEMBER 2021
	CHK'D BY: MN		
	DATUM: --		PROJECT NO.: 21216-01
	PROJECTION: --	TITLE: REGIONAL GEOLOGIC MAP	
	SCALE: --		FIGURE NO.: Figure 2
	REV. NO.: --		

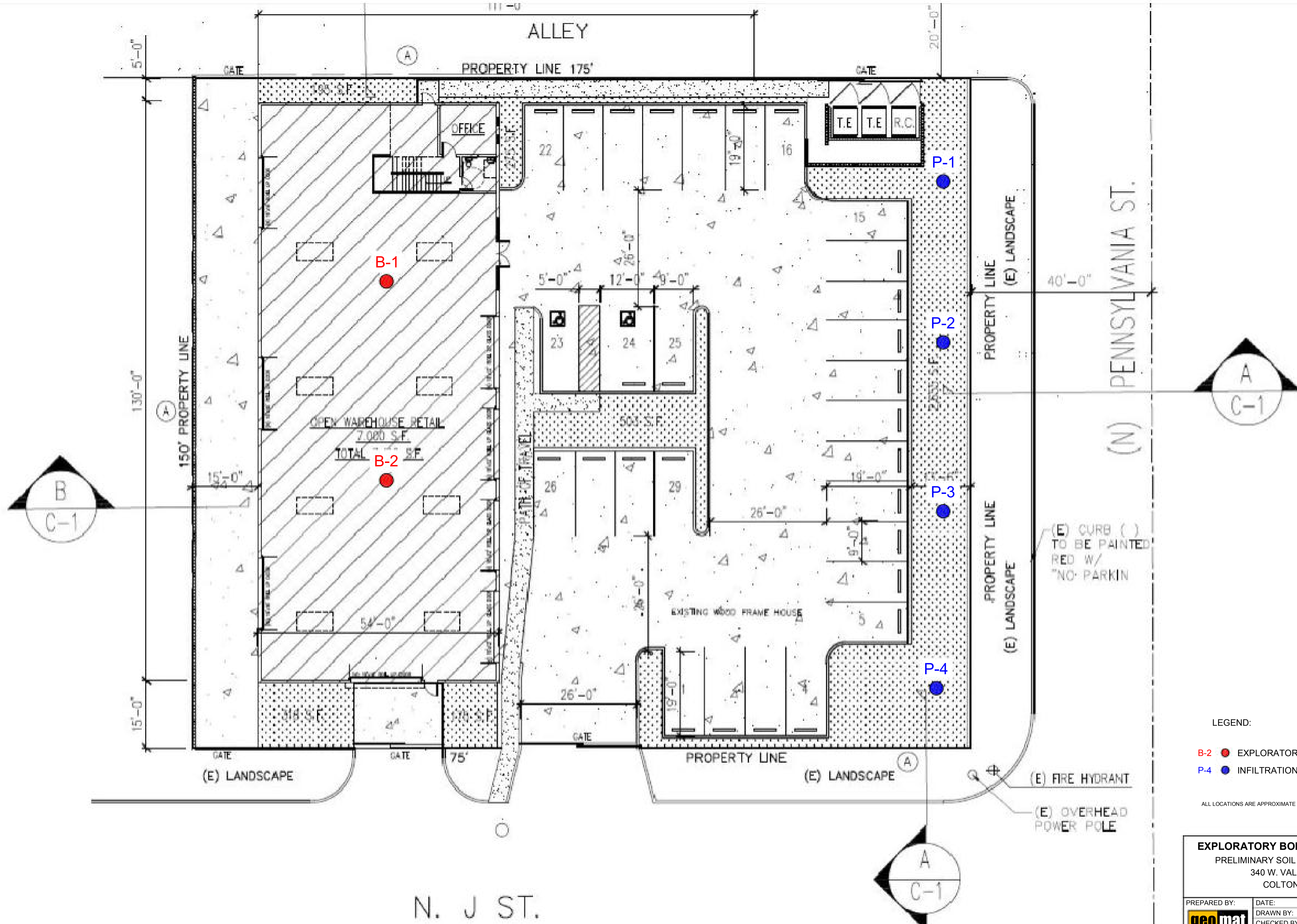


FAULT EXPLANATION:

Historic Fault Displacement | Holocene Fault Displacement | Evidence of Late Quaternary Fault Displacement | Undivided Quaternary Faults

REFERENCES: Jennings, C.W. and Bryant, W.A., 2010,"Fault Activity Map of California," California Geological Survey, GDM-006, May 2010

GeoMat Testing Laboratories, Inc. 9980 Indiana Avenue, Suite 14, Riverside, California	DWN BY: AM CHK'D BY: MN DATUM: -- PROJECTION: -- SCALE: -- REV. NO.: --	PROJECT: PRELIMINARY SOIL INVESTIGATION REPORT 340 W. VALLEY BOULEVARD COLTON, CALIFORNIA TITLE: REGIONAL FAULT MAP	DATE: NOVEMBER 2021 PROJECT NO.: 21216-01 FIGURE NO.: Figure 3



LEGEND:

B-2 EXPLORATORY BOREHOLE

P-4 INFILTRATION TEST

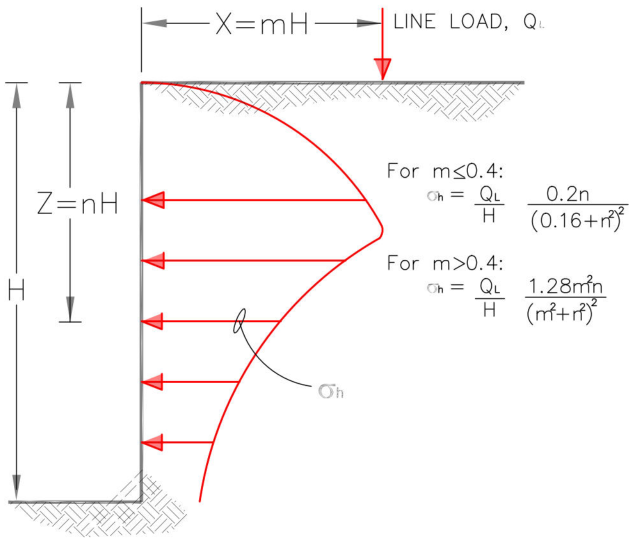
ALL LOCATIONS ARE APPROXIMATE

EXPLORATORY BOREHOLE LOCATION MAP

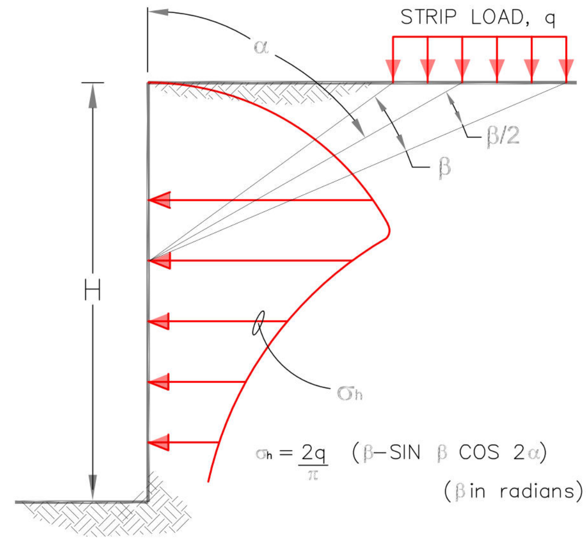
PRELIMINARY SOIL INVESTIGATION REPORT
340 W. VALLEY BOULEVARD
COLTON, CALIFORNIA

PREPARED BY:	DATE:	NOVEMBER 2021	PLATE 1
GeoMat Testing Laboratories, Inc. 9980 Indiana Avenue, Suite 14, Riverside, California	DRAWN BY:	AM	
	CHECKED BY:	HMN	
	PROJECT NO.:	21216-01	
	SCALE:	1" = 50' (11x17)	

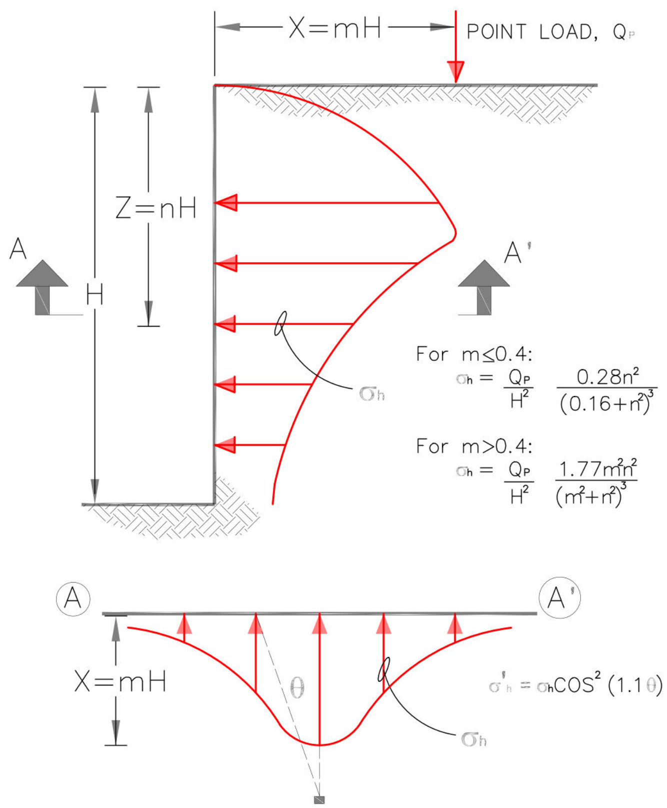
REFERENCE PLAN: VOLBEDA & GARRIDO DESIGN CONSULTANTS & ARCHITECTS, AMKO RECYCLING, LLC, 340 W. VALLEY BOULEVARD, COLTON, CA 92324, SHEET C-1, AUGUST 4, 2021



LINE LOAD PARALLEL TO WALL



STRIP LOAD PARALLEL TO WALL



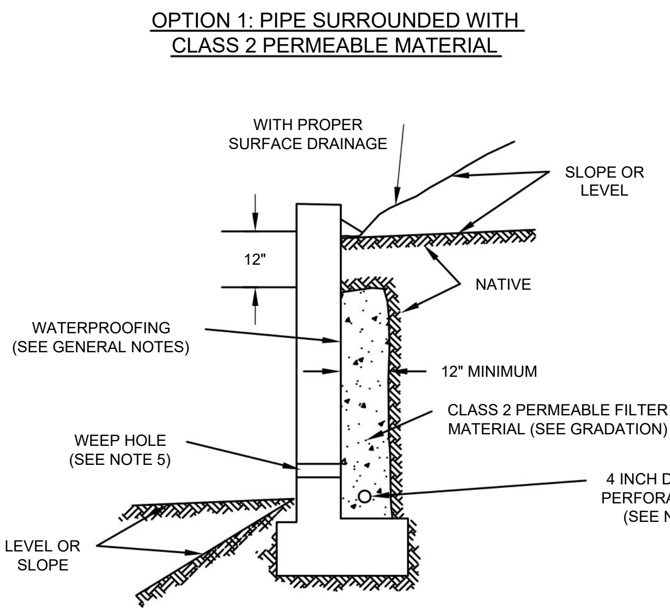
DISTRIBUTION OF HORIZONTAL PRESSURES

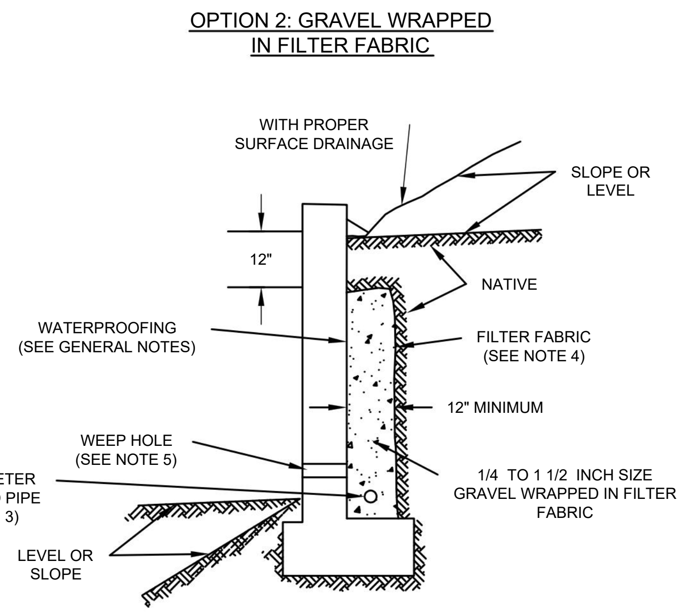
VERTICAL POINT LOAD

NOTES:

1. These guidelines apply to rigid walls with Poisson's ratio assumed to be 0.5 for backfill materials.
2. Lateral pressures from any combination of above loads may be determined by the principle of superposition.

PLATE 2 - RETAINING WALL SURCHARGE DETAIL





Class 2 Filter Permeable Material Gradation
Per Caltrans Specifications

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

GENERAL NOTES:

*Waterproofing should be provided where moisture nuisance problem through the wall is undesireable.
*Water proofing of the walls is not under the purview of the geotechnical engineer.
*All drains should have a gradient of 1 percent minimum.
*Outlet portion of the subdrain should have a 4-inch diamater solid pipe discharged into a suitable disposal area designed by the project engineer. The subdrain pipe should be accessible for maintenance (rodding).
*Other subdrain backfill options are subject to the review by the geotechnical engineer and modification of design parameters.

Notes:
1) Sand should have a sand equivalent of 30 or greater and may be densified by water jetting.
2) 1 Cu. ft. per ft. of 1/4 - to 1 1/2 -inch size gravel wrapped in filter fabric
3) Pipe type should be ASTM D1527 Acrylonitrile Butadiene Styrene (ABS) SDR35 or ASTM D1785 Polyvinyl Chlorise plastic (PVC), Schedule 40, Armco A2000 PVC, or approved equivalent. Pipe should be installed with perforations down. Perforations should be 3/8 -inch in diameter placed at the ends of a 120-degree arc in two rows at 3-inch on center (staggered).
4) Filter Fabric should be Mirafi 140NC or approved equivalent.
5) Weephole should be 3-inch minimum diameter and provided at 10-foot maximum intervals. if exposure is permitted, weepholes should be located 12-inches above finished grade. If exposure is not permitted, such as for a wall adjacent to a sidewalk/curb, a pipe under the sidewalk to be discharged through the curb face or equivalent should be provided. For a basement-type wall, a proper subdrain outlet system should be provided.
6) Retaining wall plans should be reviewed and approved by the geotechnical engineer.
7) Walls over six feet in height are subject to a special review by the geotechnical engineer and modifications to the above requirements.

PLATE 3 - RETAINING WALL BACKFILL AND SUBDRAIN DETAIL

APPENDIX A

SELECTED REFERENCES

GeoMat Testing Laboratories, Inc.
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Engineering Geology
Material Testing

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SELECTED REFERENCES

Volbeda & Garrido Design Consultants & Architects, AMKO Recycling, LLC, 340 W. Valley Boulevard, Colton, Ca 92324, Sheet C-1, August 4, 2021

Dibblee, T.W. and Minch, J.A., 2004, Geologic map of the San Bernardino North/north 1/2 of San Bernardino South quadrangles, San Bernardino and Riverside County, California, Dibblee Geological Foundation, Dibblee Foundation Map DF-127, 1:24,000.

City of Colton General Plan, Safety Element, 2018

Jennings, Charles and Bryant, William, 2010, "Fault Activity Map of California," California Geological Survey, Map No. 6, California Data Map Series, scale 1:750,000.

USGS, Contour Map Showing Minimum Depth to Ground Water, Upper Santa Ana River Valley, California, 1973-1979, Scott E. Carson and Jonathan C. Matti, 1985.

USGS TopoView Interactive Webpage (https://ngmdb.usgs.gov/topoview/viewer/#4/39.98/-107.53)

Structural Engineers Association of California, OSHPD Seismic Design Maps Interactive Website (https://seismicmaps.org/)

Department of the Navy, Design Manual 7.01, Soil Mechanics, September 1986.

Department of the Navy, Design Manual 7.02, Foundation and Earth Structures, September 1986.

Department of the Army, US Army Corps of Engineers, Engineering and Design, Bearing Capacity of Soils, EM 1110-1-1905.

Foundation Design, D. Cudoto, Second Edition, 2000.

Robert Day, Geotechnical Engineer's Portable Handbook.

Robert Day, Geotechnical Foundation Handbook.

APPENDIX B

BOREHOLE LOGS

GeoMat Testing Laboratories, Inc.
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CONSISTENCY OF COHESIVE SOILS

Descriptor	Unconfined Compressive Strength (tsf)	Pocket Penetrometer (tsf)	Torvane (tsf)	Field Approximation
Very Soft	< 0.25	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	0.25 - 0.50	0.25 - 0.50	0.12 - 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 - 1.0	0.50 - 1.0	0.25 - 0.50	Can be penetrated several inches by thumb with moderate effort
Stiff	1.0 - 2.0	1.0 - 2.0	0.50 - 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2.0 - 4.0	2.0 - 4.0	1.0 - 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

APPARENT DENSITY OF COHESIONLESS SOILS

Descriptor	SPT N60 - Value (blows / foot)
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

Descriptor	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

PERCENT OR PROPORTION OF SOILS

Descriptor	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

SOIL PARTICLE SIZE

Descriptor		Size
Boulder		> 12 inches
Cobble		3 to 12 inches
Gravel	Coarse	3/4 inch to 3 inches
	Fine	No. 4 Sieve to 3/4 inch
Sand	Coarse	No. 10 Sieve to No. 4 Sieve
	Medium	No. 40 Sieve to No. 10 Sieve
	Fine	No. 200 Sieve to No. 40 Sieve
Silt and Clay		Passing No. 200 Sieve

PLASTICITY OF FINE-GRAINED SOILS

Descriptor	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

CEMENTATION

Descriptor	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND - SILT MIXTURES
			SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT 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 GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Dual symbols are used to indicate gravels or sand with 5-12% fines and soils with fines classifying as CL-ML. Symbols separated by a slash indicate borderline soil classifications.

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KEY TO LOG OF BORING

APPENDIX B

PROJECT:	340 W. Valley Boulevard Colton, California	Log of Boring B-1	Longitude: Latitude: Elevation:

Project No.	**21216-01**	Location:	**See Plate 1**	Borehole Logged by:	MN
Excavating Co. / Rig:	**GeoMat / CME-45**	Date Started:	**10/30/2021**	Depth to Groundwater:	N/A ft
Method:	**Hollow-Stem Auger**	Date Finished:	**10/30/2021**	Depth to Bedrock:	N/A ft
Hammer Weight / Drop:	**140 lbs./30-inches**	Hammer Type:	**Automatic**	Total Depth of Borehole:	20 ft

Depth (ft)	Type	Sample	Blows / 6"	SPT "N" Value	Symbol	Classification (USCS)	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	Fines Content (%)	Pocket Pen (tsf)	Liquid Limit	Plastic Limit	Plast. Index
						SM	**ARTIFICIAL FILL (SILTY SAND)** medium brown silty sand medium to coarse grained sand dry, loose, disturbed soil							
5	R B		4 5 6	7		SP-SM	**ALLUVIUM (POORLY-GRADED SAND WITH SILT)** medium grayish brown sand with silt dry, very high caving potential loose to medium dense few to some gravel	3	106					
10	S		4 4 10	14										
15	S		20 30 50/5"	>50			gravel up to 1" noted in auger cuttings slightly moist							
20	S		5 8 18	26			**SILT WITH SAND** olive gray silt with sand, moist, very firm TD = 20'	30		73				
25														
30														
35														
40														
45														
50														

LOG LEGEND

Bedrock/Formation	Silty Sands	Bulk "Grab" Sample (B)	Groundwater (Groundwater (During Drillin
Gravels	Silts	Modified California Ring (R)	Groundwater (Groundwater (Stabilized)
Clean Sands	Clayey Sands	Standard Penetration (S)	D Disturbed Sam Disturbed Sample
	Clays	Modified Dames & Moore (D)	N No Sample Re No Sample Recovery

GeoMat Testing Laboratories, Inc.
9980 Indiana Avenue, Suite 14
Riverside, California 92504

PROJECT:	340 W. Valley Boulevard Colton, California	**Log of Boring B-2**	Longitude: Latitude: Elevation:

Project No.	**21216-01**	Location:	**See Plate 1**	Borehole Logged by:	MN	
Excavating Co. / Rig:	**GeoMat / CME-45**	Date Started:	**10/30/2021**	Depth to Groundwater:	N/A	ft
Method:	**Hollow-Stem Auger**	Date Finished:	**10/30/2021**	Depth to Bedrock:	N/A	ft
Hammer Weight / Drop:	**140 lbs./30-inches**	Hammer Type:	**Automatic**	Total Depth of Borehole:	10	ft

Depth (ft)	Type	Sample	Blows / 6"	SPT "N" Value	Symbol	Classification (USCS)	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	Fines Content (%)	Pocket Pen (tsf)	Liquid Limit	Plastic Limit	Plast. Index
0–4						SM	**ARTIFICIAL FILL (SILTY SAND)** medium brown silty sand medium to coarse grained sand dry, loose, disturbed soil							
4–10						SP-SM	**ALLUVIUM (POORLY-GRADED SAND WITH SILT)**							
5	R		5 6 7	8			medium grayish brown sand with silt dry, very high caving potential	3	106					
	B						loose to medium dense few to some gravel							
	S		20 18 15	33			gravel up to 1" noted in auger cuttings							
10							TD = 10'							

SAMPLES / LABORATORY TEST DATA

LOG LEGEND

Bedrock/Formation	Silty Sands	Bulk "Grab" Sample (B)	▽ Groundwater (Groundwater (During Drillin
Gravels	Silts	Modified California Ring (R)	▼ Groundwater (Groundwater (Stabilized)
Clean Sands	Clayey Sands	Standard Penetration (S)	D Disturbed Sam Disturbed Sample
	Clays	Modified Dames & Moore (D)	N No Sample Re No Sample Recovery

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APPENDIX C

LABORATORY TESTING

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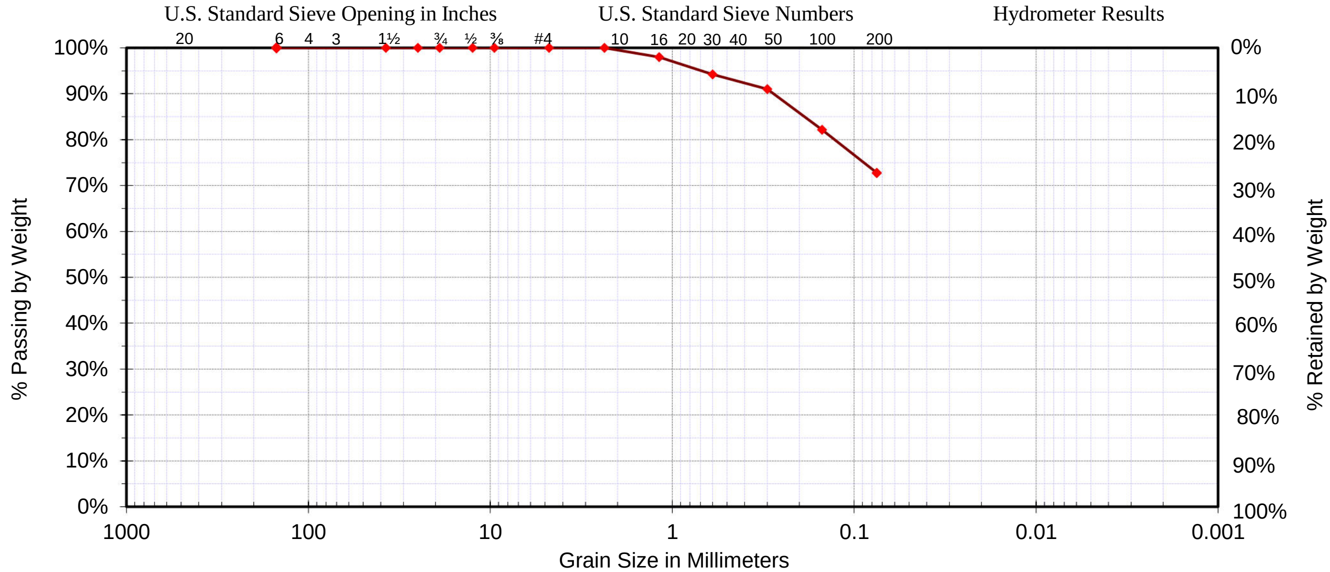
LABORATORY TEST RESULTS



Cobbles	Gravels		Sands			Silts	Clays
	Coarse	Fine	Coarse	Medium	Fine		

Date : 10/30/21
Sample #:
Sample ID: B-1 @ 20'
Source: SPT
Project: 340 W. Valley Boulevard
Location: Colton, California
Boring #: B-1
Depth: 20'

D_{10} = 0.01
D_{30} = 0.03
D_{60} = 0.06
C_C = 1.50
C_U = 6.00
Liquid Limit= n/a
Plastic Limit= n/a
Plasticity Index= n/a

Classification
ML, Silt with Sand

Specifications
custom specs 1

Fineness Modulus
0.35

% Gravel
0.00%
% Sand
27.25%
% Silt & Clay
72.75%

Sample Moisture
29.6%

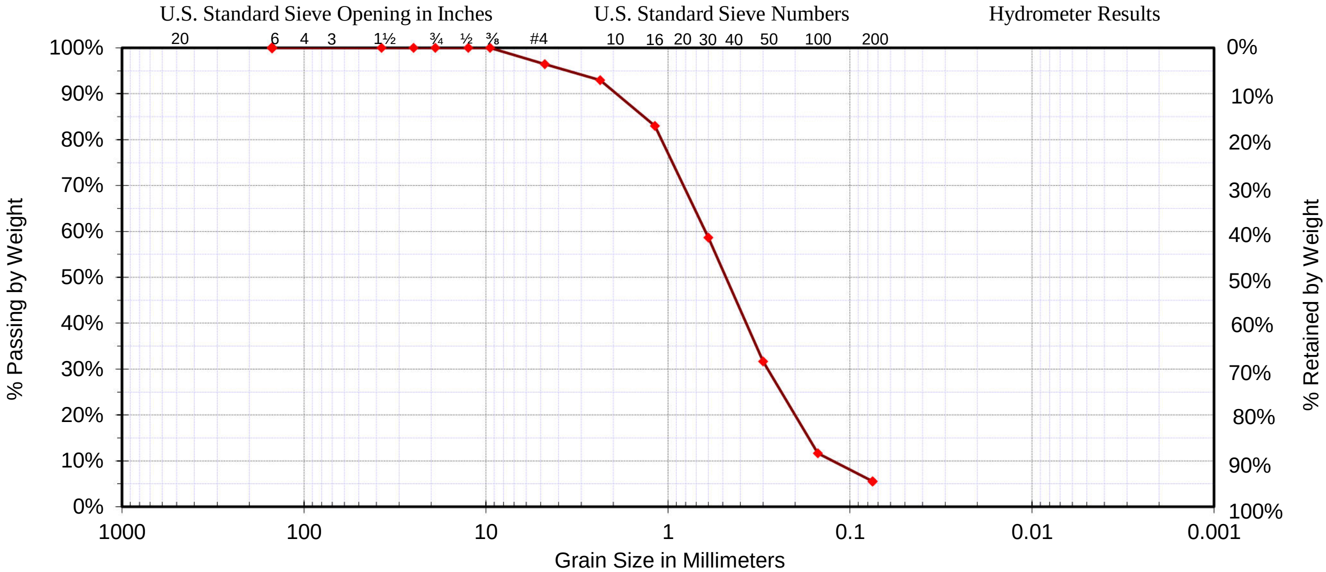
Coarse Section

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100.0%		
4.00"	100.00		100.0%		
3.00"	75.00		100.0%		
2.50"	63.00		100.0%		
2.00"	50.00		100.0%		
1.75"	45.00		100.0%		
1.50"	37.50	100.0%	100.0%		
1.25"	31.50		100.0%		
1.00"	25.00	100.0%	100.0%		
7/8"	22.40		100.0%		
3/4"	19.00	100.0%	100.0%		
5/8"	16.00		100.0%		
1/2"	12.50	100.0%	100.0%		
3/8"	9.50	100.0%	100.0%		
1/4"	6.30		100.0%		
#4	4.75	100.0%	100.0%		

Fines Section

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
#4	4.750	100.0%	100.0%		
#8	2.360	100.0%	100.0%		
#10	2.000		99.4%		
#16	1.180	98.0%	98.0%		
#20	0.850		95.8%		
#30	0.600	94.2%	94.2%		
#40	0.425		92.3%		
#50	0.300	91.0%	91.0%		
#60	0.250		88.1%		
#80	0.180		83.9%		
#100	0.150	82.2%	82.2%		
#140	0.106		76.6%		
#170	0.090		74.6%		
#200	0.075	72.8%	72.8%		
#270	0.053				

LABORATORY TEST RESULTS



Cobbles	Gravels		Sands			Silts	Clays
	Coarse	Fine	Coarse	Medium	Fine		

Date :	10/30/21	D_{10} = 0.13	**Classification**	% Gravel	
Sample #:		D_{30} = 0.29	SP-SM, Poorly graded Sand with Silt	3.56%	
Sample ID:	B-2 @ 4-10'	D_{60} = 0.63		% Sand	
Source:	Bulk	C_C = 1.01	**Specifications**	90.91%	
Project:	340 W. Valley Boulevard	C_U = 4.86	custom specs 1	% Silt & Clay	
Location:	Colton, California	Liquid Limit= n/a		5.53%	
Boring #:	B-2	Plastic Limit= n/a	Fineness Modulus	Sample Moisture	
Depth:	4-10'	Plasticity Index= n/a	2.26	**2.9%**	

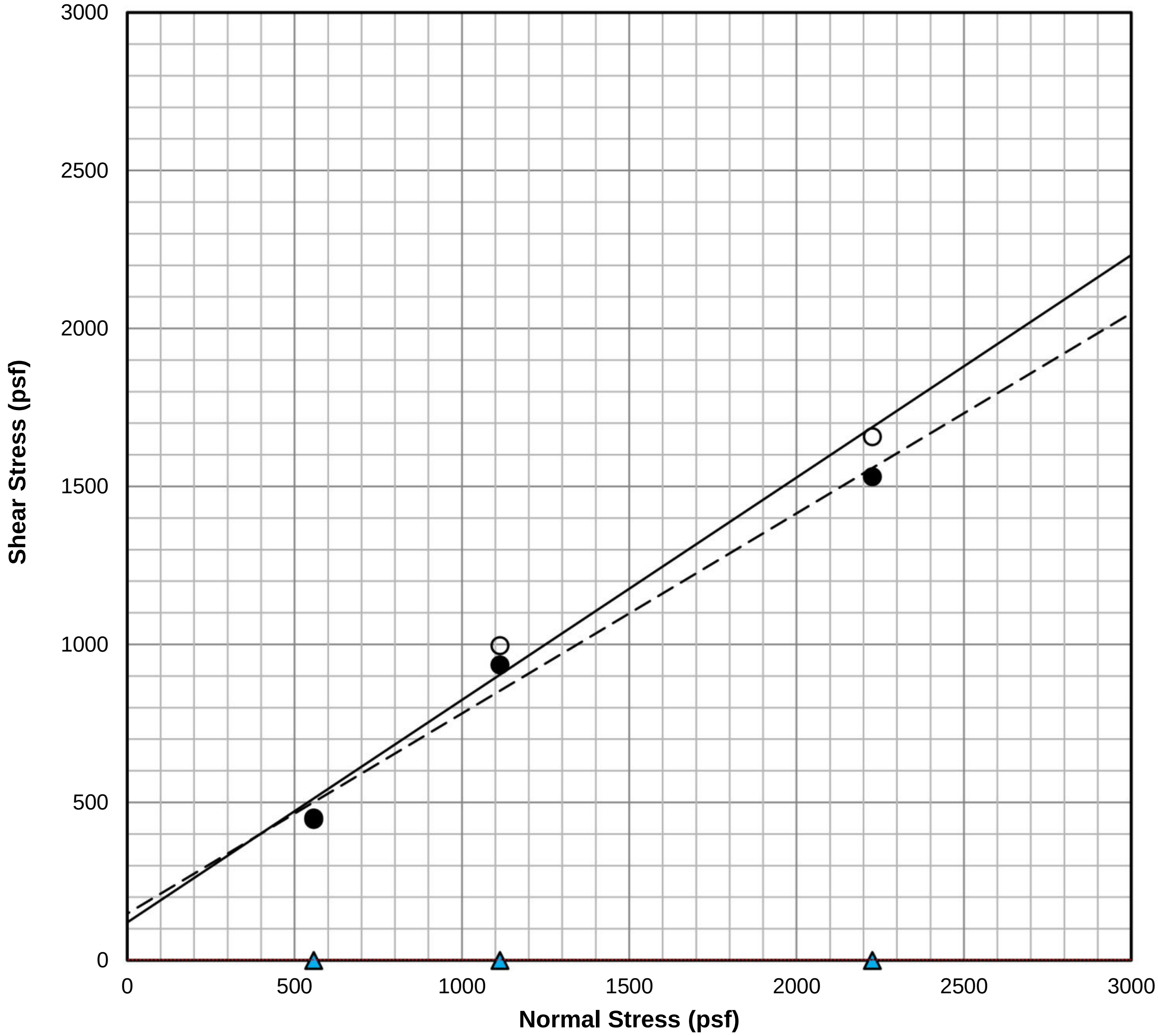
Coarse Section

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100.0%		
4.00"	100.00		100.0%		
3.00"	75.00		100.0%		
2.50"	63.00		100.0%		
2.00"	50.00		100.0%		
1.75"	45.00		100.0%		
1.50"	37.50	100.0%	100.0%		
1.25"	31.50		100.0%		
1.00"	25.00	100.0%	100.0%		
7/8"	22.40		100.0%		
3/4"	19.00	100.0%	100.0%		
5/8"	16.00		100.0%		
1/2"	12.50	100.0%	100.0%		
3/8"	9.50	100.0%	100.0%		
1/4"	6.30		97.6%		
#4	4.75	96.4%	96.4%		

Fines Section

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
#4	4.750	96.4%	96.4%		
#8	2.360	92.9%	92.9%		
#10	2.000		89.9%		
#16	1.180	83.0%	83.0%		
#20	0.850		69.2%		
#30	0.600	58.7%	58.7%		
#40	0.425		42.9%		
#50	0.300	31.7%	31.7%		
#60	0.250		25.0%		
#80	0.180		15.6%		
#100	0.150	11.6%	11.6%		
#140	0.106		8.1%		
#170	0.090		6.8%		
#200	0.075	5.5%	5.5%		
#270	0.053				

DIRECT SHEAR TEST RESULTS



Sample	Symbol	Description	Soil Type [USCS]	Shear Strength	Friction Angle φ [degrees]	Cohesion c [psf]
B-1 @ 5'	—○—	Sand with Silt	SW-SM	Peak	35.1	120
B-1 @ 5'	–●– –	Sand with Silt	SW-SM	Ultimate	32.4	148
B-1 @ 5'	- -▲- - -	Sand with Silt	SW-SM	*Residual	N/A	N/A

Sample Moisture [%]	Saturated Moisture [%]	Dry Unit Weight [pcf]
5.7	18.3	101.7

ASTM D-3080 (MODIFIED FOR CONSOLIDATED UNDRAINED CONDITION)

*Residual shear strength results were determined from the lowest of the residual shears shown abve.
(Individual residual shear results plotted with red dashed line above)

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Soil Engineering, Environmental Engineering, Materials Testing, Geology

SOLUBLE SULFATE AND CHLORIDE TEST RESULTS

Project Name	340 W. Valley Blvd, Colton, CA	**Test Date**	11/03/2021
Project No.	21216-01	**Date Sampled**	10/30/2021
Project Location	340 W. Valley Blvd, Colton, CA	**Sampled By**	MN
Location in Structure	B-1 @ 5'	**Sample Type**	Bulk
Sampled Classification	SW-SM	**Tested By**	AM

TESTING INFORMATION

Sample weight before drying ______

Sample weight after drying ______

Sample Weight Passing No. 10 Sieve ______

Moisture ______

Location	Mixing Ratio	Dilution Factor	Sulfate Reading (ppm)	Sulfate Content (ppm)	Sulfate Content (%)
B-1	3	1	<50	<150	<0.015
			Average		

Chloride Reading (ppm)	Chloride Content (ppm)	Chloride Content (%)
Average		

pH	
Average	

ACI 318-19 Table 19.3.2.1 - Requirements for Concrete by Exposure Class

Exposure Class		Water-Soluble Sulfate (%)	Maximum *w/cm*	Minimum f'*c* (psi)	Cementitous Material (Types) ASTM C150-	Cementitous Material (Types) ASTM C595	Cementitous Material (Types) ASTM C1157	Calcium Chloride Admixture
S0		<0.10	N/A	2500	No Type Restriction	No Type Restriction	No Type Restriction	No Restriction
S1		0.10 to 0.20	0.50	4000	II	Type IP, IS, or IT with (MS) Designation	MS	No Restriction
S2		0.20 to 2.00	0.45	4500	V	Type IP, IS, or IT with (HS) Designation	HS	Not Permitted
S3	Option 1	>2.00	0.45	4500	V + Pozzolan or Slag Cement	Type IP, IS, or IT with (HS) Designation + Pozzolan or Slag Cement	HS + Pozzolan or Slag Cement	Not Permitted
S3	Option 2	>2.00	0.40	5000	V	Types with (HS) designation	HS	Not Permitted

Exposure Class	Maximum *w/cm*	Minimum f'*c* (psi)	Maximum Water-Soluble Chloride ion (Cl^-) Content in Concrete, Percent by Wight of Cement: Nonprestressed Concrete	Prestressed Concrete	Additional Provisions
C0	N/A	2500	1.00	0.06	None
C1	N/A	2500	0.30	0.06	None
C2	0.40	5000	0.15	0.06	Concrete Cover

Caltrans classifies a site as corrosive to structural concrete as an area where soil and/or water contains >500pp chloride, >2000ppm sulfate, or has a pH <5.5. A minimum resistivity of less than 1000 ohm-cm indicates the potential for corrosive environment requiring testing for the above criteria.

The information in this form is not intended for corrosion engineering design. If corrosion is critical, a corrosion specialist should be contacted to provide further recommendations.

APPENDIX D

2019 CBC SEISMIC DESIGN PARAMETERS

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SEA CALIFORNIA — OSHPD

Latitude, Longitude: 34.066891, -117.329766

Date	11/3/2021, 2:38:22 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Default (See Section 11.4.3)

Type	**Value**	**Description**
S_S	2.178	MCE_R ground motion. (for 0.2 second period)
S_1	0.868	MCE_R ground motion. (for 1.0s period)
S_{MS}	2.614	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.742	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	**Value**	**Description**
SDC	null -See Section 11.4.8	Seismic design category
F_a	1.2	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.919	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	1.102	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	2.318	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.53	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.178	Factored deterministic acceleration value. (0.2 second)
S1RT	0.919	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	1.031	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.868	Factored deterministic acceleration value. (1.0 second)
PGAd	0.919	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.916	Mapped value of the risk coefficient at short periods
C_{R1}	0.891	Mapped value of the risk coefficient at a period of 1 s

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APPENDIX E

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

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TABLE OF CONTENT

GENERAL

The guidelines contained herein and the standard details attached hereto represent this firm's standard recommendation for grading and other associated operations on construction projects. These guidelines should be considered a portion of the project specifications.
All plates attached hereto shall be considered as part of these guidelines.
The Contractor should not vary from these guidelines without prior recommendation by the Geotechnical Consultant and the approval of the Client or his authorized representative. Recommendation by the Geotechnical Consultant and/or Client should not be considered to preclude requirements for the approval by the controlling agency prior to the execution of any changes.
These Standard Grading Guidelines and Standard Details may be modified and/or superseded by recommendations contained in the text of the preliminary Geotechnical Report and/or subsequent reports.
If disputes arise out of the interpretation of these grading guidelines or standard details, the Geotechnical Consultant shall provide the governing interpretation.

DEFINITION OF TERMS

ALLUVIUM
Unconsolidated soil deposits resulting from flow of water, including sediments deposited in river beds, canyons, flood plains, lakes, fans and estuaries.
AS-GRADED (AS-BUILT): The surface and subsurface conditions at completion of grading.
BACKCUT: A temporary construction slope at the rear of earth retaining structures such as buttresses, shear keys, stabilization fills or retaining walls.
BACKDRAIN: Generally a pipe and gravel or similar drainage system placed behind earth retaining structures such buttresses, stabilization fills, and retaining walls.
BEDROCK: Relatively undisturbed formational rock, more or less solid, either at the surface or beneath superficial deposits of soil.
BENCH: A relatively level step and near vertical rise excavated into sloping ground on which fill is to be placed.
BORROW (Import): Any fill material hauled to the project site from off-site areas.
BUTTRESS FILL::A fill mass, the configuration of which is designed by engineering calculations to retain slope conditions containing adverse geologic features. A buttress is generally specified by minimum key width and depth and by maximum backcut angle. A buttress normally contains a back-drainage system.
CIVIL ENGINEER: The Registered Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topographic conditions.
CLIENT: The Developer or his authorized representative who is chiefly in charge of the project. He shall have the responsibility of reviewing the findings and recommendations made by the Geotechnical Consultant and shall authorize the Contractor and/or other consultants to perform work and/or provide services.
COLLUVIUM: Generally loose deposits usually found near the base of slopes and brought there chiefly by gravity through slow continuous downhill creep (also see Slope Wash).
COMPACTION : Densification of man-placed fill by mechanical means.
CONTRACTOR – A person or company under contract or otherwise retained by the Client to perform demolition, grading and other site improvements.
DEBRIS: All products of clearing, grubbing, demolition, and contaminated soil materials unsuitable for reuse as compacted fill, and/or any other material so designated by the Geotechnical Consultant.
ENGINEERING GEOLOGIST: A Geologist holding a valid certificate of registration in the specialty of Engineering Geology.
ENGINEERED FILL: A fill of which the Geotechnical Consultant or his representative, during grading, has made sufficient tests to enable him to conclude that the fill has been placed in substantial compliance with the recommendations of the Geotechnical Consultant and the governing agency requirements.
EROSION: The wearing away of ground surface as a result of the movement of wind, water, and/or ice.
EXCAVATION: The mechanical removal of earth materials.
EXISTING GRADE: The ground surface configuration prior to grading.
FILL: Any deposits of soil, rock, soil-rock blends or other similar materials placed by man.
FINISH GRADE: The ground surface configuration at which time the surface elevations conform to the approved plan.

GEOFABRIC: Any engineering textile utilized in geotechnical applications including subgrade stabilization and filtering.
GEOLOGIST: A representative of the Geotechnical Consultant educated and trained in the field of geology.
GEOTECHNICAL CONSULTANT: The Geotechnical Engineering and Engineering Geology consulting firm retained to provide technical services for the project. For the purpose of these specifications, observations by the Geotechnical Consultant include observations by the Soil Engineer, Geotechnical Engineer, Engineering Geologist and those performed by persons employed by and responsible to the Geotechnical Consultants.
GEOTECHNICAL ENGINEER: A licensed Geotechnical Engineer or Civil Engineer who applies scientific methods, engineering principles and professional experience to the acquisition, interpretation and use of knowledge of materials of the earth's crust for the evaluation of engineering problems. Geotechnical Engineering encompasses many of the engineering aspects of soil mechanics, rock mechanics, geology, geophysics, hydrology and related sciences.
GRADING: Any operation consisting of excavation, filling or combinations thereof and associated operations.
LANDSIDE DEBRIS: Material, generally porous and of low density, produced from instability of natural or man-made slopes.
MAXIMUM DENSITY: Standard laboratory test for maximum dry unit weight. Unless otherwise specified, the maximum dry unity weight shall be determined in accordance with ASTM Method of Test D 1557-91.
OPTIMUM MOISTURE – Soil moisture content at the test maximum density.
RELATIVE COMPACTION: The degree of compaction (expressed as a percentage) of dry unit weight of a material as compared to the maximum dry unit weight of the material.
ROUGH GRADE: The ground surface configuration at which time the surface elevations approximately conform to the approved plan.
SITE: The particular parcel of land where grading is being performed.
SHEAR KEY: Similar to buttress, however, it is generally constructed by excavating a slot within a natural slope, in order to stabilize the upper portion of the slope without grading encroaching into the lower portion of the slope.
SLOPE: An inclined ground surface, the steepness of which is generally specified as a ration of horizontal:vertical (e.g., 2:1)
SLOPE WASH: Soil and/or rock material that has been transported down a slope by action of gravity assisted by runoff water not confined by channels (also see Colluvium).
SOIL: Naturally occurring deposits of sand, silt, clay, etc., or combinations thereof.
SOIL ENGINEER: Licensed Geotechnical Engineer or Civil Engineer experienced in soil mechanics (also see Geotechnical Engineer).
STABILIZATION FILL: A fill mass, the configuration of which is typically related to slope height and specified by the standards of practice for enhancing the stability of locally adverse conditions. A stabilization fill is normally specified by minimum key width and depth and by maximum backcut angle. A stabilization fill may or may not have a backdrainage system specified.
SUBDRAIN: Generally a pipe and gravel or similar drainage system placed beneath a fill in the alignment of canyons or formed drainage channels.
SLOUGH: Loose, non-compacted fill material generated during grading operations.
TAILINGS: Non-engineered fill which accumulates on or adjacent to equipment haul-roads.
TERRACE: Relatively level step constructed in the face of a graded slope surface for drainage control and maintenance purposes.
TOPSOIL: The presumable fertile upper zone of soil, which is usually darker in color and loose.
WINDROW: A string of large rocks buried within engineered fill in accordance with guidelines set forth by the Geotechnical Consultant.

OBLIGATIONS OF PARTIES

The Geotechnical Consultant should provide observation and testing services and should make evaluations in order to advise the Client on Geotechnical matters. The Geotechnical Consultant should report his findings and recommendations 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 should be 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, earthwork in accordance with the project plans, specifications and controlling agency requirements. During grading, the Contractor or his authorized representative should remain on-site. Overnight and on days off, the Contractor should remain accessible.

SITE PREPARATION

The Client, prior to any site preparation or grading, should arrange and attend a meeting among the Grading Contractor, the Design Engineer, the Geotechnical Consultant, representatives of the appropriate governing authorities as well as any other concerned parties. All parties should be given at least 48 hours notice.
Clearing and grubbing should consist of the removal of vegetation such as brush, grass, woods, stumps, trees, roots 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 man-made surface and subsurface improvements from the areas to be graded. Demolition of utilities should include proper capping and/or re-routing 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 the 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.
The Client or Contractor should obtain the required approvals for 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.

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.
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 more restrictive requirements by 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 can not be avoided, pumps should be kept on hand to continually remove water during periods of rainfall.
During periods of rainfall, plastic sheeting should be kept reasonably accessible to prevent unprotected slopes from becoming saturated. Where necessary during periods of rainfall, the Contractor should install check-dams de-silting basins, rip-rap, sandbags or other devices or methods necessary to control erosion and provide safe conditions.
During periods of rainfall, the Geotechnical Consultant should be kept informed by the Contractor as to the nature of remedial or preventative work being performed (e.g., pumping, placement of sandbags or plastic sheeting, other labor, dozing, etc.).

Following periods of rainfall, the Contractor should contact the Geotechnical Consultant and arrange a walk-over of the site in order to visually assess rain related damage. The Geotechnical Consultant may also recommend excavations and testing in order to aid in his assessments. At the request of the Geotechnical Consultant, the Contractor shall make excavations in order to evaluate the extent of rain related damage.
Rain-related damage should be considered to include, but may not be limited to, erosion, silting, saturation, swelling, structural distress and other adverse conditions identified by the Geotechnical Consultant. Soil adversely affected should be classified as Unsuitable Materials and should be subject to overexcavation and replaced with compacted fill or other remedial grading as recommended by the Geotechnical Consultant.
Relatively level areas, where saturated soils and/or erosion gullies exist to depths greater then 1 foot, should be overexcavated to unaffected, competent material. Where less than 1 foot in depth, unsuitable materials may be processed in-place to achieve near optimum moisture conditions, then thoroughly recompacted in accordance with the applicable specifications. If the desired results are not achieved, the affected materials should be overexcavated then replaced in accordance with the applicable specifications.
In slope areas, where saturated soil and/or erosion gullies exist to depths of greater than 1 foot, should be over-excavated to unaffected, competent material. Where affected materials exist to depths of 1 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. As field conditions dictate, other slope repair procedures may be recommended by the Geotechnical Consultant.

EXCAVATIONS

UNSUITABLE MATERIALS:
Materials which 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.
Materials identified by the Geotechnical Consultant as unsatisfactory due to its moisture conditions should be overexcavated, watered or dried, as needed, and thoroughly blended to uniform near optimum moisture condition (per Moisture guidelines presented herein) prior to placement as compacted fill.

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).
If excavations for cut slopes expose loose, cohesionless, significantly fractured or otherwise suitable material, overexcavation and replacement of the unsuitable materials with a compacted stabilization fill should be accomplished as recommended by the Geotechnical Consultant. Unless otherwise specified by the Geotechnical Consultant, stabilization fill construction should conform to the requirements of the Standard Details.
The Geotechnical Consultant should review cut slopes during excavation. The Geotechnical Consultant should be notified by the contractor prior to beginning slope excavations.
If during the course of grading, adverse or potentially adverse geotechnical conditions are encountered which were not anticipated in the preliminary report, the Geotechnical Consultant should explore, analyze and make recommendations to treat these problems.
When cuts slopes are made in the direction of the prevailing drainage, a non-erodible diversion swale (brow ditch) should be provided at the top-of-cut.

PAD AREAS:
All lot pad areas, including side yard terraces, above stabilization fills or buttresses should be over-excavated to provide for a minimum of 3-feet (refer to Standard Details) of compacted fill over the entire pad area. Pad areas with both fill and cut materials exposed and pad areas containing both very shallow (less than 3-feet) and deeper fill should be over- thickness (refer to Standard Details).
Cut areas exposing significantly varying material types should also be overexcavated to provide for at least a 3-foot thick compacted fill blanket. Geotechnical conditions may require greater depth of overexcavation. The actual depth should be delineated by the Geotechnical Consultant during grading.

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 and/or an appropriate pad gradient. A gradient in soil areas away from the top-of-slope of 2 percent or greater is recommended.

COMPACTED FILL

All fill materials should be compacted as specified below or by other methods specifically recommended by the Geotechnical Consultant. Unless otherwise specified, the minimum degree of compaction (relative compaction) should be 90 percent of the laboratory maximum density.

PLACEMENT

Prior to placement of compacted fill, the Contractor should request a review by the Geotechnical Consultant of the exposed ground surface. Unless otherwise recommended, the exposed ground surface should then be scarified (6-inches minimum), watered or dried as needed, thoroughly blended to achieve near optimum moisture conditions, then thoroughly compacted to a minimum of 90 percent of the maximum density. The review by the Geotechnical Consultants should not be considered to preclude requirements of inspection and approval by the governing agency.

Compacted fill should be placed in thin horizontal lifts not exceeding 8-inches in loose thickness prior to compaction. Each lift should be watered or dried as needed, thoroughly blended to achieve near optimum moisture conditions then 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. If necessary, excavation equipment should be “shut down” temporarily in order to permit proper compaction of fills. Earth moving equipment should only be considered a supplement and not substituted for conventional compaction equipment.

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 6-foot wide benches and minimum of 4-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 subsequent to keying and benching until the area has been reviewed by the Geotechnical Consultant. 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. Typical keying and benching details have been included within the accompanying Standard Details.

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.

Fill should be tested for compliance with the recommended relative compaction and moisture conditions. Field density testing should conform to ASTM Method of Testing D 1556-64, D 2922-78 and/or D2937-71. Tests should be provided for about every 2 vertical feet or 1,000 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.

The Contractor should assist the Geotechnical Consultant and/or his representative by digging test pits for removal determinations and/or for testing compacted fill.

As recommended by the Geotechnical Consultant, the Contractor should “shutdown” or remove any grading equipment from an area being tested.

The Geotechnical Consultant should maintain a plan with estimated locations of field tests. Unless the client provides for actual surveying of test locations, by the Geotechnical Consultant should only be considered rough estimates and should not be utilized for the purpose of preparing cross sections showing test locations or in any case for the purpose of after-the-fact evaluating of the sequence of fill placement.

MOISTURE

For field testing purposes, “near optimum” moisture will vary with material type and other factors including compaction procedures. “Near optimum” may be specifically recommended in Preliminary Investigation Reports and/or may be evaluated during grading.

Prior to placement of additional compacted fill following an overnight or other grading delay, the exposed surface of previously compacted fill should be processed by scarification, watered or dried as needed, thoroughly blended to near-optimum moisture conditions, then recompacted to a minimum of 90 percent of laboratory maximum dry density. Where wet or other dry or other unsuitable materials exist to depths of greater than one foot, the unsuitable materials should be overexcavated.

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.

FILL MATERIAL

Excavated on-site 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.

Where import materials are required for use on-site, the Geotechnical Consultant should be notified at least 72 hours in advance of importing, in order to sample and test materials from proposed borrow sites. No import materials should be delivered for use on-site without prior sampling and testing by Geotechnical Consultant.

Where oversized rock or similar irreducible material is generated during grading, it is recommended, where practical, to waste such material off-site or on-site in areas designated as “nonstructural rock disposal areas”. Rock placed in disposal areas should be placed with sufficient fines to fill voids. The rock should be compacted in lifts to an unyielding condition. The disposal area should be covered with at least 3-feet of compacted fill, which is free of oversized material. The upper 3-feet should be placed in accordance with the guidelines for compacted fill herein.

Rocks 3 inches in maximum dimension and smaller may be utilized within the compacted fill, provided they are placed in such a manner that nesting of the rock in avoided. Fill should be placed and thoroughly compacted over and around all rock. The amount of rock should not exceed 40 percent by dry weight passing the $^{3}/_{4}$-inch sieve size. The 3-inch and 40 percent recommendations herein may vary as field conditions dictate.

During the course of grading operations, rocks or similar irreducible materials greater than 3-inch maximum dimension (oversized material) may be generated. These rocks should not be placed within the compacted fill unless placed as recommended by the Geotechnical Consultant.

Where rocks or similar irreducible materials of greater that 3-inches but less than 4-feet of maximum dimension are generated during grading, or otherwise desired to be placed within an engineered fill, special handling in accordance with the accompanying Standard Details is recommended. Rocks greater than 4 feet should be broken down or disposed off-site. Rocks up to 4-feet maximum dimension should be placed below the upper 10-feet of any fill and should not be closer than 20-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 of deep utilities are proposes.

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 that 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 time of placement.

Material that is considered unsuitable by the Geotechnical Consultant should not be utilized in the compacted fill.

During grading operations, placing and mixing the materials from the cut and/or borrow areas may result in soil mixtures which possess unique physical properties. Testing may be required of samples obtained directly from the fill areas in order to verify conformance with the specifications. Processing of these additional samples may take two or more working days. The Contractor may elect to move the operation to other areas within the project, or may continue placing compacted fill pending laboratory and field test results. Should he elect the second alternative, fill placed is done so at the Contractor’s risk.

Any fill placed in areas not previously reviewed and evaluated by the Geotechnical Consultant, and/or in other areas, without prior notification to the Geotechnical Consultant may require removal and recompaction at the Contractor's expense. Determination of overexcavations should be made upon review of field conditions by the Geotechnical Consultant.

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 to vertical).

Except as specifically recommended otherwise or as otherwise provided for in these grading guidelines (Reference Fill Materials), compacted fill slopes should be overbuilt 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.

Although no construction procedure produces a slope free from risk of future movement, overfilling and cutting back of slope to a compacted inner core is, given no other constraints, the most desirable procedure. Other constraints, however, must often be considered. These constraints may include property line situations, access, the critical nature of the development, and cost. Where such constraints are identified, slope face compaction may be attempted by conventional construction procedures including backrolling techniques upon specific recommendations by the Geotechnical Consultant.

As a second best alternative for slopes of 2:1 (horizontal to vertical) or flatter, slope construction may be attempted as outlined herein. Fill placement should proceed in thin lifts, (i.e., 6 to 8 inch loose thickness). Each lift should be moisture conditioned and thoroughly compacted. The desired moisture condition should be maintained and/or reestablished, where necessary, during the period between successive lifts. Selected lifts should be tested to ascertain that desired compaction is being achieved. 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 establish 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 4-feet in vertical slope height or the capability of available equipment, whichever is less, fill slopes should be thoroughly backrolled utilizing a conventional sheepsfoot-type roller. Care should be taken to maintain the desired moisture conditions and/or reestablishing same as needed prior to backrolling. Upon achieving final grade, the slopes should again be moisture conditioned and thoroughly backrolled. The use of a side-boom roller will probably be necessary and vibratory methods are strongly recommended. Without delay, so as to avoid (if possible) further moisture conditioning, the slopes should then be grid-rolled to achieve a relatively smooth surface and uniformly compact condition.

In order to monitor slope construction procedures, moisture and density tests will be taken at regular intervals. Failure to achieve the desired results will likely result in a recommendation by the Geotechnical Consultant to overexcavate the slope surfaces followed by reconstruction of the slopes utilizing overfilling and cutting back procedures and/or further attempt at the conventional backrolling approach. Other recommendations may also be provided which would be commensurate with field conditions.

Where placement of fill above a natural slope or above a cut slope is proposed, the fill slope configuration as presented in the accompanying standard Details should be adopted.

For pad areas above fill slopes, positive drainage should be established away from the top-of-slope. This may be accomplished utilizing a berm and pad gradients of at least 2-percent in soil area.

OFF-SITE FILL

Off-site fill should be treated in the same manner as recommended in these specifications for site preparation, excavation, drains, compaction, etc.

Off-site canyon fill should be placed in preparation for future additional fill, as shown in the accompanying Standard Details.

Off-site fill subdrains temporarily terminated (up canyon) should be surveyed for future relocation and connection.

DRAINAGE

Canyon sub-drain systems specified by the Geotechnical Consultant should be installed in accordance with the Standard Details.
Typical sub-drains for compacted fill buttresses, slope stabilization or sidehill masses, should be installed in accordance with the specifications of the accompanying Standard Details.
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, concrete swales).
For drainage over soil areas immediately away from structures (i.e., within 4-feet), a minimum of 4 percent gradient should be maintained. Pad drainage of at least 2 percent should be maintained over soil areas. Pad drainage may be reduced to at least 1 percent for projects where no slopes exist, either natural or man-made, or greater than 10-feet in height and where no slopes are planned, either natural or man-made, steeper than 2:1 (horizontal to vertical slope ratio).
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 can be detrimental to slope stability and foundation performance.

STAKING

In all fill areas, the fill should be compacted prior to the placement of the stakes. This particularly is important on fill slopes. Slope stakes should not be placed until the slope is thoroughly compacted (backrolled). If stakes must be placed prior to the completion of compaction procedures, it must be recognized that they will be removed and/or demolished at such time as compaction procedures resume.
In order to allow for remedial grading operations, which could include overexcavations or slope stabilization, appropriate staking offsets should be provided. For finished slope and stabilization backcut areas, we recommend at least 10-feet setback from proposed toes and tops-of-cut.

SLOPE MAINTENANCE LANDSCAPE PLANTS

In order to enhance superficial 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 semiarid and arid areas may also be appropriate. A Landscape Architect would be the best party to consult regarding actual types of plants and planting configuration.

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.
Though not a requirement, consideration should be give to the installation of near-surface moisture monitoring control devices. Such devices can aid in the maintenance of relatively uniform and reasonably constant moisture conditions.
Property owners should be made aware that overwatering of slopes is detrimental to slope stability.

MAINTENANCE

Periodic inspections of landscaped slope areas should be planned and appropriate measures should be taken to control weeds and enhance growth of the landscape plants. Some areas may require occasional replanting and/or reseeding.
Terrace drains and downdrains should be periodically inspected and maintained free of debris. Damage to drainage improvements should be repaired immediately.
Property owners should be made aware that burrowing animals can be detrimental to slope stability. A preventative program should be established to control burrowing animals.
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 of time prior to landscape planting.

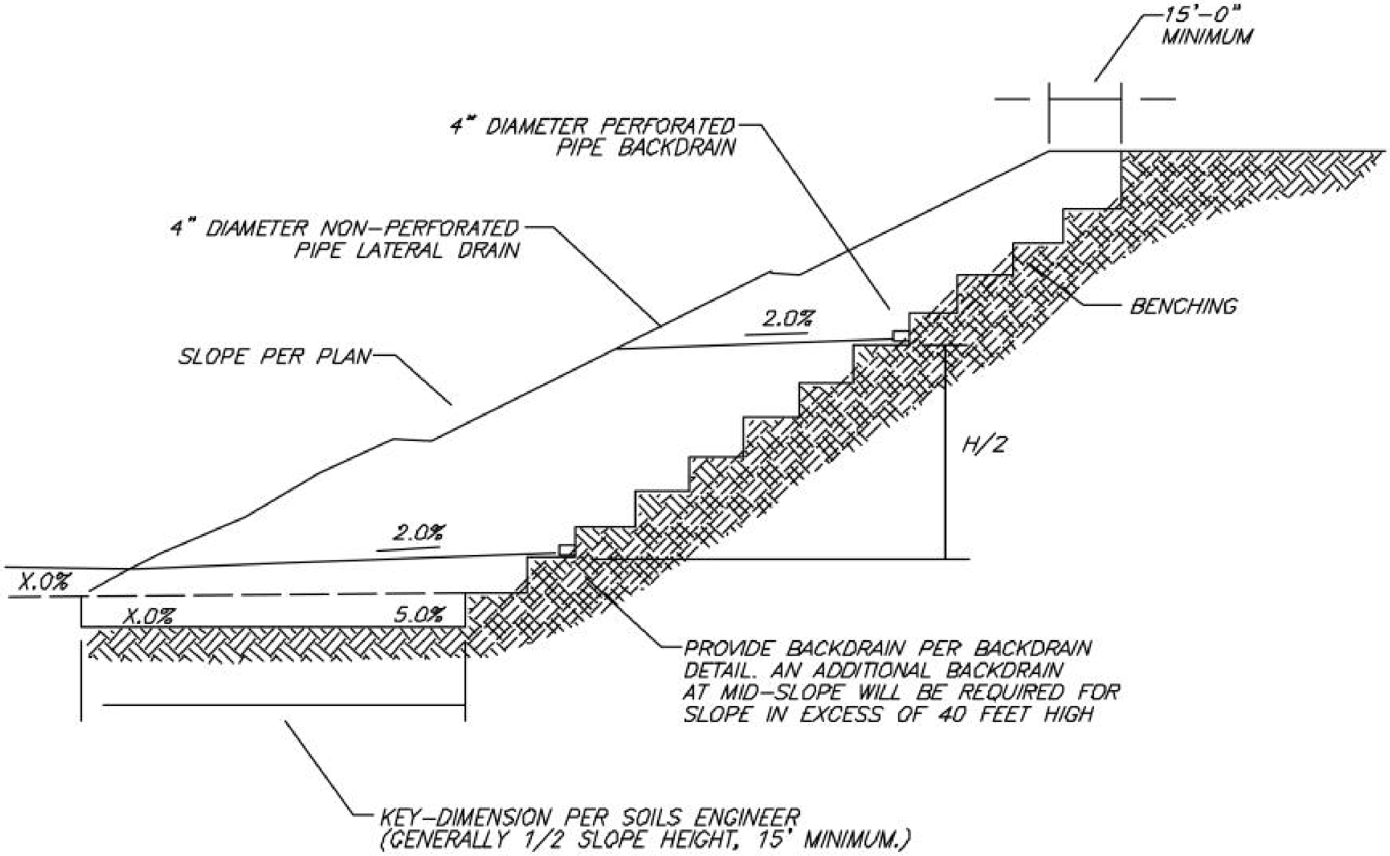
REPAIRS
If slope failures occur, the Geotechnical Consultant should be contacted for a field review of site conditions and development of recommendations for evaluation and repair.
If slope failure occurs as a result of exposure to periods of heavy rainfall, the failure areas and currently unaffected 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 1 foot to 3 feet of a slope face).

TRENCH BACKFILL

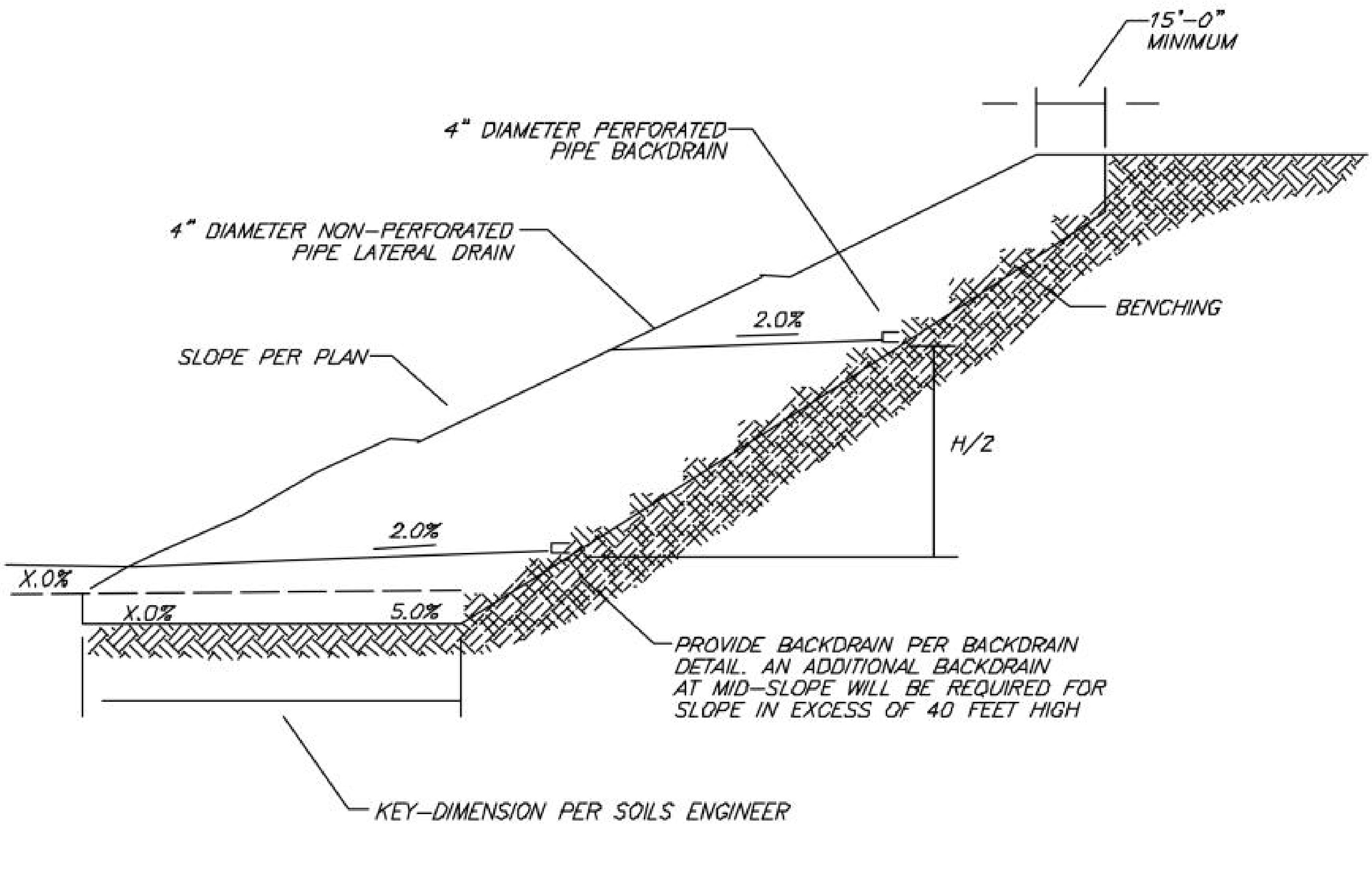
Utility trench backfill should, unless otherwise recommended, be compacted by mechanical means. Unless otherwise recommended, the degree of compaction should be a minimum of 95 percent of the laboratory maximum density.
Approved granular material (sand equivalent greater than 30) should be used to bed and backfill utilities to a depth of at least 1 foot over the pipe. This backfill should be uniformly watered, compacted and/or wheel-rolled from the surface to a firm condition for pipe support.
The remainder of the backfill shall be typical on-site soil or imported soil which should be placed in lifts not exceeding 8 inches in thickness, watered or aerated to at least 3 percent above the optimum moisture content, and mechanically compacted to at least 95 percent of maximum dry density (based on ASTM D1557).
Backfill of exterior and interior trenches extending below a 1:1 projection from the outer edge of foundations should be mechanically compacted to a minimum of 95 percent of the laboratory maximum density.
Within slab areas, but outside the influence of foundations, trenches up to 1 foot wide and 2 feet deep may be backfilled with sand and consolidated by uniformly watering 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 back-fill 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 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 by 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 unless provisions are made for a drainage system to mitigate the potential build-up of seepage forces.

STATUS OF GRADING

Prior to proceeding with any grading operation, the Geotechnical Consultant should be notified at least two working days in advance in order to schedule the necessary observation and testing services.
Prior to any significant expansion of cut back in the grading operation, the Geotechnical Consultant should be provided with adequate notice (i.e., two days) in order to make appropriate adjustments in observation and testing services.
Following completion of grading operations and/or between phases of a grading operation, the Geotechnical Consultant should be provided with at least two working days notice in advance of commencement of additional grading operations.



geomat	TYPICAL STABILIZATION FILL DETAIL	GENERAL EARTHWORK AND GRADING SPECIFICATIONS SHEET 1



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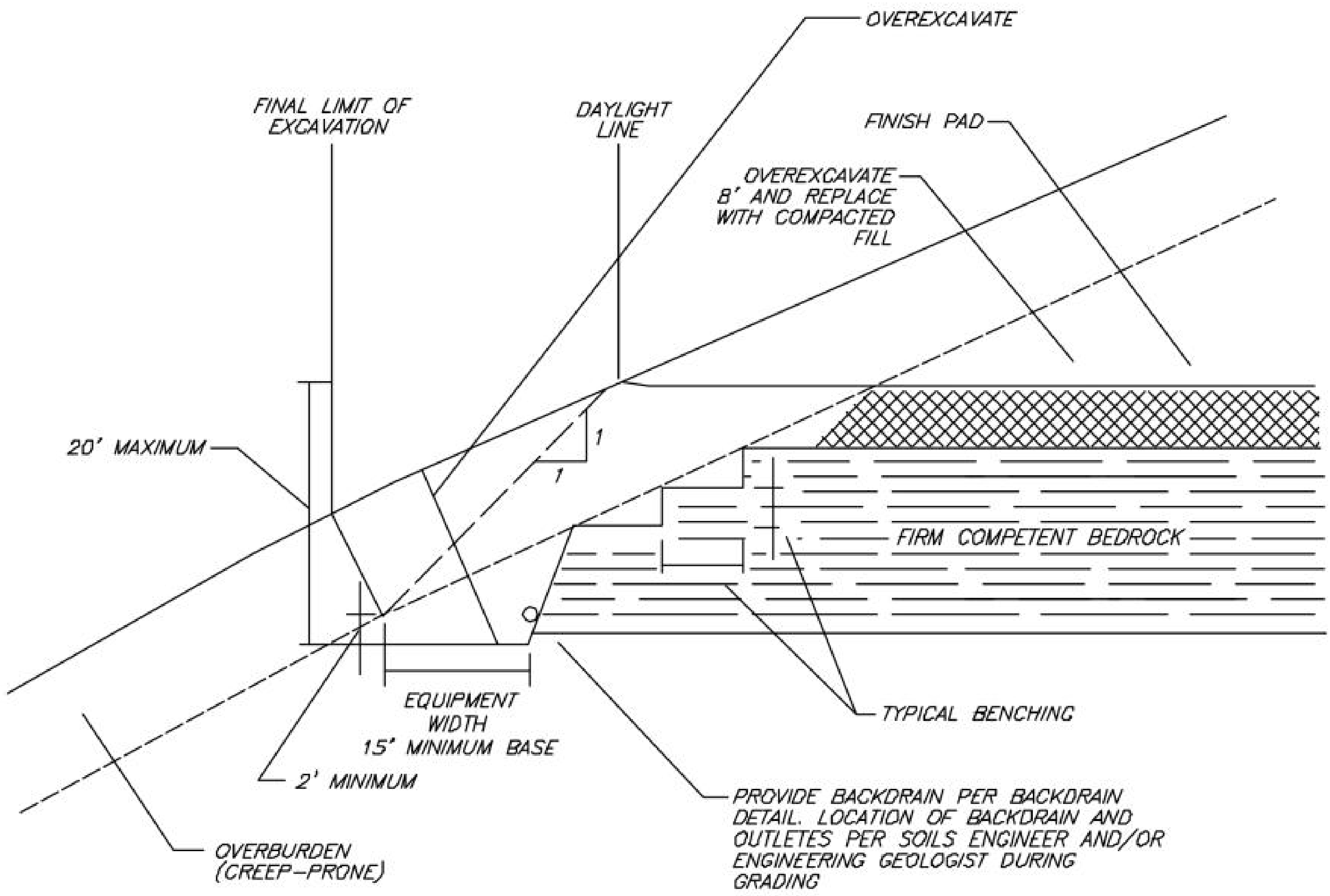
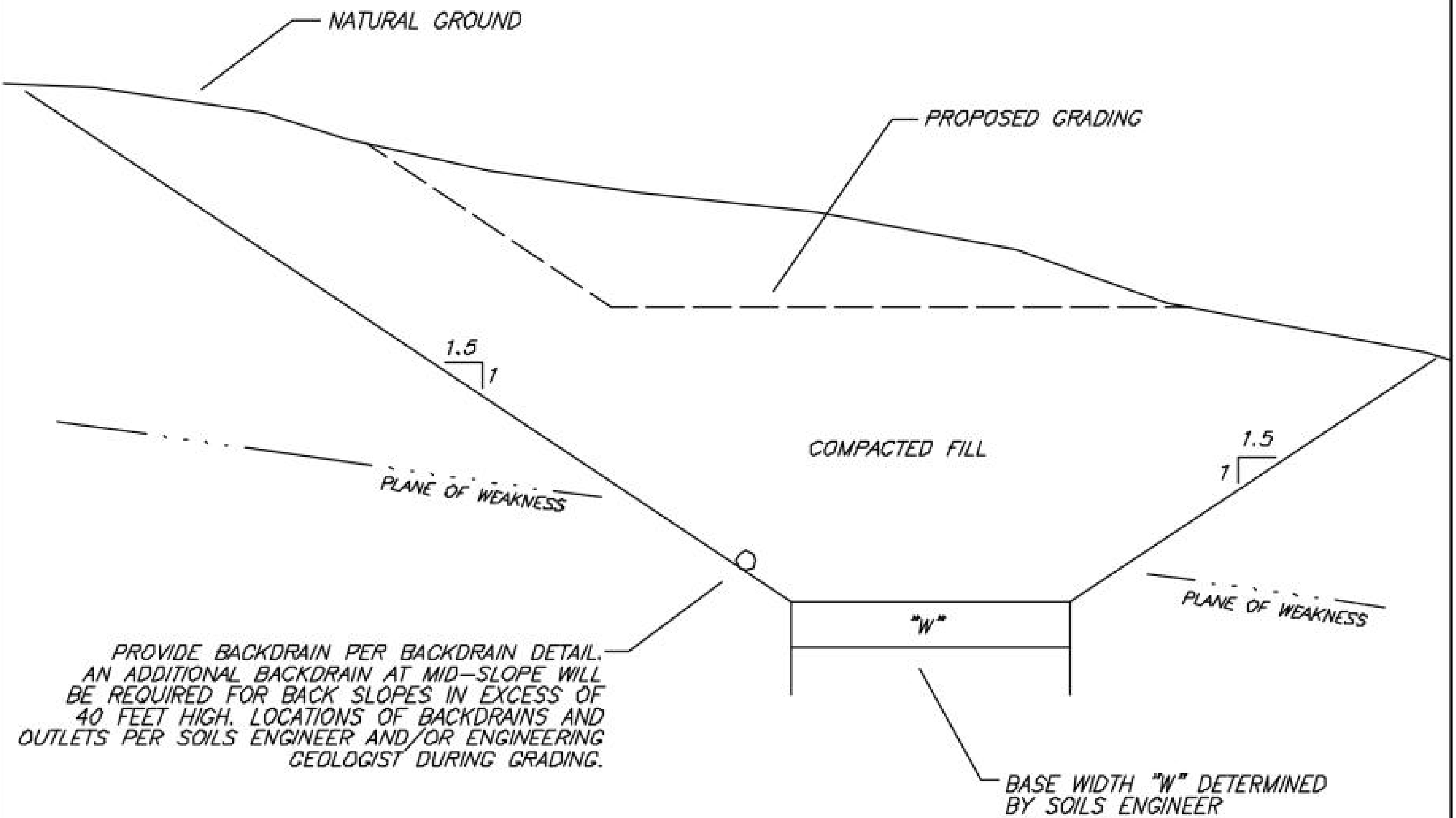
TYPICAL BUTTRESS FILL DETAIL

GENERAL EARTHWORK AND GRADING SPECIFICATIONS
SHEET 2

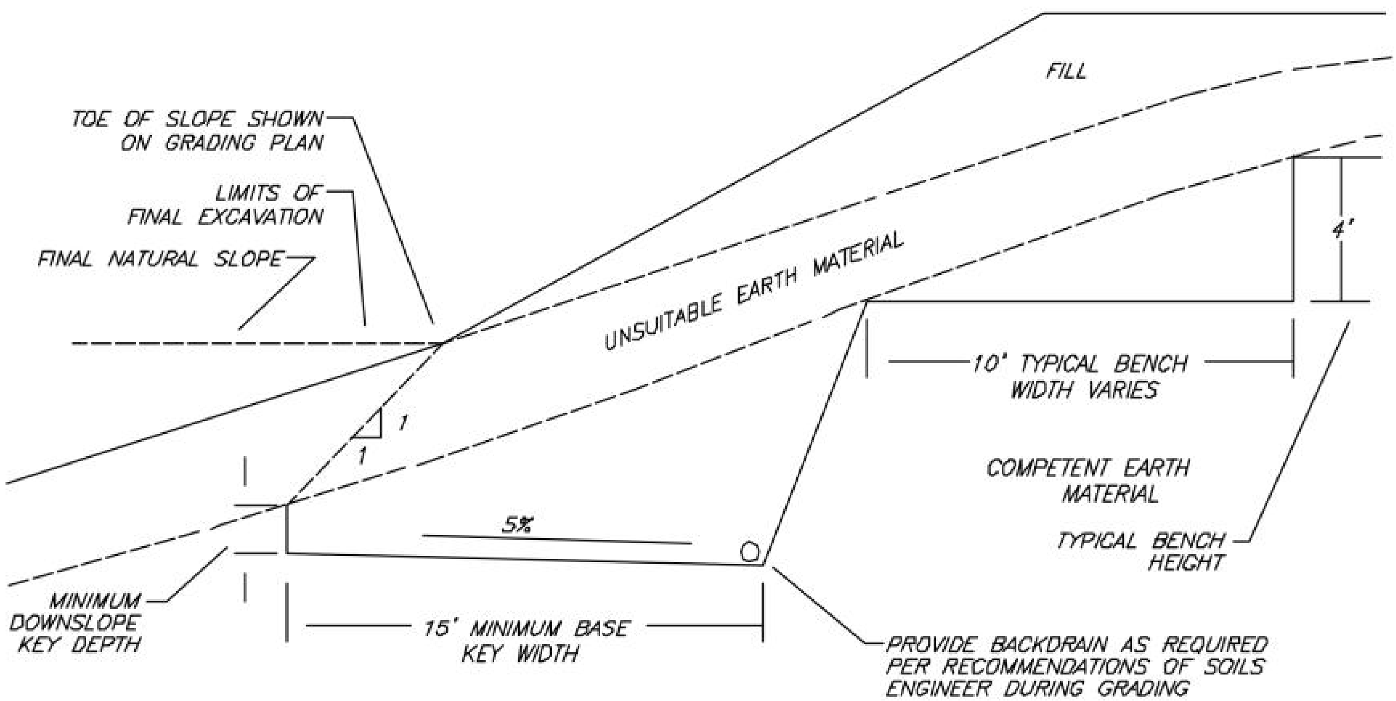


DAYLIGHT SHEAR KEY DETAIL

GENERAL EARTHWORK AND GRADING SPECIFICATIONS
SHEET 3



geomat	TYPICAL SHEAR KEY DETAIL	GENERAL EARTHWORK AND GRADING SPECIFICATIONS SHEET 4



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

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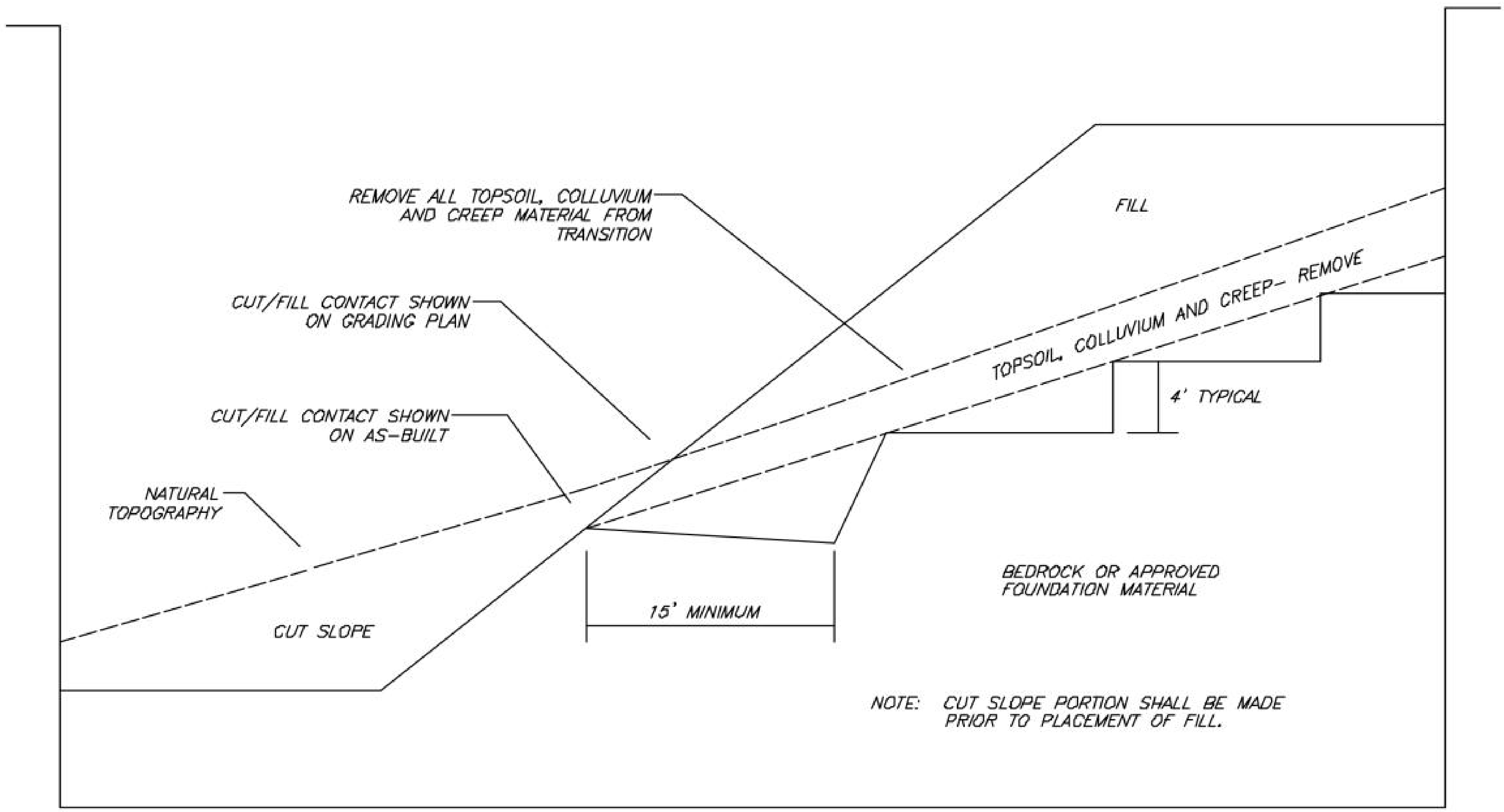
FILL SLOPE ABOVE NATURAL GROUND DETAIL



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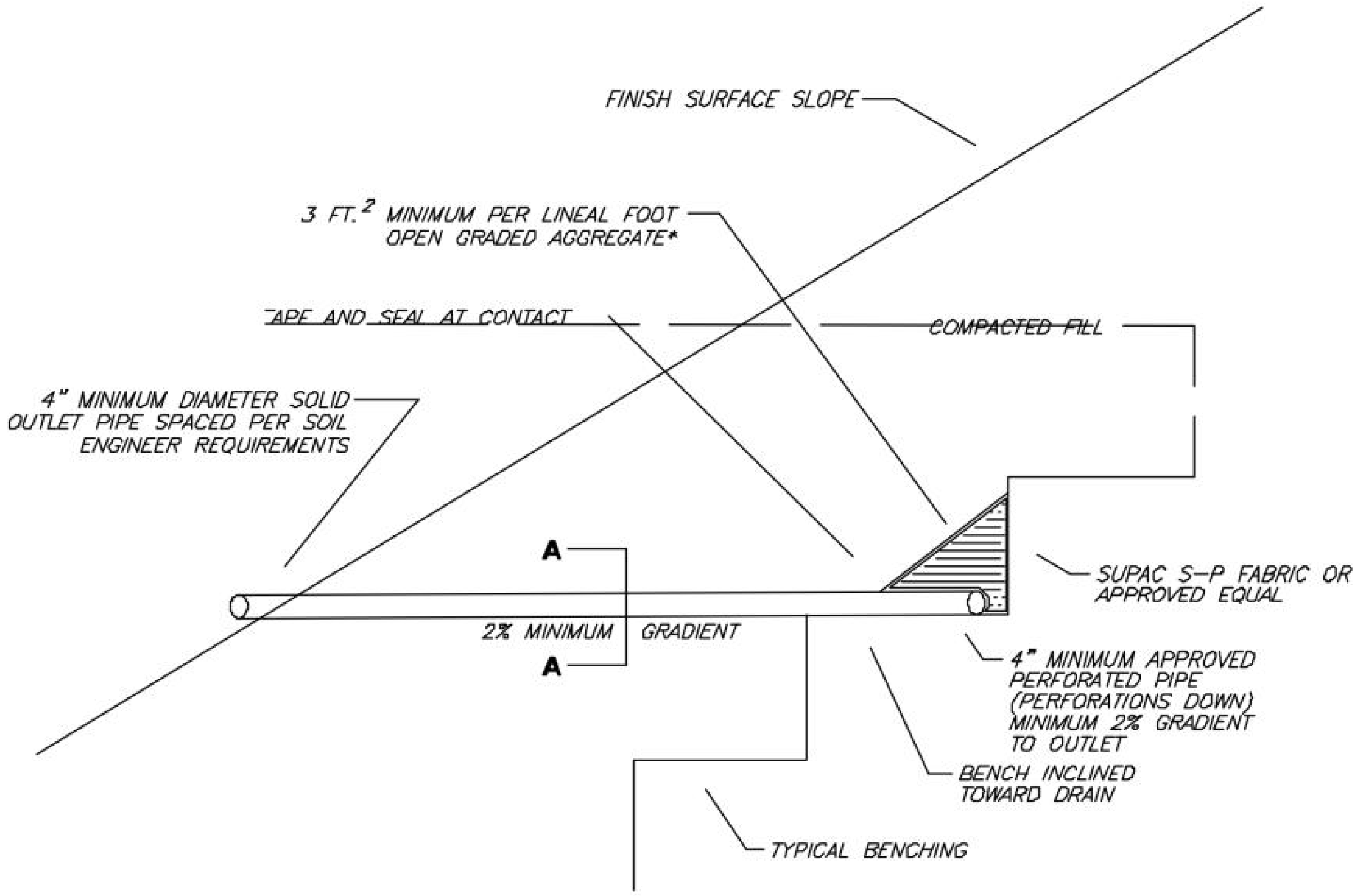
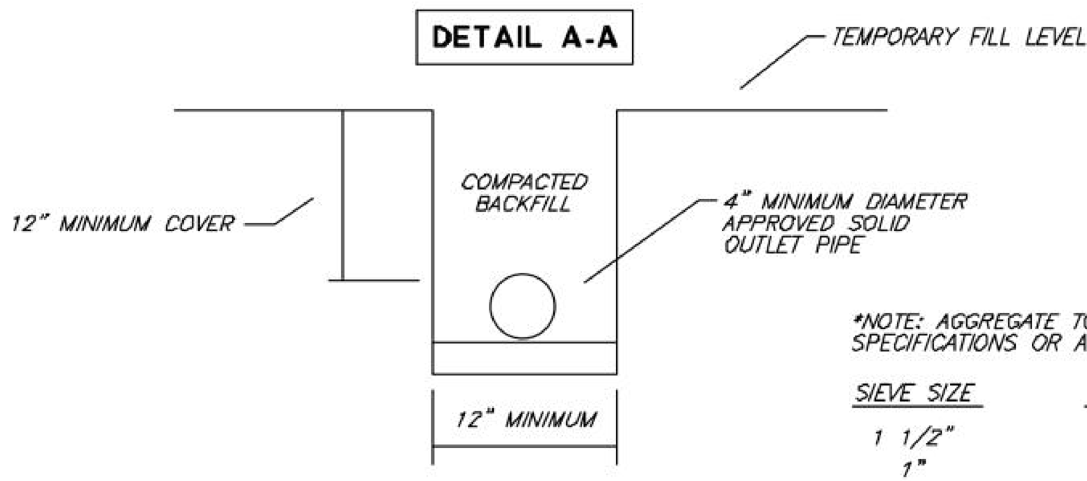
FILL SLOPE ABOVE CUT SLOPE DETAIL

GENERAL EARTHWORK AND GRADING SPECIFICATIONS
SHEET 6





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

SIEVE SIZE	PERCENTAGE PASSING
1 1/2"	100
1"	5-40
3/4"	0-17
3/8"	0-7
NO. 200	0-3

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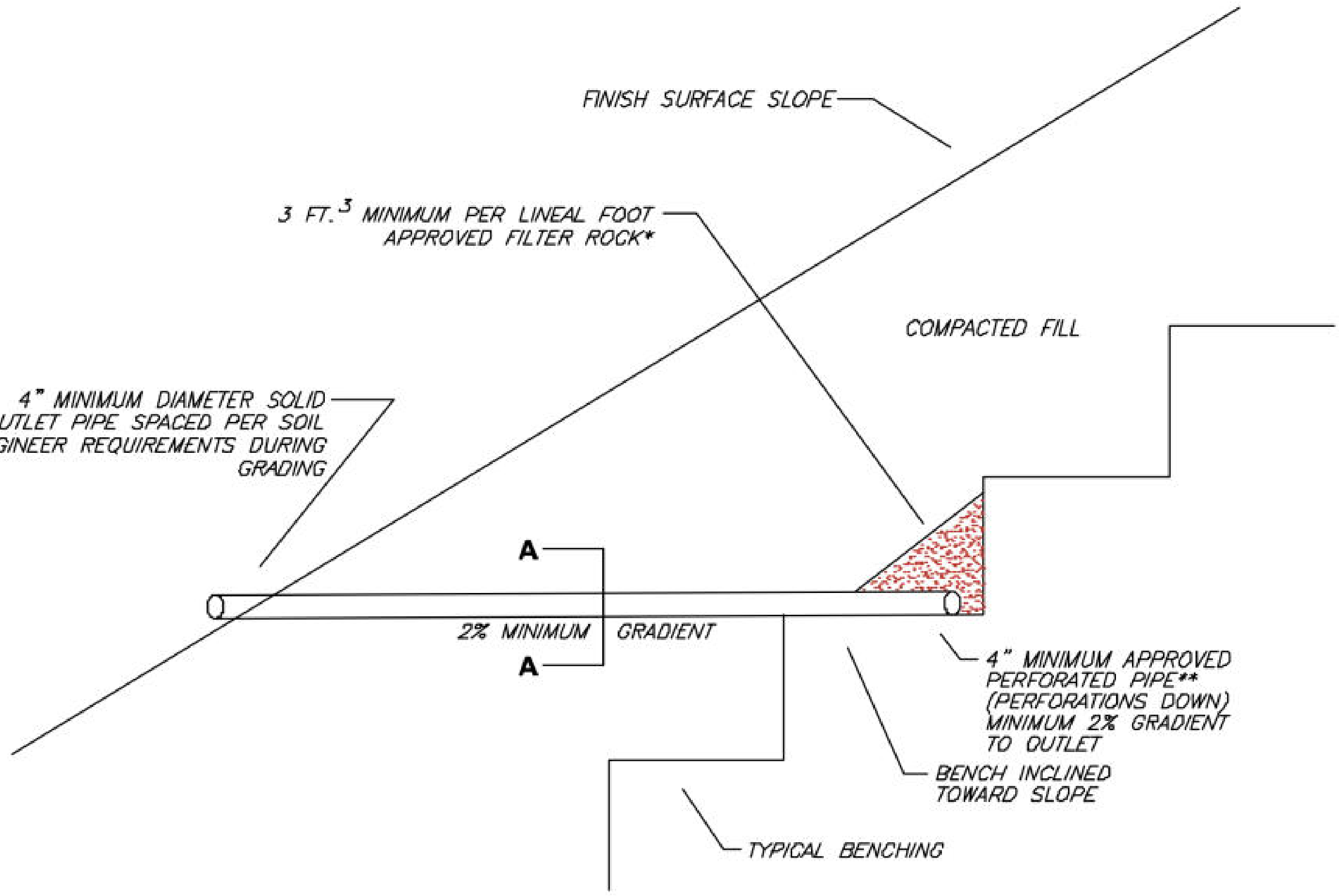
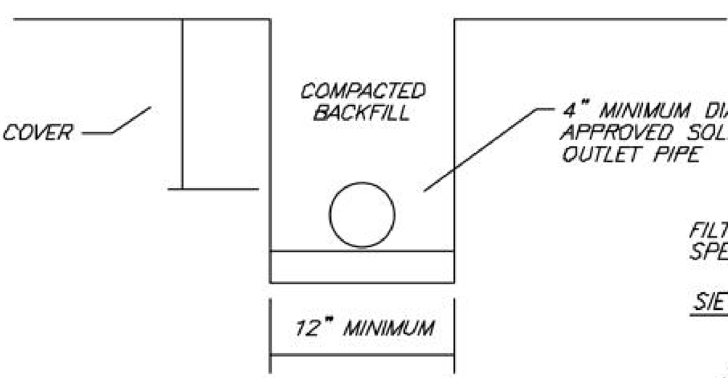
BACKDRAIN DETAIL (GEOFABRIC)

GENERAL EARTHWORK AND GRADING SPECIFICATIONS
SHEET 7



DETAIL A-A



FILTER ROCK MATERIAL TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE
1"	100
3/4"	90–100
3/8"	40–100
NO. 4	25–40
NO. 30	5–15
NO. 50	0–7
NO. 200	0–3

**APPROVED PIPE TYPE:

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

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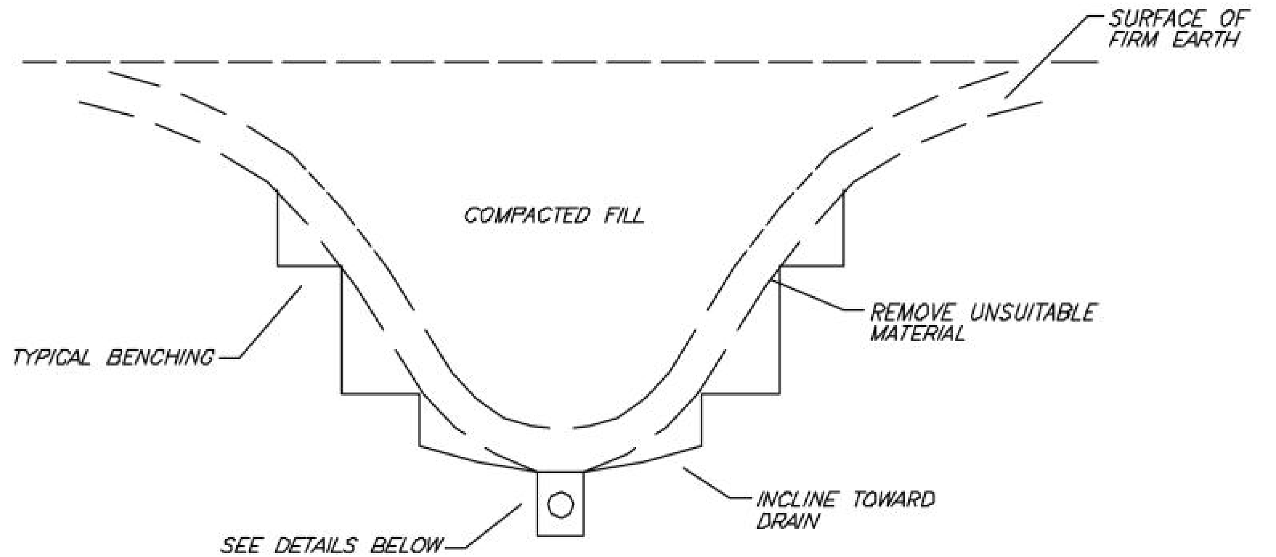
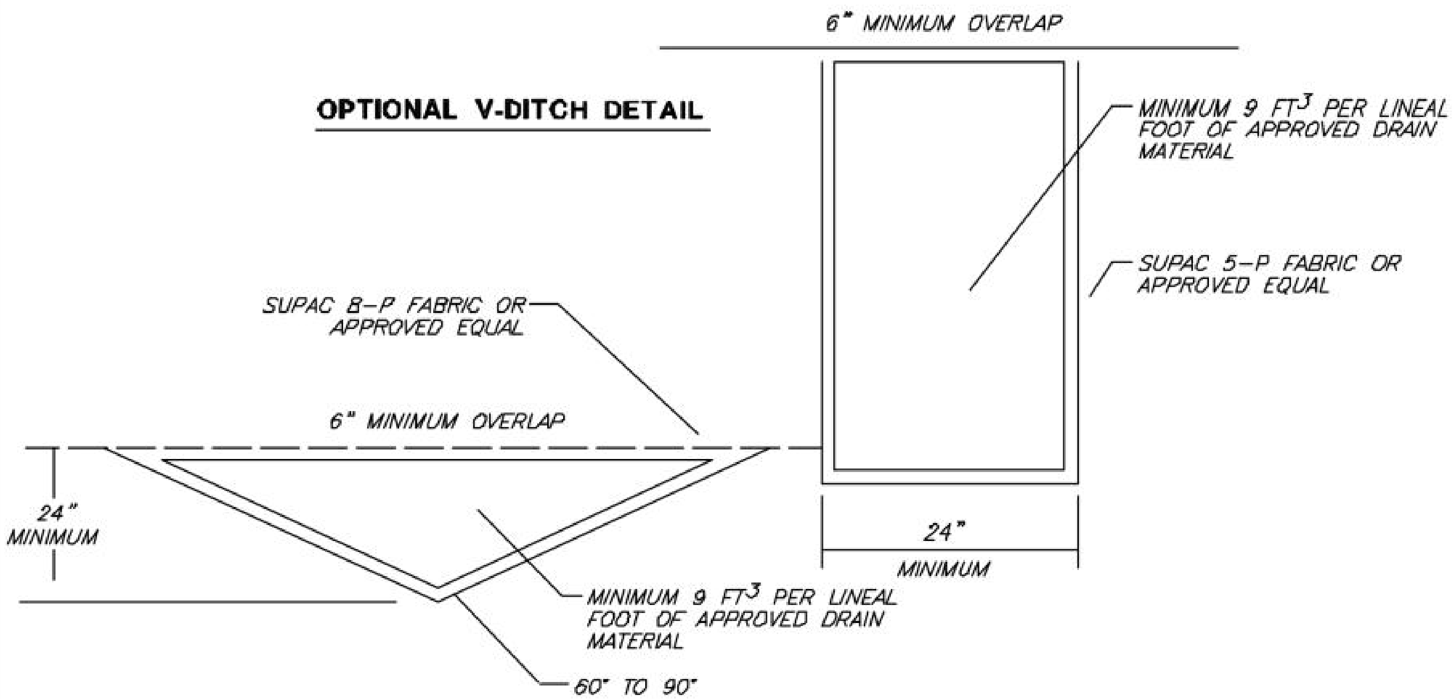
TYPICAL BACKDRAIN DETAIL

GENERAL EARTHWORK AND GRADING SPECIFICATIONS
SHEET 8



TRENCH DETAIL

OPTIONAL V-DITCH DETAIL



DRAIN MATERIAL TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1-1/2"	88-100
1"	5-40
3/4"	0-17
3/8"	0-7
NO.:200	0-3

ADD MINIMUM 4" DIAMETER APPROVED PERFORATED PIPE WHEN GRADIENT IS LESS THAN 2%

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

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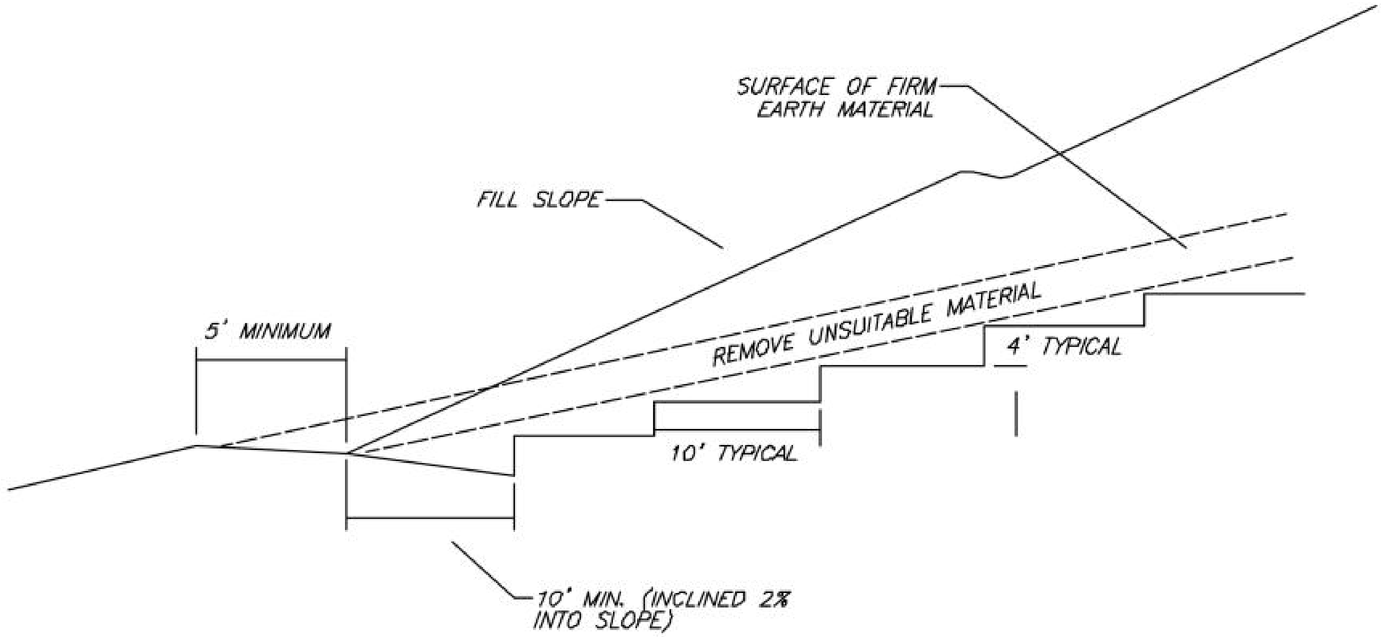
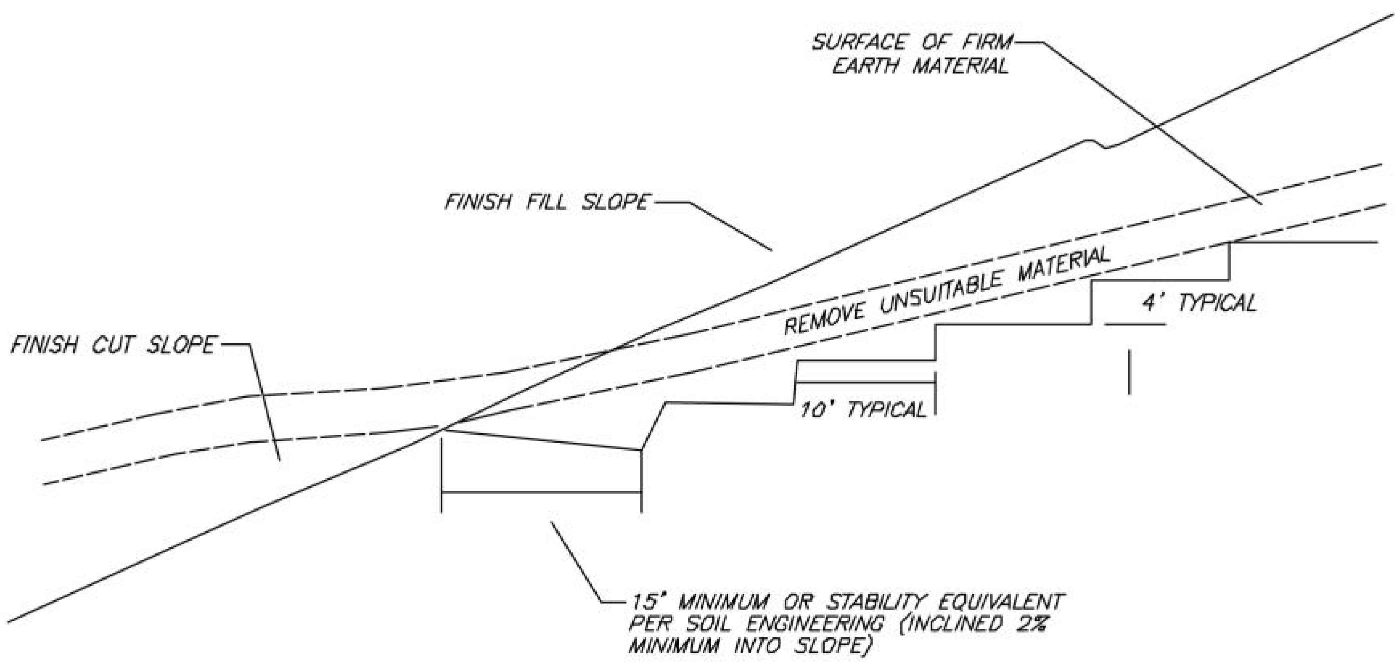
GEOFABRIC SUBDRAIN DETAIL

GENERAL EARTHWORK AND GRADING SPECIFICATIONS
SHEET 9

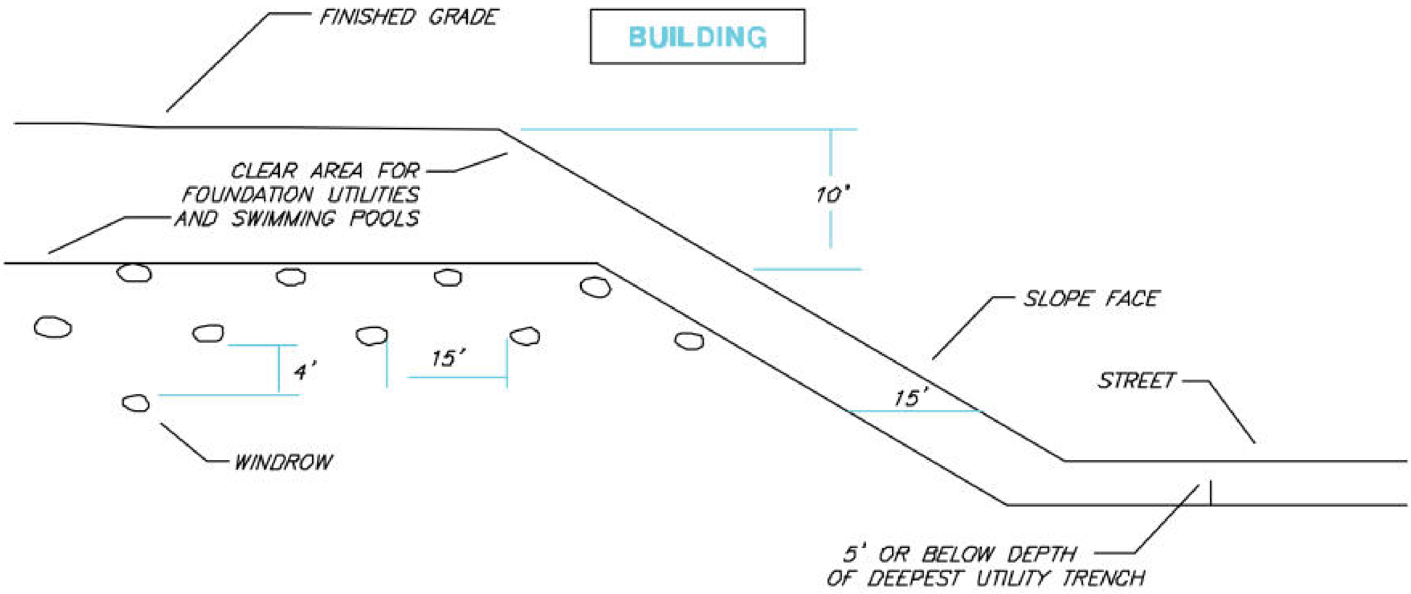
BENCHING FILL OVER NATURAL



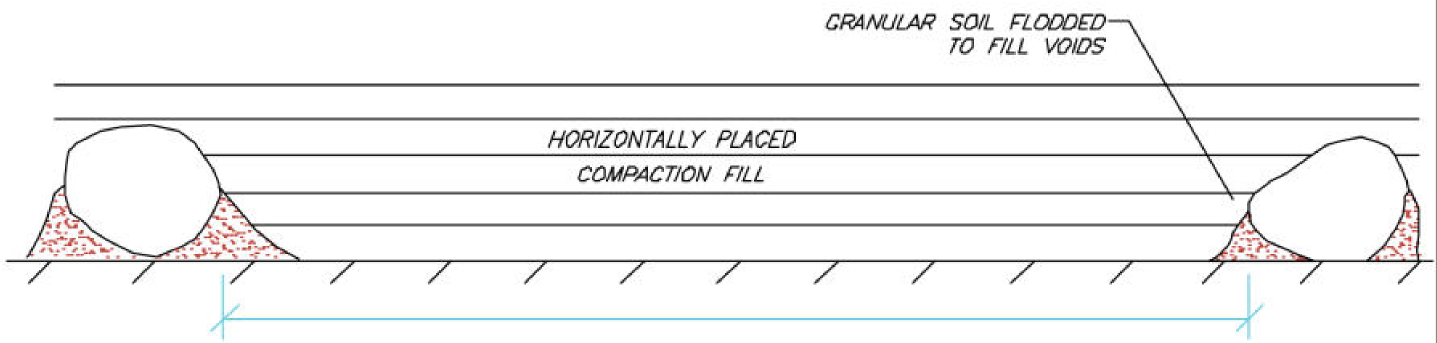
BENCHING FILL OVER CUT



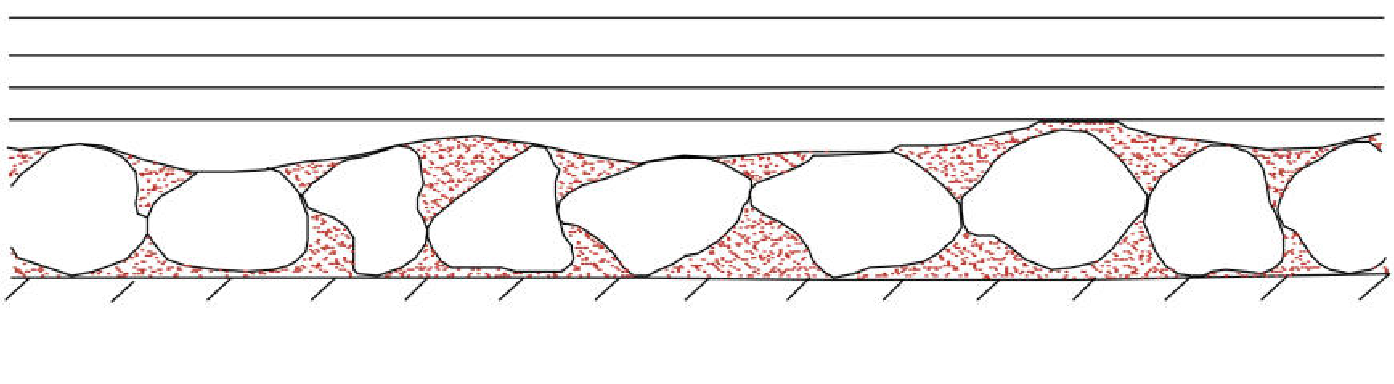
geomat	BENCHING FOR COMPACTED FILL DETAIL	GENERAL EARTHWORK AND GRADING SPECIFICATIONS SHEET 10



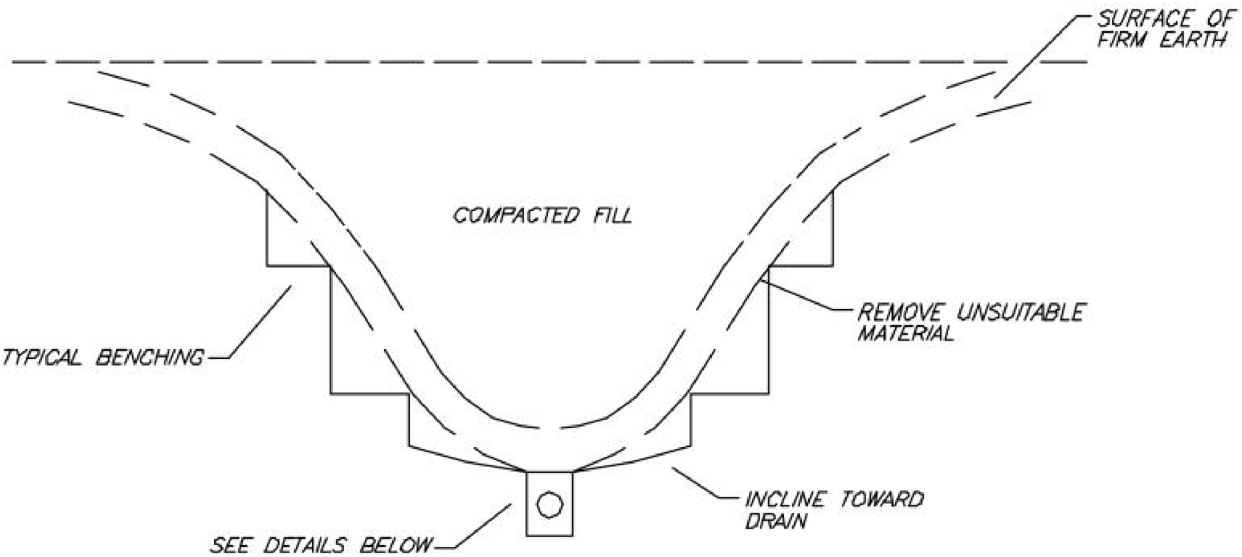
TYPICAL WINDROW DETAIL (EDGE VIEW)



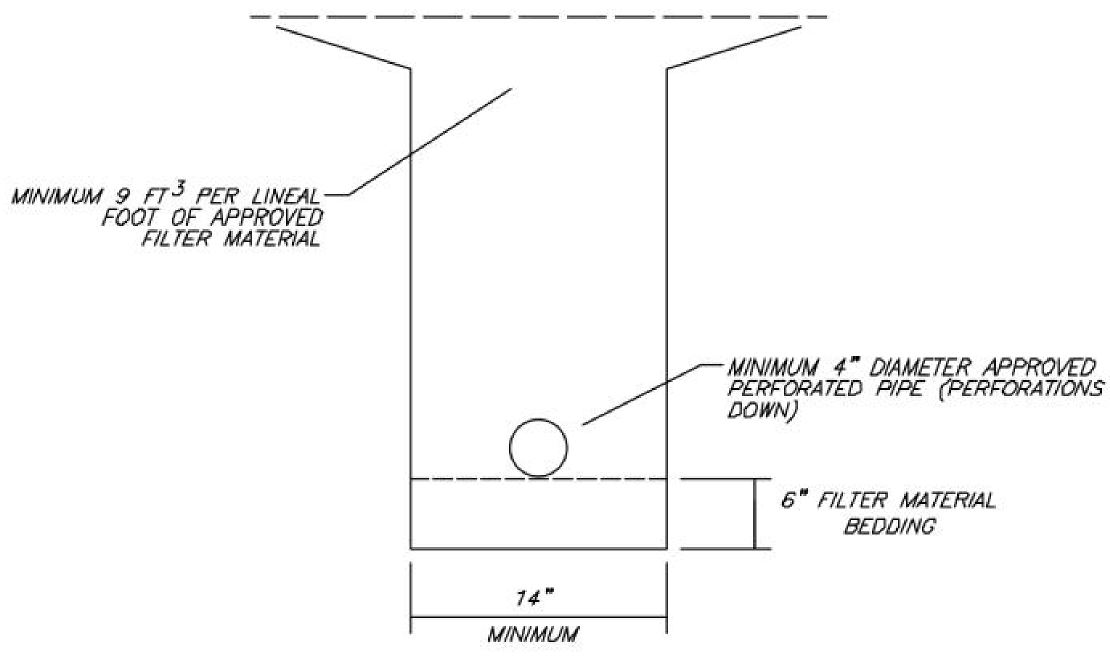
PROFILE VIEW



geomat	ROCK DISPOSAL DETAIL	GENERAL EARTHWORK AND GRADING SPECIFICATIONS SHEET 11



TRENCH DETAIL



FILTER MATERIAL TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE
1"	100
3/4"	90–100
3/8"	40–100
NO. 4	25–40
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
UPPER 500'	4"
NEXT 1000'	6"
> 1500'	8"

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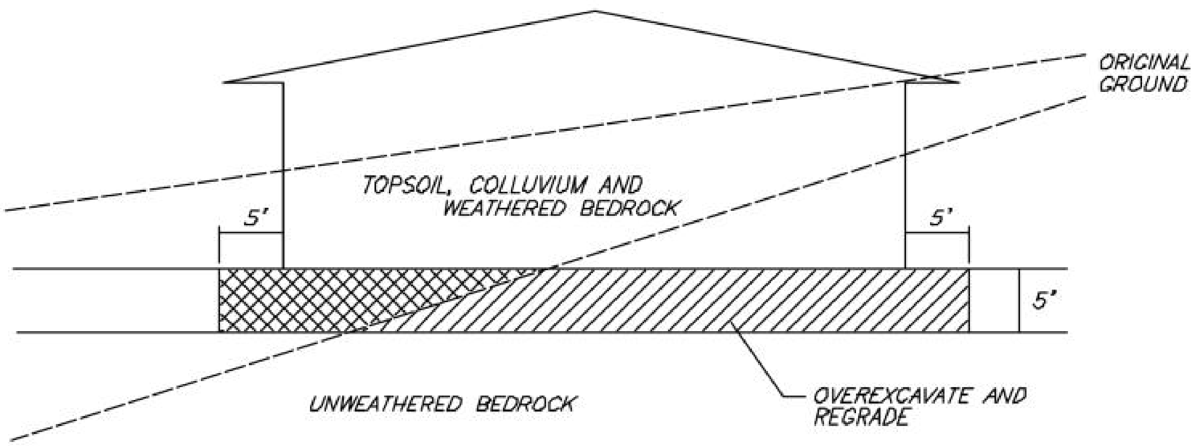
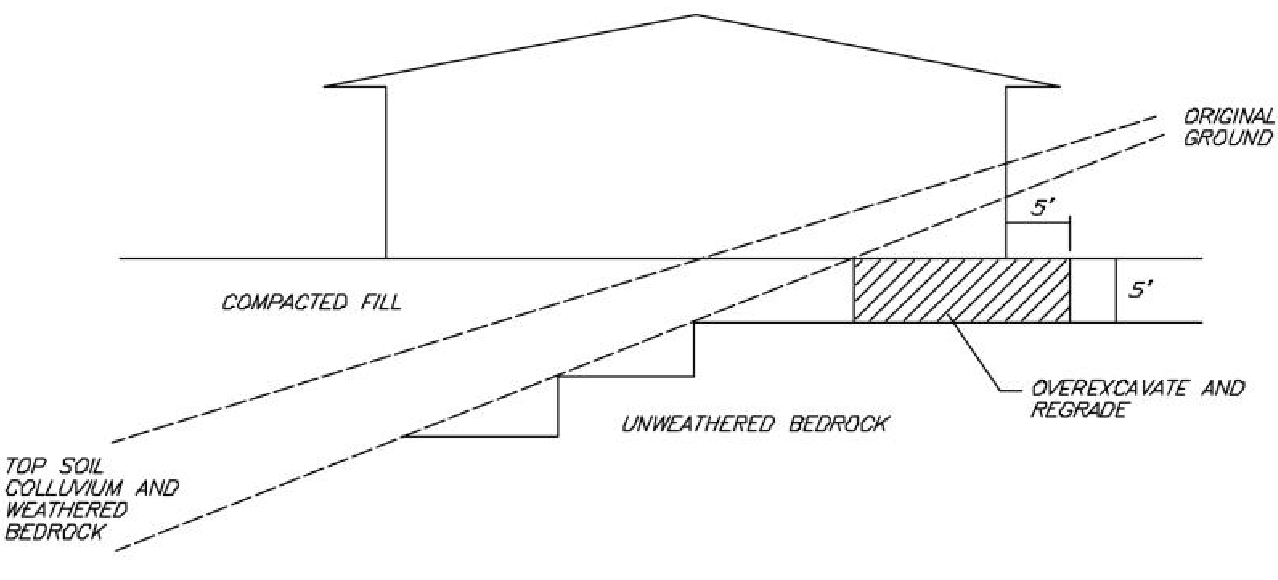
TYPICAL CANYON SUBDRAIN DETAIL

GENERAL EARTHWORK AND GRADING SPECIFICATIONS
SHEET 12

CUT LOT



CUT/FILL LOT (TRANSITION)



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TRANSITION LOT DETAIL

APPENDIX F

FIELD INFILTRATION TEST DATA

GeoMat Testing Laboratories, Inc.
Geotechnical Engineering
Engineering Geology
Material Testing

Inland Empire
9980 Indiana Ave, Suite 14
Riverside, California 92503
Office (951) 688-5400

Los Angeles
5714 W. 96th Street
Los Angeles, California 90045
Office (310) 337-9400

geomatlabs.com

BORING PERCOLATION TEST P-1

Project Name:	340 W. Valley Boulevard, Colton, CA	Depth of Hole (in):	60
Project No.:	21216-01	Borehole Diameter (in):	6
Project Location:	340 W. Valley Boulevard, Colton, CA	Test Refill Water Column Height, [d1] (in):	60
Drillied/Augered by:	MN	Pre-Soaked/Tested by:	MN
Drilling/Augering Date(s):	10/30/2021	Pre-Soak/Testing Date(s):	11/3/2021

PRESOAKING:

Pre-soaking shall be used with this procedure. Invert a full 5 gallon bottle (more if necessary) of clear water supported over the hole so that the water flow into the hole holds constant at a level at least 5 times the hole's radius above the gravel at the bottom of the hole. Testing may commence after all of the water has percolated through the test hole or after 15 hours has elapsed since initiating the pre-soak.

SANDY SOIL DETERMINATION:

Test hole shall be carefully filled with water to a depth equal to at least 5 times the hole's radius (H/r>5) above the gravel at the bottom of the test hole prior to each test interval.

A) In sandy soils, when 2 consecutive measurements show that 6 inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Measurements shall be taken with a precision of 0.25 inches or better. The drop that occurs during the final 10 minutes is used to calculate the percolation rate. Field data must show the two 25 minute readings and the six 10 minute readings.

B) In non-sandy soils, the percolation rate measurement shall be made on the day following initiation of the pre-soak as described in Item #5 above. From a fixed reference point, measure the drop in water level over a 30 minute period for at least 6 hours, refilling after every 30 minute reading. Measurements shall be taken with a precision of 0.25 inches or better. The total depth of hole must be measured at every reading to verify that collapse of the borehole has not occurred. The drop that occurs during the final reading is used to calculate the percolation rate.

CRITERIA	TIME	TIME INTERVAL (min)	D_0, INITIAL DEPTH TO WATER (in)	D_f, FINAL DEPTH TO WATER (in)	ΔH WATER DROP (in)	SANDY SOIL CRITERIA MET?
SANDY SOIL TESTING CRITERIA	0:00:00	0:25:00	0	38	38	YES
	0:25:00	25.00				
	0:00:00	0:25:00	0	38	38	YES
	0:25:00	25.00				

TRIAL NO.	TIME	TIME INTERVAL (min)	D_0, INITIAL DEPTH TO WATER (in)	D_f, FINAL DEPTH TO WATER (in)	ΔH WATER DROP (in)	AVERAGE WETTED DEPTH (in)	SURFACE AREA OF SECTION (in^2)	VOLUME OF PERCOLATED WATER (in^3)	MEASURED INFILTRATION RATE (in/hr)
1	0:00:00	0:10:00	0	15.00	15.00	52.50	1017.88	424.11	2.50
	0:10:00	10.00							
2	0:00:00	0:10:00	0	15.00	15.00	52.50	1017.88	424.11	2.50
	0:10:00	10.00							
3	0:00:00	0:10:00	0	15.00	15.00	52.50	1017.88	424.11	2.50
	0:10:00	10.00							
4	0:00:00	0:10:00	0	14.88	14.88	52.56	1019.05	420.58	2.48
	0:10:00	10.00							
5	0:00:00	0:10:00	0	14.88	14.88	52.56	1019.05	420.58	2.48
	0:10:00	10.00							
6	0:00:00	0:10:00	0	14.88	14.88	52.56	1019.05	420.58	2.48
	0:10:00	10.00							

MEASURED INFILTRATION RATE* = **2.48** **in/hr**

BORING PERCOLATION TEST P-2

Project Name:	340 W. Valley Boulevard, Colton, CA	Depth of Hole (in):	60
Project No.:	21216-01	Borehole Diameter (in):	6
Project Location:	340 W. Valley Boulevard, Colton, CA	Test Refill Water Column Height, [d1] (in):	60
Drillied/Augered by:	MN	Pre-Soaked/Tested by:	MN
Drilling/Augering Date(s):	10/30/2021	Pre-Soak/Testing Date(s):	11/3/2021

PRESOAKING:

Pre-soaking shall be used with this procedure. Invert a full 5 gallon bottle (more if necessary) of clear water supported over the hole so that the water flow into the hole holds constant at a level at least 5 times the hole's radius above the gravel at the bottom of the hole. Testing may commence after all of the water has percolated through the test hole or after 15 hours has elapsed since initiating the pre-soak.

SANDY SOIL DETERMINATION:

Test hole shall be carefully filled with water to a depth equal to at least 5 times the hole's radius (H/r>5) above the gravel at the bottom of the test hole prior to each test interval.

A) In sandy soils, when 2 consecutive measurements show that 6 inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Measurements shall be taken with a precision of 0.25 inches or better. The drop that occurs during the final 10 minutes is used to calculate the percolation rate. Field data must show the two 25 minute readings and the six 10 minute readings.

B) In non-sandy soils, the percolation rate measurement shall be made on the day following initiation of the pre-soak as described in Item #5 above. From a fixed reference point, measure the drop in water level over a 30 minute period for at least 6 hours, refilling after every 30 minute reading. Measurements shall be taken with a precision of 0.25 inches or better. The total depth of hole must be measured at every reading to verify that collapse of the borehole has not occurred. The drop that occurs during the final reading is used to calculate the percolation rate.

CRITERIA	TIME	TIME INTERVAL (min)	D_0, INITIAL DEPTH TO WATER (in)	D_f, FINAL DEPTH TO WATER (in)	ΔH WATER DROP (in)	SANDY SOIL CRITERIA MET?
SANDY SOIL TESTING CRITERIA	0:00:00	0:25:00	0	36	36	YES
	0:25:00	25.00				
	0:00:00	0:25:00	0	36	36	YES
	0:25:00	25.00				

TRIAL NO.	TIME	TIME INTERVAL (min)	D_0, INITIAL DEPTH TO WATER (in)	D_f, FINAL DEPTH TO WATER (in)	ΔH WATER DROP (in)	AVERAGE WETTED DEPTH (in)	SURFACE AREA OF SECTION (in^2)	VOLUME OF PERCOLATED WATER (in^3)	MEASURED INFILTRATION RATE (in/hr)
1	0:00:00	0:10:00	0	14.50	14.50	52.75	1022.59	409.98	2.41
	0:10:00	10.00							
2	0:00:00	0:10:00	0	14.50	14.50	52.75	1022.59	409.98	2.41
	0:10:00	10.00							
3	0:00:00	0:10:00	0	14.50	14.50	52.75	1022.59	409.98	2.41
	0:10:00	10.00							
4	0:00:00	0:10:00	0	14.50	14.50	52.75	1022.59	409.98	2.41
	0:10:00	10.00							
5	0:00:00	0:10:00	0	14.25	14.25	52.88	1024.94	402.91	2.36
	0:10:00	10.00							
6	0:00:00	0:10:00	0	14.50	14.50	52.75	1022.59	409.98	2.41
	0:10:00	10.00							

MEASURED INFILTRATION RATE* = **2.36** **in/hr**

BORING PERCOLATION TEST P-3

Project Name:	340 W. Valley Boulevard, Colton, CA	Depth of Hole (in):	60
Project No.:	21216-01	Borehole Diameter (in):	6
Project Location:	340 W. Valley Boulevard, Colton, CA	Test Refill Water Column Height, [d1] (in):	60
Drillied/Augered by:	MN	Pre-Soaked/Tested by:	MN
Drilling/Augering Date(s):	10/30/2021	Pre-Soak/Testing Date(s):	11/3/2021

PRESOAKING:

Pre-soaking shall be used with this procedure. Invert a full 5 gallon bottle (more if necessary) of clear water supported over the hole so that the water flow into the hole holds constant at a level at least 5 times the hole's radius above the gravel at the bottom of the hole. Testing may commence after all of the water has percolated through the test hole or after 15 hours has elapsed since initiating the pre-soak.

SANDY SOIL DETERMINATION:

Test hole shall be carefully filled with water to a depth equal to at least 5 times the hole's radius (H/r>5) above the gravel at the bottom of the test hole prior to each test interval.

A) In sandy soils, when 2 consecutive measurements show that 6 inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Measurements shall be taken with a precision of 0.25 inches or better. The drop that occurs during the final 10 minutes is used to calculate the percolation rate. Field data must show the two 25 minute readings and the six 10 minute readings.

B) In non-sandy soils, the percolation rate measurement shall be made on the day following initiation of the pre-soak as described in Item #5 above. From a fixed reference point, measure the drop in water level over a 30 minute period for at least 6 hours, refilling after every 30 minute reading. Measurements shall be taken with a precision of 0.25 inches or better. The total depth of hole must be measured at every reading to verify that collapse of the borehole has not occurred. The drop that occurs during the final reading is used to calculate the percolation rate.

CRITERIA	TIME	TIME INTERVAL (min)	D_0, INITIAL DEPTH TO WATER (in)	D_f, FINAL DEPTH TO WATER (in)	ΔH WATER DROP (in)	SANDY SOIL CRITERIA MET?
SANDY SOIL TESTING CRITERIA	0:00:00	0:25:00	0	45	45	YES
	0:25:00	25.00				
	0:00:00	0:25:00	0	45	45	YES
	0:25:00	25.00				

TRIAL NO.	TIME	TIME INTERVAL (min)	D_0, INITIAL DEPTH TO WATER (in)	D_f, FINAL DEPTH TO WATER (in)	ΔH WATER DROP (in)	AVERAGE WETTED DEPTH (in)	SURFACE AREA OF SECTION (in^2)	VOLUME OF PERCOLATED WATER (in^3)	MEASURED INFILTRATION RATE (in/hr)
1	0:00:00	0:10:00	0	18.00	18.00	51.00	989.60	508.94	3.09
	0:10:00	10.00							
2	0:00:00	0:10:00	0	18.00	18.00	51.00	989.60	508.94	3.09
	0:10:00	10.00							
3	0:00:00	0:10:00	0	18.00	18.00	51.00	989.60	508.94	3.09
	0:10:00	10.00							
4	0:00:00	0:10:00	0	18.00	18.00	51.00	989.60	508.94	3.09
	0:10:00	10.00							
5	0:00:00	0:10:00	0	18.00	18.00	51.00	989.60	508.94	3.09
	0:10:00	10.00							
6	0:00:00	0:10:00	0	18.00	18.00	51.00	989.60	508.94	3.09
	0:10:00	10.00							

MEASURED INFILTRATION RATE* = **3.09** **in/hr**

BORING PERCOLATION TEST P-4

Project Name:	340 W. Valley Boulevard, Colton, CA	Depth of Hole (in):	60
Project No.:	21216-01	Borehole Diameter (in):	6
Project Location:	340 W. Valley Boulevard, Colton, CA	Test Refill Water Column Height, [d1] (in):	60
Drillied/Augered by:	MN	Pre-Soaked/Tested by:	MN
Drilling/Augering Date(s):	10/30/2021	Pre-Soak/Testing Date(s):	11/3/2021

PRESOAKING:

Pre-soaking shall be used with this procedure. Invert a full 5 gallon bottle (more if necessary) of clear water supported over the hole so that the water flow into the hole holds constant at a level at least 5 times the hole's radius above the gravel at the bottom of the hole. Testing may commence after all of the water has percolated through the test hole or after 15 hours has elapsed since initiating the pre-soak.

SANDY SOIL DETERMINATION:

Test hole shall be carefully filled with water to a depth equal to at least 5 times the hole's radius (H/r>5) above the gravel at the bottom of the test hole prior to each test interval.

A) In sandy soils, when 2 consecutive measurements show that 6 inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Measurements shall be taken with a precision of 0.25 inches or better. The drop that occurs during the final 10 minutes is used to calculate the percolation rate. Field data must show the two 25 minute readings and the six 10 minute readings.

B) In non-sandy soils, the percolation rate measurement shall be made on the day following initiation of the pre-soak as described in Item #5 above. From a fixed reference point, measure the drop in water level over a 30 minute period for at least 6 hours, refilling after every 30 minute reading. Measurements shall be taken with a precision of 0.25 inches or better. The total depth of hole must be measured at every reading to verify that collapse of the borehole has not occurred. The drop that occurs during the final reading is used to calculate the percolation rate.

CRITERIA	TIME	TIME INTERVAL (min)	D_0, INITIAL DEPTH TO WATER (in)	D_f, FINAL DEPTH TO WATER (in)	ΔH WATER DROP (in)	SANDY SOIL CRITERIA MET?
SANDY SOIL TESTING CRITERIA	0:00:00	0:25:00	0	30	30	YES
	0:25:00	25.00				
	0:00:00	0:25:00	0	30	30	YES
	0:25:00	25.00				

TRIAL NO.	TIME	TIME INTERVAL (min)	D_0, INITIAL DEPTH TO WATER (in)	D_f, FINAL DEPTH TO WATER (in)	ΔH WATER DROP (in)	AVERAGE WETTED DEPTH (in)	SURFACE AREA OF SECTION (in^2)	VOLUME OF PERCOLATED WATER (in^3)	MEASURED INFILTRATION RATE (in/hr)
1	0:00:00	0:10:00	0	12.00	12.00	54.00	1046.15	339.29	1.95
	0:10:00	10.00							
2	0:00:00	0:10:00	0	12.00	12.00	54.00	1046.15	339.29	1.95
	0:10:00	10.00							
3	0:00:00	0:10:00	0	12.00	12.00	54.00	1046.15	339.29	1.95
	0:10:00	10.00							
4	0:00:00	0:10:00	0	12.00	12.00	54.00	1046.15	339.29	1.95
	0:10:00	10.00							
5	0:00:00	0:10:00	0	12.00	12.00	54.00	1046.15	339.29	1.95
	0:10:00	10.00							
6	0:00:00	0:10:00	0	11.75	11.75	54.13	1048.51	332.22	1.90
	0:10:00	10.00							

MEASURED INFILTRATION RATE* = **1.90** **in/hr**