

## Appendix D

Preliminary Geotechnical Investigation Report, Shiloh West Medical  
Center, Northwest Corner of Palmdale Road and Mesa Linda Avenue,  
Victorville, California 92392, APN 3103-561-20

TGR Geotechnical

March 25, 2022



Geotechnical  
Environmental  
Hydrogeology  
Material Testing  
Construction Inspection

March 25, 2022

Project No. 21-7337

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Subject: Preliminary Geotechnical Investigation Report, Shiloh West Medical Center, Northwest Corner of Palmdale Road and Mesa Linda Avenue, Victorville, California 92392, APN 3103-561-20.

Robert,

In accordance with your request and authorization, TGR Geotechnical, Inc. (TGR) has performed a preliminary geotechnical investigation for the proposed development at the subject site in the City of Victorville, California. This report presents the findings of our geotechnical investigation including site seismicity, settlement potential, infiltration rates and provides geotechnical design recommendations for the proposed improvements. The work was performed in general accordance with our proposal dated September 21, 2021.

Based on our investigation the proposed development is feasible from a geotechnical viewpoint provided the recommendations presented in this report are implemented during design and construction.

If you have any questions regarding this report, please do not hesitate to contact this office. We appreciate this opportunity to be of service.

Respectfully submitted,

**TGR GEOTECHNICAL, INC.**

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## INTRODUCTION

### Site Description and Proposed Project Development

The subject site is located on the northwest corner of Palmdale Road and Mesa Linda Avenue in the City of Victorville, California. The subject site is relatively flat, approximately 2.91-acre, dirt and gravel covered vacant lot with sparse vegetation. The elevation in the north of the site is approximately 3112 feet and approximately 3120 feet in the southwest with a differential elevation of 8 feet over a distance of approximately 600 feet and gradient of 1.33%. It is our understanding that the proposed development will consist of a 18,000 square foot, 2-story medical office building and an approximately 12,256 square foot commercial building consisting of a proposed family practice, medical lab, pharmacy, coffee shop and associated parking lots.

### Scope of Work

The scope of work for this geotechnical investigation included the following:

- Site reconnaissance to assess current site conditions, mark boring and test pit locations and notify Dig-Alert.
- Sampling and logging eight (8) hollow stem auger borings utilizing a hollow stem drill rig to approximate depths ranging from 11.5 to 26.5 feet at the subject site to evaluate subsurface soil conditions. The borings were backfilled with cuttings and any excess soil was disposed onsite.
- Excavation, sampling and logging three (3) test pits for infiltration testing utilizing double ring infiltrometers at three (3) locations at an approximate depth of 5 feet below existing grade at the proposed locations of stormwater infiltration for WQMP. The testing procedures followed the County of San Bernardino guidelines.
- Laboratory testing of selected samples to include in-situ moisture density, maximum density and optimum moisture content, shear, consolidation, passing No. 200 sieve, corrosion series and R-value.
- Engineering analysis including infiltration rates, site seismicity, seismic settlement, foundation design and soils engineering/earthwork with respect to the suitability of the proposed development.
- Preparation of this report summarizing current subsurface soil conditions, findings, and presenting our recommendations for the proposed development.

### Field Investigation

Field exploration was performed on March 2, 2021 by members from our firm who logged the borings and test pits and obtained representative samples, which were subsequently transported to the laboratory for further review and testing. The approximate locations of the borings are indicated on the enclosed Boring Location Map (Plate 1).

The subsurface conditions were explored by drilling, sampling, and logging eight (8) borings with a truck mounted hollow stem drill rig to approximate depths ranging eleven and one half (16.5) feet to twenty-six and one half (26.5) feet below existing grade. Subsequent to drilling, all borings were backfilled with cuttings. The logs of borings together with an explanation of symbols used are given in Appendix B.

The drill rig was equipped with a sampling apparatus to allow for recovery of driven modified California Ring Sampler (CRS), 3-inch outside diameter, and 2.42-inch inside diameter and SPT samples. Driven

samples and bulk samples of the earth materials encountered at selected intervals were recovered from the borings.

The samples were driven using an automatic 140-pound hammer falling freely from a height of 30-inches. The blow counts for CRS were converted to equivalent SPT blow counts. Soil descriptions were entered on the logs in general accordance with the Unified Soil Classification System (USCS). The locations and depths of the soil samples recovered are indicated on the logs in Appendix B.

Three (3) infiltration test pits TP-1 through TP-3 were excavated to a depth of approximately five (5) feet below existing ground surface for the proposed stormwater infiltration system. Subsequent to percolation testing the borings were backfilled with excavated soils.

#### Double Ring Infiltrometer Testing

Infiltration testing were performed at three (3) locations to determine the infiltration rate of the near surface subgrade soils. The locations of the infiltration test pits are shown on Plate 1. The field infiltration tests were performed at depths of 5 feet below existing grade. A description of the soils encountered at the test locations are presented in the table below. Testing was performed in general accordance with procedures for infiltration testing using ASTM Method D 3385, "Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer."

As noted above, the test pits were excavated to a depth of 5 feet below the existing ground surface. Upon completion of excavation the bottom of the test pit was cleaned of loose material and the inner and outer infiltrometer rings were driven using a sledgehammer. At the start of the test, water was introduced into the inner ring and annular space (outer ring). The water level was measured at constant time interval for both the inner ring and the annular space (outer ring) and was utilized to calculate the infiltration rate.

Field test data are enclosed in on Tables 1 - 3. A summary of test results is provided below:

Test Pit No.	Soil Description	Tested Infiltration Rate (in/hr.)
TP-1	Silty Sand	3.0
TP-2	Sand	18.0
TP-3	Sand	24.0

#### Suitability Assessment Safety Factor

Factor values (v), for Factor Category A, were assigned according to the San Bernardino Technical Guidance Document for WQMP, VII.4.

Table 2 (below) presents assigned factor values and the calculated Suitability Assessment Safety Factor ( $\Sigma p$ ) in Worksheet H from the San Bernardino Technical Guidance Document for WQMP Appendix VII.

**Table 2 – Worksheet H**

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) $p = w * v$
A	Suitability Assessment	Soil assessment methods	0.25	2	0.50
		Predominant soil texture	0.25	2	0.50
		Site soil variability	0.25	2	0.50
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \sum p$			

The above values should be used in conjunction with Factor Category B parameters (to be determined by others) as specified in Worksheet H of the San Bernardino Technical Guidance Document for WQMP Appendix VII to evaluate the combined safety factor that should be applied to the tested infiltration rates.

#### Laboratory Testing

Laboratory tests were performed on representative samples to verify the field classification of the recovered samples and to evaluate the geotechnical properties of the subsurface soils. The following tests were performed:

- In-situ Moisture Content (ASTM D2216) and Dry Density (ASTM D7263);
- Maximum Dry Density and Optimum Moisture Content (ASTM D1557);
- Direct Shear Strength (ASTM D3080);
- Consolidation (ASTM D2435);
- Expansion Potential (ASTM D4829);
- Passing No. 200 Sieve (ASTM D1140);
- R-value (CAL 301); and
- Corrosion series:
  1. Soluble Sulfate (CAL.417A);
  2. Soluble Chlorides (CAL.422);
  3. Minimum Resistivity (CAL.643); and
  4. pH.

Laboratory tests for geotechnical characteristics were performed in general accordance with the ASTM procedures. The results of the in-situ moisture content and density tests are shown on the borings logs (Appendix B). The results of the laboratory tests are presented in Appendix C.

## GEOTECHNICAL FINDINGS

### Geology

#### Regional Geologic Setting

The proposed development is located in the western Mojave Desert, in San Bernardino County, California. The area is located within what is known as the Mojave Block, which is a tectonic region bounded by the San Andreas fault to the southwest, and the Garlock fault to the northeast (Dibblee, 1967). The mountains that border the Mojave Desert were uplifted along these faults and other secondary faults that generally trend to the northwest across the Mojave Desert. It is theorized that in the geologic past, much of this area was intermittently submerged with water, at which time a large amount of sediment was deposited along the valley floor (Dibblee, 1967). The entire region was then intruded by granitic rocks, elevated and subsequently deeply eroded. Finally, during the more recent geologic past, deformation occurred throughout the Mojave Block due to the very active San Andreas, Garlock and associated fault zones (Dibblee, 1967).

On a local scale, the site is underlain by relatively young alluvial silt, sand and gravel derived from adjacent higher ground and deposited in the site vicinity (Dibblee, 1960).

#### Earth Units

The upper 2 to 2.5 feet of soil generally consists undocumented fill comprised of light brown silty sand to sandy silt in a dry to slightly moist condition underlain by interbedded layers of silty sand and sand to 26.5 feet below existing grade, the maximum depth explored. The undocumented fill encountered in the upper 2 to 2.5 feet is considered unsuitable and shall be removed and replaced with engineered fill. Detailed descriptions of the earth units encountered in our exploratory borings and test pits are presented in the log of the borings and test pits. (Appendix B)

#### Groundwater

Groundwater was not encountered during our subsurface exploration at a depth of 26.5 feet below existing grade, the maximum depth explored. Based on our review of available historical groundwater information (CDMG) regional historic high groundwater has not been mapped at the subject site.

Per USGS groundwater well data for the nation, the historic high groundwater for wells nearest to the subject site is approximately 284 feet below existing grade and 2821 feet above NGVD 1929 (USGS 343018117231501 005N005W22K001S), dating back to 1938.

Seasonal and long-term fluctuations in the groundwater may occur as a result of variations in subsurface conditions, rainfall, run-off conditions and other factors. Therefore, variations from our observations may occur.

Static groundwater is not anticipated to impact the proposed development.

#### Expansive Soil

Onsite soils have a tested expansion index of 0, correlating to a “very low” expansion potential. The recommendations provided in this report account for the expansion potential of the onsite soils.

#### Hydro Collapse

Laboratory testing indicates near surface soils undergo a 2-3% hydro collapse when inundated under load, correlating to a “moderate” potential for hydro collapse. The recommendations in this report account for the hydro collapse potential of near surface soils.



### Cement Type and Corrosion

Based on laboratory testing concrete used should be designed in accordance with the provisions of ACI 318-14, Chapter 19 for Exposure Class S0: Cement with a minimum unconfined compressive strength of 2,500 psi, and for Exposure Class C1 (Moderate) – Concrete exposed to moisture but not a significant source of chlorides, per ACI 318-14 Table 19.3.1.1.

Corrosion tests indicate a moderate corrosion potential for ferrous metals exposed to site soils.

TGR does not practice corrosion engineering. If needed, a qualified specialist should review the site conditions and evaluate the corrosion potential of the site soil to the proposed improvements and to provide the appropriate corrosion mitigations for the project.

### Seismic Review

#### Faulting and Seismicity

The subject site, like the rest of Southern California, is located within a seismically active region as a result of being located near the active margin between the North American and Pacific tectonic plates. The principal source of seismic activity is movement along the northwest-trending regional faults such as the San Andreas, San Jacinto and Elsinore fault zones. These fault systems produce approximately 5 to 35 millimeters per year of slip between the plates.

We consider the most significant geologic hazard to be the potential for moderate to strong seismic shaking that is likely to occur at the subject site. The subject site is located in the highly seismic Southern California region within the influence of several faults that are considered to be Holocene-active or pre-Holocene faults. A Holocene-active fault is defined by the State of California as a fault that has exhibited surface displacement within the Holocene time (about the last 11,700 years). A pre-Holocene fault is defined by the State as a fault whose history of past movement is older than 11,700 years ago and does not meet the criteria for a Holocene-active fault.

These Holocene-active and pre-Holocene faults are capable of producing potentially damaging seismic shaking at the site. It is anticipated that the subject site will periodically experience ground acceleration as the result of small to moderate magnitude earthquakes. Other active faults without surface expression (blind faults) or other potentially active seismic sources that are not currently zoned and may be capable of generating an earthquake are known to be present under in the region.

The subject site is not included within any Earthquake Fault Zones as created by the Alquist-Priolo Earthquake Fault Zoning Act (Hart, 1997). Our review of geologic literature pertaining to the site area indicates that there are no known active or potentially active faults located within or immediately adjacent to the subject property.

The nearest fault to the subject site is the Ord Mountains fault mapped approximately 12.6 miles to the southeast of the site. Other nearby faults include the Mirage Valley fault mapped approximately 12.6 miles to the northwest of the site, the Ocotillo Ridge fold mapped approximately 13.0 miles southeast of the site, the Helendale fault mapped approximately 16.2 miles northeast of the site and the San Andreas fault mapped approximately 16.2 miles to the southwest of the site. The Regional Fault Map, Figure 4, shows the location of the subject site in respect to the regional faults.

## Secondary Seismic Hazards

### Surface Fault Rupture and Ground Shaking

Since no known faults are located within the site, surface fault rupture is not anticipated. However, due to the close proximity of known active and potentially active faults, severe ground shaking should be expected during the life of the proposed structures.

### Liquefaction

Liquefaction is a seismic phenomenon in which loose, saturated, fine-grained granular soils behave similarly to a fluid when subjected to high-intensity ground shaking. Liquefaction occurs when these ground conditions exist: 1) Shallow groundwater; 2) Low density, fine, clean sandy soils; and 3) High-intensity ground motion. Effects of liquefaction can include sand boils, settlement, and bearing capacity failures below foundations.

A review of the San Bernardino County General Plan: Geologic Hazard Overlays, Map EHFH C indicates that the subject site is not located within an area mapped as having a potential for earthquake induced liquefaction (Figure 5).

Based on the above and depth to groundwater, potential for liquefaction is considered to be negligible.

### Seismically Induced Settlement

Ground accelerations generated from a seismic event can produce settlements in sands or in granular earth materials both above and below the groundwater table. This phenomenon is often referred to as seismic settlement and is most common in relatively clean sands, although it can also occur in other soil materials. Based on the density of the subsurface soils and relatively high SPT blow counts recorded during drilling, seismic settlement is anticipated to be negligible.

### Lateral Spreading

Seismically induced lateral spreading involves primarily movement of earth materials due to earth shaking. Lateral spreading is demonstrated by near-vertical cracks with predominantly horizontal movement of the soil mass involved. The topography in the vicinity of the subject site is relatively flat and the potential for seismically induced liquefaction is considered negligible. Therefore, the potential for lateral spreading at the subject site is considered very low.

## **DISCUSSIONS AND CONCLUSIONS**

### **General**

Based on our field exploration, laboratory testing, and geotechnical engineering analysis, the proposed development is considered suitable from a geotechnical viewpoint, provided that the recommendations contained in this report are incorporated into the design and construction phases of the project.

### **Conclusions**

Based on our findings and analyses, the subject site is likely to be subjected to moderate to severe ground shaking due to the proximity of known active and potentially active faults. This may reasonably be expected during the life of the structure and should be designed accordingly.

The primary conditions affecting the proposed project site development are as follows:

- Presence of approximately 2 to 2.5 feet of undocumented fill.
- Potential for hydro collapse in near surface soils.

The engineering evaluation performed concerning site preparation and the recommendations presented are based on information provided to us and obtained by us during our office and fieldwork. This report is prepared for the development of an approximately 18,000 square foot, 2-story medical office building and an approximately 12,256 square foot commercial building consisting of a proposed family practice, medical lab, pharmacy, coffee shop and associated parking lots. In the event that any significant changes are made to the proposed development, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the recommendations of this report are verified or modified in writing by TGR.

## RECOMMENDATIONS

### Seismic Design Parameters

When reviewing the 2019 California Building Code the following data should be incorporated into the design.

Parameter	Value
Latitude (degree)	34.0578
Longitude (degree)	-117.3917
Site Class	D – Stiff Soil
Site Coefficient, $F_a$	1.0
Site Coefficient, $F_v$	N/A
Mapped Spectral Acceleration at 0.2-sec Period, $S_s$	1.588 g
Mapped Spectral Acceleration at 1.0-sec Period, $S_1$	0.617 g
Spectral Acceleration at 0.2-sec Period Adjusted for Site Class, $S_{MS}$	1.588 g
Spectral Acceleration at 1.0-sec Period Adjusted for Site Class, $S_{M1}$	N/A
Design Spectral Acceleration at 0.2-sec Period, $S_{DS}$	1.058 g
Design Spectral Acceleration at 1.0-sec Period, $S_{D1}$	N/A

### Site Specific Response Spectra

The USGS Unified Hazard tool, the USGS RTGM Calculator and the USGS App for Deterministic Spectra Acceleration were utilized to develop site specific ground motion spectra. The analysis was performed utilizing the following attenuation relationships that are part of NGA as required by 2019 CBC code requirements.

- Campbell & Bozorgnia (2014)
- Boore, Stewart, Seyhan & Atkinson (2014)
- Chiou & Youngs (2014)
- Abrahamson, Silva & Kamal (2014)

The results of the Site Specific Response Spectra are incorporated in Table 1 and on Figure 1 in Appendix D. The results include deterministic spectra at 5% damping, maximum rotated component at 0.84 fractile and the probabilistic spectra, maximum rotated component at 5% damping for a return period of 2475 year and subsequently multiplied by risk coefficient to obtain the MCER probabilistic spectral acceleration. The  $V_{s30}$  utilized was 260 m/s.

The probabilistic response spectrum was determined using the OSHPD generated seismic values and raw output generated from the U.S. Geological Survey Unified Hazard Tool. The spectral response acceleration data generated from the U.S. Geological Survey Unified Hazard Tool was entered into the U.S. Geological Survey Risk-Targeted Ground Motion Calculator tool for each time period. The data is presented on Table 2 in Appendix D.

The deterministic response spectrum was determined using the greatest Deaggregation Contributor from the U.S. Geological Survey Unified Hazard Tool. The largest contributing fault parameters were

entered into the Pacific Earthquake Engineering Research Center NGAW2 tool with a user defined sigma + 5% damping. For the deterministic analysis for the subject site, the fault utilized was the San Andreas (San Bernardino N) fault, with a characteristic magnitude M of 7.99 and a fault distance R of 25.63 km. The data is presented on Table 3 in Appendix D.

The above generated spectral accelerations were compared against the minimum code requirements in ASCE7-16 (Chapters 11 and 21) resulting in the final design response spectra which is presented in Table 1 and on Figure 1 in Appendix D.

Based on Table 1 and Figure 1, the recommended Site Specific  $S_{DS}$  and  $S_{D1}$  are as follows:

$$S_{DS} = 0.900$$

$$S_{D1} = 1.050$$

Mapped values may be used in lieu of site-specific values to design structures on Site Class D sites with an  $S_1$  greater than or equal to 0.2, provided the value of the seismic response coefficient  $C_s$  is determined by Eq. (12.8-2) for values of  $T \leq 1.5T_s$  and taken as equal to 1.5 times the value computed in accordance with either Eq. (12.8-3) for  $T_L \geq T > 1.5T_s$  or Eq. (12.8-4) for  $T > T_L$ .

The structural consultant should review the above parameters and the 2019 California Building Code to evaluate the seismic design.

Conformance to the criteria presented in the above table for seismic design does not constitute any type of guarantee or assurance that significant structural damage or ground failure will not occur during a large earthquake event. The intent of the code is "life safety" and not to completely prevent damage of the structure, since such design may be economically prohibitive.

#### Foundation Design Recommendations

The proposed buildings and retaining walls may be supported on continuous and/or spread footings. Bearing capacity recommendations for shallow foundations are presented below. These recommendations assume that the footings will be supported on a minimum of three (3) feet of engineered fill.

For foundations supported on three (3) feet of engineered fill with minimum ninety (90) percent relative compaction an allowable bearing pressure of 2,000 pounds per square foot may be used in design.

All shallow foundations should extend a minimum of twenty-four (24) inches below the lowest adjacent grade. The minimum recommended footing width is eighteen (18) inches for continuous footing and twenty-four (24) inches for pad footing. A minimum reinforcement of two (2) No. 4 steel bar top and two (2) No. 4 steel bar bottom is required for continuous footings from a geotechnical viewpoint.

A one-third (1/3) increase on the aforementioned bearing pressure may be used in design for short-term wind or seismic loads.

The total static settlement and total differential settlements between adjacent footings supported on compacted fill are not anticipated to exceed 1 inch and 0.50 inches over 30 feet, respectively.

### Retaining Wall Recommendations

The following soil parameters may be used for the design of the retaining wall with level backfill and a maximum height of six (6) feet:

Conditions	Parameters
Active (Level)	35 psf/ft
Passive	300 (maximum 3,000 psf)
Friction Coefficient	0.43

- Unrestrained retaining wall, such as a cantilever wall, the active earth pressure shall be used.
- Any import backfill shall be granular non-expansive select fill with a minimum sand equivalent of 30. The import fill should be tested and approved by TGR prior to backfill.
- An allowable coefficient of friction between properly compacted on-site fill soil and concrete of 0.43 may be used with the dead-load forces.
- Passive pressure and frictional resistance could be combined in determining the total lateral resistance. However, one of them shall be reduced by 50 percent.
- The passive pressure in the upper 6 inches of soil not confined by slabs or pavement should be neglected.

Retaining structures should be provided with a drainage system to prevent buildup of hydrostatic pressure behind the walls. Provisions should be made to collect and dispose of excess water away from the wall. Wall drainage may be provided by a perforated pipe encased in gravel or crushed rock and enclosed by geo-synthetic filter fabric. We do not recommend omitting the drains behind walls.

In addition to the above lateral forces due to retained earth, surcharge due to improvements, such as an adjacent structure, should be considered in the design of the retaining wall. A minimum vertical surcharge load of 300 psf should be used in design of walls due to adjacent traffic unless the traffic is kept at least 6 feet from the walls. Loads applied within a 1:1 projection from any surcharging structure on the stem of the wall shall be considered as lateral surcharge.

For uniform lateral surcharge conditions applied to free-to-deflect walls and restrained walls, we recommend utilizing a minimum horizontal load equal to 33 percent and 50 percent of the vertical load, respectively, and should be applied uniformly over the entire height of the wall. This horizontal load should be applied below the 1:1 projection plane. To minimize the surcharge load from an adjacent footing, deepened footings may be considered.

Retaining wall footings should have a minimum embedment of twenty-four (24) inches below the lowest adjacent grade. The retaining walls footings shall be supported on a minimum three (3) feet of compacted engineered fill compacted to a minimum ninety (90) percent relative compaction as per ASTM D1557.

### Slab-On-Grade

Slab-on-grade should be a minimum of 5-inches thick and reinforced with a minimum of No. 4 reinforcing bar on 18-inch centers in two horizontally perpendicular directions. Reinforcing should be properly supported to ensure placement near the vertical midpoint of the slab. "Hooking" of the

reinforcement is not considered an acceptable method of positioning the steel. The slab should not be structurally connected to the buildings.

Subgrade material for the slab-on-grade should be compacted to a minimum of ninety (90) percent of the maximum laboratory dry density to a minimum depth of three (3) feet. Prior to placement of concrete, the subgrade soils should be moistened to near optimum moisture content and verified by our field representative.

The actual thickness and reinforcement of the slab shall be designed by the structural engineer per the 2019 California Building Code and should include the anticipated loading condition and the anticipated use of the building.

For moisture sensitive flooring, the floor slab should be underlain by minimum 15-mil impermeable polyethylene membrane (Stego Wrap, Moistop Plus, or any equivalent meeting the requirements of ASTM E1745, Class A rating) as a capillary break. Sand may be placed above and below the impermeable polyethylene membrane at the discretion of the project structural engineer/concrete contractor for proper curing and finish of the concrete slab-on-grade and protection of the membrane and is considered outside the scope of geotechnical engineering.

#### Flatwork

Flatwork should be a minimum of 4-inches thick should be reinforced with a minimum of No. 3 reinforcing bar on 24-inch centers in two horizontally perpendicular directions. Reinforcing should be properly supported to ensure placement near the vertical midpoint of the slab. "Hooking" of the reinforcement is not considered an acceptable method of positioning the steel. The subgrade material should be compacted to a minimum of ninety (90) percent of the maximum laboratory dry density (ASTM D1557) to a minimum depth of two (2) feet. Prior to placement of concrete, the subgrade soils should be moistened to near percent of optimum moisture content and verified by our field representative. The actual thickness and reinforcement of the slab shall be designed by the structural engineer and should include the anticipated loading condition, the anticipated use of the flatwork and should incorporate mitigation measures for shrinkage, expansion and thermal cracking.

#### Modulus of Subgrade Reaction

The modulus of subgrade reaction may be taken as 150 pci ( $K_1$ ) for one (1) square foot footing/slab founded on site soils. This value should be reduced for change in size per the following formula:

$$K = K_1 \left( \frac{B+1}{B} \right)^2$$

Where B = Width of Mat;

K = Coefficient of Subgrade Reaction of Footings Measuring B (ft) x B (ft).

#### Site Development Recommendations

##### General

During earthwork construction, all site preparation and the general procedures of the contractor should be observed, and the fill selectively tested by a representative of TGR. If unusual or unexpected conditions are exposed in the field, they should be reviewed by this office and if warranted, modified and/or additional recommendations will be offered.

### Grading

All grading should conform to the guidelines presented in the California Building Code (2019 edition), except where specifically superseded in the text of this report. Prior to grading, TGR's representative should be present at the pre-construction meeting to provide grading guidelines, if needed, and review any earthwork. Oversize particles may be encountered during grading. All particles greater than 4-inches shall be removed and disposed offsite.

The site is underlain by undocumented fill to depths ranging from 2 to 2.5 feet below existing grade. This fill is considered unsuitable for the support of structures and shall be removed and replaced with engineered fill. Remedial overexcavation shall extend to at least six (6) feet below existing grade and the lateral extent of removals beyond the building/structure/footing limits should be equal to at least the depth of fill or six (6) feet, whichever is greater, to limit the potential for hydro collapse.

Site soils may be reused as engineered fill provided the recommendations presented in this report are implemented. Exposed bottoms should be scarified a minimum of 6-inches, moisture conditioned and compacted to a minimum ninety (90) percent relative compaction. Subsequently, site fill soils should be re-compacted to a minimum of ninety (90) percent relative compaction at a minimum of optimum moisture content.

The depth of over-excavation should be reviewed by the Geotechnical Consultant during the actual construction. Any subsurface obstruction buried structural elements, and unsuitable material encountered during grading, should be immediately brought to the attention of the Geotechnical Consultant for proper exposure, removal and processing, as recommended.

### Fill Placement

Prior to any fill placement TGR should observe the exposed surface soils. The site soils may be reused as engineered fill provided they are free of organic content and particle size greater than 4-inches. Fill shall be moisture-conditioned to a minimum of optimum and compacted to a minimum relative compaction of ninety (90) percent in accordance with ASTM D1557. Any import soils shall be non-expansive and approved by TGR.

### Compaction

Prior to fill placement, the exposed surface should be scarified to a minimum depth of six (6) inches, fill placed in six (6) inches loose lifts, moisture conditioned to near optimum for and compacted to a minimum relative compaction of ninety (90) percent in accordance with ASTM D1557.

### Trenching

All excavations should conform to CAL-OSHA and local safety codes.

### Shrinkage/Subsidence

Removal and recompaction of the near surface soils is estimated to result in shrinkage ranging from 5 to 10 percent. Minor ground subsidence is expected to occur in the soils below the zone of removal, due to settlement and machinery working. The subsidence is estimated to be between one and two tenths of a foot.

### Drainage

Positive site drainage should be maintained at all times. Water should be directed away from foundations and not allowed to pond and/or seep into the ground. Pad drainage should be directed towards street/parking or other approved area.



### Utility Trench Backfill

All utility trench backfill in structural areas and beneath hardscape features should be brought to near-optimum moisture content and compacted to a minimum relative compaction of ninety (90) percent of the laboratory standard.

Sand backfill, (unless trench excavation material), should not be allowed in parallel exterior trenches adjacent to and within an area extending below a 1:1 plane projected from the outside bottom edge of the footing. All trench excavations should minimally conform to CAL-OSHA and local safety codes. Soils generated from utility trench excavations may be used provided it is moisture conditioned and compacted to ninety (90) percent minimum relative compaction.

### Temporary Excavation and Shoring

Due to dry to slightly moist granular onsite soils, all cuts shall be properly shored or sloped back to at least 1H:1V (Horizontal: Vertical) or flatter. Some sloughing may be anticipated due to the granular nature of site soils. The exposed slope face should be kept moist (but not saturated) during construction to reduce local sloughing. No surcharge loads should be permitted within a horizontal distance equal to the height of cut from the toe of excavation unless the cut is properly shored. Excavations that extend below an imaginary plane inclined at 45 degrees below the edge of any nearby adjacent existing site facilities should be properly shored to maintain foundation support at the adjacent structures. Temporary excavation adjacent to existing footings may require A-B-C slot cuts.

Per Cal OSHA, site soils can be classified as "Type B" for temporary excavations based on field observation and testing.

### Preliminary Pavement Design

The Caltrans method of design was utilized to develop the following asphalt pavement section. The section was developed based on a tested "R-Value" for compacted site subgrade soils of 23.

Traffic indices of 4.5, 5, 6 and 7 were assumed for use in the evaluation of pavement sections. The traffic indices are subject to approval by controlling authorities and shall be approved by the project civil engineer.

ASPHALT PAVEMENT SECTION				PCC PAVEMENT SECTION		
Traffic Index	Asphalt (Inch)	Aggregate Base (Inch)	Total (Inch)	*PCC	Aggregate Base (Inch)	Total (Inch)
4.5	3.0	6.0	9.0	--	--	--
5.0	3.0	7.5	10.5	--	--	--
6.0	4.0	8.5	12.5	7.0*	4.0	11.0
7.0	5.0	10.0	15.0	8.0*	4.0	12.0

\*Minimum concrete compressive strength of 3,500 psi.

Aggregate base material for Asphalt Pavement should consist of CAB/CMB complying with the specifications in Section 200-2.2/200-2.4 of the current "Standard Specifications for Public Works Construction" and should be compacted to at least ninety-five (95) percent of the maximum dry density (ASTM D1557). The surface of the base should exhibit a firm and unyielding condition just prior to the placement of asphalt concrete paving. The asphalt concrete shall be compacted to a minimum of ninety-five (95) percent relative compaction.

The pavement subgrade should be constructed in accordance with the recommendations presented in the grading section of this report.

An increase in the PCC pavement slab thickness, placement of steel reinforcement (or other alternatives such as Fibermesh) and joint spacing due to loading conditions including shrinkage and thermal effects may be necessary and should be incorporated by the structural engineer as necessary to prevent adverse impact on pavement performance and maintenance.

The R-value and the associated pavement section should be confirmed at the completion of site grading.

#### Geotechnical Review of Plans

All grading and foundation plans should be reviewed and accepted by the geotechnical consultant prior to construction. If significant time elapses since preparation of this report, the geotechnical consultant should verify the current site conditions, and provide any additional recommendations (if necessary) prior to construction.

#### Geotechnical Observation/Testing During Construction

Per sections 1705.6 and table 1705.6 of the 2019 California Building Code, periodic special inspection shall be performed to:

- Verify materials below shallow foundations are adequate to achieve the design bearing capacity;
- Verify excavations are extended to the proper depth and have reached proper material;
- Verify classification and test compacted materials; and
- Prior to placement of compacted fill, inspect subgrade and verify that the site has been prepared properly.

Per sections 1705.6 and table 1705.6 of the 2019 California Building Code, continuous special inspection shall be performed to:

- Verify use of proper materials, densities and lift thickness during placement and compaction of compacted fill.

The geotechnical consultant should also perform observation and/or testing at the following stages:

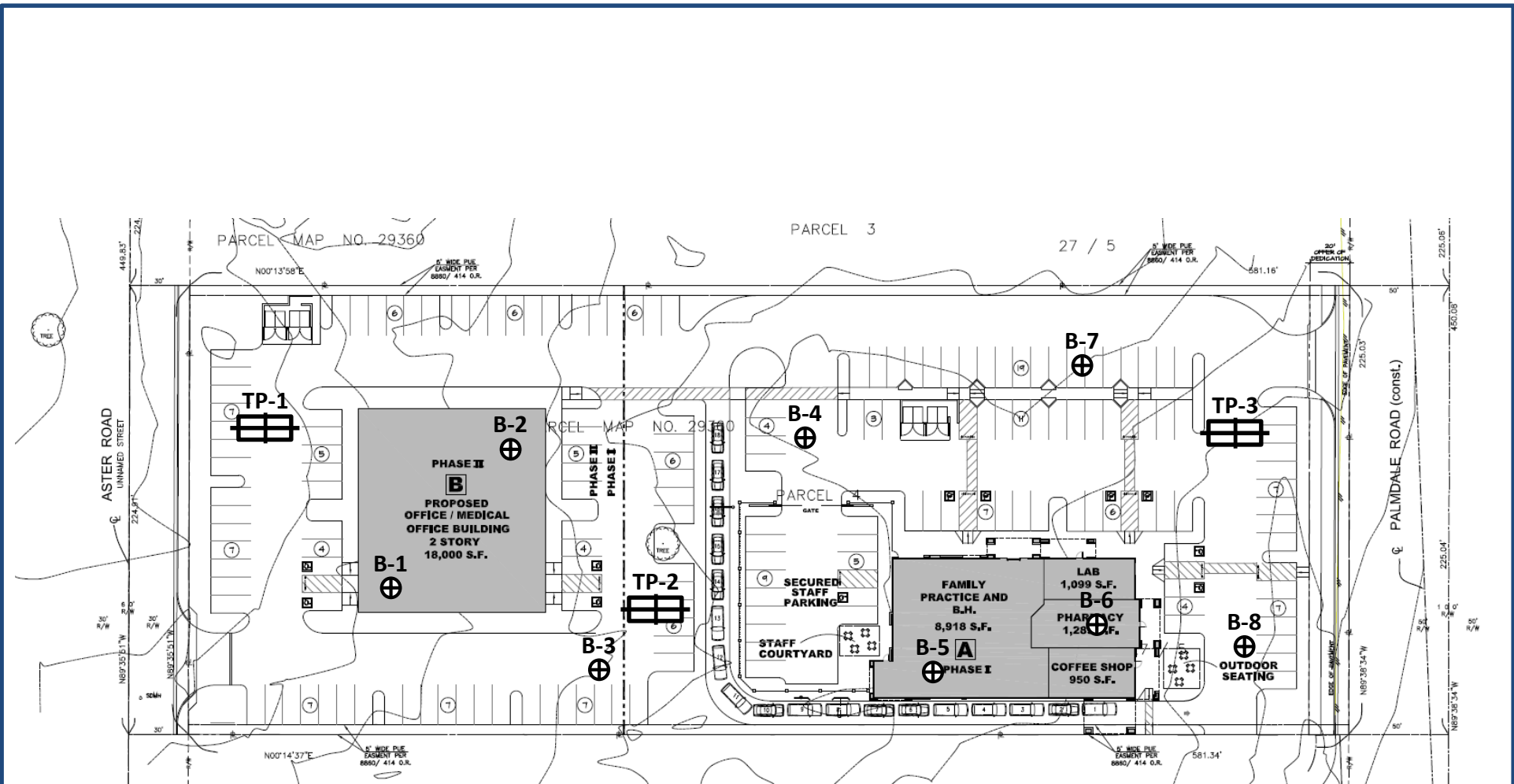
- During any grading and fill placement;
- After foundation excavation and prior to placing concrete;
- Prior to placing slab and flatwork concrete;
- During placement of aggregate base and asphalt concrete or Portland cement concrete;
- When any unusual soil conditions are encountered during any construction operation subsequent to issuance of this report.

### Limitations

This report was prepared for a specific client and a specific project, based on the client's needs, directions and requirements at the time.

This report was necessarily based upon data obtained from a limited number of observances, site visits, soil and/or other samples, tests, analyses, histories of occurrences, spaced subsurface exploration and limited information on historical events and observations. Such information is necessarily incomplete. Variations can be experienced within small distances and under various climatic conditions. Changes in subsurface conditions can and do occur over time.

This report is not authorized for use by and is not to be relied upon by any party except the client with whom TGR contracted for the work. Use or reliance on this report by any other party is that party's sole risk. Unauthorized use of or reliance on this report constitutes an agreement to defend and indemnify TGR from and against any liability which may arise as a result of such use or reliance, regardless of any fault, negligence, or strict liability of TGR.



**B-8**  
 APPROXIMATE LOCATION OF EXPLORATORY BORING

**TP-3**  
 APPROXIMATE LOCATION OF INFILTRATION TEST PIT



**BORING AND TEST PIT LOCATION MAP**  
**NW CORNER OF PALMDALE ROAD AND MESA LINDA AVENUE**  
**VICTORVILLE, CALIFORNIA**

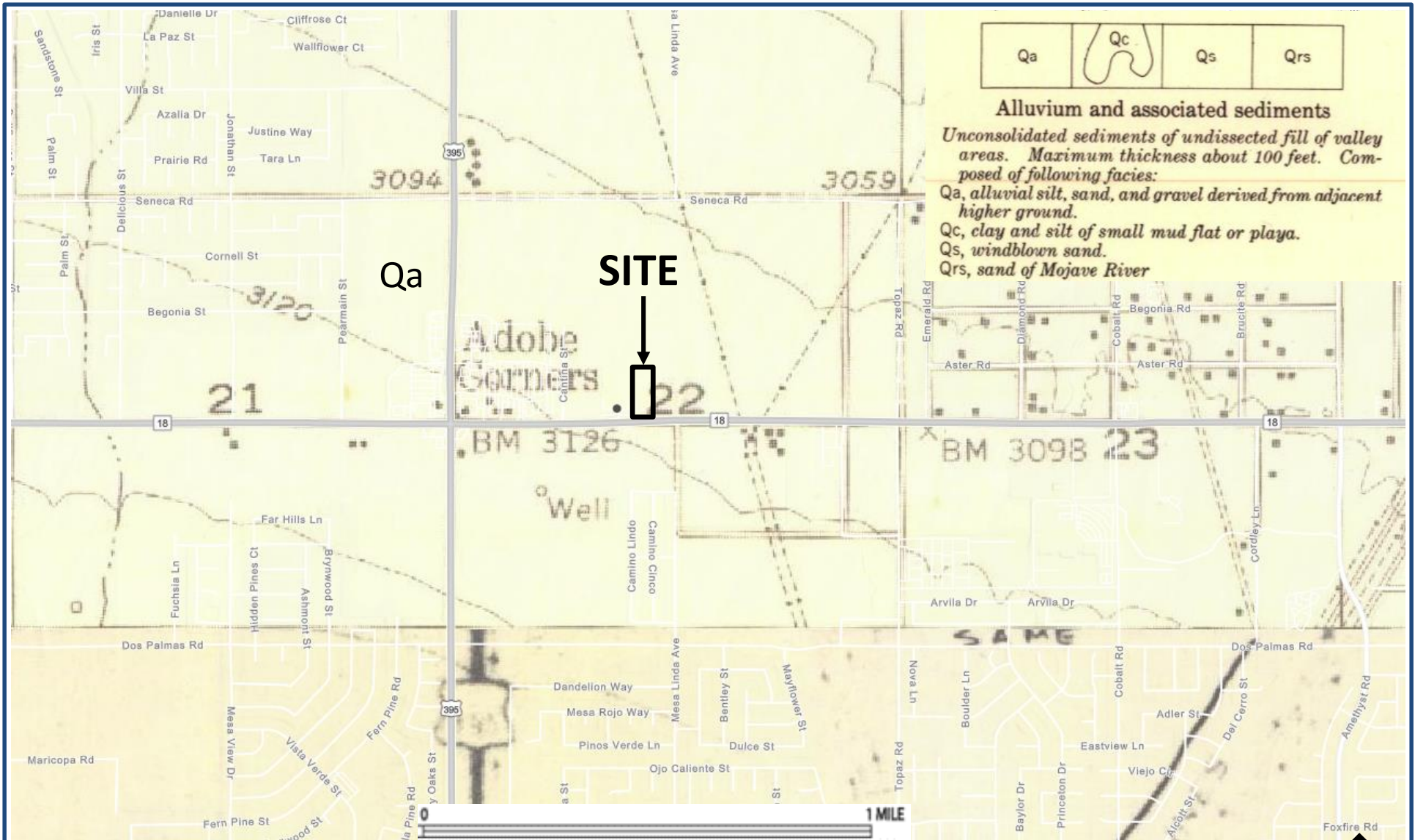
**PROJECT NO. 21-7337**

**PLATE 1**



**SITE LOCATION MAP**  
**NW CORNER OF PALMDALE ROAD AND MESA LINDA AVENUE**  
**VICTORVILLE, CALIFORNIA**

**PROJECT NO. 21-7337**  
**FIGURE 1**



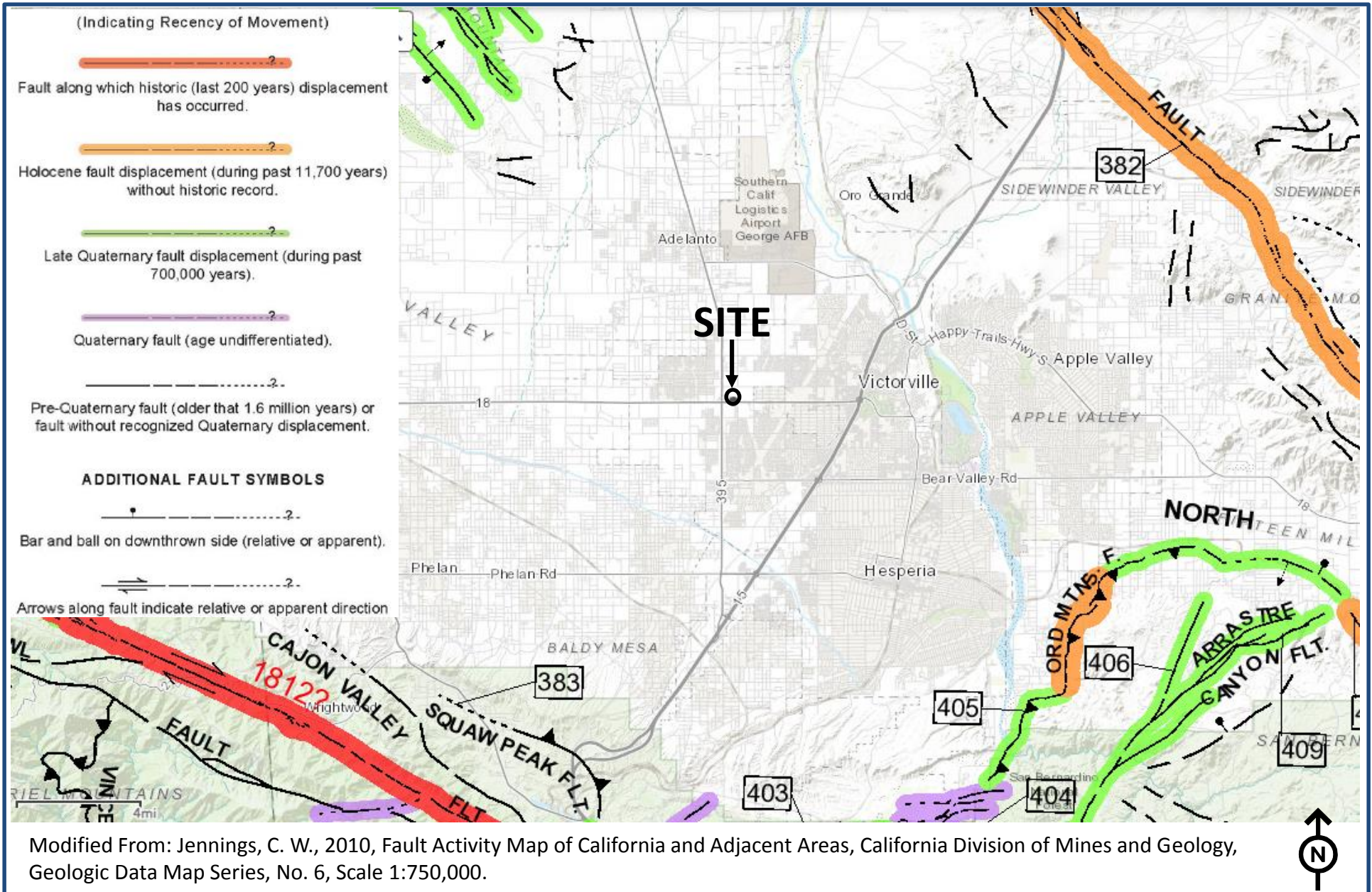
Modified From: Dibblee, T.W., 1960, Preliminary geologic map of the Victorville quadrangle, California: U.S. Geological Survey, MF-229, scale 1:62,500.

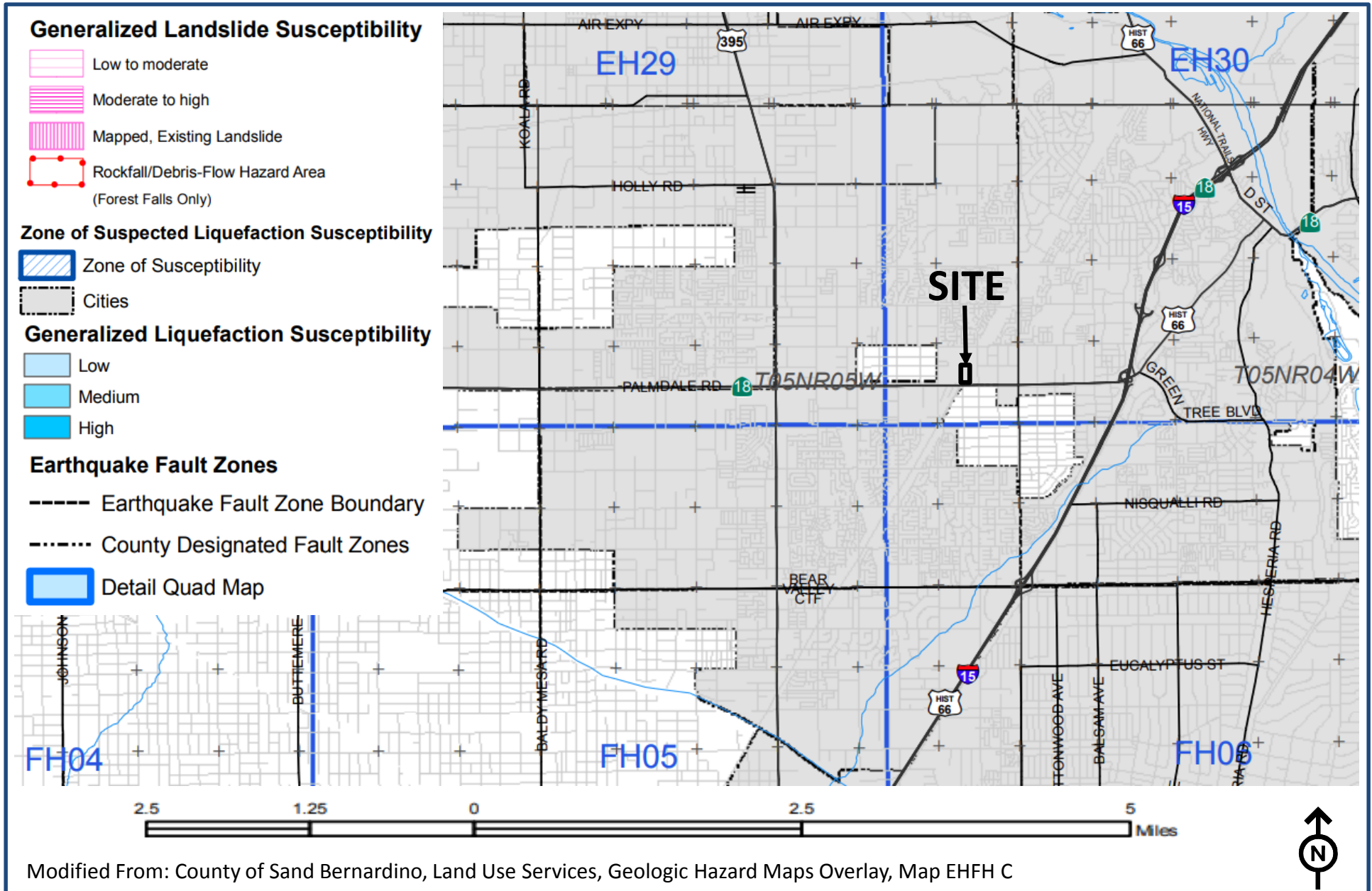


REGIONAL GEOLOGY MAP  
 NW CORNER OF PALMDALE ROAD AND MESA LINDA AVENUE  
 VICTORVILLE, CALIFORNIA

PROJECT NO. 21-7337

FIGURE 2





Modified From: County of Sand Bernardino, Land Use Services, Geologic Hazard Maps Overlay, Map EHFH C



**GEOLOGIC HAZARDS MAP**  
**NW CORNER OF PALMDALE ROAD AND MESA LINDA AVENUE**  
**VICTORVILLE, CALIFORNIA**

PROJECT NO. 21-7337

**FIGURE 4**





**TABLE 1**

**Project No.** 21-7337  
**Project Name:** Shiloh West Medical  
**Date of Test:** 3/2/2022  
**Test Location:** TP-1

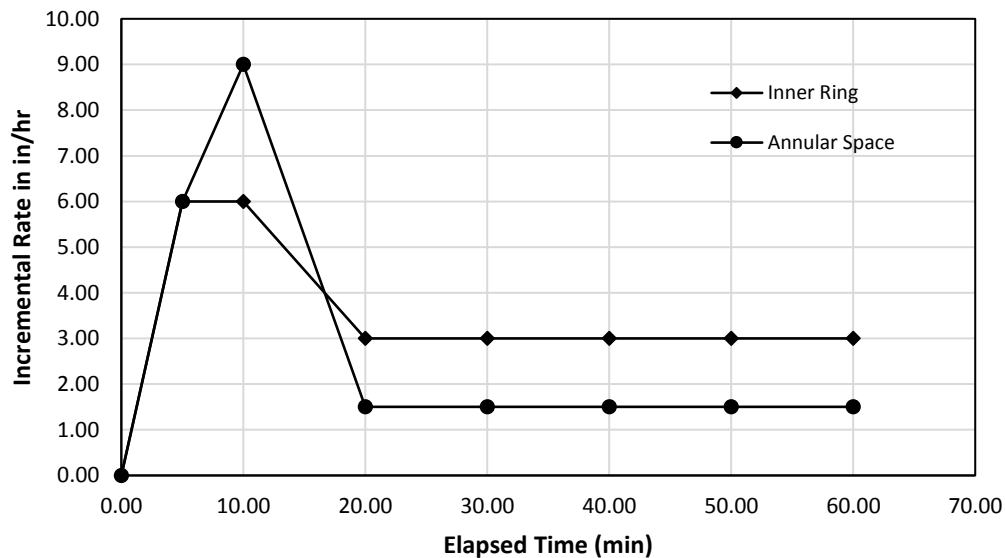
**Inner Ring:** 113 in<sup>3</sup>  
**Annular Space:** 339 in<sup>3</sup>

dt (min)	Time (min)	Volume (in <sup>3</sup> )	V <sub>IR</sub> Infiltration Rate (in/hr)	Volume (in <sup>3</sup> )	V <sub>OR</sub> Infiltration Rate (in/hr)
0.00	0.00	0.00	0.00	0.00	0.00
5.00	5.00	56.50	6.00	169.50	6.00
5.00	10.00	113.00	6.00	423.75	9.00
10.00	20.00	169.50	3.00	508.50	1.50
10.00	30.00	226.00	3.00	593.25	1.50
10.00	40.00	282.50	3.00	678.00	1.50
10.00	50.00	339.00	3.00	762.75	1.50
10.00	60.00	395.50	3.00	847.50	1.50

$V_{IR} = 3 \text{ in/hr}$

Where: V<sub>IR</sub> is Inner Ring incremental infiltration velocity, inch per hour  
 V<sub>OR</sub> is Annular Space incremental infiltration velocity, inch per hour

**Incremental Infiltration Rate**





**TABLE 2**

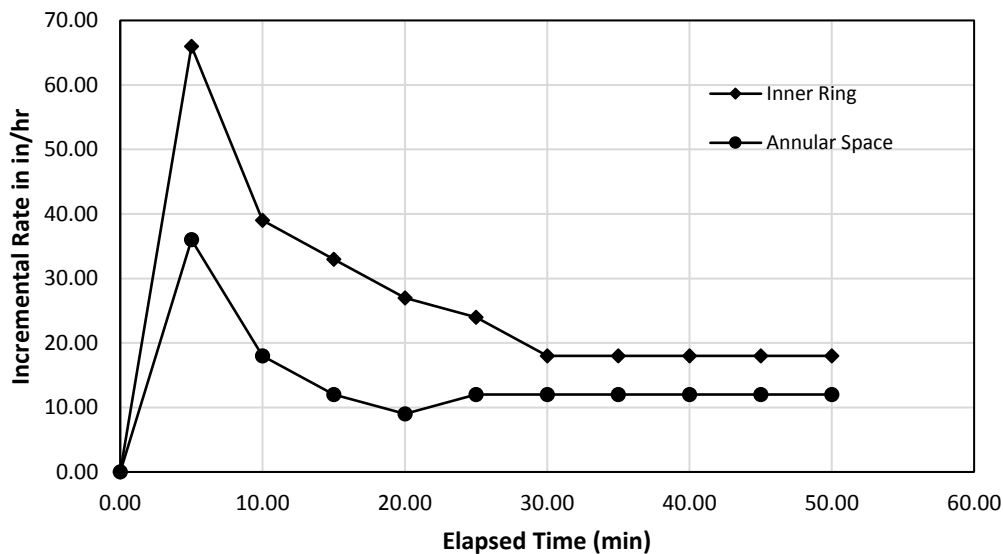
**Project No.** 21-7337 **Inner Ring:** 113 in<sup>3</sup>  
**Project Name:** Shiloh West Medical **Annular Space:** 339 in<sup>3</sup>  
**Date of Test:** 3/2/2022  
**Test Location:** TP-2

dt (min)	Time (min)	Volume (in <sup>3</sup> )	V <sub>IR</sub> Infiltration Rate (in/hr)	Volume (in <sup>3</sup> )	V <sub>OR</sub> Infiltration Rate (in/hr)
0.00	0.00	0.00	0.00	0.00	0.00
5.00	5.00	621.50	66.00	1017.00	36.00
5.00	10.00	988.75	39.00	1525.50	18.00
5.00	15.00	1299.50	33.00	1864.50	12.00
5.00	20.00	1553.75	27.00	2118.75	9.00
5.00	25.00	1779.75	24.00	2457.75	12.00
5.00	30.00	1949.25	18.00	2796.75	12.00
5.00	35.00	2118.75	18.00	3135.75	12.00
5.00	40.00	2288.25	18.00	3474.75	12.00
5.00	45.00	2457.75	18.00	3813.75	12.00
5.00	50.00	2627.25	18.00	4152.75	12.00

$V_{IR} = 18 \text{ in/hr}$

Where: V<sub>IR</sub> is Inner Ring incremental infiltration velocity, inch per hour  
 V<sub>OR</sub> is Annular Space incremental infiltration velocity, inch per hour

**Incremental Infiltration Rate**





**TABLE 3**

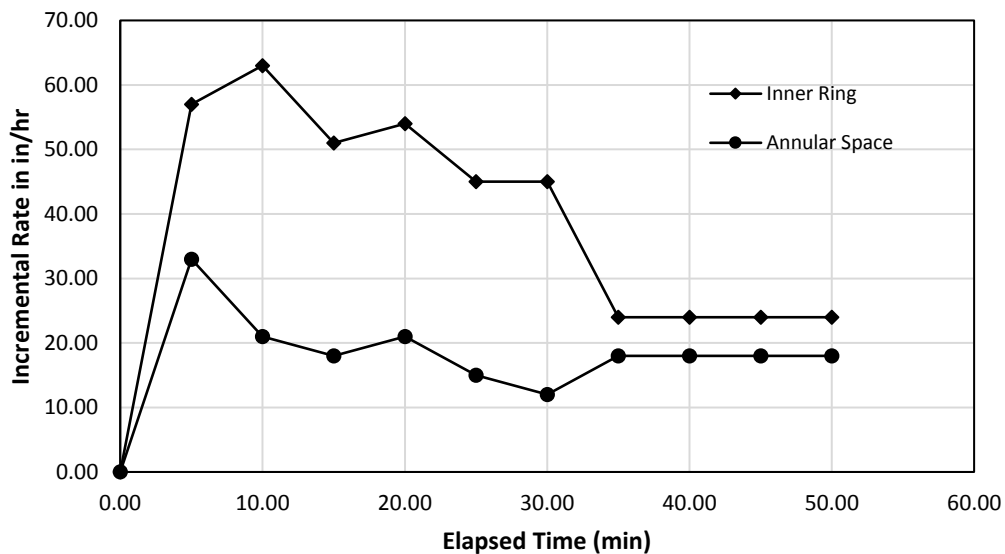
**Project No.** 21-7337 **Inner Ring:** 113 in<sup>3</sup>  
**Project Name:** Shiloh West Medical **Annular Space:** 339 in<sup>3</sup>  
**Date of Test:** 3/2/2022  
**Test Location:** TP-3

dt (min)	Time (min)	Volume (in <sup>3</sup> )	V <sub>IR</sub> Infiltration Rate (in/hr)	Volume (in <sup>3</sup> )	V <sub>OR</sub> Infiltration Rate (in/hr)
0.00	0.00	0.00	0.00	0.00	0.00
5.00	5.00	536.75	57.00	932.25	33.00
5.00	10.00	1130.00	63.00	1525.50	21.00
5.00	15.00	1610.25	51.00	2034.00	18.00
5.00	20.00	2118.75	54.00	2627.25	21.00
5.00	25.00	2542.50	45.00	3051.00	15.00
5.00	30.00	2966.25	45.00	3390.00	12.00
5.00	35.00	3192.25	24.00	3898.50	18.00
5.00	40.00	3418.25	24.00	4407.00	18.00
5.00	45.00	3644.25	24.00	4915.50	18.00
5.00	50.00	3870.25	24.00	5424.00	18.00

$V_{IR} = 24 \text{ in/hr}$

Where: V<sub>IR</sub> is Inner Ring incremental infiltration velocity, inch per hour  
 V<sub>OR</sub> is Annular Space incremental infiltration velocity, inch per hour

**Incremental Infiltration Rate**



**APPENDIX A  
REFERENCES**

## APPENDIX A

### References

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- Norris, Robert M. and Webb, Robert W., 1990, Geology of California (Second Edition).

**APPENDIX B  
LOG OF BORINGS AND TEST PITS**

THE FOLLOWING DESCRIBES THE TERMS AND SYMBOLS USED ON THE LOG OF BORINGS TO SUMMARIZE THE RESULTS OBTAINED IN THE FIELD INVESTIGATION AND SUBSEQUENT LABORATORY TESTING

**DENSITY AND CONSISTENCY**

The consistency of fine grained soils and the density of coarse grained soils are described on the basis of the Standard Penetration Test as follows:

COARSE GRAINED SOILS	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (Tsf)	FINE GRAINED SOILS
Very Loose < 4	< 0.25	Very Soft < 2
Loose 4 – 10	0.35 – 0.50	Soft 2 – 4
Medium 10 – 30	0.50 – 1.0	Firm (Medium) 4 – 8
Dense 30 – 50	1.0 – 2.0	Stiff 8 – 15
Very Dense > 50	2.0 – 4.0	Very Stiff 15 – 30
	> 4.0	Hard > 30

**PARTICLE SIZE DEFINITION (As per ASTM D2487 and D422)**

Boulder ⇒ Larger than 12 inches	Coarse Sands ⇒ No. 10 to No. 4 sieve
Cobbles ⇒ 3 to 12 inches	Medium Sands ⇒ No. 40 to No. 10 sieve
Coarse Gravel ⇒ 3/4 to 3 inches	Fine Sands ⇒ No. 200 to 40 sieve
Fine Gravel ⇒ No. 4 to 3/4 inches	Silt ⇒ 5µm to No. 200 sieve
	Clay ⇒ Smaller than 5µm

**SOIL CLASSIFICATION**

Soils and bedrock are classified and described based on their engineering properties and characteristics using ASTM D2487 and D2488.

Percentage description of minor components:

Trace	1 – 10%	Some	20 – 35%
Little	10 – 20%	And or y	25 – 50%

Stratified soils description:

Parting	0 to 1/16 inch thick	Layer	½ to 12 inches thick
Seam	1/16 to ½ inch thick	Stratum	> 12 inches thick

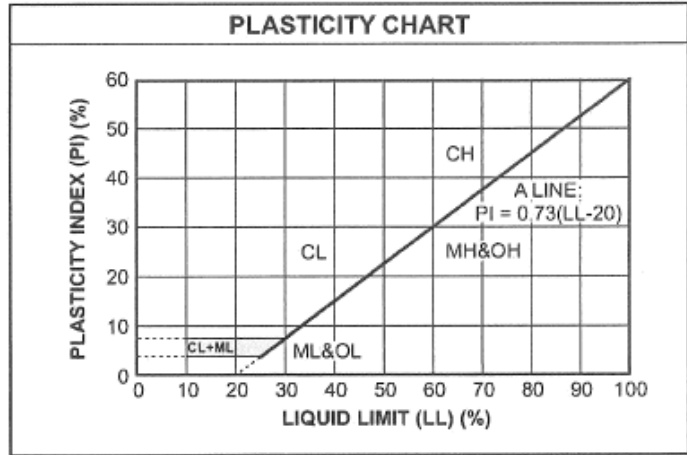
# SOIL CLASSIFICATION CHART

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART		
<b>COARSE-GRAINED SOILS</b> (more than 50% of material is larger than No. 200 sieve size.)		
Clean Gravels (Less than 5% fines)		
<b>GRAVELS</b> More than 50% of coarse fraction larger than No. 4 sieve size	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 (More than 12% fines)	
	GM	Silty gravels, gravel-sand-silt mixtures
	GC	Clayey gravels, gravel-sand-clay mixtures
Clean Sands (Less than 5% fines)		
<b>SANDS</b> 50% or more of coarse fraction smaller than No. 4 sieve size	SW	Well-graded sands, gravelly sands, little or no fines
	SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	
	SM	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand-clay mixtures
<b>FINE-GRAINED SOILS</b> (50% or more of material is smaller than No. 200 sieve size.)		
<b>SILTS AND CLAYS</b> Liquid limit less than 50%	ML	Inorganic silts and very fine sands, rock flour, silty of 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
<b>SILTS AND CLAYS</b> Liquid limit 50% or greater	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity, organic silts
<b>HIGHLY ORGANIC SOILS</b>	PT	Peat and other highly organic soils

LABORATORY CLASSIFICATION CRITERIA		
GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with P.I. greater than 7	
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent ..... GW, GP, SW, SP  
 More than 12 percent ..... GM, GC, SM, SC  
 5 to 12 percent ..... Borderline cases requiring dual symbols



## PARTICLE SIZE LIMITS

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	
	3"	¾"	NO. 4	NO. 10	NO. 40	NO. 200



# LOG OF BORING EXPLANATION



# LOG OF EXPLORATORY BORING B-1

Sheet 1 of 1

Project Number: **21-7337**  
 Project Name: **Shiloh West Medical Center, Victorville**  
 Date Drilled: **3/2/22 - 3/2/22**  
 Ground Elev: **3113**

Logged By: **PK**  
 Project Engineer: **SG**  
 Drill Type: **Hollow Stem**  
 Drive Wt & Drop: **140lbs / 30in**

Elevation (ft)	Depth (ft)	Graphic Log	FIELD RESULTS				LAB RESULTS		
			Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	Moisture Content (%)	Dry Density, (pcf)

Shelby Tube

Standard Split Spoon

No recovery

Modified California

Water Table ATD

SUMMARY OF SUBSURFACE CONDITIONS

3110	5	25	SM	<p>Surface is sand, gravel and sparse vegetation.</p> <p>FILL: Silty <u>SAND</u>- to Sandy <u>SILT</u>- light brown, fine to coarse grained sand, slightly moist to dry, medium dense.</p> <p>NATIVE: Silty <u>SAND</u>- light brown, dry, medium dense, fine to coarse grained sand, scattered fine gravel.</p> <p>...Same as above.</p>	2	115	Consol	R-Value
3105	10	20	SM	<p>...Same as above, less fines.</p>	1	92	Consol	
3100	15	>50		<p>NO RECOVERY</p>				
3095	20	>50	SM	<p>Silty <u>SAND</u>- light brown, moist, very dense, fine to coarse grained sand, slightly cemented.</p>	4			
3090	25	58	SM	<p>...Same as above, dense.</p>	5			
3085	30			<p>Total Depth: 26.5 feet.                      No groundwater encountered during drilling.                      No caving observed.                      Boring backfilled with soil cuttings upon completion.</p> <p>Ground elevation estimated with Google Earth.</p>				

LOG OF BORING 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/25/22

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 2



# LOG OF EXPLORATORY BORING B-2

Project Number: **21-7337**  
 Project Name: **Shiloh West Medical Center, Victorville**  
 Date Drilled: **3/2/22 - 3/2/22**  
 Ground Elev: **3115**

Logged By: **PK**  
 Project Engineer: **SG**  
 Drill Type: **Hollow Stem**  
 Drive Wt & Drop: **140lbs / 30in**

Elevation (ft)	Depth (ft)	Graphic Log	FIELD RESULTS				LAB RESULTS		
			Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	Moisture Content (%)	Dry Density, (pcf)

Shelby Tube

Standard Split Spoon

No recovery

Modified California

Water Table ATD

SUMMARY OF SUBSURFACE CONDITIONS

3110	5	5	27	SM	<p>Surface is sand, gravel and sparse vegetation.</p> <p>FILL: Silty <u>SAND</u> to Sandy <u>SILT</u>- light brown, slightly moist, medium dense, fine grained sand.</p> <p>NATIVE: Silty <u>SAND</u>- light brown, slightly moist, medium dense, medium to coarse grained sand, scattered fine grained gravel.</p> <p>...Same as above.</p>	2	99
3105	10	10	36	SM	<p>...Same as above, fine grained sand, slightly cemented.</p>	3	118
3100	15	15	>50	MLS	<p>Sandy <u>SILT</u> to Silty <u>SAND</u>- greyish brown, slightly moist, very dense, fine to medium grained sand, cemented.</p>	6	95
3095	20	20	52	SM	<p>Silty <u>SAND</u>- greyish brown, slightly moist, dense, fine to medium grained sand.</p>	4	
3090	25	25	45	SM	<p>...Same as above.</p>	5	
					<p>Total Depth: 26.5 feet.                      No groundwater encountered during drilling.                      No caving observed.                      Boring backfilled with soil cuttings upon completion.</p>		
3085	30				<p>Ground elevation estimated with Google Earth.</p>		

LOG OF BORING 21-7337 SHILOH WEST MEDICAL CENTER.GPJ\_TGR GEOTECH.GDT 3/25/22

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 3












# LOG OF EXPLORATORY BORING B-3

Sheet 1 of 1

Project Number: **21-7337**  
 Project Name: **Shiloh West Medical Center, Victorville**  
 Date Drilled: **3/2/22 - 3/2/22**  
 Ground Elev: **3115**

Logged By: **PK**  
 Project Engineer: **SG**  
 Drill Type: **Hollow Stem**  
 Drive Wt & Drop: **140lbs / 30in**

Elevation (ft)	Depth (ft)	Graphic Log	FIELD RESULTS				LAB RESULTS		
			Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	Moisture Content (%)	Dry Density, (pcf)
						 Shelby Tube  Standard Split Spoon  No recovery  Modified California  Water Table ATD			
SUMMARY OF SUBSURFACE CONDITIONS									

3110	5			22	SM	<p>Surface is sand, gravel and sparse vegetation.</p> <p>FILL: Sandy <u>SILT</u>- light brown, slightly moist, stiff, fine to coarse grained sand.</p> <p>NATIVE: Silty <u>SAND</u>- light brown, slightly moist, medium dense, medium to coarse grained sand, scattered fine grained gravel.</p> <p>...Same as above.</p>	3	116
3105	10			27	SM	<p>...Same as above, dry.</p>	2	105
<p>Total Depth: 11.5 feet.                      No groundwater encountered during drilling.                      No caving observed.                      Boring backfilled with soil cuttings upon completion.</p> <p>Ground elevation estimated with Google Earth.</p>								

LOG OF BORING 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/25/22

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 4











# LOG OF EXPLORATORY BORING B-4

Sheet 1 of 1

Project Number: **21-7337**  
 Project Name: **Shiloh West Medical Center, Victorville**  
 Date Drilled: **3/2/22 - 3/2/22**  
 Ground Elev: **3115**

Logged By: **PK**  
 Project Engineer: **SG**  
 Drill Type: **Hollow Stem**  
 Drive Wt & Drop: **140lbs / 30in**

Elevation (ft)	Depth (ft)	Graphic Log	FIELD RESULTS				LAB RESULTS		
			Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	Moisture Content (%)	Dry Density, (pcf)
						 Shelby Tube  Standard Split Spoon  No recovery  Modified California  Water Table ATD			
SUMMARY OF SUBSURFACE CONDITIONS									
						Surface is sand, gravel and sparse vegetation.			
						FILL: Sandy <u>SILT</u> - light brown, slightly moist, stiff, fine grained sand.			
						NATIVE: Silty <u>SAND</u> light brown, dry, medium dense, medium to coarse grained sand, scattered fine grained gravel.			
3110	5			22	SM	...Same as above.			
3105	10			56	SM	...Same as above, very dense.			
						Total Depth: 11.5 feet. No groundwater encountered during drilling. No caving observed. Boring backfilled with soil cuttings upon completion.  Ground elevation estimated with Google Earth.			

LOG OF BORING 21-7337 SHILOH WEST MEDICAL CENTER.GPJ\_TGR GEOTECH.GDT 3/25/22

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 5



# LOG OF EXPLORATORY BORING B-5

Sheet 1 of 1

Project Number: **21-7337**  
 Project Name: **Shiloh West Medical Center, Victorville**  
 Date Drilled: **3/2/22 - 3/2/22**  
 Ground Elev: **3116**

Logged By: **PK**  
 Project Engineer: **SG**  
 Drill Type: **Hollow Stem**  
 Drive Wt & Drop: **140lbs / 30in**

Elevation (ft)	Depth (ft)	Graphic Log	FIELD RESULTS				LAB RESULTS		
			Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	Moisture Content (%)	Dry Density, (pcf)
						Shelby Tube Standard Split Spoon No recovery Modified California Water Table ATD			
SUMMARY OF SUBSURFACE CONDITIONS									

3115	5	21	SM	Surface is sand, gravel and sparse vegetation. FILL: Sandy <u>SILT</u> - light brown, slightly moist, stiff, fine to coarse grained sand. NATIVE: Silty <u>SAND</u> - light brown, dry, medium dense, medium to coarse grained sand, scattered fine grained gravel.  ...Same as above.	2	118	Consol
3110	10	54	SM	...Same as above, very dense.	2	113	
3105	15	>50	SM	NO RECOVERY			
3100	20	>50	SM	Silty <u>SAND</u> - light greyish brown, moist, very dense, fine grained sand, cemented.	4		
3095	25	57	SM	...Same as above, medium dense, fine to medium grained sand.	4		
3090	30			Total Depth: 26.5 feet. No groundwater encountered during drilling. No caving observed. Boring backfilled with soil cuttings upon completion.  Ground elevation estimated with Google Earth.			

LOG OF BORING 21-7337 SHILOH WEST MEDICAL CENTER.GPJ\_TGR GEOTECH.GDT 3/25/22

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

## PLATE 6



# LOG OF EXPLORATORY BORING B-6

Sheet 1 of 1

Project Number: **21-7337**  
 Project Name: **Shiloh West Medical Center, Victorville**  
 Date Drilled: **3/2/22 - 3/2/22**  
 Ground Elev: **3116**

Logged By: **PK**  
 Project Engineer: **SG**  
 Drill Type: **Hollow Stem**  
 Drive Wt & Drop: **140lbs / 30in**

Elevation (ft)	Depth (ft)	Graphic Log	FIELD RESULTS				LAB RESULTS		
			Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	Moisture Content (%)	Dry Density, (pcf)
						Shelby Tube Standard Split Spoon No recovery Modified California Water Table ATD			
SUMMARY OF SUBSURFACE CONDITIONS									

3115							Surface is sand, gravel and sparse vegetation. FILL: Sandy <u>SILT</u> - light brown, slightly moist, stiff, fine grained sand.												
5							NATIVE: Silty <u>SAND</u> - light brown, dry, medium dense, medium to coarse grained sand, scattered fine grained gravel.												
3110			21			SM	...Same as above.	2	114										
10							...Same as above, slightly moist, dense.												
3105			31			SM		3	101	Consol									
15							Silty <u>SAND</u> - greyish brown, moist, very dense, fine grained sand, slightly cemented.												
3100			>50			SM		5	94										
20							...Same as above.												
3095			60			SM		6											
25							...Same as above.												
3090			>50			SM		5											
30							Total Depth: 26.5 feet. No groundwater encountered during drilling. No caving observed. Boring backfilled with soil cuttings upon completion.  Ground elevation estimated with Google Earth.												

LOG OF BORING 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/25/22

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 7



# LOG OF EXPLORATORY BORING B-7

Sheet 1 of 1

Project Number: **21-7337**  
 Project Name: **Shiloh West Medical Center, Victorville**  
 Date Drilled: **3/2/22 - 3/2/22**  
 Ground Elev: **3118**

Logged By: **PK**  
 Project Engineer: **SG**  
 Drill Type: **Hollow Stem**  
 Drive Wt & Drop: **140lbs / 30in**

Elevation (ft)	Depth (ft)	Graphic Log	FIELD RESULTS				LAB RESULTS		
			Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	Moisture Content (%)	Dry Density, (pcf)

Shelby Tube

Standard Split Spoon

No recovery

Modified California

Water Table ATD

SUMMARY OF SUBSURFACE CONDITIONS

3115	5	8	SM	<p>Surface is sand, gravel and sparse vegetation.</p> <p>FILL: Sandy <u>SILT</u>- light brown, slightly moist, stiff, fine grained.</p> <p>NATIVE: Silty <u>SAND</u>- light brown, slightly moist, medium dense, fine to medium grained sand, scattered fine grained gravel.</p> <p>...Same as above.</p>	3	110
3110	10	22	SM	<p>...Same as above, moist.</p>	4	111
3105				<p>Total Depth: 11.5 feet.                      No groundwater encountered during drilling.                      No caving observed.                      Boring backfilled with soil cuttings upon completion.</p> <p>Ground elevation estimated with Google Earth.</p>		

LOG OF BORING 21-7337 SHILOH WEST MEDICAL CENTER.GPJ\_TGR GEOTECH.GDT 3/25/22

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 8



**LOG OF EXPLORATORY BORING B-8**

Project Number: **21-7337**  
 Project Name: **Shiloh West Medical Center, Victorville**  
 Date Drilled: **3/2/22 - 3/2/22**  
 Ground Elev: **3117**

Logged By: **PK**  
 Project Engineer: **SG**  
 Drill Type: **Hollow Stem**  
 Drive Wt & Drop: **140lbs / 30in**

Elevation (ft)	Depth (ft)	Graphic Log	FIELD RESULTS				LAB RESULTS		
			Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	Moisture Content (%)	Dry Density (pcf)

■ Shelby Tube      ⊗ Standard Split Spoon      ● No recovery  
⊠ Modified California      ▽ Water Table ATD

SUMMARY OF SUBSURFACE CONDITIONS

3115    5   3110    10   3105		24 SM  39 SM	Surface is sand, gravel and sparse vegetation.	Max, Shear, EI, Corrosion
			FILL: Sandy <u>SILT</u> to Silty <u>SAND</u> - light brown, moist, stiff, medium to coarse grained sand.	
			NATIVE: Silty <u>SAND</u> - light brown, dry, medium dense, medium to coarse grained sand, scattered fine grained gravel.	
			...Same as above.	
			...Same as above, moist, dense.	
			Total Depth: 11.5 feet. No groundwater encountered during drilling. No caving observed. Boring backfilled with soil cuttings upon completion.  Ground elevation estimated with Google Earth.	

LOG OF BORING 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/25/22

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

**PLATE 9**





**TGR GEOTECHNICAL INC**

Project Name: <u>Shiloh West Medical</u>	Logged by: <u>RA</u>			
Project Number: <u>21-7337</u>	Elevation: <u>3119 ft</u>	Trench No.:	<u>TP-1</u>	
Equipment: <u>Back Hoe Excavator</u>	Location:			

**ENGINEERING PROPERTIES**

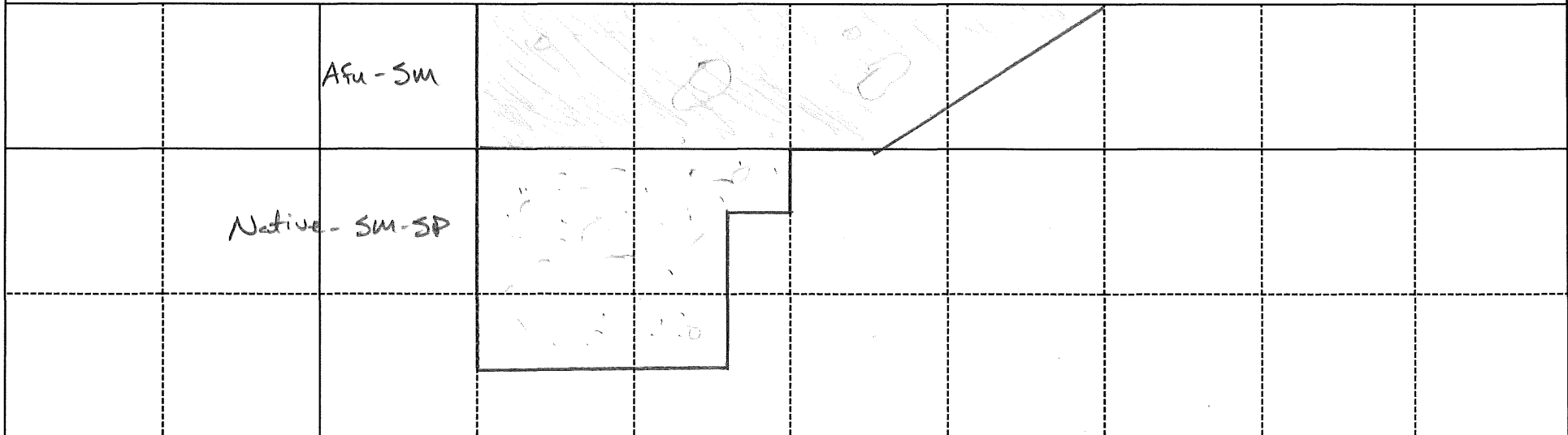
GEOLOGIC ATTITUDES	DATE: <u>3/2/2022</u>	DESCRIPTION:	GEOLOGIC UNIT	U.S.C.S.	Sample No.	Moisture (%)	Density (pcf)	Other Tests
		0-2' - UNDOCUMENTED FILL: Silty SAND, reddish brown, slightly moist, medium dense to dense, fine grained sand, some coarse, some fine to coarse gravel.	Afu	SM				
		2-5' - NATIVE: Silty SAND to SAND, reddish brown, slightly moist, medium dense, fine to coarse grained, some fine to coarse gravel.	Qa	SM-SP				
		Total Depth: 5 feet. Double Ring Infiltrometer testing performed in test pit. Trench backfilled with excavated soil upon completion.				2.1%		-200= 10.8%
		Bulk Sample @ 5 feet						

GRAPHIC PRESENTATION

SCALE: 1" = 2'

SURFACE SLOPE: Flat

TREND: E-W



Log of Trench No. TP-1

**TGR GEOTECHNICAL INC**

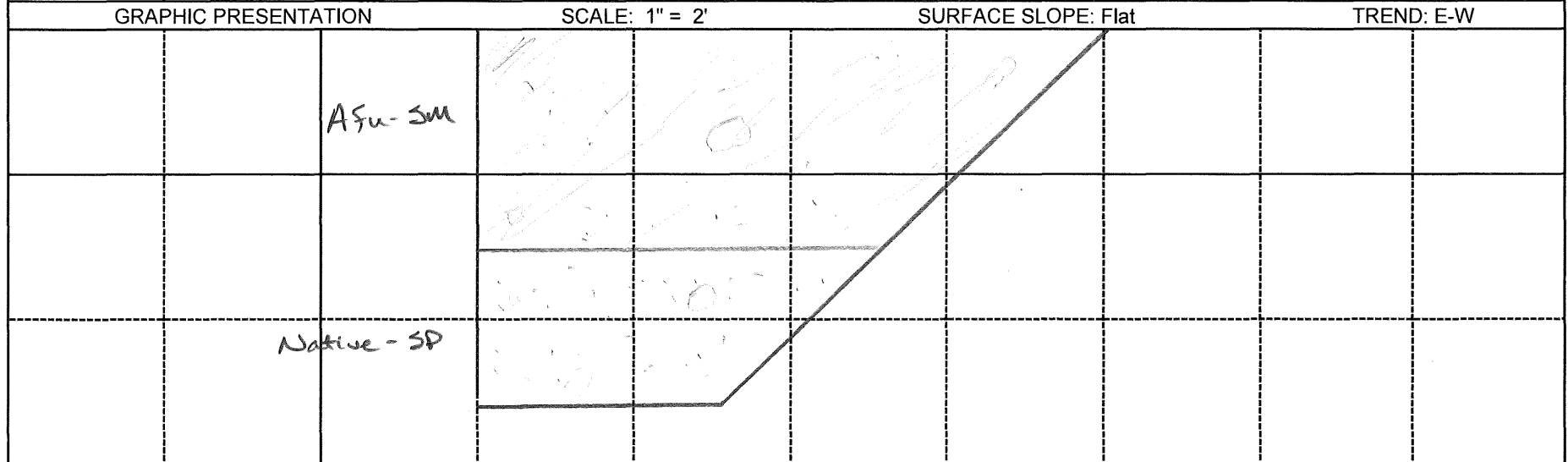
Project Name: <u>Shiloh West Medical</u>		Logged by: <u>RA</u>				<b>ENGINEERING PROPERTIES</b>				
Project Number: <u>21-7337</u>		Elevation: <u>3116 ft</u>		Trench No. <u>TP-2</u>						
Equipment: <u>Back Hoe Excavator</u>		Location:								
GEOLOGIC ATTITUDES	DATE:	3/2/2022	DESCRIPTION:	GEOLOGIC UNIT	U.S.C.S.	Sample No.	Moisture (%)	Density (pcf)	Other Tests	
	0-2.5' - UNDOCUMENTED FILL: Silty SAND, reddish brown, slightly moist, medium dense to dense, fine grained sand, some coarse, some fine to coarse gravel.			Afu	SM					
	2.5-5' - NATIVE: SAND, light reddish brown, slightly moist, medium dense, fine to coarse grained, some fine to coarse gravel.			Qa	SP		1.5%		-200=4.5%	
	Total Depth: 5 feet. Double Ring Infiltrometer testing performed in test pit. Trench backfilled with excavated soil upon completion.									
	Bulk Sample @ 5 feet									
GRAPHIC PRESENTATION			SCALE: 1" = 2'	SURFACE SLOPE: Flat			TREND: E-W			
		Afu - SM								
		Native - SP								

Log of Trench No. TP-2

**TGR GEOTECHNICAL INC**

Project Name: <u>Shiloh West Medical</u>	Logged by: <u>RA</u>		<b>ENGINEERING PROPERTIES</b>	
Project Number: <u>21-7337</u>	Elevation: <u>3113 ft</u>	Trench No. <u>TP-3</u>		
Equipment: <u>Back Hoe Excavator</u>	Location:			

GEOLOGIC ATTITUDES	DATE: <u>3/2/2022</u>	DESCRIPTION:	GEOLOGIC UNIT	U.S.C.S.	Sample No.	Moisture (%)	Density (pcf)	Other Tests
		0-3" - UNDOCUMENTED FILL: Silty SAND, reddish brown, slightly moist, medium dense to dense, very fine to fine grained sand, some coarse, some fine to coarse gravel.	Afu	SM				
		3-5' - NATIVE: SAND, light reddish brown, slightly moist, medium dense, fine to coarse grained, some fine to coarse gravel.	Qa	SP				
		Total Depth: 5 feet. Double Ring Infiltrometer testing performed in test pit. Trench backfilled with excavated soil upon completion.				2.3%		-200= 6.0%
		Bulk Sample @ 5 feet						



Log of Trench No. TP-3

**APPENDIX C  
LABORATORY TEST RESULTS**

## APPENDIX C

### Laboratory Testing Procedures and Results

**In-Situ Moisture and Dry Density Determination (ASTM D2216 and D7263):** Moisture content and dry density determinations were performed on relatively undisturbed samples obtained from the test borings. The results of these tests are presented in the boring logs. Where applicable, only moisture content was determined from "undisturbed" or disturbed samples.

**Maximum Density and Optimum Moisture Content (ASTM D1557):** The maximum dry density and optimum moisture content of typical materials were determined in accordance with ASTM Test Method D1557. The results of these tests are presented in the table below:

Sample Location	Sample Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
B-8 @ 0-5 feet	Sandy Silt to Silty Sand	133.0	9.0

**Direct Shear Strength (ASTM D3080):** Direct shear test was performed on selected remolded samples, which were soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. After transfer of the sample to the shear box, and reloading the sample, pore pressures set up in the sample due to the transfer were allowed to dissipate for a period of approximately 1-hour prior to application of shearing force. The sample was tested under various normal loads, a motor-driven, strain-controlled, direct-shear testing apparatus at a strain rate of less than 0.001 to 0.5 inches per minute (depending upon the soil type). The test results are presented in the test data and in the table below:

Sample Location	Sample Description	Friction Angle (degrees)	Apparent Cohesion (psf)
B-8 @ 0-5 feet	Sandy Silt to Silty Sand (Remolded)	33	120

**Consolidation Tests (ASTM D2435):** Consolidation test were performed on selected, relatively undisturbed ring samples. Samples were placed in a consolidometer and loads were applied in geometric progression. The percent consolidation for each load cycle was recorded as the ratio of the amount of vertical compression to the original 1-inch height. The consolidation pressure curves are presented in the test data.

**Expansion Potential (ASTM D4829):** The expansion potential of selected materials was evaluated by the Expansion Index Test, ASTM D4829. Specimens are molded under a given compactive energy to approximately the optimum moisture content and approximately 50 percent saturation or approximately 90 percent relative compaction. The prepared 1-inch thick by 4-inch diameter specimens are loaded to an equivalent 144 psf surcharge and are inundated with tap water until volumetric equilibrium is reached. The results of these tests are presented in the table below:

Sample Location	Sample Description	Expansion Index	Expansion Potential
B-8 @ 0-5 feet	Sandy Silt to Silty Sand	0	Very Low

**Soluble Sulfate (CAL 417A):** The soluble sulfate content of selected sample was determined by standard geochemical methods. The test results are presented in the test data and in the table below:

Sample Location	Sample Description	Water Soluble Sulfate in Soil, (% by Weight)	Sulfate Content (ppm)	Exposure Class*
B-8 @ 0-5 feet	Sandy Silt to Silty Sand	0.0185	185	S0

\* Based on the current version of ACI 318-14 Building Code, Table No. 19.3.1.1; Exposure Categories and Classes.

**Corrosivity Tests (CAL 422, CAL 643 and CAL 747):** Electrical conductivity, pH, and soluble chloride tests were conducted on representative samples and the results are provided in the test data and in the table below:

Sample Location	Sample Description	Soluble Chloride (CAL 422) (ppm)	Electrical Resistivity (CAL 643) (ohm-cm)	pH (CAL 747)	Potential Degree of Attack on Steel
B-8 @ 0-5 feet	Sandy Silt to Silty Sand	69	6,100	7.9	Moderate

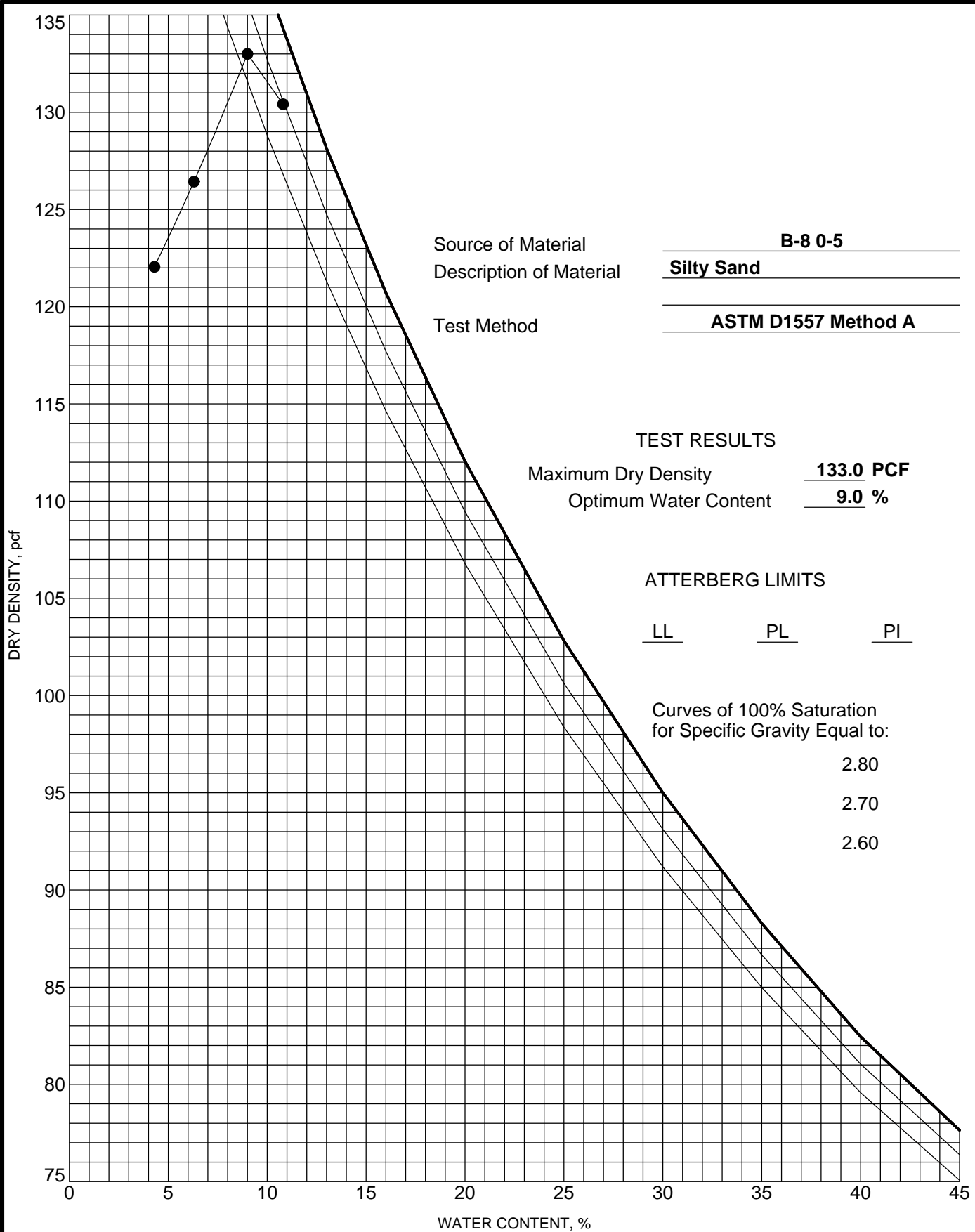
**R-Value (CAL 301):** The resistance "R"-Value was determined by the California Materials Method No. 301 for subgrade soils. Samples were prepared and exudation pressure and "R"-Value determined. The graphically determined "R"-Values at exudation pressure of 300 psi are shown in the test data and summarized in the table below:

Sample Location	Sample Description	R-Value
B-2 @ 0-5 feet	Silty Sand and Sandy Silt	23

**Passing No. 200 Sieve (ASTM D1140):** Typical materials were washed over No. 200 sieve. The test results are presented below:

Sample Location	% Passing No. 200 Sieve
TP-1 @ 5 feet	10.8
TP-2 @ 5 feet	4.5
TP-3 @ 5 feet	6.0

US COMPACTION 21-7337 SHILOH WEST MEDICAL CENTER.GPJ\_TGR GEOTECH.GDT 3/17/22

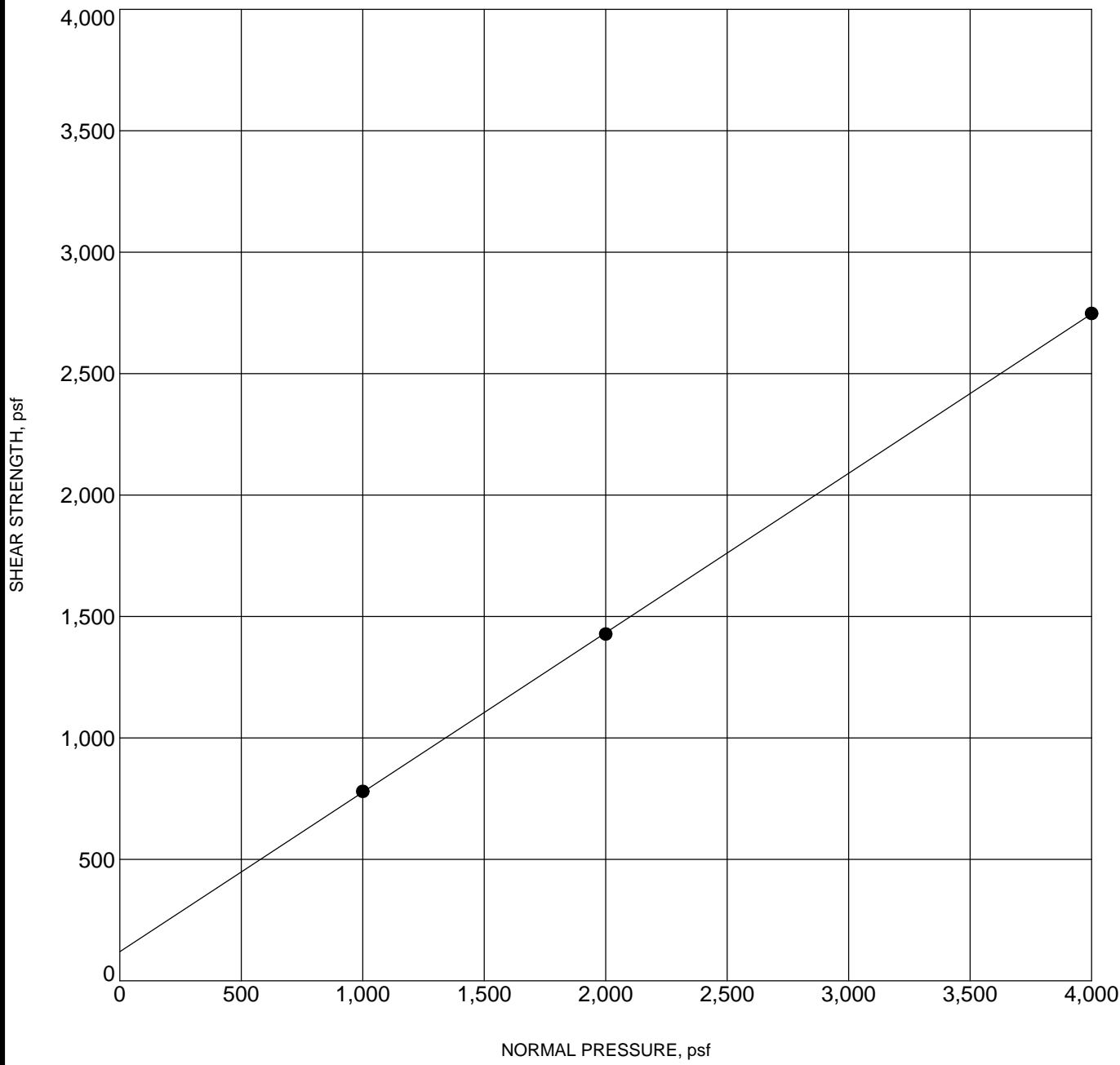


3037 S. Harbor Blvd  
 Santa Ana, CA 92704  
 Telephone: 714-641-7189  
 Fax: 714-641-7190

**MOISTURE-DENSITY RELATIONSHIP**

Project Number: 21-7337  
 Project Name: Shiloh West Medical Center, Victorville

US DIRECT SHEAR 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/17/22



Specimen Identification	Classification	$\gamma_d$	MC%	c	$\phi$
● B-8      0-5	<b>Silty Sand - Remolded - 90% RC</b>	<b>120</b>	<b>9</b>	<b>120</b>	<b>33</b>



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 Fax: 714-641-7190

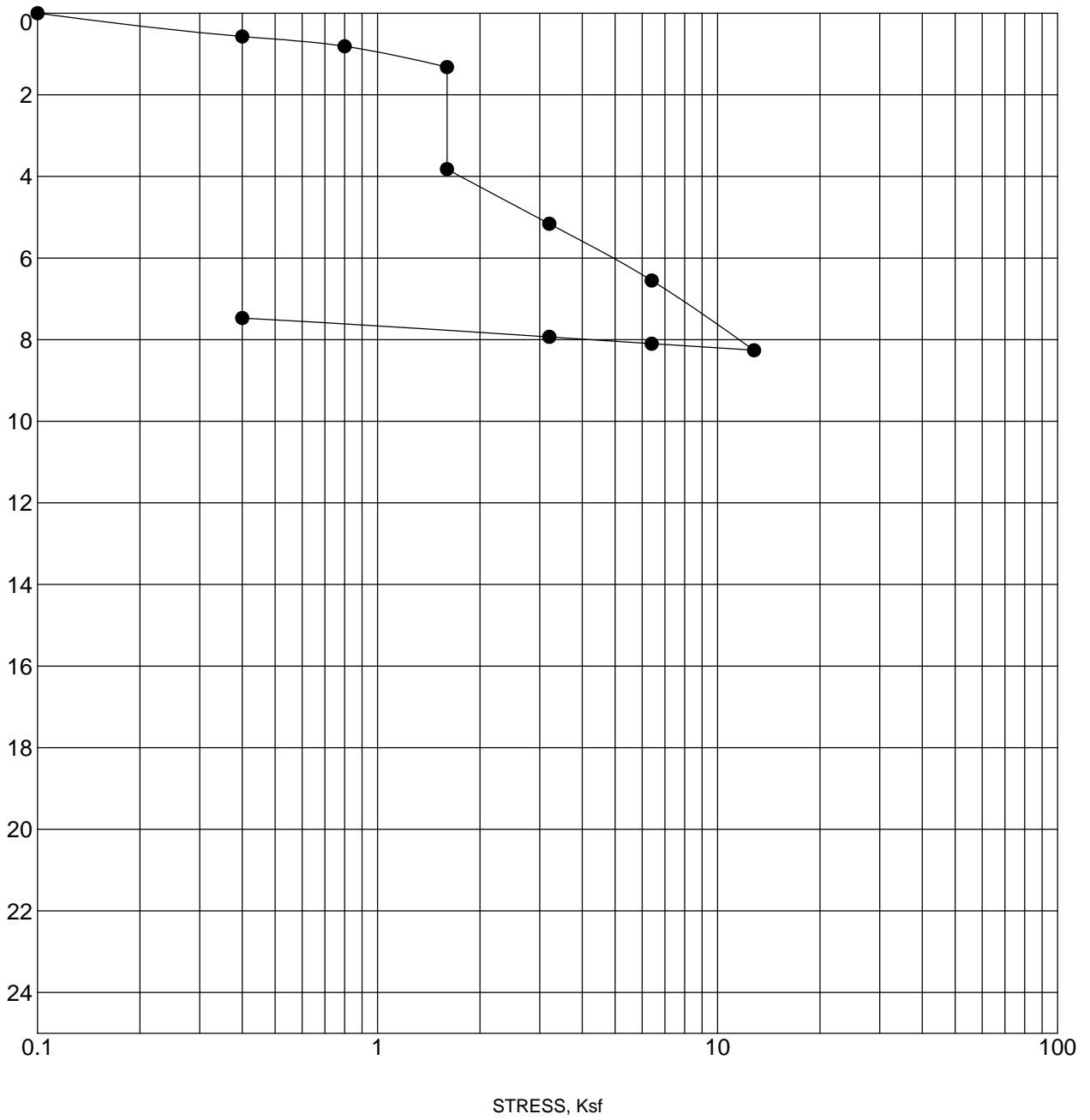
**DIRECT SHEAR TEST**

Project Number: 21-7337  
 Project Name: Shiloh West Medical Center, Victorville



US CONSOL STRAIN 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/22/22

STRAIN, %



Specimen Identification	Classification	$\gamma_d$	MC%
● B-1      5.0	Silty Sand	115	2



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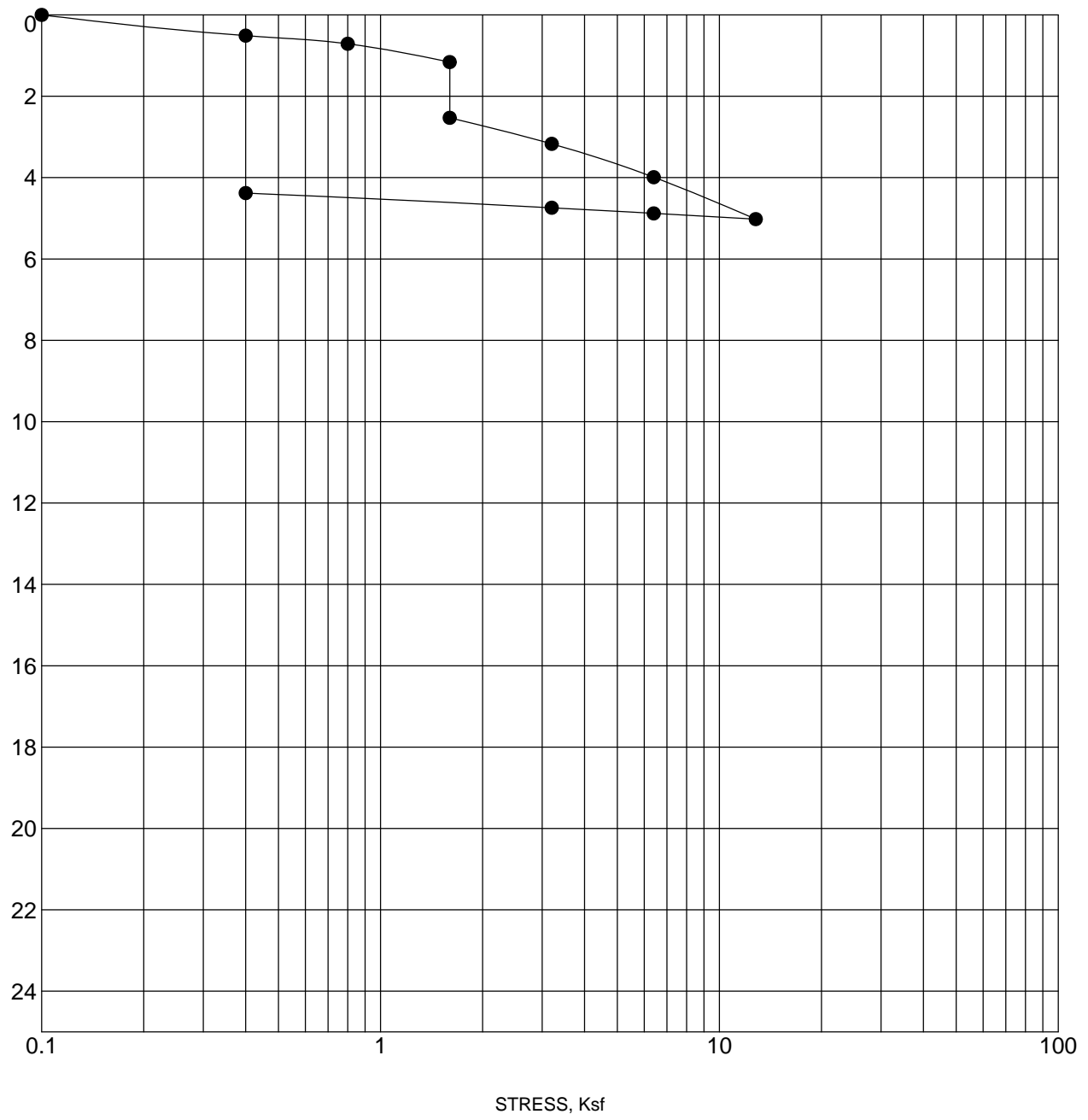
**CONSOLIDATION TEST**

Project Number: 21-7337

Project Name: Shiloh West Medical Center, Victorville

US CONSOL STRAIN 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/21/22

STRAIN, %



Specimen Identification	Classification	$\gamma_d$	MC%
● B-1      10.0	Silty Sand	92	1



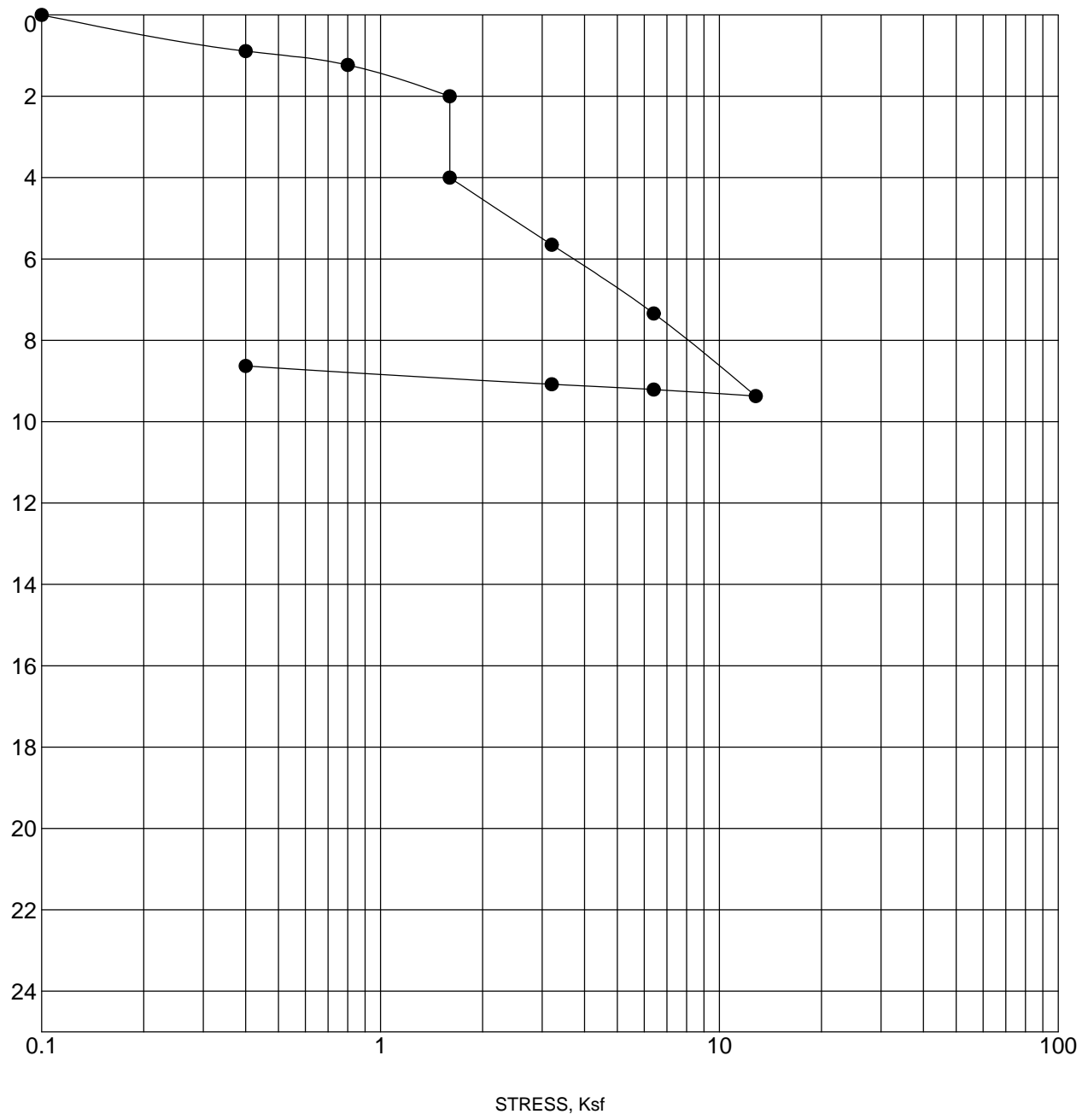
3037 S. Harbor Blvd  
 Santa Ana, CA 92704  
 Telephone: 714-641-7189  
 Fax: 714-641-7190

**CONSOLIDATION TEST**

Project Number: 21-7337  
 Project Name: Shiloh West Medical Center, Victorville

US CONSOL STRAIN 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/22/22

STRAIN, %



Specimen Identification	Classification	$\gamma_d$	MC%
● B-5      5.0	Silty Sand	118	2



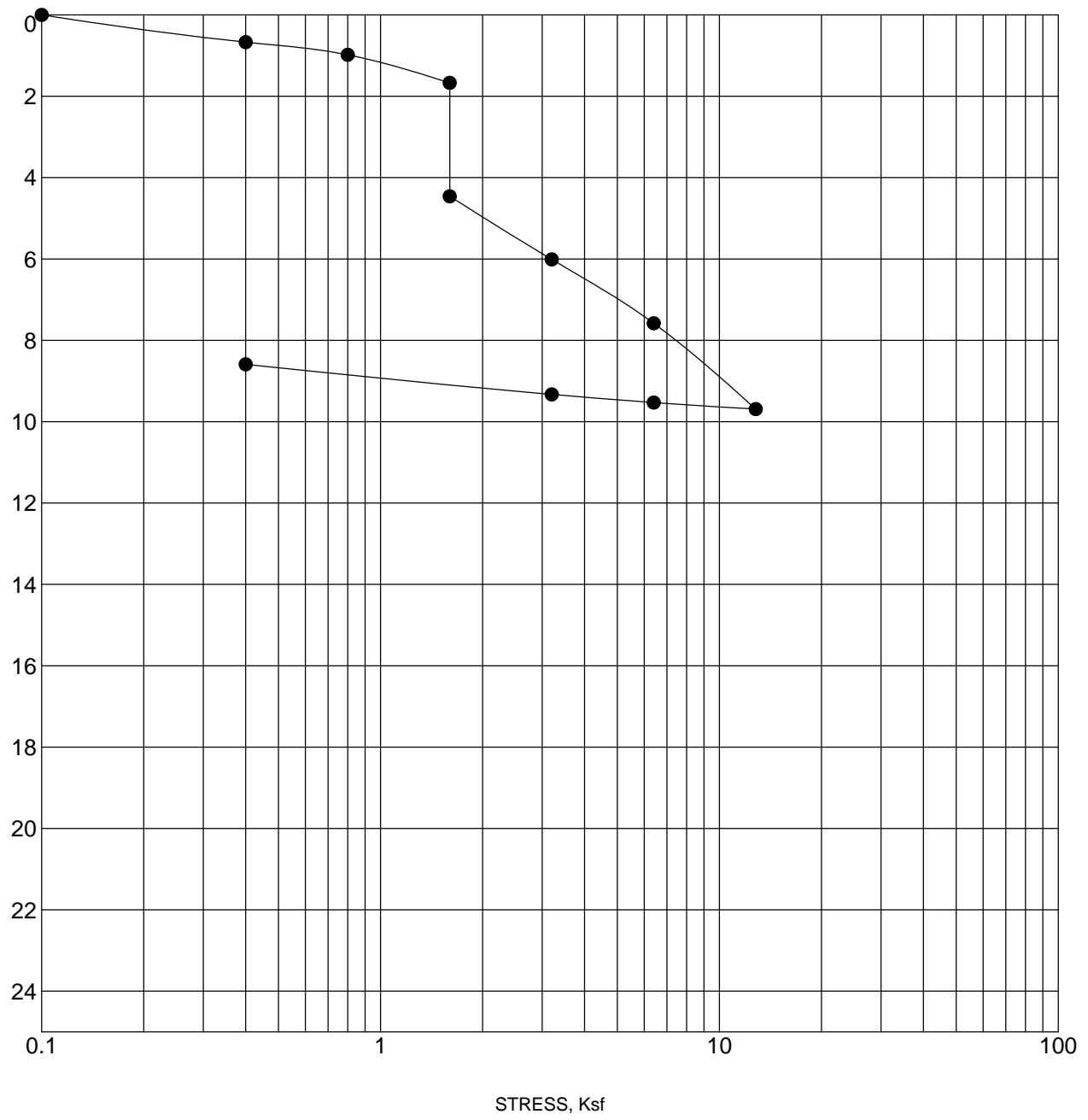
3037 S. Harbor Blvd  
 Santa Ana, CA 92704  
 Telephone: 714-641-7189  
 Fax: 714-641-7190

**CONSOLIDATION TEST**

Project Number: 21-7337  
 Project Name: Shiloh West Medical Center, Victorville

US CONSOL STRAIN 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/21/22

STRAIN, %



Specimen Identification	Classification	$\gamma_d$	MC%
● B-6      10.0	Silty Sand	101	3



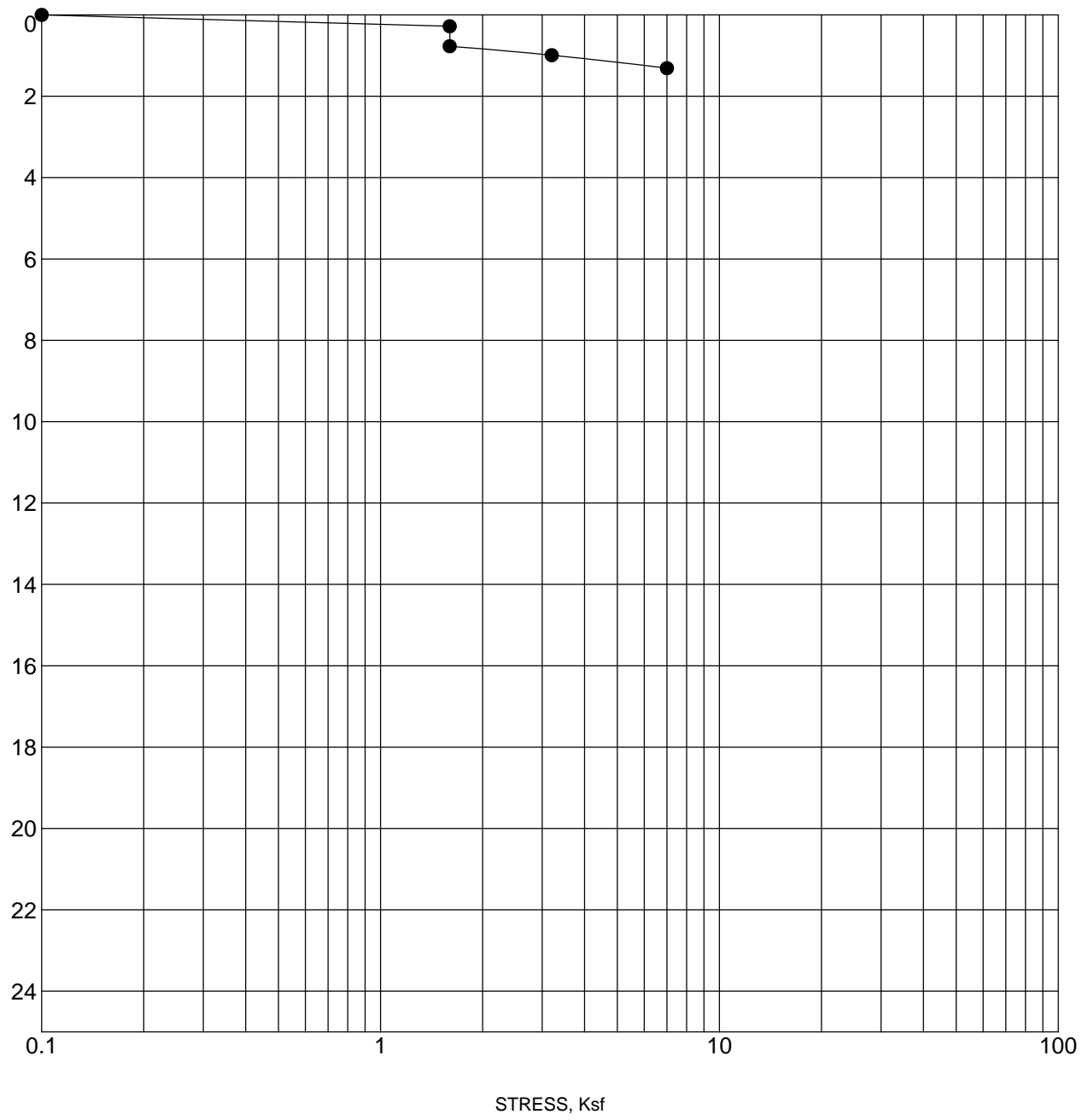
3037 S. Harbor Blvd  
 Santa Ana, CA 92704  
 Telephone: 714-641-7189  
 Fax: 714-641-7190

**CONSOLIDATION TEST**

Project Number: 21-7337  
 Project Name: Shiloh West Medical Center, Victorville

US CONSOL STRAIN 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/22/22

STRAIN, %



Specimen Identification	Classification	$\gamma_d$	MC%
● B-3      5.0	Silty Sand	116	3



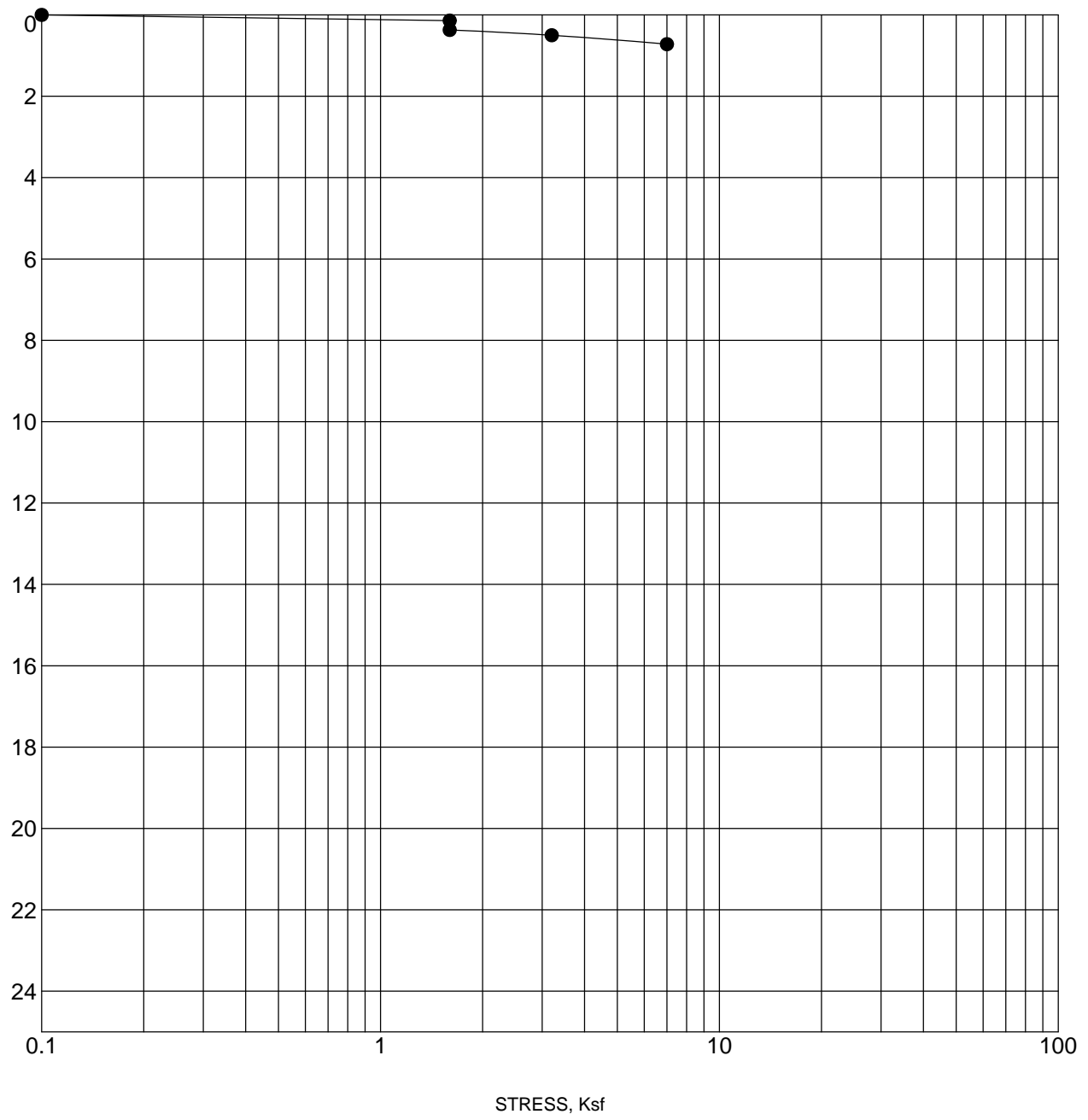
3037 S. Harbor Blvd  
 Santa Ana, CA 92704  
 Telephone: 714-641-7189  
 Fax: 714-641-7190

**COLLAPSE TEST**

Project Number: 21-7337  
 Project Name: Shiloh West Medical Center, Victorville

US CONSOL STRAIN 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/22/22

STRAIN, %



Specimen Identification	Classification	$\gamma_d$	MC%
● B-6      5.0	Silty Sand	114	2



3037 S. Harbor Blvd  
 Santa Ana, CA 92704  
 Telephone: 714-641-7189  
 Fax: 714-641-7190

**COLLAPSE TEST**

Project Number: 21-7337  
 Project Name: Shiloh West Medical Center, Victorville

# ANAHEIM TEST LAB, INC

196 Technology Dr., Unit D  
Irvine, CA 92618  
Phone (949) 336-6544

TO:

TGR GEOTECHNICAL  
3037 S. HARBOR BLVD.  
SANTA ANA, CA 92704

DATE: 3/17/2022

P.O. NO: VERBAL

LAB NO: C-5771

SPECIFICATION: CTM-643/417/422

MATERIAL: Soil

---

Project No.: 21-7337  
Project: Shiloh West Medical Center  
Sample ID: B8 @ 0-5'

## ANALYTICAL REPORT CORROSION SERIES SUMMARY OF DATA

pH	MIN. RESISTIVITY per CT. 643 ohm-cm	SOLUBLE SULFATES per CT. 417 ppm	SOLUBLE CHLORIDES per CT. 422 ppm
7.9	6,100	185	69

RESPECTFULLY SUBMITTED



---

WES BRIDGER LAB MANAGER

# ANAHEIM TEST LAB, INC

196 Technology Drive, Unit D  
Irvine, CA 92618  
Phone (949) 336-6544

TO:

TGR GEOTECHNICAL  
3037 S. HARBOR BLVD.  
SANTA ANA, CA. 92704

DATE: 3/18/2022

P.O. NO.: VERBAL

LAB NO.: C-5777

SPECIFICATION: CTM- 301

MATERIAL: Brown, Sandy Clay

---

Project No.: 21-7337  
Project: Shiloh West Medical Center  
Sample ID: B1 @ 0-5'

## ANALYTICAL REPORT

### "R" VALUE

BY EXUDATION

BY EXPANSION

23

N/A

RESPECTFULLY SUBMITTED



---

WES BRIDGER LAB MANAGER



# "R" VALUE CA 301

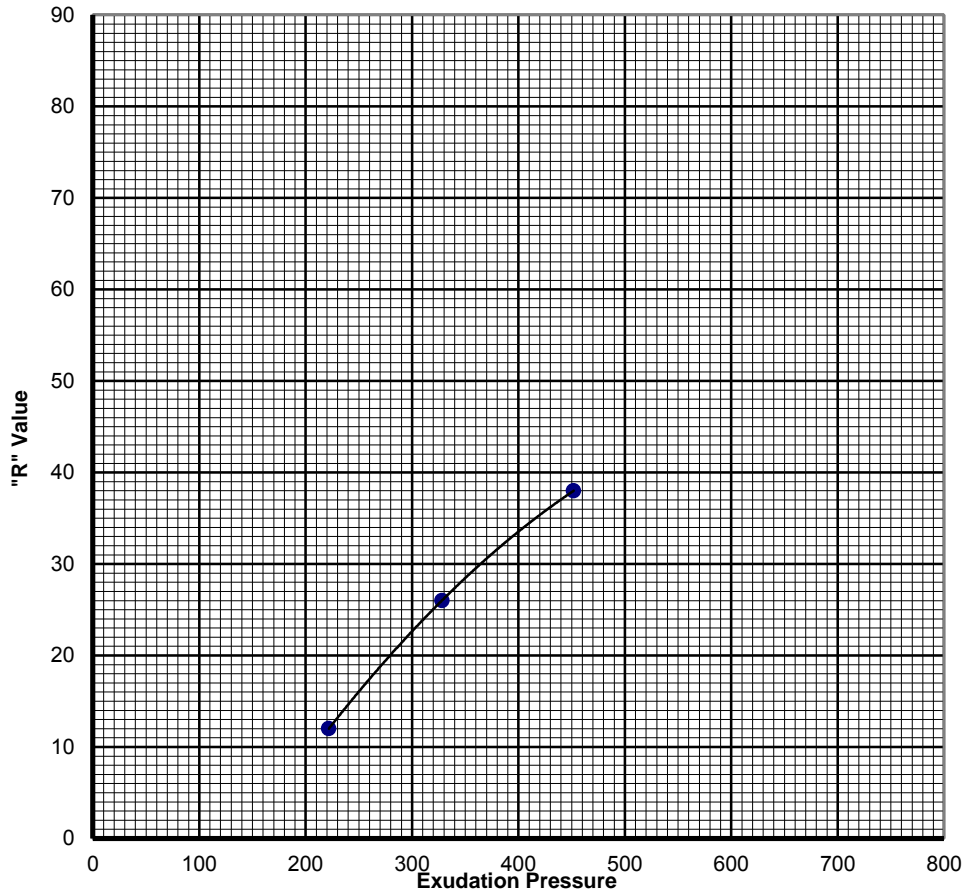
Client: TGR Geotechnical  
 Client Reference No.: 21-7337  
 Sample: B1 @ 0-5'

ATL No.: C 5777 Date: 3/18/2022

Soil Type: Brown, Sandy Clay

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	100	60	80	
Initial Moisture Content	%	4.6	4.6	4.6	
Moisture at Compaction	%	11.6	13.4	12.5	
Briquette Height	in.	2.48	2.51	2.51	
Dry Density	pcf	125.5	120.4	123.1	
EXUDATION PRESSURE	psi	452	222	328	
EXPANSION PRESSURE	psf	121	35	65	
Ph at 1000 pounds	psi	38	65	49	
Ph at 2000 pounds	psi	88	131	105	
Displacement	turns	3.36	4.12	3.82	
"R" Value		38	12	26	
CORRECTED "R" VALUE		38	12	26	

Final "R" Value	
BY EXUDATION: @ 300 psi	<b>23</b>
BY EXPANSION: TI = 5.0	<b>N/A</b>



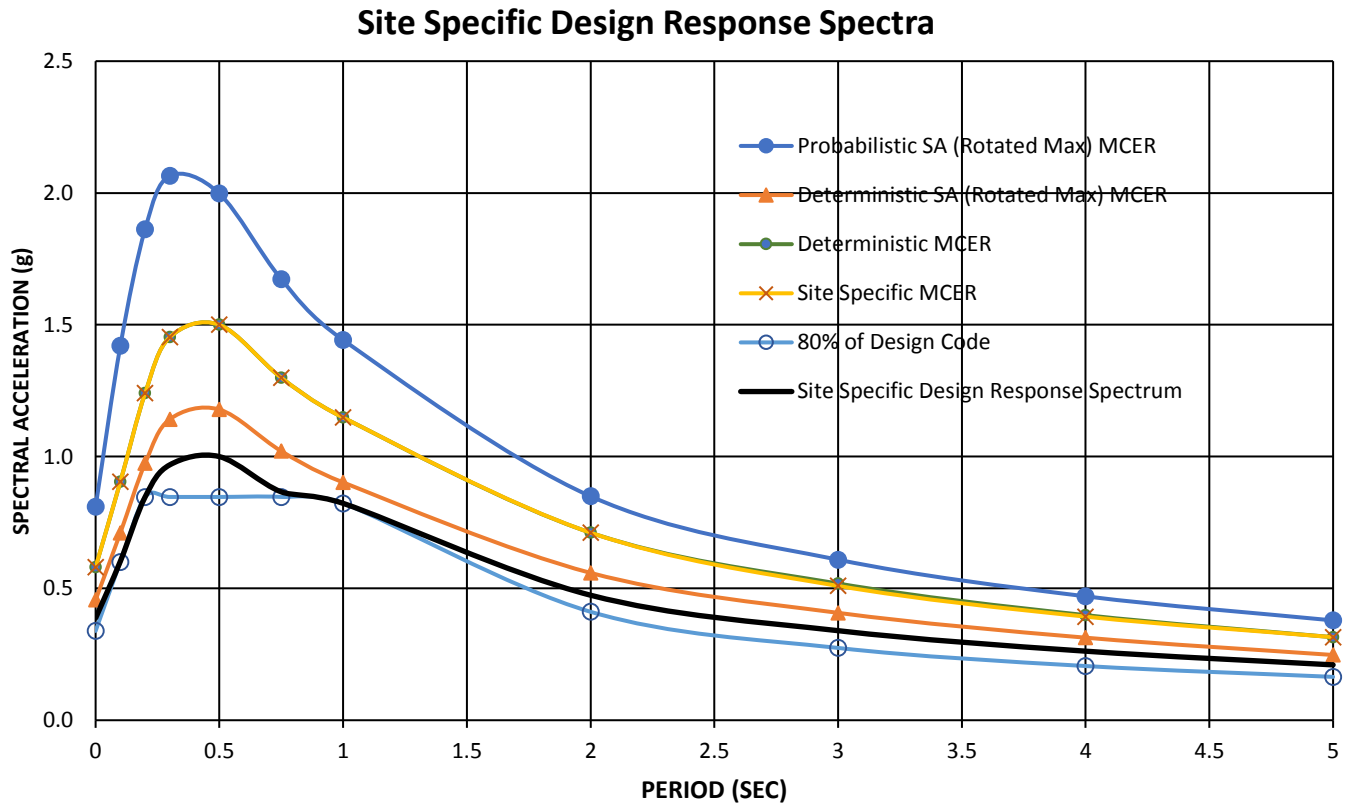
**APPENDIX D  
SITE SEISMICITY AND DEAGGREGATED PARAMETERS**

**TABLE 1**  
**SITE SPECIFIC GROUND MOTION ANALYSIS**  
**21-7337 Shiloh West Medical**

SA Period (sec)	Probabilistic Spectral Acceleration MCER (g)	Deterministic Spectral Acceleration (g)	Is Largest Deterministic Spectral Acceleration <1.5*Fa	Deterministic MCER	Site Specific MCER	2/3 of Site Specific MCER	80% Code Design	Site Specific Design Response Spectrum
	Rotated Maximum	Rotated Maximum 84th Percentile						
0	0.6864	0.4565	Yes	0.5810	0.5810	0.3874	0.3388	0.3874
0.1	1.2034	0.7106		0.9045	0.9045	0.6030	0.6003	0.6030
0.2	1.6192	0.9746		1.2405	1.2405	0.8270	0.8469	0.8469
0.3	1.8045	1.1419		1.4534	1.4534	0.9689	0.8469	0.9689
0.5	1.7555	1.1785		1.5000	1.5000	1.0000	0.8469	1.0000
0.75	1.4751	1.0209		1.2994	1.2994	0.8663	0.8469	0.8663
1	1.2649	0.9022		1.1483	1.1483	0.7655	0.8227	0.8227
2	0.7236	0.5589		0.7114	0.7114	0.4742	0.4113	0.4742
3	0.5096	0.4074		0.5185	0.5096	0.3397	0.2742	0.3397
4	0.3930	0.3132		0.3986	0.3930	0.2620	0.2057	0.2620
5	0.3165	0.2475		0.3150	0.3150	0.2100	0.1645	0.2100

Code Sds	1.059	Crs = 0.927	Code Ss = 1.588	<b>Site Specific Sds = 0.900</b>
Code Sd1	1.028	Cr1 = 0.902	Code S1 = 0.617	<b>Site Specific Sd1 = 1.050</b>
To	0.19	Code Fa = 1	Sms = 1.588	
Ts	0.97	Code Fv = 2.5	Sm1 = 1.5425	
TL	8			
Input				

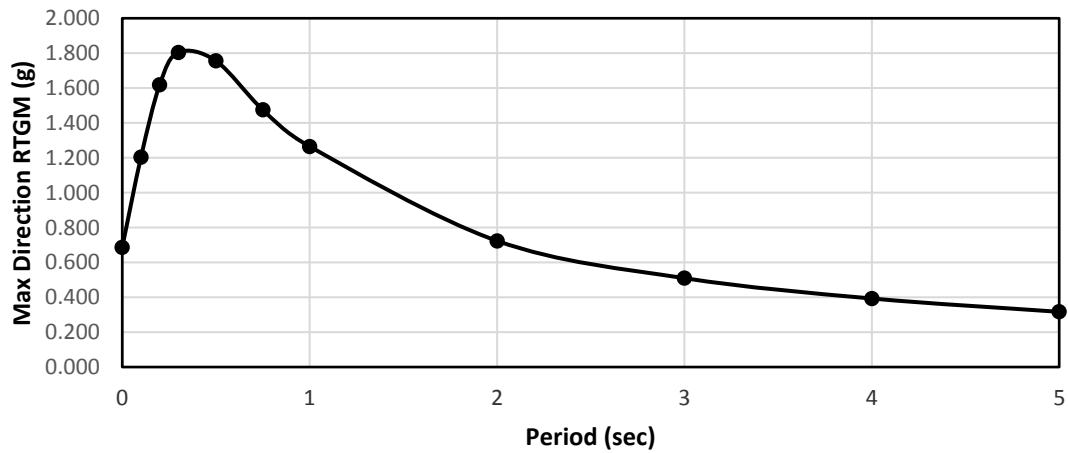
**FIGURE 1**  
**Site Specific Design Response Spectra**  
**21-7337 Shiloh West Medical**



**TABLE 2**  
**Probabilistic Response Spectrum ASCE 7-16 Method 2**  
**21-7337 Shiloh West Medical**

Period (g)	UHGM (g)	RTGM (g)	Max Dir Scale factor	Max Dir RTGM (g)
0	0.648	0.624	1.1	0.686
0.1	1.108	1.094	1.1	1.203
0.2	1.497	1.472	1.1	1.619
0.3	1.651	1.604	1.125	1.805
0.5	1.578	1.494	1.175	1.755
0.75	1.276	1.192	1.2375	1.475
1	1.054	0.973	1.3	1.265
2	0.594	0.536	1.35	0.724
3	0.409	0.364	1.4	0.510
4	0.306	0.271	1.45	0.393
5	0.239	0.211	1.5	0.317

**Probabilistic Response Spectra per ASCE 7-16**

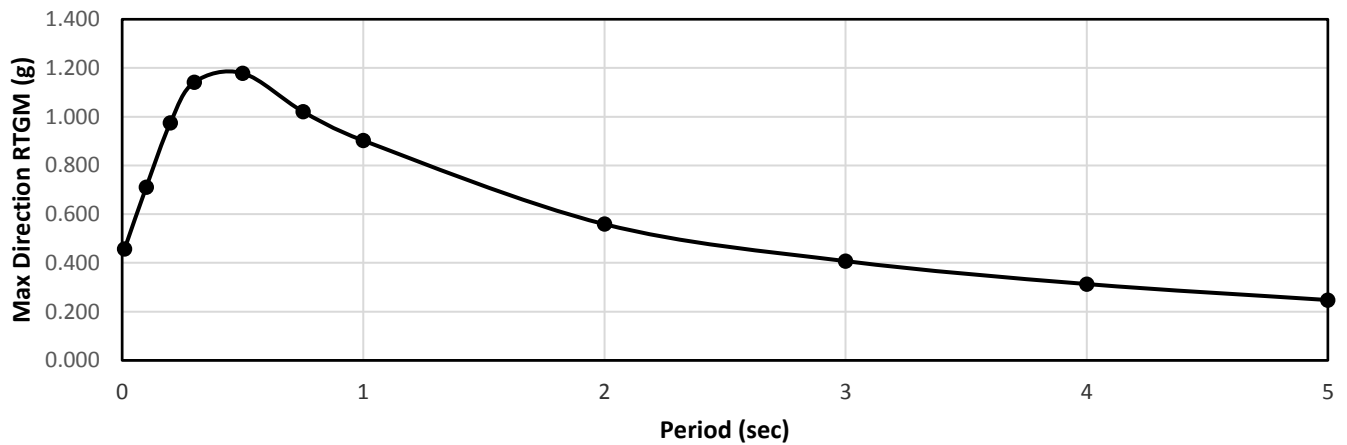


**TABLE 3**

**Deterministic Response Spectrum ASCE 7-16 - San Andreas (San Bernardino N)  
21-7337 Shiloh West Medical**

Period (g)	84th-Percentile Spectral Acceleration (g)	Max Dir Scale factor	Max Dir Deterministic SA (g)
0.01	0.415	1.1	0.457
0.1	0.646	1.1	0.711
0.2	0.886	1.1	0.975
0.3	1.015	1.125	1.142
0.5	1.003	1.175	1.179
0.75	0.825	1.2375	1.021
1	0.694	1.3	0.902
2	0.414	1.35	0.559
3	0.291	1.4	0.407
4	0.216	1.45	0.313
5	0.165	1.5	0.248

**Deterministic Response Spectra per ASCE 7-16**



PACIFIC EARTHQUAKE ENGINEERING RESEARCH CENTER



WEIGHTED AVERAGE OF 2014 NGA WEST-2 GMPEs  
Last updated: 04 14 15

San Andreas (San Bernardino N) fault

by Emel Seyhan, PhD, PEER & UCLA -- email: emel.seyhan@gmail.com, peer\_center@berkeley.edu

This excel file will be updated as necessary on the PEER website to fix any typos or other errors. Please check the website frequently for new versions at: <http://peer.berkeley.edu/ngawest2/databases/>

Legend	Pre-defined option	Main input variable	Calculated variable	Input var. flag	Internal variable
--------	--------------------	---------------------	---------------------	-----------------	-------------------

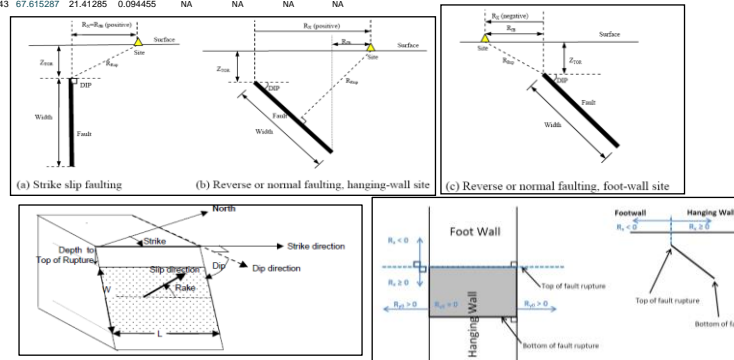
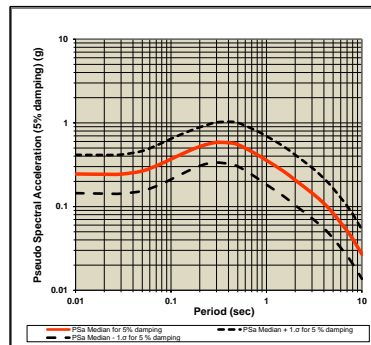
GMPE averaging	Geometric				
GMPEs	ASK14	BSSA14	CB14	CY14	I14
Weight	0.25	0.25	0.25	0.25	0
# of std. dev.	1				
Damping ratio (%)	5				

<b>ASK14</b>	Abrahamson & Silva & Kamal 2014 NGA West-2 Model
<b>BSSA14</b>	Boore & Stewart & Seyhan & Atkinson 2014 NGA West-2 Model
<b>CB14</b>	Campbell & Bozorgnia 2014 NGA West-2 Model
<b>CY14</b>	Chiou & Youngs 2014 NGA West-2 Model
<b>I14</b>	Idriss 2014 NGA West-2 Model

Modification factors are calculated in Sheet DSF

RotD50 Horizontal Component of PGA, PGV and IMs

Input variables	Errors and warnings	Baseline: 5% Damping						User defined: 5% Damping					
		T (s)	PSa Median for 5% damping	PSa Median + 1.0 for 5% damping	PSa Median - 1.0 for 5% damping	S <sub>a</sub> Median for 5% damping	PSa Median for 5% damping	PSa Median + 1.0 for 5% damping	PSa Median - 1.0 for 5% damping	S <sub>a</sub> Median for 5% damping			
M <sub>w</sub>	7.99	0.01	0.2450841	0.4150918	0.144706	0.000608	0.245084	0.4150918	0.144706	0.000608			
R <sub>rup</sub> (km)	25.63	0.05	0.2662535	0.4610385	0.153764	0.016523	0.266254	0.4610385	0.153764	0.016523			
R <sub>jb</sub> (km)	25.63	0.15	0.4554409	0.782871	0.264956	0.254379	0.456807	0.782871	0.254379				
R <sub>z</sub> (km)	25.63	0.2	0.5194956	0.8842188	0.365214	0.155832	0.521054	0.868714	0.306129				
Ry0 (km)	999	0.3	0.5832032	1.0132972	0.335663	0.130253	0.58437	1.0153238	0.336334				
V <sub>330</sub> (m/sec)	260	0.4	0.57733	1.0295552	0.323742	0.2293034	0.578485	1.0316143	0.324389				
U (BSSA13)	1: Unspecified fault mech.	0.5	0.5503516	1.0027043	0.30207	0.3415439	0.550902	1.003707	0.302372				
F <sub>rv</sub>	1: reverse fault	0.75	0.4352151	0.8256252	0.229417	0.607705	0.435215	0.8256252	0.229417				
F <sub>nr</sub>	1: normal fault	1	0.356387	0.6941533	0.182974	0.3456841	0.356387	0.6941533	0.182974				
F <sub>hw</sub>	1: hanging wall side	1.5	0.2654701	0.5263771	0.133886	0.1482738	0.265736	0.5269035	0.13402				
Dip (deg)	90	2	0.2076665	0.415138	0.103882	0.206022	0.207459	0.4147228	0.103778				
Z <sub>top</sub> (km)	999	3	0.1452813	0.2916202	0.072377	0.3245776	0.145281	0.2916202	0.072377				
Z <sub>1/2</sub> (km)	8.32	4	0.1092637	0.2171902	0.054971	0.393727	0.109154	0.216963	0.054918				
Z <sub>1/3</sub> (km)	999	5	0.0830898	0.1655004	0.041715	0.515649	0.082924	0.1661694	0.041632				
W (km)	12.8	7.5	0.046202	0.091777	0.023259	64.51332	0.045971	0.0913171	0.023143				
V330flag	measured	10	0.0270943	0.0533163	0.013789	67.25906	0.026959	0.0530497	0.0137				
F <sub>as</sub>	no	0	0.2438553	0.4127088	0.144086	0.000605	0.245084	0.4150918	0.144706				
Region	California	PGA (g)	38.050443	67.615267	21.41285	0.094455	NA	NA	NA				
Region	California	PGV (cm/s)	-	-	-	-	-	-	-				



Definition of Parameters

Damping ratio = Viscous damping ratio (%) See Sanaz et al. (2012) PEER Report

PSA = Pseudo-absolute acceleration response spectrum (g)

PGA = Peak ground acceleration (g)

PGV = Peak ground velocity (cm/s)

S<sub>a</sub> = Relative displacement response spectrum (cm)

M<sub>w</sub> = Moment magnitude

R<sub>rup</sub> = Closest distance to coseismic rupture (km), used in ASK13, CB13 and CY13. See Figures a, b and c for illustration

R<sub>jb</sub> = Closest distance to surface projection of coseismic rupture (km). See Figures a, b and c for illustration

R<sub>x</sub> = Horizontal distance from top of rupture measured perpendicular to fault strike (km). See Figures a, b and c for illustration

R<sub>y0</sub> = The horizontal distance off the end of the rupture measured parallel to strike (km)

V<sub>330</sub> = The average shear-wave velocity (m/s) over a subsurface depth of 30 m

U = Unspecified-mechanism factor: 1 for unspecified; 0 otherwise

F<sub>rv</sub> = Reverse-faulting factor: 0 for strike slip, normal, normal-oblique; 1 for reverse, reverse-oblique and thrust

F<sub>nr</sub> = Normal-faulting factor: 0 for strike slip, reverse, reverse-oblique, thrust and normal-oblique; 1 for normal

F<sub>hw</sub> = Hanging-wall factor: 1 for site on down-dip side of top of rupture; 0 otherwise

Dip = Average dip of rupture plane (degrees)

Z<sub>top</sub> = Depth to top of coseismic rupture (km)

Z<sub>hyp</sub> = Hypocentral depth from the earthquake

Z<sub>1/2</sub> = Depth to V<sub>s1</sub> = 1 km/sec

Z<sub>1/3</sub> = Depth to V<sub>s1</sub> = 2.5 km/sec

W = Fault rupture width (km)

V<sub>330flag</sub> = 1 for measured; 0 for inferred V<sub>330</sub>

F<sub>as</sub> = 0 for mainshock; 1 for aftershock

Region = Specific regions considered in the models. Click on Region to see codes

ADPP = Directivity term, direct point parameter; uses 0 for median predictions

PGA<sub>g</sub> (g) = Peak ground acceleration on rock (g), this specific cell is updated in the cell for BSSA14 and CB14, for others it is taken account for in the macros

Z<sub>bot</sub> (km) = The depth to the bottom of the seismic crust

Z<sub>bot</sub> (km) = The depth to the bottom of the rupture plane

SS = 1 for strike slip, automatically updated in the cell

Input variables with defaults (if entered 999 as input):

DEFAULTS	USER defined	Red colored value: The value is used in the code when input is unknown				
		ASK14	BSSA14	CB14	CY14	I14
W (km)	12.80					
Z <sub>1/2</sub> (km)	999.000	0.475				0.485
Z <sub>1/3</sub> (km)	0.000	0.000				
Z <sub>1/2</sub> (V <sub>330</sub> =1100) (km)	999.000			0.338		
Z <sub>1/3</sub> (V <sub>330</sub> ) (km)	999.000			2.070		
Z <sub>top</sub> (km)	8.32			10.227		
Z <sub>bot</sub> (km)	999.00			0.000	0.000	
Z <sub>hyp</sub> (km)	-			15.000		

ACKNOWLEDGEMENTS

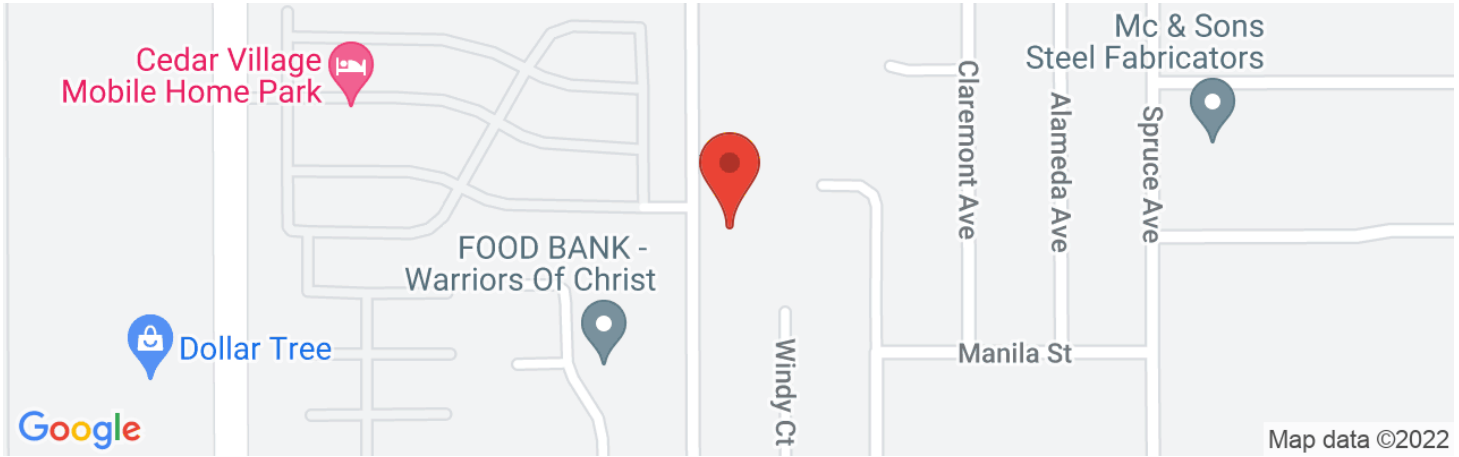
Nick Gregor, Bechtel  
Silvia Mazzoni, Consultant

All NGA West-2 participants are acknowledged for their constructive comments and feedback.



# Shiloh West Medical

Latitude, Longitude: 34.0578, -117.3917



<b>Date</b>	3/11/2022, 3:25:13 PM
<b>Design Code Reference Document</b>	ASCE7-16
<b>Risk Category</b>	III
<b>Site Class</b>	D - Stiff Soil

Type	Value	Description
S <sub>S</sub>	1.588	MCE <sub>R</sub> ground motion. (for 0.2 second period)
S <sub>1</sub>	0.617	MCE <sub>R</sub> ground motion. (for 1.0s period)
S <sub>MS</sub>	1.588	Site-modified spectral acceleration value
S <sub>M1</sub>	null -See Section 11.4.8	Site-modified spectral acceleration value
S <sub>DS</sub>	1.058	Numeric seismic design value at 0.2 second SA
S <sub>D1</sub>	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 <sub>a</sub>	1	Site amplification factor at 0.2 second
F <sub>v</sub>	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.673	MCE <sub>G</sub> peak ground acceleration
F <sub>PGA</sub>	1.1	Site amplification factor at PGA
PGA <sub>M</sub>	0.741	Site modified peak ground acceleration
T <sub>L</sub>	8	Long-period transition period in seconds
SsRT	1.98	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.136	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.588	Factored deterministic acceleration value. (0.2 second)
S1RT	0.757	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.84	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.617	Factored deterministic acceleration value. (1.0 second)
PGAd	0.673	Factored deterministic acceleration value. (Peak Ground Acceleration)
C <sub>RS</sub>	0.927	Mapped value of the risk coefficient at short periods
C <sub>R1</sub>	0.902	Mapped value of the risk coefficient at a period of 1 s



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# Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the [U.S. Seismic Design Maps web tools](#) (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

## ^ Input

### Edition

Dynamic: Conterminous U.S. 2014 (upd... ▼

### Spectral Period

Peak Ground Acceleration ▼

### Latitude

Decimal degrees

34.5078

### Time Horizon

Return period in years

2475

### Longitude

Decimal degrees, negative values for western longitudes

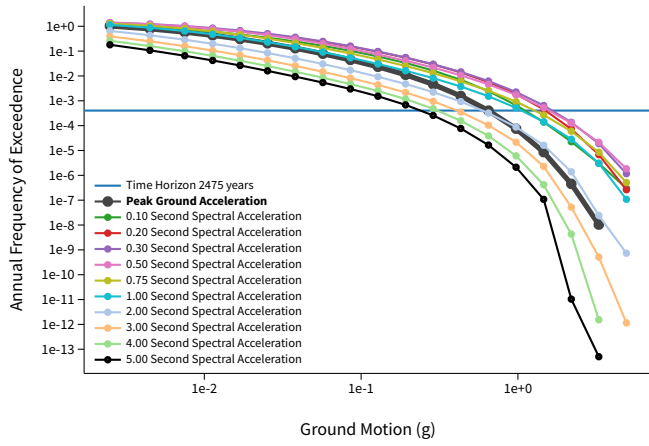
-117.3917

### Site Class

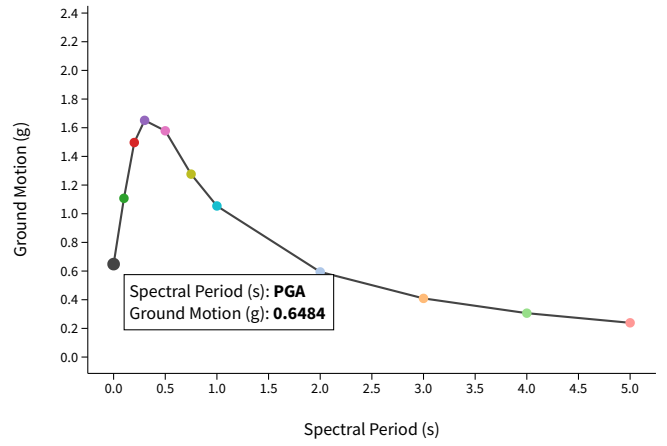
259 m/s (Site class D) ▼

# ^ Hazard Curve

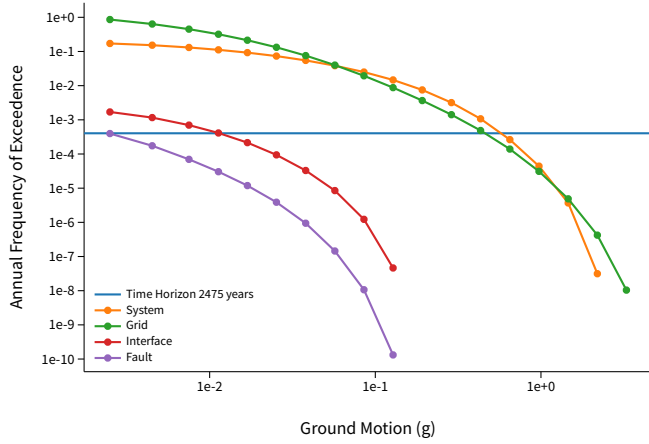
Hazard Curves



Uniform Hazard Response Spectrum



Component Curves for Peak Ground Acceleration

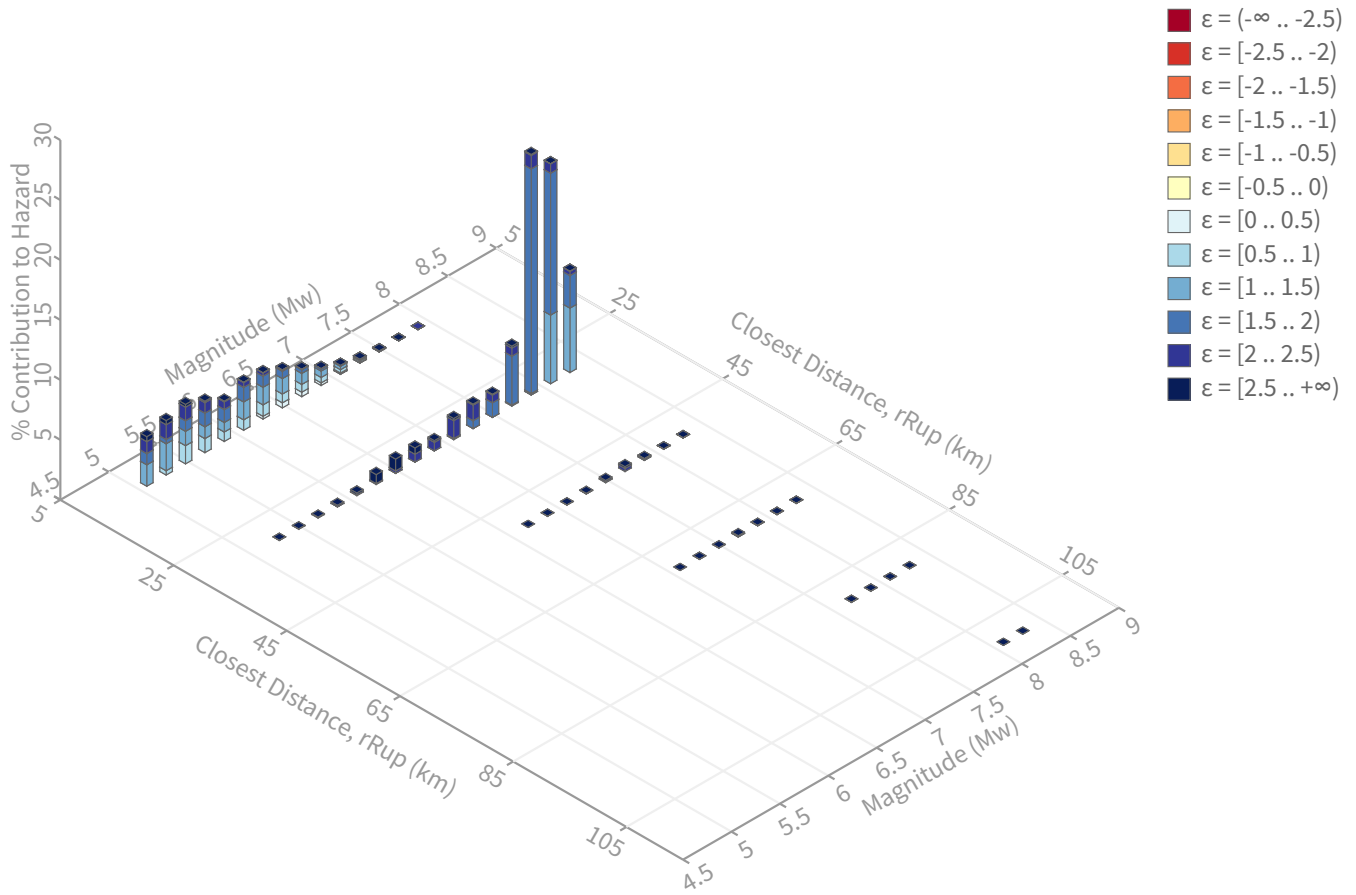


[View Raw Data](#)

# Deaggregation

Component

Total



## Summary statistics for, Deaggregation: Total

### Deaggregation targets

---

**Return period:** 2475 yrs  
**Exceedance rate:** 0.0004040404 yr<sup>-1</sup>  
**PGA ground motion:** 0.64839141 g

### Recovered targets

---

**Return period:** 3165.3233 yrs  
**Exceedance rate:** 0.00031592349 yr<sup>-1</sup>

### Totals

---

**Binned:** 100 %  
**Residual:** 0 %  
**Trace:** 0.1 %

### Mean (over all sources)

---

**m:** 7.12  
**r:** 19.68 km  
**ε0:** 1.64 σ

### Mode (largest m-r bin)

---

**m:** 7.9  
**r:** 26.17 km  
**ε0:** 1.73 σ  
**Contribution:** 20.04 %

### Mode (largest m-r-ε0 bin)

---

**m:** 7.9  
**r:** 25.98 km  
**ε0:** 1.69 σ  
**Contribution:** 18.73 %

### Discretization

---

**r:** min = 0.0, max = 1000.0, Δ = 20.0 km  
**m:** min = 4.4, max = 9.4, Δ = 0.2  
**ε:** min = -3.0, max = 3.0, Δ = 0.5 σ

### Epsilon keys

---

**ε0:** [-∞ .. -2.5)  
**ε1:** [-2.5 .. -2.0)  
**ε2:** [-2.0 .. -1.5)  
**ε3:** [-1.5 .. -1.0)  
**ε4:** [-1.0 .. -0.5)  
**ε5:** [-0.5 .. 0.0)  
**ε6:** [0.0 .. 0.5)  
**ε7:** [0.5 .. 1.0)  
**ε8:** [1.0 .. 1.5)  
**ε9:** [1.5 .. 2.0)  
**ε10:** [2.0 .. 2.5)  
**ε11:** [2.5 .. +∞]

## Deaggregation Contributors

Source Set ↴	Source	Type	r	m	$\epsilon_0$	lon	lat	az	%
UC33brAvg_FM32		System							31.10
	San Andreas (San Bernardino N) [0]		25.63	7.98	1.67	117.530°W	34.308°N	209.79	23.64
	San Andreas (Mojave S) [14]		25.72	7.31	2.09	117.549°W	34.316°N	214.17	1.38
	Cucamonga [0]		28.07	7.84	1.74	117.445°W	34.192°N	187.88	1.10
UC33brAvg_FM31		System							30.98
	San Andreas (San Bernardino N) [0]		25.63	7.99	1.66	117.530°W	34.308°N	209.79	23.53
	San Andreas (Mojave S) [14]		25.72	7.30	2.10	117.549°W	34.316°N	214.17	1.40
	Cucamonga [0]		28.07	7.83	1.75	117.445°W	34.192°N	187.88	1.02
UC33brAvg_FM31 (opt)		Grid							18.97
	PointSourceFinite: -117.392, 34.521		5.14	5.71	1.05	117.392°W	34.521°N	0.00	4.22
	PointSourceFinite: -117.392, 34.521		5.14	5.71	1.05	117.392°W	34.521°N	0.00	4.22
	PointSourceFinite: -117.392, 34.584		8.89	5.96	1.52	117.392°W	34.584°N	0.00	1.31
	PointSourceFinite: -117.392, 34.584		8.89	5.96	1.52	117.392°W	34.584°N	0.00	1.31
UC33brAvg_FM32 (opt)		Grid							18.95
	PointSourceFinite: -117.392, 34.521		5.14	5.71	1.05	117.392°W	34.521°N	0.00	4.22
	PointSourceFinite: -117.392, 34.521		5.14	5.71	1.05	117.392°W	34.521°N	0.00	4.22
	PointSourceFinite: -117.392, 34.584		8.89	5.96	1.52	117.392°W	34.584°N	0.00	1.31
	PointSourceFinite: -117.392, 34.584		8.89	5.96	1.52	117.392°W	34.584°N	0.00	1.31

**APPENDIX E  
STANDARD GRADING GUIDELINES**

## **STANDARD GRADING SPECIFICATIONS**

These specifications present the usual and minimum requirements for grading operations performed under the observation and testing of TGR Geotechnical, Inc.

No deviation from these specifications will be allowed, except where specifically superseded in the Preliminary Geotechnical Investigation report, or in other written communication signed by the Soils Engineer or Engineering Geologist.

### **1.0 GENERAL**

- The Soils Engineer and Engineering Geologist are the Owner's or Builder's representatives on the project. For the purpose of these specifications, observation and testing by the Soils Engineer includes that observation and testing performed by any person or persons employed by, and responsible to, the licensed Geotechnical Engineer or Geologist signing the grading report.
- All clearing, site preparation or earthwork performed on the project shall be conducted by the Contractor under the observation of the Geotechnical Engineer.
- It is the Contractor's responsibility to prepare the ground surface to receive the fills to the satisfaction of the Geotechnical Engineer and to place, spread, mix, water and compact the fill in accordance with the specifications of the Geotechnical Engineer. The Contractor shall also remove all material considered unsatisfactory by the Geotechnical Engineer.
- It is also the Contractor's responsibility to have suitable and sufficient compaction equipment on the job site to handle the amount of fill being placed. If necessary, excavation equipment will be shut down to permit completion of Compaction. Sufficient watering apparatus will also be provided by the Contractor, with due consideration for the fill material, rate of placement and time of year.
- A final report will be issued by the Geotechnical Engineer and Engineering Geologist attesting to the Contractor's conformance with these specifications.



**2.0 SITE PREPARATION**

- All vegetation and deleterious material such as rubbish shall be disposed of off-site. The removal must be concluded prior to placing fill.
- The Civil Engineer shall locate all houses, sheds, sewage disposal systems, large trees or structures on the site, or on the grading plan to the best of his knowledge prior to preparing the ground surface.
- Soil, alluvium or rock materials determined by the Geotechnical Engineer as being unsuitable for placement in compacted fills shall be removed and wasted from the site. Any material incorporated as part of a compacted fill must be approved by the Geotechnical Engineer.
- After the ground surface to receive fill has been cleared, it shall be scarified, disced or bladed by the Contractor until it is uniform and free from ruts, hollows, hummocks or other uneven features which may prevent uniform compaction.

The scarified ground surface shall then be brought to optimum moisture content, mixed as required, and compacted as specified. If the scarified zone is greater than twelve inches in depth, the excess shall be removed and placed in lifts restricted to six inches. Prior to placing fill, the ground surface to receive fill shall be inspected, tested and approved by the Geotechnical Engineer.

- Any underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipe lines or others not located prior to grading are to be removed or treated in a manner prescribed by the Geotechnical Engineer.

**3.0 COMPACTED FILLS**

- Any material imported or excavated on the property may be utilized in the fill, provided each material has been determined to be suitable by the Geotechnical Engineer. Roots, tree branches and other matter missed during clearing shall be removed from the fill as directed by the Geotechnical Engineer.
- Rock fragments less than six inches in diameter may be utilized in the fill, provided:

- They are not placed in concentrated pockets.
  - There is a sufficient percentage of fine-grained material to surround the rocks.
  - The distribution of the rocks is observed by the Geotechnical Engineer.
- Rocks greater than six inches in diameter shall be taken off-site, or placed in accordance with the recommendations of the Geotechnical Engineer in areas designated as suitable for rock disposal. Details for rock disposal such as location, moisture control, percentage of the rock placed, etc., will be referred to in the “Conclusions and Recommendations” section of the Geotechnical Report, if applicable.

If rocks greater than six inches in diameter were not anticipated in the Preliminary Geotechnical report, rock disposal recommendations may not have been made in the “Conclusions and Recommendations” section. In this case, the Contractor shall notify the Geotechnical Engineer if rocks greater than six inches in diameter are encountered. The Geotechnical Engineer will then prepare a rock disposal recommendation or request that such rocks be taken off-site.

- Material that is spongy, subject to decay, or otherwise considered unsuitable shall not be used in the compacted fill.
- Representative samples of materials to be utilized as compacted fill shall be analyzed in the laboratory by the Geotechnical Engineer to determine their physical properties. If any material other than that previously tested is encountered during grading, the appropriate analysis of this material shall be conducted by the Geotechnical Engineer as soon as possible.
- Material used in the compacting process shall be evenly spread, watered or dried, processed and compacted in thin lifts not to exceed six inches in thickness to obtain a uniformly dense layer. The fill shall be placed and compacted on a horizontal plane, unless otherwise approved by the Geotechnical Engineer.

- If the moisture content or relative compaction varies from that required by the Geotechnical Engineer, the Contractor shall rework the fill until it is approved by the Geotechnical Engineer.
- Each layer shall be compacted to 90 percent of the maximum dry density in compliance with the testing method specified by the controlling governmental agency; (in general, ASTM D1557 will be used.)

If compaction to a lesser percentage is authorized by the controlling governmental agency because of a specific land use or expansive soil conditions, the area to receive fill compacted to less than 90 percent shall either be delineated on the grading plan or appropriate reference made to the area in the grading report.

- All fill shall be keyed and benched through all topsoil, colluvium, alluvium or creep material, into sound bedrock or firm material where the slope receiving fill exceeds a ratio of five horizontal to one vertical, in accordance with the recommendations of the Geotechnical Engineer.
- The key for side hill fills shall be a minimum of 15 feet within bedrock or firm materials, unless otherwise specified in the Preliminary report. (See details)
- Drainage terraces and subdrainage devices shall be constructed in compliance with the ordinances of the controlling governmental agency, or with the recommendation of the Geotechnical Engineer and Engineer Geologist.
- The Contractor will be required to obtain a minimum relative compaction of 90 percent out to the finish slope face of fill slopes, buttresses and stabilization fills. This may be achieved by either overbuilding the slope and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment, or by any other procedure which produces the required compaction.

The Contractor shall prepare a written detailed description of the method or methods he will employ to obtain the required slope compaction. Such documents shall be submitted to the Geotechnical Engineer for review and comments prior to the start of grading.

If a method other than overbuilding and cutting back to the compacted core is to be employed, slope tests will be made by the Geotechnical Engineer during construction of the slopes to determine if the required compaction is being achieved. Where failing tests occur or other field problems arise, the contractor will be notified by the Geotechnical Engineer.

If the method of achieving the required slope compaction selected by the Contractor fails to produce the necessary results, the Contractor shall rework or rebuild such slopes until the required degree of compaction is obtained, at no additional cost to the Owner or Geotechnical Engineer.

- All fill slopes should be planted or protected from erosion by methods specified in the preliminary report or by means approved by the governing authorities.
- Fill-over-cut slopes shall be properly keyed through topsoil, colluvium or creep material into rock or firm materials; and the transition shall be stripped of all soil prior to placing fill. (See detail)

#### **4.0 CUT SLOPES**

- The Engineering Geologist shall inspect all cut slopes excavated in rock, lithified or formation material at vertical intervals not exceeding ten feet.
- If any conditions not anticipated in the preliminary report such as perched water, seepage, lenticular or confined strata of a potentially adverse nature, unfavorably inclined bedding, joints or fault planes are encountered during grading, these

conditions shall be analyzed by the Engineering Geologist and Geotechnical Engineer; and recommendations shall be made to treat these problems.

- Cut slopes that face in the same direction as the prevailing drainage shall be protected from slope wash by a non-erosive interceptor swale placed at the top of the slope.
- Unless otherwise specified in the soils and geological report, no cut slopes shall be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies.
- Drainage terraces shall be constructed in compliance with the ordinances of controlling governmental agencies, or with the recommendations of the Geotechnical Engineer or Engineering Geologist.

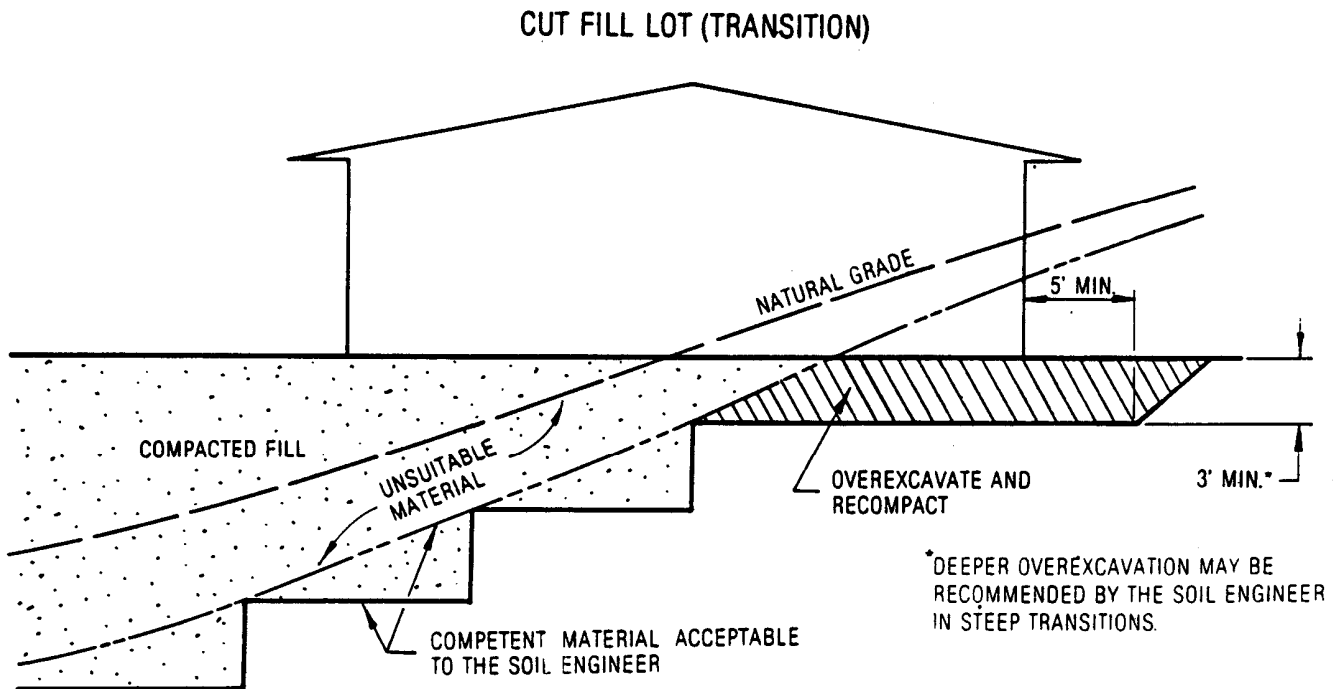
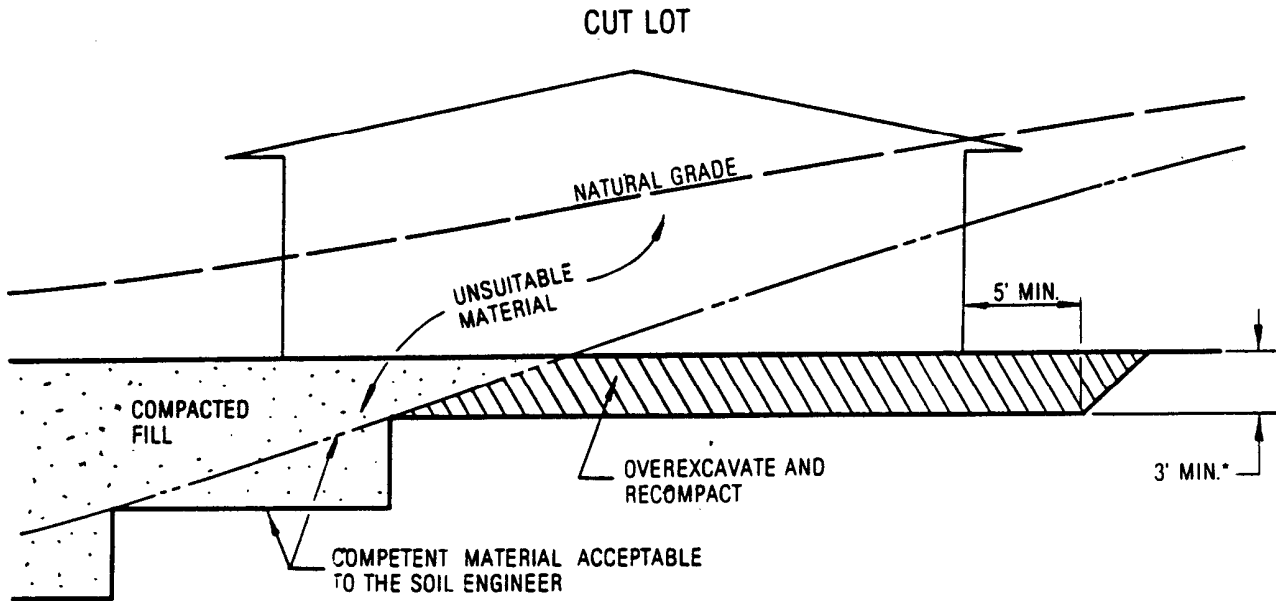
## **5.0 GRADING CONTROL**

- Inspection of the fill placement shall be provided by the Geotechnical Engineer during the progress of grading.
- In general, density tests should be made at intervals not exceeding two feet of fill height or every 500 cubic yards of fill placed. This criteria will vary depending on soil conditions and the size of the job. In any event, an adequate number of field density tests shall be made to verify that the required compaction of being achieved.
- Density tests should be made on the surface material to receive fill as required by the Geotechnical Engineer.
- All cleanout, processed ground to receive fill, key excavations, subdrains and rock disposal must be inspected and approved by the Geotechnical Engineer (and often by the governing authorities) prior to placing any fill. It shall be the Contractor's responsibility to notify the Geotechnical Engineer and governing authorities when such areas are ready for inspection.

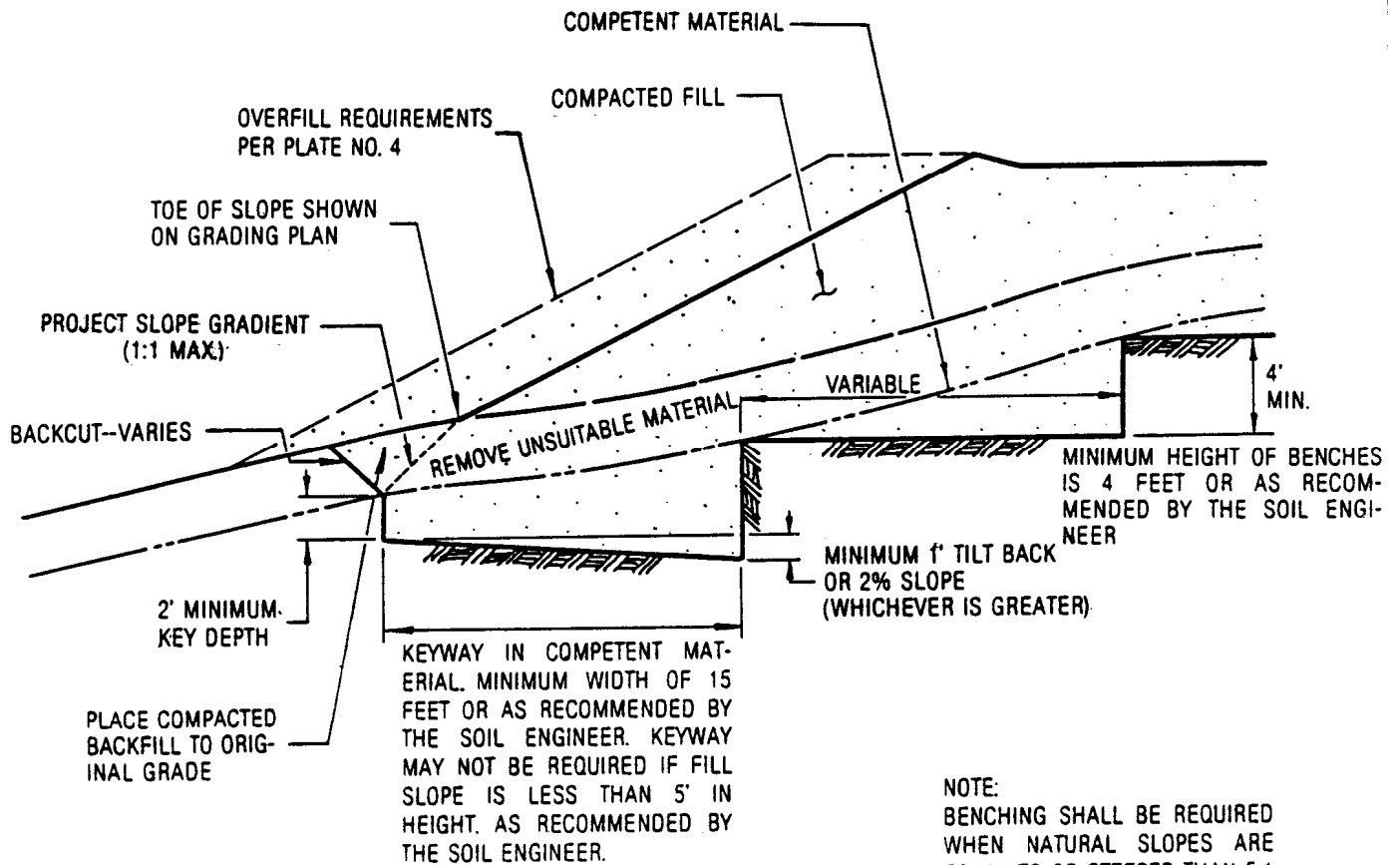
**6.0 CONSTRUCTION CONSIDERATIONS**

- Erosion control measures, when necessary, shall be provided by the Contractor during grading and prior to the completion and construction of permanent drainage controls.
- Upon completion of grading and termination of observations by the Geotechnical Engineer, no further filling or excavating, including that necessary for footings, foundations, large tree wells, retaining walls, or other features shall be performed without the approval of the Geotechnical Engineer or Engineering Geologist.
- Care shall be taken by the Contractor during final grading to preserve any berms, drainage terraces, interceptor swales, or other devices of a permanent nature on or adjacent to the property.

# TYPICAL OVEREXCAVATION OF DAYLIGHT LINE



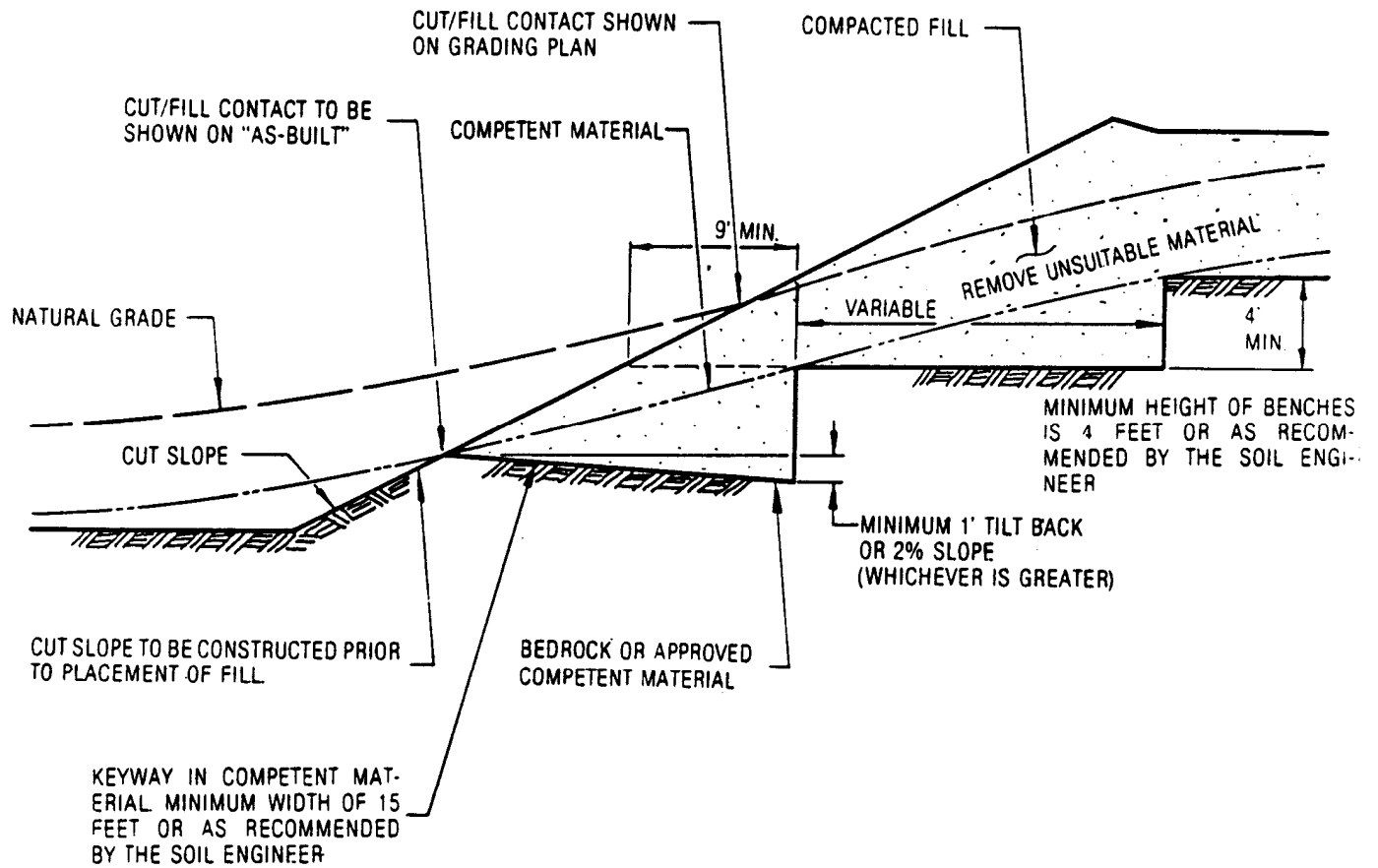
# TYPICAL FILL OVER NATURAL SLOPE



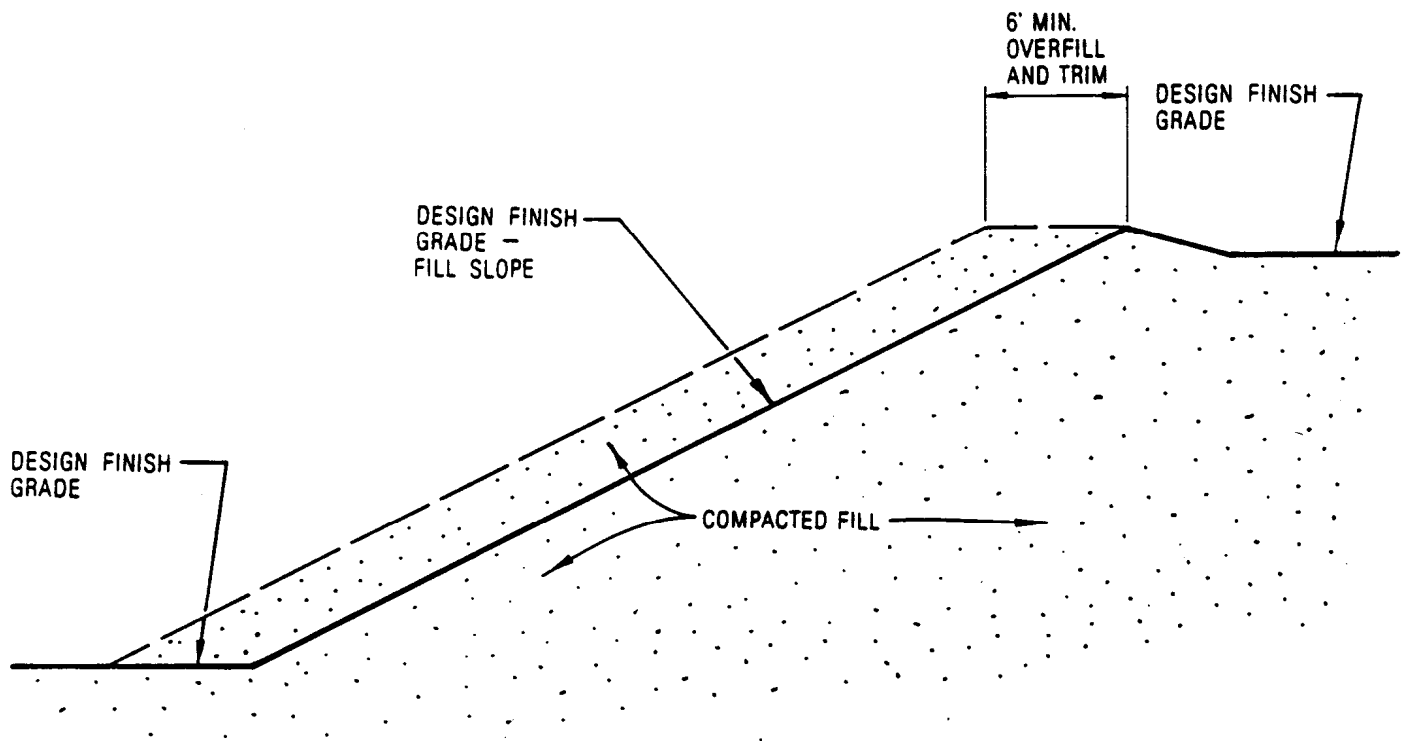
NOTE:  
 BENCHING SHALL BE REQUIRED  
 WHEN NATURAL SLOPES ARE  
 EQUAL TO OR STEEPER THAN 5:1  
 OR WHEN RECOMMENDED BY  
 THE SOIL ENGINEER.



# TYPICAL FILL-OVER-CUT SLOPE



# TYPICAL FILL SLOPE CONSTRUCTION



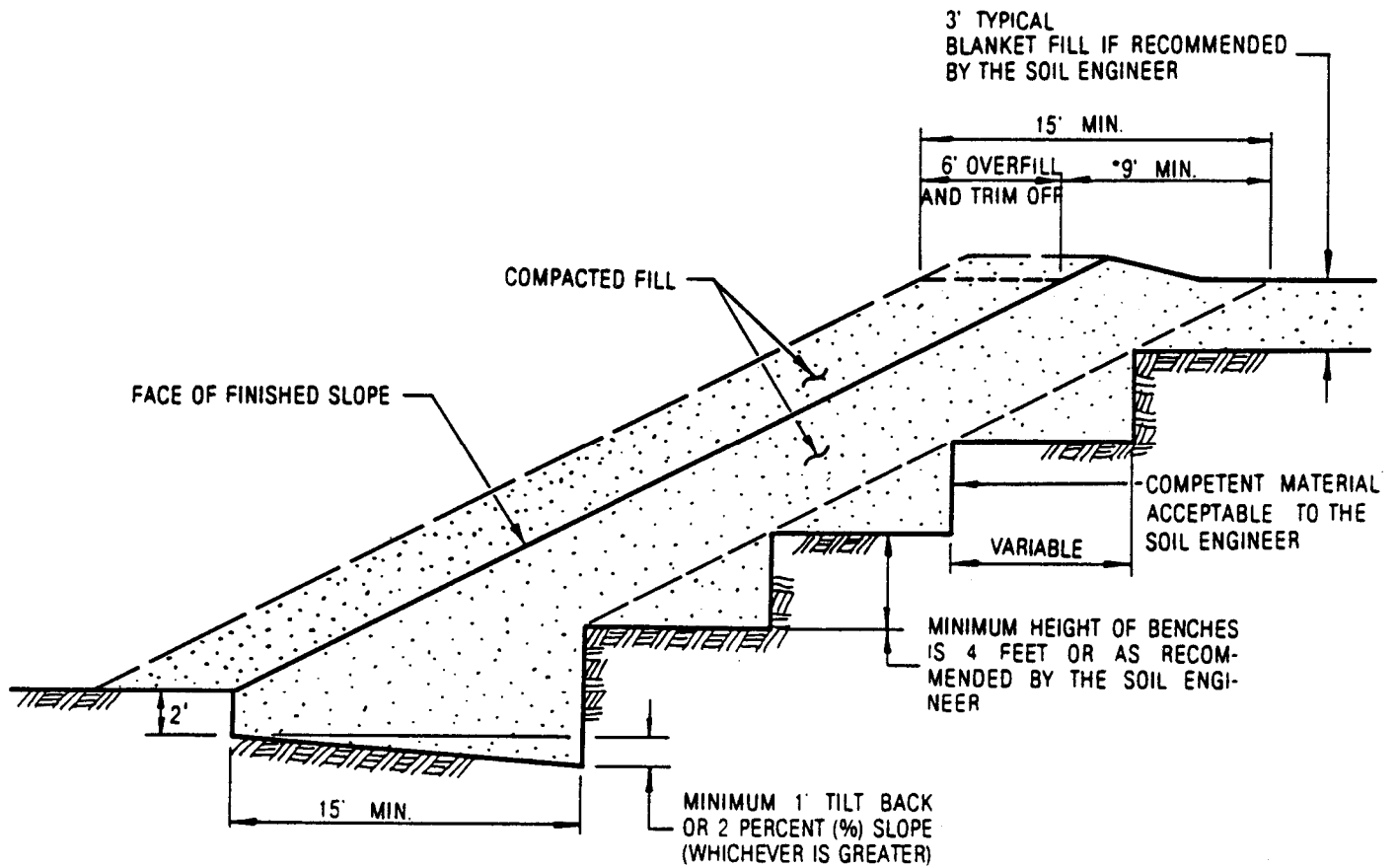
## NOTES:

1. ALL FILL SLOPES, INCLUDING BUTTRESS AND STABILIZATION FILLS, SHALL BE OVERFILLED A MINIMUM OF SIX FEET HORIZONTALLY WITH COMPACTED FILL AND TRIMMED TO THE DESIGN FINISH GRADE.

### EXCEPTIONS:

- A. FILL SLOPE OVER CUT SLOPE.
  - B. FILL SLOPE ADJACENT TO EXISTING IMPROVEMENTS.
2. THE EXCEPTIONS ABOVE WHICH DO NOT HAVE THE 6 FOOT SLOPE OVERFILL AND TRIM SHALL BE COMPACTED AS STATED IN THE PROJECT SPECIFICATIONS.

# TYPICAL STABILIZATION FILL

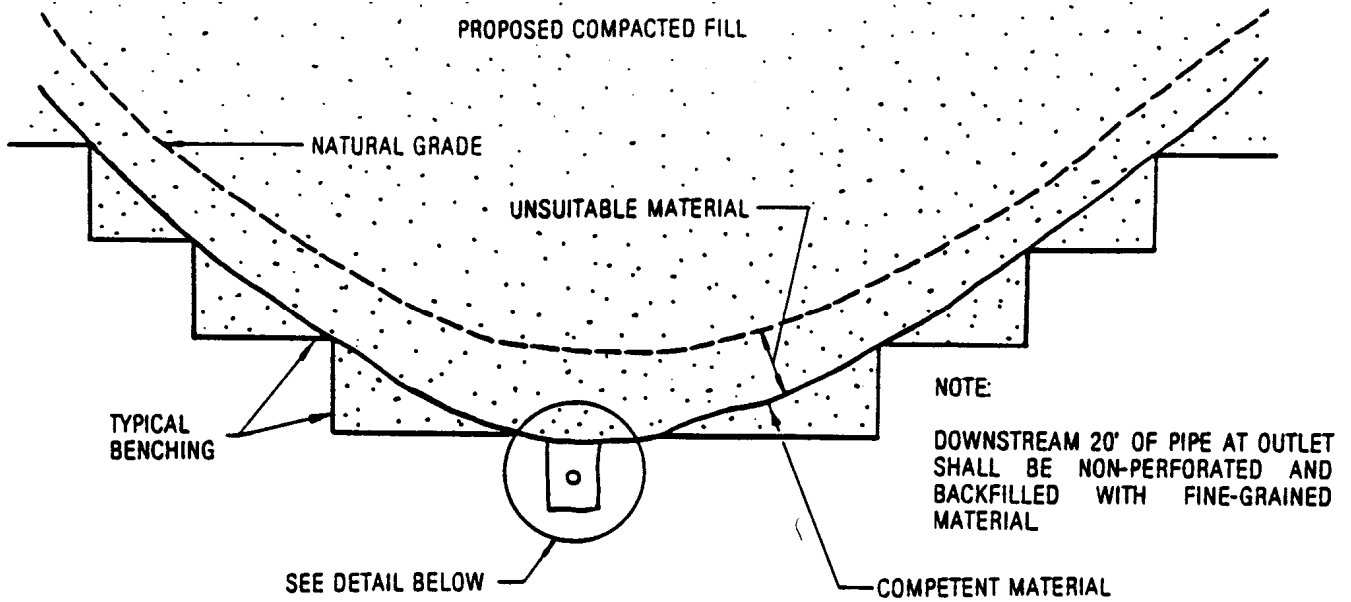


**NOTE:**

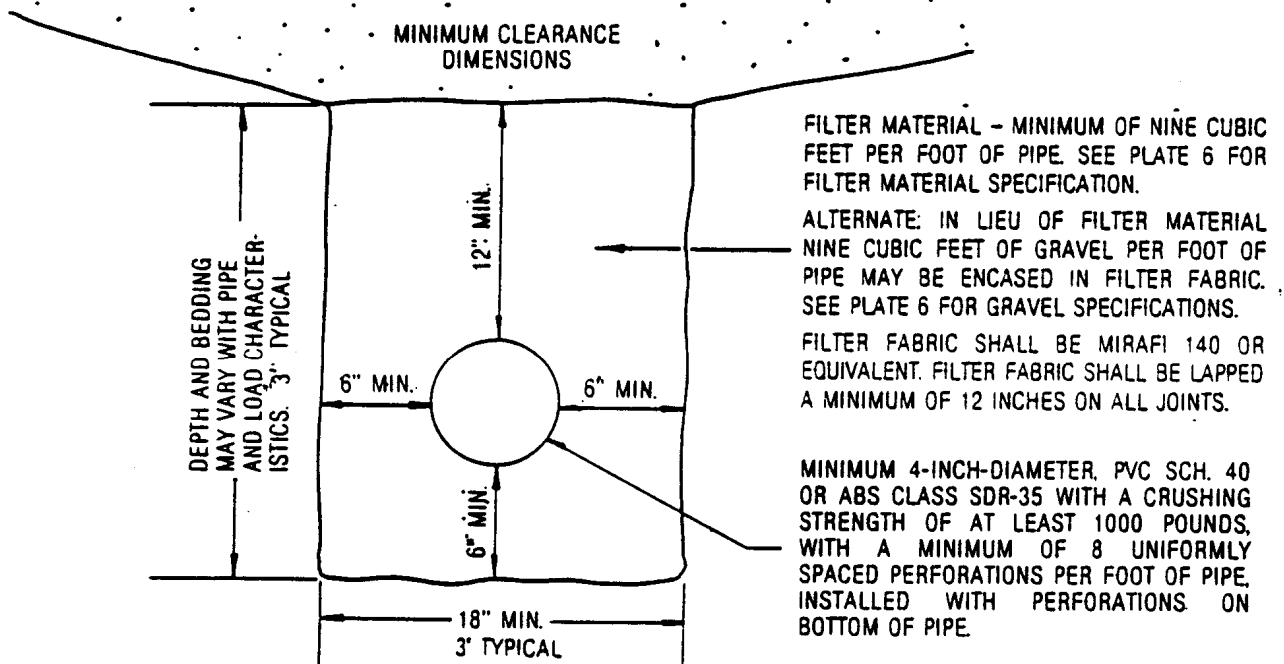
SEE PLATE 6 FOR TYPICAL SUBDRAIN DETAILS FOR STABILIZATION FILLS. IF RECOMMENDED BY THE SOIL ENGINEER.

\*GREATER THAN 9' IF RECOMMENDED BY THE SOIL ENGINEER. 15' WHERE NO 6' OVERFILL

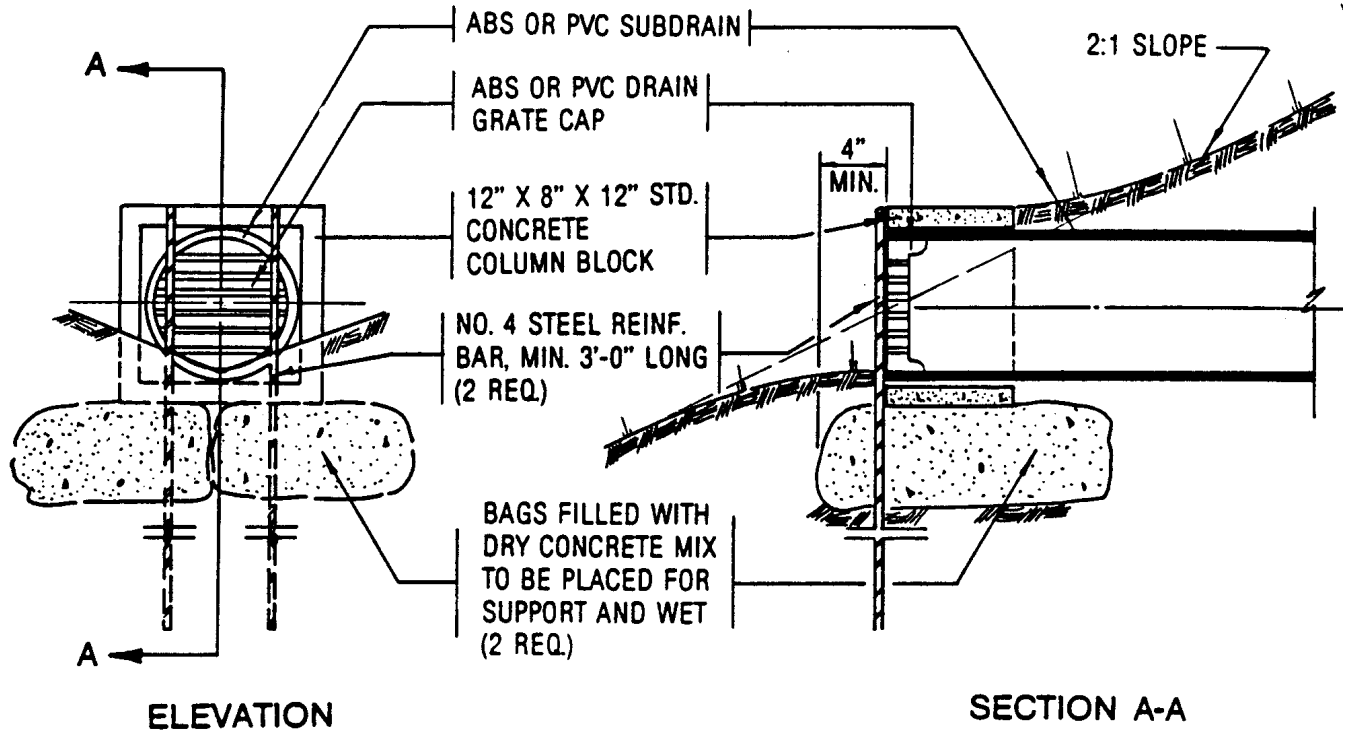
# TYPICAL CANYON SUBDRAIN



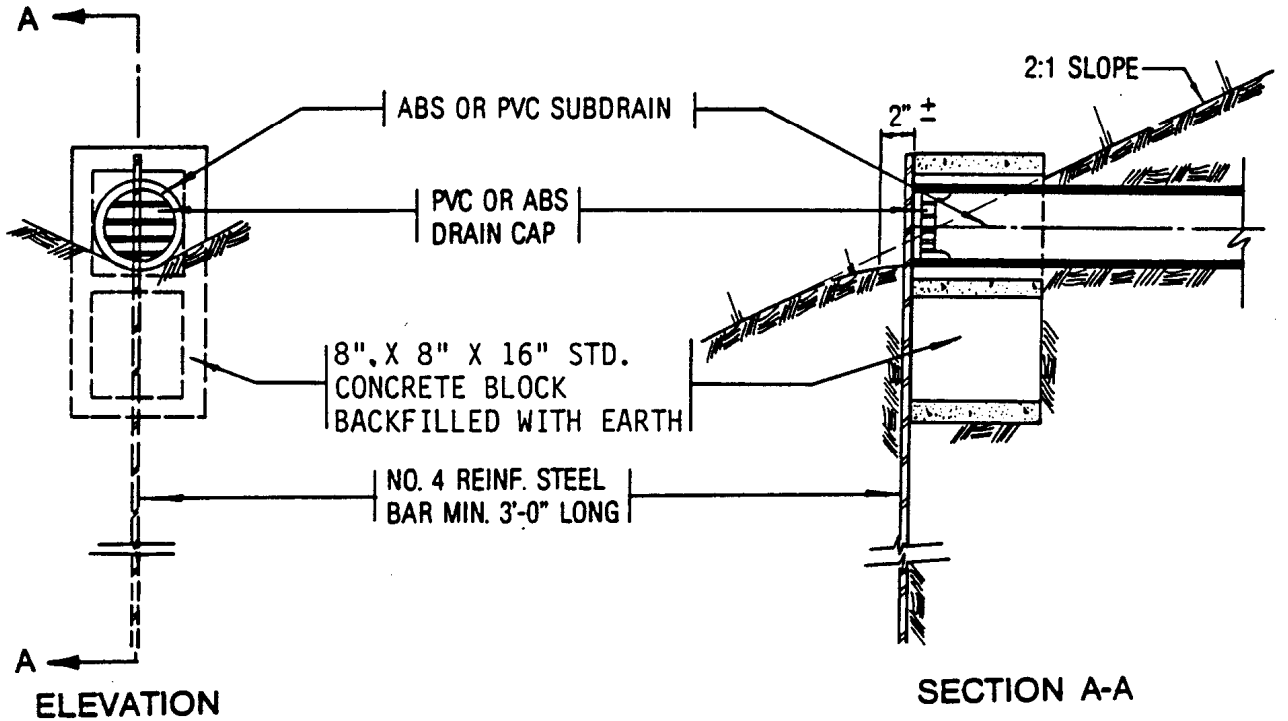
NOTES:  
PIPE SHALL BE A MINIMUM OF 4 INCHES DIAMETER AND RUNS OF 500 FEET OR MORE USE 6-INCH DIAMETER PIPE, OR AS RECOMMENDED BY THE SOIL ENGINEER



# SUBDRAIN OUTLET MARKER

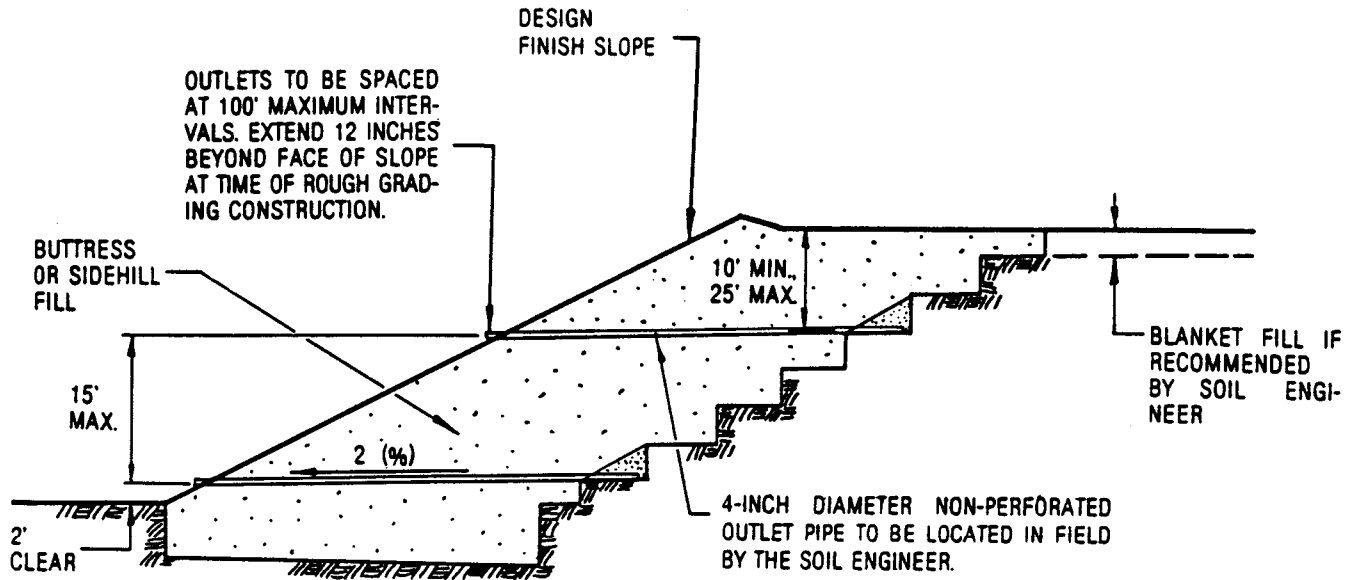


# SUBDRAIN OUTLET MARKER FOR 6" AND 8" PIPES



# SUBDRAIN OUTLET MARKER - 4" PIPE

# TYPICAL STABILIZATION AND BUTTRESS FILL SUBDRAIN



FILTER MATERIAL TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO MA STD. PLAN 323)

SIEVE SIZE	PERCENTAGE 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

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

SIEVE SIZE	MAXIMUM PERCENTAGE PASSING
1 1/2"	100
NO. 4	50
NO. 200	8

SAND EQUIVALENT = MINIMUM OF 50

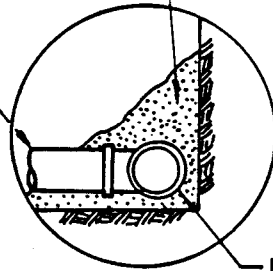
FILTER MATERIAL - MINIMUM OF FIVE CUBIC FEET PER FOOT OF PIPE. SEE ABOVE FOR FILTER MATERIAL SPECIFICATION.

ALTERNATIVE: IN LIEU OF FILTER MATERIAL FIVE CUBIC FEET OF GRAVEL PER FOOT OF PIPE MAY BE ENCASED IN FILTER FABRIC. SEE ABOVE FOR GRAVEL SPECIFICATION.

FILTER FABRIC SHALL BE MIRAFI 140 OR EQUIVALENT. FILTER FABRIC SHALL BE LAPPED A MINIMUM OF 12 INCHES ON ALL JOINTS.

MINIMUM 4-INCH DIAMETER PVC SCH 40 OR ABS CLASS SDR 35 WITH A CRUSHING STRENGTH OF AT LEAST 1,000 POUNDS, WITH A MINIMUM OF 8 UNIFORMLY SPACED PERFORATIONS PER FOOT OF PIPE INSTALLED WITH PERFORATIONS ON BOTTOM OF PIPE. PROVIDE CAP AT UPSTREAM END OF PIPE. SLOPE AT 2 PERCENT TO OUTLET PIPE.

OUTLET PIPE TO BE CONNECTED TO SUBDRAIN PIPE WITH TEE OR ELBOW

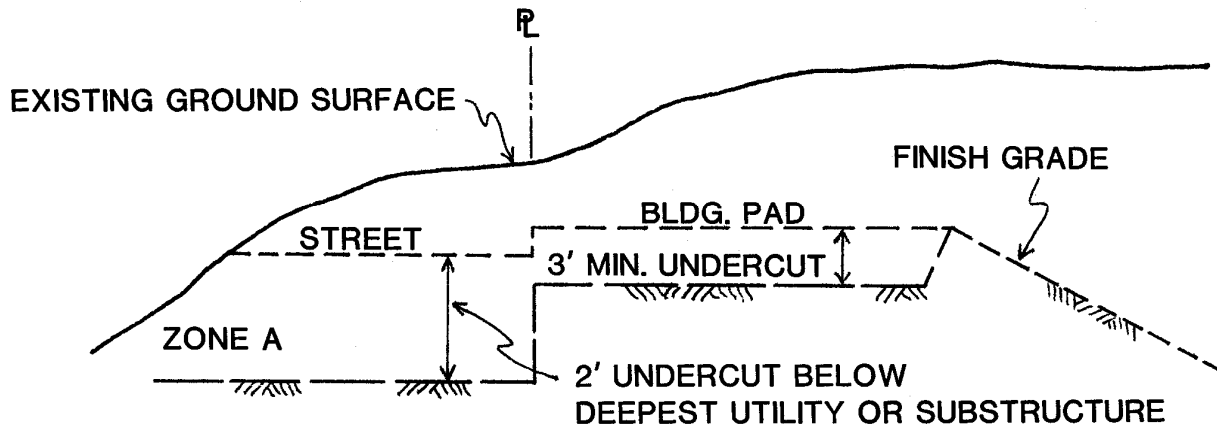


## NOTES:

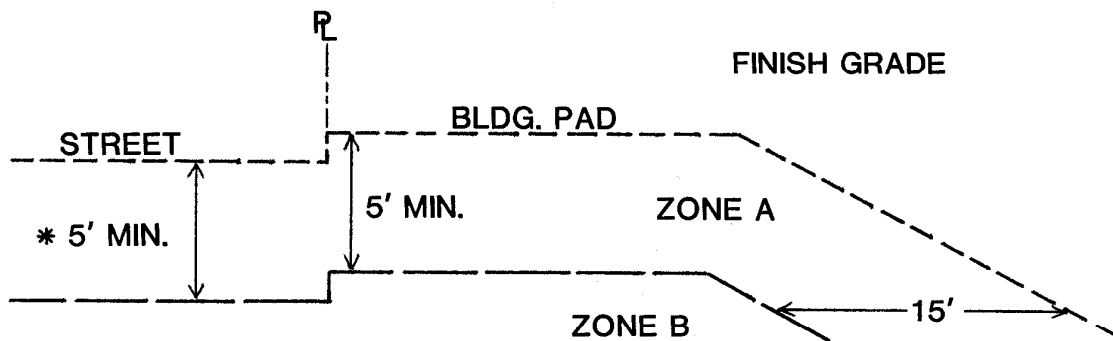
- TRENCH FOR OUTLET PIPES TO BE BACKFILLED WITH ON-SITE SOIL.

# TYPICAL CUT AND FILL GRADING DETAILS

## TYPICAL GRADING WITHIN PROPOSED DEEP BEDROCK CUT AREAS



## TYPICAL GRADING WITHIN PROPOSED FILL AREAS



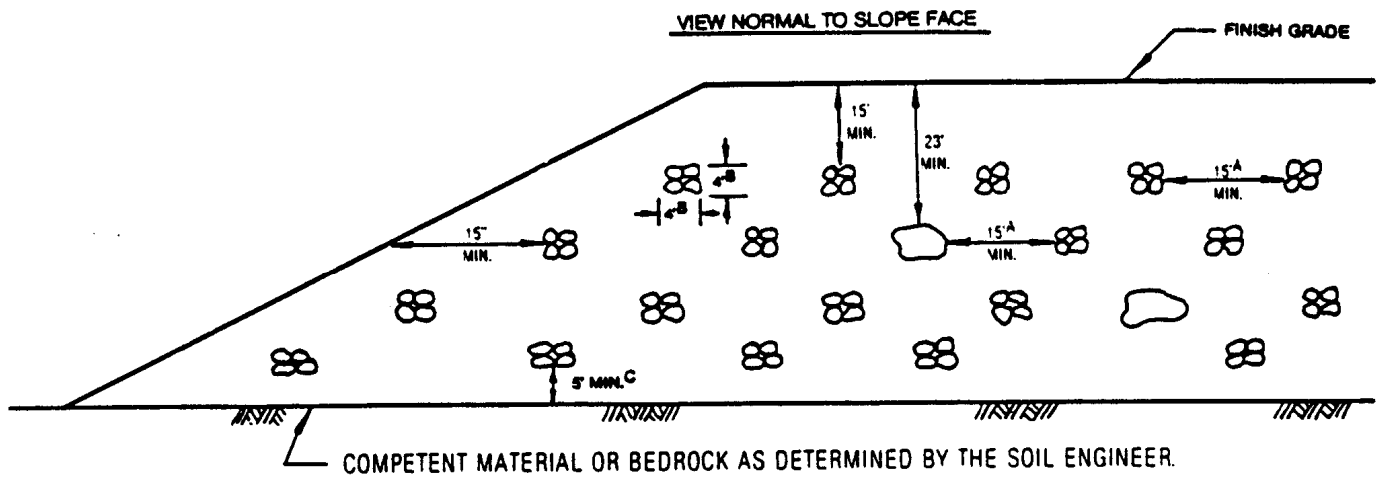
### LEGEND

ZONE A ..... "SOIL" FILL PLACED IN ACCORDANCE WITH THE RECOMMENDATIONS PRESENTED IN SECTION 11.2.3 OF THIS REPORT

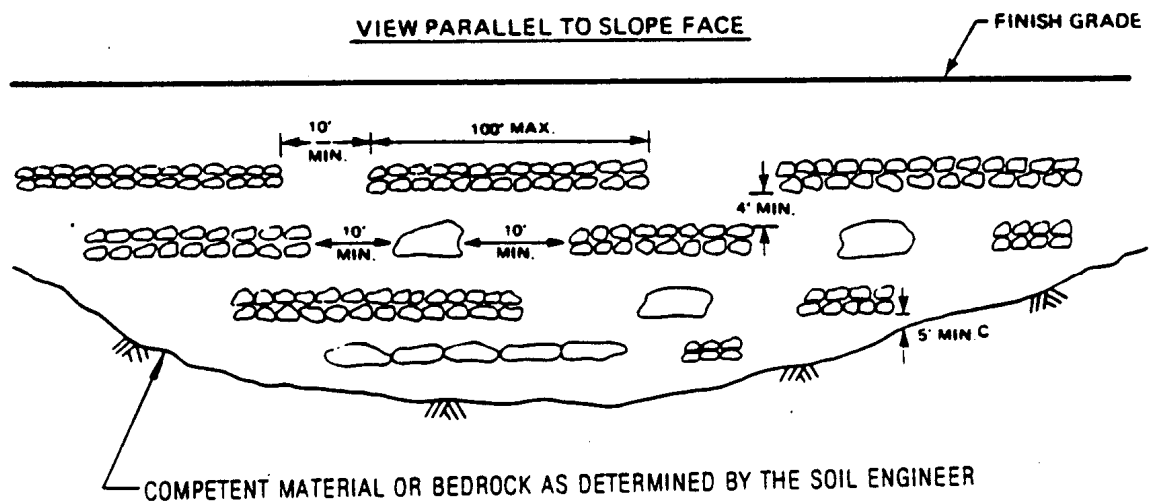
ZONE B ..... "SOIL-ROCK" AND/OR "ROCK" FILL PLACED IN ACCORDANCE WITH THE RECOMMENDATIONS PRESENTED IN SECTION 11.2.3 OF THIS REPORT

\* 5' OR 1' BELOW DEEPEST UTILITY, WHICHEVER IS GREATER

# TYPICAL OVERSIZE ROCK DISPOSAL – “SOIL-ROCK” FILL



NOTE:  
ORIENTATION OF WINDROWS MAY VARY BUT SHALL BE AS RECOMMENDED BY SOIL ENGINEER.



NOTES:

- A. ONE EQUIPMENT WIDTH OR A MINIMUM OF 15 FEET.
- B. HEIGHT AND WIDTH MAY VARY DEPENDING ON ROCK SIZE AND TYPE OF EQUIPMENT.
- C. IF APPROVED BY THE SOIL ENGINEER, WINDROWS MAY BE PLACED DIRECTLY ON COMPETENT MATERIALS OR BEDROCK PROVIDING ADEQUATE SPACE IS AVAILABLE FOR COMPACTION.
- D. VOIDS IN WINDROW TO BE FILLED BY FLOODING GRANULAR SOIL INTO PLACE. GRANULAR SOIL SHALL MEAN ANY SOIL WHICH HAS A UNIFIED SOIL CLASSIFICATION SYSTEM (UBC 29-1) DESIGNATION OF SM, SP, SW, GM, GP, OR GW.
- E. AFTER FILL BETWEEN WINDROWS IS PLACED AND COMPACTED WITH THE LIFT OF FILL COVERING WINDROW, WINDROW SHALL BE PROOF-ROLLED WITH D-9 DOZER OR EQUIVALENT.
- F. OVERSIZED ROCK IS DEFINED AS LARGER THAN 12" IN SIZE.