soil PACIFIC INC.
Geotechnical and Environmental Services

January 2, 2022
Project No. A-8880-21
PEN22-0187

TL Group Corp.
1442 Irvine Blvd., Suite 208
Tustin, CA 92780

SUBJECT: Soil and Foundation Evaluation Report
Proposed Residential Building Structures (8.89 Acres/ 40 Unit SFR)
APN 487-260-02/03/04 and 05, Moreno Valley, California

Dear Sir;

Pursuant to your authorization, we are pleased to submit our report for the subject project. Our evaluation was conducted in December 2021. This evaluation consists of field exploration; sub-surface soil sampling; laboratory testing; engineering evaluation and preparation of the following report containing a summary of our conclusions and recommendations.

The opportunity to be of service is appreciated. Should any questions arise pertaining to any portion of this report, please contact this firm in writing for further clarification.

Respectfully submitted,

Soil Pacific, Inc.

Yones Kabir
President

Hoss Eftekhari
RCE

REGISTERED PROFESSIONAL ENGINEER
HOSS EFTEKHARI
No. C50121
EXP. 6-30-23
CIVIL
STATE OF CALIFORNIA

Soil and Foundation Evaluation Report
Proposed Residential Building Structures (8.59 Acres/ 40 Unit SFR)
APN 487-260-02/03/04 and 05, Moreno Valley, California

Prepared For:

TL Group Corp.
1442 Irvine Blvd., Suite 208
Tustin, CA 92780

Prepared by:

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LIMITATIONS

Between exploratory excavations and/or field testing locations, all subsurface deposits, consequent of their anisotropic and heterogeneous characteristics, can and will vary in many important geotechnical properties. The results presented herein are based on the information in part furnished by others and as generated by this firm, and represent our best interpretation of that data benefiting from a combination of our earthwork related construction experience, as well as our overall geotechnical knowledge. Hence, the conclusions and recommendations expressed herein are our professional opinions about pertinent project geotechnical parameters which influence the understood site use; therefore, no other warranty is offered or implied.

All the findings are subject to field modification as more subsurface exposures become available for evaluations. Before providing bids, contractors shall make thorough explorations and findings. Soil Pacific Inc., is not responsible for any financial gains or losses accrued by persons/firms or third party from this project.

In the event the contents of this report are not clearly understood, due in part to the usage of technical terms or wording, please contact the undersigned in writing for clarification.

SECTION 1.0
PRELIMINARY EVALUATION

1.1 Site Description

The subject site is identified as APN 487-260-02/03/04/05. The item site is within the eastern portion of the City of Moreno Valley, about ½ of a mile south of 60 freeway. It comprise of 8.897 Acres of vacant property, stripped of vegetation and pret for site grading to development. Surrounding parcels are mainly residential properties.

The subject property is located on the south side of Fir Avenue, approximately 1,282 feet west of the intersection of Fir Avenue and Nason Street. The subject property consists of four parcels of land totaling approximately 8.89-acres in size identified by the Riverside County Assessor as Assessor's Parcel Numbers (APNs) 487-260-002, 487-260-003, 487-260-004 and 487-260-005. A road easement runs through the center of the subject property in a north-south direction. No buildings were observed on-site. A concrete- masonry unit (CMU) retaining wall and an asphalt-paved driveway was located the southeastern portion of the subject property, and concrete swales are located along the western, southern, and eastern perimeters of the subject property. The northern perimeter of the subject property along Fir Avenue is bordered by a chain-link fence and locked gate. Site access is through Fir Avenue at the north as depicted on the plot plan A-1-1. The site elevation is about 1715 feet above the main sea level, with a sheet water flow toward the southwest.

1.2 Planned Land Use

It is understood that the proposed construction will consist of a newly designed 50 Unit Townhouse Complex, with associated driveway and parking area..

1.3 Field Exploration

Subsurface conditions were explored by exploring with seven hollow stem auger drill to a maximum depth of 12 feet. Based on this evaluation, the site is underlain by a relatively thin top soils mantel above the native sandy alluvial materials.

The top soils were, wet to damp at the time of sub-surafce exploration. Underlying soils are moderately dense in place. Earth materials underlying thin topsoils within the exploratory borings were granitic bedrock fragment and boulders. Encountered soils were classified and logged by the field engineer in accordance with the visual-manual procedures of the Unified Soil Classification System (USCS), ASTM Test Standard D2488. Following our exploration, borings were loosely backfilled with the soil cuttings. The approximate locations of the exploratory borings are shown on the Exploration Location Map Figure A-1-1. Descriptive boring logs are presented in Appendix A.

1.4 Laboratory Testing

1.4.1. Classification

Soils were classified visually according to the Unified Soil Classification System. Moisture content and dry density determinations were made for the samples taken at various depths in the exploratory excavations. Results of moisture-density and dry-density determinations, together with classifications, are shown on the boring logs, Appendix A.

1.4.2 Expansion

Encountered materials at the site (2-4 feet below grade) were mainly sandy and granular soils with trace of some silt. Soil expansion potential for the encountered sub-surficial materials to the explored depth is unlikely.

1.4.3 Direct Shear

Shear strength parameters are determined by means of strain-controlled, double plain, direct shear tests performed in general accordance with ASTM D-3080. Generally, three or more specimens are tested, each under a different normal load, to determine the effects upon shear resistance and displacement, and strength properties such as Mohr strength envelopes. The direct shear test is suited to the relatively rapid determination of consolidated drained strength properties because the drainage paths through the test specimen are short, thereby allowing excess pore pressure to be dissipated more rapidly than with other drained stress tests. The rate of deformation is determined from the time required for the specimen to achieve fifty percent consolidation at given normal stress. The test can be made on all soil materials and undisturbed, remolded or compacted materials. There is, however, a limitation on maximum particle size. Sample displacement during testing may range from 10 to 20 percent of the specimen's original diameter or length.

The sample's initial void ratio, water content, dry unit weight, the degree of saturation based on the specific gravity, and mass of the total specimen may also be computed. The shear test results are plotted on the attached shear test diagrams and unless otherwise noted on the shear test diagram, all tests are performed on undisturbed, saturated samples.

Address:	26681 FIR AVE
APN	487260004
City	MORENO VALLEY
Address	26681 FIR AVE
Fault Zone	This parcel is NOT WITHIN an Earthquake Fault Zone.
Liquefaction Zone	This parcel has NOT been EVALUATED by CGS for liquefaction hazards.

Source; Loma Linda University, City of Moreno Valley, County of Riverside, San Bernardino County, Bureau of Land Management, Esri, HERE, Garmin, INCREMENT P, USGS, EPA, USDA

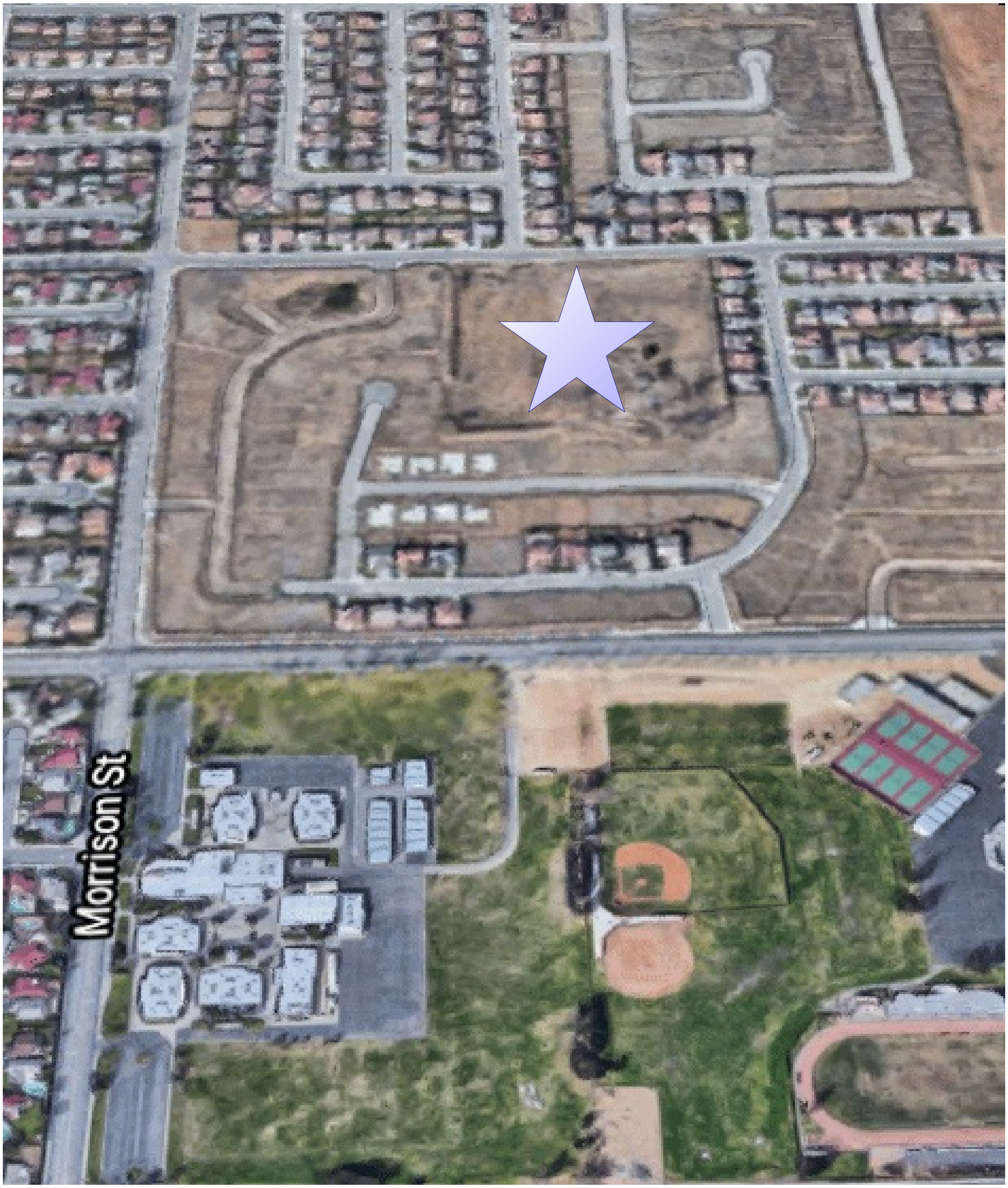

Figure 1: Site Aerial Photo.

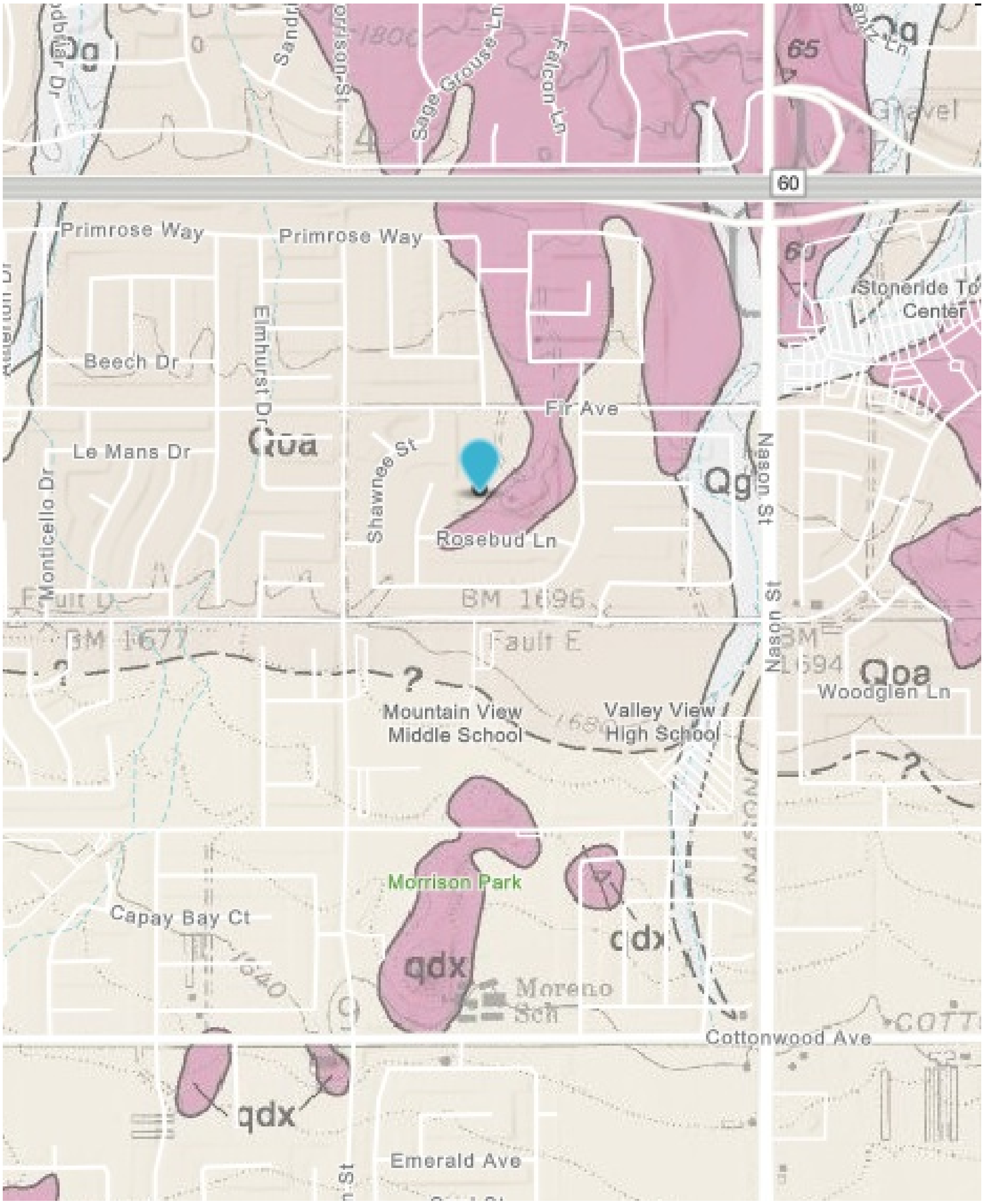

Figure 2: Site topographic and geologic map (USGS/AASG).

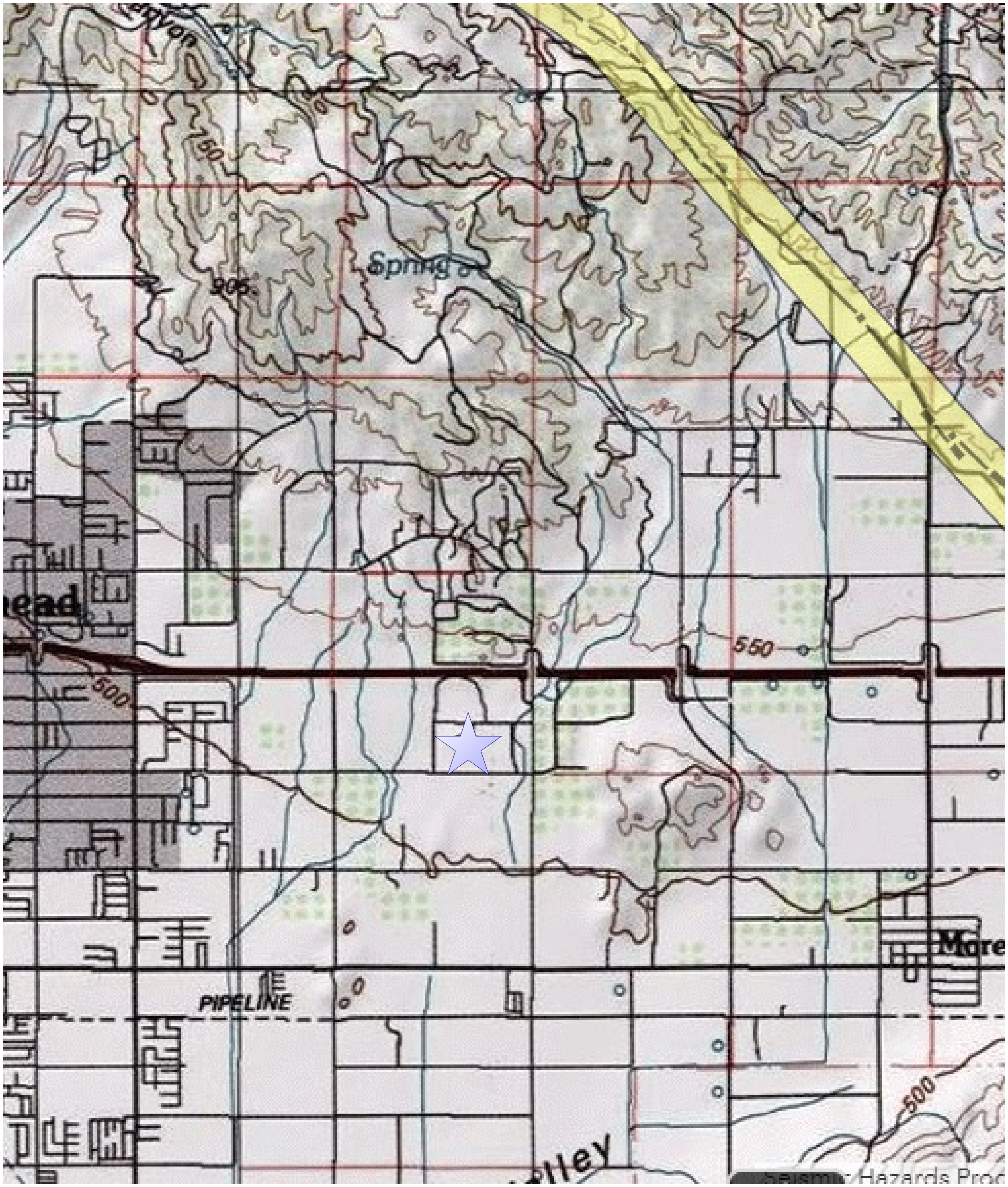

Figure 3: Site Topograhphic Map. Source: CGS

Section 2.0
Conclusions

The proposed construction is considered feasible from a soils engineering standpoint. All earthwork should be performed in accordance with applicable engineering recommendations presented herein or applicable Agency Codes, whichever are the most stringent.

2. 1 Earth Materials

The project site is located in the northern part of the Peninsular Ranges Province and is underlain by Cretaceous and older basement rocks. This part of the Peninsular Ranges Province is divided into the Perris block, located west of the San Jacinto fault and the San Jacinto Mountains block to the east. On the northern side of the San Jacinto fault zone is a thick section of Pliocene and Pleistocene continental sedimentary rocks, the upper part of the San Timoteo beds of Frick(1921). The area underlain by these rocks is termed the San Timoteo Badlands. Most of these beds consist of coarse-grained sandstone, conglomeratic sandstone, and conglomerate.

The subject site is located within older alluvial fan deposits driven from local terrains and plutonic rocks erosion. Geologic Map of the Sunnymead/ South ½ of Redlands Quadrangles, Thomas Debblee 2003.

Fill/ Topsoils

Fill/top soil mantel is relatively thin (1-2 feet). Top soils consists of light gray silty sand with some organic materials. These materials were wet to damp and relatively loose. Underlaying native materials are mainly fine sand with some clay and silty matrix and coarse grained sand at the a deeper elevation.

Native Materials (Qoa)

The Native sandy soils (“Qoa”Old Alluvial Fan silty sand and gravel deposits) were encountered at surficial elevation. Native soils were dense and firm in place.

2.2 Foundations

Proposed building complex footings will be placed and embedded into dense engineered fill that will be placed accordingly. Please refer to section 3.0.

2.3 Bearing Materials

All foundation shall be embedded into a similar materials as recommended. The subject parcel site will be overexcavated and graded for preparation and engineered fill that will support the proposed structures.

2.4 Groundwater

The site is located within a marginal distance of San Jacinto Groundwater basin (California Department of Water Resources, [CDWR], 2018). Groundwater depth and flow direction beneath the subject site can varies within the area is toward the south. Groundwater during our subsurface exploration program was not encountered.

2.5 CBC Seismic Design Parameters

Earthquake loads on earthen structures and buildings are a function of ground acceleration, which may be determined from the site-specific acceleration response spectrum. To provide the design team with the parameters necessary to construct the site-specific acceleration response spectrum for this project, we used computer application that is available on the United States Geological Survey (USGS) website, https://earthquake.usgs.gov/ws/designmaps/ or https://asce7hazardtool.online.

Based on our review of pertinent USGS maps, San Jacinto active fault is located within 2.5 miles north, northeast of the site. Southern California is seismically active with numerous faults capable of causing ground shaking at the site. The general location of active and potentially active faults within the southern California region can generate ground shaking at the site.

2.6 Chemical Contents

Chemical testing for detection of hydrocarbon or other potential contamination is beyond the scope of this report.

2.7 Liquefaction Study/ Secondary Seismic Hazard Zonation

Based on site investigation, encountered materials at the site are mainly composed of sand and gravel from fist size to boulders, the subject site does not have a potential for Liquefaction susceptibility.

Liquefaction occurs when seismically-induced dynamic loading of a saturated sand or silt causes pore water pressures to increase to levels where grain-to-grain contact pressure is significantly decreased and the soil material temporarily behaves as a viscous fluid. Liquefaction can cause settlement of the ground surface, settlement and tilting of engineered structures, flotation of buoyant buried structures and fissuring of the ground surface. A common manifestation of liquefaction is the formation of sand boils (short-lived fountains of soil and water emerges from fissures or vents and leave freshly deposited conical mounds of sand or silt on the ground surface).

Since the site has an average elevation of approximately 1715 feet above sea level, and since it does not lie in close proximity to an enclosed body of water, the probability of flooding from a tsunami or seiche is considered to be low. In addition, the site is not located within a designated tsunami inundation area.

Section 3.0
Recommendations

Based on our exploration and experience with similar projects, the proposed construction is considered feasible from a soils engineering standpoint providing the following recommendations are made a part of the plans and are implemented during construction.

3.1 Site Preparation and Excavations

If any unanticipated subsurface improvements (pipe lines, irrigation lines, etc.) are encountered during earthwork construction, this office should be informed and appropriate remedial recommendations would subsequently be provided.

3.2 Clearing and Site Preparation

Site grading is planned and will be performed. During this phase of construction any unanticipated subsurface excavation should be in accordance with the City of Moreno Valley or County of Riverside requirements. During earthwork construction, all remedial removals, and the general grading and construction procedures of the contractor should be observed, and the fill selectively tested by a representative of this office. If unusual or unexpected conditions are exposed in the field, they should be reviewed by this office and if warranted, additional recommendations will be offered.

The following recommendations will be used in preparation of the grading plan.

1. The areas to receive compacted fill should be stripped of all vegetation, construction debris and trashes, non engineered fill, left in place incompetent material up to approved soils. If soft spots are encountered, a project soil engineer will evaluate the site conditions and will provide necessary recommendations.

2. The exposed grade should then be overexcavated to an approved competent soils depth estimated to be in order of 4 feet depth. The excavated area should be scarified to a minimum of 8 inches, adjusted to optimum moisture content, and reworked to achieve a minimum of 90 percent relative compaction.

3. Compacted fill should extend at least 5 feet beyond all perimeter footings or to a distance equal to the depth of the certified compacted fill, whichever is the greatest and feasible.

4. Compacted fill, consisting of on-site soil shall be placed in lifts not exceeding 6 inches in uncompacted thickness. The excavated onsite materials are considered satisfactory for reuse in the fill if the moisture content is near optimum. All organic material and construction debris should be removed and shall be segregated. Any imported fill should be observed, tested, and approved by the soils engineer prior to use as fill. Rocks larger than 6 inches in diameter should not be used in the fill.

5. The fill should be compacted to at least 90 percent of the maximum dry density for the material. The maximum density should be determined by ASTM Test Designation D 1557-00.

6. Field observation and compaction testing during the grading should be performed by a representative of Soil Pacific Inc. to assist the contractor in obtaining the required degree of compaction and the proper moisture content. Where compaction is less than required, additional compaction effort should be made with adjustment of the moisture content, as necessary, until a minimum of 90 percent relative compaction is obtained. The contractor is encouraged to survey the adjacent building wall and note any existing distress on the walls or building if there are any. In such case, the contractor must note the observed distress and notify the owner or occupant of adjacent buildings' owner/s in writing.

3.3 Stability of Temporary Cuts

The stability of temporary cuts required during removal process depends on many factors, including the slope angle, closeness of the adjacent building foundation or public property traffic, the shearing strength of the underlying materials, and the height of the cut and the length of time the excavation remains open and exposed to equipment vibrations and rainfall. The geotechnical consultant should be present to observe all temporary excavations at the site. The possibility of temporary excavations failing may be minimized by:

1) keeping the time between cutting and filling operations to a minimum;
2) limiting excavation length exposed at any one time; and,
3) shoring prior to cut.

3.4 Foundations

Considering the site specific condition, the following recommendations may be used in preparation of the design and construction of the foundation system.

3.4.1 Bearing Value

Allowable bearing value is 2500 psf. The bearing value may be increased by 1/3 when considering short duration seismic or wind loads.

An allowable frictional resistance of 0.35 may be used for design of concrete foundations poured on approved materials. When frictional and passive resistance are combined to compute the total lateral resistance, no reduction is needed to any of these two components.

3.4.2 Foundation Settlement

Based upon anticipated structural loads, the maximum total settlement for the proposed foundation is not expected to exceed 1 inch at design load. Differential settlement between adjacent footings and lateral displacement of lateral resisting elements should not exceed 1/2 inch.

3.4.3 Concrete Type

In absence of soluble sulfate test and based on our experience within the property close to the shore only concrete Type V will be used in planning and construction.

3.4.4 Slabs-on-grade

If slabs-on-grade is desired to design then it should be a minimum of 5 inches in nominal thickness. Slab areas that are to be carpeted or tiled, or where the intrusion of moisture is objectionable, should be underlain by a moisture barrier consisting of 15-mil Visqueen, properly protected from the puncture by four inches of gravel per Calgreen requirements. The slab should be reinforced by rebars no. 3 at 18 inches on center and shall be tied to the foundation.

3.5 Utility Trench Backfill

Utility trenches backfill should be placed in accordance with Appendix D. It is the owners' and contractors' responsibility to inform subcontractors of these requirements and to notify Soil Pacific when backfill placement is to begin.

3.6 Seismic Design and Construction

Construction should be in conformance with seismic design parameters of the latest edition of California Building Code (C.B.C.) Please refer to the following table for related seismic design parameters.

SS (0.2 sec)	S1 (1.0 sec)	Soil Site Class	SDS (0.2 sec)	SD1 (1.0 sec)	PGAm	Seismic Design Cat
2.27	.81	D	1.59	1.43	.83	II

3.7 Retaining Wall Design Recommendations

If a conventional retaining wall is planned to envelop and cover the proposed decking cavity around the planned decking, then the following design criteria may be used.

1) The braced wall should be designed using at-rest pressure condition. The minimum equivalent fluid pressure, for lateral soil loads, of 40 pounds per cubic foot may be used for design for onsite non expansive granular soils conditions and level backfill (10:1 to 4:1 or less).

2) An allowable soil bearing pressure of 2000 lbs. per square foot may be used in design for footings embedded to approved native soils.

3) A friction coefficient of .35 between concrete and natural or compacted soil and a passive bearing value of 360 lbs. per square foot per foot of depth, up to a maximum of 1000 pounds per square foot at the bottom excavation level may be employed to resist lateral loads. Any wall exceeding 6 feet height should be designed against static and seismic loads.

3.8 Concrete Driveway

1. The subgrade soils for all flatwork should be checked to have a minimum moisture content of 2 percentage points above the optimum moisture content to a depth of at least 18 inches.

2. Local irrigation and drainage should be diverted from all flatwork areas. Area drains and swales should be utilized to reduce the amount of subsurface water intrusion beneath the foundation and flatwork areas.

3. The concrete flatwork should have enough cold joints to prevent cracking. A minimum of rebar no. 4 placed at 18 inches on center must be used.

4. Surface and shrinkage cracking of the finished slab may be significantly reduced if a low slump and water-cement ratio are maintained during concrete placement. Excessive water added to concrete prior to placement is likely to cause shrinkage cracking.

5. Construction joints and saw cuts should be designed and implemented by the concrete contractor or design engineer based on the medium expansive soil conditions. Maximum joint spacing should not exceed 8 feet in any direction.

6. Patio or driveway subgrade soil should be compacted to a minimum of 90 percent to a depth of 18 inches. All run-off should be gathered in gutters and conducted off-site in a non-erosive manner. Planters located adjacent to footings should be sealed, and leach water intercepted.

3.9 Patio Slabs and Hardscape

It may be desirable to support new patio slabs and hardscape (patios, steps, walkways, etc.) on the existing surficial soils. These structures are not normally subject to building code requirements for structural support. In order to reduce the potential for distress due to potential settlement, it may be desirable to provide additional subgrade preparation and additional steel and concrete thickness for the proposed patio slabs and hardscape at the site. We recommend that patio slabs and hardscape be reinforced with a minimum of No.4 rebar spaced a maximum distance of 16 inches on center, each way. The upper 18 inches of existing surficial soils (depending on field conditions) to be used for slab support should be removed and recompacted to 90% of the maximum dry density as determined by ASTM:D-1557. It should be noted that patio slabs/hardscape constructed to the preceding specification may be subject to distress over time. Periodic maintenance or replacement may be necessary.

3.10 Pavement Section Design

On site soil are mainly sandy materials. The parking and drive way areas must be included within proposed R&R areas and overexcavated /recompacted as directed on the Section 3.0 of this report. Pavement section design for the light traffic will be 4 inches of asphalt over 6 inches of Aggregate Base Class II property compacted to a minimum of 95% relative compaction. The driveway supporting the heavy trucks such as trash bins and fire engin will be paved by 5 inches of asphalt over 6 inches of aggregate class II.

3.11 Excavation

Calosha requires that any excavation exceeding 4 feet in vertical cut require shoring or 1:1 trim above the 4 feet vertical cut.

All temporary excavations shall conform to the requirements of CAL-OSHA (Title 8, Division 1, Subchapter 4, Article 6 “Excavations” Sections 1539 to 1547) as well as all specific worker safety requirements as enforced by the local Building Authority. Proposed excavation will require adequate shoring, and maintain drained in an appropriate manner to prevent the continual accumulation of water. All vertical cuts shall be inspected by this office, to verify geologic continuity.

3.12 On-site Infiltration

Based on our single wall infiltration testing using (Aka Inverse Borehole Method), on-site infiltration is feasible. On-site infiltration should be designed using an average rate of 4 inches per hour . The infiltration basin should be place within a minimum of 10 feet setback from any foundation, adjacent property, and or public ways.

3.13 Shrinkage and Subsidence

Volumetric changes in earth quantities will occur when excavated onsite soil materials are replaced as properly compacted fill. We estimate the existing surficial soils may shrink approximately 0% to 5% when removed and replaced as compacted fill. Subsidence due to the processing of excavations exposing competent deposits is anticipated to be negligible. The estimates of shrinkage and subsidence are intended as an aid for project engineers in determining earthwork quantities. However, these estimates should be used with some caution since they are not absolute values.

Contingencies should be made for balancing earthwork quantities based on actual shrinkage and subsidence that occurs during the grading process. The project Civil Engineer should consider that the upper two feet shrinkage will be much higher than 5%, while the rate of shrinkage by depth will be lesser.

3.14 Observation and Testing

All grading and earthwork including trench backfill should be performed under the observation and testing of the consulting engineer for proper sub-grade preparation, selection of satisfactory materials, placement and compaction of all structural fill. Sufficient notification prior to stripping and earthwork construction is essential in order that the work will be adequately observed and tested.

Prior to initiation of grading, a meeting should be arranged by the developer and should be attended by representatives of the governmental agencies, contractors, consultants and the developer. Construction should be inspected at the following stages by the Geotechnical Consultant.

It is recommended that representative of **Soil Pacific, Inc.** be present to observe and test during the following stages of construction:

❒ Site grading to confirm proper removal of unsuitable materials and to observe and test the placement of fill.

❒ Inspection of all foundation excavations prior to placement of steel or concrete.

❒ During the placement of retaining wall subdrain and backfill materials.

❒ Inspection of all slab-on-grade areas prior to placement of sand, Visqueen.

❒ After trenches have been properly backfilled and compacted.

❒ When any unusual conditions are encountered.

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   b. USGS. Earthquakes in Southern California
   c. NavigateLA ;
   d. SCEDC.

APPENDIX A

Field Exploration

Log of Sub-surface Exploration

Boring B-1

Equipment Type: Sh-2800		Boring # B-1
Diameter: 4"	Logged by: Y.K.	Date:12/20/21
Depth: 12 feet	G.water: - feet	Backfilled:Y

Elev. (feet)	Std. Pen / Bulk/Bag / Ring	Drive Wt: Drop: C/S N	Laboratory Moisture	Laboratory Dry Reading	Graphic	USCS Letter	Description of Earth Materials
0–2						SM	Top soils-Dark gray, gray fine to coarse grained silty sand, sand and gravel with trace of organic materilas, damp and moderately dense
3			8.1.2	112.3		SP	
5			5.5	114.2		SW	Native Materials: Brown, light brown fine togravelly sand with some silt and large pebbles. Damp and dense.
7			4.0	114.6			Light brown, gravelly sand with some pebbels and bedrock fragments, dense and damp.
10							
15							
20							End of subsurface exploration 12 feet.
25							
30							
35							
40							

Log depicts conditions at the time and location drilled.

Soil Pacific Inc.

Geotechnical and Environmental Services

Project Name: 26681 Fir Avenue, Moreno Valley, California

Project Number: A-8880-21

Report Date: Figure:

Log of Sub-surface Exploration

Boring B-2

Equipment Type: Sh-2800		Boring # B-2
Diameter: 4"	Logged by: Y.K.	Date:12/20/21
Depth: 12 feet	G.water: - feet	Backfilled:Y

Elev. (feet)	Std. Pen / Bulk/Bag / Ring	Drive Wt: Drop: C/S N	Laboratory Moisture	Laboratory Dry Reading	USCS Letter	Description of Earth Materials
					SM	Top soils-Dark gray, gray fine to coarse grained silty sand, sand and gravel with trace of organic materilas, damp and moderately dense
			6.4	113.0	SP	Native Materials: Brown, light brown fine togravelly sand with some silt and large pebbles. Damp and dense.
			4.2	115.0		
5						
			2.8.	118.0	SW	Light brown, gravelly sand with some pebbels and bedrock fragments, dense and damp.
10						
15						
20						End of subsurface exploration 12 feet.
25						
30						
35						
40						

Log depicts conditions at the time and location drilled.

Soil Pacific Inc.

Geotechnical and Environmental Services

Project Name: 26681 Fir Avenue, Moreno Valley, California

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Report Date:

Figure:

Log of Sub-surface Exploration

Boring B-3

Equipment Type: Sh-2800		Boring # B-3
Diameter: 4"	Logged by: Y.K.	Date:12/20/21
Depth: 12 feet	G.water: - feet	Backfilled:Y

Elev. (feet)	Std. Pen / Bulk/Bag / Ring	Drive Wt: Drop: C/S N	Laboratory Moisture	Laboratory Dry Reading	USCS Letter	Description of Earth Materials
					SM	Top soils-Dark gray, gray fine to coarse grained silty sand, sand and gravel with trace of organic materilas, damp and moderately dense
			6.4	113.0	SP	Native Materials: Brown, light brown fine togravelly sand with some silt and large pebbles. Damp and dense.
5			3.3	115.0	SW	Light brown, gravelly sand with some pebbels and bedrock fragments, dense and damp.
10						
15						
20						End of subsurface exploration 12 feet.
25						
30						
35						
40						

Log depicts conditions at the time and location drilled.

Soil Pacific Inc.

Geotechnical and Environmental Services

Project Name: 26681 Fir Avenue, Moreno Valley, California

Project Number: A-8880-21

Report Date: Figure:

Log of Sub-surface Exploration

Boring B-4

Equipment Type: Sh-2800		Boring # B-4
Diameter: 4"	Logged by: Y.K.	Date:12/20/21
Depth: 12 feet	G.water: - feet	Backfilled:Y

Elev. (feet)	Std. Pen / Bulk/Bag / Ring	Drive Wt: Drop: C/S N	Laboratory Moisture	Laboratory Dry Reading	USCS Letter	Description of Earth Materials
0–2.5					SM	Top soils-Dark gray, gray fine to coarse grained silty sand, sand and gravel with trace of organic materilas, damp and moderately dense
3		50				
2.5–7.5					SP	Native Materials: Brown, light brown fine togravelly sand with some silt and large pebbles. Damp and dense.
7		11/18/15				
7.5–12					SW	Light brown, gravelly sand with some pebbels and bedrock fragments, dense and damp.
11		23/23/50				
20						End of subsurface exploration 12 feet.

Depth scale: 5, 10, 15, 20, 25, 30, 35, 40

Log depicts conditions at the time and location drilled.

Soil Pacific Inc.

Geotechnical and Environmental Services

Project Name: 26681 Fir Avenue, Moreno Valley, California

Project Number: A-8880-21

Report Date:

Figure:

Log of Sub-surface Exploration

Boring B-5

Std. Pen	Drive Wt: Drop:	USCS Letter	Equipment Type: Sh-2800		Boring # B-5
Bulk/Bag		Graphic	Diameter: 4"	Logged by: Y.K.	Date:12/20/21
Ring	C/S	Laboratory	Depth: 12 feet	G.water: - feet	Backfilled:Y
Elev. (feet)	N	Moisture / Dry Reading	**Description of Earth Materials**		

Elev. (feet)	C/S N	USCS	Description of Earth Materials
0–3	50	SM	Top soils-Dark gray, gray fine to coarse grained silty sand, sand and gravel with trace of organic materilas, damp and moderately dense
5	18/15/20	SP	Native Materials: Brown, light brown fine togravelly sand with some silt and large pebbles. Damp and dense.
10	23/50	SW	Light brown, gravelly sand with some pebbels and bedrock fragments, dense and damp.
12			End of subsurface exploration 12 feet.

Elevation scale: 5, 10, 15, 20, 25, 30, 35, 40

Log depicts conditions at the time and location drilled.

Soil Pacific Inc.

Geotechnical and Environmental Services

Project Name: 26681 Fir Avenue, Moreno Valley, California

Project Number: A-8880-21

Report Date:

Figure:

Log of Sub-surface Exploration

Boring B-6

Equipment Type: Sh-2800		Boring # B-6
Diameter: 4"	Logged by: Y.K.	Date: 12/20/21
Depth: 12 feet	G.water: - feet	Backfilled: Y

Elev. (feet)	Ring	Bulk/Bag	Std. Pen	Drive Wt: Drop: C/S N	Laboratory Moisture	Laboratory Dry Reading	Graphic	USCS Letter	Description of Earth Materials
0–2								SM	Top soils-Dark gray, gray fine to coarse grained silty sand, sand and gravel with trace of organic materilas, damp and moderately dense
2–6.5								SP	Native Materials: Brown, light brown fine togravelly sand with some silt and large pebbles. Damp and dense.
6.5–12								SW	Light brown, gravelly sand with some pebbels and bedrock fragments, dense and damp.
									End of subsurface exploration 12 feet.

Depth scale: 5, 10, 15, 20, 25, 30, 35, 40

Log depicts conditions at the time and location drilled.

Soil Pacific Inc.

Geotechnical and Environmental Services

Project Name: 26681 Fir Avenue, Moreno Valley, California

Project Number: A-8880-21

Report Date:

Figure:

Log of Sub-surface Exploration

Boring B-7

Equipment Type: Sh-2800		Boring # B-7
Diameter: 4"	Logged by: Y.K.	Date:12/20/21
Depth: 12 feet	G.water: - feet	Backfilled:Y

Std. Pen	Bulk/Bag	Ring	Elev. (feet)	Drive Wt: Drop: C/S N	Laboratory: Moisture	Laboratory: Dry Reading	USCS Letter	Graphic

Elev. (feet): 5, 10, 15, 20, 25, 30, 35, 40

Description of Earth Materials

USCS	Description
SM	Top soils-Dark gray, gray fine to coarse grained silty sand, sand and gravel with trace of organic materilas, damp and moderately dense
SP	Native Materials: Brown, light brown fine togravelly sand with some silt and large pebbles. Damp and dense.
SW	Light brown, gravelly sand with some pebbels and bedrock fragments, dense and damp.

End of subsurface exploration 12 feet.

Log depicts conditions at the time and location drilled.

Soil Pacific Inc. Geotechnical and Environmental Services	Project Name: 26681 Fir Avenue, Moreno Valley, California	
	Project Number: A-8880-21	
	Report Date:	Figure:

Log of Sub-surface Exploration

Boring B-8

Equipment Type: Sh-2800		Boring # B-8
Diameter: 4"	Logged by: Y.K.	Date:12/20/21
Depth: 12 feet	G.water: - feet	Backfilled:Y

Columns: Std. Pen; Bulk/Bag; Ring; Elev. (feet); Drive Wt: Drop: C/S N; Laboratory: Moisture, Dry Reading; USCS Letter; Graphic

Description of Earth Materials

Depth (feet)	USCS	Description of Earth Materials
0–~2.5	SM	Top soils-Dark gray, gray fine to coarse grained silty sand, sand and gravel with trace of organic materilas, damp and moderately dense
~2.5–5	SP	Native Materials: Brown, light brown fine togravelly sand with some silt and large pebbles. Damp and dense.
5–12	SW	Light brown, gravelly sand with some pebbels and bedrock fragments, dense and damp.
12		End of subsurface exploration 12 feet.

Depth scale: 5, 10, 15, 20, 25, 30, 35, 40

Log depicts conditions at the time and location drilled.

Soil Pacific Inc.

Geotechnical and Environmental Services

Project Name: 26681 Fir Avenue, Moreno Valley, California	
Project Number: A-8880-21	
Report Date:	Figure:

APPENDIX B

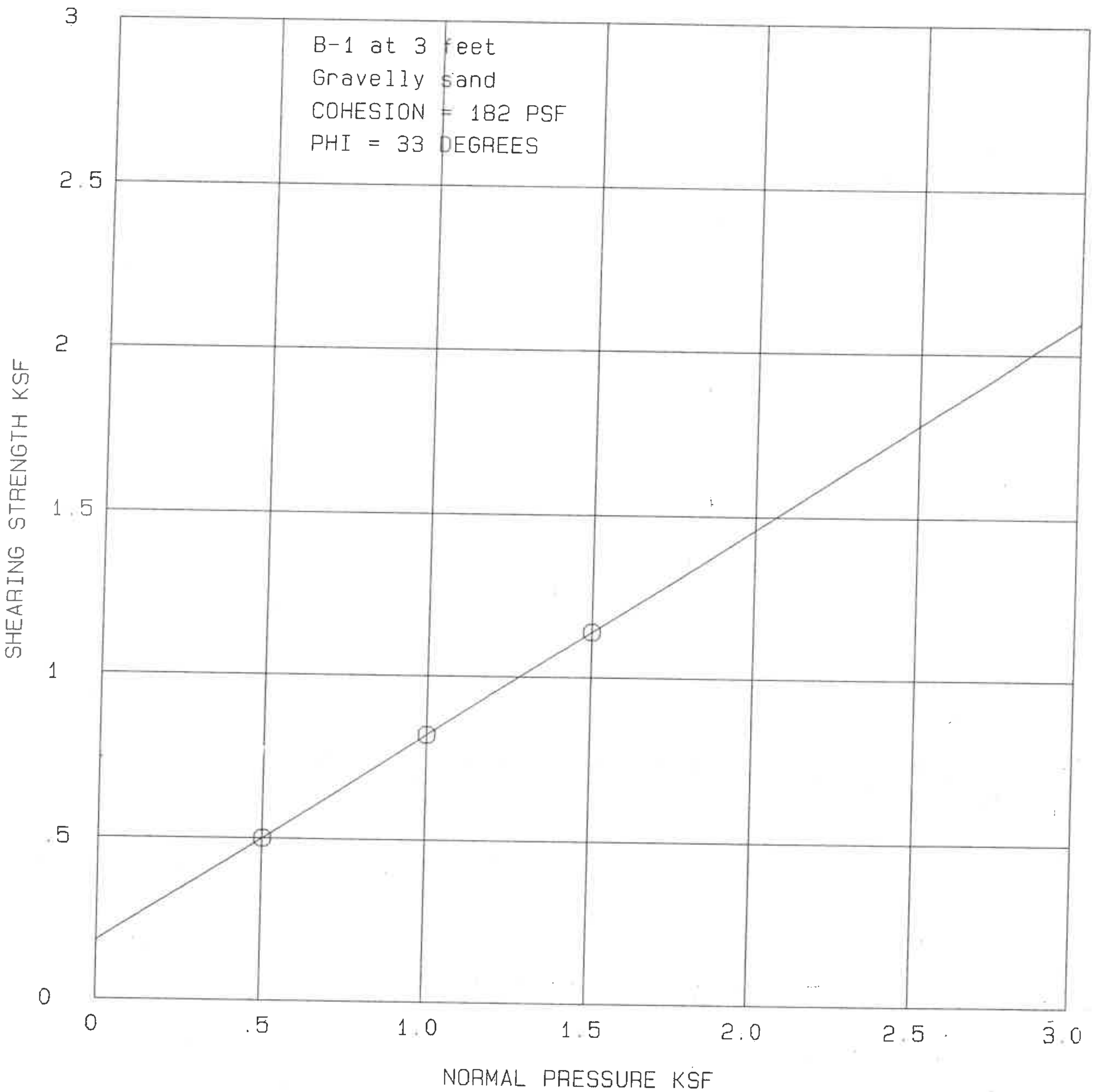
Laboratory

APPENDIX

SHEAR TEST DIAGRAM

J.O. A-8880-21

DATE 12/26/21



PLATE

APPENDIX

BEARING VALUE ANALYSIS

J.O. A-8880-21

DATE 12/26/21

COHESION = 182 PSF   GAMA = 125 PCF   PHI = 33 DEGREES

DEPTH OF FOOTING = 2 FEET

BREADTH OF FOOTING = 2 FEET

FOOTING TYPE = SQUARE

BEARING CAPACITY FACTORS

Nc = 38.6   Nq = 26.1   Ng = 29.5

FOOTING COEFFICIENTS

K1 = 1.2   K2 = .4

REFERENCE: TERZAGHI & PECK; 1967; 'SOIL MECHANICS IN ENGINEERING PRACTICE'; PAGES 217 TO 225.

FORMULA

ULIMATE BEARING = (K1 * Nc * C) + (K2 * GA * Ng * B) + (Nq * GA * D) = 17915.3

ALLOWABLE BEARING = ULTIMATE BEARING / 3 = 5971.8

THE ALLOWABLE BEARING VALUE SHOULD NOT EXCEED 5971.8 PSF. DESIGN SHOULD CONSIDER EXPANSION INDEX.

PLATE

APPENDIX

TEMPORARY BACKCUT STABILITY

J.O. A-8880-21

DATE 12/26/21

COHESION = 128 PSF   GAMA = 125 PCF   PHI = 33 DEGREES

CUT HEIGHT = 4 FEET

SOIL TYPE = Silty sand/sand

BACKFILL ASSUMED TO BE LEVEL

PORE PRESSURE NOT CONSIDERED

FORMULA

$$\text{SAFETY FACTOR} = \frac{(C * L) + (GA * AREA * COS(Z) * TAN(PHI))}{GA * AREA * SIN(Z)} = 1.57$$

$$Z = 45 + (PHI/2)$$

SINCE THE SAFETY FACTOR OF 1.57 IS GREATER THAN THE REQUIRED 1.25, THE TEMPORARY EXCAVATION IS CONSIDERED TO BE STABLE. THIS IS WITH A LEVEL AREA EQUAL TO THE LENGTH OF THE VERTICAL CUT ABOVE THE CUT.

PLATE

APPENDIX

BEARING VALUE ANALYSIS

J.O. A-8880-21

DATE 12/26/21

COHESION = 182 PSF   GAMA = 125 PCF   PHI = 33 DEGREES

DEPTH OF FOOTING = 2 FEET

BREADTH OF FOOTING = 1.5 FEET

FOOTING TYPE = CONTINUOUS

BEARING CAPACITY FACTORS

Nc = 38.6   Nq = 26.1   Ng = 29.5

FOOTING COEFFICIENTS

K1 = 1   K2 = .5

REFERENCE: TERZAGHI & PECK; 1967; 'SOIL MECHANICS IN ENGINEERING PRACTICE'; PAGES 217 TO 225.

FORMULA

ULIMATE BEARING = (K1 * Nc * C) + (K2 * GA * Ng * B) + (Nq * GA * D) = 16324.3

ALLOWABLE BEARING = ULTIMATE BEARING / 3 = 5441.4

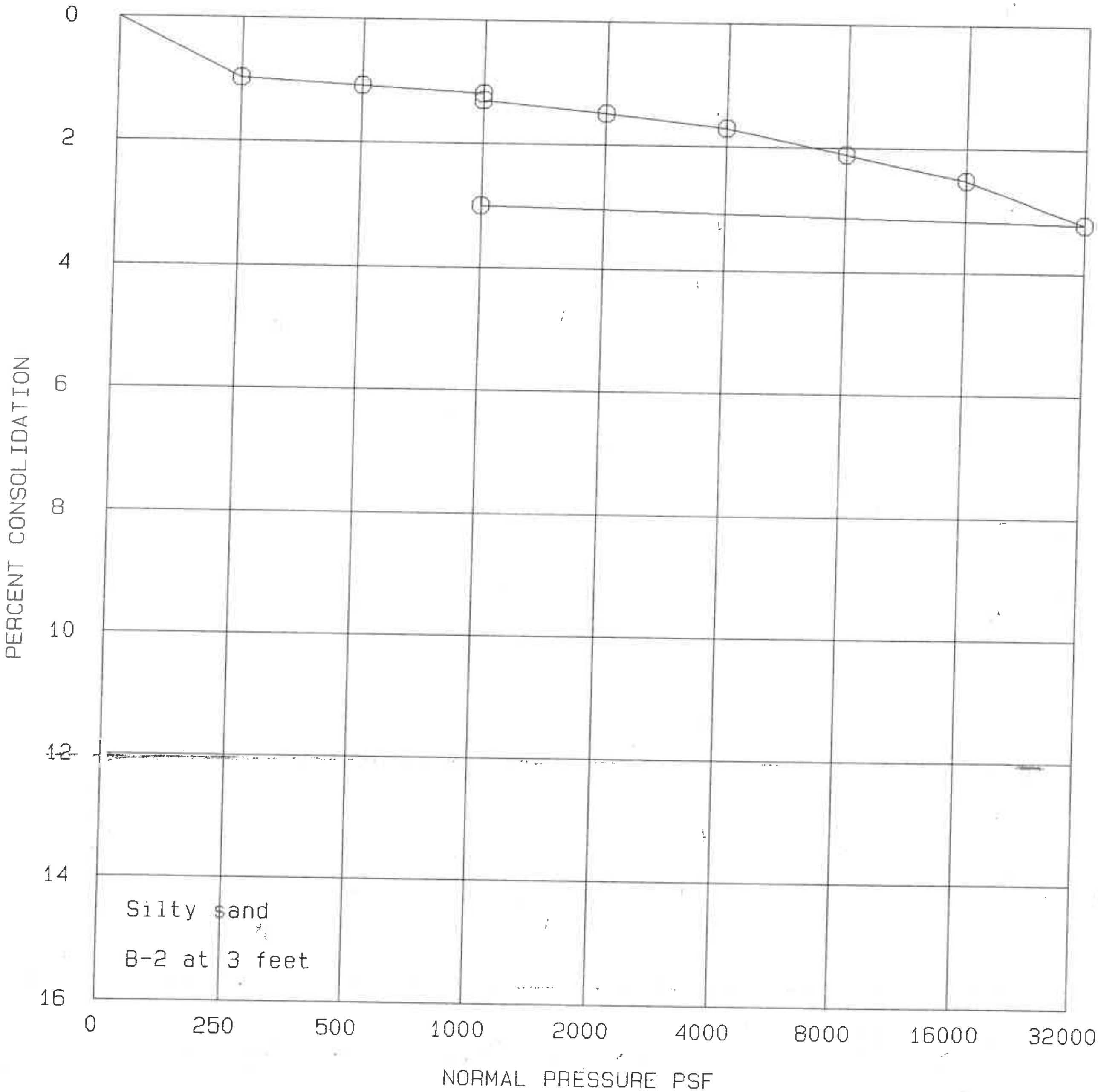
THE ALLOWABLE BEARING VALUE SHOULD NOT EXCEED 5441.4 PSF. DESIGN SHOULD CONSIDER EXPANSION INDEX.

PLATE

CONSOLIDATION PRESSURE CURVE

J.O. A-8880-21

DATE 12/26/21



PLATE

Earth Pressure Calculations

Soil Strength Parameters:

$\phi := 33$

$\gamma := 120$

Active :

$$Ka := \tan\left[\left(45 - \frac{\phi}{2}\right) \cdot \left(\frac{\pi}{180}\right)\right]^2$$

Active earth Presure

$Ka = 0.295$

$Pa := Ka \cdot \gamma$

slope angle range, degrees

$Pa = 35.376$		LEVEL BACKFILL BEHIND WALL	$Pa = 35.376$
$Pa18 := Pa \cdot 1.08$	5:1	BACKFILL BEHIND WALL	$Pa18 = 38.206$
$Pa18 := Pa \cdot 1.22$	3:1	BACKFILL BEHIND WALL	$Pa18 = 43.159$
$Pa39 := Pa \cdot 1.48$	2:1	BACKFILL BEHIND WALL	$Pa39 = 52.357$

Passive

$$Kp := \tan\left[\left(45 + \frac{\phi}{2}\right) \cdot \left(\frac{\pi}{180}\right)\right]^2$$

$Kp = 3.392$

Pasive Earth Presure

$Pp := Kp \cdot \gamma$

$Pp = 407.054$

Atrest

$$Kat := 1 - \sin\left(\phi \cdot \frac{\pi}{180}\right)$$

$Kat = 0.455$

$Pat := Kat \cdot \gamma$

$Pat = 54.643$

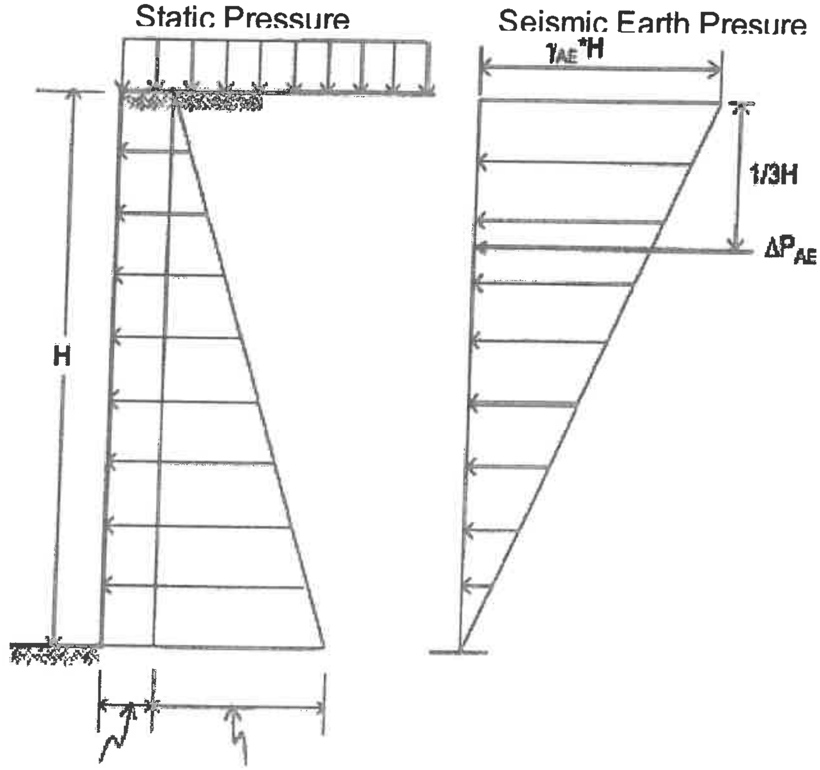
Seismic lateral earth pressure

Free standing Wall

$\phi := 33 \cdot deg$ angle of internal friction of soil

$\delta := 17 \cdot deg$ angle of friction between soil and wall, (concrete or masonry)

$PGAm := .83$



$h := 12$ Height of wall

$$kh := \frac{\left[\left(\frac{2}{3}\right) PGAm\right]}{2}$$

$kh = 0.277$

$\gamma := 120$ Soil Unit Weight

$$PaE := \frac{3}{8} \cdot \gamma \cdot h^2 \cdot kh$$

$PaE = 1.793 \times 10^3$ PLF

$$EFPs := 2 \cdot \frac{PaE}{h^2}$$

0.45q EFPxH(psf)

$EFPs = 24.9$ PCF seismic Lateral Force (retaining wall In excess of 6 feet)

$q := 0$ Surcharge Load should be added by structural justification

Project No.= A – 8880 – 21

Porchet Method, Aka Inverse Borehole Method B-2

$\Delta T := 25$	Time Interval 10 Minutes
$D0 := 10$	Initial Depth to Water, (inch)
$Df := 41$	Final Depth to Water, (inch)
$Dr := 144$	Total Depth of the Test Hole
$r := 5$	Test Hole Redius, Inch

$H0 := Dr - D0$ Initial height of water at the selected time interval

$H0 = 134$

$Hf := Dr - Df$ Final height of water at the selected time interval

$Hf = 103$

$\Delta H := H0 - Hf$ ΔH=ΔDChange in height over the time interval

$\Delta H = 31$

$$Havg := \frac{(H0 + Hf)}{2}$$

$Havg = 118.5$

The Conversion Equation is used:

$$IR := \frac{\Delta H \cdot (60 \cdot r)}{\Delta T \cdot (r + 2Havg)}$$

$IR = 1.537$ inch /Hour Infiltration rate without including factor of safety

Factor of safety 3

$IRsafe := \frac{IR}{3}$ $IRsafe := .5$ Design rate inches/hour

APPENDIX C

References

ASCE 7 Hazards Report

AMERICAN SOCIETY OF CIVIL ENGINEERS

Address:
26681 Fir Ave
Moreno Valley, California
92555

Standard: ASCE/SEI 7-22
Risk Category: II
Soil Class: D - Stiff Soil

Elevation: 1715.63 m (NAVD 88)
Latitude: 33.934072
Longitude: -117.197477

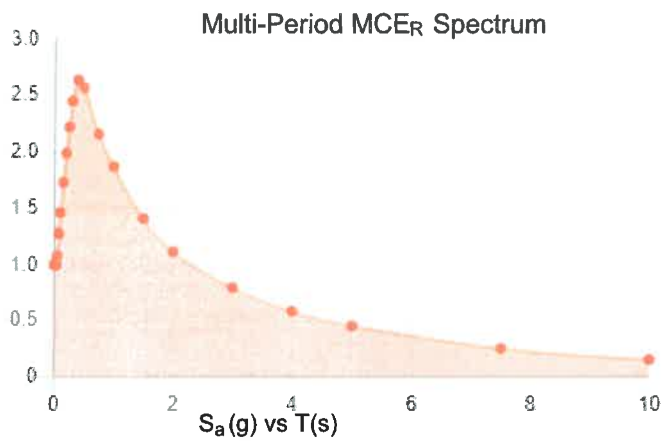
ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

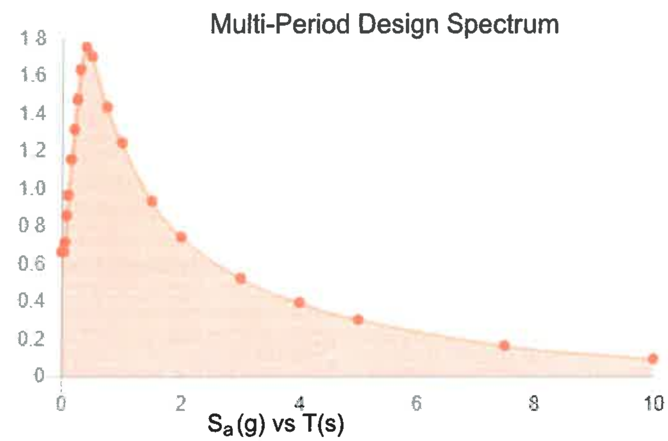
Seismic

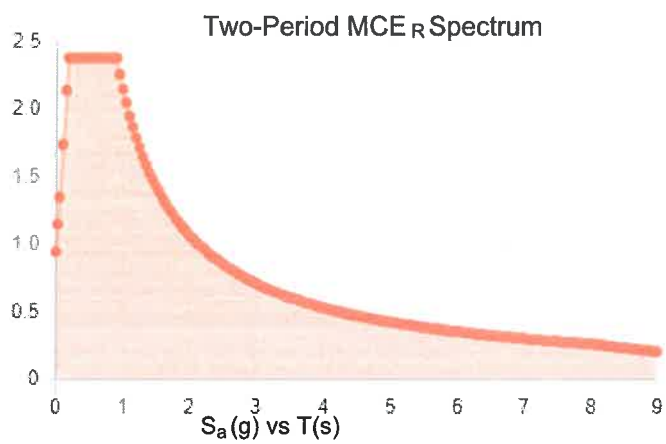
Site Soil Class:

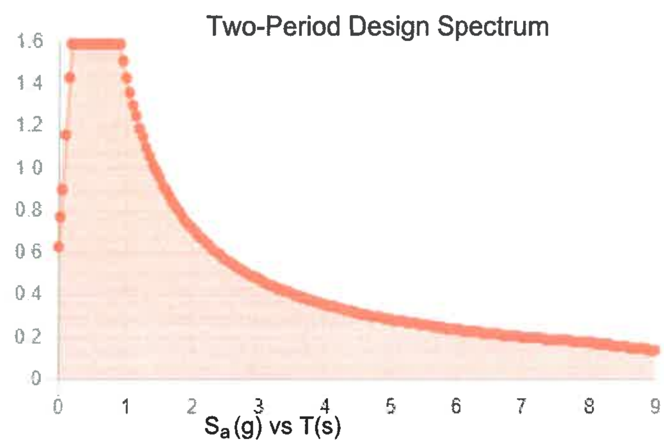
Results:

PGA_M :	0.83	T_L :	8
S_{MS} :	2.38	S_S :	2.27
S_{M1} :	2.15	S_1 :	0.81
S_{DS} :	1.59	S_{DC} :	
S_{D1} :	1.43	V_{S30} :	260









MCE$_R$ Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Design Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Data Accessed: Sat Jan 01 2022

Date Source:

USGS Seismic Design Maps based on ASCE/SEI 7-22 and ASCE/SEI 7-22 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-22 Ch. 21 are available from USGS.

The ASCE 7 Hazard Tool is provided for your convenience, for informational purposes only, and is provided "as is" and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE 7 standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

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APPENDIX D

General Grading Specifications

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

1. GENERAL INTENT

These specifications present general procedures and requirements for grading and earthwork as shown on the approved grading plans, including preparation of areas to be filled, placement of fill, installation of subdrains, and excavations. The recommendations contained in the geotechnical report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict. Evaluations performed by the consultant during the course of grading may result in new recommendations of the geotechnical report.

2.EARTHWORK OBSERVATION AND TESTING

Prior to the commencement of grading, a qualified geotechnical consultant (soils engineer and engineering geologist, and their representatives) shall be employed for the purpose of observing earthwork and testing the fills for conformance with the recommendations of the geotechnical report and these specifications. It will be necessary that the consultant provide adequate testing and observation so that he may determine that the work was accomplished as specified. It shall be the responsibility of the contractor to assist the consultant and keep him apprised of work schedules and changes so that he may schedule his personnel accordingly.

It shall be the sole responsibility of the contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If in the opinion of the consultant, unsatisfactory conditions, such as questionable soil, poor moisture condition, inadequate compaction, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the consultant will be empowered to reject the work and recommend that construction be topped until the conditions are rectified. Maximum dry density tests used to determine the degree of compaction will be performed in accordance with the American Society of Testing and Materials tests method ASTM D 1557-00.

3.0 PREPARATION OF AREAS TO BE FILLED

3.1 Clearing and Grubbing: All brush, vegetation and debris shall be removed or piled and otherwise disposed of.

3.2 Processing: The existing ground which is determined to be satisfactory for support of fill shall be scarified to a minimum depth of 6 inches. Existing ground which is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until the soils are broken down and free of large clay lumps or clods and until the working surface is reasonably uniform and free of uneven features which would inhibit uniform compaction.

3.3 Overexcavation: Soft, dry, spongy, highly fractured or otherwise unsuitable ground, extending to such a depth that the surface processing cannot adequately improve the condition, shall be overexcavated down to firm ground, approved by the consultant.

3.4 Moisture Conditioning: Overexcavated and processed soils shall be watered, dried-back, blended, and/or mixed, as required to attain a uniform moisture content near optimum.

3.5 Recompaction: Overexcavated and processed soils which have been properly mixed and moisture- conditioned shall be recompacted to a minimum relative compaction of 90 percent.

3.6 Benching: Where fills are to be placed on ground with slopes steeper than 5: 1 (horizontal to vertical units), the ground shall be stepped or benched. The lowest bench shall be a minimum of 15 feet wide, shall be at least 2 feet deep, shall expose firm material, and shall be approved by the consultant. Other benches shall be excavated in firm material for a minimum width of 4 feet. Ground sloping flatter than 5 : 1 shall be benched or otherwise overexcavated when considered necessary by the consultant.

3.7 Approval: All areas to receive fill, including processed areas, removal areas and toe-of-fill benches shall be approved by the consultant prior to fill placement.

4.0 FILL MATERIAL

4.1 General: Material to be placed as fill shall be free of organic matter and other deleterious substances, and shall be approved by the consultant. Soils of poor gradation, expansion, or strength characteristics shall be placed in areas designated by consultant or shall be mixed with other soils to serve as satisfactory fill material.

4.2 Oversize: Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 12 inches, shall not be buried or placed in fills, unless the location, materials, and disposal methods are specifically approved by the consultant. Oversize disposal operations shall be such that nesting of oversize material does not occur, and such that the oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 feet vertically of finish grade or within the range of future utilities or underground construction, unless specifically approved by the consultant.

4.3 Import: If importing of fill material is required for grading, the import material shall meet the requirements of Section 4. 1.

5.0 FILL PLACEMENT AND COMPACTION

5.1 Fill Lifts: Approved fill material shall be placed in areas prepared to receive fill in near-horizontal layers not exceeding 6 inches in compacted thickness. The consultant may approve thicker lifts if testing indicates the grading procedures are such that adequate compaction is being achieved with lifts of greater thickness. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to attain uniformity of material and moisture in each layer.

5.2 Fill Moisture: Fill layers at a moisture content less than optimum shall be watered and mixed, and wet fill layers shall be aerated by scarification or shall be blended with drier material. Moisture-conditioning and mixing of fill layers shall continue until the fill material is at a uniform moisture content or near optimum.

5.3 Compaction of Fill: After each layer has been evenly spread, moisture conditioned, and mixed, it shall be uniformly compacted to not less than 90 percent of maximum dry density. Compaction equipment shall be adequately sized and shall be either specifically designed for soil compaction or of proven reliability, to efficiently achieve the specified degree of compaction.

5.4 Fill Slopes: Compaction of slopes shall be accomplished, in addition to normal compacting procedures, by backfilling of slopes with sheepsfoot rollers at frequent increments of 2 to 3 feet in fill elevation gain, or by other methods producing satisfactory results. At the completion of grading, the relative compaction of the slope out to the slope face shall be at least 90 percent.

5.5 Compaction Testing: Field tests to check the fill moisture and degree of compaction will be performed by the consultant. The location and frequency of tests shall be at the consultant's discretion. In general, the tests will be taken at an interval not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of embankment.

6.0 SUBDRAIN INSTALLATION

Subdrain systems, if required, shall be installed in approved ground to conform to the approximate alignment and details shown on the plans or herein. The subdrain location or materials shall not be changed or modified without the approval of the consultant. The consultant, however, may recommend and upon approval, direct changes in subdrain line, grade or material. All subdrains should be surveyed for line and grade after installation, and sufficient time shall be allowed for the surveys, prior to commencement of filling over the subdrains.

7.0 EXCAVATION

Excavation and cut slopes will be examined during grading. If directed by the consultant, further excavation or overexcavation and refilling of cut areas shall be performed, and/or remedial grading of cut slopes shall be performed. Where fill-over-cut slopes are to be graded, unless otherwise approved, the cut portion of the slope shall made and approved by the consultant prior to placement of materials for construction of the fill portion of the slope.

8.0 TRENCH BACKFILLS

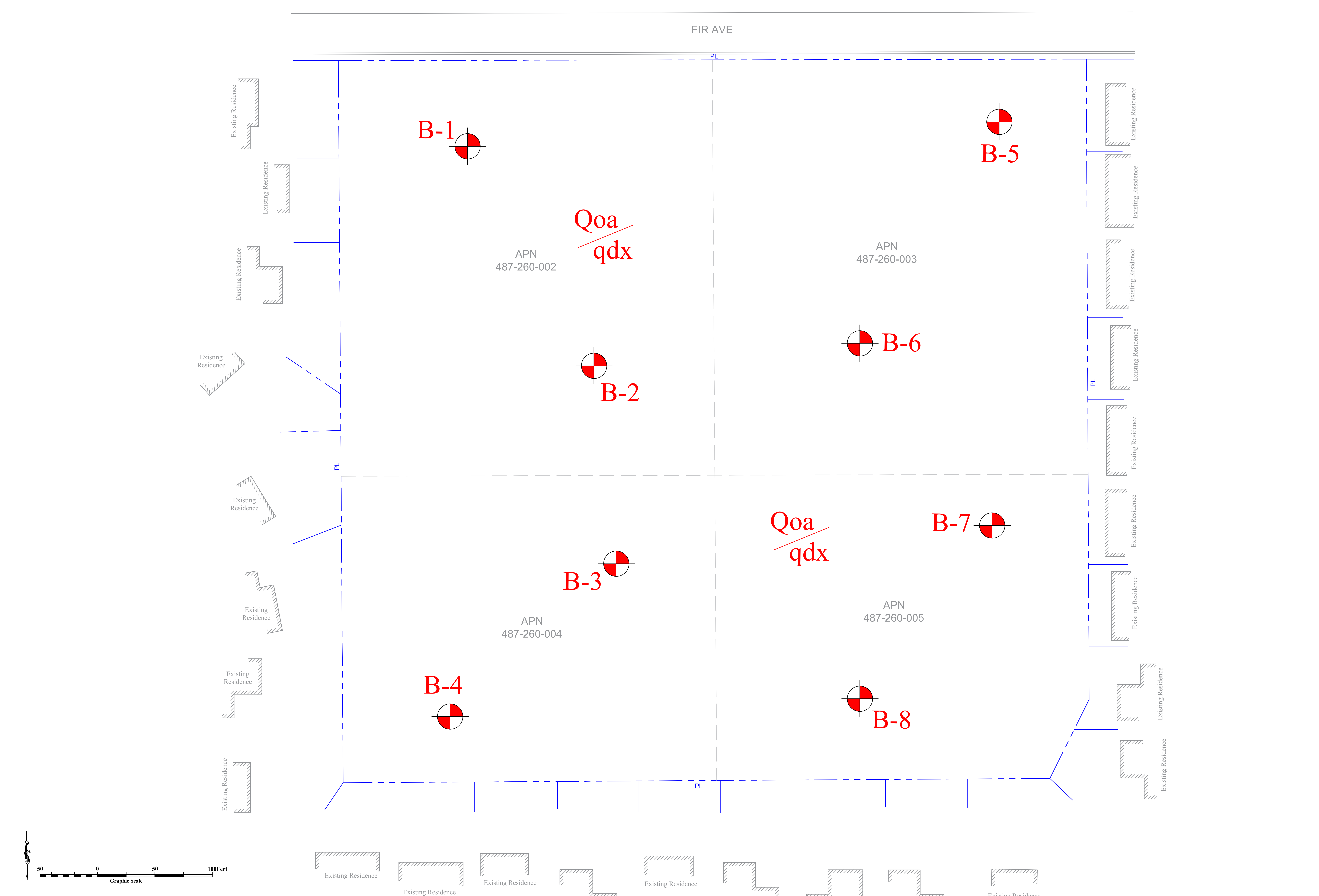
8.1 Supervision: Trench excavations for the utility pipes shall be backfilled under engineering supervision.

8.2 Pipe Zone: After the utility pipe has been laid, the space under and around the pipe shall be backfilled with clean sand or approved granular soil to a depth of at least one foot over the top of the pipe. The sand backfill shall be uniformly jetted into place before the controlled backfill is placed over the sand.

8.3 Fill Placement:'The onsite materials, or other soils approved by the engineer, shall be watered and mixed as necessary prior to placement in lifts over the sand backfill.

8.4 Compaction: The controlled backfill shall be compacted to at least 90 percent of the maximum laboratory density as determined by the ASTM compaction method described above.

8.5 Observation and 'Testing: Field density tests and inspection of the backfill procedures shall be made by the soil engineer during backfilling to see that the proper moisture content and uniform compaction is being maintained. The contractor shall provide test holes and exploratory pits as required by the soil engineer to enable sampling and testing.



LEGEND

(symbol)	Soil Boring Location
Qoa	Older Surficial Sediments
qdx	Plutonic Rocks of Peninsular Ranges

soil PACIFIC Inc.
Geotechnical & Environmental Services
675 N. Eckhoff, Suite # A
Orange, CA 92868

Project Location:
26681 Fir Ave., Moreno Valley, CA
APN 487-260-002/3/4/5

GEOTECHNICAL PLAN

FIGURE-A-1-1	PROJECT NO.:A-8880-21
DATE :12/20/2021	SCALE: 1"=50'