ABI ENGINEERING CONSULTANTS, INC.

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October 25, 2022
Project No. 22056

NOAA Group
4990 North Harbor Drive, Suite 201
San Diego, CA 92106

Attn.: Joseph Holasek

Subject: Preliminary Geotechnical Investigation Report for Proposed Residential Subdivision, 1434 Montiel Rd., Escondido, California

REFERENCES

1. California Building Standards Commission, 2019 CBC.
2. California Geological Survey (CGS). Geologic Map of the Oceanside 30' x60' Quadrangle, compiled by Michael P. Kennedy and Siang S Tan, dated 2007.
3. Structural Engineers Association of California, SEAOC/OSHPD Seismic Design Maps Tool, accessed on 7/21/2022e
4. USGS Earthquake Hazard Program, https://earthquake.usgs.gov/hazards/
5. USGS/California Geological Survey (CGS), Department of Conservation, Fault Activity Map of California, accessed July 21. 2022 at Fault Activity Map of California

Dear Mr. Holasek:

ABI Engineering Consultants, Inc. (ABI) has completed a preliminary geotechnical investigation at the subject site to provide geotechnical recommendations for the proposed residential subdivision project. It is planned to subdivide the lot into 10 residential lots. The proposed subdivision for single-family homes will require site grading for building pads, construction of driveways and access roads, utility installation and stormwater management structures. The site grading is anticipated to require cut and fill, retaining walls with heights up to 10 feet. The project is in the preliminary stages and detailed architectural plans were not available at the time of preparation of this report. The site is served by public sewer and water. The site location is shown on Figure 1, and the site plan is shown on Figure 2.

PURPOSE

The purpose of this investigation was to characterize the subsurface soil conditions at the site and provide geotechnical recommendations for earthwork, foundation design parameters, lateral soil pressure parameters, seismic parameters, and associated site improvements. Percolation tests were also performed to determine the percolation and n

SCOPE OF WORK

The scope of work included the following tasks:

- Literature and map review of the region and vicinity
- Review of site conditions
- Performing drilling and sampling at the site
- Performing laboratory testing of soil samples
- Performing percolation tests
- Engineering analysis, and
- Preparation of this report.

SITE CONDITIONS

The project site is located on west of Via Teramo, approximately 250 feet north of Montiel Road in City of Escondido, California. The subject site is approximately 1.98 acres in a residential neighborhood. The site currently consists of a small single-story building and some shed structures. A number of trees and shrubs exist at the site. The site faces Via Terano Street, with a sliver of parcel at the southeast corner of the parcel extending to Montiel Road.

The site is relatively flat with grades gently from northeast to southwest with approximate elevation of between EL. 698 to 680 feet with respect to mean sea level (msl). An approximately 10- to 25 feet high slope exists beyond the northern boundary of this property.

SUBSURFACE INVESTIGATION

The subsurface conditions beneath the site were explored on June 20, 2022, by drilling seven (7) soil borings labeled as B-1 through B-7 were drilled at the locations shown on Figure 2. The borings were advanced using 6-inch diameter hollow stem flight augers with aid of a truck mounted drill rig. The borings were drilled to depths ranging from 5 feet to 26.5 feet below adjacent ground surface level.

Standard Penetration Test blow counts (SPT-N) were obtained during drilling at approximately 5-foot intervals. Relatively undisturbed soil samples were obtained by driving 3.0-inch outer diameter Modified California Sampler lined with 2.42-inch internal diameter metal rings. Bulk soil samples were collected from drill cuttings. The collected soil samples were stored in plastic containers or bags to retain the natural moisture content. After completion of logging and sampling, the boreholes were backfilled with drill cuttings.

The soils were visually classified in the field in accordance with the Unified Soil Classification System (USCS) in accordance with ASTM D2488/ASTM D2487 standard procedure. The logs of the soil borings are attached. The logs represent our interpretations of the subsurface conditions based on our field observations, a visual examination of samples, and the indicated laboratory tests performed on selected samples. The line designating the interface between various strata on the soil boring log represents the approximate positions of the interface. The actual transition between strata may be gradual. Ground water was not encountered during borings.

PERCOLATION TESTS

Percolation tests were performed at the site to determine the percolation rate of water. The percolation rate will be used for estimating the infiltration rate of the subsurface soils. Percolation tests were performed on June 21, 22. Three percolation tests were performed at borings B-1, B-3 and B-5 to depth of 10 feet below existing grade (bgs). The percolation test holes were 6 inches in diameter. A 6-inch thick layer of gravel was placed at the bottom of each hole. A 3-inch diameter perforated PVC casing was inserted inside test hole. The annular space around the casing was filled with gravel to 12-inch below ground surface (bgs). The test was conducted after pre-soaking was completed. During the test, the drop in water levels with time was recorded at each test location.

The holes were pre-soaked prior to beginning the test. A sounder was used for water level measurements. Using percolation data, infiltration rate in each test hole was calculated using “Porchet Method”. Field testing data and calculations are attached.

GEOTECHNICAL LABORATORY INVESTIGATION

Laboratory tests were performed on collected samples obtained from the boring. Based on the soil type encountered, relevant tests required to provide the geotechnical recommendations were performed in general accordance with applicable ASTM standards. The following tests were performed:

1. In-situ Moisture Content and Density (ASTM D2216 and ASTM D 2937),
2. Particle-Size Distribution using Sieve Analysis (ASTM D 6913),
3. Atterberg Limits (Liquid Limit, Plastic Limit) (ASTM D 4318),
4. Direct Shear Test (ASTM D 3080),
5. R-Value (CA 301), and
6. Sulfate Content (CA 417).

The test results are attached to this report.

SITE GEOLOGY AND SUBSURFACE CONDITIONS

Based on Geologic Map of Oceanside 30’ x 60” Quadrangle, the site and vicinity area are underlain with Pleistocene old alluvial fan deposits, consisting of non-marine gravel, sand, and silts (Kennedy (1999). These deposits overlie weathered Cretaceous crystalline rocks.

During our subsurface investigation, soils encountered underneath the site were predominantly sand and silty sand to the explored depth. The subsurface soils were encountered in layers and in dense to very dense conditions to the maximum explored depth of 25 feet bgs.

Groundwater

Groundwater was encountered at a depth of 22.5 feet (approx. elevation of 668 ft) in a borehole B-7. during our exploration at site. However, seasonal and long-term fluctuations in the groundwater may occur as a result of variations in subsurface conditions, rainfall, run-of conditions, and other factors

GEOLOGIC AND SEISMIC HAZARD EVALUATION

Ground Surface Rupture

The property is not located in an Alquist-Priolo (AP) Special Study Fault Zone. Based on CGS map review, no known active faults are mapped as crossing or projecting towards the site. Major faults near the site are Newport-Inglewood fault, located at the closest distance of about 15.7 miles to the southwest and Elsinore fault located at the closest distance about 15.7 miles at closest distance northeast form the site. Therefore, the possibility of ground surface fault rupture at the site is considered low at this time.

Liquefaction and Seismic Settlement

Liquefaction involves sudden loss in strength of a saturated, cohesionless soil (predominantly sand) caused by the build-up of pore water pressure during cyclic loading, such as that produced by an earthquake. This increase in pore water pressure can temporarily transform the soil into a fluid mass, resulting in vertical settlement and can also cause lateral ground deformations. Typically, liquefaction occurs in areas where there are loose sands and the depth to groundwater is less than 50 feet from the surface. Seismic shaking can also cause soil compaction and ground settlement without liquefaction occurring, including settlement of dry sands above the water table.

The site is not located within a zone of required investigation for liquefaction (CGS maps). The underlying Pleistocene old alluvial fan deposits are not susceptible to liquefaction. The subsurface soils were encountered in dense to very dense conditions during our investigation. Therefore, we are of the opinion that the potential for liquefaction at the site is none.

Slope Stability

Based on review of maps available in CGS webpages, the site is not located in a State of California Earthquake-Induced Landslide Zone. The site is anticipated to be graded to either to eliminate slope or to retain slope with retaining structure within the site. With engineered design of retaining structures and slope, slope instability issues is not anticipated for this project. Any slope if constructed with cut or fill should be engineered per recommendations provided in this report.

Oil Fields

The site is not near to any active oil field, therefore, the potential for oil field gas or hydrocarbon hazard at the site is low.

Flood Hazards

The site does not fall within a 100 or a 500-year FEMA flood zone.

Other Seismic and Geologic Hazards

There are no adjacent bodies of water, and the site is located about 12 miles from the coast and has an elevation about +670 feet. Therefore, the site is not subject tsunamis or seiches. The site is not in a known natural asbestos, volcanic eruption area or within a radon-222 gas zone. Since the site is near a residential area, asbestos from fireproofing, household chemicals, lead from paint, total petroleum hydrocarbons from cars and/or pesticides and herbicides such as arsenic could be present.

Expansion Potential of Soil

Subsurface material is predominantly coarse-grained granular materials with non-plastic fines. Therefore, the subsurface soil is anticipated to be non-expansive.

Soil Corrosivity

Sulfate is an ion that can lead to damage to metallic and concrete structures. The test result performed on on-site soil shows that soluble sulfates on on-site soils range from 208 to 707 ppm8 which indicates that sulfate attack on buried concrete is anticipated to be "moderate". Concrete should be designed in accordance with the 2019 CBC Section 1904 and ACI 318 Section 4. Type II Portland cement may be used for concrete exposed to the native subsurface soils. The water-cement ratio should be 0.50 or less.

CONCLUSIONS

It is our opinion that the proposed development is feasible from geotechnical considerations. The proposed construction will not adversely impact the structures on the property or neighboring properties from a geotechnical perspective provided recommendations provided herein will be implemented during design and construction.

GEOTECHNICAL RECOMMENDATIONS

The following recommendations are based upon geotechnical conditions encountered in our subsurface investigation, laboratory investigation and our engineering analysis and judgement. It is recommended that all during grading and construction be monitored by representative from this firm to verify the findings and recommendations presented in this report. The appropriate changes in design or construction procedures are recommended if subsurface conditions differ from those described herein.

Site Preparation and Earthwork

The construction areas should be cleared of any existing vegetation, debris, disturbed surficial soils, and any deleterious materials that may be present. All demolition debris and tree stumps/roots should be completely removed, and site graded per the recommendations in this section

After clearing the site, the exposed soils should be carefully inspected to verify the removal of all unsuitable deposits. Any unsuitable materials uncovered during grading excavation should be excavated to expose a firm surface or undisturbed natural soils. If soft or "pumping" areas are observed, the area should be excavated beyond the limits of the soft pocket and re-compacted with suitable fill material according to the recommendations presented below in filling and compaction paragraphs.

Exposed soils at the bottom of slab-on-grade and pavement area excavations should be scarified to a depth of at least eight inches, brought close to optimum moisture content, and compacted to at least 90 percent of the maximum dry density determined by Modified Proctor Compaction Test per ASTM D1557 method of compaction

Fill Placement and Compaction

On-site soils are generally considered to be suitable fill materials provided the soils are free of organic material, construction debris, and rocks bigger than 3 inches. All import fill material should be approved by the Geotechnical Engineer prior to importing to the site for use as compacted fill. Import soils shall be non-expansive granular soils.

Any required fills shall be placed in loose lifts not exceeding eight inches thick and compacted to a minimum of 90 percent at of the maximum dry density, at within 3 percent of the optimum moisture content, determined by Modified Proctor Compaction Test per ASTM D1557 test standards. All backfill for utility trenches shall be compacted to 90 percent relative compaction at near optimum moisture content.

The fill surface must be maintained during construction to achieve the recommended compaction. We recommend that the fill surface be sloped to provide drainage and to prevent water from ponding on the fill. If precipitation is expected, fill construction shall be temporarily halted and the surface shall be rolled with a steel drum or rubber-tire roller to improve surface runoff. If the surface soils become excessively wet, fill operations shall be halted and the geotechnical engineer shall be consulted prior to continuing fill operations.

Temporary Excavations

Temporary excavations should be performed in accordance with Occupational Safety and Health Administration (OSHA) requirements. Based on our field investigation, the anticipated subsurface materials are predominantly “Type C Soils”. Any excavations over 5 feet in height shall be sloped back at minimum gradient of 1.5:1 (horizontal to vertical) or be shored or braced for safety and should be protected from erosion during construction. Excavations extending below a 1.5:1 (H: V) plane extending down from any adjacent footings should be shored for safety.

The contractor is solely responsible for site safety during construction. The contractor should be aware of that the excavation height and slope inclination in no case exceed those specified in local, state, and federal safety regulations.

INFILTRATION RATE

Infiltration rate of subsurface soils was estimated using “Porchet Method” utilizing percolation rates obtained from the tests. The lowest calculated infiltration rate at the site is 1.5 inches per hour or 40 minutes per inch. For the design of BMPs for stormwater, it is recommended to apply a factor of safety to the calculated infiltration rate to account for soil inconsistencies, possible compaction during site grading and potential silting of the percolating soils. Infiltration rate can be affected by silt buildup, debris, degree of soil saturation and other factors.

On-site BMPs should be constructed at least 10 feet away from the external side of the building foundation to avoid any subsurface soil saturation underneath the building.

DESIGN RECOMMENDATIONS

Foundation Design

The foundation for the proposed building shall be designed to meet the setback requirement of the 2019 California Building Code. The proposed structures can be supported on a shallow foundation system established on competent native soil or certified compacted fill. The shallow foundations consisting of continuous strip footings and/or isolated spread footings may be designed to impose a net dead plus live load pressure of 2,500 pounds per square foot (psf). The allowable bearing capacity may be increased by one-third for short-term live loads (e.g. seismic and wind loads). The bottoms of the footings should be embedded below the lowest adjacent grade or floor level to a minimum of 18 inches for exterior footings as well as interior footings. The width of strip footings should be at least 12 inches. Isolated spread footings should have a minimum width of 2 feet. The

Steel reinforcement for footing should be designed by the structural engineer. Minimum reinforcement should be of 4 #4 bars, 2 at top and 2 at bottom in exterior and interior footings.

The foundation excavations should be observed by qualified special inspection personnel to verify that the excavations are clean, and that the bearing fill soils or subgrade have not been disturbed. In cases where the bearing soils have been disturbed during excavation or have become overly dry due to having been left open for extended periods, the bearing soils should be reconditioned and re-compacted.

Settlement

The total static settlement of spread and continuous footings, established as recommended, is anticipated to be on the order of 1 inch or less with maximum differential settlements on the order of 1/2 inch over horizontal distance of 30 feet. However, the potential for additional differential settlement due to soil consolidation exists if the soils below the zone of excavation become saturated.

CONCRETE SLABS-ON-GRADE

Design of the slab-on-grade supported on firm and non-yielding subgrade (compacted fill soils) may be designed based on a modulus of subgrade reaction of 150 pounds per cubic inch. Structural elements such as thickness, reinforcement, joint spacing should be selected based on the anticipated loading, the modulus of subgrade reaction, and minimum geotechnical requirement recommended as following.

The interior and exterior concrete slabs-on-grade should have a minimum thickness of 4 inches and be reinforced with #4 reinforcing bars placed at 18 inches on-center each way. It is recommended that a minimum 4-inch-thick layer of granular material underlie the concrete pavement. This base layer should be compacted and should exhibit a firm and unyielding condition prior to concrete placement.

For interior slab with moisture sensitive floor covering, and to limit moisture infiltration and seepage through concrete slabs, a synthetic moisture barrier is recommended. A 15-mil thick polyethylene sheeting overlapped a minimum of 6 inches at seams is acceptable. The polyethylene sheet shall be protected from tears and rupture during the placement of rebar and formwork for concrete, by placing a 2-inch layer of sand above the synthetic barrier. The concrete slab should be allowed to cure properly before placing vinyl or another moisture-sensitive floor covering.

LATERAL RESISTANCE

Lateral loads may be resisted by soil friction on the footings and by the passive resistance of the soils. A coefficient of friction of 0.35 may be used between the footings and the supporting soils. The allowable lateral bearing earth pressure (passive resistance) may be computed as an equivalent fluid having a density of 300 psf per foot of depth, to a maximum earth pressure of 3,000 psf. Passive resistance shall not be considered for the upper 12 inches of soil. A one-third reduction in the passive value may be combined with the frictional resistance without reduction in determining the total lateral resistance.

LATERAL EARTH PRESSURE PARAMETERS

Assumption that typical granular compacted fill will be used as structural backfill materials, the lateral pressures can be calculated based on densities expressed as Equivalent Fluid Pressures (EFP). These values should be verified once the material has been selected and may be altered based on the gradation of the actual material to be used for the construction.

At rest pressure and active pressure should be used in the design of non-yielding and yielding walls respectively.

Table 2: Lateral Earth Pressure Parameters

Parameter	Level Backfill	Slope (2H:1V) Backfill
Active pressure (EFP)	35 pcf	45 pcf
At rest pressure (EFP)	50 pcf	70 pcf

RETAINING WALL DESIGN CRITERIA

Recommendations presented herein may apply to typical masonry or concrete vertical retaining walls to a maximum height of 12 feet. Additional review and recommendations should be requested for higher walls. A minimum foundation width of 18 inches should be used. Retaining walls should be adequately designed to resist the lateral soil pressures, adjacent structure loadings, anticipated construction loadings and service conditions. The earth pressure acting on retaining walls depends primarily on allowable wall movement, backfill material types, backfill slopes, wall inclination, surcharges, and hydrostatic pressure.

The lateral earth pressure load recommended above shall be used for design of retaining structures. The surcharge effects of any adjacent loading conditions (eg. structures, slopes, traffic loads, floor loads, etc.) should be included in retaining walls design, as appropriate. Lateral resistance provided by soil shall be taken as per recommended value in paragraph "Lateral Resistance" above.

For retaining height exceeding 6 feet, the seismically induced earth pressures should be applied in addition to the static lateral earth pressures and should be considered in combination with the static lateral pressures. For simplified analysis, an additional seismically induced earth load of $12H^2$ for level backfill and $21H^2$ for sloping backfill not steeper than 2H:1V gradient is recommended. The seismic load would act at 0.33H above the base of wall, where H is retaining height of wall.

Sub-drains should be provided in the wall backfill or weep holes/slits and they should be installed at the base of retaining walls, where feasible. At a minimum, sub-drains should consist of 4-inch diameter, perforated Schedule 40 PVC pipe or equivalent, embedded in approximately 1 cubic feet per lineal foot of permeable material meeting the State of California Standard Specification Section 68-1.025, Class 1, Type A, or equivalent. This permeable material should be enveloped in Supac 5NP geotextile fabric filter fabric or equivalent. The pipe should be located approximately 6 inches above the footing, and the pipe and trench bottom should be sloped at a minimum gradient of 1 percent to a suitable discharge outlet.

SEGMENTAL BLOCK RETAINING WALLS/REINFORCED SLOPE

Segmental Block Retaining Walls or Mechanically Stabilized Earth (MSE) walls may be designed using the following soils parameters, provided additional testing during construction confirms that he foundation, retained and backfill soils have minimum angle of internal friction recommended below.

Table 3: Segmental Block Retaining Walls Design Parameters

Soil Parameters	Foundation Soils and Retained Soils	Reinforced Fill (Imported or onsite Soil)
Internal Friction Angle, Ø °	32	32
Cohesion, C (psf)	0	0
Soil Unit Weight, γ (pcf)	125	125

Based on the site location, a seismic peak acceleration coefficient of 0.47g is recommended for the wall design.

During construction of the walls, the backfill shall be compacted to minimum 90% of the maximum dry density determined using Modified Proctor Compaction Test (ASTM D1557). The embedment of the wall shall be a minimum of 6 inches below-grade for level grade at the base of the wall, or shall be to sufficient depth that results in 5-feet to daylight at the base of the wall. The leveling pad consisting of crushed rock shall be placed to a minimum depth of 6 inches below the base of the wall. The wall shall be designed to have a subdrain at the base of the wall. Area drains for surface water drainage shall be installed the top of the walls to drain surface water away from the wall to minimize saturation of wall backfill.

SEISMIC DESIGN PARAMETERS

Seismically resistant structural design in accordance with local building ordinances shall be followed during the design of all structures. Building Codes have been developed to reduce the potential for structural damage. However, some level of damage as the result of ground shaking generated by nearby earthquakes is considered likely in the general area. Following table provides the most recent seismic coefficients and seismic data in accordance with requirements included in the 2013 California Building Code of Regulations:

Seismically resistant structural design in accordance with local building ordinances should be followed during the design of all structures. Based on site subsurface conditions, the site is classified as Site Class D: stiff soil. The following table summarizes site-specific design parameters obtained from computer based SEAOC/OSHPD Seismic Design Maps Tool

Table 4: Seismic Design Parameters

Parameter	Value
Site Class	D
Mapped Spectral Response Acceleration-Short Period (0.2 Sec), (S_S)	0.898 g
Mapped Spectral Response Acceleration-1 Second Period, (S_1)	0.329 g
Adjusted Spectral Response Acceleration @ 0.2 Sec. Period, (S_{MS})	1.783 g
Adjusted Spectral Response Acceleration @ 1Sec.Period, (S_{M1})	0.979 g
Design Spectral Response Acceleration @ 0.2 Sec. Period, (S_{DS})	1.188 g
Design Spectral Response Acceleration @ 1-Sec. Period, (S_{D1})	0.652 g
Site Specific Peak Ground Acceleration (PGA_M), per ASCE 7-10	0.47 g

Conformance to the criteria in the table above for seismic design does not constitute any guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life and not to avoid all damage, as such design may be economically prohibitive.

ASPHALT CONCRETE (FLEXIBLE) PAVEMENT

For design of asphalt concrete pavement, R-value of 50 for subgrade soils and an R-Value of 78 for the aggregate were used. The recommended asphalt pavement sections for various traffic indices (TIs) are presented in the table below. Appropriate traffic index (TI) should be selected by the project civil engineer.

Table 5: Asphalt Pavement Design

Traffic Index	Minimum Asphalt Thickness (in.)	Minimum Base Course Thickness (in.)
4	2.5	6
5	3.0	6
6	3.5	6
7	4.0	6

Prior to placing the base materials, the upper 12 inches of the subgrade soil should be scarified, moisture conditioned as necessary, and recompacted to a minimum 95 percent of maximum dry density determined per Modified Proctor Compaction test (ASTM D1557) at near optimum moisture content (per ASTM D1557). Base course material shall consist of ¾ inch Class 2 AB or equivalent and should be compacted to a minimum of 95 percent relative compaction (per ASTM D 1557).

Subgrade soil in the upper 12" of the driveways and parking areas should be compacted to 90 percent relative compaction. Base course material shall consist of ¾ inch Aggregate base, Class 2 material or equivalent and should be compacted to a minimum of 95 percent of the maximum value obtained from ASTM D1557 test method

UTILITY TRENCHES

Any soft and/or unstable material encountered at the bottom of excavations for such facilities should be removed and be replaced with an adequate bedding material. The on-site soils, if free of any particles greater than 3 inches, may be used for bedding or shading of utilities and piping. A non-expansive granular material with a sand equivalent greater than 30 may be imported for this purpose.

The on-site soils are suitable for backfill of utility and pipe trenches from one foot above the top of the pipe to the final ground surface, provided the material is free of organic matter and deleterious substances, and non-granular expansive soils. Trench backfill should be mechanically placed and compacted in thin lifts to at least 90 percent of the maximum dry density as determined by ASTM Test Method D1557. Flooding or jetting for placement and compaction of backfill is not recommended.

SITE GRADING FOR SURFACE DRAINAGE

Proper site drainage is critical to reduce the potential for differential soil movement, soil expansion, erosion, and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to building foundations. We recommend that the site should be graded in accordance with the 2013 CBC or other applicable standards and maintained such that positive drainage should be established away from structures.

We recommend all roofs should be guttered and discharge away from the structure in a non-erosive manner. It is recommended that trees should not be planted a minimum of one half their anticipated mature height from a footing. Alternatively, all planters adjacent to footings should be sealed.

Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. If water is allowed to infiltrate the subgrade soil, differential soil movement and expansion could occur.

LID BMP CONSTRUCTION

For LID BMP design, results of measured infiltration tests are presented in attached Percolation Test Data. It is advised to use appropriate factor of safety to determine the design infiltration rate. Infiltration BMP shall be setback from property lines, public right-of-way, building foundations per applicable setback requirements presented below:

1. The invert of LID infiltration BMP shall be set back at least 15 feet, and outside a 1:1 plane drawn up from the bottom of adjacent foundations.
2. LID infiltration BMP shall not be located near utility lines where the introduction of stormwater could cause damage to utilities or settlement of trench backfill.

CONSTRUCTION OBSERVATION

The firm should also be retained to perform on-site construction observations and testing to ascertain those conditions correspond to the findings and conclusions presented herein and that construction generally conforms to the recommendations presented herein. If variations in subsurface soil conditions become evident during construction, the recommendations presented herein may warrant a revision. The geotechnical and geological consultants should be called for testing and observations as indicated in this report and at least for the following:

1. All excavation bottoms should be observed by a geotechnical representative prior to fill placement.
2. Structural fill and backfill should be placed and compacted during continuous observation and testing. For fill soils placed on the site, we recommend that a minimum of one in-place field density test be conducted for every foot of compacted layer placed.
3. Observation and testing of utility trenches beneath and adjacent to structures.
4. Observation of the sand and vapor barrier placement prior to placement of reinforcement and concrete.

Please notify this office 48 hours in advance of any required sampling or observations, so that the appropriate personnel can be made available.

LIMITATIONS

The recommendations provided in this report are based on our understanding of the subject property to, and on our interpretation of the data collected. We have made our recommendations based on experience with similar subsurface conditions under similar development conditions. These recommendations apply to the project specifically discussed in this report; therefore, any changes in load conditions or site grades should be provided to us so that we may review our conclusions and recommendations and make any necessary modifications. Our professional services have been performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in this or similar localities. No other warranty, expressed or implied, is made as to the professional advice included in this report. The report has not been prepared for use by other parties and may not contain sufficient information for purposes of other parties or other uses.

If you have any questions on this letter report, please feel free to contact me at (888) 220-5596.

Sincerely,
ABI Engineering Consultants, Inc.

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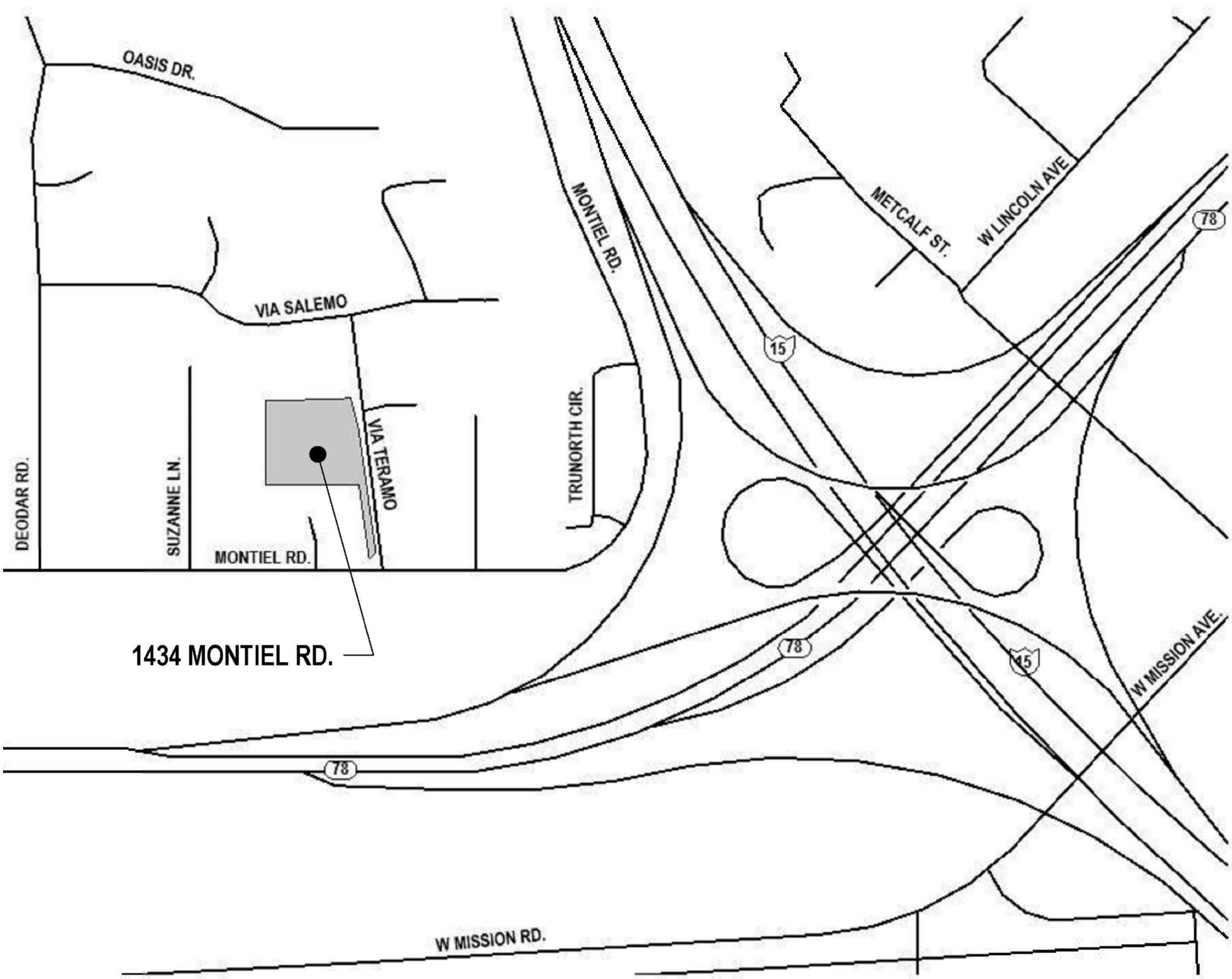
Daya Bettadapura, P.E.
Principal Engineer

Jimmy Wang, P.E.
Sr. Project Engineer

Attachments:

Figure 1 – Site Vicinity Map
Figure 2 – Site Plan
Figure 3 – Regional Geology Map
Figure 4 – Seismic Hazards Map
Figure 5 – Site Plan: Geology Map
Figure 5A – Geologic Cross Section
Boring Logs
Laboratory Test Results
Percolation Test Reports

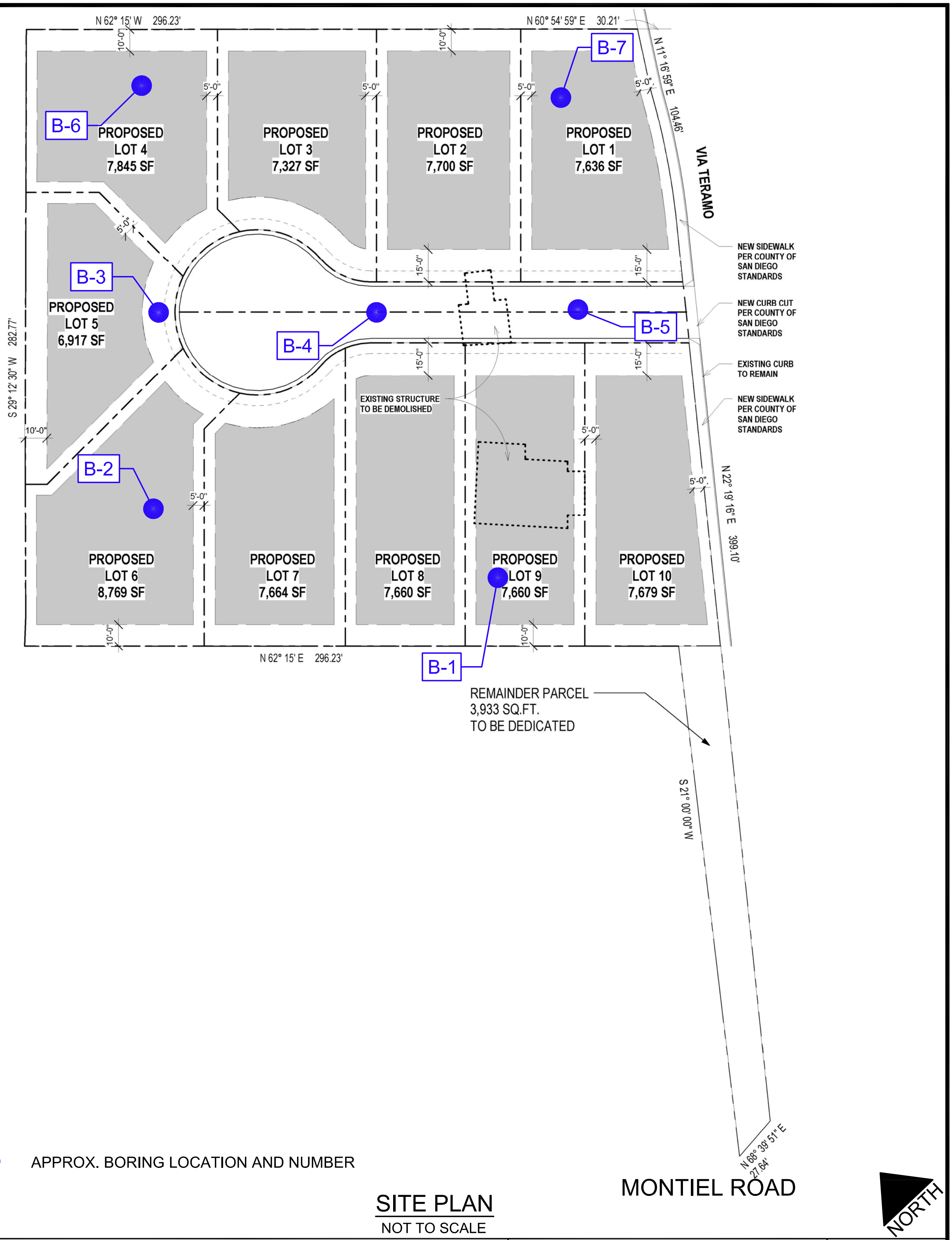


SITE VICINITY MAP

NOT TO SCALE

NORTH

PROJECT:	1434 MONTIEL ROAD ESCONDIDO, CA 92026	ABI ENGINEERING CONSULTANTS, INC. 1701 EAST EDINGER AVENUE, SUITE A9 SANTA ANA, CALIFORNIA 92705 TEL: (888) 220-5596 FAX: (714) 866-4171	FIGURE 1
PROJECT NO:	22056		



LEGEND

B-X — APPROX. BORING LOCATION AND NUMBER

SITE PLAN

NOT TO SCALE

PROJECT:	1434 MONTIEL ROAD ESCONDIDO, CA 92026	ABI ENGINEERING CONSULTANTS, INC. 1701 EAST EDINGER AVENUE, SUITE A9 SANTA ANA, CALIFORNIA 92705 TEL: (888) 220-5596 FAX: (714) 866-4171	FIGURE 2
PROJECT NO:	22056		

Project: **Montiel Road Subdivision**	# Log of Boring B-1
Project Location: **1434 Montiel Road Escondido, CA**	**Sheet 1 of 1**
Project Number: **22056**	

Date(s) Drilled **06/20/22**	Logged By **JCW**	Checked By **DB**
Drilling Method **8" USA**	Drill Bit Size/Type **8"**	Total Depth of Borehole **11.5 feet bgs**
Drill Rig Type **Mobile B-53**	Drilling Contractor **CAL PAC**	Approximate Surface Elevation **N/A**
Groundwater Level and Date Measured **Not Encountered**	Sampling Method(s) **Cal-Mod, SPT, Bulk**	Hammer Data **N/A**
Borehole Backfill	Location **33.129820 N 117.109620 W**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Percent Fines	LL, %	PI, %	REMARKS AND OTHER TESTS
	0		B1 @0-5		SM		Silty SAND, Brown, Moist, Medium Dense, Fine to Medium Grained						
			B1@2.5	7 11 15				5.5	119.3				
	5		B1@5	17 26 50-5"	SM		Silty SAND, Brown, Moist, Very Dense, Fine to Medium Grained						
					SC		Becomes Clayey SAND, Moist, Brown, Very Dense						
	10		B1@10	6 50-3"	SC		Becomes Clayey SAND, Moist, Brown, Very Dense, Coarse,						
							Bottom of Boring						
	15												
	20												
	25												
	30												

Project: **Montiel Road Subdivision** Project Location: **1434 Montiel Road Escondido, CA** Project Number: **22056**	Log of Boring B-2 **Sheet 1 of 1**

Date(s) Drilled **06/20/22**	Logged By **JCW**	Checked By **DB**
Drilling Method **8" USA**	Drill Bit Size/Type **8"**	Total Depth of Borehole **12 feet bgs**
Drill Rig Type **Mobile B-53**	Drilling Contractor **CAL PAC**	Approximate Surface Elevation **N/A**
Groundwater Level and Date Measured **Not Encountered**	Sampling Method(s) **Cal-Mod, SPT, Bulk**	Hammer Data **N/A**
Borehole Backfill	Location **33.130010 N 117.110070 W**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Percent Fines	LL, %	PI, %	REMARKS AND OTHER TESTS
	0		B2 @0-5		SM		Silty SAND, Brown, Moist, Medium Dense, Fine to Medium Grained			18.3	24	7	
			B2@2.5	8 11 50-4"									
	5		B2@5	8 10 10									
					SM		Becomes Silty SAND, Brown, Moist, Medium Dense, Fine to Medium Grained w/Rocks						
	10		B2@10	7 9 12				5.6	112.3				
					SM		Terminate Boring Due to Refusal						
	15												
	20												
	25												
	30												

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ABI ENGINEERING CONSULTANTS, INC.

Project: **Montiel Road Subdivision** Project Location: **1434 Montiel Road Escondido, CA** Project Number: **22056**	Log of Boring B-3 **Sheet 1 of 1**

Date(s) Drilled **06/20/22**	Logged By **JCW**	Checked By **DB**
Drilling Method **8" USA**	Drill Bit Size/Type **8"**	Total Depth of Borehole **6 feet bgs**
Drill Rig Type **Mobile B-53**	Drilling Contractor **CAL PAC**	Approximate Surface Elevation **N/A**
Groundwater Level and Date Measured **Not Encountered**	Sampling Method(s) **Cal-Mod, SPT, Bulk**	Hammer Data **N/A**
Borehole Backfill	Location **33.130170 N 117.110020 W**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Percent Fines	LL, %	PI, %	REMARKS AND OTHER TESTS
	0		B3 @0-5		SM		Silty SAND, Brown, Moist, Medium Dense, Fine to Medium Grained						
			B3@2.5	11 14 16	SM		Silty SAND, Brown, Moist, Medium Dense, Fine to Medium Grained						
	5		B3@5	10 12 50-4"	SM		Silty SAND, Brown, Moist, Very Dense, Fine to Medium Grained	3.6	115.5				
							Terminate Boring Due to Refusal						
	10												
	15												
	20												
	25												
	30												

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Project: **Montiel Road Subdivision**	Log of Boring B-4
Project Location: **1434 Montiel Road Escondido, CA**	**Sheet 1 of 1**
Project Number: **22056**	

Date(s) Drilled **06/20/22**	Logged By **JCW**	Checked By **DB**
Drilling Method **8" USA**	Drill Bit Size/Type **8"**	Total Depth of Borehole **15 feet bgs**
Drill Rig Type **Mobile B-53**	Drilling Contractor **CAL PAC**	Approximate Surface Elevation **N/A**
Groundwater Level and Date Measured **Not Encountered**	Sampling Method(s) **Cal-Mod, SPT, Bulk**	Hammer Data **N/A**
Borehole Backfill	Location **33.130110 N 117.109800 W**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Percent Fines	LL, %	PI, %	REMARKS AND OTHER TESTS
	0		B4 @0-5		SM		SAND w/Silt, Brown, Moist, Medium Dense, Fine to Medium Grained			21.1			
			B4@2.5	4 6 7	SM		SAND w/Silt, Brown, Moist, Medium Dense, Fine to Medium Grained						
	5		B4@5	5 4 5									
	10		B4@10	9 22 50-5"	SM		SAND w/Silt, Brown, Moist, Very Dense, Fine to Medium Grained						
	15		B4@15	50-1"	SW		SAND, Brown, Wet, Very Dense, Fine to Medium Grained						
							Bottom of Boring						
	20												
	25												
	30												

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Project: **Montiel Road Subdivision**	Log of Boring B-5
Project Location: **1434 Montiel Road Escondido, CA**	**Sheet 1 of 1**
Project Number: **22056**	

Date(s) Drilled **06/20/22**	Logged By **JCW**	Checked By **DB**
Drilling Method **8" USA**	Drill Bit Size/Type **8"**	Total Depth of Borehole **10 feet bgs**
Drill Rig Type **Mobile B-53**	Drilling Contractor **CAL PAC**	Approximate Surface Elevation **N/A**
Groundwater Level and Date Measured **Not Encountered**	Sampling Method(s) **Cal-Mod, SPT, Bulk**	Hammer Data **N/A**
Borehole Backfill	Location **33.129830 N 117.109260 W**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Percent Fines	LL, %	PI, %	REMARKS AND OTHER TESTS
	0		B5 @0-5		SM		Silty SAND, Brown, Moist, Medium Dense, Fine to Medium Grained						
			B5@2.5	8 10 14									
	5		B5@5	17 24 26	SC		Clayey SAND, Brown, Moist, Dense, Fine to Medium Grained	9.1	115.4	27			
	10		B5@10	4 7 9	SC		Clayey SAND, Brown, Moist, Medium, Dense, Fine to Medium Grained						
							Bottom of Boring						
	15												
	20												
	25												
	30												

Project: **Montiel Road Subdivision**	Log of Boring B-6
Project Location: **1434 Montiel Road Escondido, CA**	**Sheet 1 of 1**
Project Number: **22056**	

Date(s) Drilled **06/20/22**	Logged By **JCW**	Checked By **DB**
Drilling Method **8" USA**	Drill Bit Size/Type **8"**	Total Depth of Borehole **11 feet bgs**
Drill Rig Type **Mobile B-53**	Drilling Contractor **CAL PAC**	Approximate Surface Elevation **N/A**
Groundwater Level and Date Measured **Not Encountered**	Sampling Method(s) **Cal-Mod, SPT, Bulk**	Hammer Data **N/A**
Borehole Backfill	Location **33.130370 N 117.109800 W**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Percent Fines	LL, %	PI, %	REMARKS AND OTHER TESTS
	0		B6 @0-5		SM		Silty SAND, Brown, Moist, Very Dense, Fine to Medium Grained						
			B6@2.5	6 12 50-5"									
	5		B6@5	50-6"	SM		Partial Recovery 5"	2.8	102.9				
					SW		SAND, Tan, Moist, Very Dense, Fine to Medium Grained						
	10		B6@10	50-5"									
							Terminate Boring Due to Refusal						
	15												
	20												
	25												
	30												

Project: **Montiel Road Subdivision** Project Location: **1434 Montiel Road Escondido, CA** Project Number: **22056**	Log of Boring B-7 **Sheet 1 of 1**

Date(s) Drilled **06/20/22**	Logged By **JCW**	Checked By **DB**
Drilling Method **8" USA**	Drill Bit Size/Type **8"**	Total Depth of Borehole **25 feet bgs**
Drill Rig Type **Mobile B-53**	Drilling Contractor **CAL PAC**	Approximate Surface Elevation **N/A**
Groundwater Level and Date Measured **@ 22.5'**	Sampling Method(s) **Cal-Mod, SPT, Bulk**	Hammer Data **N/A**
Borehole Backfill	Location **33.130280 N 117.109280 W**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Percent Fines	LL, %	PI, %	REMARKS AND OTHER TESTS
	0		B7 @0-5		SM		Silty SAND, Tan, Dry to Moist, Medium Dense, Fine to Medium Grained						
			B7@2.5	9 12 16									
	5		B7@5	50-2"	SM		Silty SAND, Tan, Dry to Moist, Very Dense, Fine to Medium Grained	3.5	95.6				
	10		B7@10	50-4"	SM		Silty SAND, Tan, Moist, Medium Dense, Fine to Medium Grained						
	15		B7@15	50-1"	SM		Silty SAND, Tan, Moist, Medium Dense, Fine to Medium Grained						
	20		B7@20	50-5"	SM		Silty SAND, Tan, Moist, Medium Dense, Fine to Medium Grained						
							Water						
	25						Bottom of Boring/No Recovery						
	30												

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ABI ENGINEERING CONSULTANTS, INC.

Project: **Montiel Road Subdivision**
Project Location: **1434 Montiel Road Escondido, CA**
Project Number: **22056**

Key to Log of Boring

Sheet 1 of 1

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Percent Fines	LL, %	PI, %	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8	9	10	11	12	13	14

COLUMN DESCRIPTIONS

1 Elevation (feet): Elevation (MSL, feet).
2 Depth (feet): Depth in feet below the ground surface.
3 Sample Type: Type of soil sample collected at the depth interval shown.
4 Sample Number: Sample identification number.
5 Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
6 Material Type: Type of material encountered.
7 Graphic Log: Graphic depiction of the subsurface material encountered.
8 MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
9 Water Content, %: Water content of the soil sample, expressed as percentage of dry weight of sample.
10 Dry Unit Weight, pcf: Dry weight per unit volume of soil sample measured in laboratory, in pounds per cubic foot.
11 Percent Fines: The percent fines (soil passing the No. 200 Sieve) in the sample. WA indicates a Wash Sieve, SA indicates a Sieve Analysis.
12 LL, %: Liquid Limit, expressed as a water content.
13 PI, %: Plasticity Index, expressed as a water content.
14 REMARKS AND OTHER TESTS: Comments and observations regarding drilling or sampling made by driller or field personnel.

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS

Clayey SAND (SC)
Silty SAND (SM)
Well graded SAND (SW)

TYPICAL SAMPLER GRAPHIC SYMBOLS

Auger sampler
Bulk Sample
3-inch-OD California w/ brass rings
CME Sampler
Grab Sample
2.5-inch-OD Modified California w/ brass liners
Pitcher Sample
2-inch-OD unlined split spoon (SPT)
Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

Water level (at time of drilling, ATD)
Water level (after waiting)
Minor change in material properties within a stratum
Inferred/gradational contact between strata
? Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

MOISTURE AND DENSITY TEST RESULTS

Project Name: Montiel Rd Subdivision
Project No.: 22056
Location: 1424 Montiel Rd, Escondino, CA

Tested By: DW
Checked By: DB
Report Date: 7/18/2022

Boring Number	Depth (ft.)	Sample Type*	Moisture Content (%)	Dry Density (pcf)
B-1	2.5	Cal-Mod	5.5	119.3
B-2	10	Cal-Mod	5.6	112.3
B-3	5	Cal-Mod	3.6	115.5
B-5	5	Cal-Mod	9.1	115.4
* B-6	5	Cal-Mod	2.8	102.9
B-7	5	Cal-Mod	3.5	95.6

Note:
Cal-Mod: California Modified Sampler

ABI ENGINEERING CONSULTANTS, INC.

GRADATION OF SOILS USING SIEVE ANALYSIS

(ASTM D 6913)

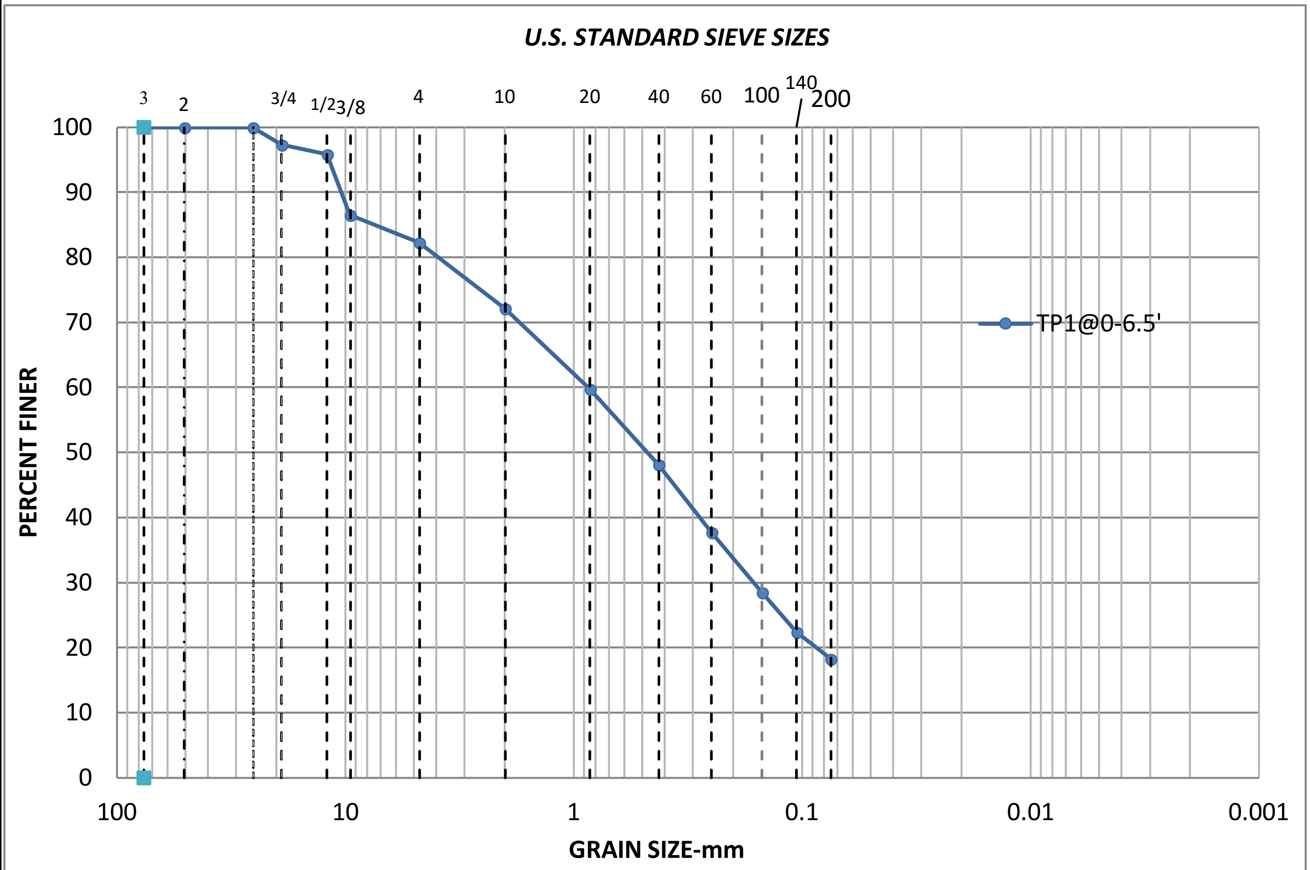
Project:	Montiel Rd Subdivision	Tested By:	DW
Project No.:	22056	Checked By:	JR
Location:	1424 Montiel Rd, Escondino, CA	Date:	7/15/2022

Boring No: B-2 Depth (ft) : 0-5

Sample ID/No.: B2@0-5

Soil Description (Visual): Silty SAND (SM)

GRAVEL		SAND			FINES (SILT AND CLAY)
COARSE	FINE	COARSE	MEDIUM	FINE	



Percent Distribution

Sieve Designation	Percent Passing
3"	100.0
0.75"	97.3
#4	82.3
#20	72.1
#40	48.2
#60	37.7
#200	18.3

Percent Distribution

	Coarse	Medium	Fine	Total
Gravel	2.7	-	15.1	17.7
Sand	10.1	23.9	29.9	64.0
Fines	18.3			

ABI ENGINEERING CONSULTANTS, INC.

GRADATION OF SOILS USING SIEVE ANALYSIS

(ASTM D 6913)

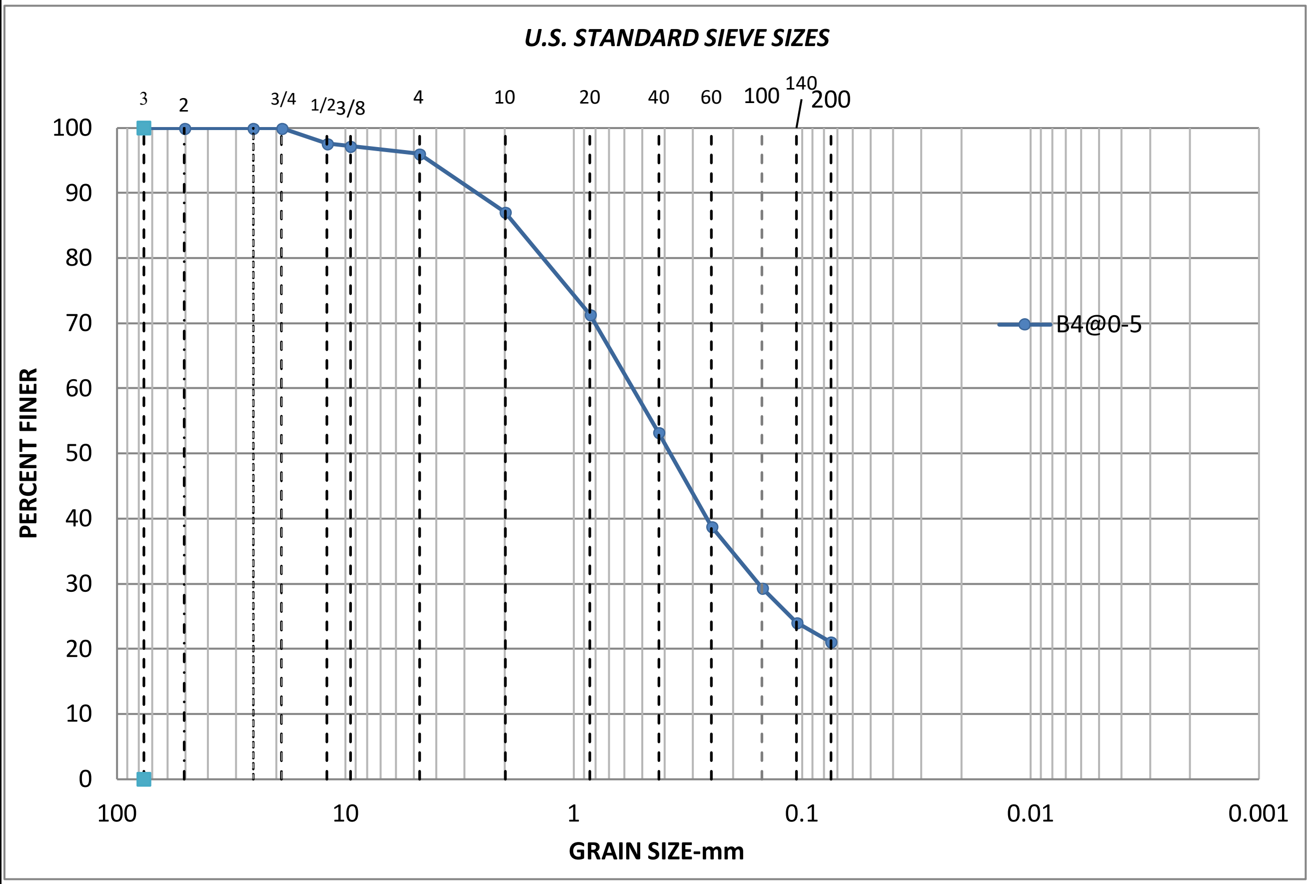
Project: Montiel Rd Subdivision
Project No.: 22056
Location: 1424 Montiel Rd, Escondino, CA

Tested By: DW
Checked By: JR
Date: 7/15/2022

Boring No: B-4 Depth (ft) : 0-5
Sample ID/No.: B4@0-5

Soil Description (Visual): Silty SAND (SM)

GRAVEL		*SAND*			*FINES (SILT AND CLAY)*
COARSE	*FINE*	*COARSE*	*MEDIUM*	*FINE*	



Percent Distribution

Sieve Designation	Percent Passing
3"	100.0
0.75"	100.0
#4	96.1
#20	87.1
#40	53.3
#60	38.8
#200	21.1

Percent Distribution

	Coarse	Medium	Fine	Total
Gravel	0.0	-	3.9	3.9
Sand	9.0	33.8	32.2	75.0
Fines	21.1			

ABI ENGINEERING CONSULTANTS, INC.

GRADATION OF SOILS USING SIEVE ANALYSIS

(ASTM D 6913)

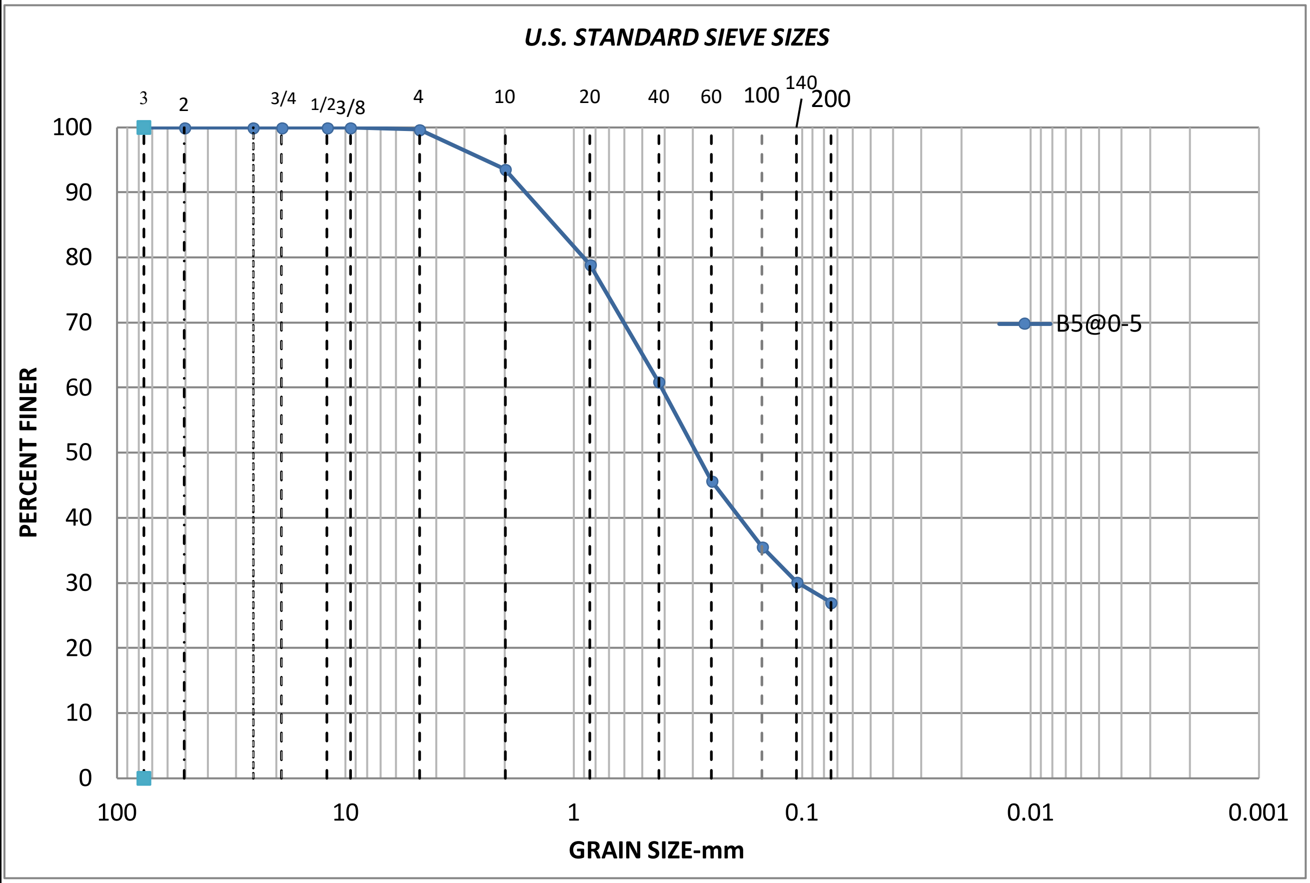
Project: Montiel Rd Subdivision
Project No.: 22056
Location: 1424 Montiel Rd, Escondino, CA

Tested By: DW
Checked By: JR
Date: 7/15/2022

Boring No: B-5 Depth (ft) : 0-5
Sample ID/No.: B5@0-5

Soil Description (Visual): Silty SAND (SM)

GRAVEL		SAND			FINES (SILT AND CLAY)
COARSE	FINE	COARSE	MEDIUM	FINE	



Percent Distribution

Sieve Designation	Percent Passing
3"	100.0
0.75"	100.0
#4	99.6
#20	93.5
#40	60.9
#60	45.7
#200	27.0

Percent Distribution

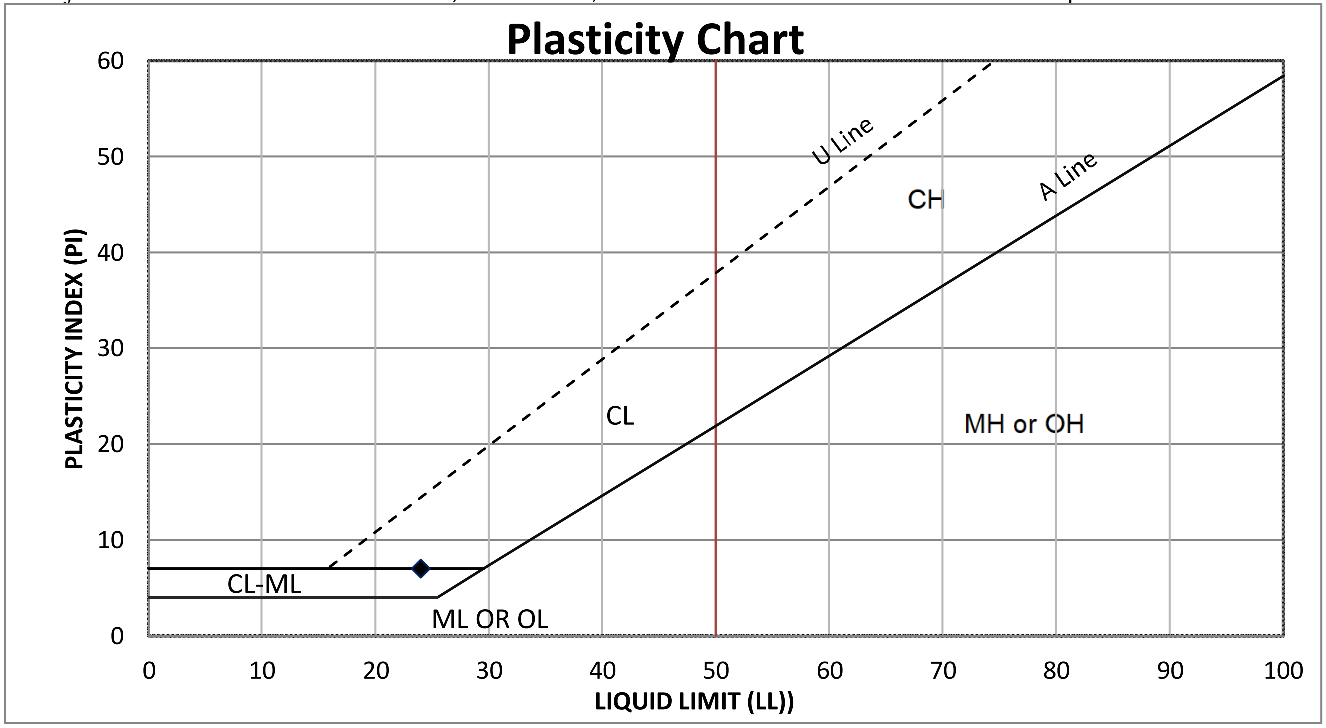
	Coarse	Medium	Fine	Total
Gravel	0.0	-	0.4	0.4
Sand	6.1	32.6	33.9	72.6
Fines	27.0			

ABI ENGINEERING CONSULTANTS, INC.

LIQUID LIMIT, PLASTIC LIMIT TEST

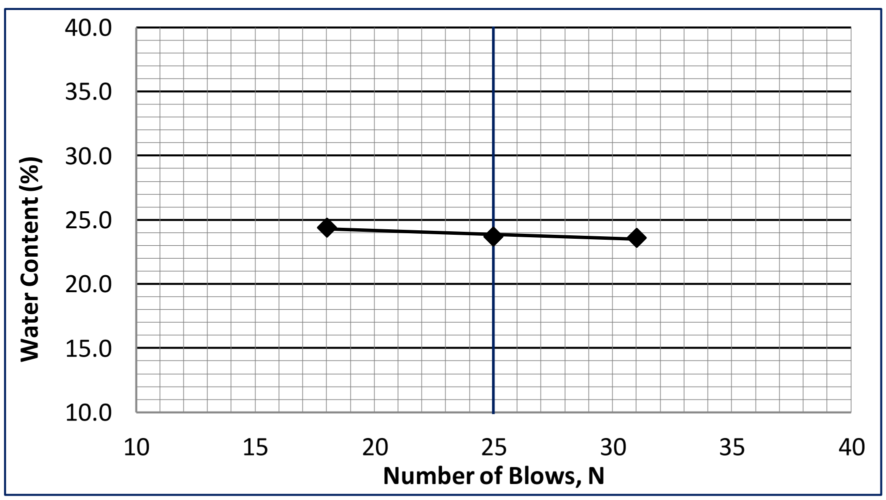
(ASTM D 4318)

Project Name:	Montiel Rd Subdivision	Tested By:	DW
Project No.:	22056	Checked By:	JR
Project Location:	1424 Montiel Rd, Escondino, CA	Report Date:	7/18/2022



PROCEDURE USED

X	Wet preparation
	Dry preparation
X	Manual liquid limit device
	Mechanical liquid limit device
X	Method A: Multipoint
	Method B: 1-Point
X	Hand rolled
	Mechanical rolled
X	Flat grooving tool
	Curve grooving tool



Symbol	Boring Number	Depth (ft.)	Sample ID/#	As received water content (w)	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Plasticity Chart Symbol
◆	B-2	0-5	B-2@0-5		24	17	7	CL-ML
	B-4	0-5	B-4@0-5		Non-Plastic			ML
	B-5	0-5	B-5@0-5		Non-Plastic			ML

Note:

ABI ENGINEERING CONSULTANTS, INC.

DIRECT SHEAR TEST RESULTS

(ASTM D 3080)

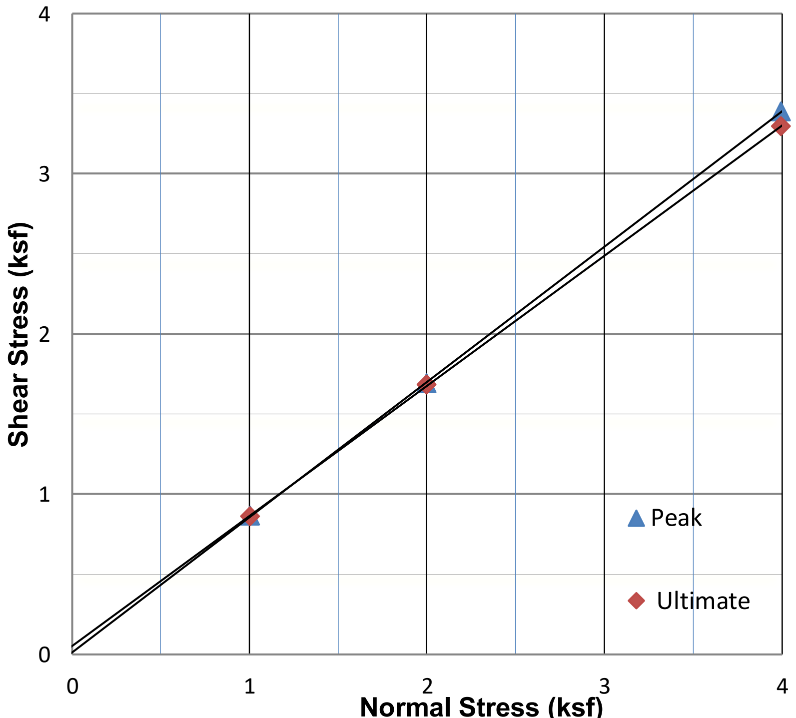
Project Name:	Montiel Rd Subdivision	Tested By :	DW
Project No.:	22056	Checked By :	DB
Project Location:	1424 Montiel Rd, Escondino, CA	Report Date :	7/18/2022

Boring No. B-1 Depth(ft): 2.5' Sample ID: 220523-002 Shape of shear box: Circular

Sample type: Cal -Mod Diameter of shear box (in): 2.416

Soil description: Silty Sand Initial specimen thickness (in): 1.000

Rate of shearing (in/min): 0.024



Strength Parameters

	Peak	**Ultimate**
Cohesion (psf)	**13**	**51**
Friction angle (degrees)	**40**	**39**

Specimen Data Test number	1	2	3			
Wet density (pcf)	127.9	123.8	132.7			
Water content (%)	5.5	5.5	5.5			
Dry mass of test specimen (g)	145.9	141.3	151.4			
Dry density (pcf)	121.2	117.4	125.8			
Void ratio	0.39	0.43	0.34			
Degree of saturation,S (%)	38.1	34.1	43.7			
Preshear/After Shear Data						
Wet density (pcf)	143.5	134.2	142.0			
Water content (%)	19.5	16.2	15.1			
Dry density (pcf)	120.1	115.5	123.4			
Void ratio	0.40	0.46	0.36			
Degree of saturation,S (%)	100.0	95.9	100.0	(Assumed specific gravity of 2.7)		
Results						
Nominal normal stress (ksf)	**1.00**	**2.00**	**3.99**			
Nominal shear stress (ksf) Peak	**0.86**	**1.69**	**3.39**			
Ultimate	**0.86**	**1.68**	**3.29**			
Total normal displacement (in.)	-0.010	-0.017	-0.020			
Total shear displacement (in.)	0.394	0.394	0.394			

ABI ENGINEERING CONSULTANTS, INC.

DIRECT SHEAR TEST RESULTS

(ASTM D 3080)

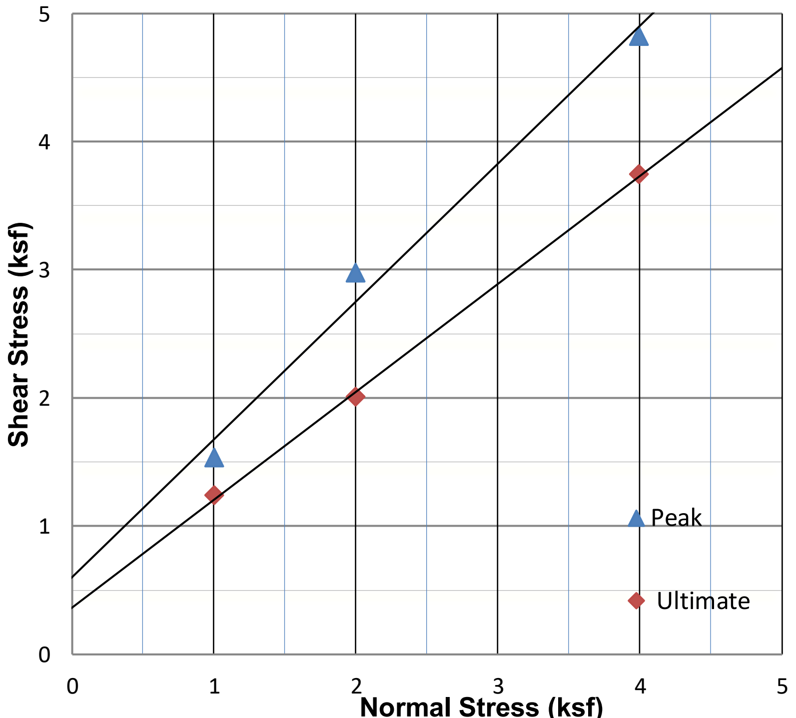
Project Name:	Montiel Rd Subdivision	Tested By :	DW
Project No.:	22056	Checked By :	DB
Project Location:	1424 Montiel Rd, Escondino, CA	Report Date :	7/18/2022

Boring No. B-6 Depth(ft): 5 Sample ID: 1/0/1900 Shape of shear box: Circular

Sample type: Cal -Mod Diameter of shear box (in): 2.416

Soil description: Silty Sand Initial specimen thickness (in): 1.000

Rate of shearing (in/min): 0.024



Strength Parameters

	Peak	**Ultimate**
Cohesion (psf)	**600**	**360**
Friction angle (degrees)	**47**	**40**

Specimen Data Test number	1	2	3			
Wet density (pcf)	125.8	129.6	131.3			
Water content (%)	2.8	2.8	2.8			
Dry mass of test specimen (g)	147.3	151.8	153.8			
Dry density (pcf)	122.4	126.1	127.8			
Void ratio	0.37	0.33	0.32			
Degree of saturation,S (%)	19.9	22.3	23.6			
Preshear/After Shear Data						
Wet density (pcf)	138.9	147.7	148.6			
Water content (%)	14.9	17.0	20.2			
Dry density (pcf)	120.8	126.3	123.6			
Void ratio	0.39	0.33	0.36			
Degree of saturation,S (%)	100.0	100.0	100.0	(Assumed specific gravity of 2.7)		
Results						
Nominal normal stress (ksf)	**1.00**	**2.00**	**3.99**			
Nominal shear stress (ksf) Peak	**1.53**	**2.97**	**4.82**			
Ultimate	**1.24**	**2.01**	**3.74**			
Total normal displacement (in.)	-0.013	0.001	-0.034			
Total shear displacement (in.)	0.394	0.394	0.394			

ANAHEIM TEST LAB, INC

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

TO:

ABI ENGINEERING
1701 E. EDENGER AVE., STE A9
SANTA ANA, CA 92705

DATE: 7/5/2022

P.O. NO.: Verbal

LAB NO.: C-6145

SPECIFICATION: CA-301

MATERIAL: Brown, Silty Sand w. trace Clay

Project No.: 22056
Project: 1434 Montiel Rd
Sample ID: B-5 @ 0-5' Bulk
Sample Date: 6/20/2022

ANALYTICAL REPORT

"R" VALUE

BY EXUDATION	BY EXPANSION
59	N/A

RESPECTFULLY SUBMITTED

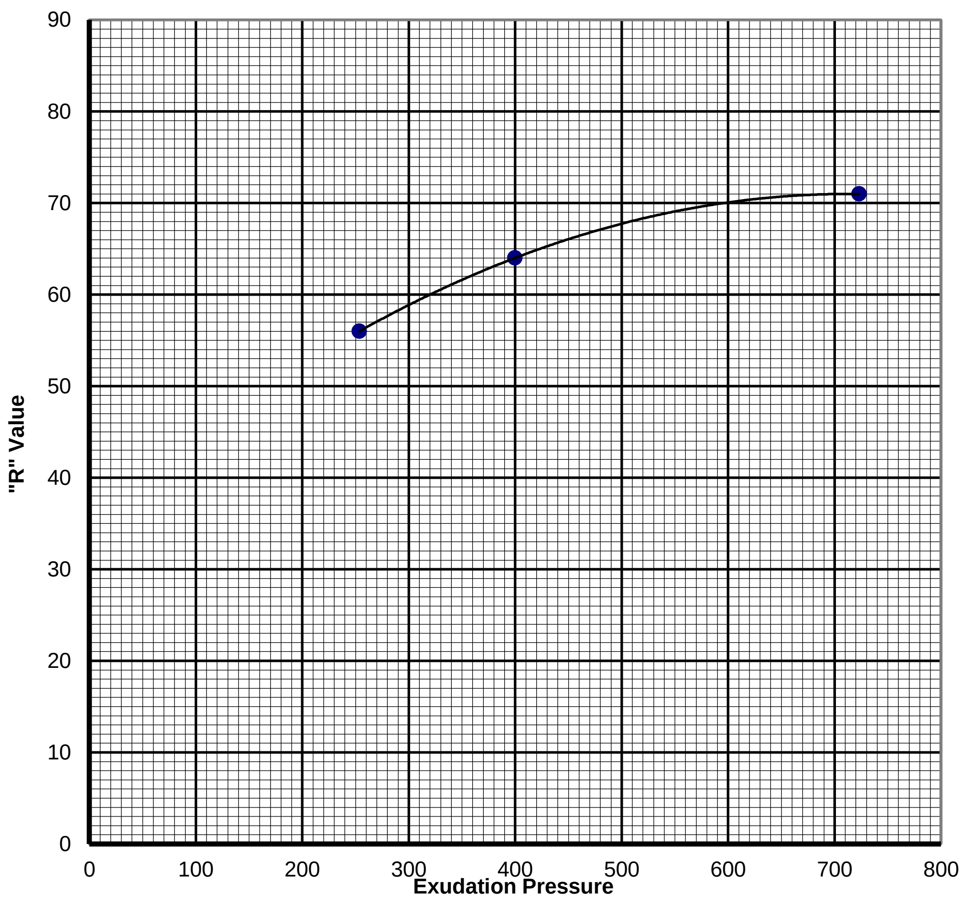
WES BRIDGER LAB MANAGER

"R" VALUE CA 301

Client: ABI Engineering **ATL No.:** C 6145 **Date:** 7/5/2022
Client Reference No.: 22056
Sample: B-5 @ 0-5' Bulk **Soil Type:** Brown, Silty Sand w. trace Clay

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	200	350	300	
Initial Moisture Content	%	5.1	5.1	5.1	
Moisture at Compaction	%	9.9	9.0	9.4	
Briquette Height	in.	2.52	2.47	2.51	
Dry Density	pcf	125.0	126.0	125.4	
EXUDATION PRESSURE	psi	254	723	400	
EXPANSION PRESSURE	psf	35	100	69	
Ph at 1000 pounds	psi	25	19	22	
Ph at 2000 pounds	psi	48	32	39	
Displacement	turns	4.65	4.15	4.29	
"R" Value		56	71	64	
CORRECTED "R" VALUE		56	71	64	

Final "R" Value	
BY EXUDATION: @ 300 psi	**59**
BY EXPANSION: TI = 5.0	**N/A**



ANAHEIM TEST LAB, INC

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

TO:

ABI ENGINEERING
1701 E. EDINGER AVE., STE A9
SANTA ANA, CA 92705

DATE: 7/1/2022

P.O. NO.: Verbal

LAB NO.: C-6140 1-2

SPECIFICATION: CTM-417

MATERIAL: Soil

Project No.: 22056
Project: Montiel Rd Subdivision
Sample Date: 6/20/2022

ANALYTICAL REPORT

SOLUBLE SULFATES
per CT. 417
ppm

1) B-2 @ 0-5'	218
2) B-7 @ 0-5'	707

RESPECTFULLY SUBMITTED

WES BRIDGER LAB MANAGER

ABI ENGINEERING CONSULTANTS, INC.

Boring Percolation Testing Field Log

Date 6/20/2021

Project Location	*1434 Montiel Rd.,Escondidos*	Boring/Test Number	**B-1**
Earth Description	*Br. Sand w/Clay*	Diameter of Boring	*8.0 in* Diameter of Casing *3.0 in*
Tested By	*DW*	Depth of Boring	*10* ft
Liquid Description	*Clear Clean Tap water*	Depth of Invert of BMP	
Measurement Method	*Sounder*	Depth to Water table	
		Depth to Initial Water Depth (d1)	ft
Time Interval Standard		Depth to bottom from reference	***10*** ft.)
Start Time for Pre-Soak	*7:20AM* *on 6/20/22*	Water Remaining in Boring (Y/N)	*Y*
Start Time for Standard	*7:00AM* *om 6/21/22*	Standard Time Interval Between Readings	*30*
			(Sandy Soil Criteria)

Reading Number	Time Start/End (hh:mm)	Elapsed Time Δtime (mins)	Water Drop During Standard Time Interval Δd (inches)		Percolation Rate Reading (in/hr)	Soil Description/Notes/Comments
1	*8:01* *8:31*	*30*	*1.30'* *3.65'*	*28.2*	*56.4*	
2	*8:32* *9:02*	*30*	*1.40'* *3.35'*	*23.4*	*46.8*	
3	*9:04* *9:34*	*30*	*1.64'* *3.30'*	*19.9*	*39.8*	
4	*9:36* *10:06*	*30*	*1.80'* *3.34'*	*18.5*	*37.0*	
5	*10:08* *10:38*	*30*	*1.40'* *3.20'*	*21.6*	*43.2*	
6	*10:40* *11:10*	*30*	*1.40'* *3.15'*	*21.0*	*42.0*	
7	*11:11* *11:41*	*30*	*1.56'* *3.18'*	*19.4*	*38.9*	
8	*11:42* *12:12*	*30*	*1.52'* *3.13'*	*19.3*	*38.6*	*Stabilized rate*

Calculation of Infiltration rate using Poechet (aks inverse hole method)

Total depth to test hole, DT =	*10.0*	*ft*	
Initial depth to water, Do =	*1.52*	*ft*	*(from Last Reading)*
Final depth to water, Df =	*3.13*	*ft.*	
Initial Height of water, $H_0 = D_T - D_0 =$	*101.8*	in	
Final Height of water, $H_f = D_T - D_f =$	*82.4*	in	
Average Height, $H_{avg.} = (H_0 + H_f)/2 =$	*92.1*	in	
Change in Height, $\Delta H = H_f - H_0 =$	*19.32*		
Tested Infiltration Rate, I_t=	**1.6 in./hr**		

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

ABI ENGINEERING CONSULTANTS, INC.

Boring Percolation Testing Field Log

Date 6/20/2021

Project Location	*1434 Montiel Rd.,Escondidos*	Boring/Test Number	**B-3**
Earth Description	*Br. Sand w/Clay*	Diameter of Boring	*8.0 in* Diameter of Casing *3.0 in*
Tested By	*DW*	Depth of Boring	*6* ft
Liquid Description	*Clear Clean Tap water*	Depth of Invert of BMP	
Measurement Method	*Sounder*	Depth to Water table	ft
		Depth to Initial Water Depth (d1)	ft
Time Interval Standard		Depth to bottom from reference	***10*** ft.)
Start Time for Pre-Soak	*8:10AM* *on 6/20/22*	Water Remaining in Boring (Y/N)	*N*
Start Time for Standard	*10:00AM* *om 6/21/22*	Standard Time Interval Between Readings	*10*

(Sandy Soil Criteria)

Reading Number	Time Start/End (hh:mm)	Elapsed Time Δtime (mins)	Water Drop During Standard Time Interval Δd (inches)		Percolation Rate Reading (in/hr)	Soil Description/Notes/Comments
	12:02		*1.30'*			*Brown Silty Sand*
1	*12:12*	*10*	*3.65'*	*28.2*	*169.2*	
	12:14		*1.40'*			*Bottom- Bedrock*
2	*12:24*	*10*	*3.35'*	*23.4*	*140.4*	
	12:26		*1.64'*			
3	*12:36*	*10*	*3.30'*	*19.9*	*119.5*	
	12:38		*1.80'*			
4	*12:48*	*10*	*3.34'*	*18.5*	*110.9*	
	12:50		*1.40'*			
5	*13:00*	*10*	*3.20'*	*21.6*	*129.6*	
	13:02		*1.40'*			
6	*13:12*	*10*	*3.15'*	*21.0*	*126.0*	
	13:14		*1.56'*			
7	*13:24*	*10*	*3.18'*	*19.4*	*116.6*	
	13:26		*1.52'*			
8	*13:36*	*10*	*3.13'*	*19.3*	*115.9*	
	13:38		*1.52'*			
9	*13:48*	10	*3.13'*	*19.3*	*115.9*	
	13:50		*1.52'*			*Stabilized rate*
10	*14:00*	10	*3.13'*	*19.3*	*115.9*	

Calculation of Infiltration rate using Poechet (aks inverse hole method)

Total depth to test hole, DT =	*10.0*	*ft*	
Initial depth to water, Do =	*1.52*	*ft*	*(from Last Reading)*
Final depth to water, Df =	*3.13*	*ft.*	
Initial Height of water, $H_0 = D_T - D_0 =$	*101.8*	in	
Final Height of water, $H_f = D_T - D_f =$	*82.4*	in	
Average Height, $H_{avg.} = (H_0 + H_f)/2 =$	*92.1*	in	
Change in Height, $\Delta H = H_f - H_0 =$	*19.32*		
Tested Infiltration Rate, I_t=	**4.8 in./hr**		

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

ABI ENGINEERING CONSULTANTS, INC.

Boring Percolation Testing Field Log

Date 6/20/2021

Project Location	*1434 Montiel Rd.,Escondidos*	Boring/Test Number	**B-5**
Earth Description	*Br. Sand w/Clay*	Diameter of Boring	*8.0 in* Diameter of Casing *3.0 in*
Tested By	*DW*	Depth of Boring	*10* ft
Liquid Description	*Clear Clean Tap water*	Depth of Invert of BMP	
Measurement Method	*Sounder*	Depth to Water table	ft
		Depth to Initial Water Depth (d m	ft
Time Interval Standard		Depth to bottom from reference	***10*** ft.)
Start Time for Pre-Soak	*11:00AM on 6/20/22*	Water Remaining in Boring (Y/N)	*Y*
Start Time for Standard	*7:00AM om 6/21/22*	Standard Time Interval Between Readings	*30*

(Sandy Soil Criteria)

Reading Number	Time Start/End (hh:mm)	Elapsed Time Δtime (mins)	Water Drop During Standard Time Interval Δd (inches)		Percolation Rate Reading (in/hr)	Soil Description/Notes/Comments
	8:03		*1.80'*			*Brown Silty Sand*
1	*8:33*	*30*	*3.41'*	*19.3*	*38.6*	
	8:34		*1.74'*			*Bottom- Bedrock*
2	*9:04*	*30*	*3.37'*	*19.6*	*39.1*	
	9:06		*1.55'*			
3	*9:36*	*30*	*3.22'*	*20.0*	*40.1*	
	9:38		*1.50'*			
4	*10:08*	*30*	*3.16'*	*19.9*	*39.8*	
	10:10		*1.48'*			
5	*10:40*	*30*	*3.15'*	*20.0*	*40.1*	
	10:42		*1.45'*			
6	*11:12*	*30*	*3.12'*	*20.0*	*40.1*	
	11:14		*1.46'*			
7	*11:44*	*30*	*3.10'*	*19.7*	*39.4*	
	11:45		*1.49'*			*Stabilized rate*
8	*12:15*	*30*	*3.05'*	*18.7*	*37.4*	

Calculation of Infiltration rate using Poechet (aks inverse hole method)

Total depth to test hole, DT =	*10.0*	*ft*	
Initial depth to water, Do =	*1.49*	*ft*	*(from Last Reading)*
Final depth to water, Df =	*3.05*	*ft.*	
Initial Height of water, $H_0 = D_T - D_0 =$	*102.1*	in	
Final Height of water, $H_f = D_T - D_f =$	*83.4*	in	
Average Height, $H_{avg.} = (H_0 + H_f)/2 =$	*92.8*	in	
Change in Height, $\Delta H = H_f - H_0 =$	*18.72*		
Tested Infiltration Rate, I_t=	**1.5 in./hr**		

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