Appendix H Geotechnical Investigation Report

Appendices

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GEOTECHNICAL INVESTIGATION REPORT

for

PROPOSED WALNUT BUSINESS PARK
20401 Valley Boulevard
Walnut, California 91789

Prepared For:

IDS Real Estate Group
515 South Figueroa Street, 16th Floor
Los Angeles, CA 90071

Prepared By:

Langan Engineering and Environmental Services, Inc.
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December 15, 2021
Langan Project No.: 700108301

LANGAN

December 15, 2021

Matt Katz and Geoff Garland
IDS Real Estate Group
515 South Figueroa Street, 16th Floor
Los Angeles, CA 90071

Geotechnical Investigation Report
Proposed Industrial Building Development
20401 Valley Boulevard
Walnut, California
Langan Project No. 700108301

Dear Matt and Geoff:

Langan Engineering & Environmental Services, Inc. is pleased to submit this geotechnical investigation report for the proposed Industrial Building development to be constructed at 20401 Valley Boulevard in Walnut, California.

This report was prepared in general accordance with our proposal dated November 9, 2021.

♦ ♦ ♦

We sincerely appreciate the opportunity to be of service to you. Please contact us if you have questions regarding this report.

Sincerely,
Langan Engineering & Environmental Services, Inc.

Christopher J. Zadoorian, G.E.
Senior Associate

CC:NG:SHW:CJZ:

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1.0 INTRODUCTION

Langan Engineering and Environmental Services, Inc. (LANGAN) has completed a geotechnical investigation for the proposed Walnut Business Park industrial building development to be constructed at 20401 Valley Boulevard in Walnut, California at the location shown on Figure 1. This report was previously submitted as a draft dated December 15, 2021.

The site is located between Valley Boulevard and Paseo del Prado, east of Lemon Avenue as shown on Figure 2 and is approximately 26 acres. The site is currently developed with approximately 36 commercial and/or industrial buildings and associated surface parking lots.

An existing 84- to 90-inch-diameter, reinforced concrete pipe (RCP) storm drain crosses the site roughly from northeast to southwest. Based on our review of County of Los Angeles files, the existing storm drain was constructed in the late 1960s and the invert ranges from approximately 15 feet bgs at the northeasterly corner of the site to approximately ten feet bgs at the southwesterly corner of the site.

The ground surface level at the site generally slopes down to the south and ranges from approximately Elevation 525 to Elevation 520.

You furnished us with a conceptual site plan dated February 22, 2023 prepared by Ware Malcomb that depicts the proposed Walnut Business Park development.

Based on our review of the site plan, we understand that the proposed development for the 23-acre site includes four at-grade, high-bay industrial buildings, designated as BLDG 1, 2, 3 and 4 with building areas 197,547-sqaure-foot, 38,192-sqaure-foot, 94,226-square-foot and 84,773-square-foot respectively, at the approximate locations shown on Figure 2.

Based on our discussions with you, each proposed building will be established approximately four feet above the existing ground surface level at the site to accommodate loading docks. For the purposes of this report, we have assumed that the lowest finish floor levels will range from approximately Elevation 525 to 530 noting that actual lowest finish floor elevations for each building may vary somewhat.

Portland cement concrete (PCC) and/or and asphalt concrete (AC) pavement are also planned for loading docks, drive lanes, and vehicle parking.

Our investigation is summarized herein followed by our conclusions and recommendations for the proposed development.

2.0 SUBSURFACE EXPLORATIONS AND CONDITIONS

2.1 Subsurface Explorations

Prior to drilling, we obtained permits from the Los Angeles (LA) County Environmental Health Department.

We drilled twelve borings, borings B-1 through B-12, at the locations show on Figure 2. Our borings were drilled to depths of approximately 25 to 50 feet below existing ground surface (bgs) using truck-mounted mud rotary drilling equipment. Table 1 summarizes the general locations of our borings with respect to the proposed building locations.

Table 1 – Boring Locations

Building Designation	Associated Borings
BLDG 1	B-1 through B-4
BLDG 2	B-5 and B-6
BLDG 3	B-7 through B-9
BLDG 4	B-10 through B-12

Our field representative maintained a log of the soil conditions encountered during drilling and we collected relatively undisturbed samples and performed standard penetration testing (SPT) at regular intervals. We also collected bulk samples in several of the borings.

The samples collected from the borings were transported to our office for further review and for assignment of geotechnical laboratory testing.

Upon completion of the borings, we backfilled the boreholes with bentonite grout in accordance with the conditions of the LA County permit.

The drill spoils from the borings were placed in 55-gallon drums for temporary storage pending subsequent off-site disposal by a licensed materials hauler.

We also restored the ground surface to the pre-existing condition at each boring location.

2.2 Subsurface Conditions

Asphalt concrete pavement (AC) was encountered in each boring overlying aggregate base. The AC pavement ranged from three to five and one-half inches in thickness overlying aggregate base ranging from as summarized in Table 2.

Table 2 – Summary of AC Pavement and Underlying Base Materials

Building Designation	Associated Borings	AC Pavement (inches)	Aggregate Base (inches)
BLDG 1	B-1 through B-4	3	2 to 6
BLDG 2	B-5 and B-6	3 to 6	4 to 6
BLDG 3	B-7 through B-9	4 to 5.5	6
BLDG 4	B-10 through B-12	4 to 5	6

Fill soils were encountered in the borings to depths of approximately 2.5 to 7.5 feet bgs. The fill consisted of moist to very moist clayey soils with varying amounts of silt, sand, and gravel and is summarized in Table 3, below.

Native soil, consisting of Quaternary-age young alluvial fan deposits were encountered beneath the fill in each boring. The native soils consisted predominately of very moist to wet medium stiff to very stiff clay with varying amounts of sand, silt, and gravel as well as a layer of medium dense sandy clay.

The upper native soils exhibit medium to high plasticity and in isolated cases are very soft and compressible as encountered in borings B-5 and B-7 at depths of approximately 20 feet bgs.

Interbedded sandstone, claystone, and siltstone bedrock of the Tertiary-aged Puente Formation, Yorba member, was encountered below the alluvial fan deposits in borings B-1, B-2, and B-4 at depths of approximately 10, 20, and 35 feet, respectively, as summarized in Table 3.

The generalized subsurface conditions at the site are depicted in Figures 3 through 10, Cross Sections A-A' through H-H'.

2.3 Groundwater

It is sometimes difficult to positively identify the groundwater level in geotechnical exploration borings in general, and when using mud-rotary drilling methods in clayey soils the difficulty is exacerbated.

The primary reason for the challenges is that the time required for the groundwater level to 'stabilize' is considerably longer than the time allotted to drill and backfill the borings.

Upon completion of each boring, the drilling mud was bailed from the borehole and the borehole was allowed to stand briefly. We measured the depth of groundwater in each case after removal of the drilling mud; however, reliable measurement were obtained only in borings B-2, B-4, B-8, B-9 and B-11. Groundwater was located measured between depths of 16 and 24½ feet bgs in these borings and it is reasonable to assume that the groundwater level in the remaining borings is similar to the levels in the nearby borings.

Table 3 below summarizes the groundwater levels measured at the time of drilling noting that groundwater was not always observed due to the drilling fluids utilized and clayey soils encountered.

Please note also that in some cases the groundwater levels shown on Figures 3 through 10 are extrapolated from the borings where groundwater was observed.

Based on our review of nearby groundwater well data and the historically highest groundwater map, provided by the State of California, the historically highest groundwater level (HHGWL) at the site is on the order of 20 feet bgs, as shown in Figure 11.

2.4 Tabular Summary of Subsurface Conditions

Table 3 summarizes the thickness of fill, depth to groundwater at the time of drilling, and depth to bedrock in each exploration boring.

Table 3 – Fill Thickness, Depth to Groundwater and Bedrock

Boring	Building Area	Fill Thickness (feet)	Depth to Groundwater[1] (feet)	Depth to Bedrock (feet)
B-1	BLDG 1	2.5		10
B-2	BLDG 1	2.5	20	20
B-3	BLDG 1	2.5		> 26.5
B-4	BLDG 1	5	24	35
B-5	BLDG 2	2.5		>26.5
B-6	BLDG 2	2.5		>26.5
B-7	BLDG 3	2.5		>26.5
B-8	BLDG 3	2.5	24.5	>51.5
B-9	BLDG 3	5	24	>26.5
B-10	BLDG 4	5		>26.5
B-11	BLDG 4	7.5	16	>51.5
B-12	BLDG 4	5		>26.5

3.0 GEOTECHNICAL LABORATORY TESTING

We performed geotechnical laboratory testing on samples collected from our borings that included the following:

- In-situ Moisture Content and Dry-density
- Atterberg Limits
- Direct Shear
- Consolidation
- Maximum Dry-density and Optimum Moisture Content
- Fines Content
- Expansion Index
- Corrosion Potential
- R-Value

4.0 GEOLOGIC AND SEISMIC HAZARDS EVALUATION

4.1 Regional and Local Geologic Setting

The subject site is located in the Los Angeles Basin, a northwest trending, alluvium-filled lowland situated at the north end of the Peninsular Ranges geomorphic province of coastal southern California. This basin, which is the surface expression of a deep structural trough, has been subdivided into four primary structural blocks distinguished from one another by contrasting basement rock types and stratigraphy. These structural blocks are generally separated by zones of faulting along which movement has occurred intermittently since middle Miocene time (Yerkes and others, 1965).

The site is located in the central portion of the Northeastern Block of the Los Angeles Basin, a roughly triangular-shaped area bounded on the south by the Elsinore/Whittier fault, on the east by the Chino fault, and on the north by the Sierra Madre/Cucamonga fault.

The city of Walnut is located between the San Jose and Puente Hills in an alluviated valley. Bedrock of these hills generally consists of the Puente Formation. Drainage through the area is controlled by San Jose Creek, which flows toward the west-southwest.

Locally, Morton and Miller (2003) have mapped the site as being underlain by middle Holocene-aged young alluvial-fan deposits (map unit Qyf_3). This unit is described as "slightly consolidated silt, sand, and coarse-grained sand to boulder alluvial fan deposits having slightly to moderately dissected surfaces." These alluvial fans are noted to consist primarily of boulder alluvial in the headward portions of the fan, grading southward into dominantly sand and gravel.

Morton and Miller indicate several outcrops of the Yorba member of the Puente Formation bedrock near the site (map unit Tpy). The Yorba member is described as "white to gray, thin bedded, micaceous and siliceous siltstone and sandy siltstone." The Yorba member is Miocene in age.

A regional geologic map of the site vicinity is provided in Figure 12.

4.2 Geologic and Seismic Hazards Evaluation

We evaluated the geologic and seismic hazards at the site in general accordance with California Geological Survey (CGS) Special Publication 117A, "*Guidelines for Evaluating and Mitigating Seismic Hazards in California."* The results of our evaluation is summarized below.

4.3 Regional Faulting

We reviewed the CGS 2010 Fault Activity Map (FAM) of California and the USGS Quaternary Fault and Fold Database (QFFD), to identify mapped faults within 100 kilometers of the site. The FAM and QFFD show that the closest mapped faults to the site are the San Jose fault, approximately 3 kilometers (1.8 miles) to the northwest, the Walnut Creek fault, approximately 6.3 kilometers to the northwest (4 miles) and the Whittier fault, approximately 8 kilometers (5 miles) to the southwest.

Figures 13A and 13B show the site location relative to the nearby seismic sources.

4.4 Regional Seismicity

The site is located in an active seismic area that has historically been affected by generally moderate to occasionally high levels of ground motion. Therefore, the proposed development will probably experience moderate to occasionally high levels of ground motion from nearby faults as well as ground motions from other active seismic areas of the southern California region.

A search of the web-based USGS Advanced National Seismic System (ANSS) Comprehensive Earthquake Catalog (ComCat), accessed on December 9, 2021, found that 62 earthquakes with magnitudes of 5.0 or greater have occurred within a 100-km radius of the site since 1800.

4.5 Ground Surface Rupture Potential

The site is not located within a County of Los Angeles or CGS Alquist-Priolo Earthquake Fault Zone based on a review of their respective websites.

Thus, the potential for ground surface rupture is considered very low.

4.6 Liquefaction Potential

Liquefaction may occur in loose to medium dense granular soils and low-plasticity silts and clays below the groundwater level as a result of strong ground shaking.

Liquefaction occurs when the cyclic loading to the soil due to strong ground shaking results in a buildup of excessive pore-water pressure in the pore spaces between the soil grains and the grain-to-grain contact of the soils is temporarily interrupted resulting is settlement as the soil particles reconstitute. Typically, liquefaction occurs within the upper approximately 50 feet bgs.

The site is located within County- and State-designated liquefaction hazard zones as shown on Figure 14.

Noting that the HHGWL is approximately 20 feet bgs and the geologic deposits present below this depth consist of stiff to very stiff clayey soils and/or bedrock, the potential for liquefaction at the site is considered to be very low.

Localized, discontinuous soft clays that would be subject to loss of strength during strong ground sharking are present at the site, however, these deposits are not anticipated to contribute appreciably to the overall performance of foundation elements constructed as part of the proposed development.

4.7 Lateral Spreading Potential

Lateral spreading is seismically-induced slope instability phenomenon wherein slope failure can occur as a result of liquefaction.

The ground surface level at the site is generally flat so that open or unsupported slopes are not present. However, San Jose Creek Diversion Channel is located as close as approximately 300 feet

south of the site. This channel has been improved with vertical concrete channel walls and is approximately 20 feet in depth.

Based on the very low liquefaction potential of the site and depth to HHGWL, the potential for lateral spreading is likewise considered very low.

4.8 Seismic (aka 'Dry') Settlement

Seismically-induced (aka 'dry') settlement may occur in loose granular soils due to strong ground shaking.

The soils encountered in the exploration borings consist mainly of medium stiff to stiff fine-grained deposits and/or medium dense granular deposits. Therefore, the potential for seismically-induced settlement is considered very low.

4.9 Earthquake-Induced Landslides

The site is not located in a zone of required investigation for Earthquake-Induced Landslides per CGS Earthquake Fault Zones and Seismic Hazard Zones, San Dimas Quadrangle map as shown on Figure 14. Additionally, no landslides have been mapped near the site on regional geologic maps of the area. No evidence of deep-seated landsliding was observed during our field exploration and no significant sloped boundary conditions exist. Therefore, the probability of earthquake-induced landsliding at the site is negligible.

4.10 Flood Mapping

Based on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Number 06071C8600H, the site is located within an area determined to be outside the 0.2 percent annual chance floodplain.

4.11 Tsunamis, Seiche, and Dam Inundation

Based on information and maps available from the CGS and the County of Los Angeles, the site is not located within a Tsunami inundation hazard zone. Based on review of adjacent water bodies, the site is not subject to inundation from seiche. Based on a review of the Dam Breach Inundation Map Web Publisher hosted by the California Division of Safety of Dams (DSOD) the site is not within a dam inundation boundary.

4.12 Subsidence

Land subsidence may be induced from withdrawal of oil, gas, or water from wells. Based on a search of the CalGEM (formerly known as Division of Oil, Gas, and Geothermal Resources [DOGGR]) GIS Well Finder online tool, the site is not located in an oil field. The nearest well is indicated approximately 0.8 miles west of the site. The status of this well is listed as plugged. According to our review of the available information from CalGEM, the likelihood of land subsidence caused by oil or gas withdrawal from oil wells is negligible.

4.13 Expansive Soils and Bedrock

Expansive soils swell and shrink when the moisture content in the soil changes as a result of cyclic wet/dry weather cycles, installation of irrigation systems, change in landscape plantings, or changes in grading.

Swelling and shrinking soils can result in differential movement of structures including floor slabs and foundations, and site work including hardscape, utilities, and sidewalks.

Based on the preliminary laboratory test data, the on-site soils have a moderate to high potential for expansion.

5.0 CONCLUSIONS

5.1 General

The site is generally free from geologic or seismic hazards that would preclude the proposed development and the proposed development is considered feasible from a geotechnical perspective.

The site is subject to strong ground shaking that would result from an earthquake occurring on a nearby or distant fault source; however, this hazard is common in Southern California and can be mitigated by following the seismic design requirements of the 2022 California Building Code (CBC).

Undocumented fill was encountered in each boring; and the undocumented fill, native soils and underlying bedrock typically contain high to very high moisture contents, are moderately to highly plastic, and are subject to swelling or shrinking due to changes in moisture content.

These conditions impact each of the primary geotechnical considerations for the proposed development including (1) foundation support, (2) floor slab and flat work support and (3) general grading.

Mitigation measures to reduce the moisture content will be required to allow the re-use of the on-site soils and also to address potential for expansion and compression due to changes in moisture content.

The planned grading, that will include placement of approximately four feet of new fill, will help to mitigate these existing conditions.

5.2 Foundations

The current planned development concept includes raising the existing ground surface level by approximately four feet across the site so that the proposed building foundations will be established at near the existing ground surface level or slightly above.

The soils present at the existing ground surface level generally consist of undocumented fill materials, likely placed as part of the existing commercial building development. The soils are not considered suitable for foundation support and should be removed and replaced as properly compacted fill as recommended herein.

The proposed buildings may be supported on spread and continuous footings established in properly compacted fill soils provided the recommendations presented herein are followed.

The existing fill soils may require some degree of drying or conditioning in order to re-use as properly compacted fill.

The bottom of footings for Buildings 1, 2 and 3 should be established at a suitable depth so that surcharge loading is not imposed to the existing RCP storm drains and illustrated on cross sections A-A', D-D', and F-F'.

5.3 Earthwork Considerations

Based on the current planned development concept and the recommendations presented herein for remedial grading, we anticipate that mass excavation typically on the order of two to three feet and locally up to approximately eight feet will be required to remove existing undocumented fill.

The existing fill soils generally contain relatively high moisture contents and are subject to shrinkage and swelling due to changes in moisture content and these soils are not suitable for reuse in required fills.

Additionally, these soils are subject to shrinkage and swelling with subsequent changes in moisture content.

The on-site soils may be re-used on-site provided mitigation measures are performed to address the moisture and plasticity (shrink and swell potential) of these soil. Mitigation measures are presented herein.

Alternatively, the on-site fill soils could be exported and suitable import materials could be utilized.

We anticipate that the exposed excavation bottoms will be relatively wet and compressible and that mitigation measures will be required to establish a firm working surface to receive new compacted select fill.

Recommendations for bottom stabilization are presented herein.

5.4 Floor Slab Support

Again noting that the proposed finish floor levels will be established approximately four feet above the existing ground surface level, the proposed building floor slab may be established on non-expansive properly compacted fill as recommended herein.

5.5 Pavement Design and Construction

Existing undocumented fill soils are not suitable for pavement support due the previously described expansive potential and high moisture contents.

PCC and AC pavement may be supported on properly compacted fill as recommended herein.

5.6 Groundwater

The current groundwater level at the site is on the order of 16 to 25 feet bgs; these depths correspond roughly with the HHGWL, which is on the order of 20 feet BGS.

As noted above, we estimate the maximum depth of on-site excavation to be on the order of eight feet bgs to remove existing undocumented fill soils.

Thus, it is unlikely that groundwater will be encountered during mass excavation.

5.7 Stormwater Infiltration

The Los Angeles County Public Works Guidelines for *Geotechnical Investigation and Development – Low Impact Development Stormwater Infiltration (LA County Stormwater Guidelines)* dated June 30, 2021 lists the conditions at a site that allow for stormwater infiltration.

Introduction of stormwater within the soils above the groundwater level will likely result in expansion and swelling of the upper soils and therefore is not considered feasible.

As stated earlier, we submitted an addendum to our draft report summarizing the results of our field percolation testing at the project site. We calculated design infiltration rates of 0.00 to 0.07 inches per hour for the site, which are below minimum allowable design infiltration rate of 0.3 inches per hour.

5.8 Corrosion Considerations

The results of the corrosion testing are summarized in Table 4.

Table 4 - Corrosion Test Results

Boring (Depth)	Soil Type	Resistivity (ohm-cm)	pH	Sulfate (% by Mass)	Chloride (% by Mass)
B-1 (0-5 feet)	Clay (CL)	820	7.4	0.0687	0.0106
B-9 (0-5 feet)	Clay (CL)	770	7.5	0.0448	0.0098

The results of the sulfate testing indicates that the on-site soils be classified as exposure category S_0 for sulfates and exposure category C_1 for chlorides in accordance with American Concrete Institute (ACI) Table 19.3.1.1).

The sulfate concentrations indicate a low potential for sulfate attack on PCC and that the on-site soils are extremely corrosive to ferrous metals.

It would be prudent to engage a corrosion consultant to evaluate the need for mitigation measures for buried metallic piping.

6.0 RECOMMENDATIONS

6.1 Foundations

The proposed industrial buildings may be supported on spread and continuous footings established in properly compacted fill soils.

Spread and continuous footings a minimum of two feet wide and established at least two feet below the lowest finish floor level and/or adjacent grade may be designed using an allowable bearing pressure of 5,000 pounds per square foot (psf). The recommended bearing pressure may be increased by one-third when considering short term wind and seismic loading conditions.

We anticipate static settlement due to the dead-plus-live loading to be on the order of 1 inch or less.

Differential settlement between adjacent footings is expected to be on the order of ¼ inch or less.

Lateral loading may be resisted by passive pressure of the soils acting against the sides of the footings and friction along the bottom of the footing.

To resist lateral loading, an ultimate passive resistance equal to 600 psf per foot of embedment up to a maximum value of 6,000 psf and an ultimate coefficient of friction equal to 0.6 may be used.

The ultimate passive pressure and the ultimate coefficient of friction may be combined noting that the ultimate passive resistance should be reduced in this case by 50 percent in consideration of the deformation required to mobilize the full passive resistance.

6.2 Seismic Design

Based on the data from our investigation and our review of available shear wave velocity mapping, the site may be classified as Site Class D in accordance with Chapter 20 of ASCE-7-16. We anticipate that exception 2 of Section 11.4.8 of ASCE 7-16 will be applicable for the proposed building and therefore, a site specific response spectra is not required per CBC.

CBC-prescribed seismic design parameters are presented in Table 5.

Table 5 – CBC Prescriptive Seismic Design Parameters

Criteria	Mapped Value
MCE_R Spectral response acceleration at Short Periods, S_S	1.774g
MCE_R Spectral response acceleration at 1 second period, S_1	0.627g
Short Period Site Coefficient, F_a	1.0
Site Coefficient at 1 second period, F_v	2.5
Site-modified MCE_R Spectral Response Acceleration at Short Periods, S_{MS}	1.774g
Site-modified MCE_R Spectral Response Acceleration at 1 second period, S_{M1}	1.568g
Design Spectral Response Acceleration at short periods, S_{DS}	1.182g
Design Spectral Response Acceleration at 1 second period, S_{D1}	1.045g

The recommended mapped values of F_v, S_{M1}, and S_{D1} above have been increased by 150 percent in accordance with the exception of Section 11.4.8.1 of Supplement No. 3 to ASCE 7-16. If the structural engineer elects not to use this exception in the seismic design approach, we should be notified so that we may develop site-specific response spectra and seismic design criteria in accordance with Chapter 21 of ASCE 7-16.

6.3 Floor Slab Support

The proposed buildings floor slab may be supported on non-expansive properly compacted fill soil.

To minimize the potential of moisture transfer from the soil through the building floor slab that could damage finish flooring, a capillary break section should be installed beneath the building floor slab.

The capillary break section should consist of six inches of gravel underlying a 15-mil HDPE membrane and is required only where finish flooring or moisture-sensitive equipment is planned.

6.4 Pavement Design Recommendations

The required pavement and base thicknesses will depend on the expected wheel loads, traffic index (TI), and the R-value of the subgrade materials.

Pavement sections should be supported on 12 inches of properly compacted fill soils.

Our pavement design recommendations for asphalt concrete (AC) and Portland cement concrete (PCC) are based on a R-value test for onsite soil of 4 and are provided below.

6.4.1 Asphalt-Concrete Pavement Design

AC pavement for surface parking shall be designed in accordance with the CATRANS method. Table 6 summarizes our AC pavement recommendations for assumed TIs of 4.5, 5, 6, and 7.

Table 6 – AC Pavement Design Recommendations

Traffic Use	TI	AC (inches)	AB (inches)
Parking Areas	4.5	3	8
Automobile Drive Lanes	5	3.5	9

Truck and Trailer Drive Lanes	6	4	11
Delivery Access and Loading Docks	7	5	13

We can determine the recommended pavement and aggregate base thickness for other TIs if required. Careful inspection is recommended to confirm that the recommended thickness or greater is achieved and there proper construction procedures are followed.

The aggregate base should conform to California Department of Transportation (CALTRANS) Class II aggregate base or equivalent. The base should be compacted to at least 95 percent relative compaction.

6.4.2 Portland Cement Concrete Pavement Design

Table 7 summarizes our Portland cement concrete (PCC) pavement recommendations for assumed TIs of 6 and 7 based on minimum compressive strength of 3,000 psi for the PCC.

Table 7 – PCC Pavement Design Recommendations

Traffic Use	TI	PCC (inches)	AB (inches)
Truck and Trailer Drive Lanes	6	7	7
Delivery Access and Loading Docks	7	8	7

Dowels are recommended at joints to reduce any possible offsets. Careful inspection is recommended to check that the recommended thickness or greater is achieved and that proper construction procedures are followed.

The aggregate base should conform to CALTRANS Class II aggregate base or equivalent. The base should be compacted to at least 95 percent relative compaction.

6.5 Site Flatwork / Sidewalks

The design section for site flatwork, including sidewalks, should consist of four inches of reinforced PCC over four inches of CALTRANS Class II aggregate base. The PCC thickness should be increased to six inches for the outer six horizontal inches of the flatwork or sidewalk.

Steel reinforcement should consist of #3 bars placed at 24-inch center-to-center spacing in each direction.

The PCC and CMB, or AB section should be underlain by a minimum of 12 inches of properly compacted fill soils; however we anticipate that site flatwork will be established within the minimum 3 foot properly compacted fill zone required for the building foundations. New fill soils may be placed on existing undocumented fill soils provided the recommendations presented in Section 6.7.2 are followed.

6.6 Earthwork Considerations

6.6.1 Temporary Vertical Cuts and Construction Slopes

Temporary vertical cuts are feasible in the native material and should not exceed 4 feet in height.

Temporary, unsurcharged slopes may be excavated into the on-site soils and fill materials and these slopes should not exceed a 1.5H:1V gradient and should not exceed 15 feet in height.

Temporary vertical cuts and temporary construction slopes should be protected from erosion by directing surface water away from the top of the slope, by placing sand-bags at the top of the slopes and vertical cuts, and/or covering the slopes with plastic sheeting during rain.

6.6.2 Subgrade Preparation

Demolition of the existing buildings and site flatwork will be performed along with subsequent removal and recompaction of the existing undocumented fill soils.

We anticipate that very moist to wet, medium to high plasticity, potentially expansive soils are present at the bottom of the mass excavation.

It will be necessary to stabilize the exposed bottom to allow subsequent placement and compaction of new, select fill. One method to stabilize the bottom of the mass excavation is to place a one-foot thick layer of 1½-minus crushed rock directly on the exposed bottom to establish a firm working surface.

Depending on the condition of the exposed bottom, additional stabilization could be require and could include the use of a geotextile fabric and/or a geosynthetic cellular confinement material.

Other methods are also suitable, provided we review the procedure with the contractor, again, to assure the required degree of stabilization is achieved.

There is not any benefit in performing mechanical preparation on the exposed mass excavation bottom, rather scarification and compaction effort on the moist to wet clayey soils will likely result in significant disturbance accompanied by little, if any improvement.

Prior to the placement of one or more of the above-referenced stabilization methods, the exposed excavation bottom should be proof rolled with light-weight steel drum equipment and the crushed rock and/or geotextile material(s) may be placed directly on the proof-rolled native alluvial clayey soils.

The crushed rock should be densified using vibratory compaction equipment, noting again however that it is not advisable to utilize heavy-duty equipment such as vibratory rollers; rather it would be prudent to utilize vibratory equipment that delivers its energy with an eight to 12-inch thick lift. Heavy-duty equipment may result in disturbance of the wet, clayey soil, even with 12 inches of crushed rock overlying these native materials.

The suitability of the crushed rock and geotextile fabric, if utilized, to support new fill can be evaluated in the field by observing the deformation of the surface materials under loaded construction equipment (scrapers, front-end loaders with a fully loaded bucket, etc.).

The crushed rock materials may be considered to be part of the select fill beneath the footings.

Prior to the placement of new select fill on the stabilized bottom, all deleterious materials should be removed from the areas to be graded prior to initiation of grading operations and should be disposed of off-site.

6.6.3 Materials for Fill

The existing on-site soils, including existing undocumented fill soils consist primarily of very moist clayey soils. These soils are generally suitable for re-use in compacted fills, however, it is likely that these soils will require drying or blending with drier granular materials to achieve the required degree of compaction.

One method that would allow re-use of on-site clayey soils in compacted fills would be to blend these soils with dry coarse materials including crushed miscellaneous base (CMB), aggregate base, crushed rock and/or coarse sand.

Blending of on-site soils will result in three primary benefits that will facilitate grading and enhance performance of the fill: (1) reduction in the moisture content to facilitate placement and compaction, (2) stiffening of the clayey material to reduce compressibility and strength increase including an increase in allowable bearing pressure, and (3) reduced potential for expansion.

It will be necessary to perform strength and compressibility testing on proposed blends to confirm the mixture sufficiently improves the stiffness and compressibility of the onsite soil; however, as a preliminary estimate, it may be assumed that one part CMB blended with two parts of on-site clayey soil, may achieve the necessary improvements.

Imported fill materials, if utilized, should consist of relatively non-expansive materials (expansion index < 50) with adequate strength and stiffness to support foundation, floor slab, and pavement loading. We should be provided with samples of proposed import materials prior to import to the site to evaluate the suitability of those materials for the intended on-site use.

In general, all fill soils should be free of organic and other deleterious materials and have a maximum particle size no greater than three inches.

6.6.4 Fill Placement and Compaction

Fill soils shall be moisture conditioned as recommended herein, placed in loose lifts not exceeding 8-inches in thickness and mechanically compacted.

For the purposes of this report, the above-recommended granular and on-site clayey soil blend may be considered to be a fine-grained soil.

Fine-grained fill soils should be moisture conditioned to 2 to 4 percent above the optimum moisture content and compacted to at least 90 percent of the maximum dry density obtainable per ASTM D-1557. We recommend that relatively light-weight compaction equipment be utilized when working in fine-grained soils.

Granular soils should be moisture conditioned to 0 to 2 percent above the optimum moisture content and compacted to at least 95 percent of the maximum dry density obtained per ASTM D-1557.

6.6.5 Site Drainage

Proper drainage should be maintained at all times. Ponding or trapping of water in localized areas can cause differing moisture levels in the subsurface soil. Drainage should be directed away from the tops of slopes. Erosion protection and drainage control measures should be implemented during periods of inclement weather. During rain, backfill operations may need to be restricted to allow for proper moisture control during fill placement.

7.0 LIMITATIONS

The conclusions and recommendations provided in this report are based on subsurface conditions inferred from available boring and test pit data, as well as project information provided to date.

This report was prepared for IDS Reality Group, their design consultants and subcontractors for use in the proposed development.

If changes to the proposed development are made, we should be notified to review our conclusions and recommendations.

We should be retained during the construction phase to perform necessary geotechnical observations and testing in accordance with good geotechnical engineering practice.

Information on subsurface strata and groundwater levels shown on the logs represent conditions encountered only at the locations indicated and at the time of investigation. .

8.0 CLOSING

We sincerely appreciate the opportunity to provide professional services for this project and look forward to working with you on this project. Please contact us at your convenience to discuss any questions you may have regarding this report.

Sincerely,

Langan Engineering and Environmental Services, Inc.

Claudia Rangel
Staff Engineer

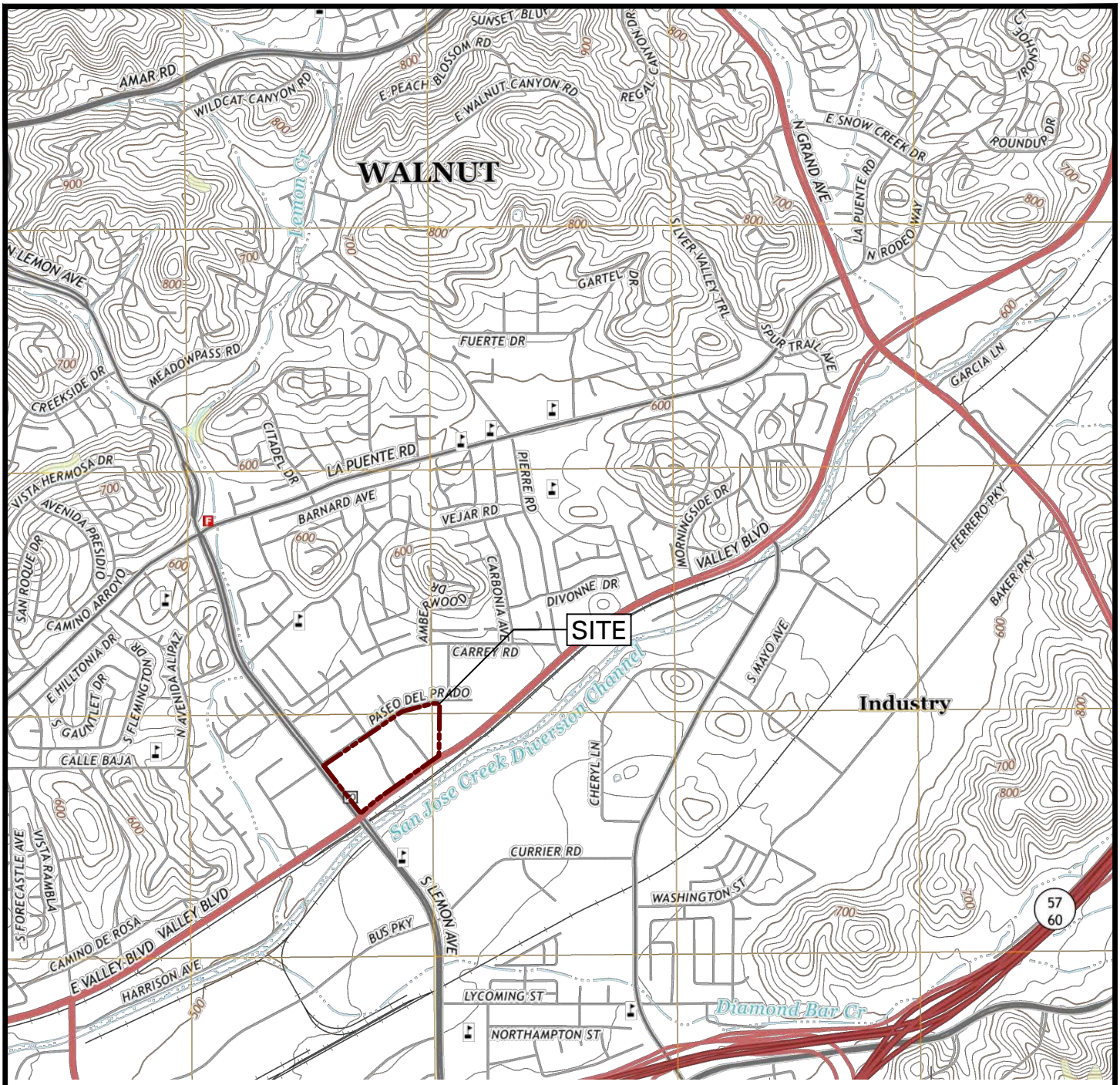
signed 12/15/21

Shaun Wilkins
Senior Project Geologist

signed 12/15/21

Christopher J. Zadoorian
Senior Associate

FIGURES



LEGEND:

SITE LIMITS

2000 1000 0 2000

SCALE IN FEET

REFERENCE: 7.5-MINUTE USGS SAN DIMAS TOPOGRAPHIC QUADRANGLE (2015).

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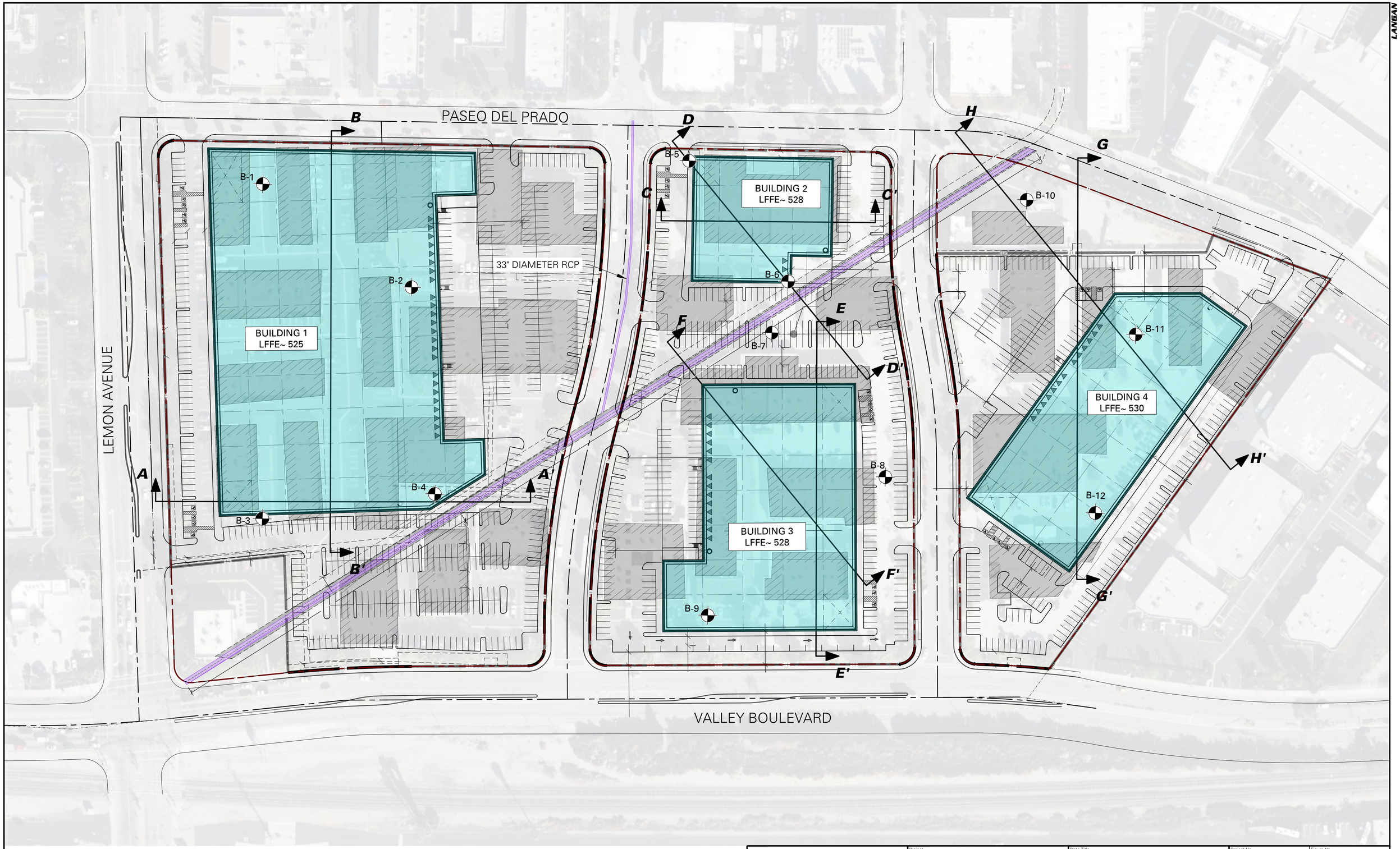
WALNUT
LOS ANGELES COUNTY CALIFORNIA

Figure Title

SITE LOCATION MAP

Project No.	Figure No.
700108301	1
Date: December 2021	
Scale: AS SHOWN	
Drawn By: CC	

Filename: \\langan.com\data\IRV\data3\700108301\Project Data_Discipline\Geotechnical\CAD\01\2D-DesignFiles\GEOTECHNICAL\GEOTECHNICAL FIGURES.dwg Date: 12/8/2021 Time: 09:11 User: crangel Style Table: Langan.stb Layout: SLM



LEGEND:

- SITE LIMITS
- B-1 BORING LOCATION
- PROPOSED INDUSTRIAL BUILDINGS
- LFFE~ 525 LOWEST FINISHED FLOOR ELEVATION (FEET)
- APPROXIMATE LOCATION OF EXISTING STORM DRAIN
- APPROXIMATE LOCATION OF EXISTING 15-FOOT STORM DRAIN EASEMENT

NOTES:

1. BACKGROUND IMAGE REFERENCED FROM "IDS WALNUT BUSINESS CENTER VALLEY BOULEVEARD & LEMON AVENUE WALNUT, CALIFORNIA 91789", SHT A100, PREPARED BY WARE MALCOMB, DATED DECEMBER 07, 2022.
2. STORM DRAIN LOCATION REFERENCED FROM "PROJECT NO. 8301, WALNUT LINE B", PREPARED BY NATIONAL ENGINEERING CO., DATED JULY 18, 1967.
3. STORM DRAIN LOCATION REFERENCED FROM "STORM DRAIN PLANS IN TRACT NO. 33488", PREPARED BY JENNINGS-HALDERMAN-HOOD, DATED APRIL 10, 1978.

60 30 0 60
SCALE IN FEET

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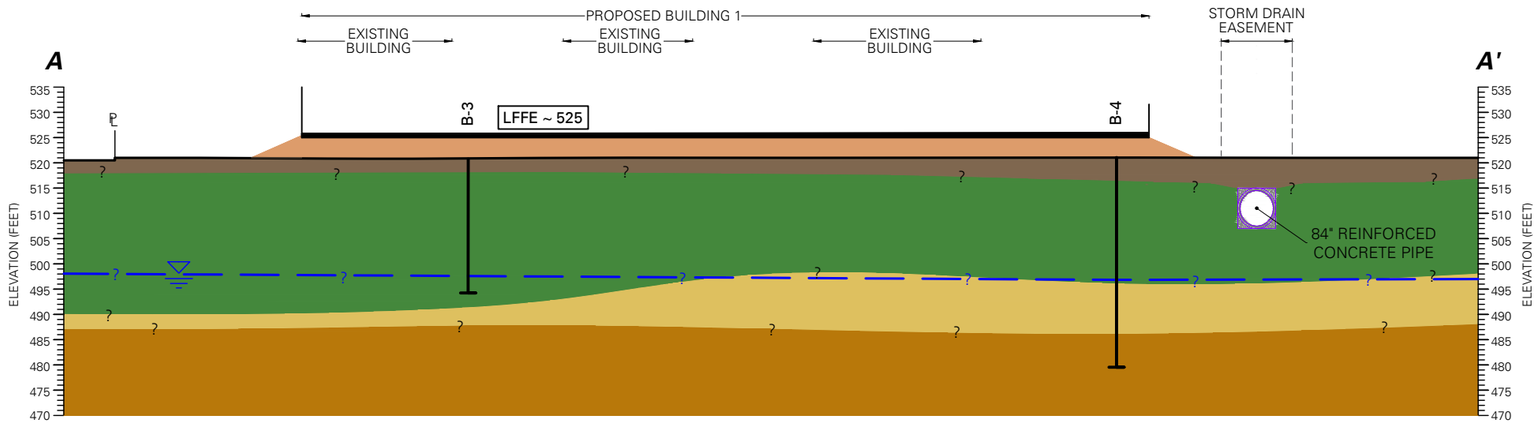
Plate Title: **SITE PLAN**

Project No. 700108301
Date December 2021
Scale AS SHOWN
Drawn By CC
Figure No. **2**

Filename: \\langan.com\data\IRV\data3\700108301\Project Data_Discipline\Geotechnical\CAD\01\2D-DesignFiles\GEOTECHNICAL\GEOTECHNICAL FIGURES.dwg Date: 3/30/2023 Time: 16:25 User: mgalvan Style Table: Langan.stb Layout: SP 24x36

CROSS SECTION A-A'

N54E



LEGEND:

- APPROXIMATE GROUND SURFACE LEVEL
- PROPOSED FILL
- ARTIFICIAL FILL (af)
- PREDOMINATELY SANDY SOILS
- PREDOMINATELY CLAYEY SOILS
- SANDSTONE/SILTSTONE/CLAYSTONE
- APPROXIMATE GROUNDWATER LEVEL AT TIME OF EXPLORATION
- LFFE ~ 525 — LOWEST FINISHED FLOOR ELEVATION (FEET)

NOTES:

1. CROSS SECTION DISPLAYS GENERALIZED SUBSURFACE CONDITIONS; FOR A DETAILED DESCRIPTION OF CONDITIONS ENCOUNTERED REFER TO BORING LOGS.
2. REFER TO SITE PLAN FOR LOCATION OF CROSS SECTIONS.
3. GROUND SURFACE PROFILE INFERRED FROM GOOGLE EARTH PRO ON DECEMBER 3, 2021.

30 15 0 30
SCALE IN FEET (VERTICAL)

60 30 0 60
SCALE IN FEET (HORIZONTAL)

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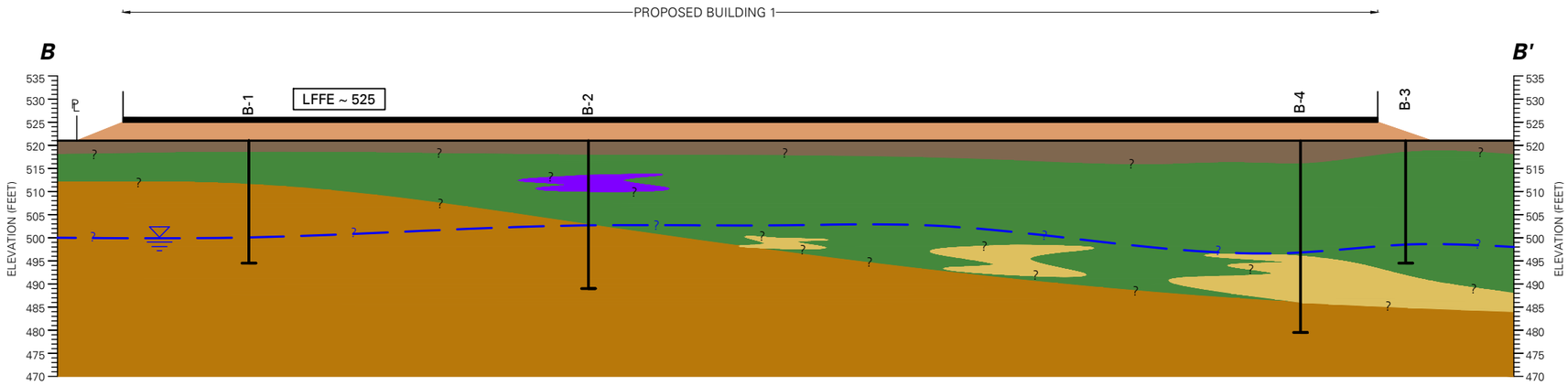
Project	WALNUT BUSINESS PARK 20401 VALLEY BOULEVARD WALNUT LOS ANGELES COUNTY CALIFORNIA
Figure Title	CROSS SECTION A-A'
Project No.	700108301
Date	December 2021
Scale	AS SHOWN
Drawn By	CC
Figure No.	3

CROSS SECTION B-B'

N36W



LEGEND:

- APPROXIMATE GROUND SURFACE LEVEL
- PROPOSED FILL
- ARTIFICIAL FILL (af)
- PREDOMINATELY SANDY SOILS
- PREDOMINATELY CLAYEY SOILS
- PREDOMINATELY HIGH PLASTICITY CLAY
- SANDSTONE/SILTSTONE/CLAYSTONE
- APPROXIMATE GROUNDWATER LEVEL AT TIME OF EXPLORATION
- LFFE ~ 525 — LOWEST FINISHED FLOOR ELEVATION (FEET)

NOTES:

1. CROSS SECTION DISPLAYS GENERALIZED SUBSURFACE CONDITIONS; FOR A DETAILED DESCRIPTION OF CONDITIONS ENCOUNTERED REFER TO BORING LOGS.
2. REFER TO SITE PLAN FOR LOCATION OF CROSS SECTIONS.
3. GROUND SURFACE PROFILE INFERRED FROM GOOGLE EARTH PRO ON DECEMBER 3, 2021.

30 15 0 30
SCALE IN FEET (VERTICAL)

60 30 0 60
SCALE IN FEET (HORIZONTAL)

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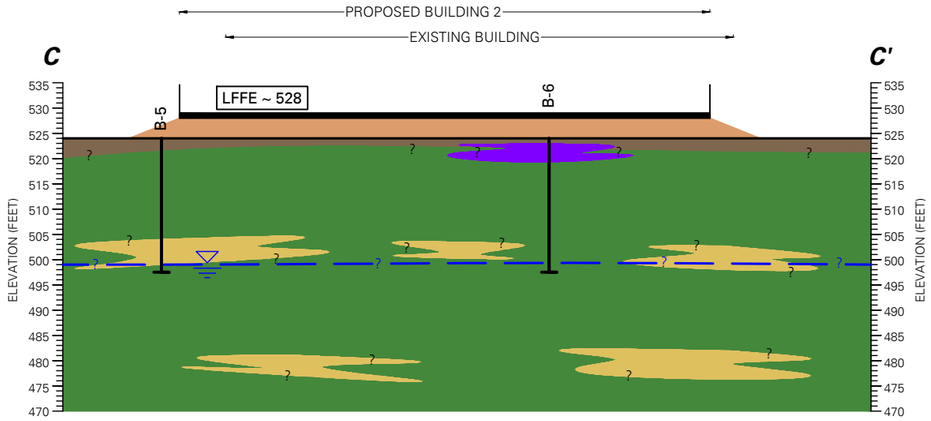
Figure Title
CROSS SECTION B-B'

Project No. 700108301
Date December 2021
Scale AS SHOWN
Drawn By CC

Figure No. **4**

CROSS SECTION C-C'

N54E



LEGEND:

- APPROXIMATE GROUND SURFACE LEVEL
- PROPOSED FILL
- ARTIFICIAL FILL (af)
- PREDOMINATELY SANDY SOILS
- PREDOMINATELY CLAYEY SOILS
- PREDOMINATELY HIGH PLASTICITY CLAY
- SANDSTONE/SILTSTONE/CLAYSTONE
- APPROXIMATE GROUNDWATER LEVEL AT TIME OF EXPLORATION
- LFFE ~ 528 — LOWEST FINISHED FLOOR ELEVATION (FEET)

NOTES:

1. CROSS SECTION DISPLAYS GENERALIZED SUBSURFACE CONDITIONS; FOR A DETAILED DESCRIPTION OF CONDITIONS ENCOUNTERED REFER TO BORING LOGS.
2. REFER TO SITE PLAN FOR LOCATION OF CROSS SECTIONS.
3. GROUND SURFACE PROFILE INFERRED FROM GOOGLE EARTH PRO ON DECEMBER 3, 2021.

30 15 0 30
SCALE IN FEET (VERTICAL)

60 30 0 60
SCALE IN FEET (HORIZONTAL)

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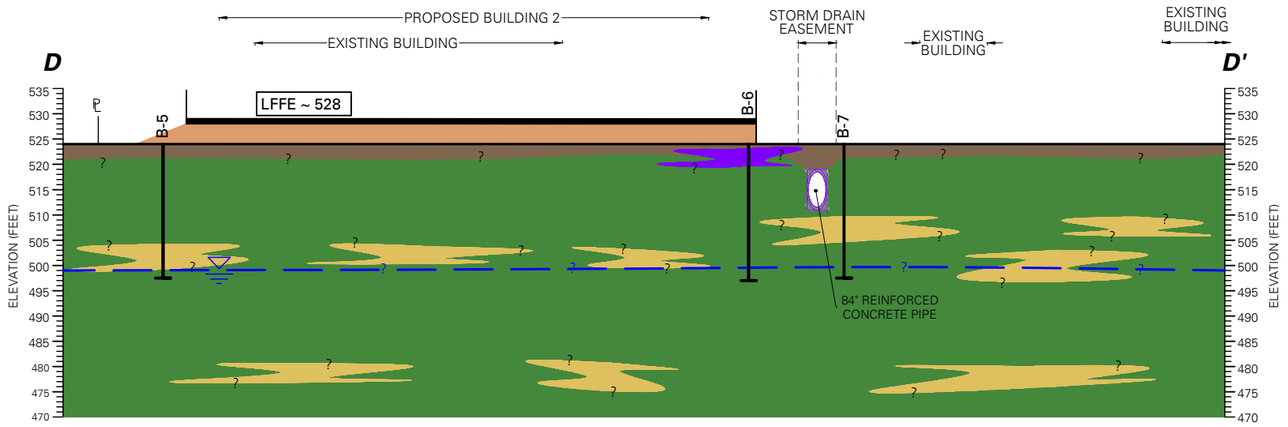
Project	WALNUT BUSINESS PARK 20401 VALLEY BOULEVARD WALNUT LOS ANGELES COUNTY CALIFORNIA
Figure Title	CROSS SECTION C-C'
Project No.	700108301
Date	December 2021
Scale	AS SHOWN
Drawn By	CC
Figure No.	5

CROSS SECTION D-D'

N75W



LEGEND:

- APPROXIMATE GROUND SURFACE LEVEL
- PROPOSED FILL
- ARTIFICIAL FILL (af)
- PREDOMINATELY SANDY SOILS
- PREDOMINATELY CLAYEY SOILS
- PREDOMINATELY HIGH PLASTICITY CLAY
- SANDSTONE/SILTSTONE/CLAYSTONE
- APPROXIMATE GROUNDWATER LEVEL AT TIME OF EXPLORATION
- LFFE ~ 528 — LOWEST FINISHED FLOOR ELEVATION (FEET)

NOTES:

1. CROSS SECTION DISPLAYS GENERALIZED SUBSURFACE CONDITIONS; FOR A DETAILED DESCRIPTION OF CONDITIONS ENCOUNTERED REFER TO BORING LOGS.
2. REFER TO SITE PLAN FOR LOCATION OF CROSS SECTIONS.
3. GROUND SURFACE PROFILE INFERRED FROM GOOGLE EARTH PRO ON DECEMBER 3, 2021.

30 15 0 30
SCALE IN FEET (VERTICAL)

60 30 0 60
SCALE IN FEET (HORIZONTAL)

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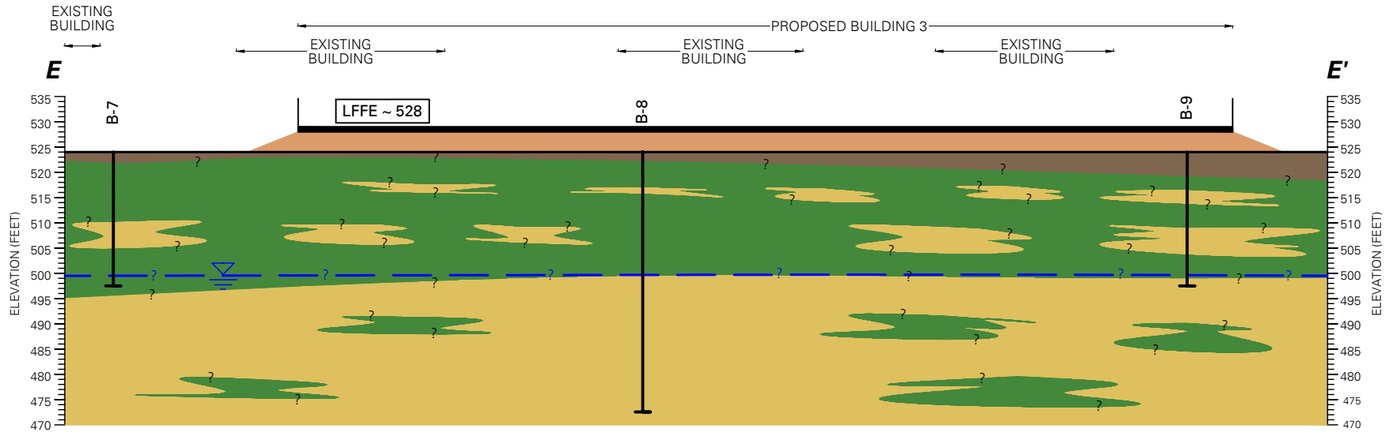
Figure Title
CROSS SECTION D-D'

Project No. 700108301
Date December 2021
Scale AS SHOWN
Drawn By CC

Figure No. **6**

CROSS SECTION E-E'

N36W



LEGEND:

- APPROXIMATE GROUND SURFACE LEVEL
- PROPOSED FILL
- ARTIFICIAL FILL (af)
- PREDOMINATELY SANDY SOILS
- PREDOMINATELY CLAYEY SOILS
- SANDSTONE/SILTSTONE/CLAYSTONE
- APPROXIMATE GROUNDWATER LEVEL AT TIME OF EXPLORATION
- LFFE ~ 528 — LOWEST FINISHED FLOOR ELEVATION (FEET)

NOTES:

1. CROSS SECTION DISPLAYS GENERALIZED SUBSURFACE CONDITIONS; FOR A DETAILED DESCRIPTION OF CONDITIONS ENCOUNTERED REFER TO BORING LOGS.
2. REFER TO SITE PLAN FOR LOCATION OF CROSS SECTIONS.
3. GROUND SURFACE PROFILE INFERRED FROM GOOGLE EARTH PRO ON DECEMBER 3, 2021.

30 15 0 30
SCALE IN FEET (VERTICAL)

60 30 0 60
SCALE IN FEET (HORIZONTAL)

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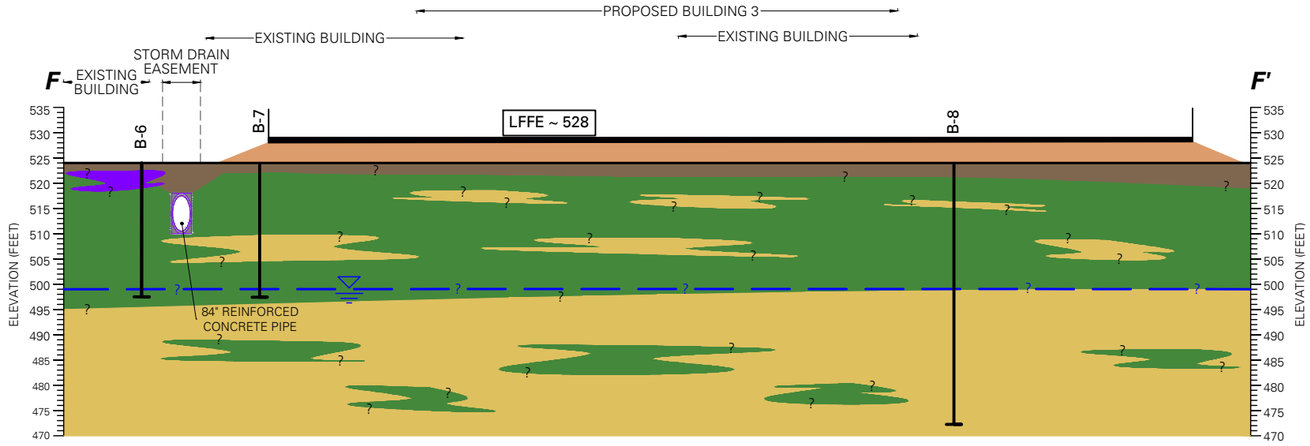
Figure Title
CROSS SECTION E-E'

Project No. 700108301
Date December 2021
Scale AS SHOWN
Drawn By CC

Figure No. **7**

CROSS SECTION F-F'

N75W



LEGEND:

- APPROXIMATE GROUND SURFACE LEVEL
- PROPOSED FILL
- ARTIFICIAL FILL (af)
- PREDOMINATELY SANDY SOILS
- PREDOMINATELY CLAYEY SOILS
- PREDOMINATELY HIGH PLASTICITY CLAY
- SANDSTONE/SILTSTONE/CLAYSTONE
- APPROXIMATE GROUNDWATER LEVEL AT TIME OF EXPLORATION
- LFFE ~ 525 — LOWEST FINISHED FLOOR ELEVATION (FEET)

NOTES:

1. CROSS SECTION DISPLAYS GENERALIZED SUBSURFACE CONDITIONS; FOR A DETAILED DESCRIPTION OF CONDITIONS ENCOUNTERED REFER TO BORING LOGS.
2. REFER TO SITE PLAN FOR LOCATION OF CROSS SECTIONS.
3. GROUND SURFACE PROFILE INFERRED FROM GOOGLE EARTH PRO ON DECEMBER 3, 2021.

30 15 0 30
SCALE IN FEET (VERTICAL)

60 30 0 60
SCALE IN FEET (HORIZONTAL)

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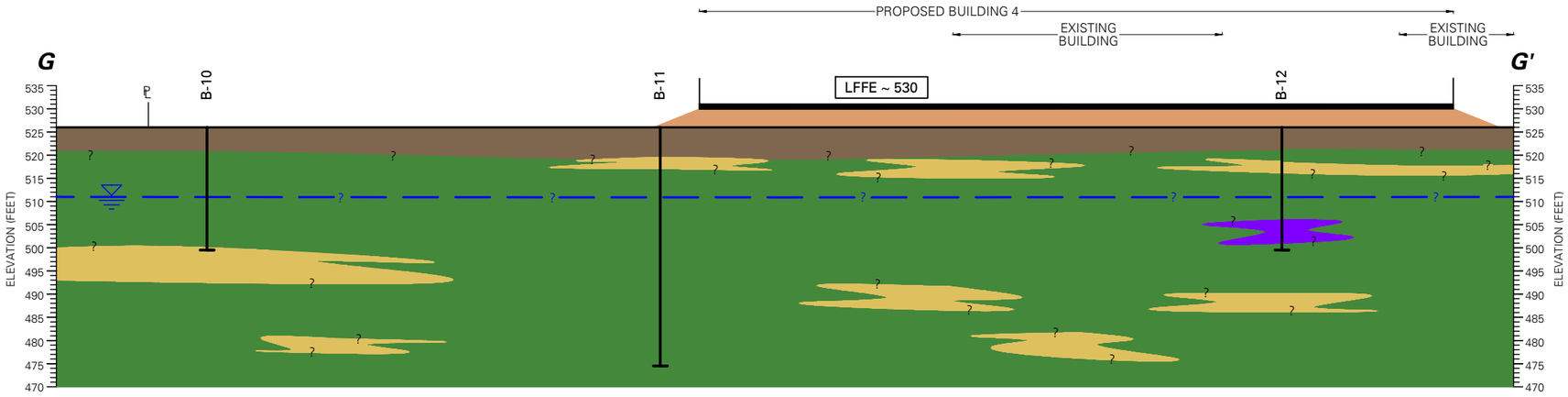
Figure Title
CROSS SECTION F-F'

Project No. 700108301
Date December 2021
Scale AS SHOWN
Drawn By CC

Figure No. **8**

CROSS SECTION G-G'

N36W



LEGEND:

- APPROXIMATE GROUND SURFACE LEVEL
- PROPOSED FILL
- ARTIFICIAL FILL (af)
- PREDOMINATELY SANDY SOILS
- PREDOMINATELY CLAYEY SOILS
- PREDOMINATELY HIGH PLASTICITY CLAY
- SANDSTONE/SILTSTONE/CLAYSTONE
- APPROXIMATE GROUNDWATER LEVEL AT TIME OF EXPLORATION
- LFFE ~ 530 — LOWEST FINISHED FLOOR ELEVATION (FEET)

NOTES:

1. CROSS SECTION DISPLAYS GENERALIZED SUBSURFACE CONDITIONS; FOR A DETAILED DESCRIPTION OF CONDITIONS ENCOUNTERED REFER TO BORING LOGS.
2. REFER TO SITE PLAN FOR LOCATION OF CROSS SECTIONS.
3. GROUND SURFACE PROFILE INFERRED FROM GOOGLE EARTH PRO ON DECEMBER 3, 2021.

30 15 0 30
SCALE IN FEET (VERTICAL)

60 30 0 60
SCALE IN FEET (HORIZONTAL)

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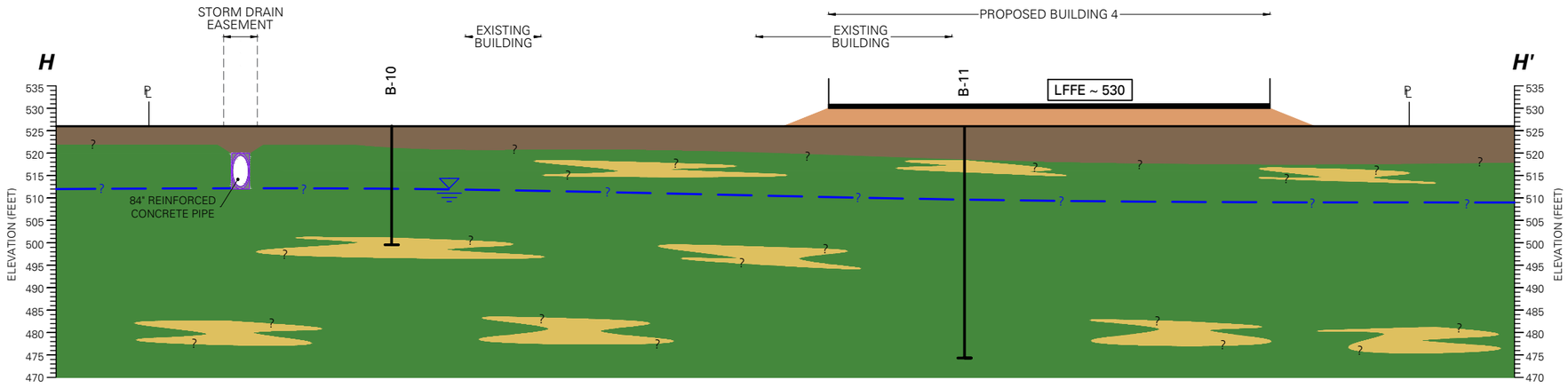
Figure Title	CROSS SECTION G-G'
Project No.	700108301
Date	December 2021
Scale	AS SHOWN
Drawn By	CC
Figure No.	9

CROSS SECTION H-H'

N75W



LEGEND:

- APPROXIMATE GROUND SURFACE LEVEL
- PROPOSED FILL
- ARTIFICIAL FILL (af)
- PREDOMINATELY SANDY SOILS
- PREDOMINATELY CLAYEY SOILS
- SANDSTONE/SILTSTONE/CLAYSTONE
- APPROXIMATE GROUNDWATER LEVEL AT TIME OF EXPLORATION
- LFFE ~ 530 — LOWEST FINISHED FLOOR ELEVATION (FEET)

NOTES:

1. CROSS SECTION DISPLAYS GENERALIZED SUBSURFACE CONDITIONS; FOR A DETAILED DESCRIPTION OF CONDITIONS ENCOUNTERED REFER TO BORING LOGS.
2. REFER TO SITE PLAN FOR LOCATION OF CROSS SECTIONS.
3. GROUND SURFACE PROFILE INFERRED FROM GOOGLE EARTH PRO ON DECEMBER 3, 2021.

30 15 0 30
SCALE IN FEET (VERTICAL)

60 30 0 60
SCALE IN FEET (HORIZONTAL)

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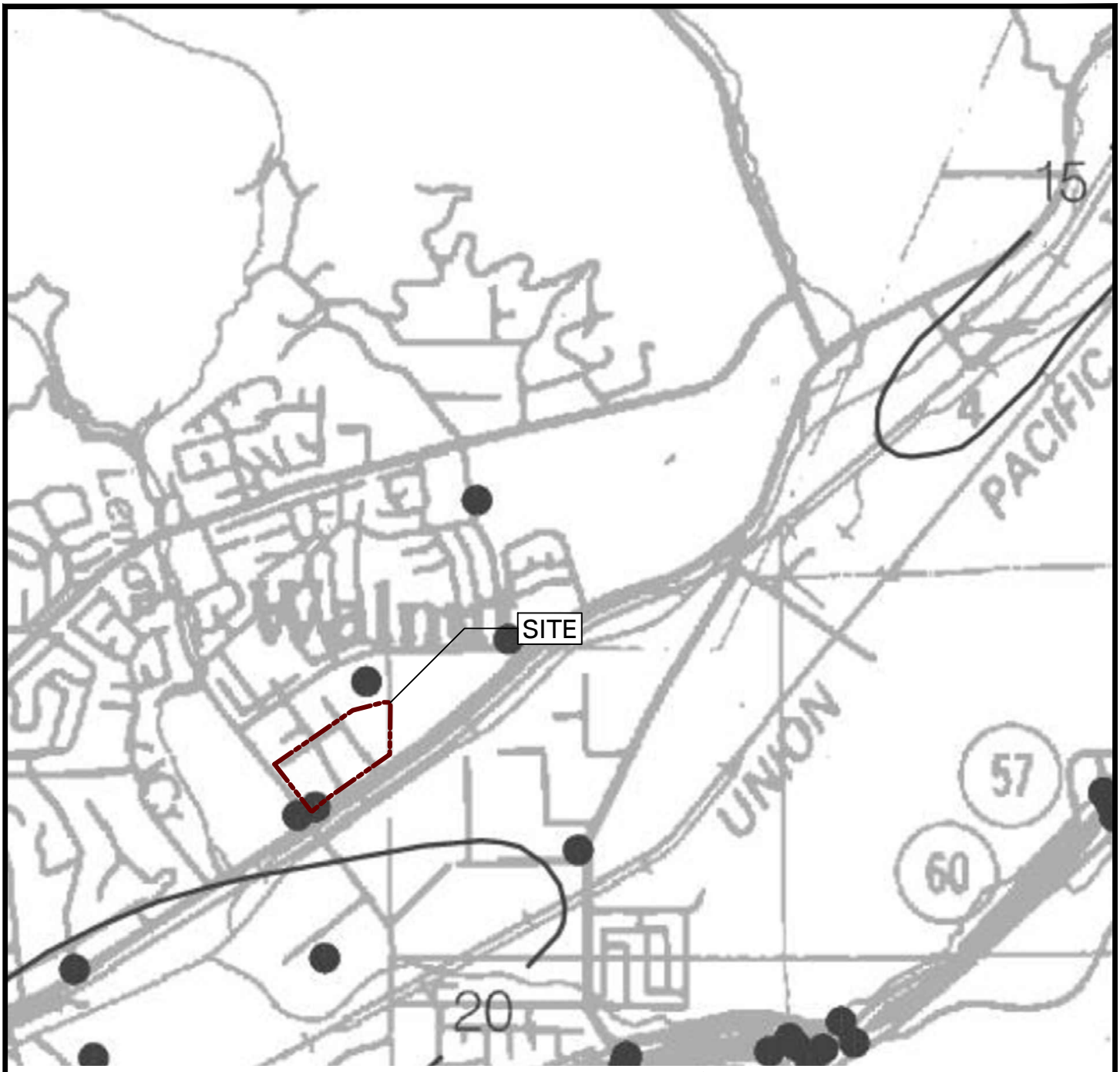
Figure Title	CROSS SECTION H-H'
Project No.	700108301
Date	December 2021
Scale	AS SHOWN
Drawn By	CC
Figure No.	10



LEGEND:

SITE LIMITS

30 DEPTH TO GROUNDWATER IN FEET

BOREHOLE SITE

2000 1000 0 2000

SCALE IN FEET

REFERENCE: SEISMIC HAZARD ZONE REPORT OF THE SAN DIMAS QUADRANGLE, LOS ANGELES COUNTY, CALIFORNIA, PLATE 1.2 (CALIFORNIA DEPARTMENT OF CONSERVATION, 1998)

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Figure Title

HISTORICAL HIGH GROUNDWATER MAP

Project No. 700108301

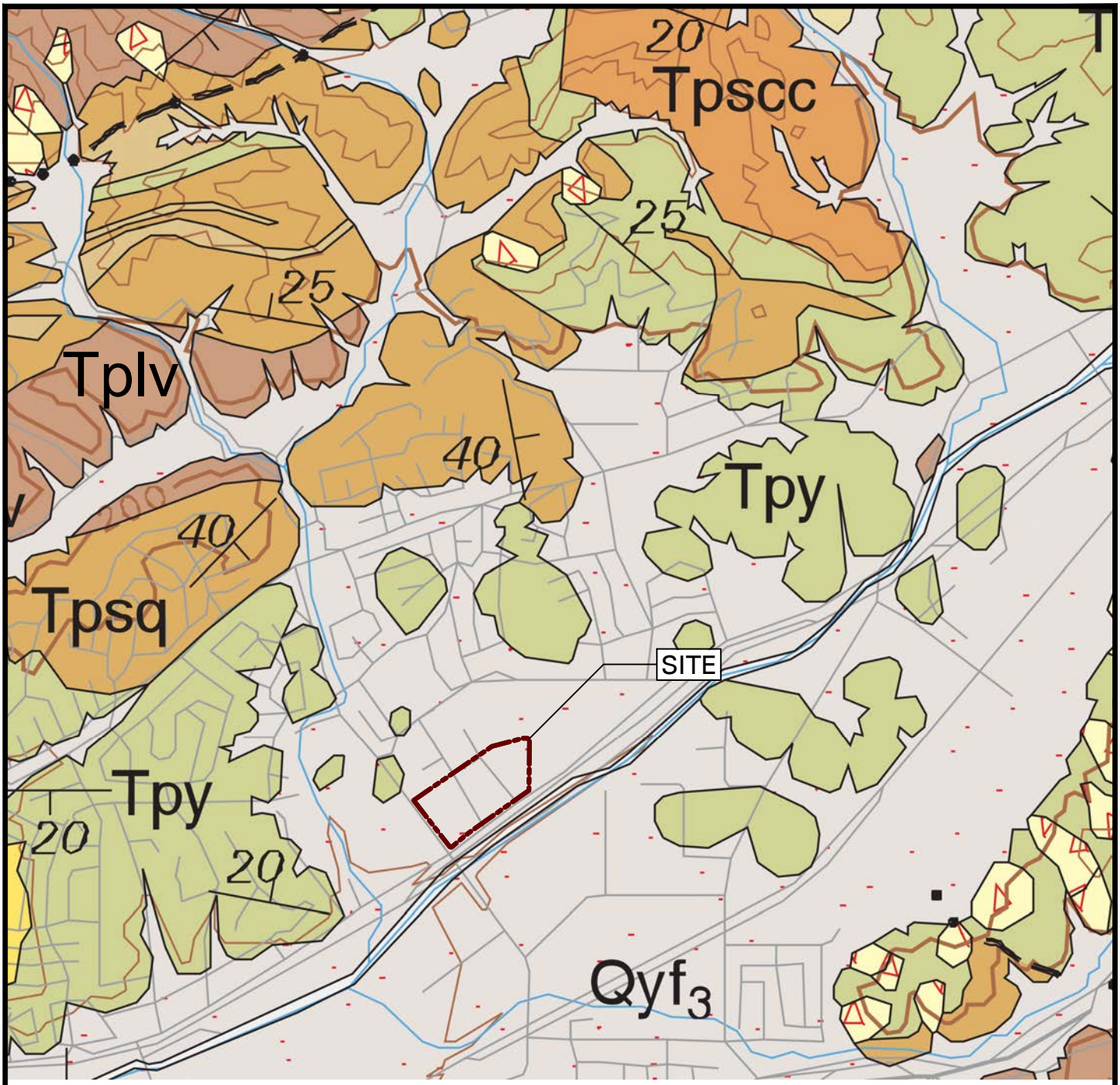
Date December 2021

Scale AS SHOWN

Drawn By CC

Figure No. **11**

Filename: \\langan.com\data\IRV\data3\700108301\Project Data_Discipline\Geotechnical\CAD\01\2D-DesignFiles\GEOTECHNICAL\GEOTECHNICAL FIGURES.dwg Date: 12/13/2021 Time: 10:25 User: cconstantino Style Table: Langan.stb Layout: HHGWL



LEGEND:

Qyf	YOUNG ALLUVIAL-FAN DEPOSITS
	PUENTE FORMATION
Tpy	YORBA MEMBER
Tpscc	SYCAMORE CANYON MEMBER
Tpsq	SOQUEL MEMBER
Tplv	LA VIDA MEMBER

2000 1000 0 2000

SCALE IN FEET

REFERENCE: PRELIMINARY GEOLOGIC MAP OF THE SAN BERNARDINO 30' X 60' QUADRANGLE, CALIFORNIA (MORTON & MILLER, 2003)

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Figure Title
REGIONAL GEOLOGIC MAP

Project No.
700108301

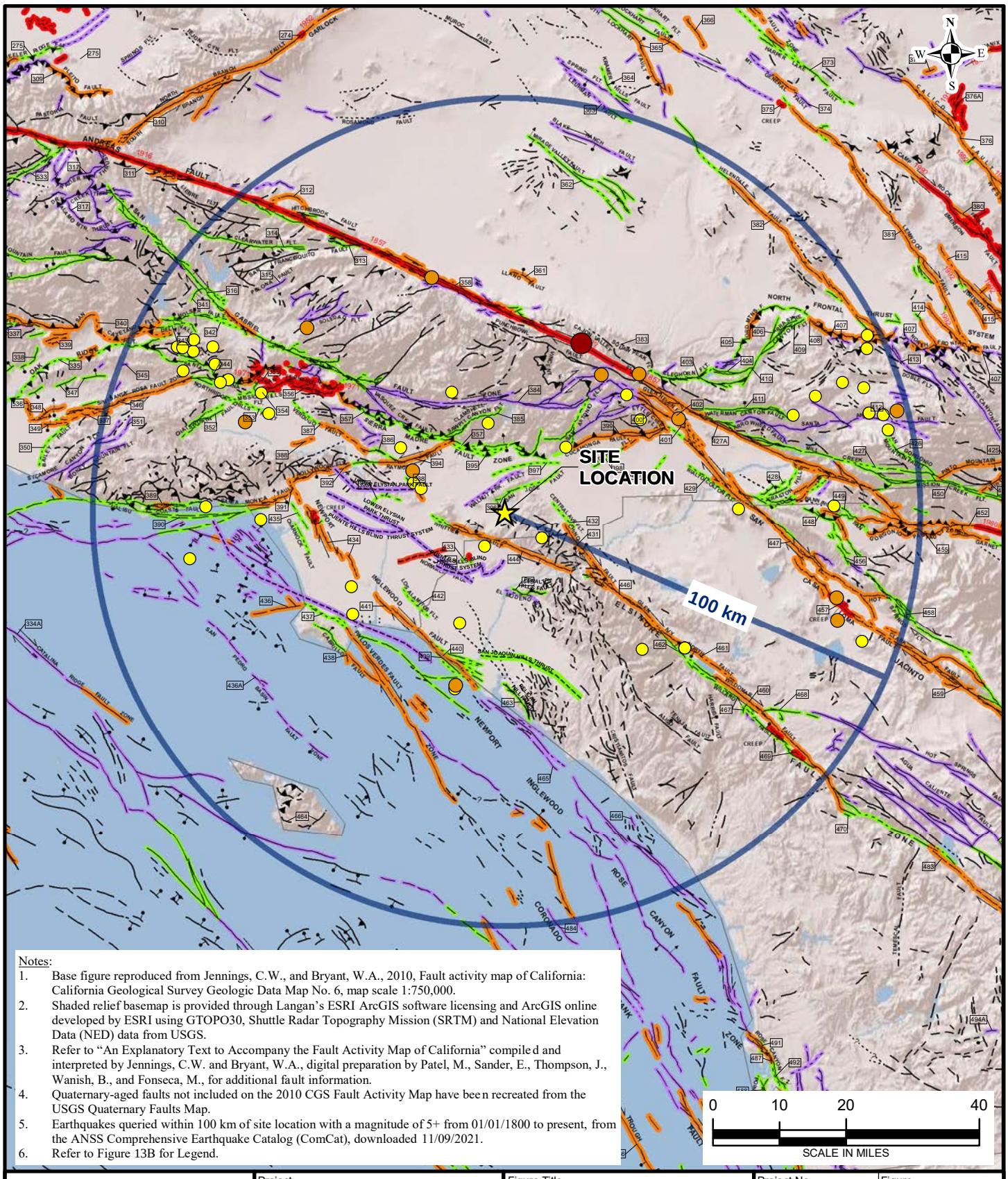
Date
December 2021

Scale
AS SHOWN

Drawn By
CC

Figure No.
12

Filename: \\langan.com\data\IRV\data3\700108301\Project Data_Discipline\Geotechnical\CAD\01\2D-DesignFiles\GEOTECHNICAL\GEOTECHNICAL FIGURES.dwg Date: 12/13/2021 Time: 10:25 User: cconstantino Style Table: Langan.stb Layout: RGM



Notes:

1. Base figure reproduced from Jennings, C.W., and Bryant, W.A., 2010, Fault activity map of California: California Geological Survey Geologic Data Map No. 6, map scale 1:750,000.
2. Shaded relief basemap is provided through Langan's ESRI ArcGIS software licensing and ArcGIS online developed by ESRI using GTOPO30, Shuttle Radar Topography Mission (SRTM) and National Elevation Data (NED) data from USGS.
3. Refer to "An Explanatory Text to Accompany the Fault Activity Map of California" compiled and interpreted by Jennings, C.W. and Bryant, W.A., digital preparation by Patel, M., Sander, E., Thompson, J., Wanish, B., and Fonseca, M., for additional fault information.
4. Quaternary-aged faults not included on the 2010 CGS Fault Activity Map have been recreated from the USGS Quaternary Faults Map.
5. Earthquakes queried within 100 km of site location with a magnitude of 5+ from 01/01/1800 to present, from the ANSS Comprehensive Earthquake Catalog (ComCat), downloaded 11/09/2021.
6. Refer to Figure 13B for Legend.

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Project
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Figure Title
QUATERNARY FAULT ACTIVITY AND EARTHQUAKE EPICENTER MAP

Project No. 700108301
Date December 2021
Scale 1 inch = 20 miles
Drawn By TO

Figure 13A

Path: \\langan.com\data\IRV\data3\700108301\Project Data\ArcGIS\MXD\Geotech_Figures\Fault 7A - Fault Map.mxd Date: 11/15/2021 User: Toulie Time: 11:08:11 AM

LEGEND:

Fault Age

The age classifications are based on geologic evidence to determine the youngest faulted unit and the oldest unfaulted unit along each fault or fault section

- Historic
- Holocene
- Late Quaternary
- Quaternary

Earthquake Epicenter

- Magnitude 5.0 to 5.9
- Magnitude 6.0 to 6.9
- Magnitude 7.0 to 7.4
- Magnitude 7.5 to 8.0

Pre-Quaternary Faults

- fault, certain
- fault, approx. located
- fault, concealed
- thrust fault, certain
- thrust fault, approx. located
- thrust fault, approx. located, queried
- fault, certain
- fault, concealed
- fault, approx. located

Quaternary Faults

- fault, certain
- fault, approx. located
- fault, approx. located, queried
- fault, inferred, queried
- fault, concealed
- fault, concealed, queried
- thrust fault, certain
- thrust fault, approx. located
- thrust fault, concealed
- dextral fault, certain
- dextral fault, approx. located
- dextral fault, concealed
- sinistral fault, certain
- sinistral fault, approx. located
- sinistral fault, concealed
- thrust fault, certain (2)
- thrust fault, approx. located (2)
- thrust fault, concealed (2)
- fault, solid
- fault, dashed
- fault, dotted
- dextral fault, solid
- fault, dotted, queried
- fault, dotted, queried (2)
- fault, solid, dip
- fault, dashed, dip
- fault, dotted, dip
- reverse fault, solid
- reverse fault, dashed
- reverse fault, dotted

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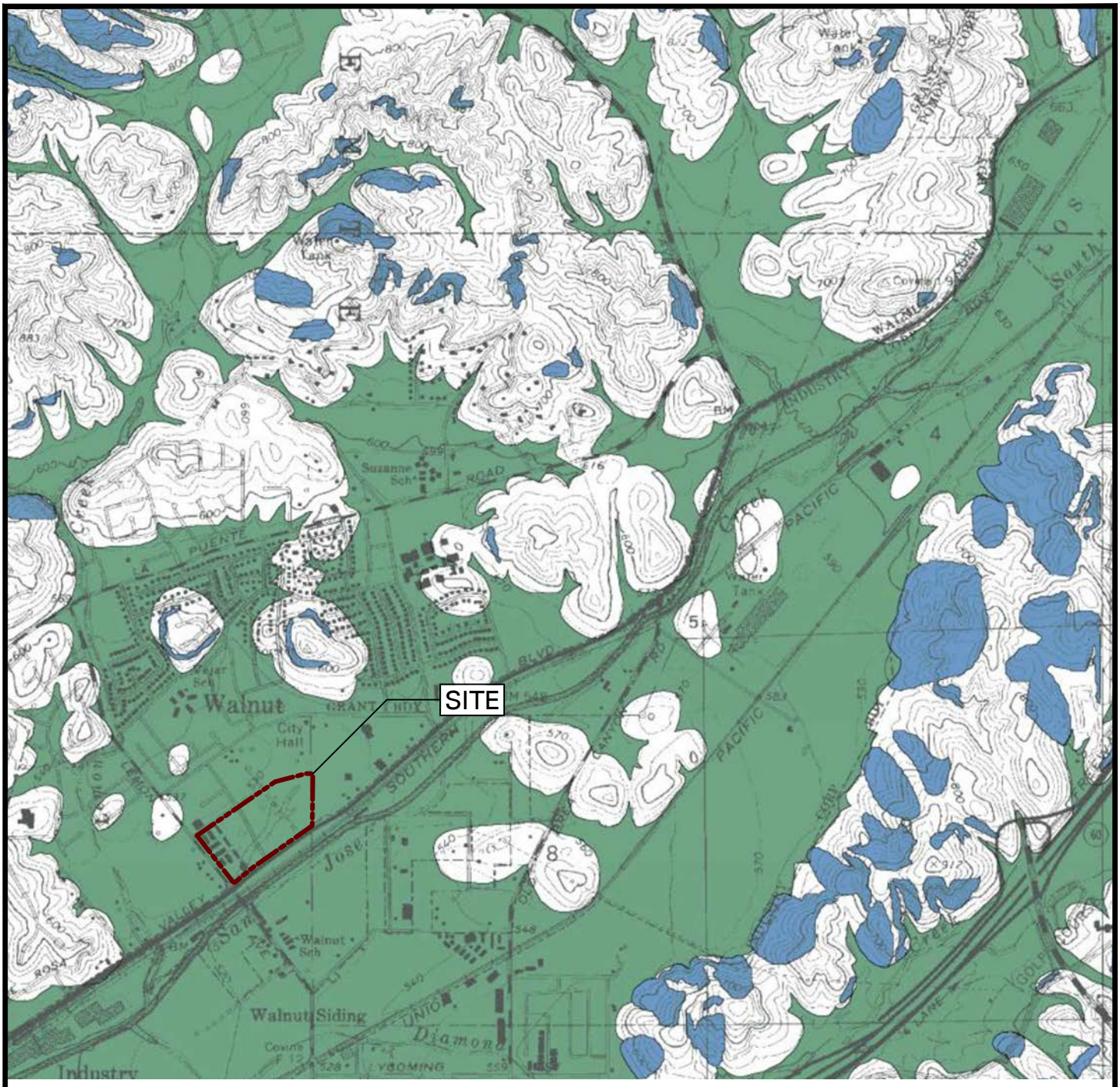
Project: WALNUT BUSINESS PARK
WALNUT
LOS ANGELES COUNTY CALIFORNIA

Figure Title: QUATERNARY FAULT ACTIVITY AND EARTHQUAKE EPICENTER MAP

Project No.: 700108301
Date: December 2021
Scale: NOT TO SCALE
Drawn By: TO

Figure: 13B



LEGEND:

Liquefaction
Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslides
Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

REFERENCE: CGS EARTHQUAKE ZONES OF REQUIRED INVESTIGATION FOR THE SAN DIMAS, CALIFORNIA 7.5-MINUTE QUADRANGLE (1999)

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20401 VALLEY BOULEVARD
WALNUT
LOS ANGELES COUNTY CALIFORNIA

Figure Title
SEISMIC HAZARD ZONES MAP

Project No. 700108301
Date
Scale AS SHOWN
Drawn By CC

Figure No. **14**

APPENDIX A
Field Explorations and Laboratory Testing

APPENDIX A

SUBSURFACE EXPLORATIONS

We explored the subsurface conditions at the site by drilling twelve borings (B-1 through B-12) to depths ranging between 26.5 and 51.5 feet BGS at the locations shown on Figure 2. The borings were drilled in November 2021 by SoCal Drilling Co. using a Mayhew 1,000 Mud-Rotary drill.

The locations of the explorations were determined in the field by observing nearby landmarks. This information should be considered accurate only to the degree implied by the methods used.

A member of our geotechnical staff observed and logged the explorations. We obtained representative samples of the various soil encountered in the explorations. Classifications and sampling intervals are presented on the exploration logs included in this appendix.

SOIL SAMPLING

Samples were collected from the borings using modified California split-spoon samplers in general accordance with ASTM D3550 and we performed Standard Penetration Tests (SPTs) in general accordance with ASTM D1586.

The modified California samplers and SPTs were driven using a 140-pound hammer free falling 30 inches. The samplers were driven a total distance of 18 inches or to refusal. The number of blow counts required to drive the sampler for each 6 inch (California sampler) and 12-inch (SPT) segment was recorded (or less if refusal is met) on the exploration logs. Sampling methods and intervals are shown on the exploration logs.

The samples collected from the borings were transported to our office for further review and for assignment of geotechnical laboratory testing.

SOIL CLASSIFICATION

The soil samples were described in accordance with the classification legend that is included in this appendix prior to the exploration logs. The exploration logs indicate the depths at which the soils or their characteristics change, although the change actually may be gradual. If the change was observed directly in a sample then the contact is indicated with a solid line on the logs. If the change occurred between sample locations, the depth was interpreted and the change is indicated on the logs with a dashed line. Classifications are shown on the exploration logs.

LABORATORY TESTING

Moisture Content and In-place Dry Density

The natural moisture content of select soil samples were performed in general accordance with ASTM D2216. The natural moisture content is a ratio of the weight of the water to soil in a test sample and is expressed as a percentage.

Select soil samples were tested to determine the in situ dry density. The tests were performed in general accordance with ASTM D2937. The dry density is defined as the ratio of the dry weight of the soil sample to the volume of that sample. The dry density typically is expressed in units of pounds per cubic foot (pcf).

The test results are presented in this appendix.

Maximum Dry-Density and Optimum Moisture Content

Maximum dry-density and optimum moisture content testing was performed in general accordance with ASTM D 1557 on one bulk samples obtained from the explorations. The tests determines the optimal moisture content at which sample achieves its maximum dry density. The test results are presented in this appendix.

Grain size Analysis

Grain Size analysis was completed on select samples obtained from the explorations. The tests were conducted in general accordance with ASTM D 1140. The test measures the liquid limit, plastic limit, and plasticity index of soils. The test results are presented in this appendix.

Atterberg Limits

Atterberg Limit tests were completed on select samples obtained from the explorations. The tests were conducted in general accordance with ASTM D 4318. The test measures the amount of material finer than 75-µm (No. 200) sieve in soils. The test results are presented in this appendix.

Expansion Index

Expansion index tests were performed on selected bulk samples of the on-site soils in accordance with the latest version of Test Method ASTM D4829.

The test results are presented in this appendix.

Corrosion Testing

Chemical and electrical analyses were performed on selected bulk samples of onsite soils to determine their soluble sulfate content, chloride content, pH (acidity) and minimum electrical resistivity. These tests were performed in accordance with the latest versions of California Test Method Nos. CTM 417 (sulfate), CTM 422 (chloride), and CTM 643 (pH and resistivity) respectively. The results of these tests are included in this appendix.

Consolidation Testing

One-dimensional consolidation testing was performed in general accordance with ASTM D2435 on relatively undisturbed soil samples. The test measures the volume change of a soil sample under predetermined loads.

The test results are presented in this appendix.

Strength Testing

Direct shear tests were completed on select samples obtained from the explorations. The tests were performed in general accordance with ASTM D3080. The test determines the effects upon shear resistance and displacement, and strength properties such as Mohr strength envelopes.

The test results are presented in this appendix.

R-Value

A representative sample of the near-surface soil was tested for resistance value (R-Value) in accordance with California Test Method 301. This test is designed to provide a relative measure of soil strength for use in pavement design.

The test result is presented in this appendix.

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		Symbols	Typical Names
Coarse-Grained Soil (more than half of soil is larger than the no. 200 sieve size)	**Gravels** (more than half of coarse fraction is retained/> no. 4 sieve size)	**GW**	Well-graded GRAVELS with less than 5% fines or gravel-sand mixtures
		GP	Poorly-graded GRAVELS with less than 5% fines or gravel-sand mixtures
		GM	Silty gravels, gravel-sand-silt mixtures;GRAVELS with greater than 12% ML or MH fines
		GC	Clayey gravels, gravel-sand-clay mixtures; GRAVELS with greater than 12% CL or CH
	Sands (more than half of coarse fraction passes/< no. 4 sieve size)	**SW**	Well-graded sands with less than 5% fines or gravelly sands, little or no fines
		SP	Poorly-graded sands with less than 5% fines or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures; SANDS with greater than 12% ML or MH fines
		SC	Clayey sands, sand-clay mixtures; SANDS with greater than 12% CL or CH fines
Fine-Grained Soils (more than half of soil is smaller than the no. 200 sieve size)	**Silts and Clays** LL = < 50	**ML**	Inorganic silts and clayey silts of low plasticity, sandy non-plastic SILT, gravelly SILT
		CL	Inorganic clays of low to medium plasticity, silty CLAY, trace fines, sand
		OL	Organic silts and organic silt-clays of non-plastic to medium plasticity
	Silts and Clays LL = > 50	**MH**	Inorganic medium plastic silts, medium plastic to very plastic clayey silts.
		CH	Inorganic plastic to very plastic CLAYS, sandy plastic CLAY
		OH	Organic medium plastic to plastic silty CLAYS, and very plastic CLAYS
Highly Organic Soils		**PT**	Peat and other highly organic soils

GRAIN SIZE CHART

Classification	Range of Grain Sizes	
	U.S. Standard Sieve Size	Grain Size in Millimeters
Boulders	Above 12"	Above 305
Cobbles	12" to 3"	305 to 76.2
Gravel	3" to No. 4	76.2 to 4.75
coarse	3" to ¾"	76.2 to 19.1
fine	¾" to No.4	19.1 to 4.75
Sand	No. 4 to No. 200	4.76 to 0.075
coarse	No. 4 to No. 10	4.76 to 2.00
medium	No. 10 to No. 40	2.00 to 0.420
fine	No. 40 to No. 200	0.240 to 0.075
Silt and Clay	Below No. 200	Below 0.075

GROUNDWATER READING

- Groundwater encountered during drilling
- Groundwater at completion
- Groundwater at 24 hours

SOIL DESCRIPTIONS/SYMBOLS

- Well-graded GRAVEL (GW)
- Poorly-graded GRAVEL (GP)
- Silty GRAVEL (GM)
- Clayey GRAVEL (GC)
- Well-graded SAND (SW)
- Poorly-graded SAND (SP)
- Silty SAND (SM)
- Clayey SAND (SC)
- AGGREGATE BASE
- Low-Plasticity SILT (ML)
- High-Plasticity SILT (MH)
- Low-Plasticity CLAY (CL)
- High-Plasticity CLAY (CH)
- SANDSTONE
- CLAYSTONE
- SILTSTONE
- FILL
- ASPHALT

SAMPLER TYPE

- CR - Modified California (CR) split-barrel ring sampler with 3.0-inch outside diameter and a 2.5-inch inside diameter.
- SPT - Standard Penetration Test (SPT) split-barrel sampler with a 2.00-inch outside diameter with a 1.5-inch inside diameter
- ST - Shelby Tube (3.0-inch outside diameter, thin-walled tube) advanced with hydraulic pressure
- BAG - Bulk Sample
- C - Core Barrel

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Figure Title

BORING LOG LEGEND

Figure No.

APPENDIX A

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Log of Boring **B-1** Sheet 1 of 2

Project: Walnut Business Park	Project No.: 700108301
Location: 20401 Valley Boulevard	Elevation and Datum: Google Earth = 521 (feet, MSL)
Drilling Company: SoCal Drilling	Date Started: 11/22/21 — Date Finished: 11/22/21
Drilling Equipment: Mayhew 1000	Completion Depth: 26.5 ft — Rock Depth: -
Size and Type of Bit: 4.75" Mud Rotary	Number of Samples: Disturbed 4 — Undisturbed 4 — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First ▽ — Completion ▼ - — 24 HR. ▼ -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Randy
Sampler: Bulk; 2-inch O.D. SPT Split-Barrel, 2.5-inch I.D. Cal Mod	Field Engineer: A. Nieblas
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+521.0	AC = 3-inches thick, AB = 6-inches thick.	0						Bulk sample collected from 0-10 feet. Remolded Direct Shear Corrosivity Test Expansion Index Max Dry Density
	+520.3	**Artificial Fill (af)** CLAY (CL), olive brown with dark brown mottled, stiff, moist [FILL].	1						
	+518.5	**Quaternary Young Alluvial Fan Deposits (Qyf)** CLAY with Sand (CL), dark brown, stiff, very moist, some sand.	2						
			3	S-1	CR	18	4 8 12		
		Olive brown, medium stiff to stiff.	4						
			5						
			6	S-2	SPT	12	2 4 4		
	+513.5	CLAY (CL), olive gray and brown mottled, stiff, very moist, abundant caliche, few iron oxide and limonite staining.	7						DD = 94.0 pcf, MC = 28.9%
			8	S-3	CR	18	4 8 9		
			9						
	+511.0	**BEDROCK - Tertiary Puente Formation Yorba Member (Tpy)** Clayey SANDSTONE, olive brown with iron oxide and limonite mottled, medium dense, moist, fine sand, distinct shallow dipping planar beds, thinly bedded.	10	S-4	SPT	12	4 6 10		
			11						
			12						
			13						
			14						
	+506.0	SANDSTONE/SILTSTONE/CLAYSTONE, olive brown/gray/orangish brown, hard to dense, moist, iron oxide and some limonite staining, moderately dipping, thinly bedded, planar.	15	S-5	CR	18	9 22 29		
			16						
			17						
			18						
			19						
	+501.0		20						

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Log of Boring **B-1** Sheet 2 of 2

Project	Project No.
Walnut Business Park	700108301
Location	**Elevation and Datum**
20401 Valley Boulevard	Google Earth = 521 (feet, MSL)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+501.0	SANDSTONE with Clay and SILTSTONE, olive brown with gray and orangish brown interbeds, medium dense to very stiff, moist, fine sand, well to moderate bedding.	20	S-6	SPT	10	5 9 9		
	+496.0		21						
			22						
			23						
			24						
			25						
		SILTSTONE/SANDSTONE, olive brown with gray and orangish brown interbeds, very dense to hard, moist, fine sand, moderately shallow dipping planar beds, thinly bedded.	26	S-7	CR	18	20 38 49		
	+494.5	Total Depth = 26.5 feet Boring bailed after completion. Depth to groundwater not apparent. Boring backfilled with bentonite grout and AC patched.	27						
			28						
			29						
			30						
			31						
			32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						

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Log of Boring **B-2** Sheet 1 of 2

Project: Walnut Business Park	Project No.: 700108301
Location: 20401 Valley Boulevard	Elevation and Datum: Google Earth = 521 (feet, MSL)
Drilling Company: SoCal Drilling	Date Started: 11/22/21 — Date Finished: 11/22/21
Drilling Equipment: Mayhew 1000	Completion Depth: 32 ft — Rock Depth: -
Size and Type of Bit: 4.75" Mud Rotary	Number of Samples: Disturbed 4 — Undisturbed 4 — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First ▽ — Completion ▼ 20 — 24 HR. ▼ -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Randy
Sampler: 2-inch O.D. SPT Split-Barrel, 2.5-inch I.D. Cal Mod	Field Engineer: A. Nieblas
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+521.0	AC = 3-inches thick, AB = 6-inches thick.	0						
	+520.3	**Artificial Fill (af)** CLAY (CL), olive brown with dark brown mottled, stiff, moist [FILL].	1						
	+518.5	**Quaternary Young Alluvial Fan Deposits (Qyf)** CLAY (CL), dark brown, stiff, very moist, moderate plasticity.	2						
			3	S-1	SPT	6	4 4 5		
	+516.0	Sandy CLAY (CL), olive brown with yellow and orangish brown mottled, stiff, moist, fine to medium sand, trace caliche.	4						
	+515.0	Sandy CLAY (CH), olive brown, stiff, moist to very moist, fine sand, abundant caliche.	5	S-2	CR	18	5 9 12		DD = 104.2 pcf, MC = 19.8%
			6						
			7						
			8	S-3	SPT	12	3 5 5		LL = 52, PL = 21, PI = 31
			9						
	+511.0	CLAY with Sand (CL), olive gray and brown, stiff, very moist, some fine sand, caliche stringers.	10	S-4	CR	18	3 6 8		DD = 97.8 pcf, MC = 27.2%
			11						
			12						
			13						
			14						
	+506.0	Sandy CLAY (CL), orangish dusk brown, stiff, moist, fine sand, fine to coarse gravel.	15	S-5	SPT	18	4 7 7		
			16						
			17						
			18						
			19						
	+501.0		20						

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Log of Boring **B-2** Sheet 2 of 2

Project	Project No.
Walnut Business Park	700108301
Location	**Elevation and Datum**
20401 Valley Boulevard	Google Earth = 521 (feet, MSL)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+501.0	**BEDROCK - Tertiary Puente Formation Yorba Member (Tpy)** SANDSTONE/SILTSTONE, olive brown and orangish brown, very dense to hard, moist, fine sand, planar, shallow dipping beds.	20	S-6	CR	18	12 34 42		
	+496.0	Clayey to Silty SANDSTONE, orangish brown to olive brown, very dense, moist, fine sand, iron oxide staining.	25	S-7	SPT	12	15 27 36		
		Very hard, concretionary bed.	30	S-8	CR	0	50/3.5"		No sample recovery.
	+489.0	Total Depth = 32 feet Boring bailed after completion. Groundwater observed at 20 feet bgs. Boring backfilled with bentonite grout and AC patched.	32						

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Log of Boring **B-3** Sheet 1 of 2

Project: Walnut Business Park	Project No.: 700108301
Location: 20401 Valley Boulevard	Elevation and Datum: Google Earth = 521 (feet, MSL)
Drilling Company: SoCal Drilling	Date Started: 11/22/21 — Date Finished: 11/22/21
Drilling Equipment: Mayhew 1000	Completion Depth: 26.5 ft — Rock Depth: -
Size and Type of Bit: 4.75" Mud Rotary	Number of Samples: Disturbed 4 — Undisturbed 3 — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First ▽ — Completion ▼ - — 24 HR. ▼ -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Randy
Sampler: 2-inch O.D. SPT Split-Barrel, 2.5-inch I.D. Cal Mod	Field Engineer: A. Nieblas
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Number	Sample Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+521.0		0						
	+520.6	AC = 3-inches thick, AB = 2-inches thick.							
		Artificial Fill (af) CLAY (CL), olive brown with dark brown mottled, stiff, moist [FILL].	1						
	+518.5	**Quaternary Young Alluvial Fan Deposits (Qyf)** Silty CLAY (CL), olive brown, stiff, very moist.	2						
			3	S-1	SPT	5	2 5 4		
	+517.0	CLAY with Silt (CL), olive gray, very stiff, very moist.	4						
			5	S-2	CR	15	5 9 11		DD = 87.4 pcf, MC = 29.6%
			6						
	+513.5	CLAY with Silt and Sand (CL), olive gray, stiff, very moist, abundant caliche stringers.	7						
			8	S-3	SPT	6	2 4 4		
		Very stiff, fine gravel, decreased sand.	9						
			10	S-4	CR	18	6 10 14		DD = 95.1 pcf, MC = 28.2%
			11						
			12						
			13						
			14						
		Olive brown, increased clay.	15						LL = 47, PL = 21, PI = 26
			16	S-5	SPT	10	6 12 8		
			17						
			18						
	+502.0		19						
		CLAY (CL), gray brown, very stiff, very moist, few caliche and rootlets.	20						

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Log of Boring **B-3** Sheet 2 of 2

Project	Project No.
Walnut Business Park	700108301
Location	**Elevation and Datum**
20401 Valley Boulevard	Google Earth = 521 (feet, MSL)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+501.0		20						DD = 96.8 pcf, MC = 26.6%
			21	S-6	CR	18	10 18 22		
			22						
	+498.0	Sandy CLAY (CL), olive brown, very stiff, very moist, iron oxide and limonite staining.	23						
			24						
			25						
			26	S-7	SPT	18	6 8 10		
	+494.5	Total Depth = 26.5 feet Boring bailed after completion. Depth to groundwater not apparent. Boring backfilled with bentonite grout and AC patched.	27						
			28						
			29						
			30						
			31						
			32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						

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Log of Boring **B-4** Sheet 1 of 2

Project: Walnut Business Park	Project No.: 700108301
Location: 20401 Valley Boulevard	Elevation and Datum: Google Earth = 521 (feet, MSL)
Drilling Company: SoCal Drilling	Date Started: 11/22/21 — Date Finished: 11/22/21
Drilling Equipment: Mayhew 1000	Completion Depth: 41.5 ft — Rock Depth: -
Size and Type of Bit: 4.75" Mud Rotary	Number of Samples: Disturbed 5 — Undisturbed 5 — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First ▽ — Completion ▼ 24 — 24 HR. ▼ -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Randy
Sampler: 2-inch O.D. SPT Split-Barrel, 2.5-inch I.D. Cal Mod	Field Engineer: A. Nieblas
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+521.0		0						
	+520.4	AC = 3-inches thick, AB = 4-inches thick.							
		Artificial Fill (af) SILT with Sand (ML), dark olive gray, medium stiff, fine sand, high plasticity, few rootlets [FILL].	1						
			2						
			3	S-1	CR	18	3 3 5		
			4						
	+516.0		5						
		Quaternary Young Alluvial Fan Deposits (Qyf) CLAY (CL), olive brown and gray, soft to medium stiff, very moist, abundant caliche.	6	S-2	SPT	6	1 2 2		
			7						
		Olive gray, medium stiff, fine sand, caliche stringers.	8	S-3	CR	15	2 4 6		DD = 90.8 pcf, MC = 26.0%
			9						
		Olive brown, abundant caliche stringers.	10	S-4	SPT	12	2 3 4		
			11						
			12						
			13						
			14						
	+506.0		15						
		Sandy CLAY (CL), reddish dusk brown, stiff, moist to very moist, fine to very coarse sand.	16	S-5	CR	18	4 8 9		DD = 104.6 pcf, MC = 21.9% Consolidation Test
			17						
			18						
			19						
			20						

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Log of Boring **B-4** Sheet 2 of 2

Project	Project No.
Walnut Business Park	700108301
Location	**Elevation and Datum**
20401 Valley Boulevard	Google Earth = 521 (feet, MSL)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+501.0	Reddish brown with some brown mottled, medium dense to stiff, moist, very fine sand, increase sand.	20	S-6	SPT	12	6 8 7		
	+496.0	Clayey SAND (SC), olive brown, dense, moist to very moist, medium to coarse sand, fine gravel.	25	S-7	CR	18	26 29 22		DD = 114.4 pcf, MC = 19.5% % Passing #200 = 38
	+491.0	Clayey SAND with Gravel (SC), olive brown, very dense, very moist, fine to coarse sand and gravel.	30	S-8	SPT	6	14 37 50/5"		Heavy auger chatter from 28-33 feet. % Passing #200 = 14
	+486.0	**BEDROCK - Tertiary Puente Formation Yorba Member (Tpy)** SILTSTONE/SANDSTONE, gray and olive brown interbeds, very dense to hard, moist to very moist, fine sandstone with some silt, well to moderate plannar bedding with shallow dip, thinly bedded.	35	S-9	CR	17	30 45 50/5"		
	+481.0	SANDY SILTSTONE/SILTY SANDSTONE, olive brown and gray, hard to very dense, moist, thinly bedded, planar.	40	S-10	SPT	10	28 32 36		
	+479.5	Total Depth = 41.5 feet Boring bailed after completion. Groundwater observed at 24 feet bgs. Boring backfilled with bentonite grout and AC patched.	45						

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Log of Boring **B-5** Sheet 1 of 2

Project: Walnut Business Park	Project No.: 700108301
Location: 20401 Valley Boulevard	Elevation and Datum: Google Earth = 524 (feet, MSL)
Drilling Company: SoCal Drilling	Date Started: 11/24/21 — Date Finished: 11/24/21
Drilling Equipment: Mayhew 1000	Completion Depth: 26.5 ft — Rock Depth: -
Size and Type of Bit: 4.75" Mud Rotary	Number of Samples: Disturbed 5 — Undisturbed 3 — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First ▽ — Completion ▼ - — 24 HR. ▼ -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Randy
Sampler: Bulk; 2-inch O.D. SPT Split-Barrel, 2.5-inch I.D. Cal Mod	Field Engineer: A. Nieblas
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+524.0	AC = 3-inches thick, AB = 6-inches thick.	0						Bulk sample collected from 0-10 feet.
	+523.3	**Artificial Fill (af)** CLAY (CL), olive brown with dark brown mottled, stiff, moist [FILL].	1						
	+521.5	**Quaternary Young Alluvial Fan Deposits (Qyf)** CLAY with Gravel (CL), medium brown with some dark brown mottled, stiff, moist, fine gravel.	2						
			3	S-1	SPT	3	3 6 6		
			4						
			5	S-2	CR	18	5 8 8		DD = 108.3 pcf, MC = 26.1%
			6						
		Medium stiff to stiff.	7						
			8	S-3	SPT	9	2 4 4		
			9						
	+514.0	CLAY with Gravel (CL), olive brown with orangish brown mottled, medium stiff, moist to very moist, caliche.	10	S-4	CR	18	2 4 6		DD = 100.8 pcf, MC = 26.3%
			11						
			12						
			13						
			14						
	+509.0	Sandy CLAY (CL), reddish dusk brown, medium stiff, moist, fine gravel.	15	S-5	SPT	12	2 3 3		LL = 40, PL = 23, PI = 17
			16						
			17						
			18						
			19						
	+504.0		20						

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Log of Boring **B-5** Sheet 2 of 2

Project	Project No.
Walnut Business Park	700108301
Location	**Elevation and Datum**
20401 Valley Boulevard	Google Earth = 524 (feet, MSL)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+504.0	SILT (ML), dusky brown, stiff, wet, grades into Silty SAND with Gravel (SM) with depth.	20	S-6	CR	18	3 4 16		Soil saturated. DD = 79.8 pcf, MC = 40.5% % Passing #200 = 27
	+499.0	Sandy CLAY (CL), reddish dusk brown, very stiff, very moist, very fine to fine sand.	25	S-7	SPT	10	6 9 14		
	+497.5	Total Depth = 26.5 feet Boring bailed after completion. Depth to groundwater not apparent. Boring backfilled with bentonite grout and AC patched.	27						

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Log of Boring **B-6** Sheet 1 of 2

Project: Walnut Business Park	Project No.: 700108301
Location: 20401 Valley Boulevard	Elevation and Datum: Google Earth = 524 (feet, MSL)
Drilling Company: SoCal Drilling	Date Started: 11/23/21 — Date Finished: 11/23/21
Drilling Equipment: Mayhew 1000	Completion Depth: 26.5 ft — Rock Depth: -
Size and Type of Bit: 4.75" Mud Rotary	Number of Samples: Disturbed 4 — Undisturbed 3 — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First ▽ — Completion ▼ - — 24 HR. ▼ -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Randy
Sampler: 2-inch O.D. SPT Split-Barrel, 2.5-inch I.D. Cal Mod	Field Engineer: A. Nieblas
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+524.0	AC = 4-inches thick, AB = 4-inches thick.	0						
	+523.3	**Artificial Fill (af)** CLAY (CL), olive brown with dark brown mottled, stiff, moist [FILL].	1						
	+521.5	**Quaternary Young Alluvial Fan Deposits (Qyf)** Sandy CLAY (CH), olive gray, medium stiff to stiff, moist, fine to coarse sand, moderately plastic clay.	2						
			3	S-1	SPT	9	2 3 5		LL = 54, PL = 28, PI = 26
			4						
	+519.0	CLAY with Sand (CL), olive gray, stiff, very moist, some fine sand, caliche.	5	S-2	CR	18	4 10 14		DD =115.0 pcf, MC = 29.3%
			6						
			7						
		Olive brown and gray, medium stiff, moist, fine to coarse sand, iron oxide.	8	S-3	SPT	9	2 3 4		
			9						
	+514.0	CLAY (CL), olive brown with orange and light brown mottled, stiff, very moist, fine to coarse sand, abundant caliche, iron oxide staining.	10	S-4	CR	18	4 6 9		DD = 104.6 pcf, MC = 30.7%
			11						
			12						
			13						
			14						
		Olive brown with brown mottled, medium stiff, no caliche.	15	S-5	SPT	18	2 3 4		
			16						
			17						
			18						
			19						
			20						

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Log of Boring **B-6** Sheet 2 of 2

Project	Project No.
Walnut Business Park	700108301
Location	**Elevation and Datum**
20401 Valley Boulevard	Google Earth = 524 (feet, MSL)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+504.0	Dusk brown, medium stiff to stiff, coarse sand.	20	S-6	CR	18	2 4 8		DD = 98.8 pcf, MC = 30.1%
			21						
			22						
			23						
			24						
		Olive and dusky brown, stiff, fine to coarse sand.	25	S-7	SPT	12	3 4 8		
	+497.5		26						
		Total Depth = 26.5 feet Boring bailed after completion. Depth to groundwater not apparent. Boring backfilled with bentonite grout and concrete patched.	27						
			28						
			29						
			30						
			31						
			32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						

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Log of Boring **B-7** Sheet 1 of 2

Project: Walnut Business Park	Project No.: 700108301
Location: 20401 Valley Boulevard	Elevation and Datum: Google Earth = 524 (feet, MSL)
Drilling Company: SoCal Drilling	Date Started: 11/23/21 — Date Finished: 11/23/21
Drilling Equipment: Mayhew 1000	Completion Depth: 26.5 ft — Rock Depth: -
Size and Type of Bit: 4.75" Mud Rotary	Number of Samples: Disturbed 3 — Undisturbed 4 — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First ▽ — Completion ▼ - — 24 HR. ▼ -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Randy
Sampler: 2-inch O.D. SPT Split-Barrel, 2.5-inch I.D. Cal Mod	Field Engineer: A. Nieblas
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+524.0	AC = 5.5-inches thick, AB = 6-inches thick.	0						
	+523.0	**Artificial Fill (af)** CLAY (CL), olive brown with dark brown mottled, stiff, moist [FILL].	1						
	+521.5	**Quaternary Young Alluvial Fan Deposits (Qyf)** CLAY (CL), dark brown, stiff, moist, fine to coarse sand, some caliche.	2						
			3	S-1	CR	18	4 9 12		
	+519.0	CLAY (CL), olive gray, medium stiff, very moist, fine sand, some caliche.	4						
			5	S-2	SPT	12	2 3 4		
		Olive brown, stiff, moist to very moist, iron oxide and abundant caliche mottled.	6						
			7	S-3	CR	18	3 5 8		DD = 98.9 pcf, MC = 32.9%
		Olive gray, medium stiff, very moist, some iron oxide and abundant caliche staining.	8						
			9	S-4	SPT	12	2 3 5		
	+509.0	Clayey SAND (SC), brown to orangish brown, medium dense, slightly moist, fine gravel.	10						
			11						
			12						
			13						
			14						
			15	S-5	CR	18	8 11 5		Poor sample recovery. DD = 96.8 pcf, MC = 17.1% % Passing #200 = 29
			16						
			17						
			18						
			19						
	+504.0		20						

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Log of Boring **B-7** Sheet 2 of 2

Project	Project No.
Walnut Business Park	700108301
Location	**Elevation and Datum**
20401 Valley Boulevard	Google Earth = 524 (feet, MSL)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+504.0	CLAY (CL), dusky reddish brown, very soft, very moist.	20	S-6	SPT	10	0 1 0		
	+499.0	Sandy SILT (ML), medium olive brown, medium stiff, wet, very fine to fine sand, low plasticity.	25	S-7	CR	18	2 2 6		DD = 99.3 pcf, MC = 24.4%
	+497.5	Total Depth = 26.5 feet Boring bailed after completion. Depth to groundwater not apparent. Boring backfilled with bentonite grout and concrete patched.	27						

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Log of Boring **B-8** Sheet 1 of 3

Project: Walnut Business Park	Project No.: 700108301
Location: 20401 Valley Boulevard	Elevation and Datum: Google Earth = 524 (feet, MSL)
Drilling Company: SoCal Drilling	Date Started: 11/23/21 — Date Finished: 11/23/21
Drilling Equipment: Mayhew 1000	Completion Depth: 51.5 ft — Rock Depth: -
Size and Type of Bit: 4.75" Mud Rotary	Number of Samples: Disturbed 6 — Undisturbed 6 — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First ▽ — Completion ▼ 24.5 — 24 HR. ▼ -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Randy
Sampler: 2-inch O.D. SPT Split-Barrel, 2.5-inch I.D. Cal Mod	Field Engineer: A. Nieblas
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	524.0	AC = 4-inches thick, AB = 6-inches thick.	0						
	523.2	**Artificial Fill (af)** CLAY (CL), dark brown with light brown mottled, very stiff, moist [FILL].	1						
	521.5	**Quaternary Young Alluvial Fan Deposits (Qyf)** CLAY (CL), olive gray, stiff, very moist, caliche, few old rootlets.	2						
			3	S-1	CR	18	6 11 14		
			4						
			5	S-2	SPT	8	2 4 5		
			6						
	516.5	Silty SAND (SM), olive gray and brown, loose, moist to very moist.	7						DD = 92.8 pcf, MC = 22.9%
	515.5	CLAY (CL), olive gray and brown, medium stiff, moist to very moist.	8	S-3	CR	12	3 4 6		
			9						
		Dark brown with some light brown mottled, very moist, coarse sand.	10						
			11	S-4	SPT	12	2 3 3		
			12						
			13						
			14						
	509.0	CLAY with Sand (CL), olive brown, very stiff, very moist, abundant caliche, few very old rootlets.	15						DD = 107.7 pcf, MC = 20.3% LL = 38, PL = 22, PI = 16
			16	S-5	CR	18	7 16 17		
			17						
			18						
			19						
	504.0		20						

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Log of Boring **B-8** Sheet 2 of 3

Project	Project No.
Walnut Business Park	700108301
Location	**Elevation and Datum**
20401 Valley Boulevard	Google Earth = 524 (feet, MSL)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+504.0	CLAY (CL), reddish dusk brown, very stiff, very moist, coarse sand.	20	S-6	SPT	12	5 7 9		
	+499.0	Clayey SAND with Gravel (SC), reddish dusky brown, dense, moist, fine gravel.	25	S-7	CR	12	10 26 34		DD = 119.3 pcf, MC = 14.7% Auger chatter from 26-45 feet.
		Olive brown, very dense, very moist, fine gravel.	30	S-8	SPT	10	36 50/4"		
	+489.0	Sandy to Clayey GRAVEL (GC), olive brown, very dense, wet, fine to coarse gravel.	35	S-9	CR	2	50/5"		Poor sample recovery.
	+484.0	SAND with Clay and Gravel (SP-SC), olive brown, very dense, wet, fine to coarse gravel.	40	S-10	SPT	10	35 37 38		% Passing #200 = 12
	+479.0		45						

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Log of Boring **B-8** Sheet 3 of 3

Project	Project No.
Walnut Business Park	700108301
Location	**Elevation and Datum**
20401 Valley Boulevard	Google Earth = 524 (feet, MSL)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+479.0	Silty to Clayey SAND (SC), olive brown, medium dense, wet, some caliche, few lenses of Sandy Silt/Clay.	45	S-11	CR	12	11 9 9		
			46						
			47						
			48						
			49						
		Fine to very fine sand, no caliche.	50	S-12	SPT	10	8 10 11		
	+472.5		51						
		Total Depth = 51.5 feet Boring bailed after completion. Groundwater observed at 24.5 feet bgs. Boring backfilled with bentonite grout and AC patched.	52						
			53						
			54						
			55						
			56						
			57						
			58						
			59						
			60						
			61						
			62						
			63						
			64						
			65						
			66						
			67						
			68						
			69						
			70						

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Log of Boring **B-9** Sheet 1 of 2

Project: Walnut Business Park	Project No.: 700108301
Location: 20401 Valley Boulevard	Elevation and Datum: Google Earth = 524 (feet, MSL)
Drilling Company: SoCal Drilling	Date Started: 11/23/21 — Date Finished: 11/23/21
Drilling Equipment: Mayhew 1000	Completion Depth: 26.5 ft — Rock Depth: -
Size and Type of Bit: 4.75" Mud Rotary	Number of Samples: Disturbed 5 — Undisturbed 3 — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First ▽ — Completion ▼ 24 — 24 HR. ▼ -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Randy
Sampler: Bulk; 2-inch O.D. SPT Split-Barrel, 2.5-inch I.D. Cal Mod	Field Engineer: A. Nieblas
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+524.0	AC = 4-inches thick, AB = 6-inches thick.	0						Bulk sample collected from 0-10 feet. Remolded Direct Shear and Consolidation Test Corrosivity Test R Value Expansion Index Max Dry Density
	+523.2	**Artificial Fill (af)** CLAY (CL), dark brown and light brown mottled, stiff, very moist, fine sand [FILL].	1						
			2						
			3	S-1	SPT	9	3 5 6		
			4						
	+519.0	**Quaternary Young Alluvial Fan Deposits (Qyf)** CLAY (CL), olive gray and brown mottled, stiff, very moist, trace caliche.	5						DD = 96.5 pcf, MC = 27.3%
			6	S-2	CR	15	4 7 9		
			7						
	+516.5	Silty SAND (SM), medium brown, loose, moist.	8	S-3	SPT	6	2 2 2		
			9						
	+514.0	CLAY (CL), dark brown, stiff, very moist.	10	S-4	CR	18	3 4 6		DD = 87.4 pcf, MC = 33.4% Direct Shear Test
			11						
			12						Auger chatter from 12-14 feet.
			13						
			14						
	+509.0	Clayey SAND with Gravel (SC), brown and light brown mottled, medium dense, slightly moist to moist, fine to coarse sand, fine gravel, iron oxide staining.	15	S-5	SPT	4	4 8 8		
			16						
			17						
			18						
			19						
	+504.0		20						

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Log of Boring **B-9** Sheet 2 of 2

Project	Project No.
Walnut Business Park	700108301
Location	**Elevation and Datum**
20401 Valley Boulevard	Google Earth = 524 (feet, MSL)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+504.0	CLAY (CL), medium to dark brown, medium stiff, very moist.	20	S-6	CR	18	1 3 5		DD = 96.7 pcf, MC = 27.9%
	+499.0	Silty SAND (SM), medium brown, medium dense, moist, very fine sand.	25	S-7	SPT	18	4 11 10		
	+497.5	Total Depth = 26.5 feet Boring bailed after completion. Groundwater observed at 24 feet bgs. Boring backfilled with bentonite grout and AC patched.	27						

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Log of Boring **B-10** Sheet 1 of 2

Project: Walnut Business Park	Project No.: 700108301
Location: 20401 Valley Boulevard	Elevation and Datum: Google Earth = 526 (feet, MSL)
Drilling Company: SoCal Drilling	Date Started: 11/24/21 — Date Finished: 11/24/21
Drilling Equipment: Mayhew 1000	Completion Depth: 26.5 ft — Rock Depth: -
Size and Type of Bit: 4.75" Mud Rotary	Number of Samples: Disturbed 3 — Undisturbed 4 — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First ▽ — Completion ▼ - — 24 HR. ▼ -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Randy
Sampler: 2-inch O.D. SPT Split-Barrel, 2.5-inch I.D. Cal Mod	Field Engineer: A. Nieblas
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+526.0	AC = 4-inches thick, AB = 6-inches thick.	0						
	+525.2	**Artificial Fill (af)** CLAY with Sand (CL), dark gray and light gray mottled, stiff, moist [FILL].	1						
			2						
			3	S-1	CR	18	5 9 11		
			4						
	+521.0	**Quaternary Young Alluvial Fan Deposits (Qyf)** CLAY with Silt (CL), light olive gray, stiff moist, abundant caliche.	5						
			6	S-2	SPT	5	3 6 7		
			7						
	+518.5	CLAY with Sand (CL), olive gray, stiff, moist, fine to very fine sand.	8	S-3	CR	18	5 8 12		DD = 95.3 pcf, MC = 27.8% Direct Shear Test
			9						
		Olive brown and gray, medium stiff, some iron oxide and caliche.	10	S-4	SPT	10	2 3 4		
			11						
			12						
			13						
			14						
	+511.0	SILT with Sand (ML), medium brown, very stiff, moist, fine to very fine sand.	15	S-5	CR	18	4 11 14		DD = 105.0 pcf, MC = 21.5% Consolidation Test
			16						
			17						
			18						
	+507.0	CLAY with Sand (CL), dusk brown, stiff, moist to very moist, fine to very fine sand.	19						
			20						

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Log of Boring **B-10** Sheet 2 of 2

Project	Project No.
Walnut Business Park	700108301
Location	**Elevation and Datum**
20401 Valley Boulevard	Google Earth = 526 (feet, MSL)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+506.0		20	S-6	SPT	10	5 6 7		LL = 39, PL = 24, PI = 15
	+501.0	Clayey SAND (SC), medium brown, medium dense, very moist to wet.	25	S-7	CR	18	7 16 18		
	+499.5	Total Depth = 26.5 feet Boring bailed after completion. Depth to groundwater not apparent. Boring backfilled with bentonite grout and AC patched.	27						

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Log of Boring **B-11** Sheet 1 of 3

Project: Walnut Business Park	Project No.: 700108301
Location: 20401 Valley Boulevard	Elevation and Datum: Google Earth = 526 (feet, MSL)
Drilling Company: SoCal Drilling	Date Started: 11/24/21 — Date Finished: 11/24/21
Drilling Equipment: Mayhew 1000	Completion Depth: 51.5 ft — Rock Depth: -
Size and Type of Bit: 4.75" Mud Rotary	Number of Samples: Disturbed 7 — Undisturbed 6 — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First ▽ — Completion ▼ 16 — 24 HR. ▼ -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Randy
Sampler: Bulk; 2-inch O.D. SPT Split-Barrel, 2.5-inch I.D. Cal Mod	Field Engineer: A. Nieblas
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+526.0	AC = 4-inches thick, AB = 6-inches thick.	0						Bulk sample collected from 0-10 feet.
	+525.2	**Artificial Fill (af)** Sandy CLAY (CL), brown and dark brown, very stiff, moist [FILL].	1						
			2						
			3	S-1	SPT	9	3 8 9		
			4						
		Light and dark brown, medium stiff to stiff.	5	S-2	CR	18	3 5 7		DD = 94.6 pcf, MC = 25.6%
			6						
	+518.5	**Quaternary Young Alluvial Fan Deposits (Qyf)** Clayey SAND (SC), olive brown, medium dense, wet, fine gravel.	7						
			8	S-3	SPT	4	4 8 6		% Passing #200 = 23
			9						
	+516.0	CLAY (CL), olive gray, medium stiff, very moist, fine gravel, medium plasticity.	10	S-4	CR	18	1 3 4		DD = 100.5 pcf, MC = 35.9%
			11						
			12						
			13						
			14						
	+511.0	CLAY with Sand (CL), medium brown, soft, very moist, fine sand.	15						
			16	S-5	SPT	10	2 2 2		
			17						
			18						
			19						
	+506.0		20						

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Log of Boring **B-11** Sheet 2 of 3

Project	Project No.
Walnut Business Park	700108301
Location	**Elevation and Datum**
20401 Valley Boulevard	Google Earth = 526 (feet, MSL)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+506.0	Sandy CLAY (CL), medium brown, soft, very moist.	20	S-6	CR	18	2 2 2		DD = 107.6 pcf, MC = 26.9%
			21						
			22						
			23						
			24						
		Brown, very stiff, very moist, iron oxide staining.	25	S-7	SPT	15	5 8 9		
			26						
			27						
			28						
			29						
		Orangish brown, moist, very fine to fine sand, some iron oxide staining.	30	S-8	CR	18	7 12 14		DD = 103.8 pcf, MC = 22.6%
			31						
			32						
			33						
			34						
		Light brown and dark brown mottled, stiff, very moist.	35	S-9	SPT	15	4 5 6		
			36						
			37						
			38						
			39						
		Brown, very stiff, very moist, abundant caliche, some iron oxide.	40	S-10	CR	18	14 18 21		
			41						
			42						
			43						
			44						
			45						

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Log of Boring **B-11** Sheet 3 of 3

Project	Project No.
Walnut Business Park	700108301
Location	**Elevation and Datum**
20401 Valley Boulevard	Google Earth = 526 (feet, MSL)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+481.0	Medium brown, stiff, moist.	45	S-11	SPT	9	6 7 7		
	+476.0	Sandy SILT (ML), olive brown, very stiff, moist.	50	S-12	CR	18	6 17 21		
	+474.5	Total Depth = 51.5 feet Boring bailed after completion. Groundwater observed at 16 feet bgs. Boring backfilled with bentonite grout and concrete patched.	52						

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Log of Boring **B-12** Sheet 1 of 2

Project: Walnut Business Park	Project No.: 700108301
Location: 20401 Valley Boulevard	Elevation and Datum: Google Earth = 526 (feet, MSL)
Drilling Company: SoCal Drilling	Date Started: 11/24/21 — Date Finished: 11/24/21
Drilling Equipment: Mayhew 1000	Completion Depth: 26.5 ft — Rock Depth: -
Size and Type of Bit: 4.75" Mud Rotary	Number of Samples: Disturbed 3 — Undisturbed 4 — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First ▽ — Completion ▼ - — 24 HR. ▼ -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Randy
Sampler: 2-inch O.D. SPT Split-Barrel, 2.5-inch I.D. Cal Mod	Field Engineer: A. Nieblas
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+526.0	AC = 5-inches thick, AB = 6-inches thick.	0						
	+525.1	**Artificial Fill (af)** CLAY with Sand (CL), dusky brown to dark brown, stiff, very moist, few gravel [FILL].	1						
			2						
			3	S-1	CR	18	2 7 8		
			4						
	+521.0	**Quaternary Young Alluvial Fan Deposits (Qyf)** CLAY with Silt (CL), olive brown, medium stiff, very moist, fine gravel.	5						
			6	S-2	SPT	9	1 2 3		
			7						
	+518.5	SAND (SP), light brown, medium dense, moist, coarse sand, fine to medium gravel.	8	S-3	CR	18	9 20 15		DD = 106.8 pcf, MC = 5.0%
			9						
	+516.0	CLAY (CL), olive brown, soft, very moist, caliche.	10						
			11	S-4	SPT	9	1 2 1		
			12						
			13						
			14						
		Olive gray.	15	S-5	CR	18	5 9 14		DD = 115.3 pcf, MC = 29.0%
			16						
			17						
			18						
			19						
	+506.0		20						

LANGAN

Log of Boring **B-12** Sheet 2 of 2

Project	Project No.
Walnut Business Park	700108301
Location	**Elevation and Datum**
20401 Valley Boulevard	Google Earth = 526 (feet, MSL)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Water Content	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+506.0	CLAY with Silt (CH), olive to medium brown, stiff to very stiff, caliche.	20	S-6	SPT	12	4 7 8		LL = 51, PL = 25, PI = 26
	+501.0	Sandy CLAY (CL), medium brown, hard, very moist, with gravel.	25	S-7	CR	18	11 22 30		
	+499.5	Total Depth = 26.5 feet Boring bailed after completion. Depth to groundwater not apparent. Boring backfilled with bentonite grout and concrete patched.	27						

MOISTURE DENSITY TESTS

PROJECT Langan # 70018301 **JOB NO.** 2012-0057 **BY** LD **DATE** 12/13/21

Sample No.	B-1 / S-3	B-2 / S-2	B-2 / S-4	B-3 / S-2	B-3 / S-4	B-3 / S-6	B-4 / S-3	B-4 / S-5
Depth (ft)	7.5	5.0	10.0	5.0	10.0	20.0	7.5	15.0
Testing								
Soil Type	Brown, Silty Clay	Brown, Silty Clay	Brown, Silty Clay	Brown, Silty Clay	Brown, Silty Clay	Brown, Silty Clay	Brown, Silty Clay	Brown, Silty Clay
Wet+Tare	952.0	1169.6	971.8	905.1	957.2	960.6	729.6	990.1
No. Ring	5	6	5	5	5	5	4	5
Wet Weight	110.3	139.3	132.4	150.1	128.8	112.9	131.4	144.3
Dry Weight	85.6	116.3	104.1	115.8	100.5	89.2	104.3	118.4
Wet density	121.1	124.9	124.4	113.2	121.9	122.5	114.4	127.4
% Water	28.9	19.8	27.2	29.6	28.2	26.6	26.0	21.9
Dry Density	94.0	104.2	97.8	87.4	95.1	96.8	90.8	104.6
O.B.Press(psf)								

Sample No.	B-4 / S-7	B-5 / S-2	B-5 / S-3	B-5 / S-4	B-6 / S-2	B-6 / S-4	B-6 / S-6	B-7 / S-3
Depth (ft)	2.5	5.0	10.0	20.0	5.0	10.0	20.0	7.5
Testing								
Soil Type	Brown, Silty Clay w. Sand	Brown, Silty Clay w. Gravel	Brown, Silty Clay	Brown, Silty Clay w. Gravel	Brown, Silty Clay	Brown, Silty Clay	Brown, Silty Clay	Brown, Silty Clay
Wet+Tare	1180.9	951.5	1131.5	945.5	949.6	936.4	950.1	1124.3
No. Ring	6	5	6	5	5	5	5	6
Wet Weight	169.5	136.6	127.3	112.1	148.7	136.7	128.5	131.4
Dry Weight	141.9	108.3	100.8	79.8	115.0	104.6	98.8	98.9
Wet density	136.6	136.6	127.3	112.1	148.7	136.7	128.5	131.4
% Water	19.5	26.1	26.3	40.5	29.3	30.7	30.1	32.9
Dry Density	114.4	108.3	100.8	79.8	115.0	104.6	98.8	98.9
O.B.Press(psf)								

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MOISTURE DENSITY TESTS

PROJECT Langan # 70018301 **JOB NO.** 2012-0057 **BY** LD **DATE** 12/13/21

Sample No.	B-7 / S-5	B-7 / S-7	B-8 / S-3	B-8 / S-5	B-8 / S-7	B-9 / S-2	B-9 / S-6	B-11 / S-2
Depth (ft)	15.0	25.0	7.5	15.0	25.0	5.0	20.0	5.0
Testing								
Soil Type	Brown, Silty Sand w. Gravel &Silty Clay	Brown, Clayey Sand	Brown, Clayey Sand	Brown, Silty Clay	Brown, Silty Clay w. Silty Sand	Brown, Silty Clay	Brown, Silty Clay	Brown, Silty Clay
Wet+Tare	725.0	773.6	909.9	1002.6	1045.9	962.8	1161.3	938.3
No. Ring	4	4	5	5	5	5	6	5
Wet Weight	155.1	187.7	124.5	132.9	157.1	123.9	135.6	86.9
Dry Weight	132.4	150.9	101.3	110.5	137.0	97.3	106.0	69.2
Wet density	113.4	123.6	114.0	129.5	136.8	122.9	123.7	118.8
% Water	17.1	24.4	22.9	20.3	14.7	27.3	27.9	25.6
Dry Density	96.8	99.3	92.8	107.7	119.3	96.5	96.7	94.6
O.B.Press(psf)								

Sample No.	B-11 / S-4	B-11 / S-6	B-11 / S-8	B-12 / S-5	B-12 / S-4			
Depth (ft)	10.0	20.0	30.0	7.5	15.0			
Testing								
Soil Type	Brown, Silty Clay	Brown, Silty Clay	Brown, Silty Clay	Brown, Silty Sand	Brown, Silty Clay			
Wet+Tare	908.0	1175.5	1193.7	929.4	956.8			
No. Ring	5	6	6	5	5			
Wet Weight	118.5	168.3	133.9	166.8	121.6			
Dry Weight	87.2	132.6	109.2	158.9	94.3			
Wet density	136.6	136.6	127.3	112.1	148.7			
% Water	35.9	26.9	22.6	5.0	29.0			
Dry Density	100.5	107.6	103.8	106.8	115.3			
O.B.Press(psf)								

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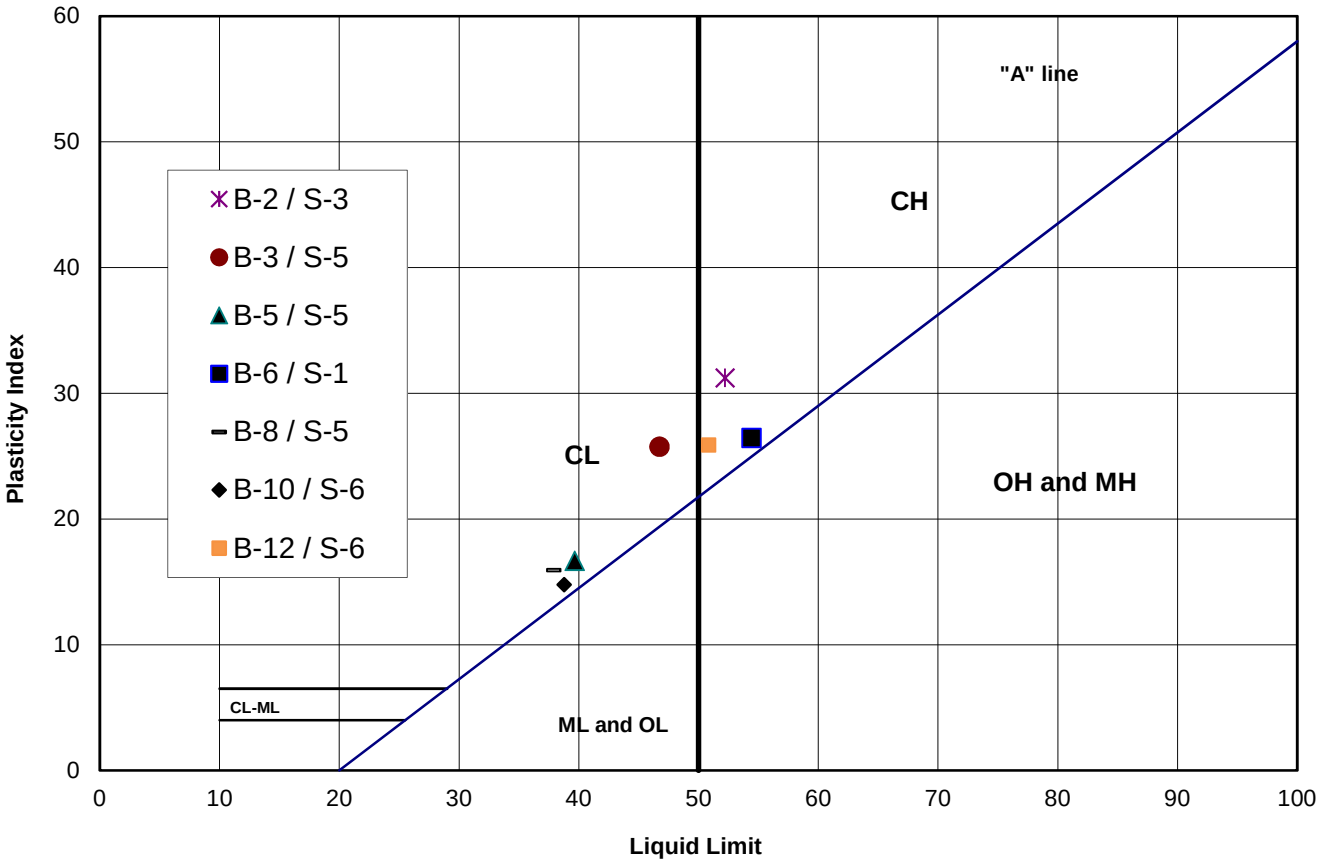
PLASTICITY INDEX _ ASTM D4318



Sample	Depth	LL	PL	PI	USCS	Material Description
B-2 / S-3	7.5'	52	21	31	CH	
B-3 / S-5	15'	47	21	26	CL	
B-5 / S-5	15'	40	23	17	CL	
B-6 / S-1	2.5'	54	28	26	CH	
B-8 / S-5	15'	38	22	16	CL	
B-10 / S-6	20'	39	24	15	CL	
B-12 / S-6	20'	51	25	26	CH	

Job Name: Langan # 700108301 Date: 12/22/21

Job No.: 2012-0057

Geo-Logic ASSOCIATES

WASH #200 SIEVE - ASTM D 1140-92

Job Name	Langan # 700108301	Date	12-19-21
Job No.	2012-0057	By	LD

Sample	B-4 / S-7	**Sample**	B-4 / S-8	**Sample**	B-5 / S-9
Soil Type		Soil Type		Soil Type	
% water		% water		% water	
Wet weight		Wet weight		Wet weight	
Dry weight	141.9	Dry weight	359.2	Dry weight	215.1
+ 200 sieve	87.4	+ 200 sieve	309.5	+ 200 sieve	156.8
% Retained	61.6	% Retained	86.2	% Retained	72.9
%Pass. #200	**38**	**%Pass. # 200**	**14**	**%Pass. #200**	**27**

Sample	B-7 / S-5	**Sample**	B-8 / S-10	**Sample**	B-11 / S-3
Soil Type		Soil Type		Soil Type	
% water		% water		% water	
Wet weight		Wet weight		Wet weight	
Dry weight	317.0	Dry weight	328.7	Dry weight	337.1
+ 200 sieve	225.7	+ 200 sieve	290	+ 200 sieve	259.2
% Retained	71.2	% Retained	88.2	% Retained	76.9
%Pass. #200	**29**	**%Pass. # 200**	**12**	**%Pass. #200**	**23**

Sample		**Sample**		**Sample**	
Soil Type		Soil Type		Soil Type	
% water		% water		% water	
Wet weight		Wet weight		Wet weight	
Dry weight		Dry weight		Dry weight	
+ 200 sieve		+ 200 sieve		+ 200 sieve	
% Retained		% Retained		% Retained	
%Pass. #200		**%Pass. # 200**		**%Pass. #200**	

Sample		**Sample**		**Sample**	
Soil Type		Soil Type		Soil Type	
% water		% water		% water	
Wet weight		Wet weight		Wet weight	
Dry weight		Dry weight		Dry weight	
+ 200 sieve		+ 200 sieve		+ 200 sieve	
% Retained		% Retained		% Retained	
%Pass. #200		**%Pass. # 200**		**%Pass. #200**	

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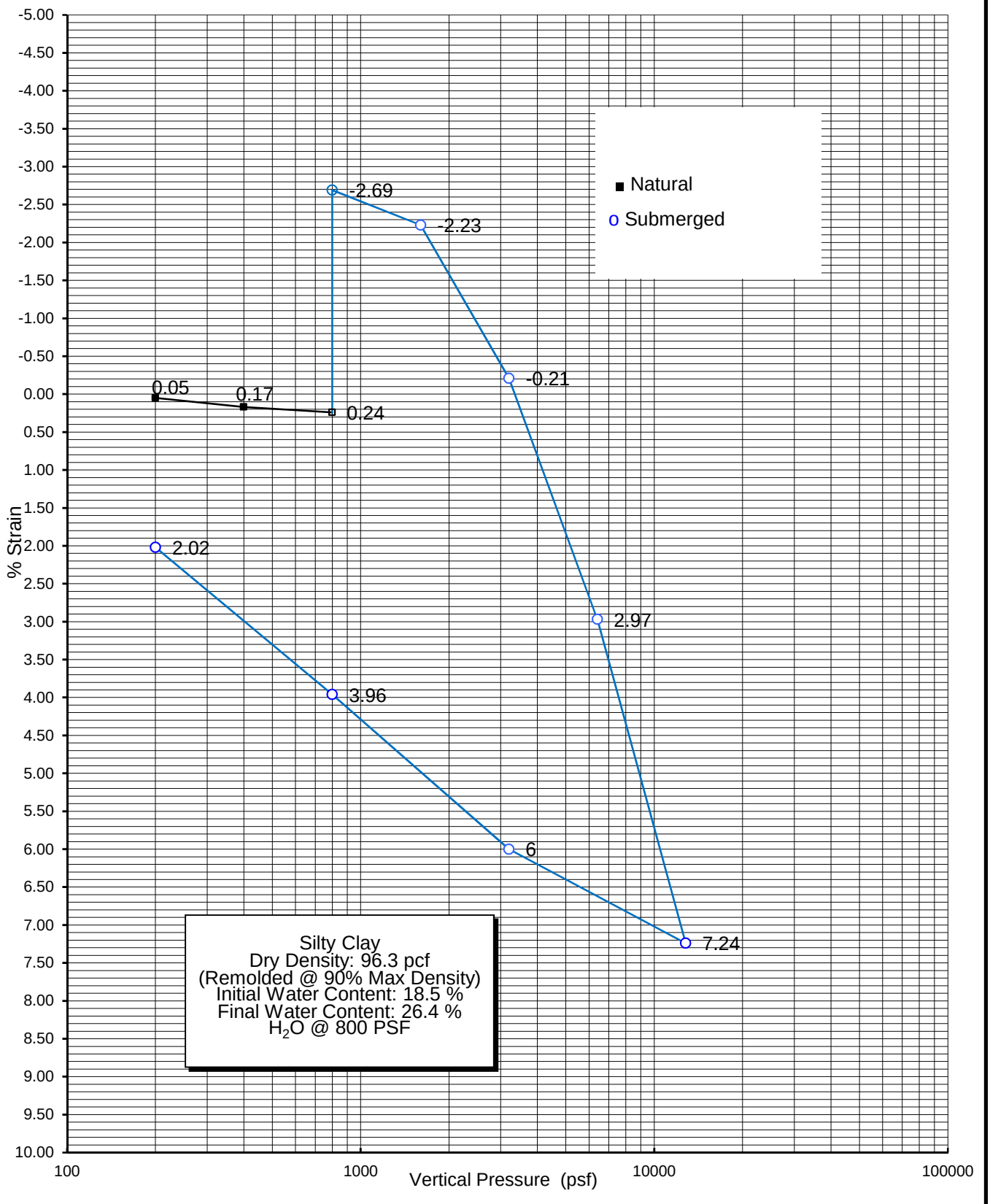
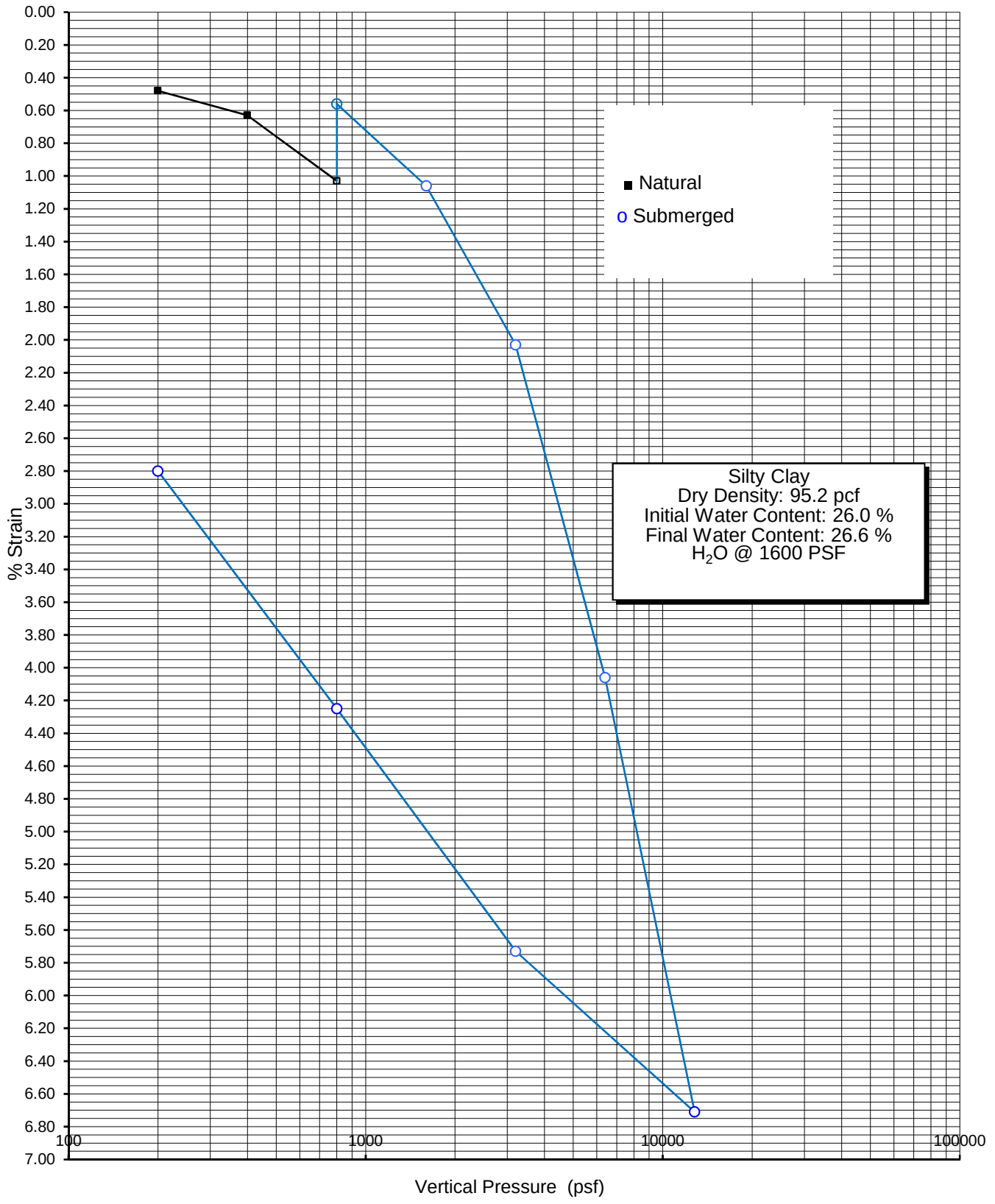
CONSOLIDATION TEST - ASTM D2435

Boring / Sample No.	B-9 / Bulk	Depth:	0 - 5'	Date	12-15-21



CONSOLIDATION TEST - ASTM D2435

Boring / Sample No.	B-4 / S-3	Depth:	15'	Date	12-08-21



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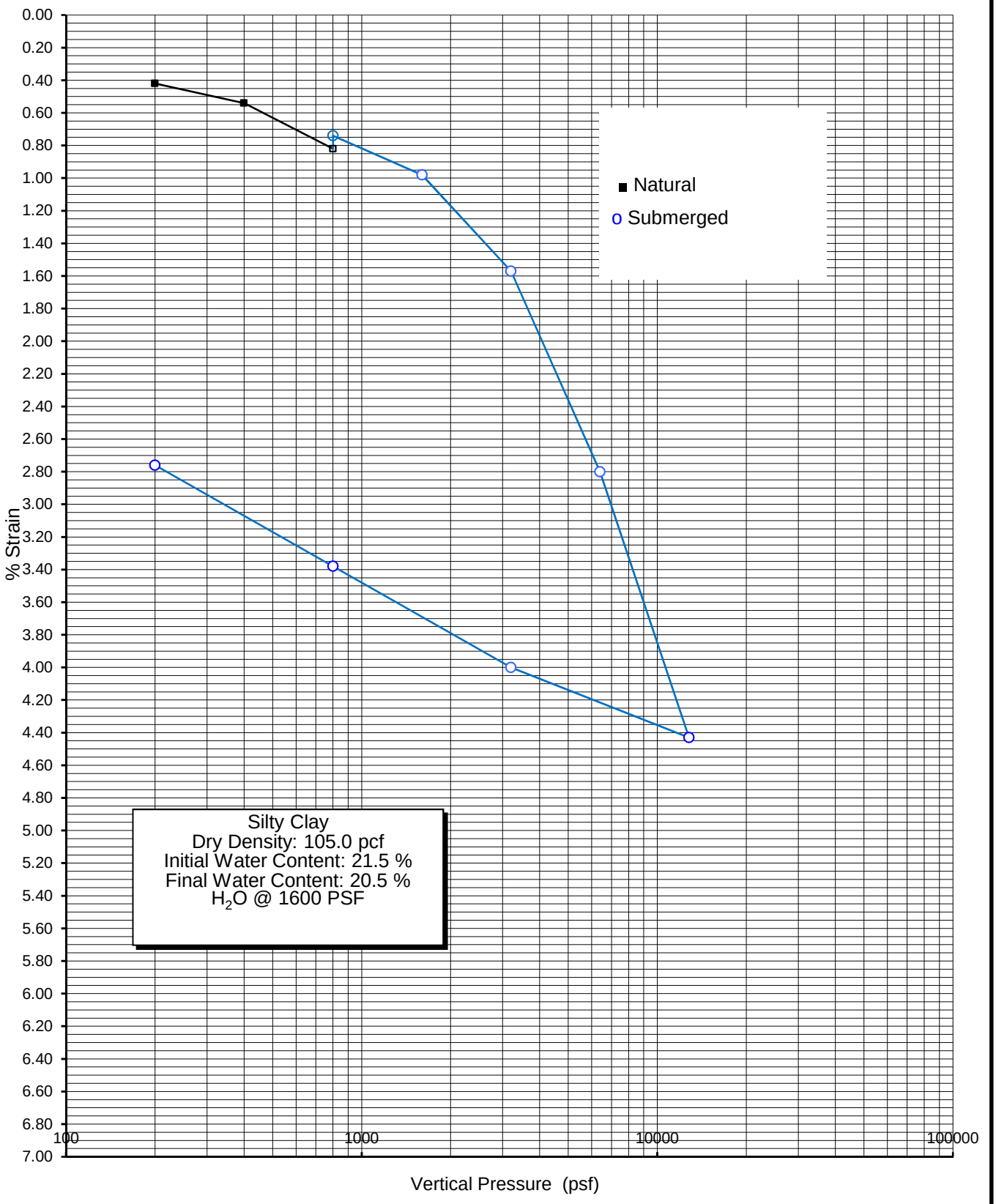
Boring / Sample No.	B-10 / S-5	Depth:	15'	Date	12-08-21



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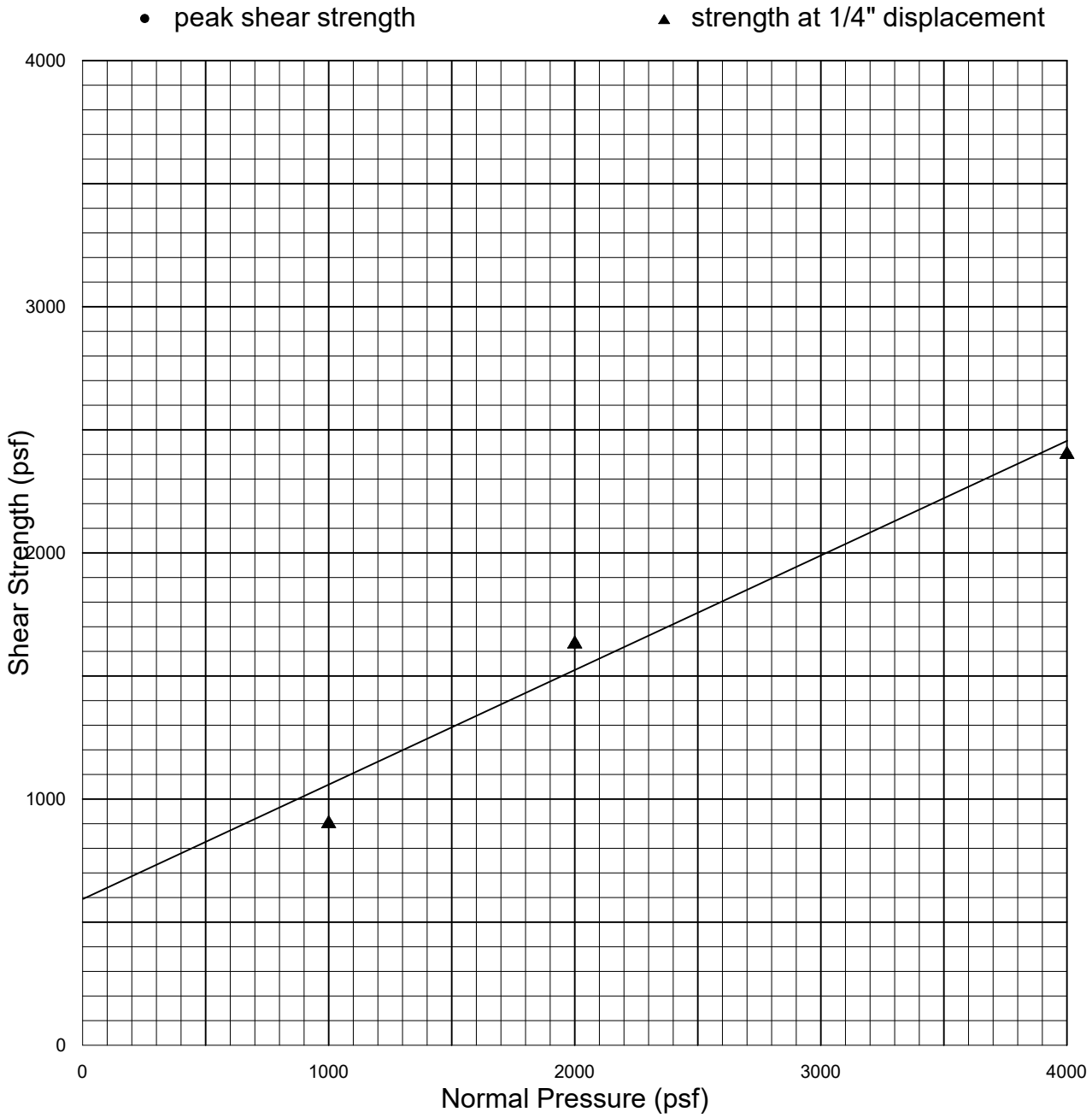
DIRECT SHEAR TEST - ASTM D-3080



Strain Rate: 0.0084 in. / min.

Sample	Type	Description	Dry Density (pcf)	Initial W.C. (%)	Final W.C. (%)
B-1/Bulk @0-5'	Undisturbed & Saturated	Silty Clay	96.8 (90% Max Density)	19.5	29.5

Normal Pressure (psf)	Peak Shear Strength (psf)	Ultimate Shear Strength (psf)
1000	900 @ 0.1400"	900
2000	1630 @ 0.2350"	1630
4000	2400 @ 0.2350"	2400
	C = 600 psf	C = 600 psf
	ϕ = 25 deg.	ϕ = 25 deg.

Date: 12-20-2021

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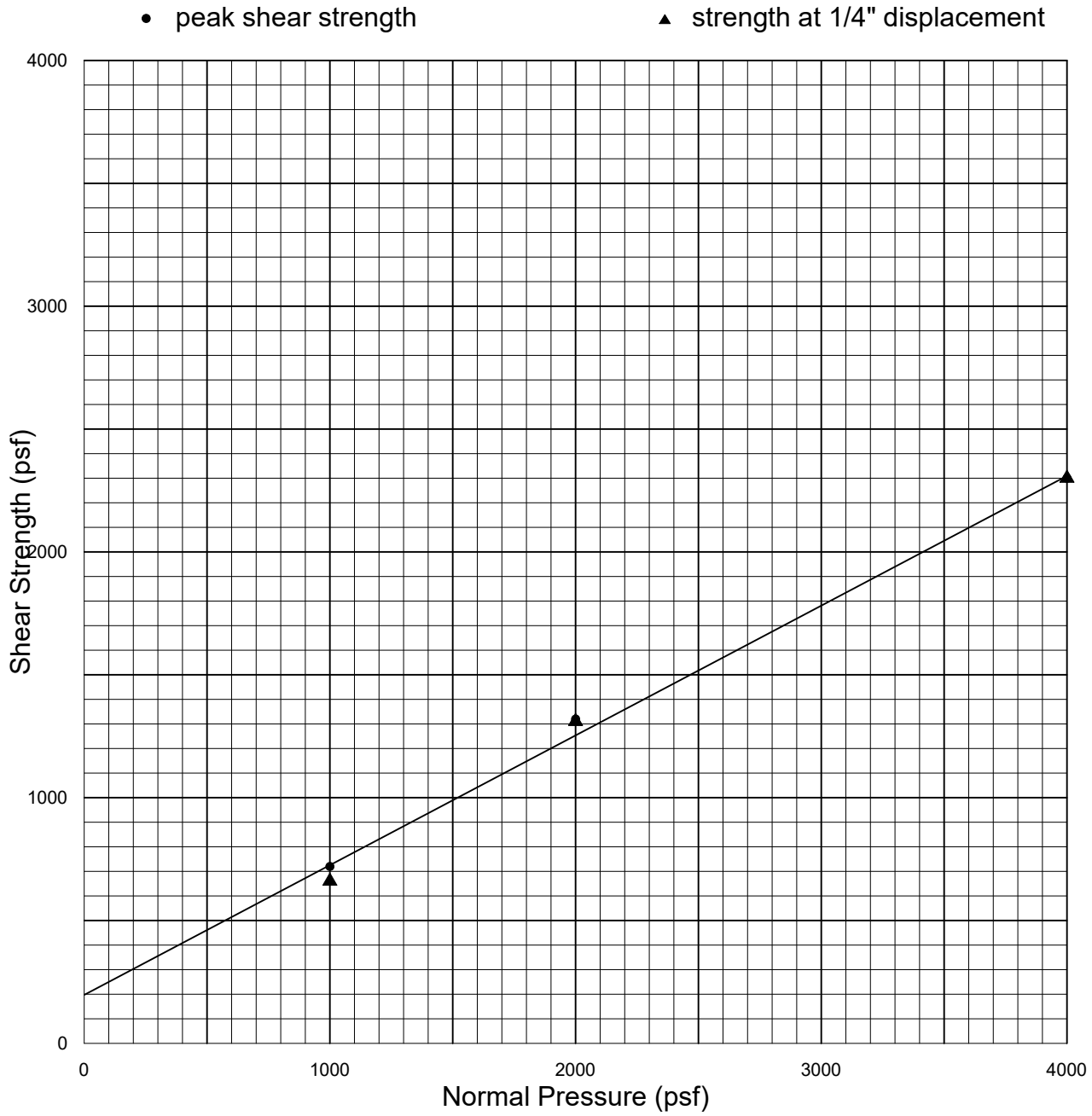
DIRECT SHEAR TEST - ASTM D-3080



Strain Rate: 0.0084 in. / min.

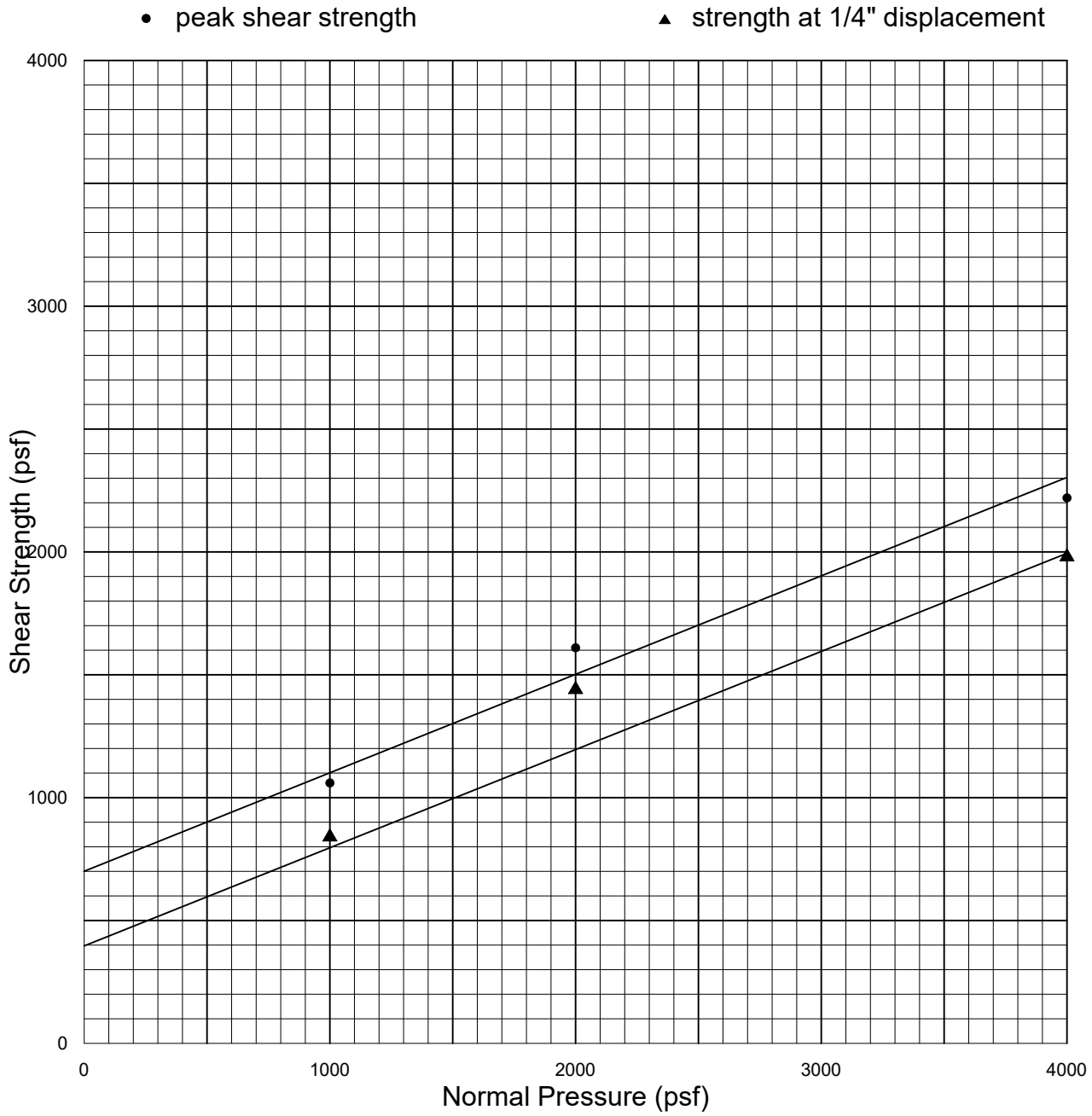
Sample	Type	Description	Dry Density (pcf)	Initial W.C. (%)	Final W.C. (%)
B-9/Bulk @0-5'	Undisturbed & Saturated	Silty Clay	96.3 (90% Max Density)	18.5	30.5

Normal Pressure (psf)	Peak Shear Strength (psf)	Ultimate Shear Strength (psf)
1000	720 @ 0.0750"	660
2000	1320 @ 0.1650"	1310
4000	2300 @ 0.2000"	2300
	C = 200 psf	C = 200 psf
	ϕ = 28 deg.	ϕ = 28 deg.

Date: 12-20-2021

GeoLogic Associates

DIRECT SHEAR TEST - ASTM D-3080



Strain Rate: 0.0084 in. / min.

Sample	Type	Description	Dry Density (pcf)	Initial W.C. (%)	Final W.C. (%)
B-9/S-4	Undisturbed & Saturated	Silty Clay	87.4	33.4	37.4

Normal Pressure (psf)	Peak Shear Strength (psf)	Ultimate Shear Strength (psf)
1000	1060 @ 0.1050"	840
2000	1610 @ 0.1100"	1440
4000	2220 @ 0.1055"	1980
	C = 700 psf	C = 400 psf
	ϕ = 22 deg.	ϕ = 22 deg.

Date: 12-13-2021

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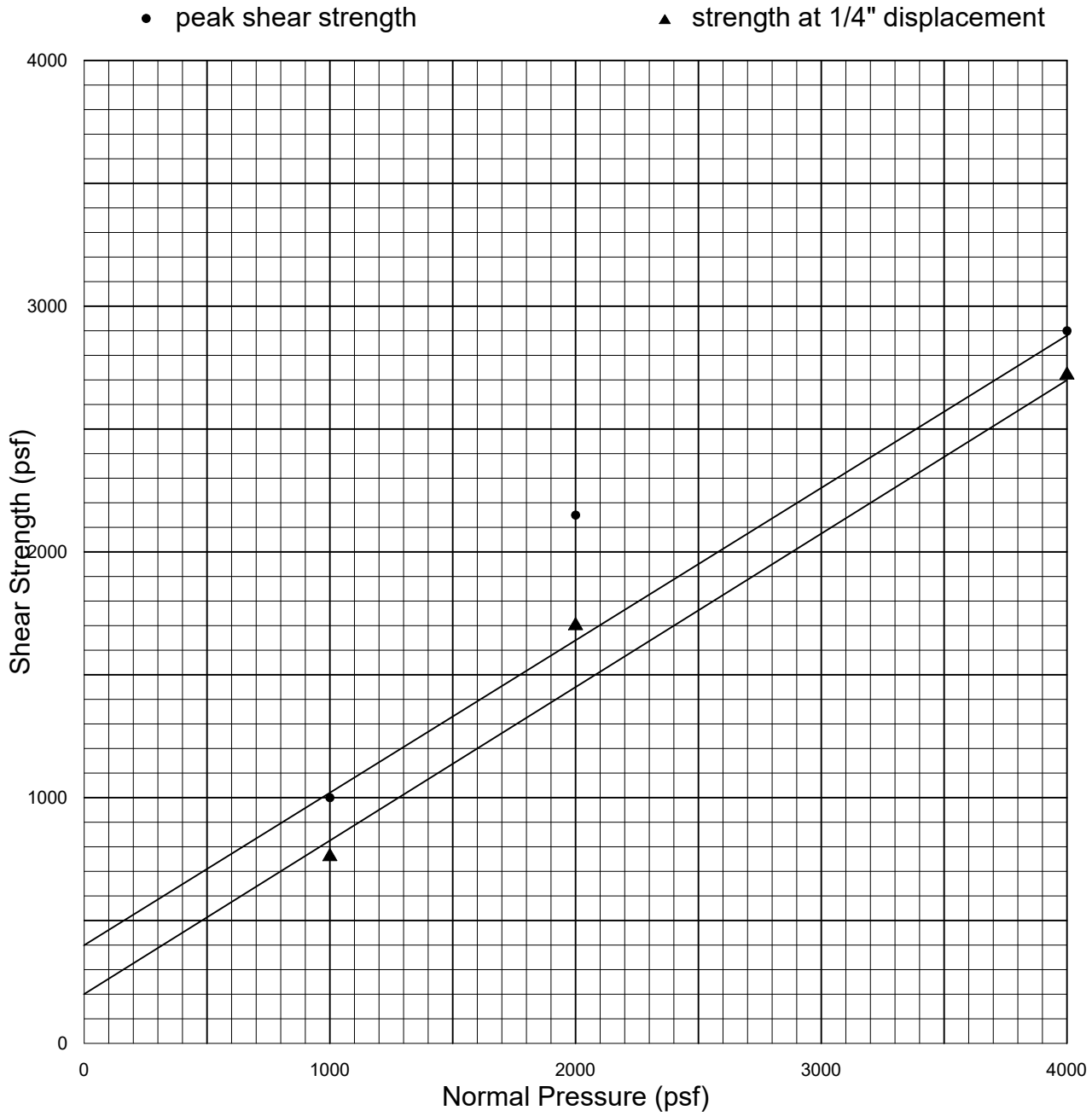
DIRECT SHEAR TEST - ASTM D-3080



Strain Rate: 0.0084 in. / min.

Sample	Type	Description	Dry Density (pcf)	Initial W.C. (%)	Final W.C. (%)
B-10/S-3	Undisturbed & Saturated	Silty Clay	95.3	27.8	27.9

Normal Pressure (psf)	Peak Shear Strength (psf)	Ultimate Shear Strength (psf)
1000	1000 @ 0.0405"	760
2000	2150 @ 0.1200"	1700
4000	2900 @ 0.1455"	2720
	C = 400 psf	C = 200 psf
	ϕ = 32 deg.	ϕ = 32 deg.

Date: 12-13-2021

GeoLogic Associates

SAMPLE NO.:	B-1	B-9			
Depth:	0 - 5'	0 - 5'			
DIRECT SHEAR TEST (type)					
Initial Moisture Content %					
Dry Density (pcf)					
Normal Stress (psf)					
Peak Shear Stress (psf)					
Ultimate Shear Stress (psf)					
Cohesion (psf)					
Internal Friction Angle (degrees)					
EXPANSION TEST UBC STD 18-2					
Initial Dry Density (pcf)					
Initial Moisture Content %					
Final Moisture Content %					
Pressure (psf)					
Expansion Index / Swell %					
CORROSIVITY TEST					
Resistivity (CTM 643) (ohm-cm)	820	770			
pH (ASTM D1293)	7.4	7.5			
CHEMICAL TESTS					
Soluble Sulfate (CTM 417) (%)	0.0687	0.0448			
Chloride Content (CTM 422) (%)	0.0106	0.0098			
Wash #200 Sieve (ASTM-1140) %					
Sand Equivalent (ASTM D2419)					

Geo-Logic ASSOCIATES

'R' VALUE CA 301

Client: Langan Date: 12/15/21 By: LD

Client's Job No.: 700108301 Sample : B-9 @ 0 - 10'

GLA Reference: 2012-0057 Soil Type: Brown, Silty Clay

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	**70**	**60**	**100**	
Initial Moisture Content	%	**8.4**	**8.4**	**8.4**	
Water Added	ml	**200**	**230**	**215**	
Moisture at Compaction	%	26.5	29.2	27.8	
Sample & Mold Weight	gms	**3088**	**3073**	**3092**	
Mold Weight	gms	**2095**	**2102**	**2098**	
Net Sample Weight	gms	993	971	994	
Sample Height	in.	**2.49**	**2.495**	**2.492**	
Dry Density	pcf	95.5	91.3	94.6	
Pressure	lbs	**6000**	**3745**	**4920**	
Exudation Pressure	psi	478	298	392	
Expansion Dial	x 0.0001	**82**	**51**	**69**	
Expansion Pressure	psf	355	221	299	
Ph at 1000lbs	psi	**60**	**65**	**63**	
Ph at 2000lbs	psi	**137**	**147**	**142**	
Displacement	turns	**4.16**	**4.88**	**4.48**	
R' Value		9	4	7	
Corrected 'R' Value		**9**	**4**	**7**	

FINAL 'R' VALUE	
By Exudation Pressure (@ 300 psi):	**4**
By Epansion Pressure :	**<5**
TI = 5	

EXPANSION INDEX - UBC 18-2 & ASTM D 4829-88

PROJECT Langan # 700108301 JOB NO. 2012-0057

Sample	B-1 / Bulk		By LD		Sample	B-9 / Bulk		By LD	
Sta. No.					Sta. No.				
Soil Type	Brown, Silty Clay				Soil Type	Brown, Silty Clay			
Date	Time	Dial Reading	Wet+Tare	554.1	Date	Time	Dial Reading	Wet+Tare	567.6
12/15/2021	13:00	0.3102	Tare	214.7	12/15/2021	13:00	0.2382	Tare	219.7
		H2O	Net Weight	339.4			H2O	Net Weight	347.9
12/16/2021	10:00	0.2142	% Water	16.5	12/16/2021	10:00	0.1385	% Water	15.5
			Dry Dens.	88.3				Dry Dens.	91.3
			% Max					% Max	
			Wet+Tare	614.6				Wet+Tare	627.4
			Tare	214.7				Tare	219.7
			Net Weight	399.9				Net Weight	407.7
INDEX	96	9.6%	% Water	37.3	**INDEX**	100	10.0%	% Water	35.4

Sample			By		Sample			By	
Sta. No.					Sta. No.				
Soil Type					Soil Type				
Date	Time	Dial Reading	Wet+Tare		Date	Time	Dial Reading	Wet+Tare	
			Tare					Tare	
			Net Weight					Net Weight	
			% Water					% Water	
			Dry Dens.					Dry Dens.	
			% Max					% Max	
			Wet+Tare					Wet+Tare	
			Tare					Tare	
			Net Weight					Net Weight	
INDEX			% Water		**INDEX**			% Water	

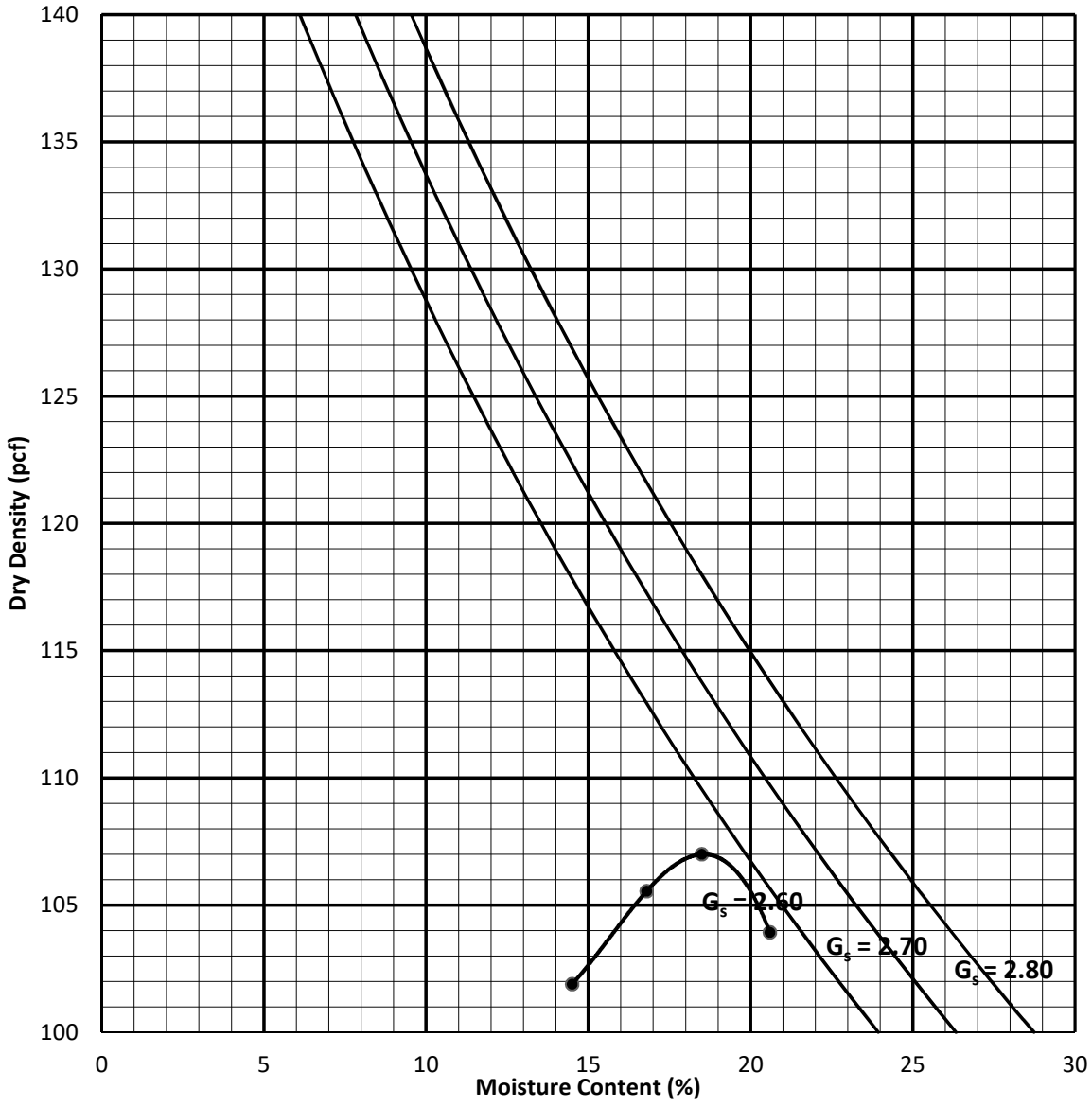
Geo-Logic ASSOCIATES

COMPACTION TEST REPORT

Project: Langan # 700108301 **GLA No.** 2012-0057
Sample: B-1 @ 0 - 10' **Date:** 12/15/2021
Description: Brown, Silty Clay **By:** LD

ASTM D1557	Method A	Volume (cf): 0.03333		# Blows: 25	# Layers: 5
Specimen		A	B	C	D
Wet Weight (grs)		1917	1864	1895	1764
Wet Density (pcf)		126.8	123.3	125.3	116.7
Moisture Content (%)		18.5	16.8	20.6	14.5
Dry Density (pcf)		107.0	105.5	103.9	101.9

Max. Dry Density : 107.0 pcf
Opt. Water Content: 18.5 %



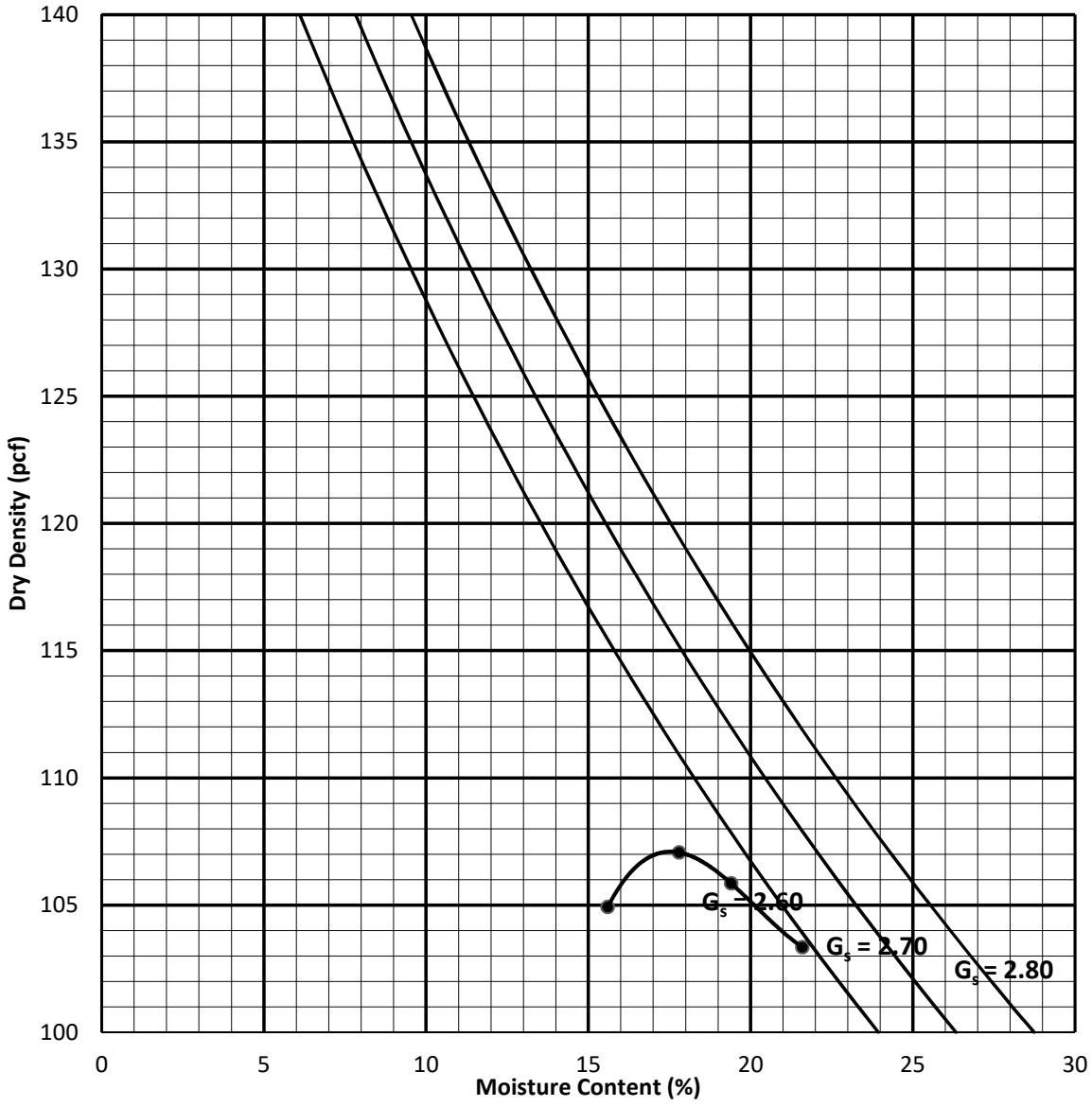
Geo-Logic ASSOCIATES

COMPACTION TEST REPORT

Project: Langan # 700108301 **GLA No.** 2012-0057
Sample: B-9 @ 0 - 10' **Date:** 12/15/2021
Description: Brown, Silty Clay **By:** LD

ASTM D1557	Method A	Volume (cf): 0.03333		# Blows: 25	# Layers: 5
Specimen		A	B	C	D
Wet Weight (grs)		1911	1900	1907	1834
Wet Density (pcf)		126.4	125.7	126.1	121.3
Moisture Content (%)		19.4	21.6	17.8	15.6
Dry Density (pcf)		105.9	103.3	107.1	104.9

Max. Dry Density : 107.0 pcf
Opt. Water Content: 17.5 %



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