Attachment H

Geotechnical Investigation

ESA

CITY OF LOS ANGELES

CALIFORNIA

ERIC GARCETTI
MAYOR

DEPARTMENT OF
BUILDING AND SAFETY
201 NORTH FIGUEROA STREET
LOS ANGELES, CA 90012

OSAMA YOUNAN, P.E.
GENERAL MANAGER
SUPERINTENDENT OF BUILDING

JOHN WEIGHT
EXECUTIVE OFFICER

SOILS REPORT APPROVAL LETTER

November 9, 2020

LOG # 114908
SOILS/GEOLOGY FILE - 2

Bow West Capital
718 South Hill Street, Suite 601
Los Angeles, CA 90014

TRACT: IRVING PARK (M B 17-18/19)
LOT(S): 11 / 12 / 13 / 14
LOCATION: 5600-5606 W Hollywood Blvd, 1655-1681 N St. Andrews Pl, 5607 W Carlton Way

CURRENT REFERENCE REPORT/LETTER(S)	REPORT No.	DATE OF DOCUMENT	PREPARED BY
Soils Report	700071901	10/05/2020	Langan Engineering and Environmental Services, Inc.
Laboratory Testing Report	2012-0057	04/30/2020	Geo-Logic Associates
Geophysical Data Report	20241-01 rev0	08/10/2020	GEOVision Geophysical Services

The Grading Division of the Department of Building and Safety has reviewed the referenced report that provides recommendations for the proposed tiered residential tower over 2 to 3 subterranean parking levels.

The project site includes four lots and is currently developed with a 3-level residential development and a 2-level masonry building. The earth materials at the subsurface exploration locations consist of up to 6 feet of uncertified fill underlain by old alluvial fan deposits. The consultants recommend to support the proposed structure on mat-type foundations bearing on native undisturbed soils. Additionally, the consultants indicated that the floor slabs shall be established on approved compacted fill placed on the mat foundation to allow for a utility pass. This foundation system shall be verified during the plan check.

The design recommendations provided by Langan Engineering and Environmental Services, Inc. (Langan) are based on laboratory testing performed by Geo-Logic Associates, based on geophysical data acquired by GEO Vision Geophysical Services report dated 08/10/2020, and based on previous geotechnical investigation reports prepared by AGI Geotechnical, Inc., dated 08/05/2016 and Geocon West, dated 11/29/2017. Langan is accepting responsibility for use of the data in accordance to Code section 91.7008.5 of LABC.

The referenced reports are acceptable, provided the following conditions are complied with during site development:

(Note: Numbers in parenthesis ( ) refer to applicable sections of the 2020 City of LA Building Code. P/BC numbers refer the applicable Information Bulletin. Information Bulletins can be accessed on the internet at LADBS.ORG.)

1. Provide a notarized letter from all adjoining property owners allowing tie-back anchors on their property (7006.6).

2. The soils engineer shall review and approve the detailed plans prior to issuance of any permit. This approval shall be by signature on the plans that clearly indicates the soils engineer has reviewed the plans prepared by the design engineer; and, that the plans included the recommendations contained in their reports (7006.1).

3. All recommendations of the report that are in addition to or more restrictive than the conditions contained herein shall be incorporated into the plans.

4. A copy of the subject and appropriate referenced reports and this approval letter shall be attached to the District Office and field set of plans (7006.1). Submit one copy of the above reports to the Building Department Plan Checker prior to issuance of the permit.

5. A grading permit shall be obtained for all structural fill and retaining wall backfill (106.1.2).

6. All man-made fill shall be compacted to a minimum 90 percent of the maximum dry density of the fill material per the latest version of ASTM D 1557. Where cohesionless soil having less than 15 percent finer than 0.005 millimeters is used for fill, it shall be compacted to a minimum of 95 percent relative compaction based on maximum dry density. Placement of gravel in lieu of compacted fill is only allowed if complying with LAMC Section 91.7011.3.

7. Existing uncertified fill shall not be used for support of footings, concrete slabs or new fill (1809.2, 7011.3).

8. Drainage in conformance with the provisions of the Code shall be maintained during and subsequent to construction (7013.12).

9. The applicant is advised that the approval of this report does not waive the requirements for excavations contained in the General Safety Orders of the California Department of Industrial Relations (3301.1).

10. Temporary excavations that remove lateral support to the public way, adjacent property, or adjacent structures shall be supported by shoring. Note: Lateral support shall be considered to be removed when the excavation extends below a plane projected downward at an angle of 45 degrees from the bottom of a footing of an existing structure, from the edge of the public way or an adjacent property. (3307.3.1)

11. Where any excavation, not addressed in the approved reports, would remove lateral support (as defined in 3307.3.1) from a public way, adjacent property or structures, a supplemental report shall be submitted to the Grading Division of the Department containing recommendations for shoring, underpinning, and sequence of construction.

12. Prior to the issuance of any permit that authorizes an excavation where the excavation is to be of a greater depth than are the walls or foundation of any adjoining building or structure

and located closer to the property line than the depth of the excavation, the owner of the subject site shall provide the Department with evidence that the adjacent property owner has been given a 30-day written notice of such intent to make an excavation (3307.1).

13. The soils engineer shall review and approve the shoring plans prior to issuance of the permit (3307.3.2).

14. Prior to the issuance of the permits, the soils engineer and/or the structural designer shall evaluate the surcharge loads used in the report calculations for the design of the retaining walls and shoring. If the surcharge loads used in the calculations do not conform to the actual surcharge loads, the soil engineer shall submit a supplementary report with revised recommendations to the Department for approval.

15. Unsurcharged temporary excavation may be cut vertical up to 4 feet. For excavations over 4 feet, the portion of the excavation above the vertical cut shall be trimmed back at a uniform gradient not exceeding 1:1 (horizontal to vertical), as recommended.

16. Shoring shall be designed for the lateral earth pressures specified in the section titled "Temporary Shoring" starting on page 11 of the 10/05/2020 report; all surcharge loads shall be included into the design as shown on Plate 11. Total lateral load on shoring piles shall be determined by multiplying the recommended EFP by the pile spacing.

17. Shoring shall be designed for a maximum lateral deflection of 1 inch, provided there are no structures within a 1:1 plane projected up from the base of the excavation. Where a structure is within a 1:1 plane projected up from the base of the excavation, shoring shall be designed for a maximum lateral deflection of ½ inch, or to a lower deflection determined by the consultant that does not present any potential hazard to the adjacent structure.

18. A shoring monitoring program shall be implemented to the satisfaction of the soils engineer.

19. All foundations shall derive entire support from native undisturbed soils, as recommended and approved by the geologist and soils engineer by inspection.

20. The consultants indicated that the floor slabs shall be established on approved compacted fill placed on the mat foundation to allow for a utility pass. This foundation system shall be verified during the plan check.

21. Concrete floor slabs placed on expansive soil shall be placed on a 4-inch fill of coarse aggregate or on a moisture barrier membrane. The slabs shall be at least 3½ inches thick and shall be reinforced with ½-inch diameter (#4) reinforcing bars spaced a maximum of 16 inches on center each way.

22. The seismic design shall be based on a Site Class C, as recommended on page 14 of the 10/05/2020 report, provided the "Base" (level at which the horizontal seismic ground motions are considered to be imparted to the structure) is applied at the bottom of the basement. All other seismic design parameters shall be reviewed by LADBS building plan check

23. Retaining walls shall be designed for the lateral earth pressures specified in the section titled "Design Lateral Earth Pressure" starting on page 10 of the 10/05/2020 report. All surcharge loads shall be included into the design as shown on Plates 9 and 10.

24. All retaining walls shall be provided with a standard surface backdrain system and all drainage shall be conducted in a non-erosive device to the street in an acceptable manner (7013.11).

25. With the exception of retaining walls designed for hydrostatic pressure, all retaining walls shall be provided with a subdrain system to prevent possible hydrostatic pressure behind the wall. Prior to issuance of any permit, the retaining wall subdrain system recommended in the soils report shall be incorporated into the foundation plan which shall be reviewed and approved by the soils engineer of record (1805.4).

26. Installation of the subdrain system shall be inspected and approved by the soils engineer of record and the City grading/building inspector (108.9).

27. Basement walls and floors shall be waterproofed/damp-proofed with an LA City approved "Below-grade" waterproofing/damp-proofing material with a research report number (104.2.6).

28. Prefabricated drainage composites (Miradrain, Geotextiles) may be only used in addition to traditionally accepted methods of draining retained earth.

29. Where the ground water table is lowered and maintained at an elevation not less than 6 inches below the bottom of the lowest floor, or where hydrostatic pressures will not occur, the floor and basement walls shall be damp-proofed.

30. The structure shall be connected to the public sewer system per P/BC 2020-027.

31. The infiltration facility design and construction shall comply with the minimum requirements specified in the Information Bulletin P/BC 2020-118.

32. The infiltration system shall be constructed at the location shown on the drawing attached to the current report.

33. The construction of the infiltration system shall be provided under the inspection and approval of the soils engineer.

34. An overflow outlet shall be provided to conduct water to the street in the event that the infiltration system capacity is exceeded. (P/BC 2020-118)

35. Approval for the proposed infiltration system from the Bureau of Sanitation, Department of Public Works shall be secured.

36. A minimum distance of 10 feet (in any direction) shall be provided from adjacent proposed/existing footings to the [discharge of the] proposed infiltration system. A minimum distance of 10 feet horizontally shall be provided from private property lines to the proposed infiltration system.

37. The dry well area between the blank casing and the surround soils shall be sealed to a minimum depth of 10 feet below the bottom of any adjacent foundation with bentonite slurry (or equivalent) to prevent unintended leakage or horizontal infiltration. An emergency pump shall be provided and properly connected to the dry well in case of disfunction or overflow of the dry well.

38. All concentrated drainage shall be conducted in an approved device and disposed of in a manner approved by the LADBS (7013.10).

39. The soils engineer shall inspect all excavations to determine that conditions anticipated in the report have been encountered and to provide recommendations for the correction of hazards found during grading (7008, 1705.6 & 1705.8).

40. Prior to pouring concrete, a representative of the consulting soils engineer shall inspect and approve the footing excavations. The representative shall post a notice on the job site for the LADBS Inspector and the Contractor stating that the work inspected meets the conditions of the report. No concrete shall be poured until the LADBS Inspector has also inspected and approved the footing excavations. A written certification to this effect shall be filed with the Grading Division of the Department upon completion of the work. (108.9 & 7008.2)

41. Prior to excavation an initial inspection shall be called with the LADBS Inspector. During the initial inspection, the sequence of construction; shoring; protection fences; and, dust and traffic control will be scheduled (108.9.1).

42. Installation of shoring shall be performed under the inspection and approval of the soils engineer and deputy grading inspector (1705.6, 1705.8).

43. Prior to the placing of compacted fill, a representative of the soils engineer shall inspect and approve the bottom excavations. The representative shall post a notice on the job site for the LADBS Inspector and the Contractor stating that the soil inspected meets the conditions of the report. No fill shall be placed until the LADBS Inspector has also inspected and approved the bottom excavations. A written certification to this effect shall be included in the final compaction report filed with the Grading Division of the Department. All fill shall be placed under the inspection and approval of the soils engineer. A compaction report together with the approved soil report and Department approval letter shall be submitted to the Grading Division of the Department upon completion of the compaction. An Engineer's Certificate of Compliance with the legal description as indicated in the grading permit and the permit number shall be included (7011.3).

44. No footing/slab shall be poured until the compaction report is submitted and approved by the Grading Division of the Department.

DAN L. STOICA
Geotechnical Engineer I

DLS/dls
Log No. 114908
213-482-0480

cc: Langan Engineering and Environmental Services, Inc., Project Consultant
LA District Office

CITY OF LOS ANGELES
DEPARTMENT OF BUILDING AND SAFETY
Grading Division

District LA	Log No. 114908

APPLICATION FOR REVIEW OF TECHNICAL REPORTS

INSTRUCTIONS

A. Address all communications to the Grading Division, LADBS, 221 N. Figueroa St., 12th Fl., Los Angeles, CA 90012 Telephone No. (213)482-0480.
B. Submit two copies (three for subdivisions) of reports, one "pdf" copy of the report on a CD-Rom or flash drive, and one copy of application with items "1" through "10" completed.
C. Check should be made to the City of Los Angeles.

1. LEGAL DESCRIPTION
Tract: Irving Park
Block: Lots: 12

2. PROJECT ADDRESS:
5600 Hollywood Boulevard

3. OWNER: Bow West Capital
Address: 718 South Hill Street, Suite 601
City: Los Angeles Zip: 90014
Phone (Daytime):

4. APPLICANT Langan
Address: 18575 Jamboree Road, Suite 150
City: Irvine Zip: 92612
Phone (Daytime): 9495619200 ; 7144250666
E-mail address: czadoorian@langan.com

5. Report(s) Prepared by: Langan

6. Report Date(s): 10/5/2020

7. Status of project: ☑ Proposed ☐ Under Construction ☐ Storm Damage

8. Previous site reports? ☐ YES if yes, give date(s) of report(s) and name of company who prepared report(s)
n/a

9. Previous Department actions? ☐ YES if yes, provide dates and attach a copy to expedite processing.
Dates:

10. Applicant Signature: [signature] Position: ASSOCIATE

(DEPARTMENT USE ONLY)

REVIEW REQUESTED	FEES	REVIEW REQUESTED		FEES
☐ Soils Engineering		No. of Lots		
☐ Geology		No. of Acres		
☒ Combined Soils Engr. & Geol.	363.00	☐ Division of Land		
☐ Supplemental		Other		
☐ Combined Supplemental		☒ Expedite		181.50
☐ Import-Export Route		☐ Response to Correction		
Cubic Yards:		☐ Expedite ONLY		
			Sub-total	544.50
			Surcharge	129.80
			TOTAL FEE	674.30

Fee Due: 674.30
Fee Verified By: NL Date: 10/9/20
(Cashier Use Only)

Los Angeles Department of Building and Safety
Metro 4th Floor 10/13/2020 2:57:18 PM
User ID: rrodriguez
Receipt Ref Nbr: 2020287002-126
Transaction ID: 2020287002-126-1
GRADING REPORT $363.00
SYSTEMS DEV SURCH $32.67
GEN PLAN MAINT SURCH $38.12
DEV SERV CENTER SURCH $16.34
CITY PLAN SURCH $32.67
PLAN APPROVAL FEE $181.50
MISC OTHER $10.00
Amount Paid: $674.30
PCIS Number: NA
Job Address: 5600 Hollywood Blvd.
Owners Name: Bow West Capital

ACTION BY:

THE REPORT IS: ☐ NOT APPROVED

☐ APPROVED WITH CONDITIONS ☐ BELOW ☐ ATTACHED

For Geology Date

For Soils Date

GEOTECHNICAL INVESTIGATION REPORT

PROPOSED RESIDENTIAL TOWER

5600 Hollywood Boulevard

Los Angeles, California 90028

Prepared For:

Bow West Capital

718 South Hill Street, Suite 601

Los Angeles, CA 90014

Prepared By:

Langan Engineering and Environmental Services, Inc.

18575 Jamboree Road, Suite 150

Irvine, California 92612

October 5, 2020

Langan Project No.: 700071901

LANGAN

October 5, 2020

Sean Beddoe
Bow West Capital
718 South Hill Street, Suite 601
Los Angeles, CA 90014

Geotechnical Investigation Report
Proposed Residential Tower
5600 Hollywood Boulevard
Los Angeles, California 90028
Langan Project: 700071901

Dear Mr. Beddoe,

Langan Engineering & Environmental Services, Inc. is pleased to submit this geotechnical investigation report for the proposed residential tower to be constructed 5600 Hollywood Boulevard in Los Angeles, California.

Our services were performed in general accordance with our most recent proposal dated July 16, 2020 and our agreement for professional services that was executed on February 18, 2020.

♦ ♦ ♦

We 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

Chris Zadoorian, G.E.
Associate

cc: Antonio Rubbo, A. Rubbo & Associates, Inc.

SW:JH:SR:CJZ:
Attachments
Document ID: 700081101

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FIGURES

APPENDICES

1.0 INTRODUCTION

This report summarizes our geotechnical investigation for the proposed residential tower development to be constructed at 5600 Hollywood Boulevard in Los Angeles, California at the location shown on Figure 1.

The site is located at the southwest corner of Hollywood Boulevard and North Saint Andrews Place. The Site is bound by Hollywood Boulevard and Carlton Way on the north and south, Saint Andrews Place to the east, and a one- to two-level masonry commercial building (5610 Hollywood Boulevard) and a five-story residential development (5611 Carlton Way) and on the west as shown on Figure 2.

Jonathan Bensick of HKS Inc. furnished us with as-built foundation plans dated June 5, 1929 that were prepared by C.C. Overpack General Contractor for the existing residential building located at 5611 Carlton Way. Based on our review of the plans, the existing building is established at grade on the south end of the building, and partially below grade on the north end of the building. The building is supported on spread and continuous footings that appear to have been designed with an allowable bearing pressure of up to 4,000 psf.

Mr. Bensick also furnished undated partial plans that were prepared by Youssefian Associates for the existing building located at 5610 Hollywood Boulevard. Based on our review of the plans, the existing building includes two levels near for the northerly approximately one-fourth of the building footprint and a one level open workshop within the southerly approximately three-fourths of the building footprint. Although foundation plans were not included in the partial plan set, we anticipate that the existing building is also supported on spread and continuous footings and that the applied foundation loading is relatively light.

The site is currently developed with a three-level residential development and a two-level masonry building at the locations shown on Figure 2. Each of the existing developments include asphalt-paved surface parking adjacently to the west and south respectively.

The northeast quadrant of the site is currently undeveloped and covered with moderate vegetation and minor remnants of a prior building development. The prior building at this location was demolished circa 2002 based on review of GoogleEarth historical aerial imagery.

The ground surface level at the site slopes down to the south and ranges from approximately Elevation 392 approximately Elevation 381.

Antonio Rubbo of A. Rubbo and Associates furnished us plans dated July 24, 2020 prepared by HKS for the proposed development. Based on our review of the plans, the proposed development includes a tiered residential tower over two to three subterranean parking levels. The building will include three, seven, 12, 16 and 17 levels above grade as shown on Figure 2.

The lowest finish floor level of the parking levels will be established at approximately Elevation 359, corresponding to approximately 25 to 33 feet below the existing ground surface (BGS) at the south and north sides of the site, respectively. The sloping ground surface level will result in three levels below grade at the north end of the site and two levels below grade at the south end of the site.

Kelly Weldon of Nabih Youssef and Associates (NYA) furnished us with dead-plus-live foundation loading for the proposed tower in terms of average applied bearing pressures for each tier of the tower. Table 1 summarizes the loading.

Table 1 – Foundation Loading

Tier	Above-Grade Levels	Approximate Location within Building Footprint	Applied Foundation Pressure (psf)
Tier 1	3	Westerly 25 feet	1,500
Tier 2	7	Southerly 85 feet	2,200
Tier 3	12	South-Central 80 feet	3,200
Tier 4	16 to 17	Northerly 200 feet	4,000

Mr. Weldon also furnished us with schematic foundation plans dated July 24, 2020 for the proposed development and based on our review of these plans, a mat foundation ranging from approximately 3½ to 7 feet in thickness is planned.

We also discussed the project with Christopher Chin of KPFF Consulting Engineers, and based on our discussion, the storm water mitigation system is planned to consist of a deep dry well situated within the building footprint.

We were also furnished with prior geotechnical investigation reports dated Augsut 5, 2016 prepared by AGI Geotechnical, Inc., and November 29, 2017 prepared by Geocon West, Inc. that were each prepared for previously proposed developments at the site. The prior investigations included five borings ranging between 26 and 60 feet BGS.

We have reviewed the data presented in their reports and have determined that the information presented therein is generally suitable for use in developing geotechnical design recommendations. We therefore assume the professional responsibility for the use and interpretation of the data presented therein.

We performed independent geotechnical explorations at the site to supplement that data available from the prior investigations.

The results of our investigation and the pertinent prior data is summarized herein following by our conclusions and recommendations for the proposed development.

2.0 SITE EXPLORATIONS AND SUBSURFACE CONDITIONS

2.1 Current Investigation

We drilled three borings, boring B-4 through B-6, to a depths ranging from 76½ to 151½ BGS, and performed field percolation testing at a depth of 47½ feet BGS in an additional borehole, P-1.

Borings B-4, B-5 and field percolation test P-1 were each drilled with a truck-mounted hollow-stem auger drilling equipment, and boring B-6 was drilled with a truck-mounted mud-rotary drilling equipment.

We collected relatively undisturbed and bulk samples from the borings at regular intervals and our geologist maintained a log of the subsurface conditions encountered in 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 drilling at B-4 and B-5, and upon completion of field percolation testing at P-1, we backfilled the bore holes with soil cuttings. The percolation test well was removed prior to backfilling.

Upon completion of boring B-6, the drilling spoils from the mud-rotary operation were placed in 55 gallon drums and stored temporarily on-site pending the results of chemical testing and subsequent off-site disposal by a licensed materials hauler.

Logs of our borings are presented in Appendix A.

2.2 Prior Investigation

A total of five borings were drilled at the site as part of the prior geotechnical explorations. The prior borings were drilled to depths ranging from 26 to 60½ feet BGS using truck-mounted hollow-stem auger drilling equipment.

The locations of the prior borings are shown on Figure 2 and logs of the prior borings are presented in Appendix B.

2.3 Subsurface Conditions

Asphalt concrete (AC) 2- to 3½ inches in thickness was encountered in each of the Geocon borings, and in our boring B-4 and B-6. Aggregate base was not encountered within the borings.

Artificial fill, approximately five to six feet in thickness, was encountered in each of our borings and in each of the Geocon borings consisting of loose, predominately sandy material with various amounts of silt and clay, and stiff sandy silt. AGI's boring logs do not indicate the presence of artificial fill; however, based on the proximity of their borings and the information presented on the other boring logs, we believe that fill materials are likely present in the vicinity of AGI's borings as well.

The underlying native materials are mapped as old alluvial fan deposits (Qof). Based on the current and prior boring data, the on-site native soils generally consist of alternating layers of medium dense to very dense, predominately sandy material with various amounts of silt and clay, and stiff to hard predominately silty and clayey material with various amounts of sand.

Generalized geologic sections are presented in Figures 3.

2.4 Groundwater Conditions

Groundwater was encountered in our current borings between depths of 69 and 75 feet BGS corresponding to approximately Elevations 313 to 318.

Perched water was also logged in prior Geocon boring B-3 at a depth of approximately 50 feet BGS, corresponding to approximately Elevation 334; groundwater was not logged in prior Geocon boring B-1 or B-2. Groundwater was not encountered in either of AGI's borings to the full depth explored of 41 feet.

Based on CGS' Seismic Hazard Zone Report (SHZR) 026 for the Hollywood Quadrangle, the historical high groundwater level at the site is reported at depths of approximately 80 feet BGS. However, the data points shown in the SHZR are not located within close proximity to the site. Therefore, for the purposes of this report and recommendations presented herein, the current groundwater level at the site is taken to be at Elevation 318.

2.5 Field Percolation Testing

We performed field percolation testing in general conformance with the guidelines presented in the City of Los Angeles *Planning and Land Development Handbook for Low Impact Development (LID), Part B 5th Edition*, dated May 9, 2016 (City of Los Angeles LID Handbook).

Section 4.2 of the City Manual refers to the *Administrative Manual, County of Los Angeles Department of Public Works Geotechnical and Materials Engineering Division, Guidelines for Geotechnical Investigation and Reporting Low Impact Development Storm Water Infiltration*, dated June 30, 2017 (*Los Angeles County Guidelines*) for percolation testing methods that can be used to determine the in-situ infiltration rates.

Field percolation testing was performed in P-1 at a depth of approximately 47.5 feet BGS. The test well was constructed by drilling to the pre-determined test depth and installing a 3-inch outside-diameter solid PVC casing in the upper 37.5 feet, and 3-inch outside-diameter perforated PVC casing in the lower 10 feet of the test well. Three inches of ¾-inch gravel were placed at the bottom of the well prior to installing the casing, and within the annular space between the boring side walls and the perforated casing.

Water was introduced to the subsurface soils through the test well and allowed to pre-soak for a period of approximately 1 hour, then testing was administered in general accordance with the City of Los Angeles LID Handbook and the Los Angeles Count Guidelines.

The observed field percolation rate was measured to be approximately 4½ inches per hour.

The results of our percolation test are summarized in Appendix C, and our recommendations for storm water infiltration are presented in Section 6.6.

2.6 P-S Suspension Seismic Velocity Logging

We engaged our geophysical sub-consultant, Geovision, to performed site-specific shear wave velocity measurements utilizing the P-S suspension velocity logging. This method uses a 7-meter probe that contains a source and two receivers spaced one meter apart. The probe is lowered down the drilled hole where the source generates a pressure wave in the drilling fluid within the hole. The pressure wave is converted to seismic P- and S-waves at the boring sidewalls; at each receiver, the P- and S-waves are converted back to pressure waves. The elapsed time between wave arrivals at the receivers is used to determine the average velocity of a 1-meter-high column of soil. The process is repeated for the full depth of the boring to obtain a continuous log of the boring

GEOVision used the results of the geophysical testing to develop a shear wave velocity profile for the upper approximately 30 meters (100 feet) below the planned foundation bottom (approximately 33.5 feet below existing grade).

The results of the P-S logging indicated a shear wave velocity of approximately 1,330 feet per section (406 meter per second) when measured from a depth of approximately 33 feet BGS; at the approximate planned foundation bottom level.

The results of the P-S logging are presented in Appendix D.

3.0 LABORATORY TESTING

3.1 Current Investigation

We utilized a City of Los Angeles-certified laboratory, Geo-Logic Associates, to perform the following geotechnical laboratory tests on samples collected from our current borings:

- In-situ Moisture Content and Dry Density
- Maximum Density and Optimum Moisture Content
- Direct Shear
- Consolidation
- Corrosion

We have reviewed the results of the laboratory testing and take professional responsibility for the interpretation and use of the data.

The results of the geotechnical laboratory testing from our current investigation are presented in Appendix A.

3.2 Prior Investigation

As part of their prior investigation, Geocon West and AGI performed the following geotechnical laboratory testing:

- In-situ Moisture Content and Dry Density
- Maximum dry-density and Optimum Moisture Content
- Direct Shear
- Consolidation
- Expansion Index
- Corrosion
- Grain-size Distribution with Hydrometer

We have reviewed the results of the prior laboratory testing and take professional responsibility for the interpretation and use of the data.

The results of the prior geotechnical laboratory testing are presented in Appendix B.

4.0 GEOLOGIC AND SEISMIC HAZARDS EVALUATION

4.1 Regional and Local Geologic Setting

The site is located near the northwestern end of the Peninsular Ranges Geomorphic Province of Southern California. The Peninsular Ranges Geomorphic Province consists of a series of mountain ranges separated by northwest trending valleys that are subparallel to faults that branch from the San Andreas Fault.

More specifically, the site is within the Central Block of the Los Angeles Basin, an extensive sediment-filled depression bound by the San Gabriel Mountains on the north, Santa Monica Mountains and the Pacific Ocean on the west, the Palos Verdes Peninsula on the southwest, the Santa Ana Mountains on the southeast, and the Puente, San Jose, and Chino Hills on the east. The basin's structural history includes extension and strike-slip faulting, followed by oblique contraction via thrusting and strike-slip faulting (Yerkes et al, 1965).

Based on the CGS "Seismic Hazard Zone Report for the Hollywood 7.5 Minute Quadrangle, Los Angeles County, California" (Seismic Hazard Zone Report 026), revised January13, 2006, the site is underlain by Pleistocene alluvial deposits (map unit Q_{OA}), described as "fine to coarse clayey sand and sandy clay, with lesser amounts of silt."

Regional geologic maps of the area by Dibblee (1991) indicates the site is underlain by older alluvial fan sediments (map unit Q_{AE}) while Campbell et al (2014) have mapped the site area as being underlain by old alluvial fan deposits (map unit Q_{OF}).

These late to middle Pleistocene soils are described as "slightly to moderately consolidated silt, sand, and gravel deposits on alluvial fans; surfaces dissected in varying degrees; surfaces can show moderately to well-developed pedogenic soils."

The data from the current and prior exploration borings is consistent with the geologic conditions summarized by CGS, Dibble, and Campbell et al.

Figure 5 presents a regional geologic map depicting the surficial geologic deposits at the site.

4.2 Geologic and Seismic Hazards Evaluation

4.2.1 General

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

4.2.2 Regional Faulting

We reviewed the CGS 2010 *Fault Activity Map of California* and the accompanying document, *An Explanatory Text to Accompany the Fault Activity Map of California,* to identify mapped faults within 100 kilometers of the site. The *Fault Activity Map* shows that the closest mapped faults to the site are the Hollywood fault, approximately 1.0 kilometer (0.62 miles) north and the Santa Monica Fault Zone approximately 0.2 kilometers (0.12 miles) southwest.

Figure 6 shows the site location relative to the nearby seismic sources.

4.2.3 Regional Seismicity

A search of the USGS ANSS Comprehensive Earthquake Catalog (ComCat) using a web-based Earthquake Archive Search and URL builder tool, found that as of March 26, 2020, 41 earthquakes with magnitudes between 5.0 or greater have occurred within a 100-km radius of the site since 1900.

The site location relative to historic earthquakes is shown on Figure 7.

4.2.4 Ground Surface Rupture Potential

The site is not located within an Alquist-Priolo Fault Zone or a Preliminary Fault Rupture Study Area based on a review of State of California and City of Los Angeles fault maps as shown on Figure 8.

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

4.2.5 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 disrupted temporarily resulting is settlement as the soil particles reconstitute.

Typically, liquefaction occurs within the upper approximately 50 feet BGS.

The site is not located within a City- or State-designated liquefaction hazard zone as shown on Figure 8. Groundwater (perched and/or the groundwater table) was not encountered within the upper 50 feet BGS and the soils encountered in the exploration borings consist of stiff fine-grained deposits and/or medium dense to dense granular deposits.

Thus, the potential for liquefaction at the site is considered very low.

4.2.6 Lateral Spreading Potential

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

The site is not located within a liquefaction hazard zone and the ground surface level at the site is generally flat so that open or unsupported slopes are not present.

Thus, the potential for lateral spreading is considered negligible.

4.2.7 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 of stiff fine-grained deposits and/or medium dense to dense granular deposits.

Therefore, the potential for seismically-induced settlement is considered very low.

4.2.8 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, Hollywood Quadrangle map as shown on Figure 8. Additionally, the site is not located in a Landslide Hazard Zone in the City of Los Angeles' ZIMAS online tool.

The site slopes gently toward the south at roughly a 35:1 ratio and there are no sloped boundary conditions. Thus, the potential for earthquake-induced landsliding is considered negligible.

4.2.9 Historical High Groundwater

Based on CGS' Seismic Hazard Zone Report (SHZR) 026 for the Hollywood Quadrangle, the historical high groundwater level at the site is reported at depths of approximately 80 feet BGS. However, the data points shown in the SHZR are not located within close proximity to the site.

Groundwater was encountered in our current borings between depths of 69 and 75 feet BGS corresponding to approximately Elevations 313 to 318.

Perched water was also logged in prior Geocon boring B-3 at a depth of approximately 50 feet BGS, corresponding to approximately Elevation 334.

For the purposes of this report and recommendations presented herein, the current groundwater level at the site is taken to be at Elevation 318.

4.2.10 Flood Mapping

Based on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Number 06037C1610F, the site is located within an area determined to be outside the 0.2 percent annual chance floodplain.

4.2.11 Tsunamis, Seiche, and Dam Inundation

Based on information and maps available from the CGS and the City 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.

4.2.12 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, a plugged well is located about 4800 feet southwest of the site, the Hollywood Corehole #1 (API 0403720765, well number 1. 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 low.

4.2.13 Expansive Soils

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.

Laboratory testing performed as part of the prior investigations indicate the on-site soil near the bottom of the proposed foundations have an Expansion Index of 107 at a depth of 20 to 25 feet BGS..

However, these soils are generally above the bottom of the current planned bottom of mass excavation.

4.2.14 Methane Zone

Per the City's ZIMAS on-line tool, the site is not located within a City of Los Angeles-designated Methane Zone. As a result, a methane mitigation will not be required per City of Los Angeles Ordinance 175790.

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 Los Angeles and can be mitigated by following the seismic design requirements of the Los Angeles Building Code (LABC).

5.2 Foundations

The native soils encountered at the planned foundation levels consist of Quaternary-age very stiff to hard predominantly silt and clay soils, and medium dense to dense sand with various amounts of silt and clay.

The proposed tower may be supported on a mat foundation established on the native soils present at the planned bottom of foundation level.

Recommendations for foundation design are presented in Section 6.1.

5.3 Shoring, Excavation and Permanent Below-Grade Walls

The planned excavations will extend below the existing two-level masonry commercial building (5610 Hollywood Boulevard) and five-story residential development (5611 Carlton Way) located immediately west of the site, as well as the existing Hollywood Boulevard, St. Andrews Place, and Carlton Way located to the north, east, and south respectively.

Temporary and permanent support for the existing residential/commercial buildings and roadways adjacent to the site will be required.

As noted in Section 1.0, the existing building at 5611 Carlton way is supported on spread and continuous footings. Based on our review of the foundation plans, the spread footings adjacent to the proposed structure are on the order of 8½ feet wide and the adjacent perimeter footings are approximately 1½ feet wide. The resulting loaded area is approximately 11 feet in width, including nominal clear space between the spread footings and the perimeter footings. The foundations appear to have been designed using a bearing pressure of up to 4,000 psf.

The foundation plans for the existing building at 5610 Hollywood Boulevard, however we anticipate these loads to be relatively light considering the nature of this building.

Our preliminary surcharge loading for permanent building walls below grade and temporary shoring are presented in Sections 6.2 and 6.4.

5.4 Storm Water Infiltration

Based on the results of the field percolation testing performed as part of this investigation, storm water infiltration is feasible at the site at depths of approximately 10-foot-thick predominately sand layer present between approximately 40 and 55 feet BGS at the site.

Our recommendations for storm water infiltration are presented in Section 6.6.

5.5 Floor Slab Support

We anticipate that the building floor slab will be established on properly compacted fill placed on the mat foundation to allow for a utility pass. Alternatively, the mat foundation may also serve as the building floor slab-on-grade.

Recommendations for floor slab support are presented in Section 6.7.

5.6 Subgrade Preparation

In general, the soils at the planned bottom of excavation levels contain relatively high moisture contents and as a result, provisions for stabilization of the excavation bottom may be required to establish a firm working surface.

Recommendations for subgrade preparation and/or bottom stabilization are presented in Section 6.9.

5.7 Sulfate Attack on Concrete and Corrosion Potential

Based on the results of the chemical testing performed as part of the current and prior investigations, the on-site soils are moderately aggressive for concrete and the on-site soils are considered to be corrosive to buried metallic piping.

Type II cement with a maximum water-to-cement ratio of 0.5, and a minimum compressive strength of 4,000 psi may be used per the *American Concrete Institute (ACI) 318-19 Building Code Requirements for Structural Concrete and Commentary*.

If buried metallic piping is utilized, corrosion protection should be designed by a corrosion engineer. Alternatively, polyvinyl chloride (PVC) piping may be used.

6.0 RECOMMENDATIONS

6.1 Mat Foundation

The proposed structure can be supported on a mat foundation established on the native soils present at the planned foundation bottom level.

Based on our review of the foundation plans provided by Mr. Weldon, the bottom of the mat foundation will be established between approximately Elevations 355 to 351.

The native soils present at the planned foundation bottom consist of medium dense clayey sand and very still sandy clay.

Foundation deformation analysis for the planned mat foundation may be performed using a subgrade modulus of reaction equal to 110 pounds per cubic inch (pci).

A net bearing pressure equal to 6,000 pounds per square foot (psf) may be used for the design of the mat foundation noting that a pressure release of approximately 3,000 to 3,600 psf will occur as a result of the planned excavation.

The recommended bearing pressure may be increased by one-third when considering short term wind and seismic loading conditions.

We estimate the total settlement for foundations designed as recommended herein will be on the order of 1½ inches or less and the differential settlement across the mat foundation will be on the order of ½ inch or less.

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

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 to resist lateral loading.

The ultimate passive pressure and the ultimate coefficient of friction may be combined with a reduction in ultimate passive resistance of 50 percent to account for the deformation required to mobilize the full passive value.

6.2 Below-Grade Walls

6.2.1 Design Lateral Earth Pressure

For static conditions, drained below-grade building walls should be designed to resist a trapezoidal-shaped braced lateral earth pressure distribution with the maximum value equal to 28H psf as shown on Figure 9.

For dynamic loading conditions, drained below-grade building walls should be designed to resists a triangular-shaped active lateral earth pressure with the maximum value equal to 36H psf in conjunction with a triangular-shaped seismic lateral earth pressure distribution with the maximum value equal to 15H psf as shown on Figure 10.

The upper 10 feet of the below-grade building walls should also be designed to resist a uniform lateral earth pressure equal to 100 psf to account for normal traffic loading as shown on Figures 9 and 10.

The load combination (active and seismic earth pressure) and the shape of the seismic lateral earth pressure distribution are each based on *Seismic Earth Pressures on Cantilevered Retaining Structures* (Atik and Sitar, 2010) and *Seismic Earth Pressures: Fact of Fiction* (Lew, Atik and Sitar, 2010).

In addition to the static and dynamic earth pressures, preliminary surcharge recommendations from the existing adjacent structures are presented in Section 6.2.2 and shown on Figures 9 and 10.

Although not currently planned, if the surface at the top of the walls is slope, the recommended lateral earth pressures should be increased as indicated in Table 2.

Table 2. Lateral Earth Pressures Increases

Slope Inclination at Top of Wall (H:V)	Increase in Lateral Earth Pressure (percent)
1:1	200
1.5:1	165
2:1	150

6.2.2 Surcharge Loading from Adjacent Structures and Vehicular Loads

Preliminary surcharge loading from the adjacent structure located at 5611Carlton Way should be taken as 1,200 psf within the upper 8 feet of the proposed below-grade wall, and can decrease linearly with depth to 20 feet.

Preliminary surcharge loading from the adjacent structure located at 5610 Hollywood Boulevard was determined based on an assumed areal load of 500 to 750 psf across the building footprint. Based on this assumption, we computed the surcharge load from this building may be taken as a uniform distribution of 150 psf along the full height of the wall.

To account for vehicular surcharge loads at each of the below-grade walls, we recommend utilizing a lateral load distribution of 100 psf within the upper 10 feet.

Lateral surcharge loading is shown on Figure 9, Figure 10, and Figure 11.

As an alternative to including the surcharge loading against the permanent walls below grade, foundations for the existing buildings could be underpinned and the foundation loading in this case would be transferred vertically down below the bottom of the planned excavation so that surcharge loading would not be required.

We can provide recommendations for underpinning in an addendum if this alternative is considered.

6.2.3 Wall Back-Drainage Provisions

Permanent below-grade walls should be constructed with adequate back-drainage to prevent the build-up of hydrostatic pressure behind the walls. Typically, a pre-fabricated geo-composited drainage board is affixed to the temporary shoring wall and the below-grade building walls is constructed by placement of shotcrete directly against the drainage board.

In addition to the drainage board (or other, LABDS-approved materials), LABDS Grading Division requires the installation of 'rock pockets' consisting of one cubic foot of crushed rock spaced at 8-feet center-to-center around the perimeter of the building below-grade walls to promote drainage.

The rock pockets require an outlet to drain and this is typically accomplished by installing a PVC pipe in the center of the crushed rock and returning the PVC pipe into the building. The PVC pipes are typically connected to the internal building sump system.

6.3 Temporary Vertical Cuts and Construction Slopes

Temporary vertical cuts are feasible in the on-site silty and clayey soils. Temporary vertical cuts should not exceed 4 feet in height.

Temporary, unsurcharged slopes may be excavated into the on-site clayey and silty soils and these slopes should not exceed a 1H: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 events.

6.4 Temporary Shoring

6.4.1 Design Lateral Earth Pressures

Typically, cantilevered shoring is feasible for retained heights of approximately 15 feet or less and braced shoring typically becomes economical for retained heights exceeding 15 feet.

Cantilevered shoring may be designed to resist a triangular lateral earth pressure distribution where the maximum value is 36H psf.

Internally braced shoring should be designed to resist a trapezoidal earth pressure distribution where the maximum value is equal to 28H psf.

Shoring should also be designed to resist the surcharge loads imposed by the existing structures located at 5611 Carlton Way, and 5610 Hollywood Boulevard, as well as vehicular loading as presented in Section 6.2.2.

As an alternative to including the surcharge loading against the temporary shoring wall, foundations for the existing buildings could be underpinned and the foundation loading in this case would be transferred vertically down below the bottom of the planned excavation so that surcharge loading would not be required.

We can provide recommendations for underpinning in an addendum if this alternative is considered.

For cantilevered and braced shoring design, where the surface at the top of the shoring is sloped, the recommended lateral earth pressures should be increased as indicated in Table 2.

The design of temporary shoring walls should consider the location of construction cranes and other potentially heavy equipment or loads that may act against the shoring system. Surcharge loading for these features may be determined by using NAVFAC DM 7.2 Chapter 3, Section 4. If needed, we can provide additional surcharge loading on a case-by-case basis.

6.4.2 Soldier Pile Design and Installation

For the design of soldier piles spaced at least two diameters on-center, the allowable lateral bearing value (passive pressure) of the native soils below the planned bottom of the excavation may be assumed to be 400 psf per foot of depth, up to a maximum value of 4,000 psf. To develop the full lateral bearing value, provides should be taken to assure firm contact between the soldier piles and the undisturbed native soils.

If the embedded portion of the soldier pile shafts are filled with controlled low strength material (CLSM) in conformance with the City of Los Angeles Department of Building and Safety information bulletin P/BC 2014-121, the effective width of the soldier pile shaft for use in developing passive resistance may be assumed to be twice the diameter of the soldier pile shaft. If the embedded portion of the soldier pile shaft is filled with other material (such as low-strength sand-cement slurry, for instance), the effective width of the soldier pile should be limited to be the diagonal dimension of the soldier pile.

The portion of the soldier piles below the bottom of the excavation may also be relied on to support downward loading. For soldier piles that are drilled and filled with structural concrete below the bottom of the excavation, the frictional resistance between the concrete and surrounding soil may be taken as 600 psf. For soldier piles that are vibrated into place, the frictional resistance may be taken as 800 psf.

6.4.3 Timber Lagging Design

Continuous lagging will be required between the soldier piles. The soldier piles should be designed for the full anticipated lateral earth pressure; however, the pressure on the lagging will be less due to arching in the soil. For clear spans of up to six feet, we recommend the lagging be designed for a triangular pressure distribution where the maximum pressure is 400 psf at the mid-point between soldier piles and zero at the soldier piles.

6.4.4 Tiebacks

The capacities of anchors should be determined by testing the initial anchors as outlined below. We anticipate that gravity-filled anchors will achieve an allowable bond strength of 1 kips to3 kips per lineal foot of anchor, depending on the method of construction. A variety of methods are available for construction of anchors. If post-grouted anchors are used, we estimate the anchors will develop resistance on the order of three times the estimated value. We recommend that the shoring designer and contractor be responsible for selecting the appropriate bond length and installation methods to achieve the required capacityOnly the frictional resistance developed beyond the active wedge would be effective in resisting lateral loads. If the anchors are spaced at least 6 feet on-center, reduction in the capacity of the anchors do not need to be considered due to group action.

The anchors are commonly installed at angles of 15 to 40 degrees below the horizontal: however, in many cases it is necessary to use steeper inclinations where adjacent private property is present. Caving of the anchor holes should be anticipated and provisions made to minimize such caving. The anchors should be filled with concrete placed by pumping from the tip out, and the concrete should extend from the tip of the anchor to the active wedge. To minimize chances of caving, we suggest that the portion of the anchor shaft within the active wedge be backfilled with sand before testing the anchor. The portion of the shaft should be filled tightly and flush with the face of the excavation. The sand backfill may contain a small amount of cement to allow the sand to be placed by pumping. For 8-inch-diameter or less post-grouted anchors, the anchor may be filled with concrete to the surface of the shoring.

Our representative should select a representative number of the initial anchors for 24-hour, 200 percent tests and 200 percent quick tests. The purpose of the 200 percent test is to verify the friction value assumed in design. The anchors should be tested to develop twice the assumed friction value. Where satisfactory tests are not achieved on the initial anchors, the anchor diameter and/or length should be increased until satisfactory test results are obtained.

For post-grouted anchors where concrete is used to backfill the anchor along its entire length, the test load should be computed as required to develop the appropriate friction along the entire bonded length of the anchor. We estimate that the influence of the post-grouting and the adjacent soil within the bonded length of the anchors will be less than 5 feet from the anchor.

Total deflection during the 24-hour, 200 percent test should not exceed 12 inches during loading. Anchor deflection should not exceed 0.75 inch during the 24-hour period. Measured after the 200 percent test load is applied. If the anchor movement after the 200 percent load has been applied for six hours is less than 0.5 inch and the movement over the previous four hours has been less than 0.1 inch, the test may be terminated.

For the quick 200 percent tests, the 200 percent test load should be maintained for 30 minutes. The total deflection of the anchor during the quick 200 percent tests should not exceed 12 inches. Anchor deflection after the 200 percent test load has been applied should not exceed 0.75 inch during the 30 minute period. Where satisfactory tests are not achieved on the initial anchors, the anchor diameter and/or length should be increased until satisfactory test results are obtained.

All the production anchors should be pre-tested to at least 150 percent of the design load. Total deflection during the tests should not exceed 12 inches. The rate of creep under the 150 percent test should not exceed 0.1 inch over a 15-minute period for the anchor to be approved for the design loading.

After satisfactory test, each production anchor should be locked off at the design load. The locked-off load should be verified by rechecking the load in the anchor. If the locked-off load varies by more than 10 percent from the design load, the load should be until the anchor is locked off within 10 percent of the design load. Installation of the anchors and testing of the completed anchors should be observed by a representative of our firm.

6.4.5 Lateral Deflection, Shoring Monitoring, and Existing Conditions Survey

Some means of monitoring the performance of the shoring system is recommended. The monitoring should consist of periodic surveying of the lateral and vertical deflections of top of each soldier pile. When design of the shoring system is finalized, we can discuss appropriate monitoring methods with the design consultants and shoring contractor.

It is difficult to accurately predict the amount of deflection of a shoring system and it should be understood that the shoring system is designed to deflect at the top. We recommend the shoring system be designed to limit deflection at the top to be 0.5 inch or less where the shoring provides lateral support for existing buildings, and 1 inch or less where existing buildings are not present. If greater deflection occurs during construction, additional vertical support or lateral bracing may be required.

Additionally, we recommend an existing condition survey be performed to document the condition of the adjacent buildings along the western edge of the proposed building. The survey should include photographs and placement of monitoring devices (crack monitors, for instance) if appropriate and should be performed prior to the start of the shoring installation.

6.5 Seismic Design

Assuming that the seismic base of the proposed tower is taken from the foundation level, Site Class C may be used to determine seismic design parameters in accordance with Chapter 20 of ASCE 7-16. Seismic design parameters based on Site Class C are presented in Table 3.

Table 3 –Seismic Design Parameters

Criteria	Value
MCE_R Ground Motion at Short Periods, S_s	2.114
MCE_R Ground Motion at 1Second Period, S_1	0.759
Site Class	C
Site-Modified Spectral Acceleration Value at Short Periods, S_{MS}	2.536
Site-Modified Spectral Acceleration Value at 1 Second Period, S_{M1}	1.063
Design Spectral Response Acceleration at short periods, S_{DS}	1.691
Design Spectral Response Acceleration at 1 second period, S_{D1}	0.709
MCE_G Peak Ground Acceleration, PGA_M	1.089

6.6 Storm Water Infiltration

Deep dry wells may be used for storm water infiltration. In accordance with the Table 4.1 of the City of Los Angeles Guidelines and the Los Angeles Department of Building and Safety (LADBS) Bulletin P/BC 2017-118, storm water infiltration should be limited to at least 10 feet below the bottom of mat foundation and at least 10 feet above the groundwater level.

Based on the data from the current and prior investigations, storm water infiltration should be performed above Elevation 328.

The results of the field percolation testing indicate an observed percolation rate of 4½ inches per hour for the granular soils present between depths of approximately 40 to 55 feet BGS at the site, corresponding to approximately Elevations 335 to 350.

We understand that the project's civil consultant will determine the appropriate design infiltration rate as part of their independent analysis and design of the proposed drywell system.

6.7 Floor Slab Support

We anticipate that the building floor slab will be established on properly compacted fill placed on the mat foundation to allow for a utility pass. Alternatively, the mat foundation may also serve as the building floor slab-on-grade.

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.

6.8 Pavement Design

6.8.1 General

The required pavement and base thicknesses will depend on the expected wheel loads, traffic index (TI), and the R-value of the subgrade soils. We have conservatively assumed an R-value of 10 for the design of pavement sections established near existing grade. If needed, R-value testing can be completed during construction to confirm the recommendations provided herein.

Artificial fill and/or zones of soft, loose, excessively moist or otherwise unsuitable materials should be over-excavated by 12 inches and replaced as properly compacted fill beneath pavement sections to provide suitable support. Excavation bottoms should be carefully evaluated by our field representative during construction.

Our pavement design recommendations for asphalt concrete (AC) and Portland cement concrete (PCC) are provided below.

6.8.2 Asphalt-Concrete Pavement Design

If planned, near surface AC pavement shall be designed in accordance with the CATRANS method. Table 4 below summarizes our AC pavement recommendations for assumed TIs of 4, 5, and 7.

Table 4. AC Pavement Design Recommendations

Traffic Use	TI	AC (inches)	AB (inches)
Parking Areas	4	3	6
Drive Lanes	5	4	8
Delivery Access and Loading Docks	7	4	10

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 requirements of Section 26 of State of California Standard Specifications for Public Works Construction (Green Book). The aggregate base should be compacted to at least 95 percent relative compaction.

6.8.3 Portland Cement Concrete (PCC) Pavement Design

Table 5 summarizes our PCC pavement recommendations for assumed TIs of 4, 5, and 7 based on minimum compressive strength of 3,000 psi for the PCC.

Table 5. PCC Pavement Design Recommendations

Traffic Use	TI	PCC (inches)	AB (inches)
Parking Areas	4	5	6
Drive Lanes	5	6	6
Delivery Access and Loading Docks	7	8	6

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.

State of California Department of Transportation Type 2 base, or equivalent, should be used in the required sections. The base should be compacted to at least 95 percent relative compaction.

6.9 Earthwork Considerations

6.9.1 Subgrade Preparation

The planned development will require excavations on the order of 32 feet to the bottom of foundation at the southern end of the building and on the order of 40 feet to the bottom of foundation at the northern end of the building.

Based on moisture test results, the native materials at the proposed excavation bottom may contain relatively high moisture content and these soils may not provide a firm working surface. In this case, these soils may be removed and replaced with a 12-inch layer of ¾-inch-minus crushed rock.

As an alternative, a waste-slab could be installed consisting of 4 inches of sand-cement slurry to establish a firm working surface at the bottom of the excavation.

6.9.2 Materials for Fill

The on-site soils are generally suitable for re-use in the required fills. However, some of the soils encountered may require some processing to achieve suitable moisture content.

All fill soils should be free of organic and other deleterious materials and have a maximum particle size no greater than 3 inches.

Imported fill should contain no more than 12 percent passing the No. 200 sieve by dry weight and have a plasticity index less than 7.

6.9.3 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.

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.

6.9.4 Site Drainage Fill Placement and Compaction

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 rainfall events, 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 data, as well as Project information provided to date.

This report was prepared for the Bow West Capital, 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 the requirements of the City of Los Angeles and 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.

REGISTERED PROFESSIONAL ENGINEER
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signed 10/5/20
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Senior Project Engineer

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CHRISTOPHER JOHN ZADOORIAN
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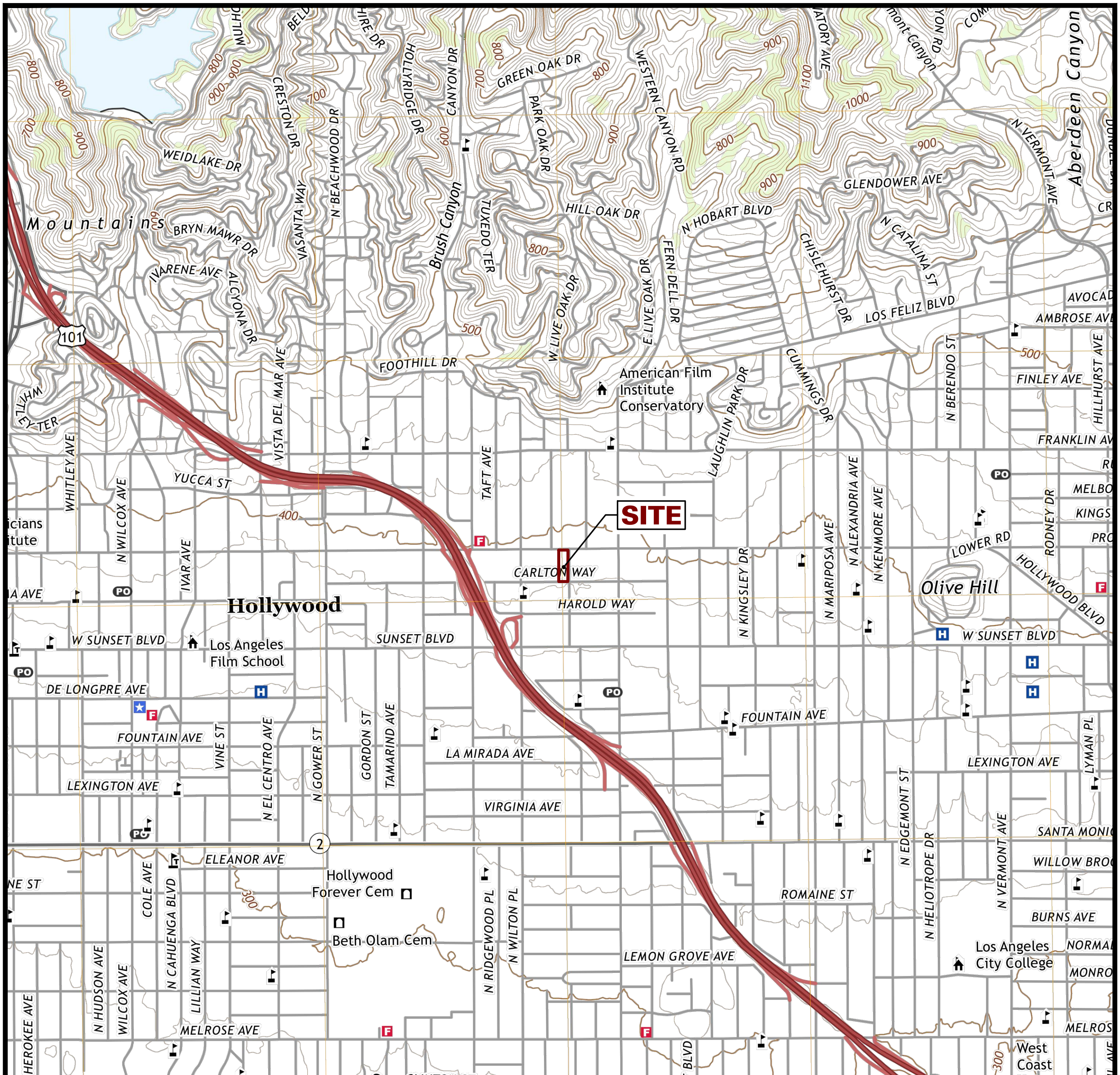
Christopher J. Zadoorian, GE
Associate

FIGURES



NOTES:

SITE LIMITS

2000	1000	0	2000

SCALE IN FEET

REFERENCE: USGS 7.5-MINUTE TOPOGRAPHIC MAP, HOLLYWOOD, CA QUADRANGLE (2012).

LANGAN

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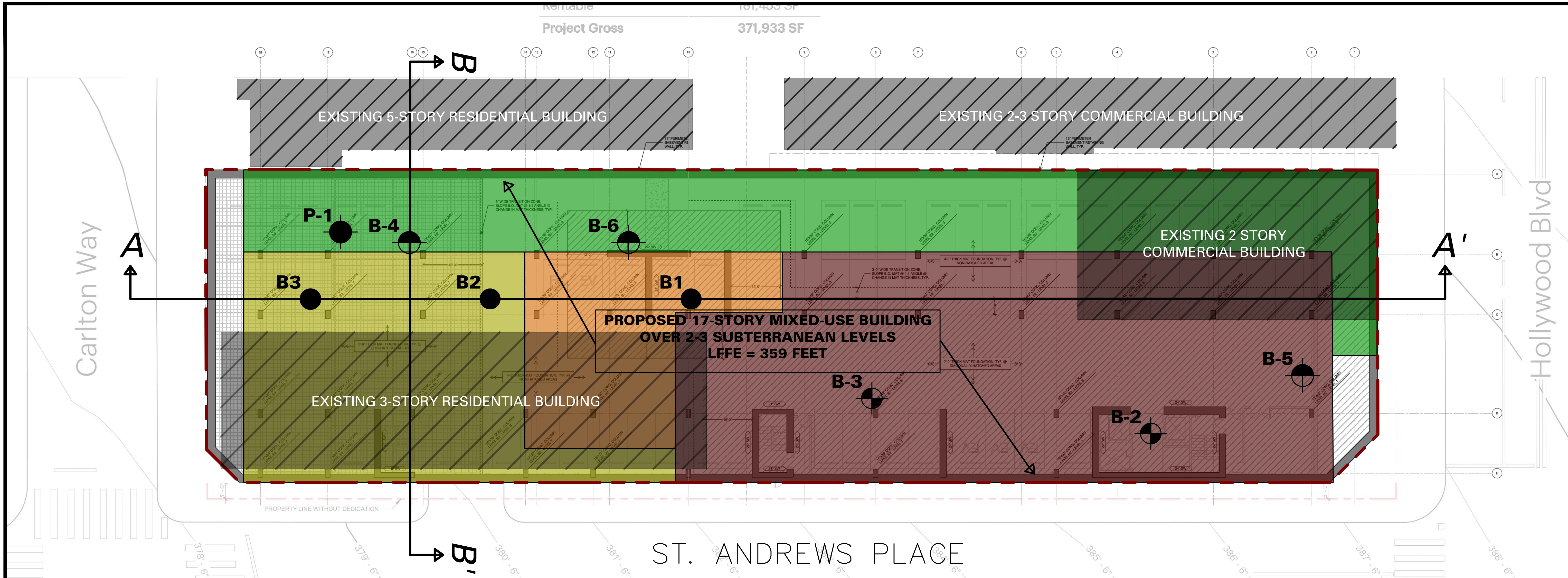
Project	Figure Title	Project No.	Figure No.
PROPOSED RESIDENTIAL TOWER 5600 HOLLYWOOD BOULEVARD, LOS ANGELES LOS ANGELES COUNTY CALIFORNIA	SITE LOCATION MAP	700071901	1
		Date: OCTOBER 2020	
		Scale: AS SHOWN	
		Drawn By: CDC	

Filename: \\Langan.com\data\IRV\data9\700071901\Project Data\CAD\01\2D-DesignFiles\700071901 - SITE PLAN AND XS.dwg Date: 10/5/2020 Time: 14:37 User: mgalvan Style Table: Langan.stb Layout: 1-SVM



LEGEND:

	SITE LIMITS
B-6	BORING (LANGAN, 2020)
P-1	PERCOLCATION TEST (LANGAN, 2020)
B3	PRIOR BORING (GEOCON WEST, 2017)
B-2	PRIOR BORING (AGI, GEOTECHNICAL, 2016)
	APPROXIMATE LIMITS OF EXISTING BUILDINGS
	APPROXIMATE LIMITS OF PROPOSED BUILDINGS
	FOOTING

TIER ONE - THREE LEVELS ABOVE GRADE

TIER TWO - SEVEN LEVELS ABOVE GRADE

TIER THREE - TWELVE LEVELS ABOVE GRADE

TIER FOUR - SIXTEEN TO SEVENTEEN LEVELS ABOVE GRADE

30 15 0 30

SCALE IN FEET

NOTES:

1. BACKGROUND FLOOR PLAN REFERENCED FROM SHEET S2.01A AND S2.01B, FROM PROJECT TITLED," 5600 HOLLYWOOD BOULEVARD", BY HKS ARCHITECTS, INC., DATED 07/24/2020.
2. FIGURE DISPLAYS APPROXIMATE BORING AND PERCOLATION TEST LOCATIONS.
3. FOOTINGS ARE REFERENCED FROM PLAN TITLED, "FOOTING PLAN O'BRIEN APARTMENT 5611 CARLTON WAY", BY C.C. OVERPECK CONTRACTORS, DATED 5 JUNE 1929.

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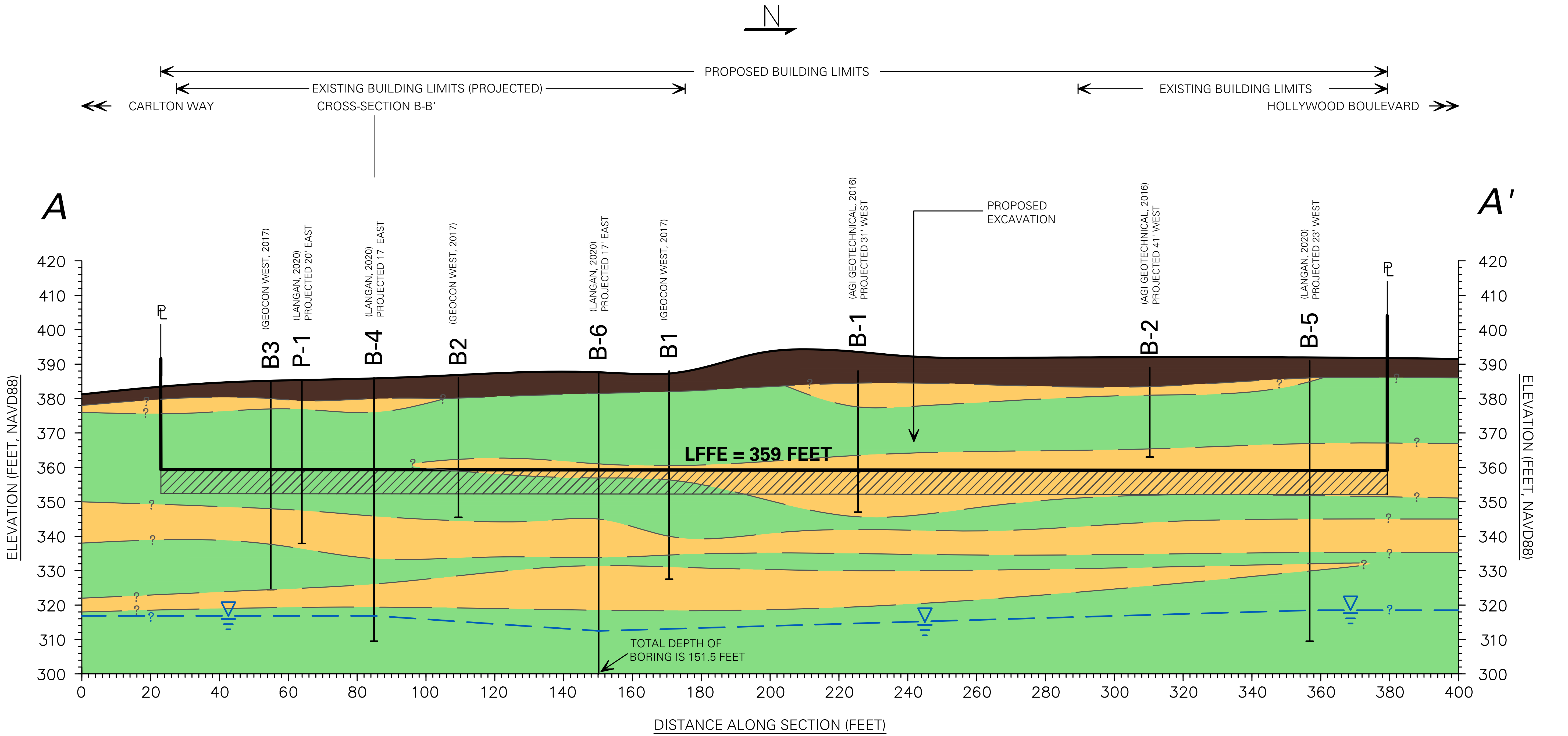
Project	Figure Title	Project No.	Figure No.
PROPOSED RESIDENTIAL TOWER 5600 HOLLYWOOD BOULEVARD, LOS ANGELES LOS ANGELES COUNTY CALIFORNIA	SITE PLAN	700071901	2
		Date: OCTOBER 2020	
		Scale: AS SHOWN	
		Drawn By: MAG	



LEGEND:

EXISTING GROUND SURFACE	ARTIFICIAL FILL
GROUNDWATER	OLD ALLUVIAL FAN DEPOSITS (Qof) - STIFF TO HARD PREDOMINANTLY SILT AND CLAY
PROPOSED BUILDING FOOTPRINT	OLD ALLUVIAL FAN DEPOSITS (Qof) - MEDIUM DENSE TO VERY DENSE PREDOMINANTLY SAND
INFERRED GEOLOGIC CONTACT	PROPOSED 3½ TO 7 FOOT THICK MAT FOUNDATION

30 15 0 30

SCALE IN FEET (HORIZONTAL=VERTICAL)

NOTES:

1. SURFACE ELEVATIONS ARE APPROXIMATE AND REFERENCED FROM "HOLLYWOOD BOULEVARD DESIGN SURVEY", SHEET 1 OF 1, BY KPFF, DATED OCTOBER 31, 2019.
2. SEE FIGURE 2 FOR LOCATION OF CROSS-SECTION WITH RESPECT TO SITE PLAN.

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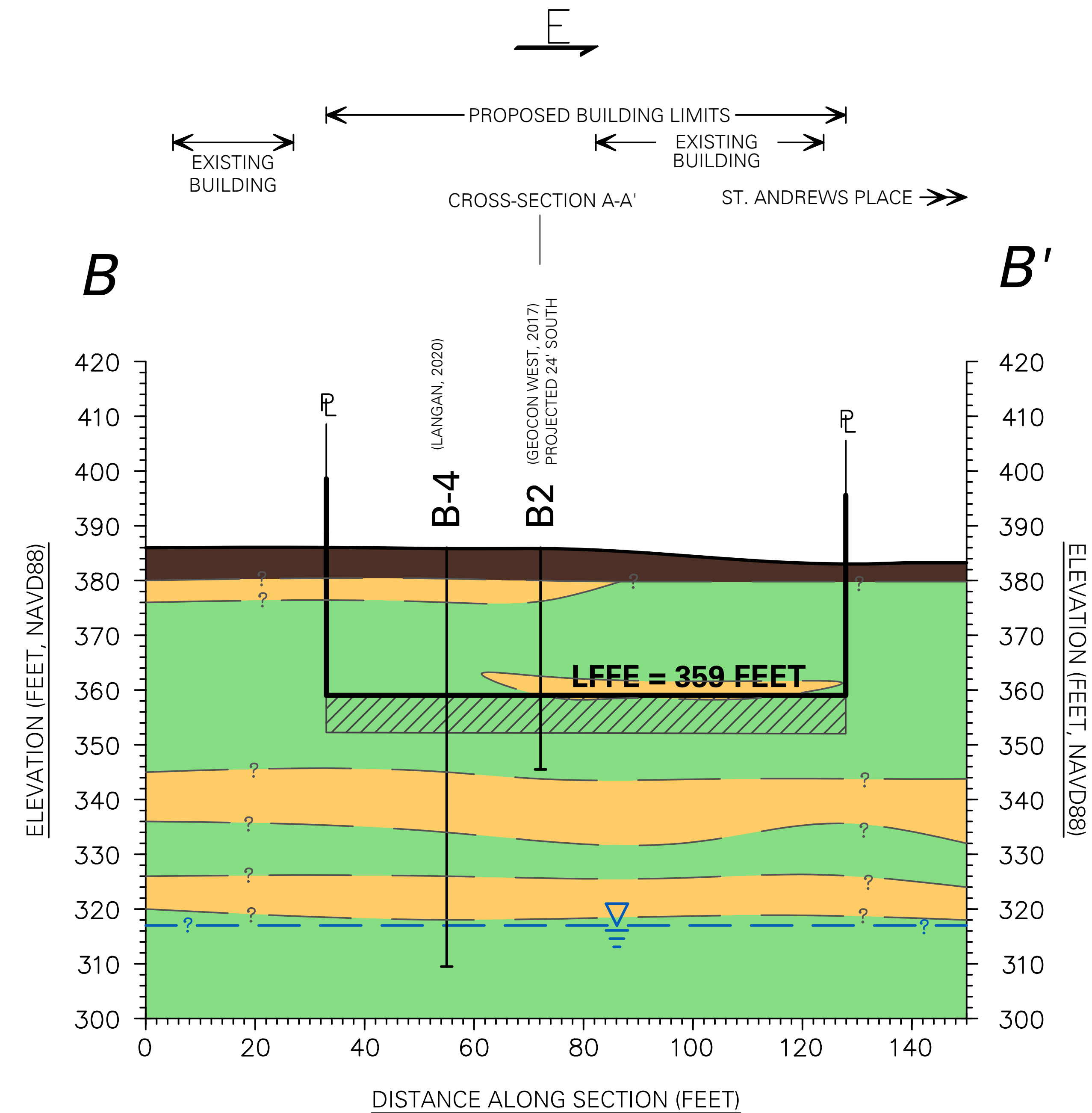
Project	Figure Title	Project No. 700071901	Figure No.
PROPOSED RESIDENTIAL TOWER 5600 HOLLYWOOD BOULEVARD, LOS ANGELES LOS ANGELES COUNTY CALIFORNIA	CROSS-SECTION A-A′	Date OCTOBER 2020 Scale AS SHOWN Drawn By CDC	3

Filename: \\Langan.com\data\IRV\data9\700071901\Project Data\CAD\01\2D-DesignFiles\700071901 - SITE PLAN AND XS.dwg Date: 10/5/2020 Time: 14:37 User: mgalvan Style Table: Langan.stb Layout: 3-XS A



LEGEND:

EXISTING GROUND SURFACE

GROUNDWATER

PROPOSED BUILDING FOOTPRINT

INFERRED GEOLOGIC CONTACT

ARTIFICIAL FILL

OLD ALLUVIAL FAN DEPOSITS (Qof) - STIFF TO HARD PREDOMINANTLY SILT AND CLAY

OLD ALLUVIAL FAN DEPOSITS (Qof) - MEDIUM DENSE TO VERY DENSE PREDOMINANTLY SAND

PROPOSED 3½ TO 7 FOOT THICK MAT FOUNDATION

30 15 0 30

SCALE IN FEET (HORIZONTAL=VERTICAL)

NOTES:

1. SURFACE ELEVATIONS ARE APPROXIMATE AND REFERENCED FROM "HOLLYWOOD BOULEVARD DESIGN SURVEY", SHEET 1 OF 1, BY KPFF, DATED OCTOBER 31, 2019.
2. SEE FIGURE 2 FOR LOCATION OF CROSS-SECTION WITH RESPECT TO SITE PLAN.

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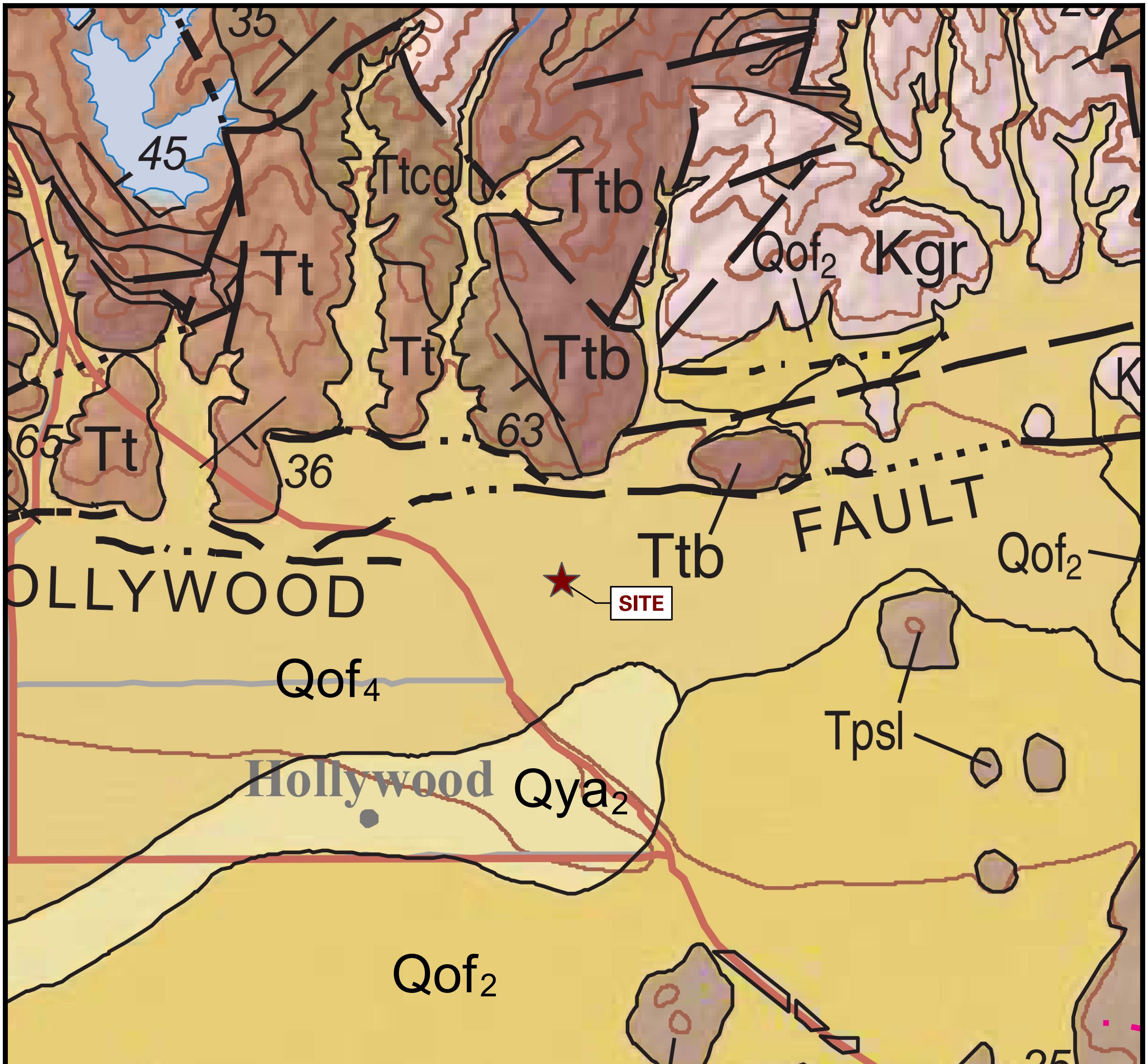
Project	Figure Title	Project No.	Figure No.
PROPOSED RESIDENTIAL TOWER 5600 HOLLYWOOD BOULEVARD, LOS ANGELES LOS ANGELES COUNTY CALIFORNIA	CROSS-SECTION B-B′	700071901	4
		Date: OCTOBER 2020	
		Scale: AS SHOWN	
		Drawn By: CDC	

Filename: \\Langan.com\data\IRV\data9\700071901\Project Data\CAD\01\2D-DesignFiles\700071901 - SITE PLAN AND XS.dwg Date: 10/5/2020 Time: 14:37 User: mgalvan Style Table: Langan.stb Layout: 4-XS B



LEGEND:

Qya	YOUNG ALLUVIUM
Qof	OLD ALLUVIAL FAN DEPOSITS
Tpsl	PUENTE FORMATION (SILTSTONE)
Tt	TOPANGA FORMATION (OAT MOUNTAIN)
Ttcg	TOPANGA FORMATION (CONGLAMERATE)
Ttb	TOPANGA FORMATION (INTRUSIVE AND EXTRUSIVE VOLCANIC ROCK)
Kgr	GRANITIC ROCKS

NOTES:

1. BACKGROUND REFERENCED FROM "PRELIMINARY GEOLOGIC MAP OF LOS ANGELES 30'x60' QUADRANGLE, CALIFORNIA", PUBLISHED 2014.

N

2000 1000 0 2000

SCALE IN FEET

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PROPOSED RESIDENTIAL TOWER

5600 HOLLYWOOD BOULEVARD, LOS ANGELES
LOS ANGELES COUNTY CALIFORNIA

Figure Title

REGIONAL GEOLOGIC MAP

Project No.	Figure No.
700071901	5
Date: OCTOBER 2020	
Scale: AS SHOWN	
Drawn By: MAG	

FAULT CLASSIFICATION COLOR CODE
(Indicating Recency of Movement)

Fault along which historic (last 200 years) displacement has occurred.

A triangle to the right or left of the date indicates termination point of observed surface displacement. Solid red triangle indicates known location of rupture termination point. Open black triangle indicates uncertain or estimated location of rupture termination point.

Date bracketed by triangles indicates local fault break.

No triangle by date indicates an intermediate point along faultbreak.

Fault that exhibits fault creep slippage. Hachures indicate linear extent of fault creep. Annotation (creep with leader) indicates representative locations where fault creep has been observed and recorded.

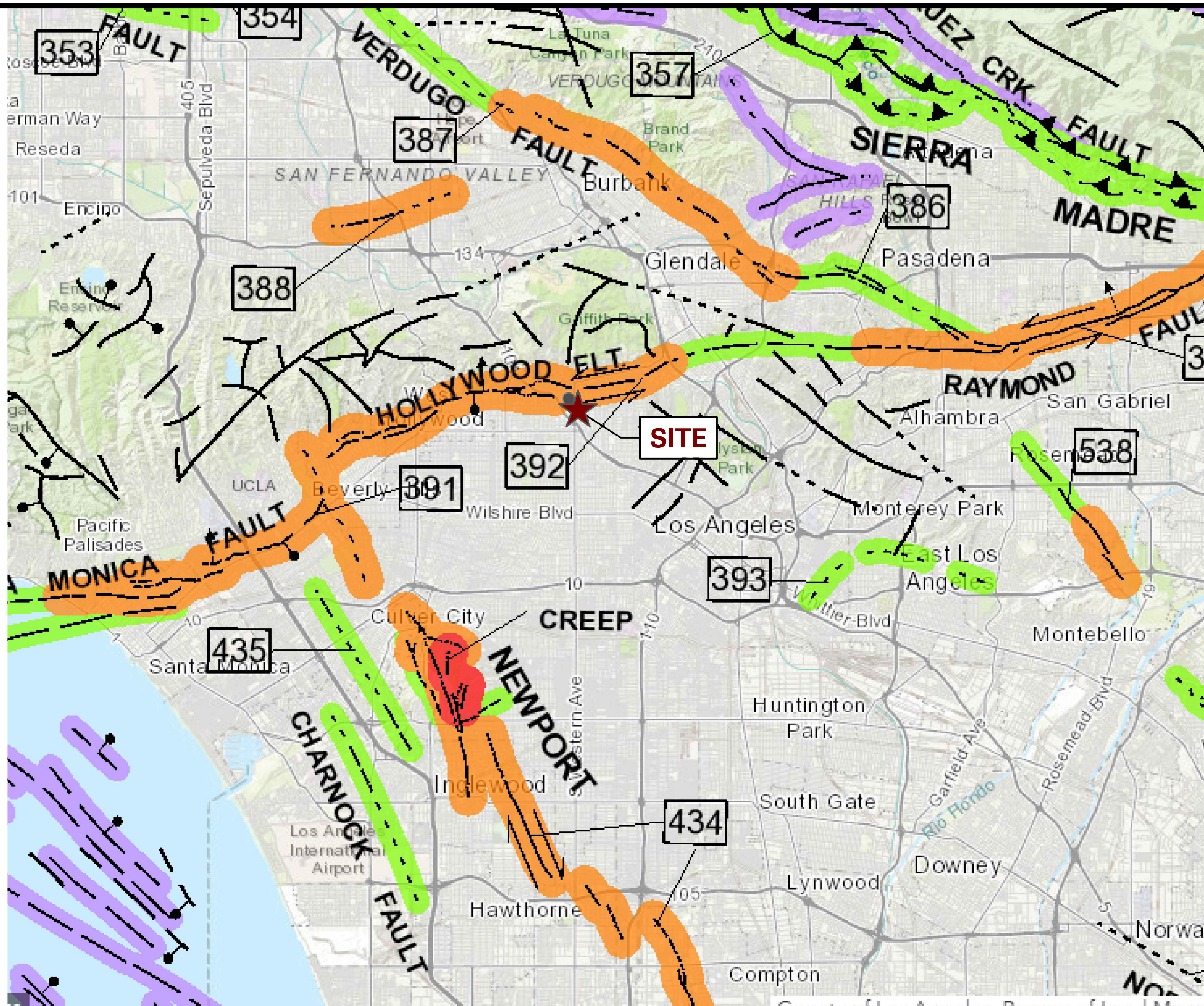
Square on fault indicates where fault creep slippage has occured that has been triggered by an earthquake on some other fault. Date of causative earthquake indicated. Squares to right and left of date indicate terminal points between which triggered creep slippage has occurred (creep either continuous or intermittent between these end points).

Holocene fault displacement (during past 11,700 years) without historic record.

Late Quaternary fault displacement (during past 700,000 years).

Quaternary fault (age undifferentiated).

Pre-Quaternary fault (older that 1.6 million years) or fault without recognized Quaternary displacement.



NOTES:

1. BACKGROUND REFERENCED FROM THE CGS ONLINE FAULT ACTIVITY MAP OF CALIFORNIA.

4 2 0 4

SCALE IN MILES

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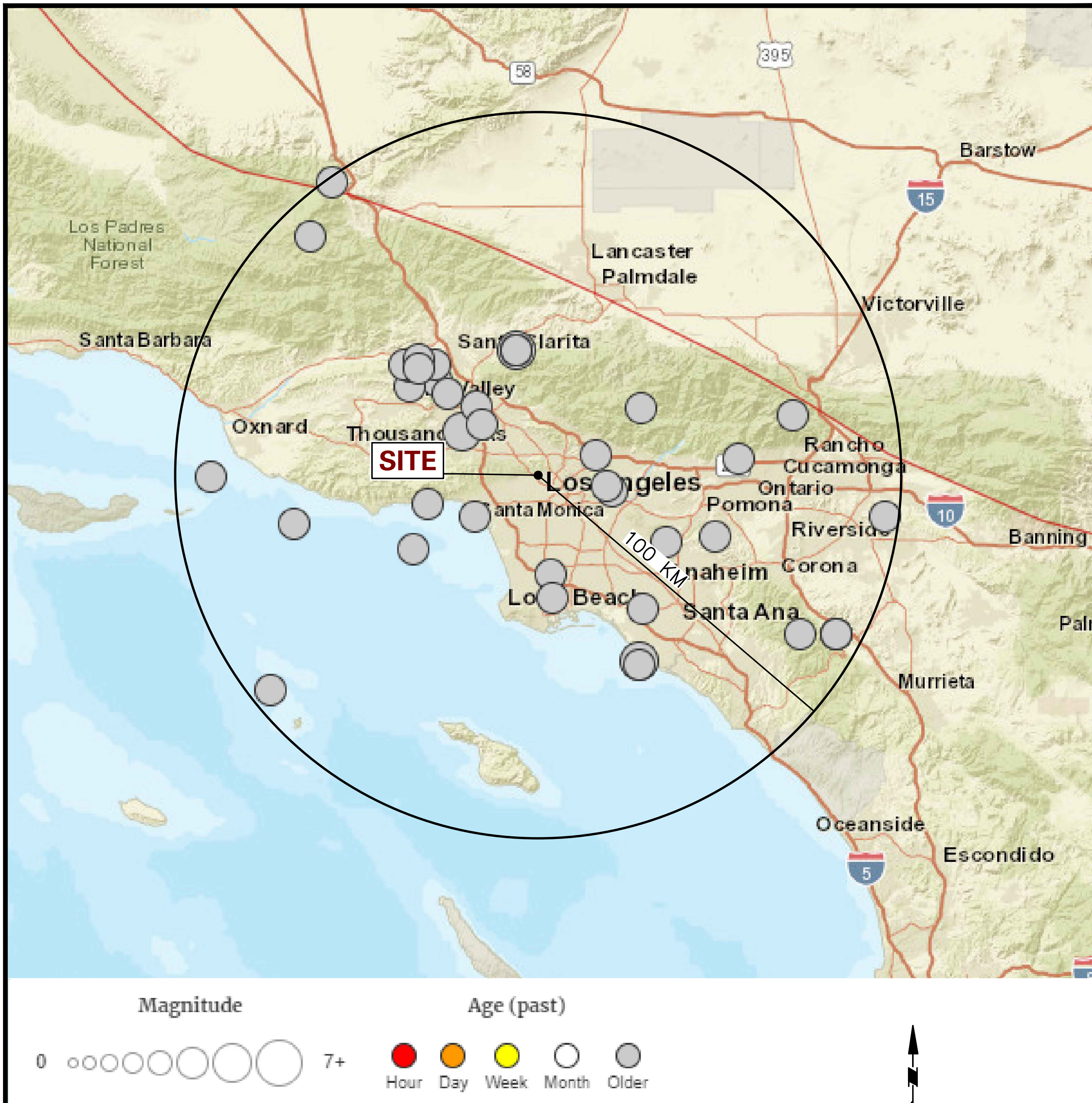
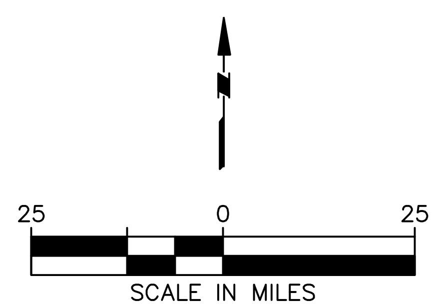
Project	Figure Title	Project No.	Figure No.
PROPOSED RESIDENTIAL TOWER 5600 HOLLYWOOD BOULEVARD, LOS ANGELES LOS ANGELES COUNTY CALIFORNIA	FAULT ACTIVITY MAP	700071901 Date: OCTOBER 2020 Scale: AS SHOWN Drawn By: MAG	6





NOTES:

1. THE FIGURE SHOWS EARTHQUAKE EPICENTERS OF MAGNITUDES 5.0 OR GREATER SINCE JANUARY 11, 1900 AND WITHIN 100 KILOMETERS FROM SITE.
2. RELATIVE MAGNITUDE OF EARTHQUAKE DISPLAYED BY SIZE OF CIRCLE.
3. BACKGROUND IMAGE REFERENCED FROM USGS, ONLINE EARTHQUAKE DATA BASE ON APRIL 17, 2020.

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PROPOSED RESIDENTIAL TOWER

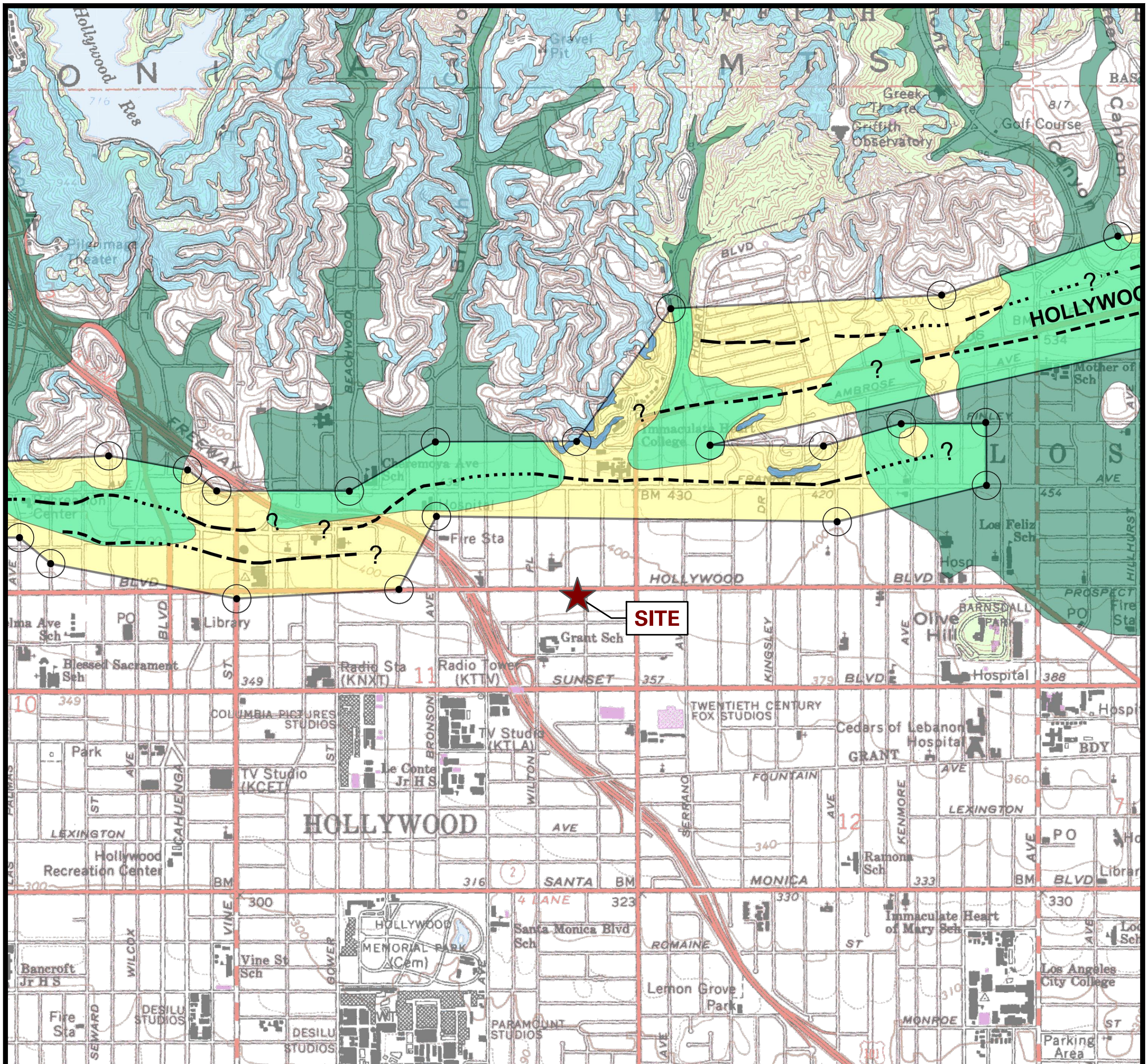
5600 HOLLYWOOD BOULEVARD, LOS ANGELES
LOS ANGELES COUNTY CALIFORNIA

Figure Title

HISTORIC EARTHQUAKE MAP

Project No.	Figure No.
700071901	7
Date	
OCTOBER 2020	
Scale	
AS SHOWN	
Drawn By	
MAG	

Filename: \\Langan.com\data\IRV\data9\700071901\Project Data\CAD\01\2D-DesignFiles\700071901 - MAPS.dwg Date: 10/5/2020 Time: 14:38 User: mgalvan Style Table: Langan.stb Layout: FIGURE 7



LEGEND:

EARTHQUAKE FAULT ZONES

ACTIVE FAULT TRACES

LIQUEFACTION ZONES

EARTHQUAKE-INDUCED LANDSLIDE ZONES

NOTES:

1. BACKGROUND REFERENCED FROM CGS "EARTHQUAKE ZONES OF REQUIRED INVESTIGATION HOLLYWOOD QUADRANGLE" DATED NOVEMBER 6, 2014.

2000 1000 0 2000

SCALE IN FEET

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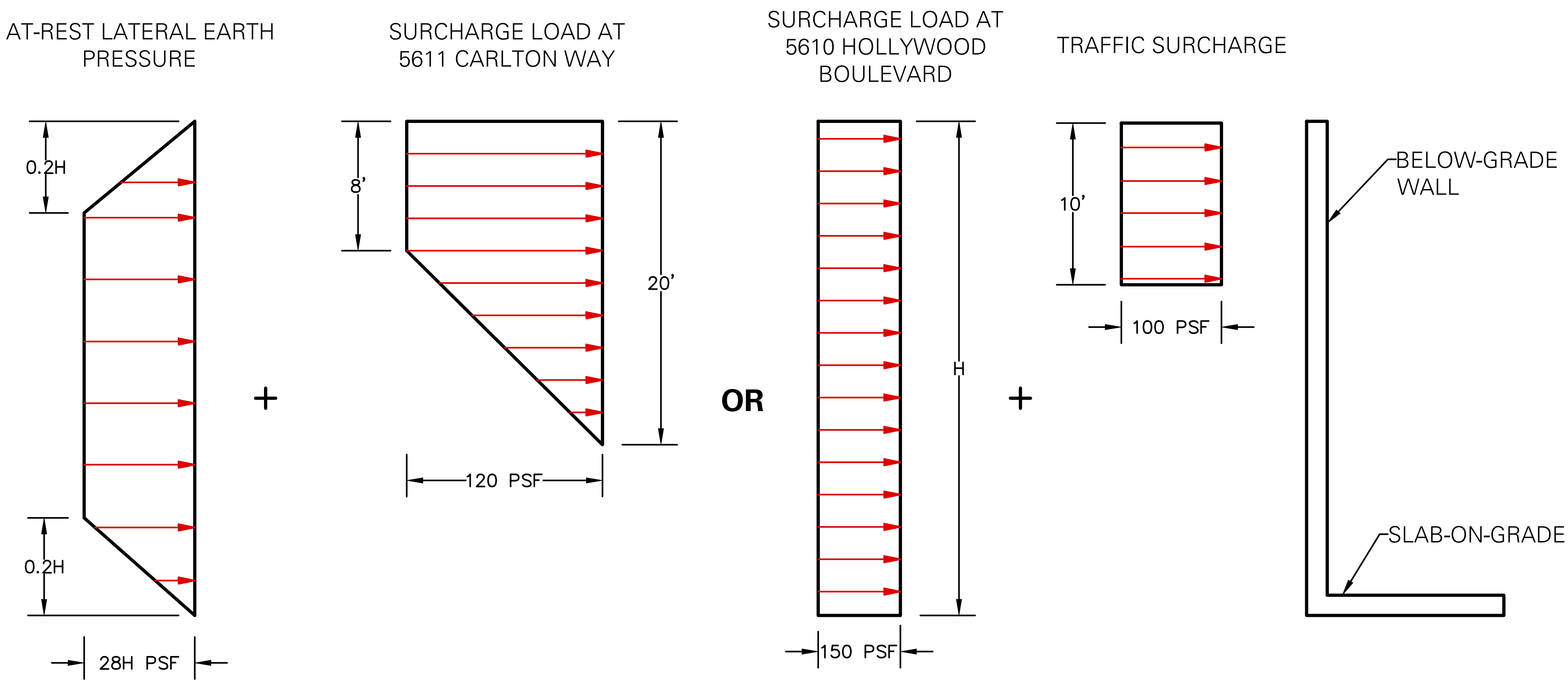

NOT TO SCALE

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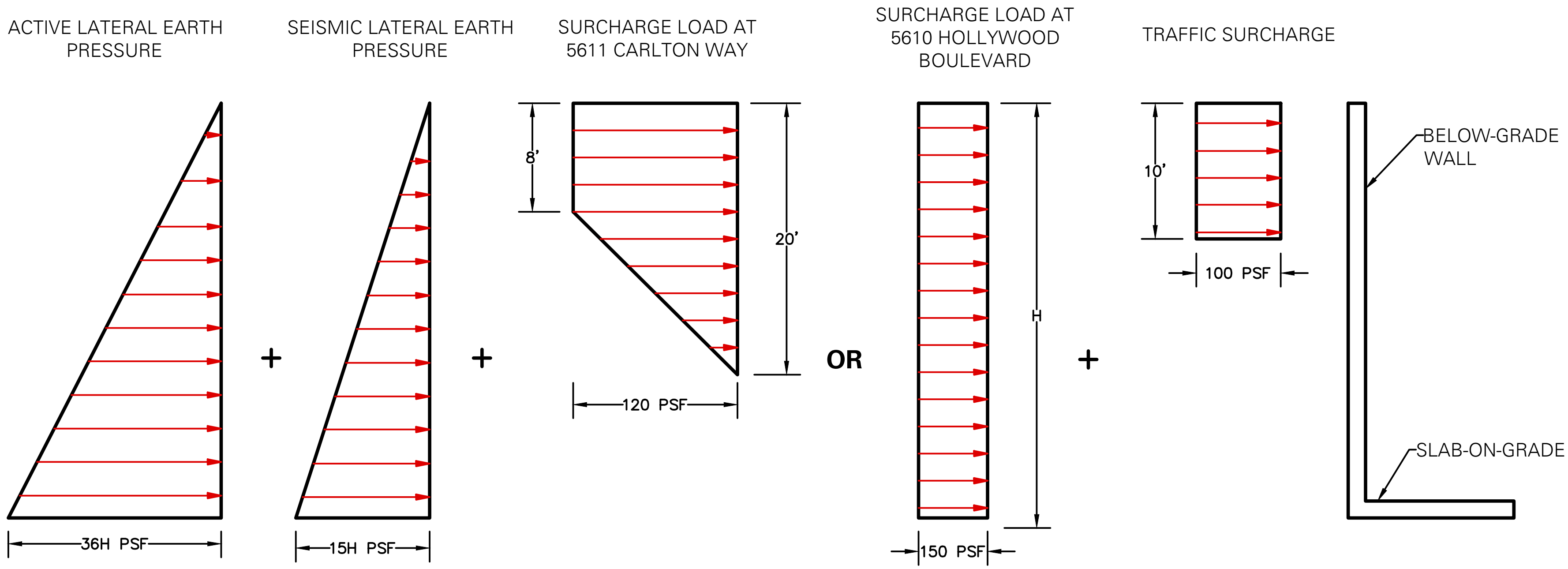
Project
PROPOSED RESIDENTIAL TOWER DEVELOPMENT
5600 HOLLYWOOD BOULEVARD,
LOS ANGELES
LOS ANGELES COUNTY CALIFORNIA

Figure Title
DRAINED LATERAL EARTH PRESSURE FOR BRACED CONDITIONS

Project No.	700071901
Date	OCTOBER 2020
Scale	N.T.S.
Drawn By	CDC
Figure No.	9



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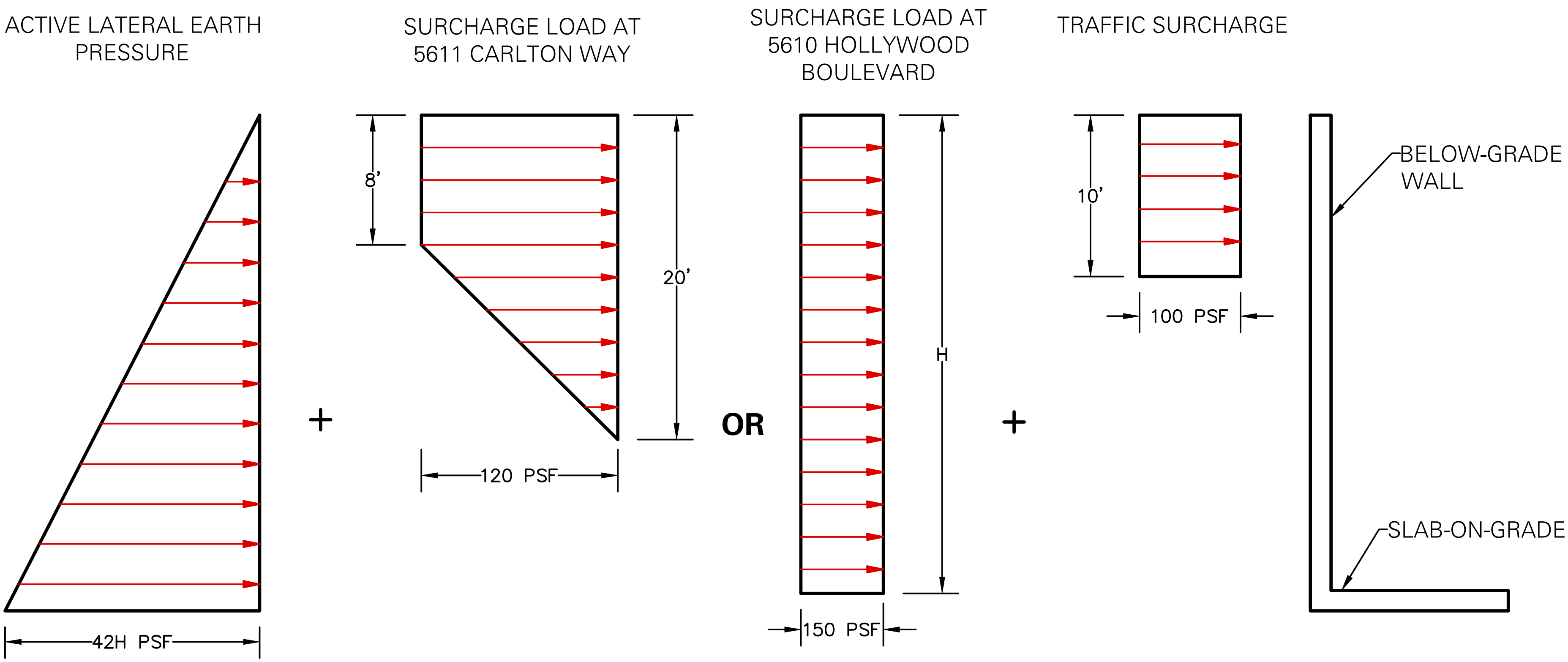
Project
PROPOSED RESIDENTIAL TOWER DEVELOPMENT
5600 HOLLYWOOD BOULEVARD, LOS ANGELES
LOS ANGELES COUNTY CALIFORNIA

Figure Title
SEISMIC LATERAL EARTH PRESSURE

Project No. 700071901
Date OCTOBER 2020
Scale N.T.S.
Drawn By CDC
Figure No. 10



NOT TO SCALE

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18575 Jamboree Road, Suite 150, Irvine, CA 92612 T: 949.561.9200 F: 949.561.9201 www.langan.com Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. S.A. Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. Langan Engineering and Environmental Services, Inc. Langan CT, Inc. Langan International LLC Collectively known as Langan	PROPOSED RESIDENTIAL TOWER DEVELOPMENT 5600 HOLLYWOOD BOULEVARD, LOS ANGELES LOS ANGELES COUNTY CALIFORNIA	DRAINED LATERAL EARTH PRESSURE - CANTILEVER SHORING	700071901 Date: OCTOBER 2020 Scale: N.T.S. Drawn By: CDC	11

APPENDIX A

Current Field Explorations and Laboratory Testing

SUBSURFACE EXPLORATIONS

GENERAL

We explored the subsurface conditions at the site by drilling three borings (B-4 through B-6) to depths of 76½, 81½, and 151½ feet bgs, respectively and one percolation test P-1to a depth of 47.5 feet bgs, at the locations shown on Figure 2. Borings B-4 and P-1 were drilled on March 9, and B-5 was drilled on March 11, 2020 by 2R Drilling, Inc. using a CME 75 truck-mounted drill rig with an 8-inch outer-diameter hollow stem auger.

Boring B-6 was drilled on July 28, 2020 by SoCal Drilling Co. using the mud-rotary drilling method with a Mayhew 1000 truck-mounted drill rig and an approximately 5-inch diameter drill bit. Prior to backfill of boring B-6, PS suspension seismic velocity logging was performed by GEOVision, Inc. on July 29, 2020. Details of the PS suspension seismic velocity logging are provided in Appendix D. The borings were drilled to collect geotechnical data and to collect soil samples for subsequent laboratory testing.

Boring B-4, B-5, and P-1 were backfilled with soil cuttings upon completion and surface patched with asphalt concrete, or Portland cement concrete as appropriate. Boring B-6 was backfilled with bentonite grout and the soil cuttings were containerized in 55 gallon drums and temporarily stored on site pending environmental testing and subsequent disposal.

The locations of the exploratory borings were determined in the field by the observed conditions of the site and/or rolling-wheel and tape measurements from existing site features. This information should be considered accurate only to the degree implied by the methods used.

Our Certified Engineering Geologist and Field Engineer observed and logged the explorations and collected representative samples of the various soils encountered in the explorations. Upon completion of the borings, we backfilled the boreholes with soil cuttings or bentonite slurry and restored the ground surface to the pre-existing conditions. Descriptions of conditions encountered and sampling intervals are presented in the boring logs included in this appendix.

SOIL SAMPLING

Soil samples were collected using a 2.5-inch inner-diameter modified California split-spoon sampler in general accordance with ASTM D3550. The split-spoon sampler was driven into the soil with a 140 pound hammer free falling 30 inches. The sampler was driven 18 inches or to refusal as indicated on the exploration logs. Refusal is defined as having blow counts of 50 or more per 6 inches of penetration. The number of blows required to drive the sampler the final 12 inches (or less if refusal was encountered) is recorded on the exploration logs, unless otherwise noted.

In addition, standard penetration tests (SPTs) were performed in general accordance with ASTM D1586. A standard 2-inch-diameter split-spoon sampler was driven into the soil with a 140-pound hammer free-falling 30 inches. The sampler was driven a total distance of 18 inches or to refusal. The number of blows required to drive the sampler the final 12 inches is recorded (or less if refusal was encountered) on the exploration logs, unless otherwise noted.

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

The sampling methods and intervals are shown on the boring logs.

SOIL CLASSIFICATION

The soil samples were classified in general accordance with the United Soil Classification System (USCS). The boring logs indicate the soil conditions encountered during drilling and indicate the depths at which the soil or their characteristics change, although the change might occur more gradually than implied on the logs. If a change occurred between sampling intervals, the depth was interpreted. Classifications are presented in the boring logs.

LABORATORY TESTING

Moisture Content

The in-situ moisture content of select samples obtained from the investigation was determined in general conformance with ASTM D2216. In-situ moisture content is defined as the ratio of the weight of water to the weight of soil in a test sample and is expressed as a percentage. The test results are presented in this appendix and on the boring logs.

Dry Density

The in-situ dry density of select samples obtained from the investigation was determined in general conformance with ASTM D2937. Dry density is defined as the ratio of the dry weight of the soil sample to the volume of that sample. The test results are presented in this appendix and on the boring logs.

Direct Shear Testing

Direct shear testing was performed on a select sample obtained from the investigation and in general conformance with ASTM D3080. The test results are presented in this appendix.

Consolidation Testing

One-dimensional consolidation testing was performed in general accordance with ASTM D2435 on a relatively undisturbed soil sample. The test measures the volume change of a soil sample under predetermined loads. 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 conformance with ASTM D1557. The testing determines the optimum moisture content at which the soil sample exhibits maximum dry density. The rest results are presented in this appendix.

Corrosion Testing

Corrosion testing was performed on select samples to determine the soils corrosion characteristics towards concrete and ferrous metals. Testing includes a suite of tests including electrical resistivity and pH in conformance with CTM 643, soluble sulfate content in conformance with CTM 417, and chloride content in conformance with CTM 422.

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 coarse fine	3" to No. 4 3" to ¾" ¾" to No.4	76.2 to 4.75 76.2 to 19.1 19.1 to 4.75
Sand coarse medium fine	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.075 4.76 to 2.00 2.00 to 0.420 0.240 to 0.075
Silt and Clay	Below No. 200	Below 0.075

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

GROUNDWATER READING

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

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

Project: Proposed Residential Tower		Project No.: 700071901	
Location: 5600 Hollywood Boulevard		Elevation and Datum: Approx. 386 feet (MSL)	
Drilling Company: 2R Drilling		Date Started: 3/9/20	Date Finished: 3/9/20
Drilling Equipment: Truck Mounted CME75		Completion Depth: 76.5 ft	Rock Depth: --
Size and Type of Bit: 4-inch I.D. H.S.A.		Number of Samples: Disturbed 1; Undisturbed 16; Core --	
Casing Diameter (in): --	Casing Depth (ft): --	Water Level (ft.): First 71; Completion 69; 24 HR. --	
Casing Hammer: -- Weight (lbs): --	Drop (in): --	Drilling Foreman: Ismael	
Sampler: 2.5 I.D. Cal Mod, 2.0-inch O.D. SPT, Bulk			
Sampler Hammer: Automatic Weight (lbs): 140	Drop (in): 30	Field Engineer: Shaun Wilkins	

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+386.0		0					Boring started at 7:30.
+385.8	Asphalt Concrete: 2.5-inches thick. No Base.						
	Artificial FIll (af) Clayey SAND (SC), brown, very loose, moist, fine to medium grained sand, with some fine gravel and silt.		BULK 1	BAG			Bulk 1 collected from 0.5 - 5.0 feet bgs.
	Slightly moist	2	S-1	CR	18	7 6 4	WC = 5.6% DD = 97.1 pcf
+382.5	SAND with Gravel (SP), pale yellowish brown, loose, dry to slightly moist, fine to coarse grained sand and gravel, with trash/debris.	4					
	Medium dense		S-2	CR	18	2 4 13	WC = 9.7% DD = 116.9 pcf
+380.0	**Old Alluvial Fan Deposits (Qof)** Silty SAND (SM), brown, medium dense, moist, fine to medium grained sand.	6					
		8					
+376.0	CLAY (CL), brown, very stiff, moist, few fine to medium grained sand, with some silt, slightly porous.	10	S-3	CR	18	9 12 12	
		12	BULK 2	BAG			Bulk 2 collected from 10.0 - 15.0 feet bgs.
		14					
	Non-porous		S-4	CR	10	10 15 22	WC = 20.9% DD = 104.5 pcf
		16					
		18					
	Stiff and increased fine to coarse grained sand content.	20	S-5	CR	12	4 8 7	
		22					
		24					
+361.0		25					

Project	Project No.
Proposed Residential Tower	700071901
Location	**Elevation and Datum**
5600 Hollywood Boulevard	Approx. 386 feet (MSL)

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
361.0	Sandy CLAY (CL), brown, stiff, moist, fine to coarse grained sand, with some silt.	25	S-6	CR	8	7 / 8 / 12	WC = 11.5% DD = 113.4 pcf
356.0	Sandy CLAY (CL), brown, very stiff, moist, fine to coarse grained sand.	30	S-7	CR	12	8 / 18 / 22	WC = 17.8% DD = 109.8 pcf
351.0	CLAY (CL), brown, very stiff, moist, with carbon blebs, slightly porous, with few fine grained sand, some silt.	35	S-8	CR	12	7 / 11 / 17	WC = 24.9% DD = 99.2 pcf
	2-inch-thick sand lens.	36.5	S-9	SPT	18	5 / 8 / 11	WC = 16.1%
	Hard	40	S-10	CR	12	5 / 17 / 35	8:40 - Drill rig break down (U-joint broke). Restarted at noon with new rig.
345.0	SAND (SP), gray-brown, dense, slightly moist, fine to coarse grained sand, with few silt.	41					Difficult drilling from 40.0 - 50.0 feet bgs. WC = 6.4% DD = 115.4 pcf
341.0	SAND to SAND with Silt (SP-SM), gray-brown, dense, slightly moist to moist, fine to coarse grained sand and gravel. Some fine to coarse gravel.	45	S-11	CR	12	19 / 32 / 33	Water added at 45.0 feet bgs. WC = 4.9% DD = 110.4 pcf
336.0	SAND with Silt and Gravel (SP-SM), gray-brown, very dense, slightly moist, fine to coarse grained sand and gravel.	50	S-12	CR	12	23 / 37 / 50/3.5"	
334.0	Sandy CLAY (CL), brown, very stiff, moist, fine grained sand, with some silt.	52					
		55	S-13	CR	18	10 / 18	
330.0		56					

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Log of Boring **B-4** Sheet 3 of 3

Project	Project No.
Proposed Residential Tower	700071901
Location	**Elevation and Datum**
5600 Hollywood Boulevard	Approx. 386 feet (MSL)

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
329.8	Sandy SILT (ML), brown, very stiff, moist, fine grained sand.					28	
326.0	Clayey SAND with Gravel (SC), brown, very dense, moist, fine to coarse grained sand and gravel.	60	S-14	CR	7	28 50/2.5"	@60.0' Sampled on a rock Difficult drilling from 60.0 - 75.0 feet bgs.
	Medium dense, decreased gravel content	65	S-15	CR	12	23 19 18	
319.0	CLAY (CL), brown, very stiff, moist, few very fine grained sand, with some silt.	67					
316.0	Sandy CLAY (CL), brown, very stiff, very moist, very fine to fine grained sand, slightly micaceous.	70	S-16	CR	18	8 15 22	Groundwater initially encountered at 71.0 feet bgs. After 10 minutes, groundwater was measured at 69.0 feet bgs.
311.0	CLAY (CL), brown, stiff, very moist.	75	S-17	CR	18	5 9 15	
309.5	End of boring at 76.5 feet bgs. Groundwater encountered initially at 71.0 feet bgs. After 10 minutes, groundwater was measured at 69.0 feet bgs. Borehole backfilled with soil cuttings, tamped and asphalt concrete patched.	76.5					Boring completed at 14:30.

Depth scale: 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 87.5

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Log of Boring **B-5** Sheet 1 of 3

Project: Proposed Residential Tower		Project No.: 700071901	
Location: 5600 Hollywood Boulevard		Elevation and Datum: Approx. 391 feet (MSL)	
Drilling Company: 2R Drilling		Date Started: 3/11/20	Date Finished: 3/11/20
Drilling Equipment: Truck Mounted CME75		Completion Depth: 81.5 ft	Rock Depth: --
Size and Type of Bit: 4-inch I.D. H.S.A.		Number of Samples: Disturbed 0; Undisturbed 17; Core --	
Casing Diameter (in): --	Casing Depth (ft): --	Water Level (ft.): First 75; Completion 73; 24 HR. --	
Casing Hammer: --	Weight (lbs): --; Drop (in): --	Drilling Foreman: Ismael	
Sampler: 2.5 I.D. Cal Mod, Bulk			
Sampler Hammer: Automatic	Weight (lbs): 140; Drop (in): 30	Field Engineer: Shaun Wilkins	

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+391.0	**Artificial Fill (af)** Silty SAND (SM), brown, loose, moist, very fine to medium grained sand, with some clay.	0					Boring started at 10:25.
	Mortar and wood fragments, rootlets.	4	S-1	CR	18	3 / 6 / 8	WC = 10.7% DD = 115.4 pcf
+386.0	**Old Alluvial Fan Deposits (Qof)** Silty SAND (SM), light gray-brown, medium dense, slightly moist, fine to medium grained sand. Few fine gravel and decreased silt content.	5–6	S-2	CR	12	6 / 8 / 8	WC = 4.5% DD = 108.9 pcf
+384.5	Sandy CLAY (CL), brown, stiff, moist, very fine to fine grained sand, with trace mica and some silt.	6.5					
	Slightly porous.	10	S-3	CR	10	8 / 9 / 10	WC = 18.5% DD = 104.6 pcf
	Very stiff	15	S-4	CR	10	8 / 15 / 21	
	Fine to medium grained sand, light limonite and calcite stringers.	20	S-5	CR	8	10 / 13 / 14	WC = 18.6% DD = 106.8 pcf
+366.0		25					

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Log of Boring **B-5** Sheet 2 of 3

Project	Project No.
Proposed Residential Tower	700071901
Location	**Elevation and Datum**
5600 Hollywood Boulevard	Approx. 391 feet (MSL)

Elev. (ft)	Sample Description	Depth Scale	Sample Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
366.0	Silty SAND (SM), gray-brown, medium dense, sligthly moist to moist, fine to medium grained sand, with few clay.	25	S-6	CR	18	7 / 9 / 9	
		27–30	BULK	BAG			Bulk sample collected from 25-0 - 30.0 feet bgs.
	Brown, moist, very fine to fine grained sand, with gravelly sand lenses.	30	S-7	CR	12	10 / 19 / 23	
359.5	Sandy CLAY (CL), brown, very stiff, moist, fine grained sand, slightly micaceous, with some silt.	31.5					Difficulty drilling at 32.0 feet bgs.
358.0	Silty SAND (SM), brown, medium dense, moist, fine to medium grained sand, with carbon blebs, few clay, porous.	33					
	Increased clay content.	35	S-8	CR	10	8 / 10 / 13	Water added at 35.0 feet bgs. WC = 19.4% DD = 104.8 pcf
355.0	Clayey SAND (SC), brown, medium dense, moist, fine to medium grained sand, with carbon blebs.	36					
351.0	Sandy SILT (ML), brown, very stiff, moist, very fine grained sand, with some clay.	40	S-9	CR	12	10 / 19 / 20	WC = 19.1% DD = 112.9 pcf
		45	S-10	CR	18	6 / 40 / 40	WC = 5.6% DD = 115.8 pcf
345.0	Gravelly SAND (SP), brown, very dense, slightly moist, fine to coarse grained sand and gravel, with few silt and cobbles up to 4-inches.	46					
341.0	SAND (SP), brown, dense, slightly moist, fine to medium grained sand, with some silt and no gravel.	50	S-11	CR	12	17 / 26 / 44	WC = 6.9% DD = 121.0 pcf
336.0	CLAY (CL), brown, hard, moist,with few very fine to coarse grained sand and gravel lenses, some silt.	55	S-12	CR	18	12 / 26	

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Log of Boring **B-5** Sheet 3 of 3

Project	Project No.
Proposed Residential Tower	700071901
Location	**Elevation and Datum**
5600 Hollywood Boulevard	Approx. 391 feet (MSL)

Elev. (ft)	Sample Description	Depth Scale	Sample Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
334.8						32	
332.0	Silty SAND (SM), yellowish brown, very dense, moist, fine to medium grained sand.	58					
		60	S-13	CR	8	21 50/5"	
330.0	Sandy CLAY (CL), brown, very stiff, very moist, very fine to fine grained sand	62, 64					
326.0	Sandy CLAY (CL), brown, very stiff, very moist, very fine to medium grained sand, with few coarse grained gravel, slightly micaceous, some silt.	66	S-14	CR	18	9 18 50	
		68					
321.0	Sandy CLAY with Gravel (CL), brown, very stiff, very moist, fine to coarse grained sand and gravel, with cobbles to 4-inches.	70	S-15	CR	8	45 50/2"	
		72, 74					Groundwater encountered initially at 75.0 feet bgs. After 10 minutes, groundwater was measured at 73.0 feet bgs.
316.0	Sandy CLAY (CL), light brown, hard, very moist, fine to medium grained sand, with some silt.	76	S-16	CR	18	18 27 45	
		78					
	Wet, fine to coarse grained sand	80	S-17	CR	18	9 17 23	
309.5	End of boring at 81.5 feet bgs. Groundwater encountered initially at 75.0 feet bgs. After 10 minutes, groundwater was measured at 73.0 feet bgs. Borehole backfilled with soil cuttings.	82, 84, 86, 87.5					Boring completed at 14:30.

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Log of Boring B-6 Sheet 1 of 6

Project: Proposed Residential Tower		Project No.: 700071901			
Location: 5600 Hollywood Boulevard		Elevation and Datum: Approx. 387.5 feet (MSL)			
Drilling Company: SoCal Drilling		Date Started: 7/28/20		Date Finished: 7/29/20	
Drilling Equipment: Mayhew 1000 Mud Rotary		Completion Depth: 151.5 ft		Rock Depth: --	
Size and Type of Bit: 5-inch I.D. H.S.A.		Number of Samples	Disturbed: 15	Undisturbed: 0	Core: --
Casing Diameter (in): --	Casing Depth (ft): --	Water Level (ft.)	First: --	Completion: 75	24 HR.: --
Casing Hammer: --	Weight (lbs): -- / Drop (in): --	Drilling Foreman: Randy			
Sampler: 2-inch O.D. SPT		Field Engineer: Brandon Watkins			
Sampler Hammer: Automatic	Weight (lbs): 140 / Drop (in): 30				

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+387.5		0					
+387.2	Asphalt Concrete: 3.5-inches thick. No base.						Boring started at 7:15.
	Clay (CL), brown, stiff, moist, with trace fine to medium grained sand.						
		10	S-1	SPT	12	2, 5, 6	
	Clay (CL), brown, stiff, moist, with trace fine to medium grained sand.	20	S-2	SPT	6	5, 5, 6	
		25					

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Project	Project No.
Proposed Residential Tower	700071901
Location	Elevation and Datum
5600 Hollywood Boulevard	Approx. 387.5 feet (MSL)

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
362.5		25					
361.0	Sandy CLAY (CL), brown, very stiff, moist, fine to coarse grained sand.	26.5					
		30	S-3	SPT	9	7 / 8 / 9	
	Fine to medium grained sand.	35	S-4	SPT	12	5 / 6 / 9	
	Increased sand content, fine to coarse grained sand.	40	S-5	SPT	12	7 / 11 / 11	
345.0	SAND with Silt (SP-SM), brown, medium dense, moist, fine to coarse grained sand, with trace fine, angular to subangular gravel.	42.5					
		45	S-6	SPT	12	11 / 12 / 15	
337.5	SAND with Clay (SP-SC), brown, dense, moist, fine to coarse grained sand, with trace fine, angular to subangular gravel.	50	S-7	SPT	18	12 / 15 / 18	
		56					

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Project	Project No.
Proposed Residential Tower	700071901
Location	**Elevation and Datum**
5600 Hollywood Boulevard	Approx. 387.5 feet (MSL)

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
331.3							
327.5	Clayey SAND with Gravel (SC), brown, very dense, moist, fine to coarse grained sand, fine to coarse, angular to subangular gravel.	60	S-8	SPT	5	40 50/4"	Drill rig chatter at 60 feet bgs.
318.5	Sandy CLAY (CL), brown, very stiff, moist, fine to medium grained sand.	69					Drill rig chatter at approximately 68-69 feet bgs.
		70	S-9	SPT	18	7 10 14	
		75	S-10	SPT	18	6 8 12	Groundwater encountered at 75 feet bgs.
	Sandy CLAY (CL), brown, very stiff, wet, fine to coarse grained sand, with trace silt and fine, angular gravel.	80	S-11	SPT	18	8 9 12	
		87.5					

Project	Project No.
Proposed Residential Tower	700071901
Location	**Elevation and Datum**
5600 Hollywood Boulevard	Approx. 387.5 feet (MSL)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+300.0		87.5					
	+297.5	Clayey SAND with Gravel (SC), brown, dense, wet, fine to coarse grained sand, fine to coarse, angular to subrounded gravel.	90					
			100	S-12	SPT	18	23 37 26	
			108					Drill rig chatter from 108-120 feet bgs.

Project	Project No.
Proposed Residential Tower	700071901
Location	**Elevation and Datum**
5600 Hollywood Boulevard	Approx. 387.5 feet (MSL)

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
268.8							
267.5	Clayey SAND (SC), brown, dense, wet, fine to coarse grained sand, with trace silt and fine, angular gravel.	120	S-13	SPT	18	20 / 18 / 22	
		122					
		124					
		126					
		128					
257.5	CLAY with Sand (CL), brown, hard, wet, fine to medium grained sand, with some silt.	130					
		132					
		134					
		136					
		138					
		140	S-14	SPT	18	14 / 18 / 30	
		142					
		144					
242.5	Sandy CLAY (CL), brown, hard, wet, fine to coarse grained sand, trace fine, subrounded gravel.						
		146					
		148					
		150					

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

Project	Project No.
Proposed Residential Tower	700071901
Location	**Elevation and Datum**
5600 Hollywood Boulevard	Approx. 387.5 feet (MSL)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in		Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+237.5		150	S-15	SPT	18	23 28 37		
	+236.0	End of boring at 151.5 feet bgs. Groundwater encountered at 75 feet bgs at end of drilling. Borehole backfilled with bentonite slurry and patched with concrete.	152						
			154						
			156						
			158						
			160						
			162						
			164						
			166						
			168						
			170						
			172						
			174						
			176						
			178						
			180						

LANGAN

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

Project: Proposed Residential Tower		Project No.: 700071901	
Location: 5600 Hollywood Boulevard		Elevation and Datum: Approx. 385 feet (MSL)	
Drilling Company: 2R Drilling		Date Started: 3/9/20	Date Finished: 3/9/20
Drilling Equipment: Truck Mounted CME75		Completion Depth: 47.5 ft	Rock Depth: --
Size and Type of Bit: 4-inch I.D. H.S.A.		Number of Samples: Disturbed 1; Undisturbed 0; Core --	
Casing Diameter (in): --	Casing Depth (ft): --	Water Level (ft.): First --; Completion --; 24 HR. --	
Casing Hammer: -- Weight (lbs): --	Drop (in): --	Drilling Foreman: Ismael	
Sampler: 2-inch O.D. SPT			
Sampler Hammer: Automatic Weight (lbs): 140	Drop (in): 30	Field Engineer: Shaun Wilkins	

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+385.0 / +384.8	Asphalt Concrete: 2-inches thick. No base.	0					Boring started at 14:40.
	Artificial Fill (af) Silty SAND (SM), brown, loose, moist, fine to medium grained sand, with some clay.	2, 4					
+379.0	**Old Alluvial Fan Deposits (Qof)** SAND (SP), gray-brown, medium dense, slightly moist, fine to medium grained sand, with some silt.	6, 8					
+375.0	Sandy CLAY (CL), brown, stiff, moist, fine grained sand, with some silt.	10, 12					
+372.0	CLAY (CL), brown, stiff, moist, with some silt.	14, 16					
+368.0	CLAY (CL), gray-brown, stiff, moist.	18					
+365.0	Sandy CLAY (CL), light gray-brown, stiff, moist, very fine to fine grained sand, with some silt.	20, 22, 24, 25					

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

Project	Project No.
Proposed Residential Tower	700071901
Location	**Elevation and Datum**
5600 Hollywood Boulevard	Approx. 385 feet (MSL)

Elev. (ft)	Sample Description	Depth Scale	Sample Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+360.0	Brown, decreased sand content.	25					
+343.0	Silty SAND (SM), light brown, medium dense, moist, fine to coarse grained sand, with few clay.	42					
+340.0	SAND with Silt (SP-SM), gray-brown, dense, slightly moist, fine to coarse grained sand, with some silt, intermittent thin layers of Silty SAND (SM).	45	S-1	SPT	12	6 / 12 / 13	
+337.5	End of boring at 47.5 feet bgs. Groundwater not encountered. Boring converted to percolation test well, then backfilled with soil cuttings and asphalt concrete patched. Percolation Test Setup: 3-inches of 3/4-inch gravel at bottom. 10 feet of 3-inch diameter perforated PVC pipe with sock. 37.5 feet of 3-inch diameter solid PVC pipe. 3/4-inch gravel in anular space to 37.5' bgs.	47.5					Boring completed at 16:00.

Depth scale: 25, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56

Geo-Logic
ASSOCIATES

Geologists • Hydrogeologists • Engineers

Date: April 30, 2020
Project No. 2012-0057

Langan Engineering
18575 Jamboree Road, Suite 150
Irvine, CA 92612
Att.: Mr. John Halseth

RE: Langan Engineering Job # 700071901
5600 Hollywood Blvd., Los Angeles, CA

Transmitted herewith are the results of laboratory testing performed by Geo-Logic Associates on the soil samples delivered to our office in March 2020 . All tests were performed by qualified personnel in our laboratory (City of Los Angeles Testing Agency Certification No. 10198). The following tests were performed:

- Dry Density / Moisture Content ASTM D7263
- Max. Density & Optimum W.C. ASTM D1557
- Consolidation Test ASTM D2435
- Min. Resistivity & pH, CTM 643
- Soluble Sulfate, CTM 417
- Chloride Content, CTM 422
- Direct Shear Test (saturated) ASTM D3080

We appreciated the opportunity to be of service. Please contact the undersigned if you have any questions regarding this letter.

Respectfully submitted,

Geo-Logic Associates

Joseph G. Franzone, PE, GE 2189
Supervising Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
JOSEPH G. FRANZONE
No. GE 2189
Exp. 12-31-21
GEOTECHNICAL
STATE OF CALIFORNIA

Attachments: Laboratory Test Results

Distribution: (2) Mr. John Halseth

MOISTURE DENSITY TESTS

PROJECT Langan # 721021101 **JOB NO.** 2012-0057 **BY** LD **DATE** 4/28/2020

Sample No.	B-4 / S-1	B-4 / S-2	B-4 / S-4	B-4 / S-6	B-4 / S-7	B-4 / S-8	B-4 / S-9	B-4 / S-10	B-4 / S-11
Depth (ft)	2.5	5.0	15.0	25.0	30.0	35.0	36.5	40.0	45.0
Testing									
Soil Type	Brown, Silty Sand w. Gravel	Brown, Silty Sand w. trace Clay	Brown, Silty Clay	Brown, Clayey Sand	Brown, Silty Clay	Brown, Silty Clay	Brown, Silty Clay	Brown, Silty Sand w. Gravel	Brown, Silty Sand w. Gravel
Wet+Tare	803.9	765.7	946.2	946.7	964.1	931.2		924.6	882.9
No. Ring	5	4	5	5	5	5		5	5
Wet Weight	169.2	153.2	78.1	108.0	146.6	124.9	128.6	134.5	100.5
Dry Weight	160.2	139.7	64.6	96.9	124.4	100.0	110.8	126.4	95.8
Wet density	102.6	128.2	126.4	126.4	129.4	123.9		122.8	115.8
% Water	5.6	9.7	20.9	11.5	17.8	24.9	16.1	6.4	4.9
Dry Density	97.1	116.9	104.5	113.4	109.8	99.2		115.4	110.4
O.B.Press(psf)									
Sample No.	B-5 / S-1	B-5 / S-2	B-5 / S-3	B-5 / S-5	B-5 / S-8	B-5 / S-9	B-5 / S-10	B-5 / S-11	
Depth (ft)	3.5	5.0	10.0	20.0	35.0	40.0	45.0	50.0	
Testing									
Soil Type	Brown, Sandy Clay w. F. Gravel	Brown, Silty Sand w. Gravel	Brown, Silty Clay	Brown, Silty Clay	Brown, Sandy Clay	Brown, Silty Clay	Brown, M.C. Silty Sand w. Gravel	Brown, Silty Sand w. Gravel	
Wet+Tare	954.5	1045.2	932.0	948.0	939.1	994.7	1106.1	1156.8	
No. Ring	5	6	5	5	5	5	6	6	
Wet Weight	103.8	112.0	118.4	100.2	125.5	131.0	135.8	159.8	
Dry Weight	93.8	107.2	99.9	84.5	105.1	110.0	128.6	149.5	
Wet density	127.7	113.8	124.0	126.7	125.2	134.5	122.3	129.3	
% Water	10.7	4.5	18.5	18.6	19.4	19.1	5.6	6.9	
Dry Density	115.4	108.9	104.6	106.8	104.8	112.9	115.8	121.0	
O.B.Press(psf)									

Geo-Logic ASSOCIATES

COMPACTION TEST REPORT

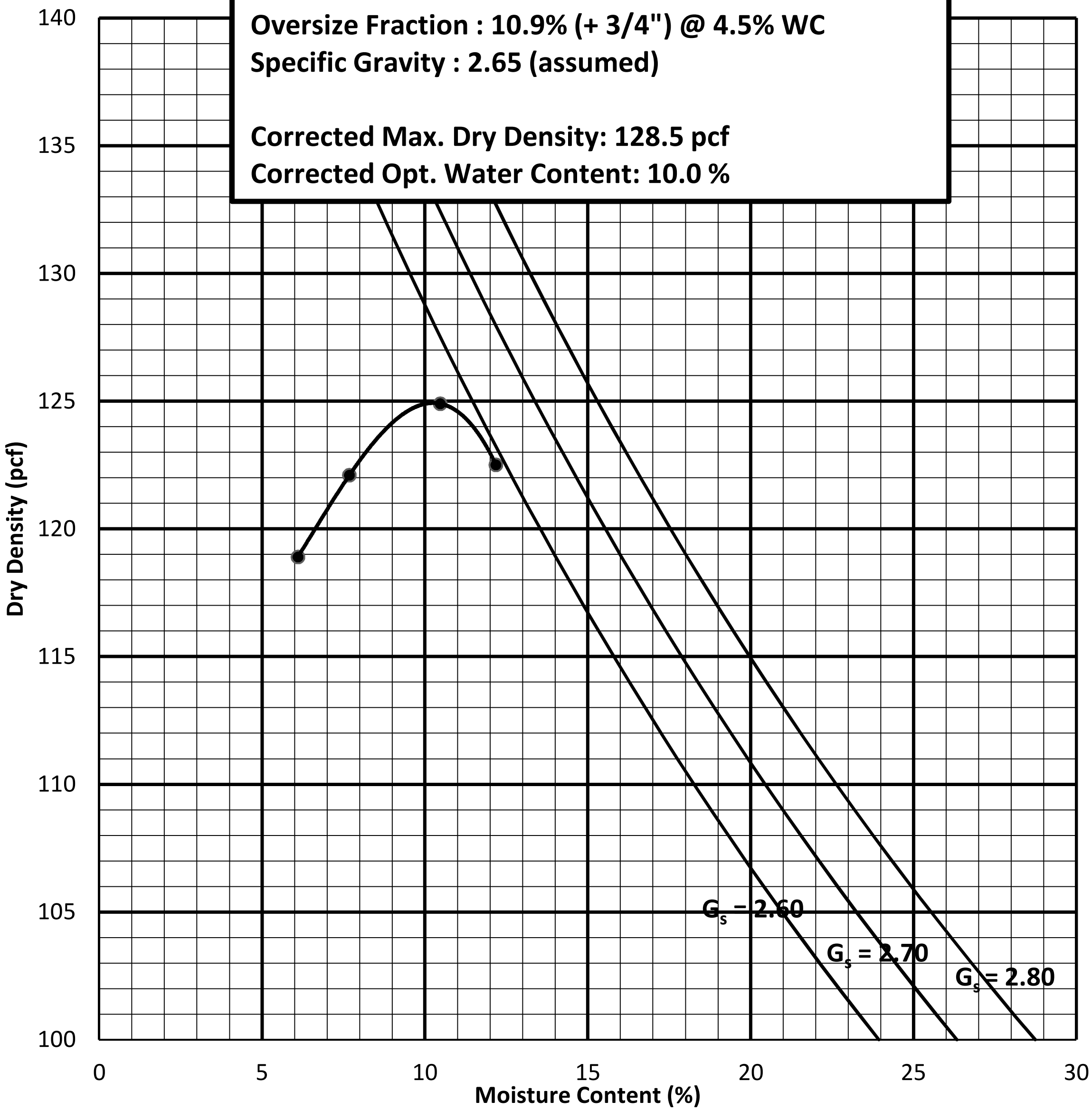
Project: Langan # 700071901 **GLA No.** 2012-0057
Sample: B-4 @ 10' - 15' **Date:** 04/26/20
Description: Brown, Silty Sand w. Gravel **By:** LD

ASTM D1557	Method C	Volume (cf): 0.075		# Blows: 56	# Layers: 5
Specimen		**A**	**B**	**C**	**D**
Wet Weight (lbs)		10.31	10.35	9.86	9.46
Wet Density (pcf)		137.4	138.0	131.5	126.2
Moisture Content (%)		12.2	10.5	7.7	6.1
Dry Density (pcf)		122.5	124.9	122.1	118.9

Max. Dry Density : 125.0 pcf (uncorrected)
Opt. Water Content: 10.5 %

Oversize Fraction : 10.9% (+ 3/4") @ 4.5% WC
Specific Gravity : 2.65 (assumed)

Corrected Max. Dry Density: 128.5 pcf
Corrected Opt. Water Content: 10.0 %



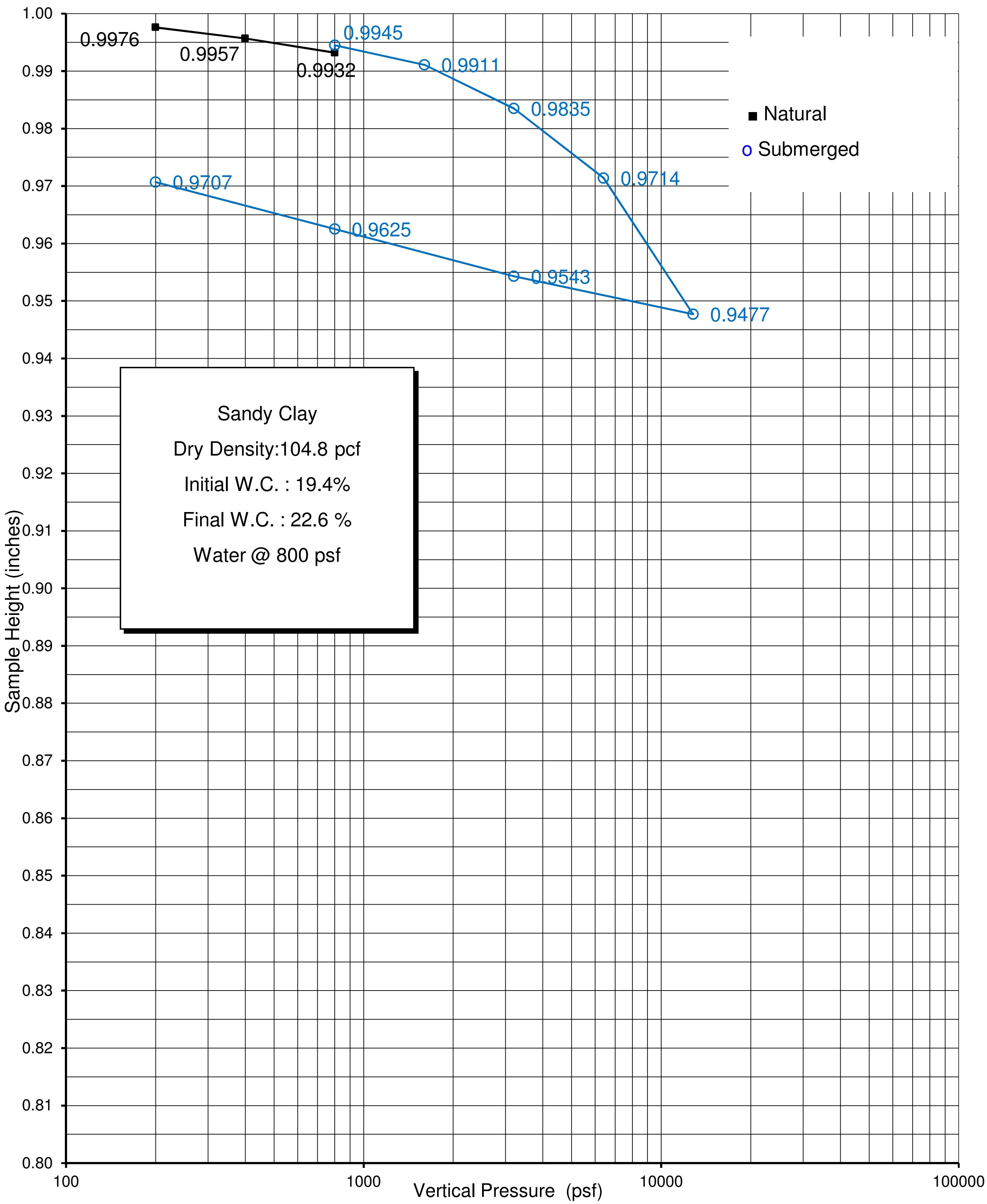
Geo-Logic ASSOCIATES

SAMPLE NO.:	B-4				
Depth	10' - 15'				
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 (CTM643) (ohm-cm)	2000				
pH (CTM643)	7.4				
CHEMICAL TESTS					
Soluble Sulfate (CTM 417) (ppm)	395				
Chloride Content (CTM 422) (ppm)	94				
Wash #200 Sieve (ASTM-1140) %					
Sand Equivalent (ASTM D2419)					

Geo-Logic ASSOCIATES

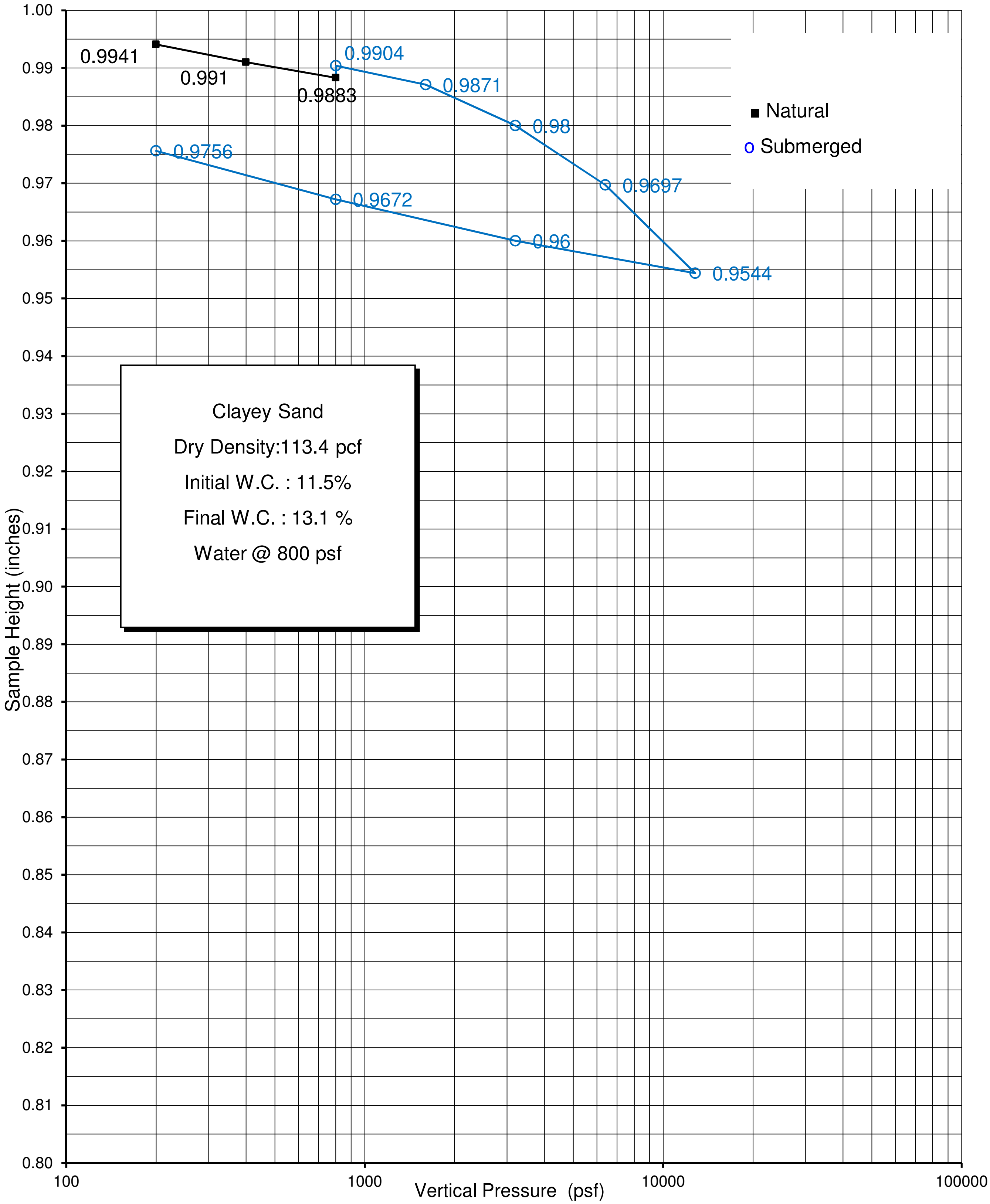
CONSOLIDATION TEST - ASTM D2435

Boring / Sample No.	B-5 / S-8	Depth:	35'	Date	04-20-20

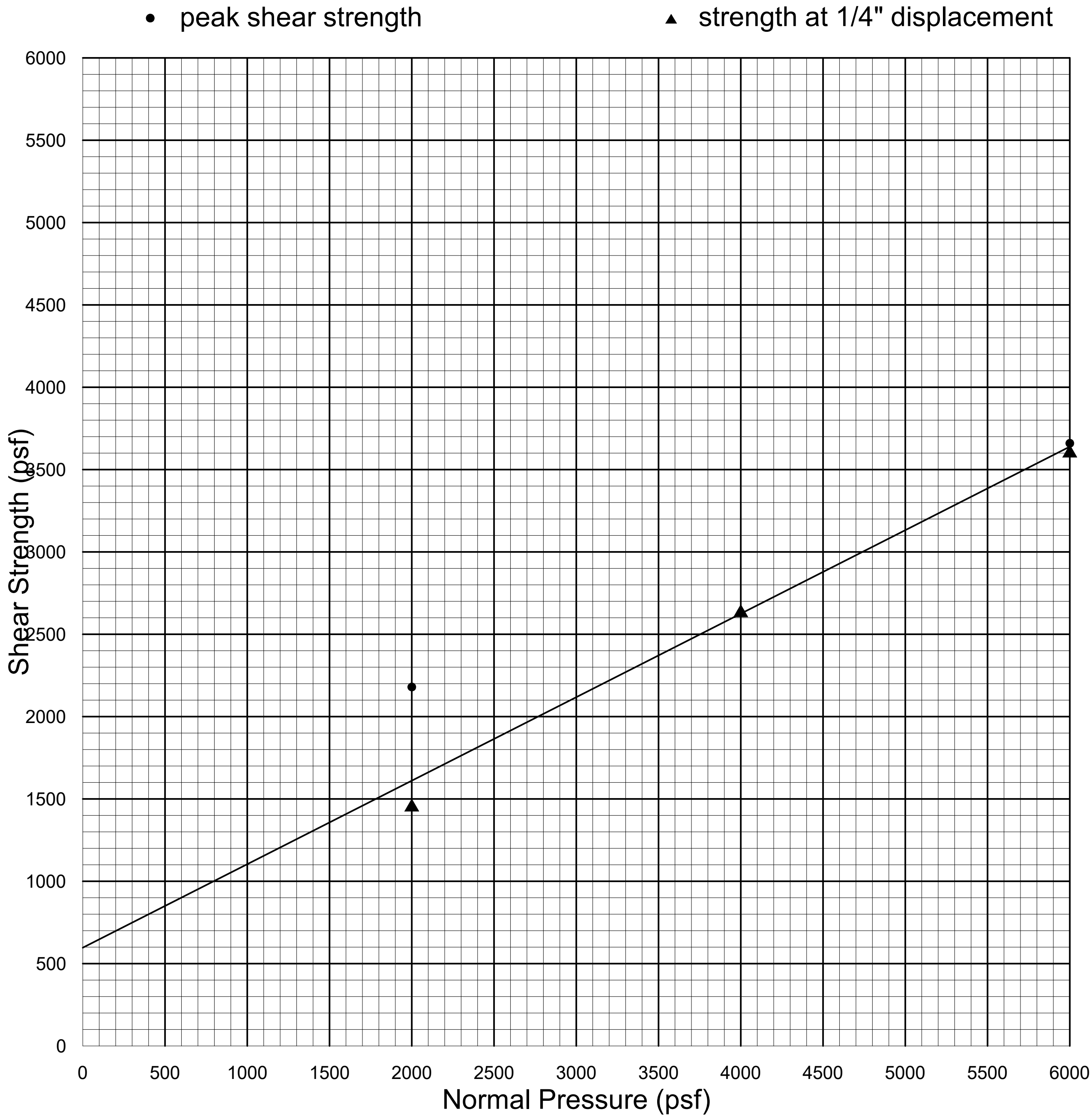


CONSOLIDATION TEST - ASTM D2435

Boring / Sample No. B-4 / S-6	Depth: 25'	Date 04-20-20



DIRECT SHEAR TEST - ASTM D-3080



Strain Rate: 0.0042 in. / min.

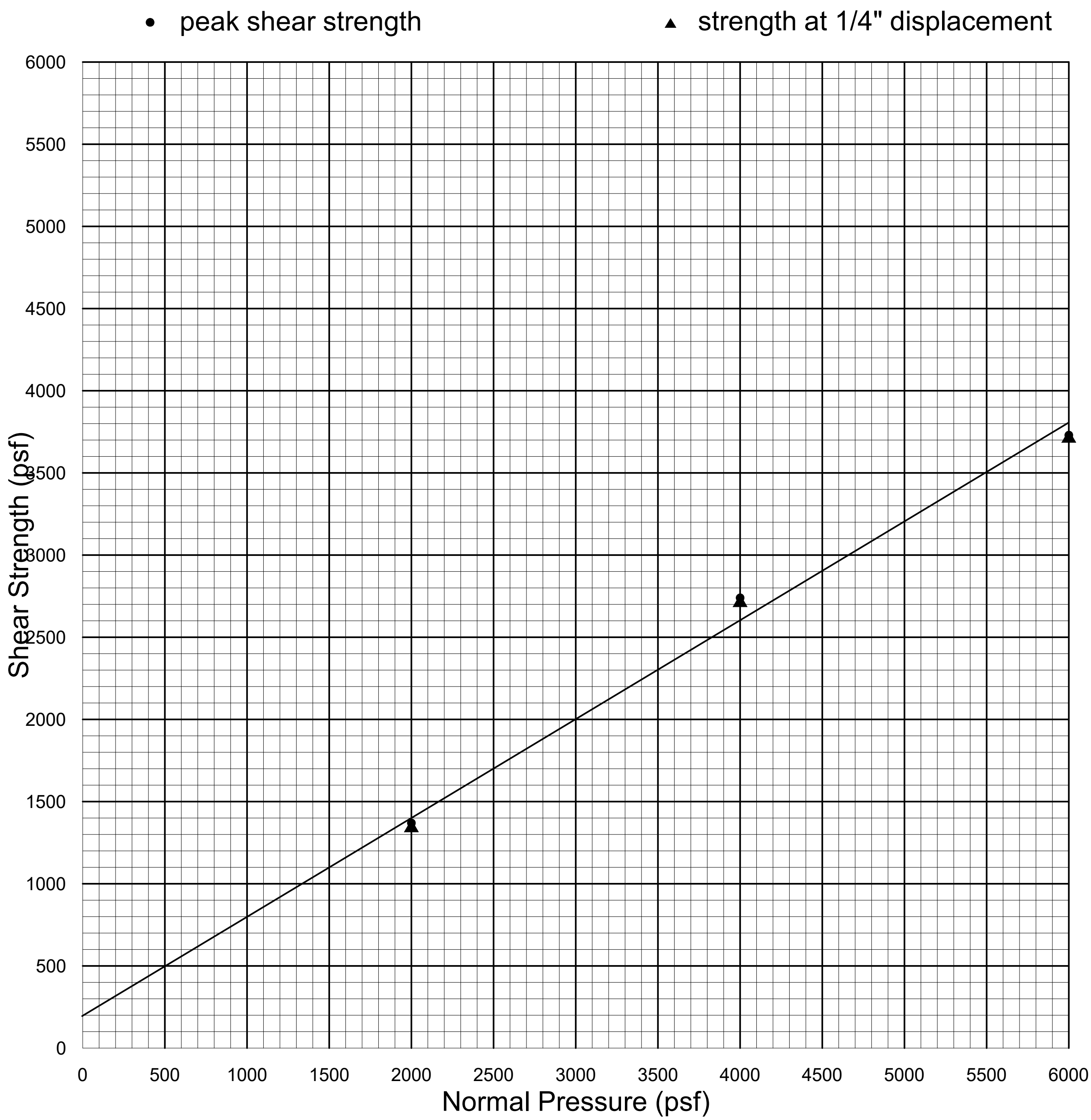
Sample	Type	Description	Dry Density (pcf)	Initial W.C. (%)	Final W.C. (%)
B4 / S7 @ 30'	Undisturbed & Saturated	Silty Clay	109.8	17.8	27.5

Normal Pressure (psf)	Peak Shear Strength (psf)	Ultimate Shear Strength (psf)
2000	2180 @ 0.0750"	1450
4000	2630 @ 0.2450"	2630
6000	3660 @ 0.1850"	3600
	C = 600 psf	C = 600 psf
	ϕ = 26.5 deg.	ϕ = 26.5 deg.

Date: 04-26-20

Geo**L**ogic **A**ssociates

DIRECT SHEAR TEST - ASTM D-3080



Strain Rate: 0.0042 in. / min.

Sample	Type	Description	Dry Density (pcf)	Initial W.C. (%)	Final W.C. (%)
B5 / S6 @ 25'	Undisturbed & Saturated	Clayey Sand	112.5	8.9	17.4

Normal Pressure (psf)	Peak Shear Strength (psf)	Ultimate Shear Strength (psf)
2000	1370 @ 0.1650"	1340
4000	2740 @ 0.2050"	2710
6000	3730 @ 0.2200"	3710
	C = 200 psf	C = 200 psf
	ϕ = 31deg.	ϕ = 31 deg.

Date: 04-26-20

Geo**L**ogic **A**ssociates

APPENDIX B

Prior Explorations and Laboratory Testing

PROJECT NO. A9678-06-01

BORING 1

ELEV. (MSL.) **- -** DATE COMPLETED **10/19/17**

EQUIPMENT **HOLLOW STEM AUGER** BY: **SRH**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ASPHALT: 2" BASE: NONE** **ARTIFICIAL FILL** Silty Sand, loose, slightly moist, brown, fine- to medium-grained, trace coarse-grained.			
5	B1@5'					13	101.3	11.6
6				ML	**ALLUVIUM** Sandy Silt, stiff, slightly moist, brown, fine-grained.			
10	B1@10'					34	105.0	16.7
15	B1@15'				- decrease in sand content	40	99.5	20.0
20	B1@20'					27	102.7	21.2
23	B1@23'				- yellowish brown	27	118.4	9.1
26	B1@26'					36	108.6	11.9
28				SM	Silty Sand, medium dense, slightly moist, yellowish brown, fine- to medium-grained.			
29	B1@29'					29	105.8	17.4

Figure A1,
Log of Boring 1, Page 1 of 3

A9678-06-01 BORING LOGS.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING 1

ELEV. (MSL.) - - DATE COMPLETED 10/19/17

EQUIPMENT **HOLLOW STEM AUGER** BY: **SRH**

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30		SM				
		ML	Silt with Sand, firm, slightly moist, brown, fine-grained.			
32	B1@32'			18	105.5	17.6
35	B1@35'		- yellowish brown	18	106.7	21.2
40	B1@40'		- stiff	29	113.6	17.1
45	B1@45'		- firm, dark reddish brown, oxidation staining	20	94.0	30.0
48		SM	Silty Sand, dense, slightly moist, light brown with orange and white mottles, fine- to medium-grained.			
50	B1@50'			69	114.7	13.6
53		ML	Silt with Sand, hard, slightly moist, brown, fine-grained, some fine gravel (to 0.5").			
55	B1@55'			50	111.4	19.5
57		SP-SM	Sand with Silt, poorly graded, very dense, dry, light brown, fine- to medium-grained, some fine gravel, large rock fragments.			

Figure A1,
Log of Boring 1, Page 2 of 3

A9678-06-01 BORING LOGS.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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PROJECT NO. A9678-06-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING 1 ELEV. (MSL.) - - DATE COMPLETED 10/19/17 EQUIPMENT HOLLOW STEM AUGER BY: SRH	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
60	B1@60'			SP-SM		50 (6")	--	6.9
					Total depth of boring: 60.5 feet Fill to 6 feet. No groundwater encountered. Backfilled with soil cuttings and tamped. Asphalt patched. *Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.			

A9678-06-01 BORING LOGS.GPJ

Figure A1,
Log of Boring 1, Page 3 of 3

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING 2

ELEV. (MSL.) - - DATE COMPLETED 10/19/17

EQUIPMENT HOLLOW STEM AUGER BY: SRH

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ASPHALT: 2.5" BASE: NONE** **ARTIFICIAL FILL** Silty Sand, loose, slightly moist, light brown, fine- to medium-grained, some coarse-grained.			
5	B2@5'					10	104.2	5.5
6				ML	**ALLUVIUM** Silt with Sand, firm, slightly moist, brown.			
10	B2@10'					16	100.7	20.5
15	B2@15'				- stiff	31	102.9	21.9
20	B2@20'				- firm, increase in sand content	17	97.6	20.8
24				SM	Silty Sand, loose, slightly moist, yellowish brown, trace fine gravel.			
25	B2@25'					16	109.0	18.2
27				ML	Silt with Sand, stiff, slightly moist, brown, (grain size).			

Figure A2,
Log of Boring 2, Page 1 of 2

A9678-06-01 BORING LOGS.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... DISTURBED OR BAG SAMPLE
- ... STANDARD PENETRATION TEST
- ... CHUNK SAMPLE
- ... DRIVE SAMPLE (UNDISTURBED)
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. A9678-06-01

BORING 2

ELEV. (MSL.) - - DATE COMPLETED 10/19/17

EQUIPMENT **HOLLOW STEM AUGER** BY: **SRH**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B2@30'					34	104.6	23.8
32								
34								
36	B2@35'			ML	- firm, light brown	16	105.5	22.4
38								
40	B2@40'				- brown, increase in sand content	16	100.3	6.7

Total depth of boring: 40.5 feet
Fill to 6 feet.
No groundwater encountered.
Backfilled with soil cuttings and tamped.
Asphalt patched.

*Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.

Figure A2,
Log of Boring 2, Page 2 of 2

A9678-06-01 BORING LOGS.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

BORING 3

ELEV. (MSL.) - - DATE COMPLETED 10/19/17

EQUIPMENT HOLLOW STEM AUGER BY: SRH

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ASPHALT: 3" BASE: NONE** **ARTIFICIAL FILL** Sandy Silt, stiff, slightly moist, brown, fine-grained.			
5	B3@5'			SP-SM	**ALLUVIUM** Sand with Silt, poorly graded, medium dense, slightly moist, yellowish brown, fine- to medium-grained.	26	--	3.8
8				ML	Silt with Sand, stiff, slightly moist, light brown, fine-grained.			
10	B3@10'					38	101.4	19.5
15	B3@15'				- brown	38	101.1	20.6
20	B3@20'				- firm	15	91.0	30.6
23	B3@23'				- fine- to medium-grained	16	108.8	17.9
26	B3@26'					20	97.6	11.6
29	B3@29'				- stiff	37	106.5	22.5

Figure A3,
Log of Boring 3, Page 1 of 3

A9678-06-01 BORING LOGS.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING 3** ELEV. (MSL.) - - DATE COMPLETED **10/19/17** EQUIPMENT **HOLLOW STEM AUGER** BY: **SRH** — MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30								
32	B3@32'			ML	- firm, increase in sand content	14	100.2	20.5
34								
36	B3@35'				- decrease in sand content	39	99.4	25.0
38				SM	Silty Sand, medium dense, slightly moist, yellowish brown, fine- to medium-grained, trace coarse-grained, trace fine gravel.			
40	B3@40'					50	122.9	8.6
42								
44								
46	B3@45'				- very dense, fine- to medium-grained	50 (6")	102.7	7.6
48				ML	Silt, very dense, saturated, light brown.			
50	B3@50'		▼			50 (5")	100.2	25.4
52				ML	Silt with Sand, stiff, slightly moist, brown, (grain size).			
54								
56	B3@55'					23	99.6	26.6
58								

Figure A3,
Log of Boring 3, Page 2 of 3

A9678-06-01 BORING LOGS.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING 3

ELEV. (MSL.) - - DATE COMPLETED 10/19/17

EQUIPMENT HOLLOW STEM AUGER BY: SRH

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B3@60'			ML	Sand with Silt, poorly graded, very dense, slightly moist, brown, fine- to medium-grained, some coarse-grained.	50 (6")	111.7	8.0
					Total depth of boring: 60.5 feet Fill to 5 feet. Groundwater perched at 50 feet. Backfilled with soil cuttings and tamped. Asphalt patched. *Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.			

Figure A3,
Log of Boring 3, Page 3 of 3

A9678-06-01 BORING LOGS.GPJ

SAMPLE SYMBOLS
... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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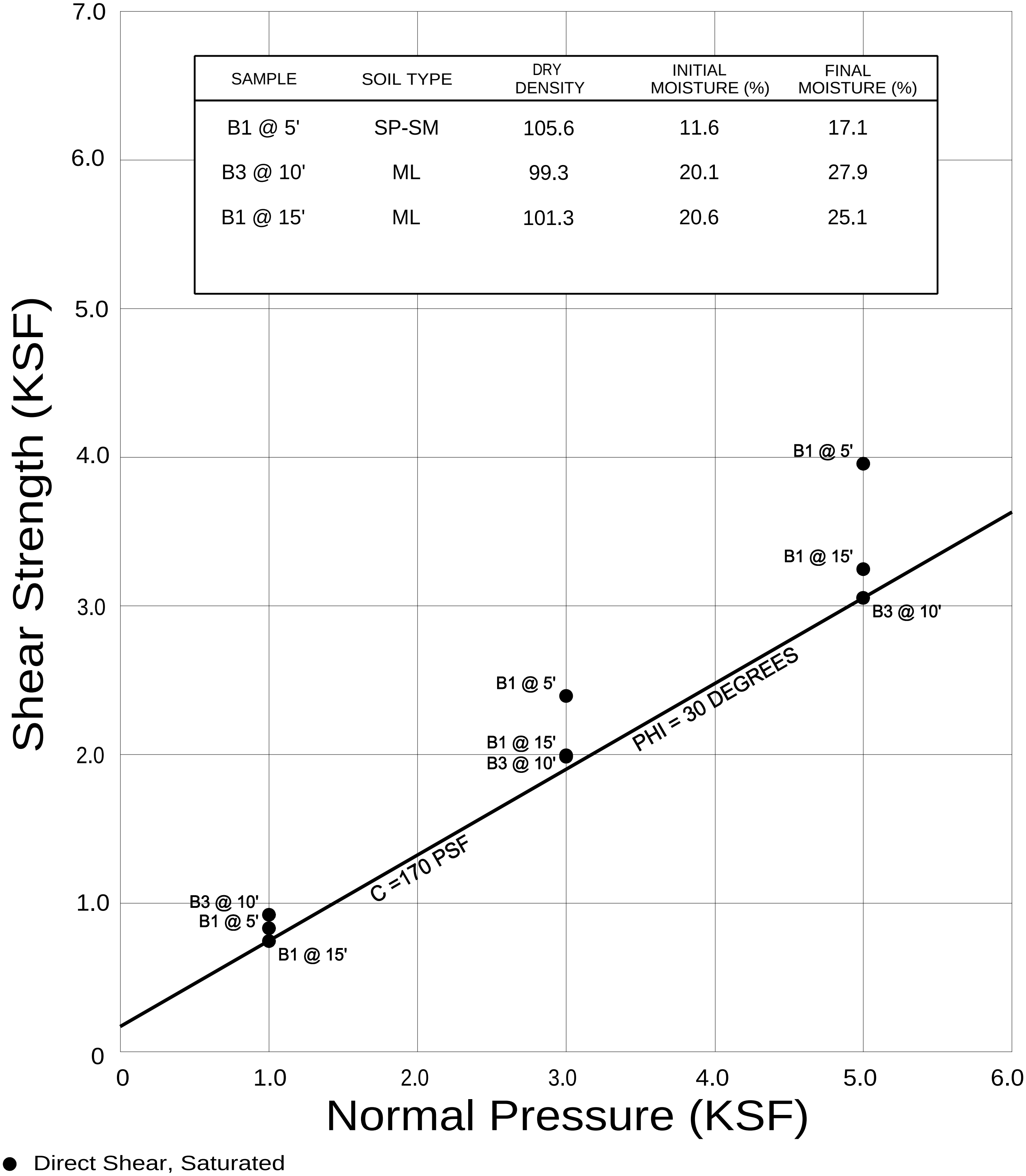

SAMPLE	SOIL TYPE	DRY DENSITY	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B1 @ 5'	SP-SM	105.6	11.6	17.1
B3 @ 10'	ML	99.3	20.1	27.9
B1 @ 15'	ML	101.3	20.6	25.1

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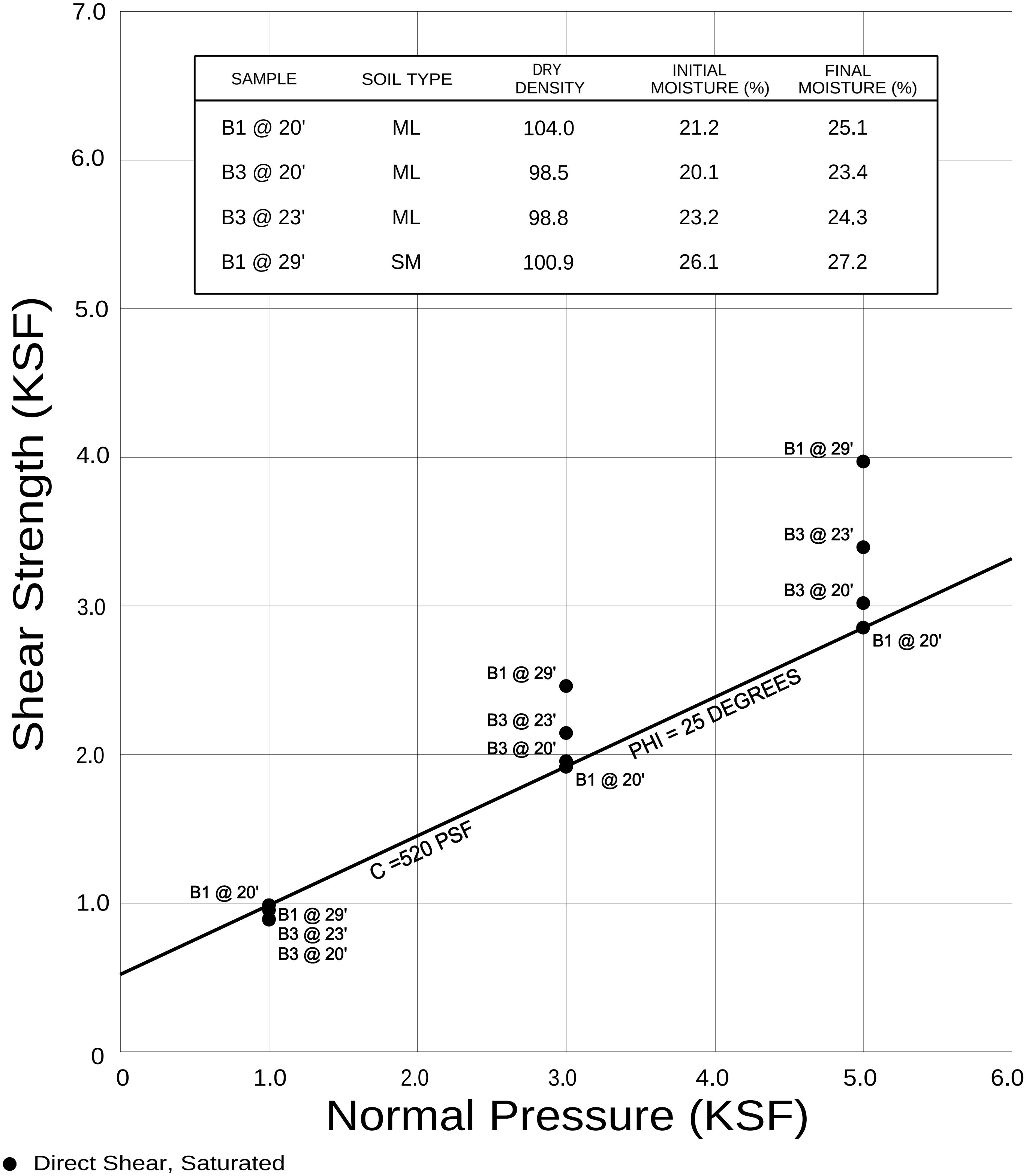
3303 N. SAN FERNANDO BLVD. - SUITE 100 - BURBANK, CA 91504
PHONE (818) 841-8388 - FAX (818) 841-1704

DRAFTED BY: JAO	CHECKED BY: HHD

DIRECT SHEAR TEST RESULTS

EVOLVE REALTY & DEVELOPMENT
5607 CARLTON WAY
LOS ANGELES, CALIFORNIA

NOV 2017	PROJECT NO. A9678-06-01	FIG. B1



SAMPLE	SOIL TYPE	DRY DENSITY	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B1 @ 20'	ML	104.0	21.2	25.1
B3 @ 20'	ML	98.5	20.1	23.4
B3 @ 23'	ML	98.8	23.2	24.3
B1 @ 29'	SM	100.9	26.1	27.2

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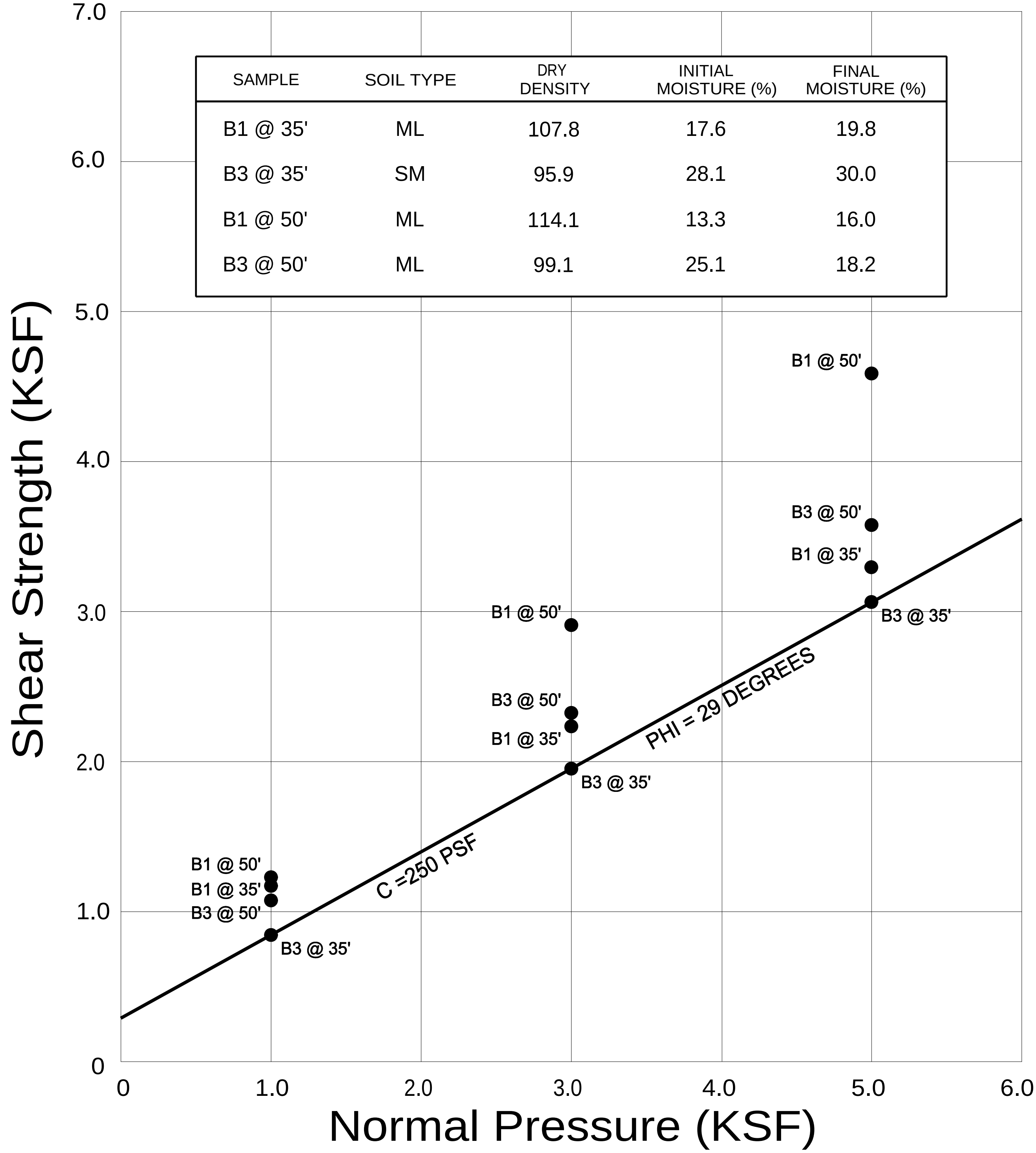
DIRECT SHEAR TEST RESULTS

EVOLVE REALTY & DEVELOPMENT
5607 CARLTON WAY
LOS ANGELES, CALIFORNIA

NOV 2017 | PROJECT NO. A9678-06-01 | FIG. B2



SAMPLE	SOIL TYPE	DRY DENSITY	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B1 @ 35'	ML	107.8	17.6	19.8
B3 @ 35'	SM	95.9	28.1	30.0
B1 @ 50'	ML	114.1	13.3	16.0
B3 @ 50'	ML	99.1	25.1	18.2

● Direct Shear, Saturated

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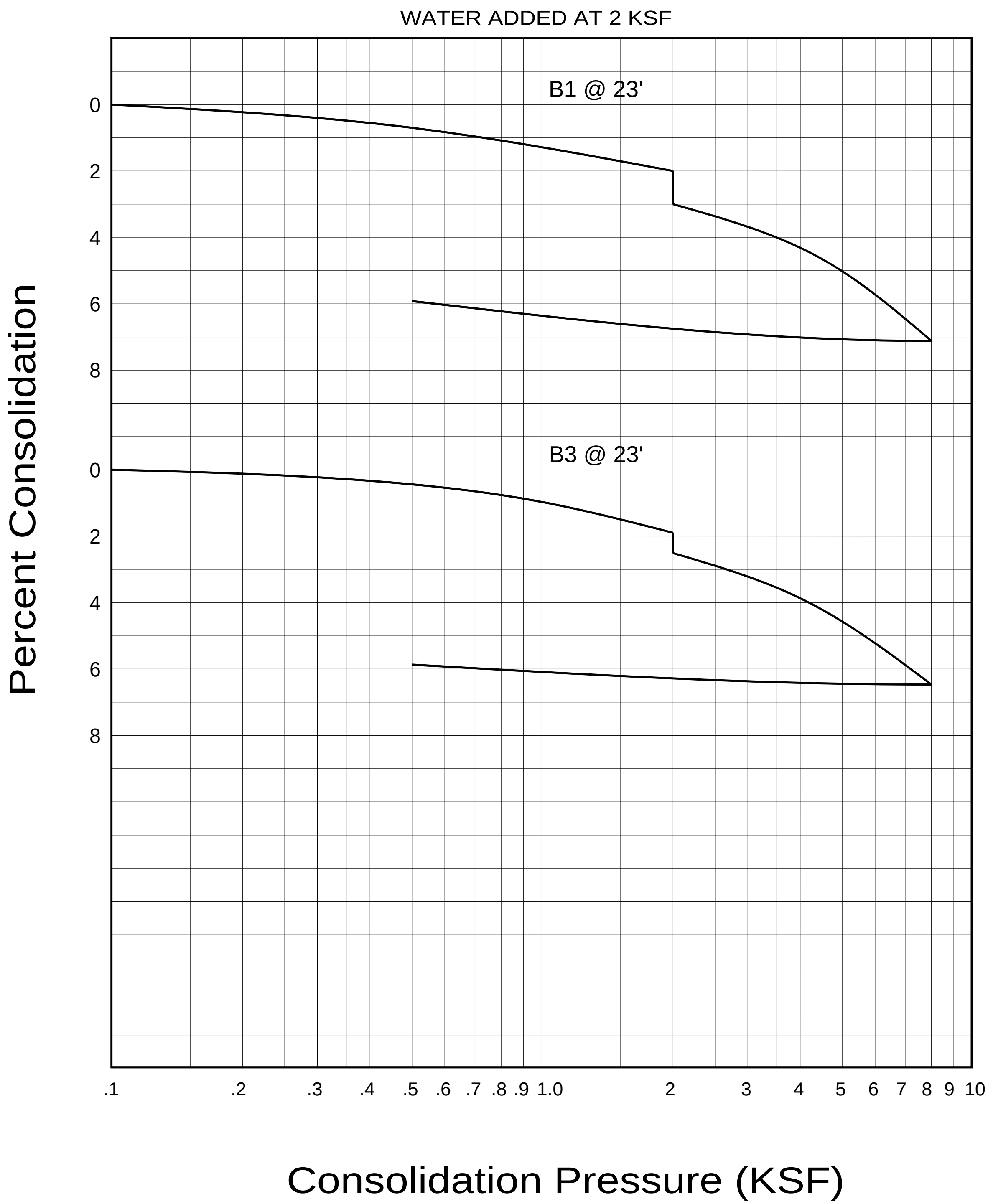
DIRECT SHEAR TEST RESULTS

EVOLVE REALTY & DEVELOPMENT
5607 CARLTON WAY
LOS ANGELES, CALIFORNIA

NOV 2017 | PROJECT NO. A9678-06-01 | FIG. B3



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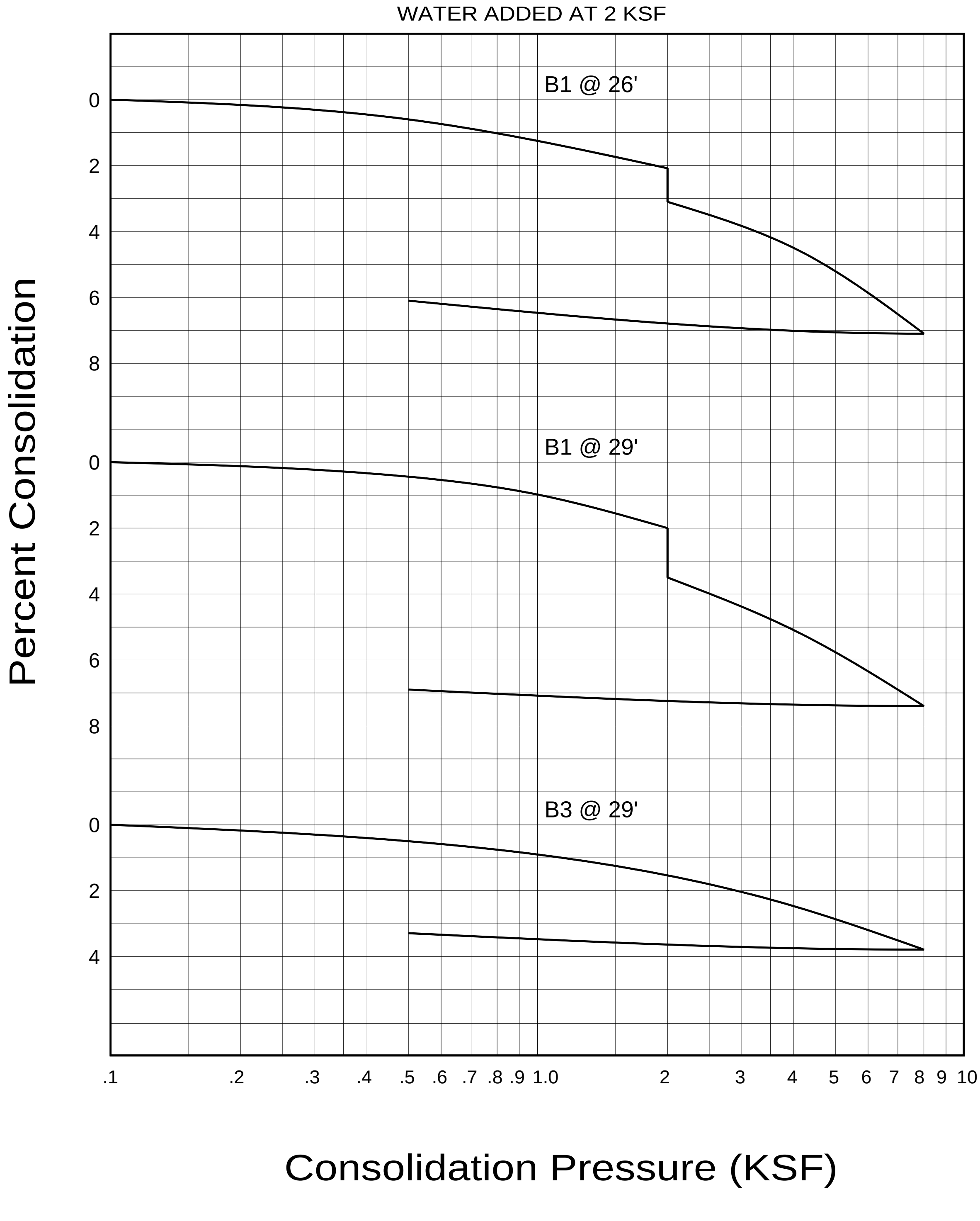
CONSOLIDATION TEST RESULTS

EVOLVE REALTY & DEVELOPMENT
5607 CARLTON WAY
LOS ANGELES, CALIFORNIA

DRAFTED BY: JAO	CHECKED BY: HHD	NOV 2017	PROJECT NO. A9678-06-01	FIG. B4



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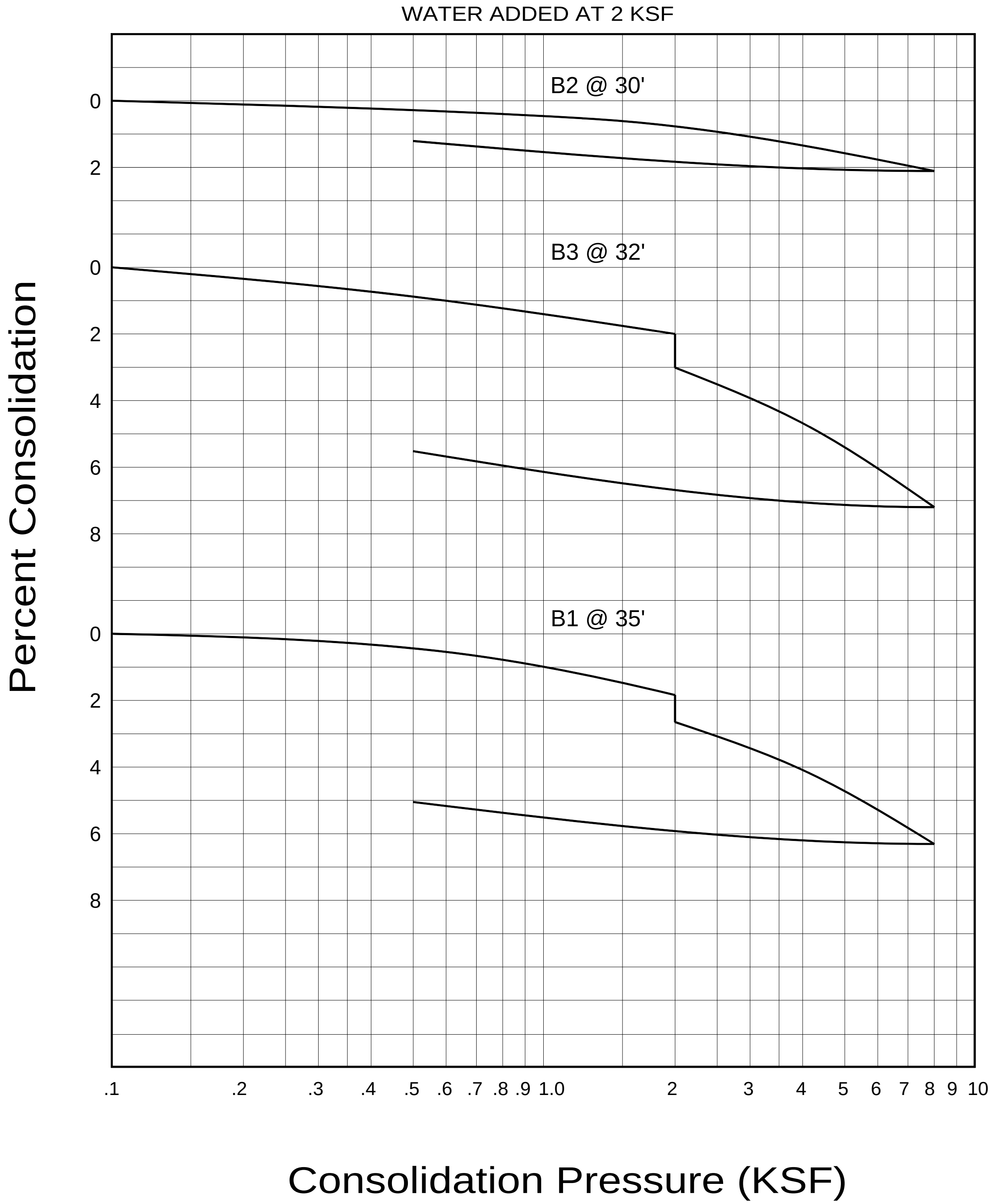
DRAFTED BY: JAO | CHECKED BY: HHD

CONSOLIDATION TEST RESULTS

EVOLVE REALTY & DEVELOPMENT
5607 CARLTON WAY
LOS ANGELES, CALIFORNIA

NOV 2017 | PROJECT NO. A9678-06-01 | FIG. B5



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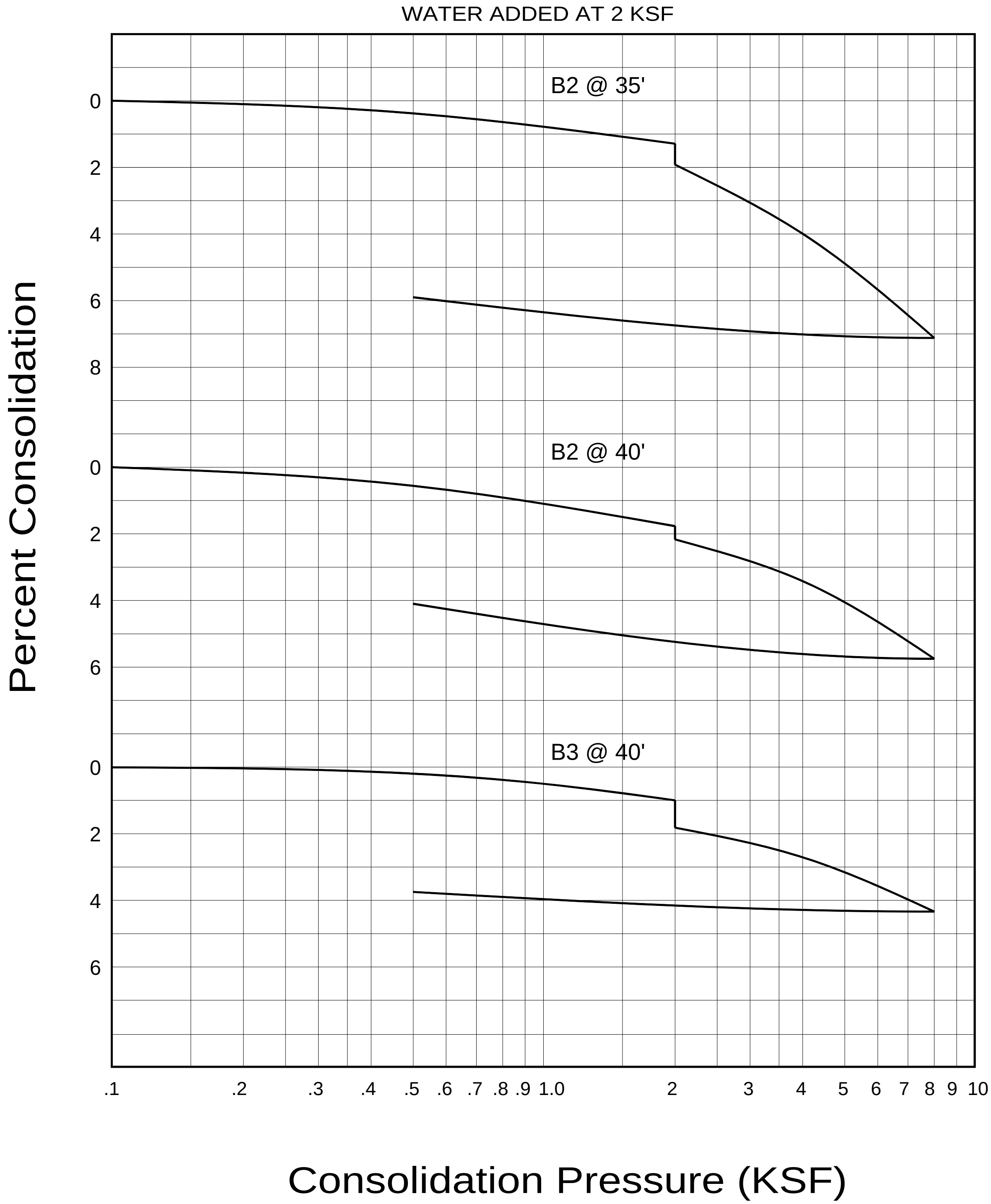
CONSOLIDATION TEST RESULTS

EVOLVE REALTY & DEVELOPMENT
5607 CARLTON WAY
LOS ANGELES, CALIFORNIA

DRAFTED BY: JAO	CHECKED BY: HHD	NOV 2017	PROJECT NO. A9678-06-01	FIG. B6



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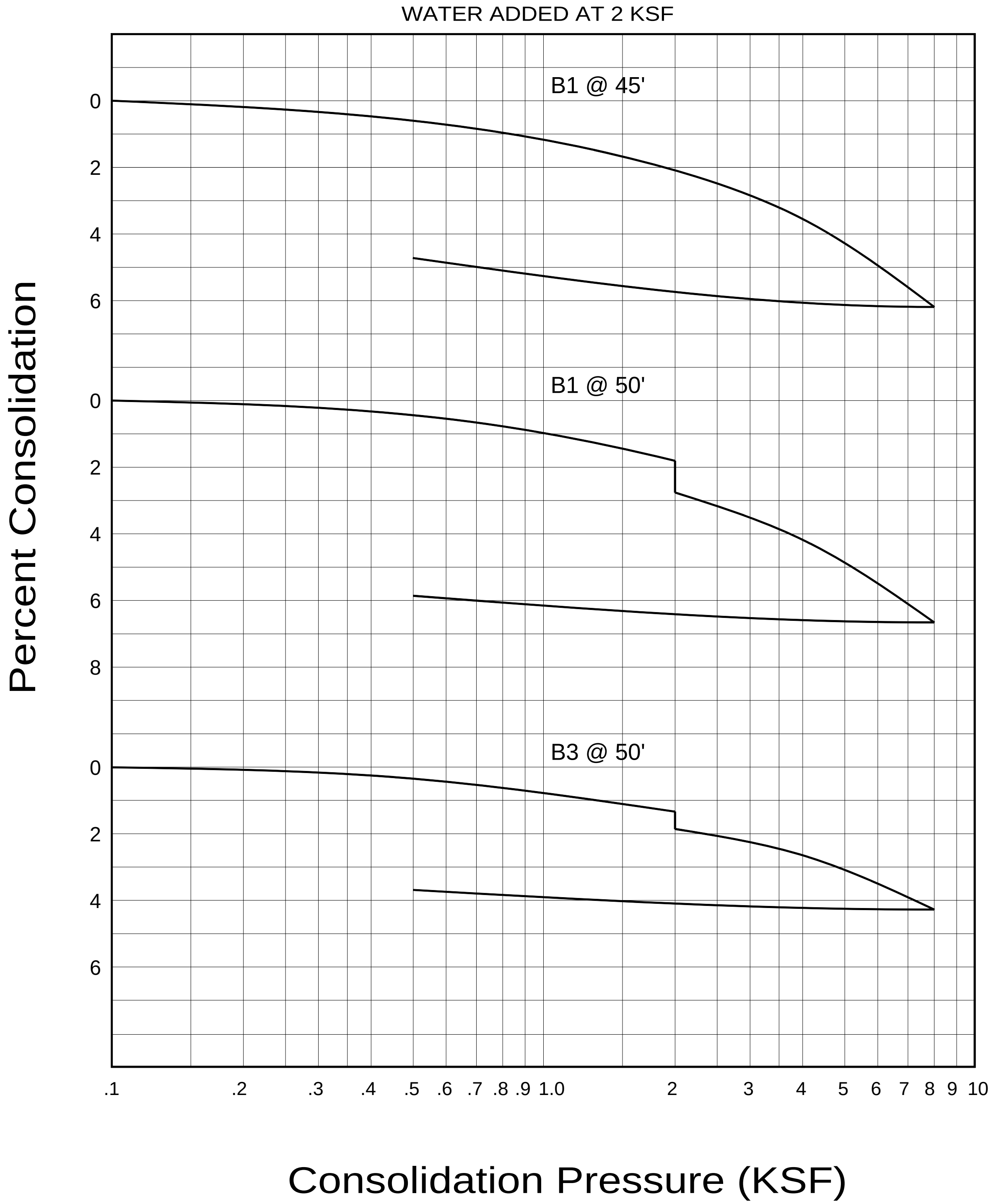
CONSOLIDATION TEST RESULTS

EVOLVE REALTY & DEVELOPMENT
5607 CARLTON WAY
LOS ANGELES, CALIFORNIA

DRAFTED BY: JAO	CHECKED BY: HHD	NOV 2017	PROJECT NO. A9678-06-01	FIG. B7



GEOCON WEST, INC.

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CONSOLIDATION TEST RESULTS

EVOLVE REALTY & DEVELOPMENT
5607 CARLTON WAY
LOS ANGELES, CALIFORNIA

DRAFTED BY: JAO	CHECKED BY: HHD	NOV 2017	PROJECT NO. A9678-06-01	FIG. B8

SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829-11

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	*UBC Classification	**CBC Classification
	Before	After				
B1 @ 20-25'	14.2	35.0	94.9	107	High	Expansive

* Reference: 1997 Uniform Building Code, Table 18-I-B.

** Reference: 2016 California Building Code, Section 1803.5.3

SUMMARY OF LABORATORY MAXIMUM DENSITY AND
AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557-12

Sample No.	Soil Description	Maximum Dry Density (pcf)	Optimum Moisture (%)
B1 @ 20-25'	Brown Sandy Silt	117.0	14.0

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3303 N. SAN FERNANDO BLVD. - SUITE 100 - BURBANK, CA 91504
PHONE (818) 841-8388 - FAX (818) 841-1704

DRAFTED BY: JAO | CHECKED BY: HHD

LABORATORY TEST RESULTS

EVOLVE REALTY & DEVELOPMENT
5607 CARLTON WAY
LOS ANGELES, CALIFORNIA

SUMMARY OF LABORATORY POTENTIAL OF HYDROGEN (pH) AND RESISTIVITY TEST RESULTS CALIFORNIA TEST NO. 643

Sample No.	pH	Resistivity (Ohm Centimeters)
B1 @ 20-25'	7.4	1000 (Severely Corrosive)

SUMMARY OF LABORATORY CHLORIDE CONTENT TEST RESULTS EPA NO. 325.3

Sample No.	Chloride Ion Content (%)
B1 @ 20-25'	0.004

SUMMARY OF LABORATORY WATER SOLUBLE SULFATE TEST RESULTS CALIFORNIA TEST NO. 417

Sample No.	Water Soluble Sulfate (% SO_4)	Sulfate Exposure*
B1 @ 20-25'	0.001	Negligible

* Reference: 2016 California Building Code, Section 1904.3 and ACI 318-11 Section 4.3.

GEOCON
W E S T, I N C.

ENVIRONMENTAL GEOTECHNICAL MATERIALS
3303 N. SAN FERNANDO BLVD. - SUITE 100 - BURBANK, CA 91504
PHONE (818) 841-8388 - FAX (818) 841-1704

DRAFTED BY: JAO	CHECKED BY: HHD

CORROSIVITY TEST RESULTS

EVOLVE REALTY & DEVELOPMENT
5607 CARLTON WAY
LOS ANGELES, CALIFORNIA

NOV 2017	PROJECT NO. A9678-06-01	FIG. B10

BORING LOGS

LEGEND

Ring Sample, or Bulk Sample

Standard Penetration Test (SPT)

Ground Water Level

SOIL SIZE	
COMPONENT	SIZE RANGE
Boulders	Above 12"
Cobbles	3"-12"
Gravel	#4 - 3"
coarse	¾" - 3"
fine	#4 - ¾"
Sand	#200-#4
coarse	#10-#4
medium	#40-#10
fine	#200-#40
Fines (Silt or Clays)	Below #200

PLASTICITY OF FINE GRAINED SOILS	
PLASTICITY INDEX	VOLUME CHANGE POTENTIAL
0-15	Probably Low
15-30	Probably Moderate
30 or more	Probably High

WATER CONTENT
Dry: No feel of moisture
Damp: Much less than normal moisture
Moist: Normal moisture
Wet: Much greater than normal moisture
Saturated: At or near saturation

RELATIVE DENSITY	
SANDS & GRAVELS	BLOWS PER FOOT
Very loose	0-4
Loose	4-10
Medium dense	10-30
Dense	30-50
Very dense	Over 50

	GROUP SYMBOLS	DESCRIPTIONS	DIVISIONS
COARSE-GRAINED SOILS (Less than 50% Fines)	GW	Well-graded gravels or gravel-sand mixtures, less than 5% fines	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size
	GP	Poorly-graded gravels or gravel-sand mixtures, less than 5% fines	
	GM	Silty gravels, gravel-sand silt mixtures, more than 12% fines	
	GC	Clayey gravels, gravel-sand-clay mixtures, more than 12% fines	
	SW	Well-graded sands or gravelly sands, less than 5% fines	SANDS More than half of coarse fraction is smaller than No. 4 sieve size
	SP	Poorly-graded sands or gravelly sands, less than 5% fines	
	SM	Silty sands, sand-silt mixtures, more than 12% fines	
	SC	Clayey sands, sand-clay mixtures, more than 12% fines	
FINE-GRAINED SOILS (More than 50% Fines	ML	Inorganic silt, very fine sands, rock flour, silty or clayey fine sands	SILTS AND CLAYS Liquid limit less than 50
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
	OL	Organic silts or organic silt-clays of low plasticity	
	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	SILTS AND CLAYS Liquid limit less than 50
	CH	Inorganic clays of high plasticity, fat clays	
	OH	Organic clays of medium to high plasticity	
	PT	Peat, mulch, and other highly organic soils	HIGHLY ORGANIC SOILS

CONSISTENCY	
CLAYS & SILTS	BLOWS PER FOOT
Very soft	0-2
Soft	2-4
Firm	4-8
Stiff	8-15
Very stiff	15-30
Hard	Over 30

AGI

A.G.I. GEOTECHNICAL, INC.

A.G.I. Geotechnical, Inc. 16555 Sherman Way, Unit A Van Nuys, California 91406 Telephone: (818) 785-5244 Fax: (818) 785-6251

CLIENT: Hollywood Square, LLC
PROJECT NAME: Proposed 7-Story Mixed-Use Bldg. Over 1 Level of Subterranean Parking
PROJECT NUMBER: 26-4327-00
PROJECT LOCATION: 5600 W. Hollywoood Blvd., Hollywood
DATE STARTED: 7/1/16 COMPLETED: 7/1/16
GROUND ELEVATION: BORING DIAMETER: 8"
EXCAVATION METHOD: 8" Hollow Stem Auger
GROUND WATER LEVELS:
DRILLING CONTRACTOR: Choice Drilling
LOGGED BY: RI CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLPE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS			MATERIAL DESCRIPTION	<200	D 50	Classification
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX				
0			X							Brown Clayey SAND with Gravel (Moist, medium dense to dense)			SC
5	X	11/12/15		6.3	122	129							
10	X	18/20/23		16.3	109	127				Brown Sandy CLAY (Moist, stiff)			CL
15	X	23/37/42		17.7	110	129							
20	X	12/18/24		13.2	118	133							
25	X	15/19/26		8.9	95	103				Brown Clayey SAND (Moist, dense)			SC
30	X	20/35/40		22.6	103	126							

BORING NUMBER B-1

A.G.I. GEOTECHNICAL, INC.

A.G.I. Geotechnical, Inc. 16555 Sherman Way, Unit A Van Nuys, California 91406 Telephone: (818) 785-5244 Fax: (818) 785-6251

CLIENT: Hollywood Square, LLC
PROJECT NAME: Proposed 7-Story Mixed-Use Bldg. Over 1 Level of Subterranean Parking
PROJECT NUMBER: 26-4327-00
PROJECT LOCATION: 5600 W. Hollywoood Blvd., Hollywood
DATE STARTED: 7/1/16 COMPLETED: 7/1/16
GROUND ELEVATION:
BORING DIAMETER: 8"
EXCAVATION METHOD: 8" Hollow Stem Auger
GROUND WATER LEVELS:
DRILLING CONTRACTOR: Choice Drilling
LOGGED BY: RI CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLPE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D 50	Classification
35	X	15/18/24		8.2	128	138				Brown Clayey SAND (Moist, dense)			SC
40	X	19/30/41		21.5	105	127				Brown Clayey SAND (Very moist, very dense)			SC
45										Total Depth: 41.0' No Water			
50													
55													
60													
65													

BORING NUMBER B-2

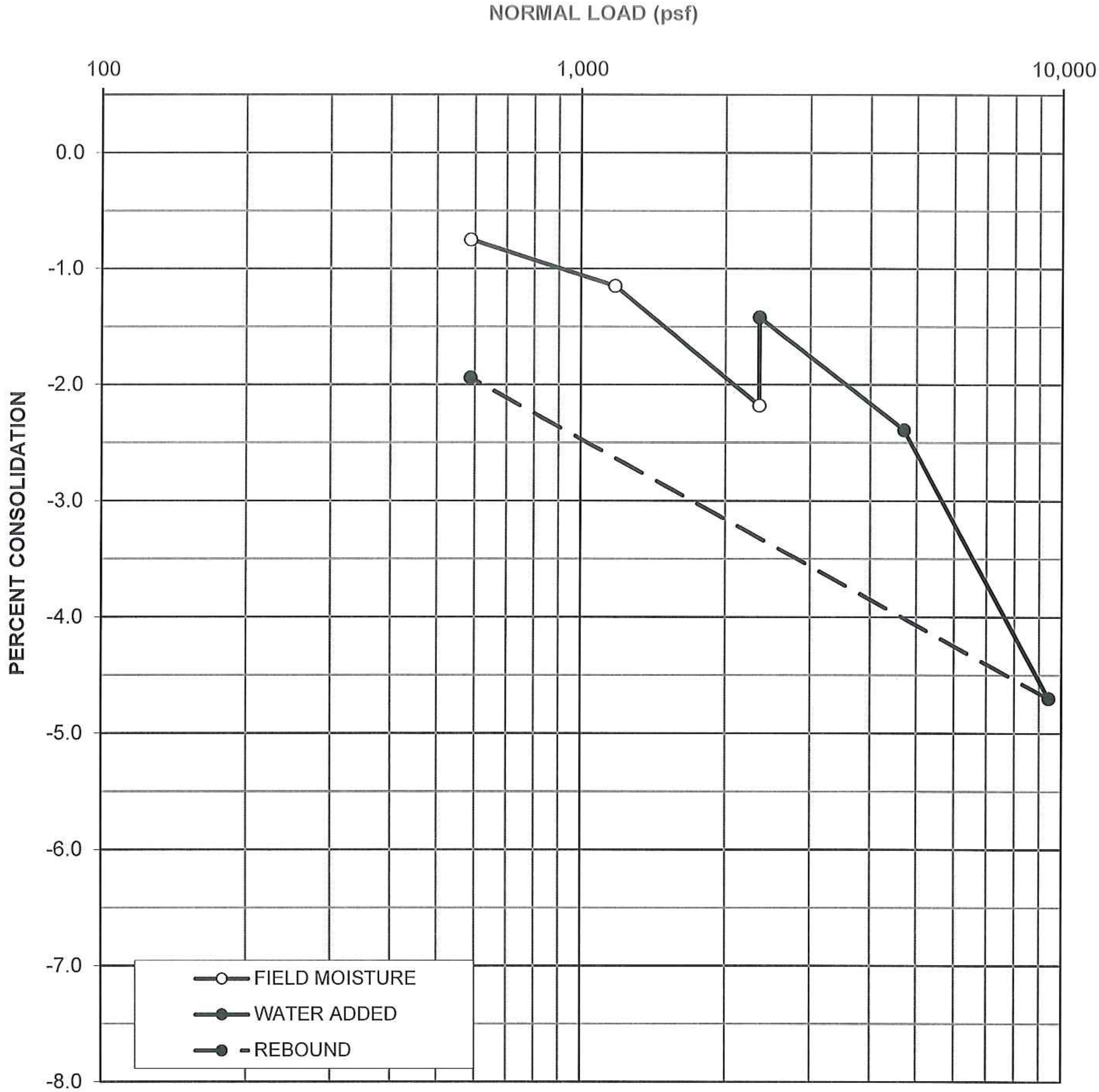
A.G.I. GEOTECHNICAL, INC.

A.G.I. Geotechnical, Inc. 16555 Sherman Way, Unit A Van Nuys, California 91406 Telephone: (818) 785-5244 Fax: (818) 785-6251

CLIENT: Hollywood Square, LLC
PROJECT NAME: Proposed 7-Story Mixed-Use Bldg. Over 1 Level of Subterranean Parking
PROJECT NUMBER: 26-4327-00
PROJECT LOCATION: 5600 W. Hollywoood Blvd., Hollywood
DATE STARTED: 7/1/16 COMPLETED: 7/1/16
GROUND ELEVATION:
BORING DIAMETER: 8"
EXCAVATION METHOD: 8" Hollow Stem Auger
GROUND WATER LEVELS:
DRILLING CONTRACTOR: Choice Drilling
LOGGED BY: RI CHECKED BY: JAV

DEPTH (ft)	DRIVE SAMPLPE	BLOW COUNT (N VALUE)	BULK SAMPLE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	WET UNIT WT. (pcf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	MATERIAL DESCRIPTION	<200	D 50	Classification
0										Brown Clayey SAND (Moist, medium dense)			SC
5	X	10/11/15		5.5	104	110							
										Brown Sandy CLAY (Moist, stiff)			CL
10	X	16/20/22		10.9	87	98							
15	X	22/36/40		15.3	88	101							
20	X	11/20/23		13.3	98	111							
25	X	14/19/25		8.4	124	135				Brown Clayey SAND (Moist, dense)			SC
										Total Depth: 26' No Water			
30													

LABORATORY TEST RESULTS



PROJECT NO. 26-4327-00 BORING NO. B1 DEPTH (FT) 10

REPRESENTATIVE FOR: Existing Soils

SOIL TYPE AND DESCRIPTION: (CL) Sandy CLAY

HYDROCONSOLIDATION (%) -0.76

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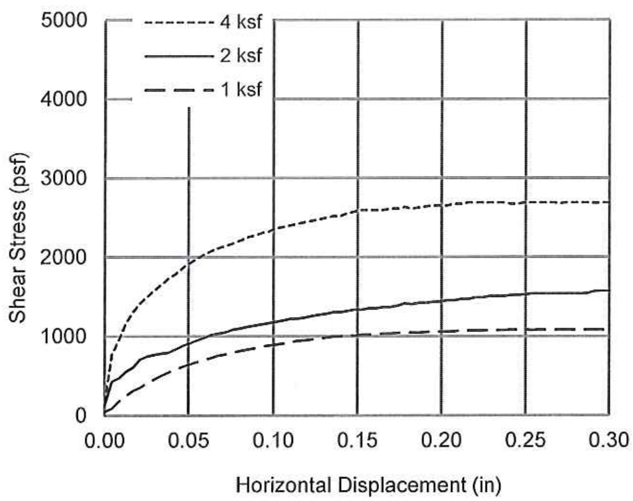
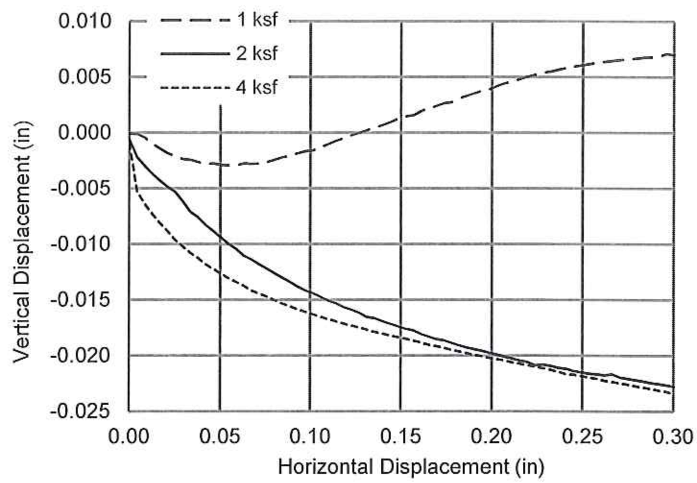
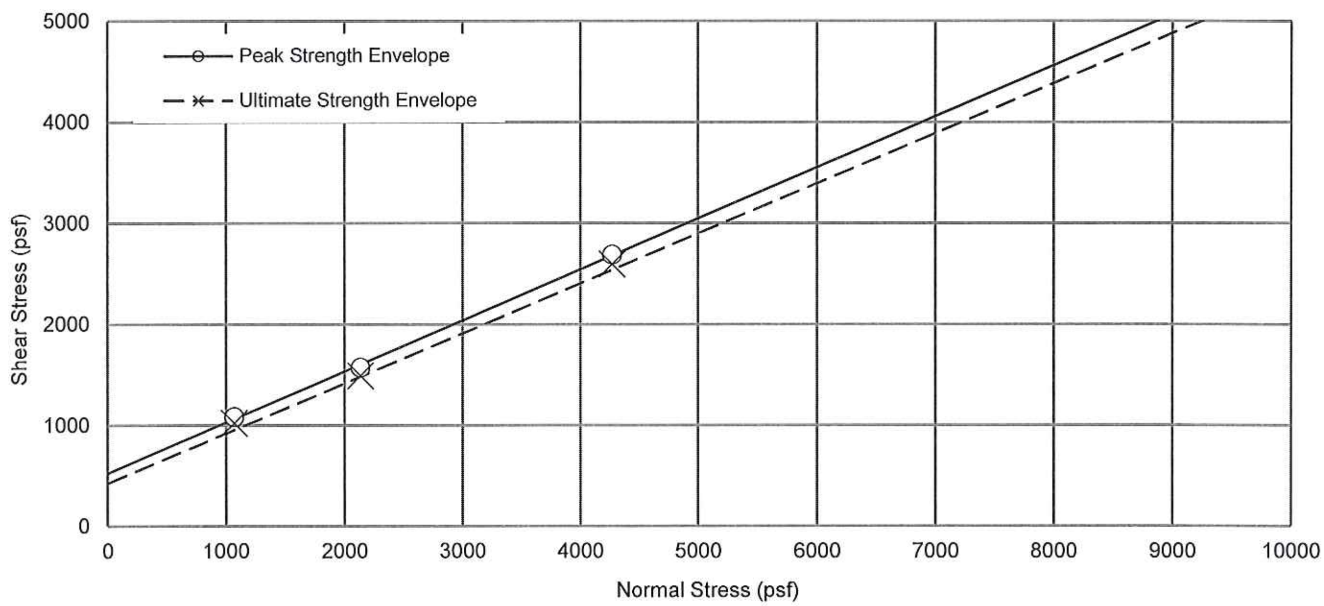
A.G.I. GEOTECHNICAL, INC.

Sample ID :		1 ksf	2 ksf	4 ksf			
Initial	Water Content (%)	9.0	9.0	9.0			
	Dry Density (%)	115.4	114.9	114.4			
	Saturation (%)	52.8	52.1	51.4			
Final	Water Content (%)	18.3	18.6	18.8			
	Dry Density (pcf)	114.5	113.5	112.7			
	Saturation (%)	104.8	103.7	102.6			
Normal Stress (psf)		1067	2134	4269			
Peak Shear Stress (psf)		1084	1572	2690			
Ultimate Shear Stress (psf)		1021	1490	2594			







Peak Cohesion, c' (psf):	525	Ultimate Cohesion, c (psf):	425	**DIRECT SHEAR TEST (ASTM D 3080)**
Peak Friction, ϕ' (deg):	26.8	Ultimate Friction, Φ' (deg):	26.3	

SAMPLE TYPE: Remolded
DESCRIPTION: Clayey SAND

LL:
PL:
PI:
% <0.75μ
% <0.02μ
EI

USCS:
GEOLOGY:
SYMBOL:
REMARKS:

FIGURE NO.:

CLIENT: Hollywood Square, LLC
PROJECT NAME:
LOCATION:

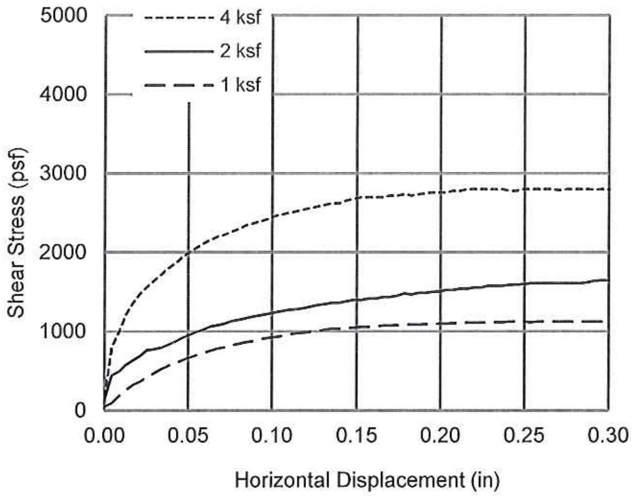
SAMPLE LOCATION: B1 @ 0-5'

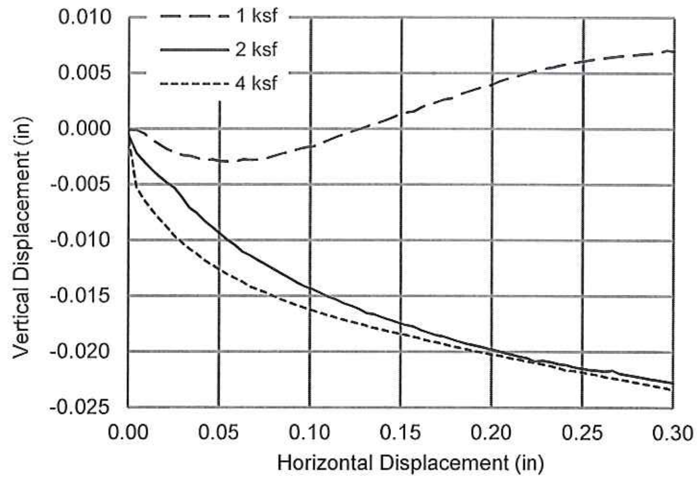
PROJECT NO.: 26-4327-00 TESTED: 07/29/16

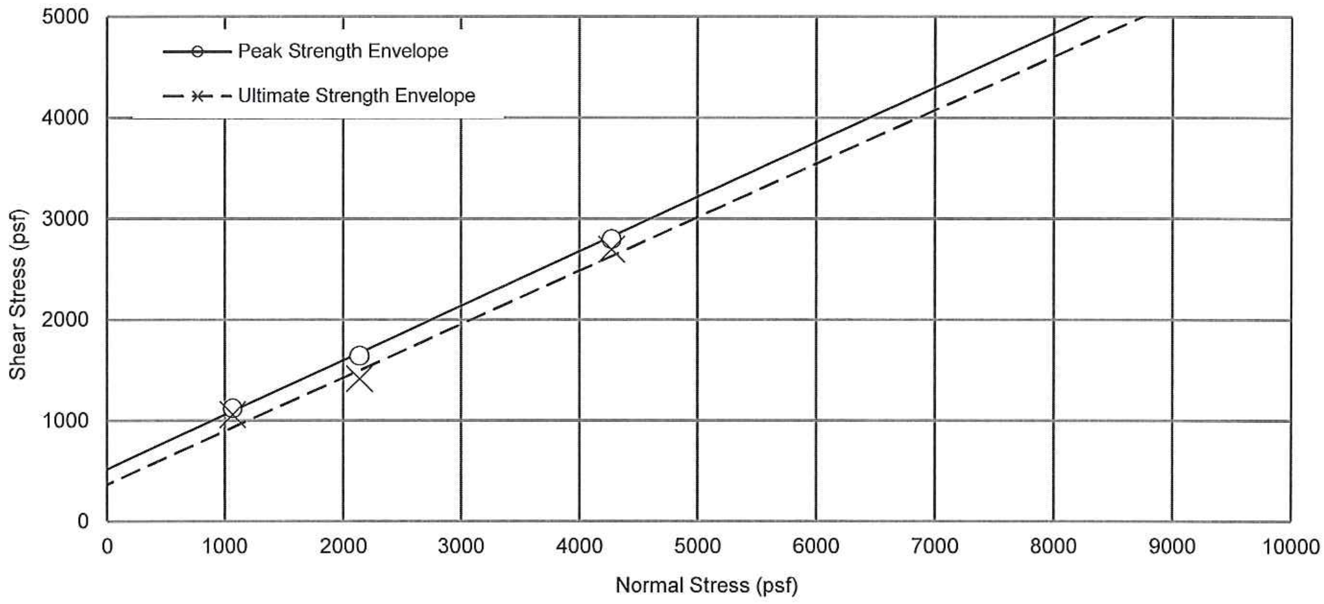
AGI

AGI GEOTECHNICAL, INC.

Sample ID :		1 ksf	2 ksf	4 ksf			
Initial	Water Content (%)	6.3	6.3	6.3			
	Dry Density (%)	121.1	120.7	120.2			
	Saturation (%)	43.5	43.0	42.3			
Final	Water Content (%)	16.1	16.3	16.0			
	Dry Density (pcf)	120.2	119.3	118.5			
	Saturation (%)	108.2	106.8	102.4			
Normal Stress (psf)		1067	2134	4269			
Peak Shear Stress (psf)		1124	1644	2798			
Ultimate Shear Stress (psf)		1058	1414	2698			







Peak Cohesion, c' (psf):	520	Ultimate Cohesion, c (psf):	366
Peak Friction, ϕ' (deg):	28.4	Ultimate Friction, Φ' (deg):	27.9

DIRECT SHEAR TEST (ASTM D 3080)

SAMPLE TYPE: Undisturbed
DESCRIPTION: Clayey SAND

LL:
PL:
PI:
% <0.75μ
% <0.02μ
EI

USCS:
GEOLOGY:
SYMBOL:
REMARKS:

FIGURE NO.:

CLIENT: Hollywood Square, LLC
PROJECT NAME:
LOCATION:

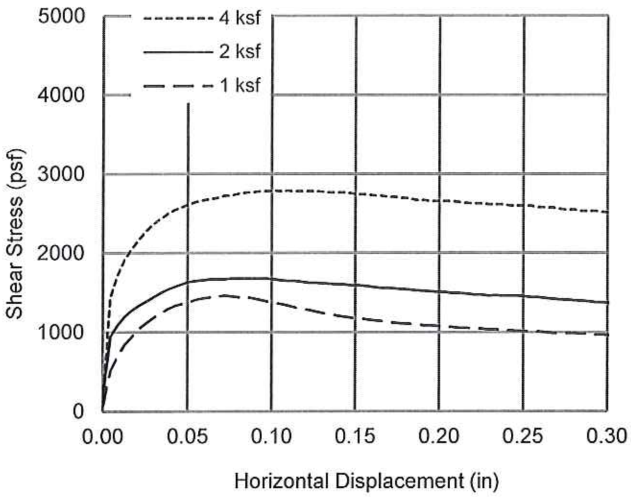
SAMPLE LOCATION: B1 @ 5'

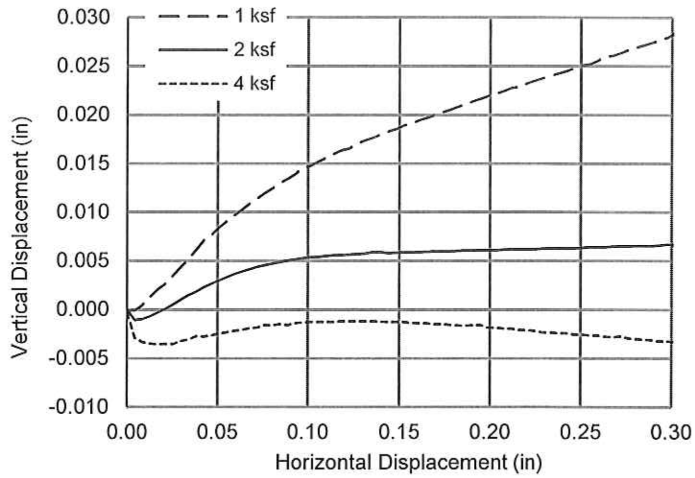
PROJECT NO.: 26-4327-00 TESTED: 07/29/16

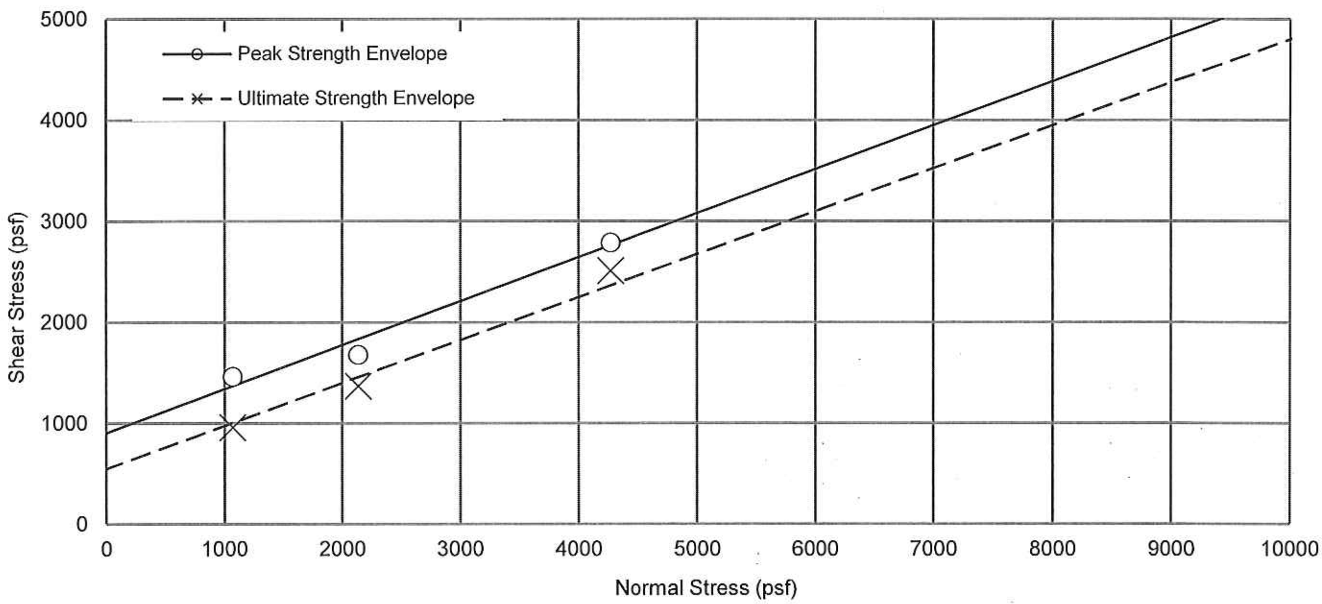
AGI

AGI GEOTECHNICAL, INC.

	Sample ID :	1 ksf	2 ksf	4 ksf			
Initial	Water Content (%)	10.9	10.9	10.9			
	Dry Density (%)	86.8	86.3	85.9			
	Saturation (%)	31.3	30.9	30.6			
Final	Water Content (%)	38.0	38.2	38.5			
	Dry Density (pcf)	85.6	84.7	83.9			
	Saturation (%)	106.0	104.3	103.1			
Normal Stress (psf)		1067	2134	4269			
Peak Shear Stress (psf)		1461	1679	2788			
Ultimate Shear Stress (psf)		958	1367	2508			







Peak Cohesion, c' (psf):	907	Ultimate Cohesion, c (psf):	550
Peak Friction, ϕ' (deg):	23.5	Ultimate Friction, Φ' (deg):	23.0

DIRECT SHEAR TEST (ASTM D 3080)

SAMPLE TYPE: Undisturbed
DESCRIPTION: Sandy CLAY

LL:
PL:
PI:
% <0.75μ
% <0.02μ
EI

USCS:
GEOLOGY:
SYMBOL:
REMARKS:

FIGURE NO.:

CLIENT: Hollywood Square, LLC
PROJECT NAME:
LOCATION:

SAMPLE LOCATION: B2 @ 9'

PROJECT NO.: 26-4327-00 TESTED: 07/28/16

AGI

AGI GEOTECHNICAL, INC.

GRAIN SIZE DISTRIBUTION

PROJECT NO. 26-4327-00 BORING NO. B1 DEPTH (FT) 5

Liquid Limit (%) 24 Plastic Limit (%) 21 Plasticity Index 3

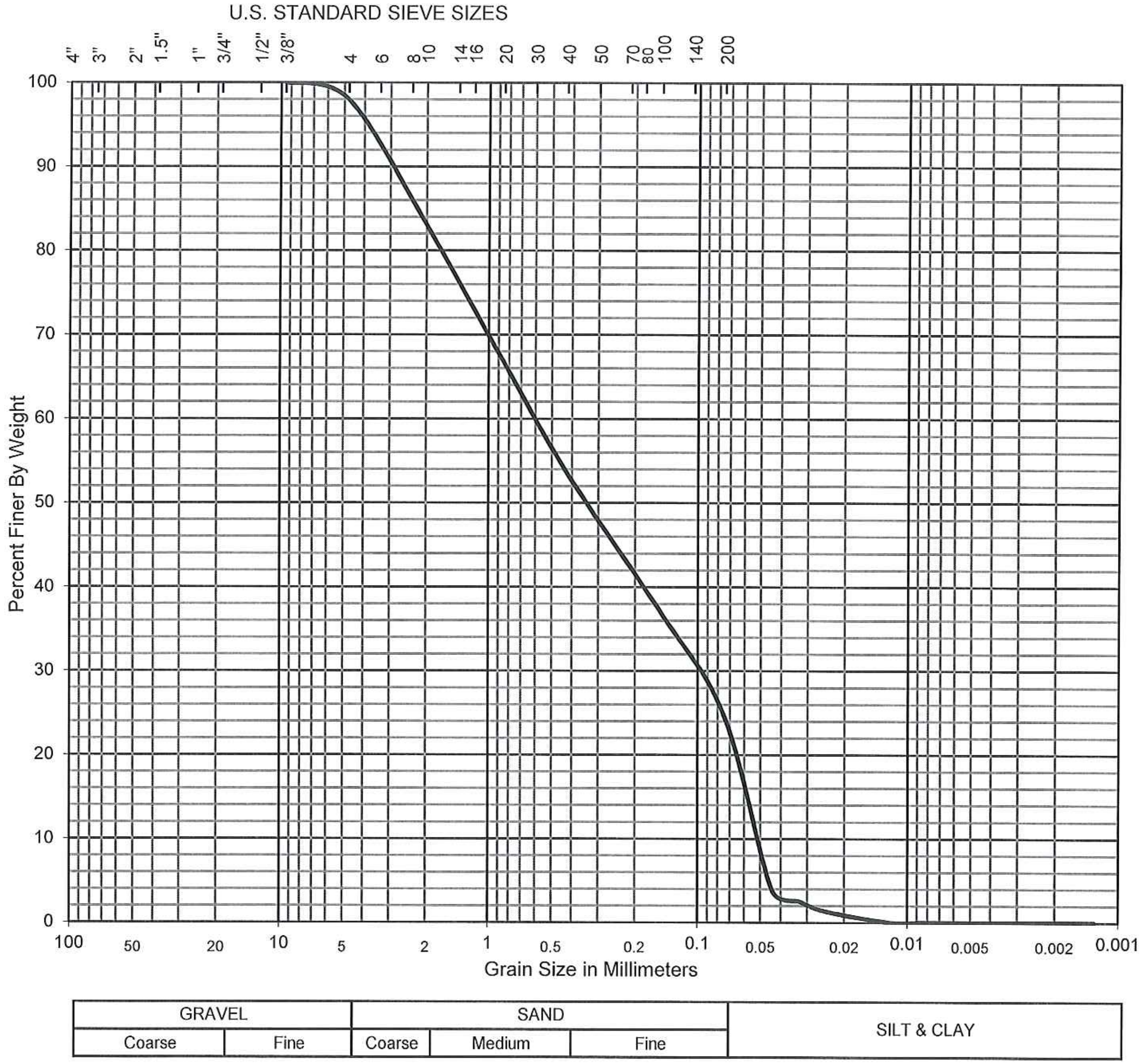
Gravel (%) 2.1 Sand (%) 73.2 Silt & Clay (%) 24.7

D_{10} (mm) - D_{30} (mm) - D_{60} (mm) - D_{50} (mm) -

C_u - C_c - % Fines (< 75υm) 24.7

REPRESENTATIVE FOR Existing Soil

SOIL TYPE AND DESCRIPTION (SC) Clayey SAND with Gravel



AGI

GRAIN SIZE DISTRIBUTION

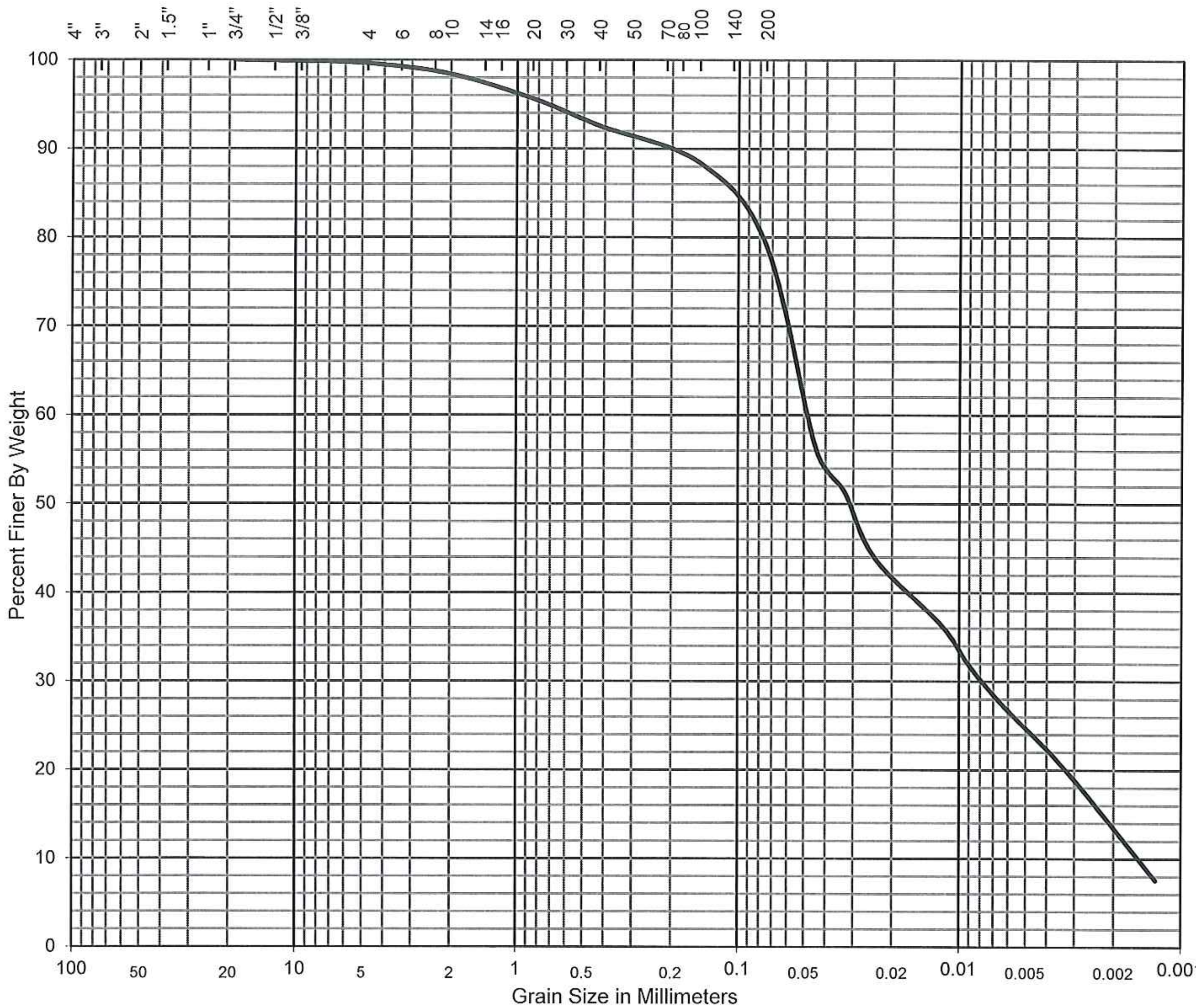
PROJECT NO.	26-4327-00	**BORING NO.**	B1	**DEPTH (FT)**	15
Liquid Limit (%)		**Plastic Limit (%)**		**Plasticity Index**	-
Gravel (%)	0.4	**Sand (%)**	20.4	**Silt & Clay (%)**	79.2

D_{10} (mm) - **D_{30} (mm)** - **D_{60} (mm)** - **D_{50} (mm)** -

C_u - **C_c** - **% Fines (< 75υm)** 79.2

REPRESENTATIVE FOR Existing Soil

SOIL TYPE AND DESCRIPTION (CL) Sandy CLAY



GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

A.G.I. GEOTECHNICAL, INC.

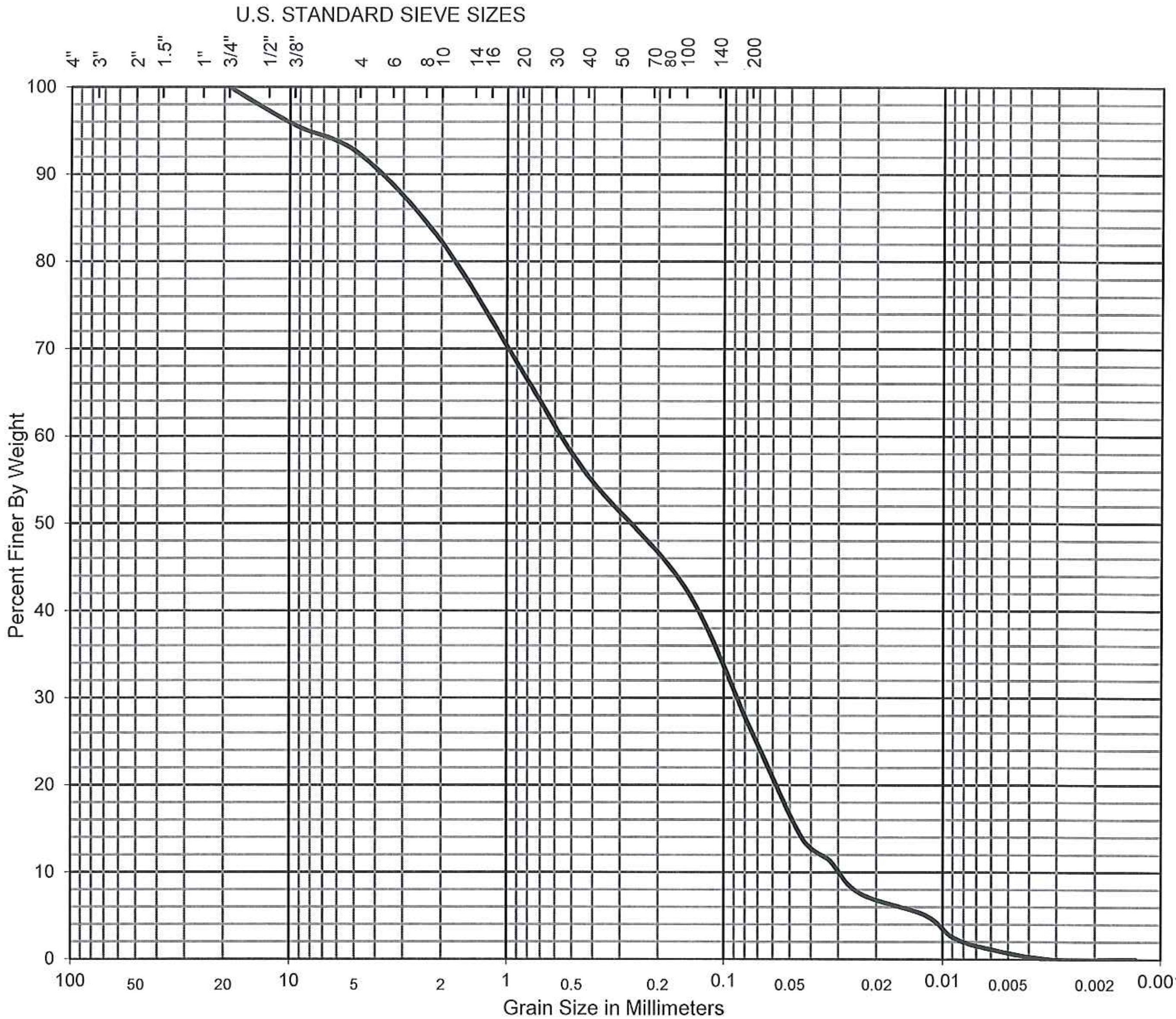
GRAIN SIZE DISTRIBUTION

PROJECT NO.	26-4327-00	BORING NO.	B1	DEPTH (FT)	25
Liquid Limit (%)		Plastic Limit (%)		Plasticity Index	-
Gravel (%)	7.7	Sand (%)	66.0	Silt & Clay (%)	26.2

D_{10} (mm)	-	D_{30} (mm)	-	D_{60} (mm)	-	D_{50} (mm)	-
C_u	-	C_c	-			% Fines (< 75υm)	26.2

REPRESENTATIVE FOR Existing Soil

SOIL TYPE AND DESCRIPTION (SC) Clayey SAND



GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

A.G.I. GEOTECHNICAL, INC.

GRAIN SIZE DISTRIBUTION

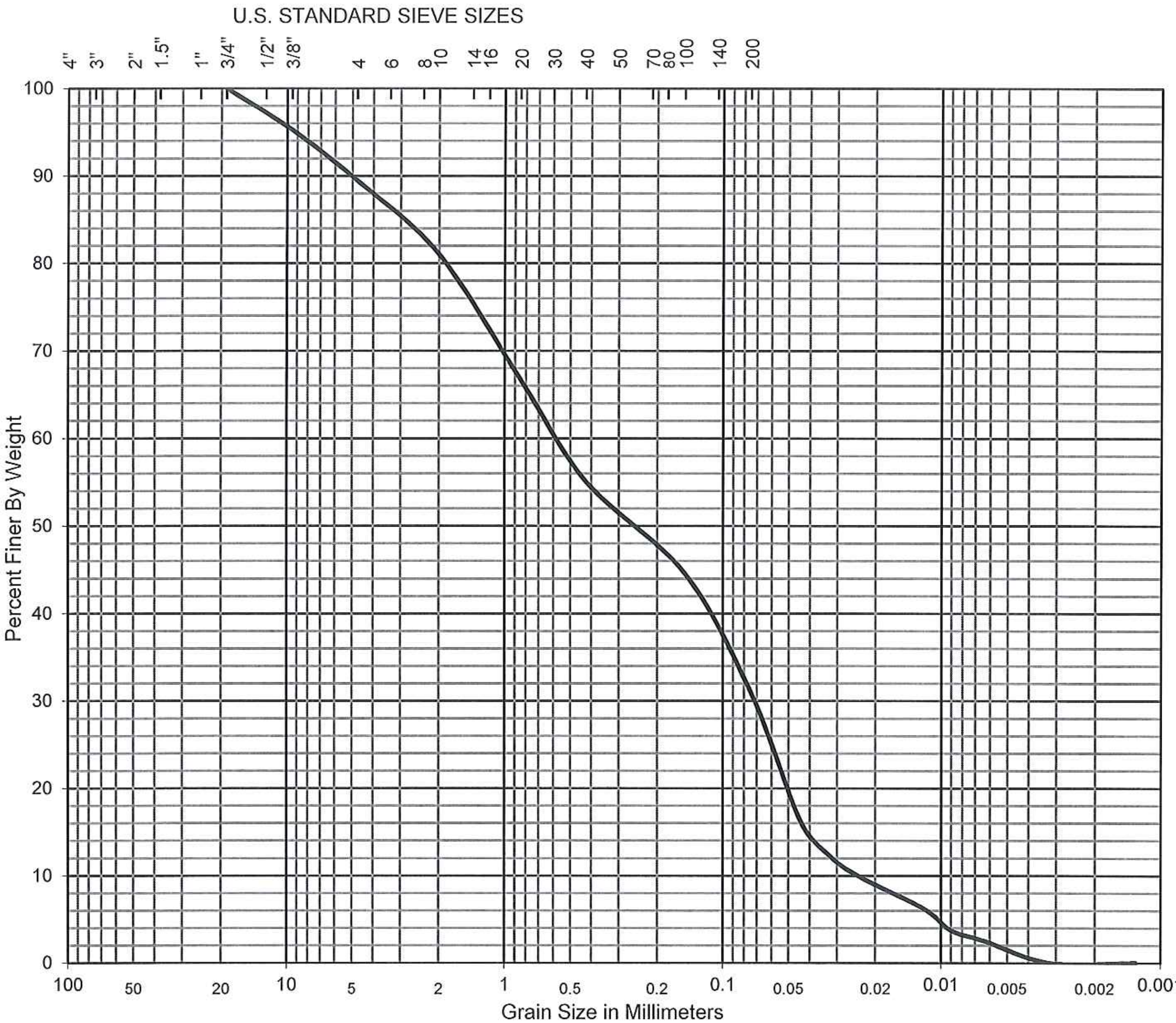
PROJECT NO.	26-4327-00	BORING NO.	B1	DEPTH (FT)	0-5
Liquid Limit (%)		Plastic Limit (%)		Plasticity Index	-
Gravel (%)	10.6	Sand (%)	58.3	Silt & Clay (%)	31.1

D_{10} (mm) - D_{30} (mm) - D_{60} (mm) - D_{50} (mm) -

C_u - C_c - % Fines (< 75υm) 31.1

REPRESENTATIVE FOR Existing Soil

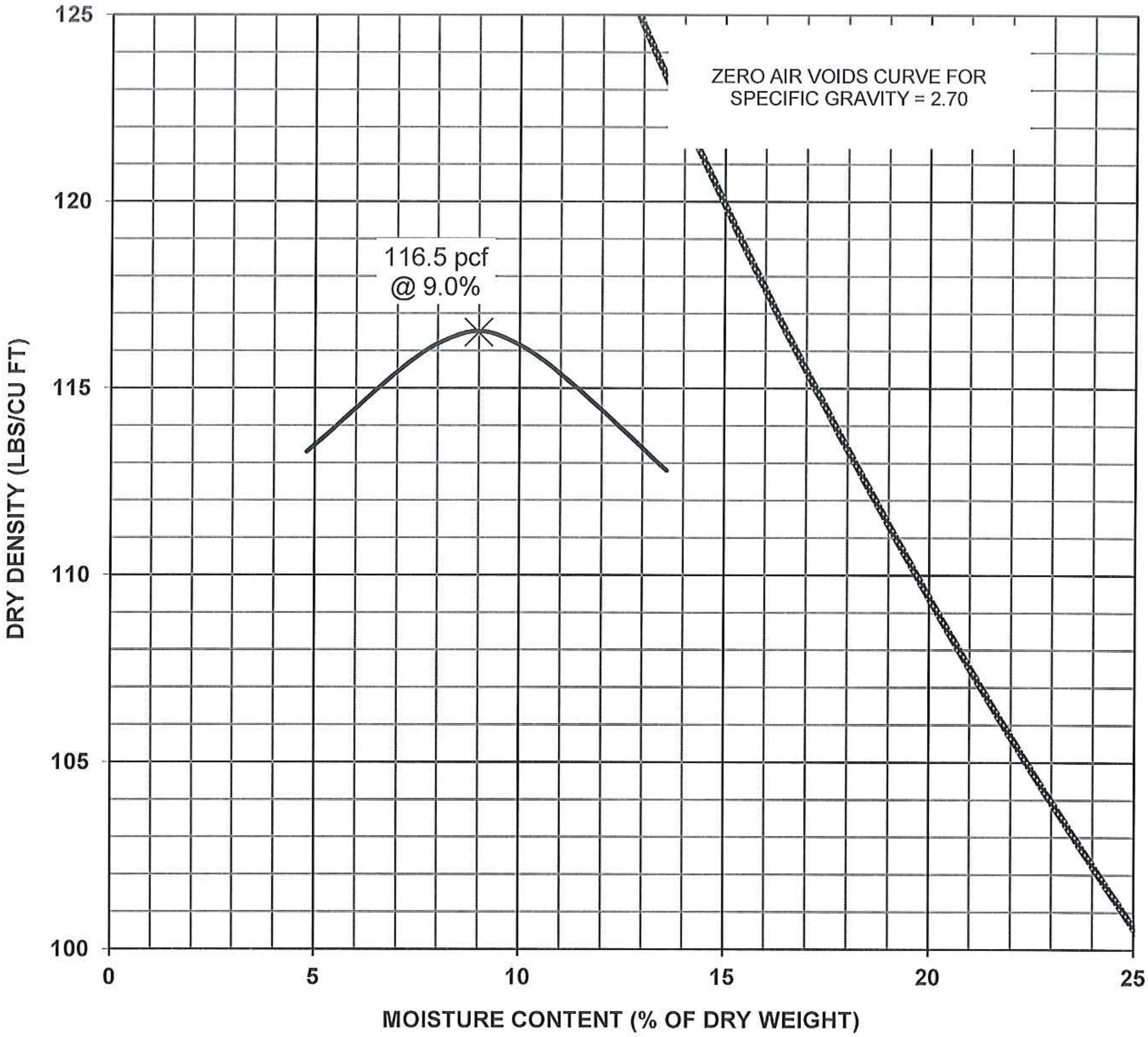
SOIL TYPE AND DESCRIPTION (SC) Clayey SAND with Gravel



GRAVEL		SAND			SILT & CLAY
Coarse	Fine	Coarse	Medium	Fine	

A.G.I. GEOTECHNICAL, INC.

MAXIMUM DENSITY CURVE



PROJECT NO. 26-4327-00 **BORING NO.** B-1 **DEPTH (FT)** 0-5

REPRESENTATIVE FOR Existing Soils

SOIL TYPE AND DESCRIPTION (SC) Clayey SAND

MAXIMUM DRY DENSITY (LBS/CU FT) 116.5

OPTIMUM MOISTURE CONTENT (% OF DRY WEIGHT) 9.0

METHOD OF COMPACTION
ASTM:D-1557

AGI

A.G.I. GEOTECHNICAL, INC.

APPENDIX C

Percolation Test Results

PERCOLATION TEST DATA SHEET

Project:	5600 Hollywood Boulevard	Project No.:	700071901	Date:	3/9/2020
Test Hole No.:	P-1	Tested By:	SHW		
Depth of Test Hole (ft):	47.5	USCS Soil Classification:		Sand with Silt (SP)	
PVC Pipe Dimension:	3-in I.D.	Test Hole Diameter (in):		8	

Trial No.	Date	Time of Measurement	Initial Depth to Water (ft)	Time of Measurement	Final Depth to Water (ft)	Volume of Water Infiltrated (cu.in.)	Surface Area (sq.in.)	Time Interval (min)	Percolation Rate (in/hr)
Pre-Soak	3/9/2020	4:10 PM	32.00	4:35 PM	44.00	7238	4725	25	--
Pre-Soak	3/9/2020	4:35 PM	32.00	4:52 PM	37.50	3318	4725	17	--
#1 (Refill)	3/9/2020	4:52 PM	37.50	5:02 PM	39.60	1267	3066	10	2.48
#2 (Refill)	3/9/2020	5:02 PM	39.60	5:12 PM	42.70	1870	2433	10	4.61
#3 (Refill)	3/9/2020	5:12 PM	42.70	5:22 PM	43.68	591	1498	10	2.37
#4 (Refill)	3/9/2020	5:23 PM	42.50	5:33 PM	44.42	1158	1558	10	4.46
#5 (Refill)	3/9/2020	5:35 PM	42.50	5:45 PM	44.35	1116	1558	10	4.30
#6 (Refill)	3/9/2020	5:46 PM	42.50	5:56 PM	44.44	1170	1558	10	4.51
#7 (Refill)	3/9/2020	5:57 PM	42.50	6:07 PM	44.51	1212	1558	10	4.67
#8 (Refill)	3/9/2020	6:08 PM	42.50	6:18 PM	44.45	1176	1558	10	4.53

Comments:			
	1. Percolation test was performed in accordance with the Boring Percolation Test Procedure provided in the "Guidelines for Design, Investigation, and Reporting - Low Impact Development Stormwater Infiltration," prepared by County of Los Angeles Department of Public Works, dated 30 June 2017. 2. Weather: Partly cloudy and cool.	Average Stabilized Rate	4.49
		Reduction Factors: RFt	-
		Reduction Factors: RFv	-
		Reduction Factors: RFs	-
		Design Infiltration Rate (in/hr)	Applicable reduction factors and design infiltration rate to be determined by civil consultant.

LANGAN

APPENDIX D

PS Suspension Seismic Velocity Logging

BOREHOLE GEOPHYSICS
5600 HOLLYWOOD BOULEVARD
LOS ANGELES, CALIFORNIA

Prepared for

Langan
18575 Jamboree Road, Suite 150
Irvine, California 92612

Prepared by

GEOVision Geophysical Services
1124 Olympic Drive
Corona, California 92881
(951) 549-1234

August 10, 2020

Report 20241-01 rev 0

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APPENDICES

INTRODUCTION

GEO*Vision* acquired geophysical data in one borehole at 5600 Hollywood Boulevard, Los Angeles, California on July 29, 2020. The work was performed for Langan with Chris Zadoorian as point of contact. A **GEO***Vision* professional Geophysicist or Engineer reviewed fieldwork, data analysis, and report.

SCOPE OF WORK

This report presents the results of geophysical data acquired in one borehole on July 29, 2020, as detailed in Table 1. The purpose of these measurements was to supplement data obtained during the drilling investigation by acquiring shear wave and compressional wave velocities as a function of depth and estimate the average shear wave velocity in the upper 30 meters (Vs30).

An OYO PS Suspension Logging System was used to obtain in-situ horizontal shear (S_H), and compressional (P) wave velocity measurements in one borehole at 1.6-foot intervals. Measurements followed **GEO***Vision* Procedure for PS Suspension Seismic Velocity Logging, revision 1.5. Acquired data were analyzed and a profile of velocity versus depth was produced for both S_H and P waves.

A detailed reference for the PS Suspension velocity measurement techniques used in this study is:

> Guidelines for Determining Design Basis Ground Motions, Report TR-102293, Electric Power Research Institute, Palo Alto, California, November 1993, Sections 7 and 8.

INSTRUMENTATION

Suspension Velocity Instrumentation

Suspension velocity measurements were performed using the PS Suspension logging system, manufactured by OYO Corporation, and their subsidiary, Robertson Geo (RG). This system directly determines the average velocity of a 3.3-foot high segment of the soil column surrounding the borehole of interest by measuring the elapsed time between arrivals of a wave propagating upward through the soil column. The receivers that detect the wave, and the source that generates the wave, are moved as a unit in the borehole, producing relatively constant amplitude signals at all depths.

The suspension system probe consists of a combined reversible polarity solenoid horizontal shear-wave source and compressional-wave source, joined to two biaxial receivers by a flexible isolation cylinder, as shown in Figure 1. The separation of the two receivers is 3.3 feet, allowing average wave velocity in the region between the receivers to be determined by inversion of the wave travel time between the two receivers. The total length of the probe in these surveys is approximately 25 feet, with the center point of the receiver pair 12.5 feet above the bottom end of the probe.

The probe receives control signals from, and sends the digitized receiver signals to, the instrumentation on the surface via an armored multi-conductor cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured to provide probe depth data using a sheave of known circumference fitted with a digital rotary encoder.

The entire probe is suspended in the borehole by the cable; therefore, source motion is not coupled directly to the borehole walls; rather, the source motion creates a horizontally propagating impulsive pressure wave in the fluid filling the borehole and surrounding the source. This pressure wave is converted to P and S_H-waves in the surrounding soil and rock as it impinges upon the wall of the borehole. These waves propagate through the soil and rock surrounding the borehole, in turn causing a pressure wave to be generated in the fluid surrounding the receivers as the soil waves pass their location. Separation of the P and S_H-waves at the receivers is performed using the following steps:

1. The orientation of the horizontal receivers is maintained parallel to the axis of the source, maximizing the amplitude of the recorded S_H -wave signals.
2. At each depth, S_H-wave signals are recorded with the source actuated in opposite directions, producing S_H-wave signals of opposite polarity, providing a characteristic S_H-wave signature distinct from the P-wave signal.
3. The 6.3-foot separation of source and receiver 1 permits the P-wave signal to pass and damp significantly before the slower S_H-wave signal arrives at the receiver. In faster soils or rock, the isolation cylinder is extended to allow greater separation of the P- and S_H-wave signals.
4. In saturated soils, the received P-wave signal is typical of much higher frequency than the received S_H-wave signal, permitting additional separation of the two signals by low pass filtering.
5. Direct arrival of the original pressure pulse in the fluid is not detected at the receivers because the wavelength of the pressure pulse in the fluid is significantly greater than the dimension of the fluid annulus surrounding the probe (feet versus inches scale), preventing significant energy transmission through the fluid medium.

In operation, a distinct, repeatable pattern of impulses is generated at each depth as follows:

1. The source is fired in one direction producing dominantly horizontal shear with some vertical compression, and the signals from the horizontal receivers situated parallel to the axis of motion of the source are recorded.
2. The source is fired again in the opposite direction and the horizontal receiver signals are recorded.
3. The source is fired again and the vertical receiver signals are recorded. The repeated source pattern facilitates the picking of the P and S_H-wave arrivals; reversal of the source changes the polarity of the S_H-wave pattern but not the P-wave pattern.

The data from each receiver during each source activation is recorded as a different channel on the recording system. The PS Suspension system has six channels (two simultaneous recording channels), each with a 1024 sample record. The recorded data are displayed as six channels with a common time scale.

A review of the displayed data on the recorder or computer screen allows the operator to set the gains, filters, delay time, pulse length (energy), and sample rate to optimize the quality of the data before recording. Verification of the calibration of the PS Suspension digital recorder is performed at least every twelve months using a NIST traceable frequency source and counter, as presented in Appendix B.

MEASUREMENT PROCEDURES

Suspension Velocity Measurement Procedures

The borehole was logged uncased and filled with fluid. Measurements followed the **GEO***Vision* Procedure for PS Suspension Seismic Velocity Logging, revision 1.5. Prior to the logging run, the probe was positioned with the top of the probe even with a stationary reference point. The electronic depth counter was set to the distance between the mid-point of the receiver and the top of the probe, minus the height of the stationary reference point, if any. Measurements were verified with a tape measure, and calculations recorded on a field log.

The probe was lowered to the bottom of the borehole, stopping at 1.6-foot intervals to collect data, as summarized in Table 2. At each measurement depth, the measurement sequence of two opposite horizontal records and one vertical record was performed. Gains were adjusted as required. The data from each depth were viewed on the computer display, checked, and saved to disk before moving to the next depth.

Upon completion of the measurements, the probe was returned to the surface, and the zero-depth indication at the depth reference point was verified prior to removal from the borehole.

DATA ANALYSIS

Suspension Velocity Analysis

Recorded digital waveforms were analyzed to locate the most prominent first minima, first maxima, or the first break on the vertical axis records, indicating the arrival of P-wave energy. The difference in travel time between receiver 1 and receiver 2 (R1-R2) arrivals was used to calculate the P-wave velocity for that 1.0-meter segment of the soil column. When observable, P-wave arrivals on the horizontal axis records were used to verify the velocities determined from the vertical axis data. The time picks were then transferred into a template to complete the velocity calculations based on the arrival time picks made in PSLOG. The Microsoft Excel® analysis file accompanies this report.

P-wave velocity over the 6.3-foot interval from source to receiver 1 (S-R1) was also picked, calculated, and plotted for quality assurance of the velocity derived from the travel time between receivers. In this analysis, the depth values as recorded were increased by 4.8 feet to correspond to the mid-point of the 6.33-foot S-R1 interval. Travel times were obtained by picking the first break of the P-wave signal at receiver 1 and subtracting the calculated and experimentally verified delay, in milliseconds, from source trigger pulse (beginning of record) to source impact. This delay corresponds to the duration of the acceleration of the solenoid before the impact.

As with the P-wave records, the recorded digital waveforms were analyzed to locate clear S_H-wave pulses, as indicated by the presence of opposite polarity pulses on each pair of horizontal records. Ideally, the S_H-wave signals from the 'normal' and 'reverse' source pulses are very nearly inverted images of each other. Digital Fast Fourier Transform – Inverse Fast Fourier Transform (FFT – IFFT) lowpass filtering was used to remove the higher frequency P-wave signal from the S_H-wave signal. Different filter cutoffs were used to separate P- and S_H-waves at different depths, ranging from 600 Hz in the slowest zones to 4000 Hz in the regions of highest velocity. At each depth, the filter frequency was selected to be at least twice the fundamental frequency of the S_H-wave signal being filtered.

Generally, the first maxima were picked for the 'normal' signals and the first minima for the 'reverse' signals, although other points on the waveform were used if the first pulse was distorted. The absolute arrival time of the 'normal' and 'reverse' signals may vary by +/- 0.2 milliseconds, due to differences in the actuation time of the solenoid source caused by constant mechanical bias in the source, or by borehole inclination. This variation does not affect the R1-R2 velocity determinations, as the differential time is measured between arrivals of waves created by the same source actuation. The final velocity value is the average of the values obtained from the 'normal' and 'reverse' source actuation.

As with the P-wave data, S_H-wave velocity calculated from the travel time over the 6.33-foot interval from source to receiver 1 was calculated and plotted for verification of the velocity derived from the travel time between receivers. In this analysis, the depth values were increased by 4.8 feet to correspond to the mid-point of the 6.33-foot S-R1 interval. Travel times were obtained by picking the first break of the S_H-wave signal at the near receiver and subtracting the calculated and experimentally verified delay, in milliseconds, from the beginning of the record at the source trigger pulse to source impact.

Poisson's Ratio, **ν**, was calculated using the following formula:

$$\boldsymbol{\nu} = \frac{\left(\dfrac{V_s}{V_p}\right)^2 - 0.5}{\left(\dfrac{V_s}{V_p}\right)^2 - 1.0}$$

Figure 2 shows an example of R1 - R2 measurements on a sample filtered suspension record. In Figure 2, the time difference over the 3.3-foot interval of 1.88 milliseconds for the horizontal signals is equivalent to an S_H-wave velocity of 1745 feet/second. Whenever possible, time differences were determined from several phase points on the S_H-waveform records to verify the data obtained from the first arrival of the S_H-wave pulse. Figure 3 displays the same record before filtering the S_H-waveform record with a 1400 Hz FFT - IFFT digital lowpass filter, illustrating the presence of higher frequency P-wave energy at the beginning of the record, and distortion of the lower frequency S_H-wave by the residual P-wave signal.

Data and analyses were reviewed by a **GEO***Vision* Professional Geophysicist or Engineer as a component of the in-house data validation program.

Vs30 Analysis

As requested, the 30 meter average shear wave velocity was calculated using PS Suspension data acquired from 10m – 40m below ground surface; $V_s30_{10m\text{-}40m}$ in this case. The PS Suspension logger measures directly the travel time over a 1 meter interval. However, data are logged at ½ meter intervals. The overlapped measurements (at nominal 0.5m intervals for your data) are overlapping travel times. These are then used to calculate the interval times, which are then accumulated to obtain the total travel time over 30 meters. V_s30 is 30 meters divided by this total travel time.

RESULTS

Suspension Velocity Results

Suspension R1-R2 P- and S_H-wave velocities for borehole B-6 are plotted in Figure 4 and data are compiled in Table 3. The associated Microsoft Excel® analysis files accompany this report. Included in the Microsoft Excel® analysis file are Poisson's Ratio calculations, tabulated data, and plots.

P- and S_H-wave velocity data from R1-R2 analysis and quality assurance analysis of S-R1 data are plotted together in Figure A-1 in Appendix A to aid in visual comparison. Note that R1-R2 data are an average velocity over a 3.3-foot segment of the soil column; S-R1 data are an average over 6.3 feet, creating a significant smoothing relative to the R1-R2 plots. The S-R1 velocity data displayed in this figure are also compiled in Table A-1.

Vs30 Results

The $V_s30_{10m\text{-}40m}$ estimate for borehole B-4 is 406 meters/second. This estimate is calculated from the PS measurement at 10m (32.8ft) down to the PS measurement at 40m (131ft).

* Site Classifications taken from Table 1615 1.1 Site Class Definitions published in 2000 International Building code, International Code Council, Inc. on page 350

SUMMARY

Discussion of Suspension Velocity Results

Suspension PS velocity data are ideally collected in an uncased fluid filled borehole, drilled with rotary mud (rotary wash) methods, as was the case for this borehole.

Suspension PS velocity data quality is judged based upon 5 criteria.

	Criteria	B-6
1	Consistent data between receiver to receiver (R1 – R2) and source to receiver (S – R1) data.	Yes
2	Consistency between data from adjacent depth intervals.	Yes
3	Consistent relationship between P-wave and S_H -wave (excluding transition to saturated soils)	Yes Saturation occurs at about 70ft BGS
4	Clarity of P-wave and S_H-wave onset, as well as damping of later oscillations.	This is excellent data
5	Consistency of profile between adjacent borings, if available.	Not applicable

These data indicate good consistency between R1-R2 and S-R1 velocities, and consistency between adjacent depths in the intervals tested.

Quality Assurance

These borehole geophysical measurements were performed using industry-standard or better methods for measurements and analysis. All work was performed under **GEO***Vision* quality assurance procedures, which include:

- Use of NIST-traceable calibrations, where applicable, for field and laboratory instrumentation
- Use of standard field data logs
- Use of independent verification of velocity data by comparison of receiver-to-receiver and source-to-receiver velocities
- Independent review of calculations and results by a registered professional engineer, geologist, or geophysicist.

Suspension Velocity Data Reliability

P- and S_H-wave velocity measurement using the PS suspension method gives average velocities over a 3.3-foot interval of depth. This high resolution results in the scatter of values shown in the graphs. Individual measurements are very reliable, with an estimated precision of +/- 5%. Depth indications are very reliable with an estimated precision of +/- 0.2 feet. Standardized field procedures and quality assurance checks contribute to the reliability of these data.

CERTIFICATION

All geophysical data, analysis, interpretations, conclusions, and recommendations in this document have been prepared under the supervision of and reviewed by a **GEO***Vision* California Professional Geophysicist or Engineer.

Prepared by:

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California Professional Geophysicist, PGp 1074
GEO*Vision* Geophysical Services

PROFESSIONAL GEOPHYSICIST
VICTOR GONZALEZ
PGp 1074
STATE OF CALIFORNIA

* This geophysical investigation was conducted under the supervision of a California Professional Geophysicist using industry-standard methods and equipment. A high degree of professionalism was maintained during all aspects of the project from the field investigation and data acquisition through data processing, interpretation and reporting. All original field data files, field notes and observations, and other pertinent information are maintained in the project files and are available for the client to review for a period of at least one year.

A professional geophysicist's certification of interpreted geophysical conditions comprises a declaration of his/her professional judgment. It does not constitute a warranty or guarantee, expressed or implied, nor does it relieve any other party of its responsibility to abide by contract documents, applicable codes, standards, regulations, or ordinances.

Table 1. Borehole locations and logging dates

BOREHOLE DESIGNATION	DATES LOGGED	COORDINATES [1] (DEGREES)		
		LATITUDE	LONGITUDE	ELEVATION (FT)
B-6	7/29/2020			387.5

[1] Coordinates not available at time of report; elevation provided by Langan

Table 2. Logging dates and depth ranges

BOREHOLE NUMBER	TOOL AND RUN NUMBER	DEPTH RANGE (FEET)	OPEN HOLE (FEET)	SAMPLE INTERVAL (FEET)	DATE LOGGED
B-6	SUSPENSION DOWN01	1.6 – 136.2	150	1.6	7/29/2020

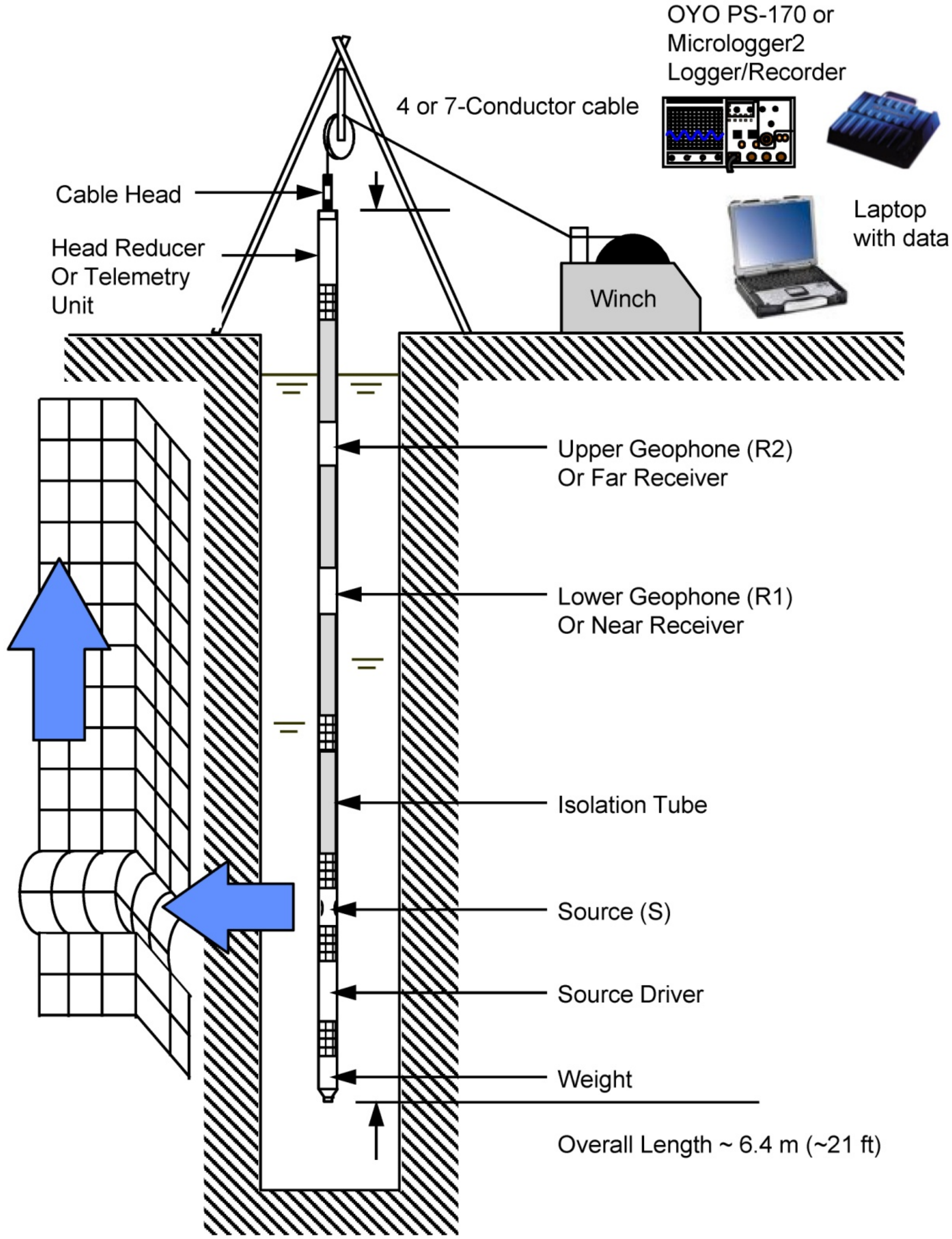

Figure 1: Concept illustration of PS logging system

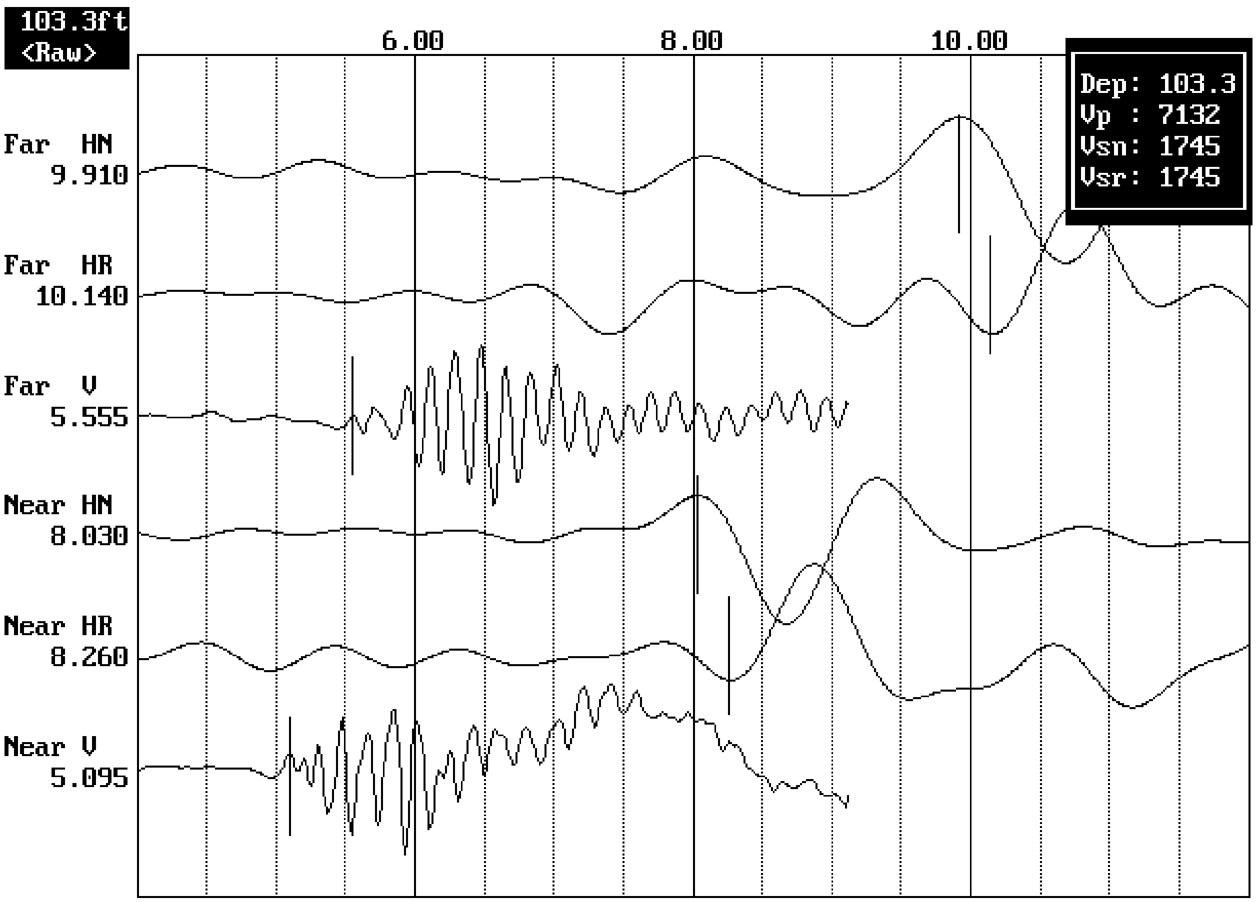

Figure 2: Example of filtered (1400 Hz lowpass) suspension record

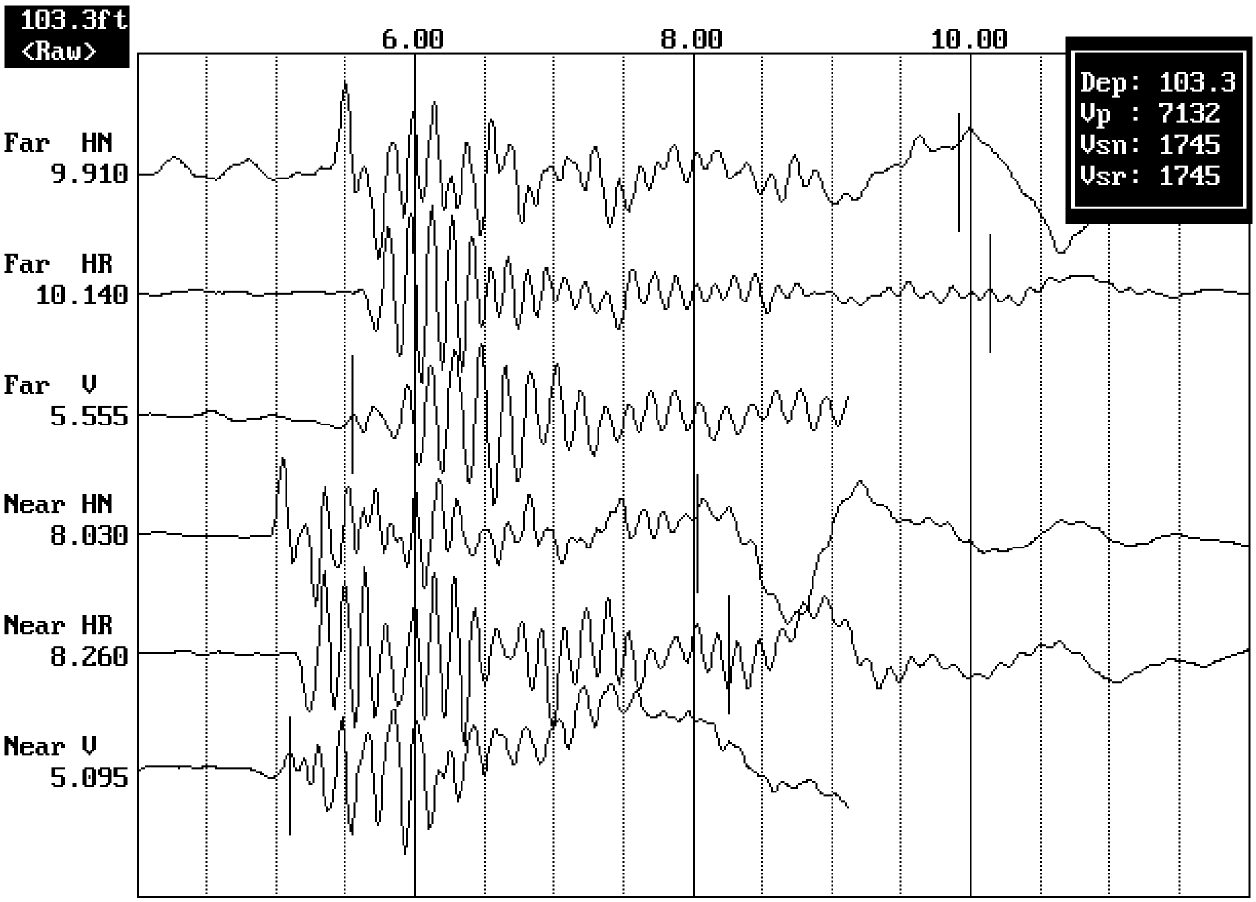

Figure 3. Example of unfiltered suspension record

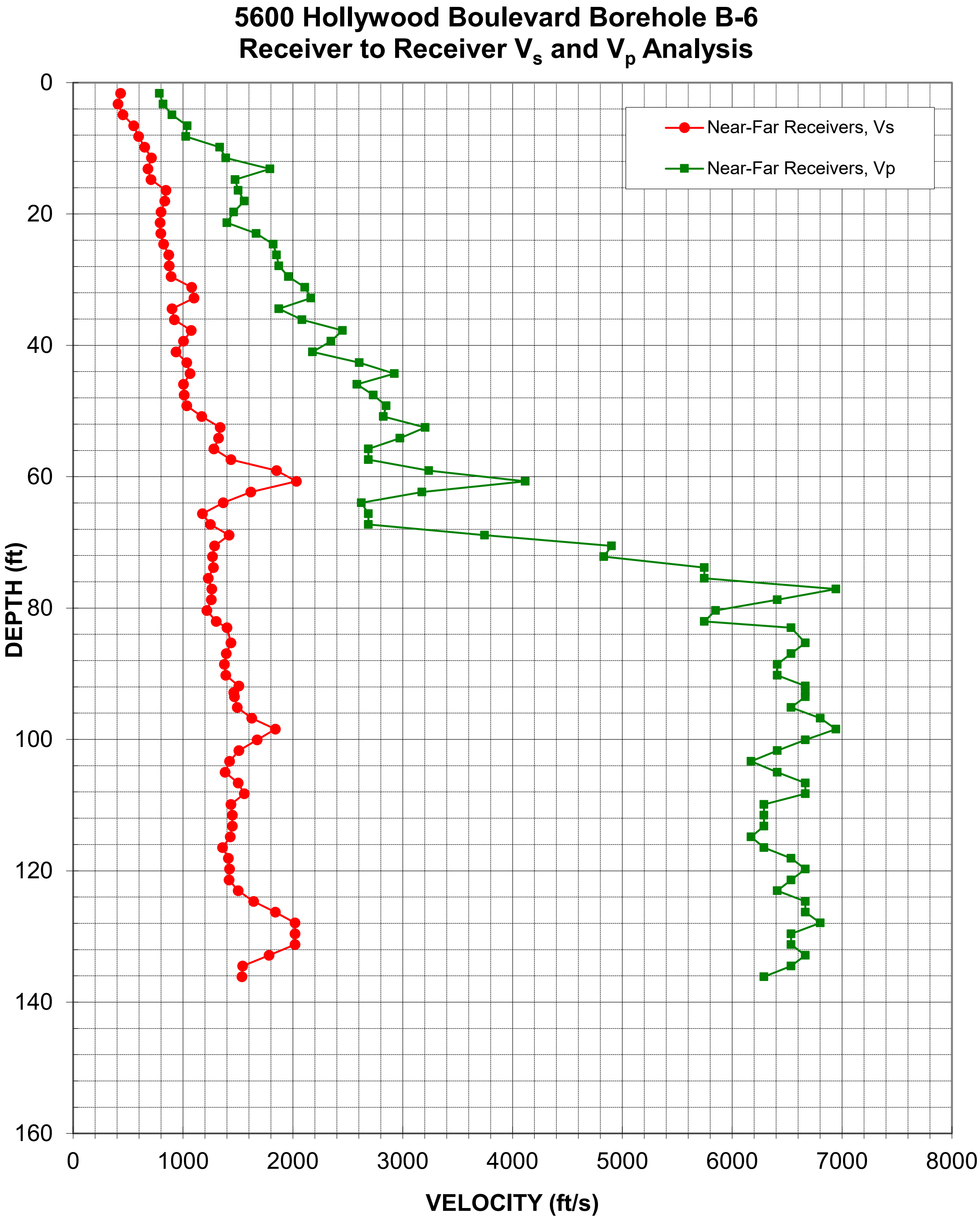

Figure 4: Borehole B-6, Suspension R1-R2 P- and SH-wave velocities

Table 3. Borehole B-6, Suspension R1-R2 depths and P- and S_H-wave velocities

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio Based on Receiver-to-Receiver Travel Time Data - Borehole B-6

American Units				Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio	Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V_s	V_p			V_s	V_p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
1.6	430	780	0.28	0.5	130	240	0.28
3.3	410	820	0.33	1.0	120	250	0.33
4.9	450	900	0.33	1.5	140	270	0.33
6.6	550	1040	0.30	2.0	170	320	0.30
8.2	600	1030	0.25	2.5	180	310	0.25
9.8	650	1330	0.34	3.0	200	410	0.34
11.5	710	1390	0.32	3.5	220	420	0.32
13.1	680	1790	0.42	4.0	210	550	0.42
14.8	710	1470	0.35	4.5	220	450	0.35
16.4	840	1500	0.27	5.0	260	460	0.27
18.0	830	1560	0.30	5.5	250	470	0.30
19.7	800	1460	0.29	6.0	240	450	0.29
21.3	790	1400	0.27	6.5	240	430	0.27
23.0	800	1670	0.35	7.0	240	510	0.35
24.6	820	1820	0.37	7.5	250	560	0.37
26.3	870	1850	0.36	8.0	270	560	0.36
27.9	870	1870	0.36	8.5	270	570	0.36
29.5	890	1960	0.37	9.0	270	600	0.37
31.2	1080	2110	0.32	9.5	330	640	0.32
32.8	1100	2160	0.33	10.0	340	660	0.33
34.5	900	1870	0.35	10.5	270	570	0.35
36.1	920	2080	0.38	11.0	280	640	0.38
37.7	1080	2450	0.38	11.5	330	750	0.38
39.4	1000	2350	0.39	12.0	310	720	0.39
41.0	940	2180	0.39	12.5	290	660	0.39
42.7	1040	2600	0.41	13.0	320	790	0.41
44.3	1060	2920	0.42	13.5	320	890	0.42
45.9	1000	2580	0.41	14.0	310	790	0.41
47.6	1010	2730	0.42	14.5	310	830	0.42
49.2	1040	2850	0.42	15.0	320	870	0.42
50.9	1170	2820	0.40	15.5	360	860	0.40
52.5	1340	3210	0.39	16.0	410	980	0.39
54.1	1320	2980	0.38	16.5	400	910	0.38
55.8	1280	2690	0.35	17.0	390	820	0.35
57.4	1440	2690	0.30	17.5	440	820	0.30
59.1	1850	3240	0.26	18.0	560	990	0.26
60.7	2030	4120	0.34	18.5	620	1250	0.34
62.3	1620	3170	0.32	19.0	490	970	0.32

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio Based on Receiver-to-Receiver Travel Time Data - Borehole B-6

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V_s	V_p	
(ft)	(ft/s)	(ft/s)	
64.0	1370	2620	0.31
65.6	1180	2690	0.38
67.3	1250	2690	0.36
68.9	1420	3750	0.42
70.5	1290	4900	0.46
72.2	1270	4830	0.46
73.8	1280	5750	0.47
75.5	1230	5750	0.48
77.1	1260	6940	0.48
78.7	1260	6410	0.48
80.4	1220	5850	0.48
82.0	1300	5750	0.47
83.0	1400	6540	0.48
85.3	1440	6670	0.48
86.9	1390	6540	0.48
88.6	1380	6410	0.48
90.2	1390	6410	0.48
91.9	1510	6670	0.47
92.9	1460	6670	0.47
93.5	1470	6670	0.47
95.1	1490	6540	0.47
96.8	1630	6800	0.47
98.4	1840	6940	0.46
100.1	1680	6670	0.47
101.7	1510	6410	0.47
103.4	1420	6170	0.47
105.0	1380	6410	0.48
106.6	1500	6670	0.47
108.3	1560	6670	0.47
109.9	1440	6290	0.47
111.6	1450	6290	0.47
113.2	1450	6290	0.47
114.8	1430	6170	0.47
116.5	1360	6290	0.48
118.1	1410	6540	0.48
119.8	1420	6670	0.48
121.4	1420	6540	0.48
123.0	1500	6410	0.47
124.7	1640	6670	0.47
126.3	1840	6670	0.46

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V_s	V_p	
(m)	(m/s)	(m/s)	
19.5	420	800	0.31
20.0	360	820	0.38
20.5	380	820	0.36
21.0	430	1140	0.42
21.5	390	1490	0.46
22.0	390	1470	0.46
22.5	390	1750	0.47
23.0	370	1750	0.48
23.5	380	2120	0.48
24.0	380	1950	0.48
24.5	370	1780	0.48
25.0	400	1750	0.47
25.3	430	1990	0.48
26.0	440	2030	0.48
26.5	430	1990	0.48
27.0	420	1950	0.48
27.5	420	1950	0.48
28.0	460	2030	0.47
28.3	450	2030	0.47
28.5	450	2030	0.47
29.0	460	1990	0.47
29.5	500	2070	0.47
30.0	560	2120	0.46
30.5	510	2030	0.47
31.0	460	1950	0.47
31.5	430	1880	0.47
32.0	420	1950	0.48
32.5	460	2030	0.47
33.0	470	2030	0.47
33.5	440	1920	0.47
34.0	440	1920	0.47
34.5	440	1920	0.47
35.0	440	1880	0.47
35.5	410	1920	0.48
36.0	430	1990	0.48
36.5	430	2030	0.48
37.0	430	1990	0.48
37.5	460	1950	0.47
38.0	500	2030	0.47
38.5	560	2030	0.46

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio Based on Receiver-to-Receiver Travel Time Data - Borehole B-6

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V_s	V_p	
(ft)	(ft/s)	(ft/s)	
128.0	2020	6800	0.45
129.6	2020	6540	0.45
131.2	2020	6540	0.45
132.9	1780	6670	0.46
134.5	1540	6540	0.47
136.2	1540	6290	0.47

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V_s	V_p	
(m)	(m/s)	(m/s)	
39.0	620	2070	0.45
39.5	620	1990	0.45
40.0	620	1990	0.45
40.5	540	2030	0.46
41.0	470	1990	0.47
41.5	470	1920	0.47

APPENDIX A

SUSPENSION VELOCITY MEASUREMENT QUALITY ASSURANCE SUSPENSION SOURCE TO RECEIVER ANALYSIS RESULTS

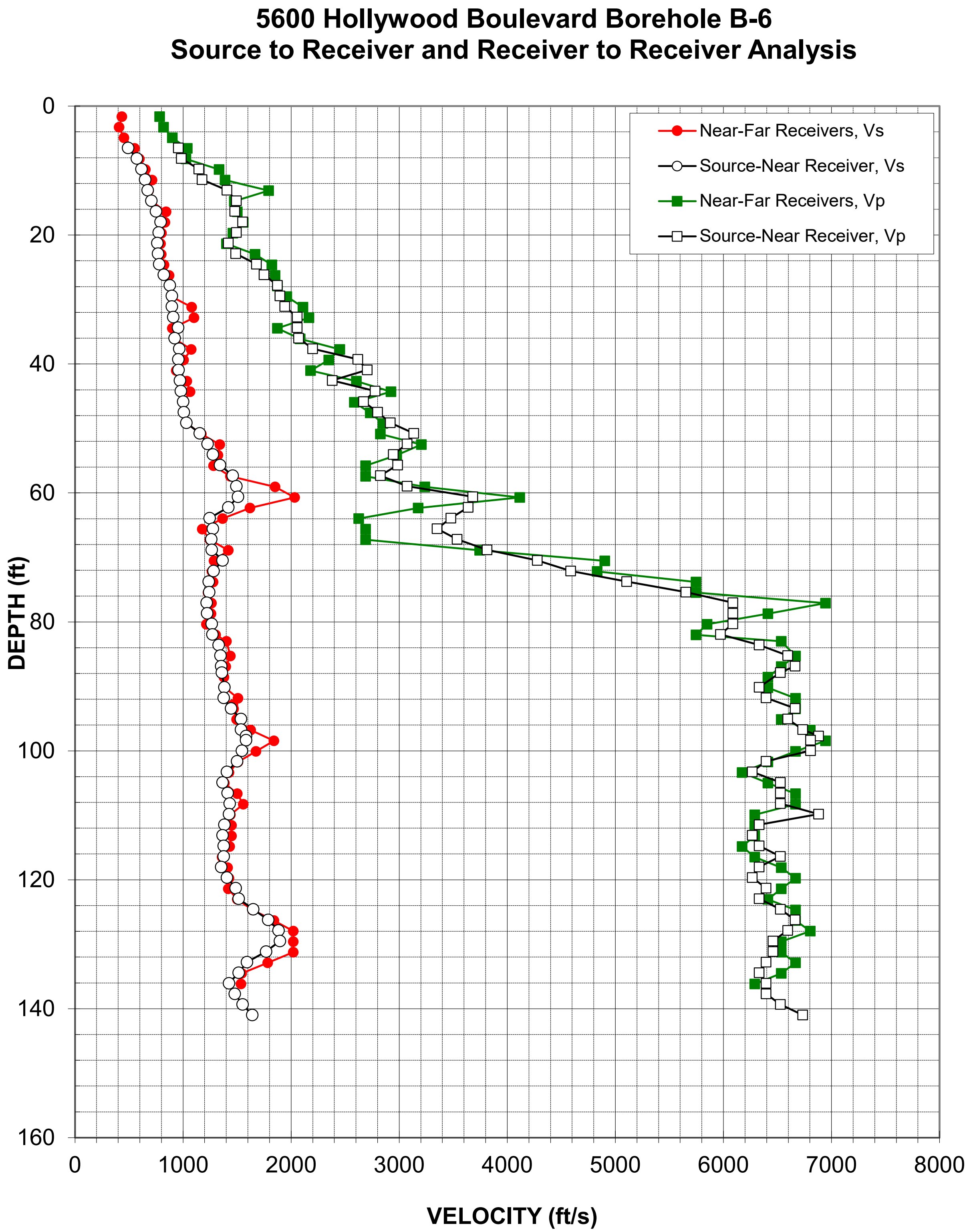

Figure A-1: Borehole B-6, Suspension S-R1 P- and S_H-wave velocities

Table A-1. Borehole B-6, S - R1 quality assurance analysis P- and S_H-wave data

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole B-6

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V_s	V_p			V_s	V_p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
6.5	490	960	0.32	2.0	150	290	0.32
8.1	570	980	0.24	2.5	170	300	0.24
9.8	610	1140	0.30	3.0	190	350	0.30
11.4	650	1180	0.28	3.5	200	360	0.28
13.0	670	1410	0.35	4.0	210	430	0.35
14.7	710	1490	0.36	4.5	220	460	0.36
16.3	750	1480	0.33	5.0	230	450	0.33
18.0	790	1550	0.32	5.5	240	470	0.32
19.6	770	1490	0.32	6.0	240	460	0.32
21.2	760	1420	0.30	6.5	230	430	0.30
22.9	770	1490	0.32	7.0	230	450	0.32
24.5	780	1680	0.36	7.5	240	510	0.36
26.2	820	1750	0.36	8.0	250	530	0.36
27.8	880	1870	0.36	8.5	270	570	0.36
29.4	900	1900	0.36	9.0	270	580	0.36
31.1	900	1940	0.36	9.5	270	590	0.36
32.7	910	2060	0.38	10.0	280	630	0.38
34.4	950	2060	0.36	10.5	290	630	0.36
36.0	920	2070	0.38	11.0	280	630	0.38
37.6	960	2200	0.38	11.5	290	670	0.38
39.3	960	2620	0.42	12.0	290	800	0.42
40.9	960	2710	0.43	12.5	290	820	0.43
42.6	970	2380	0.40	13.0	300	730	0.40
44.2	980	2780	0.43	13.5	300	850	0.43
45.8	1000	2670	0.42	14.0	310	810	0.42
47.5	1010	2800	0.43	14.5	310	850	0.43
49.1	1030	2920	0.43	15.0	310	890	0.43
50.8	1160	3130	0.42	15.5	350	960	0.42
52.4	1230	3070	0.41	16.0	370	940	0.41
54.0	1280	2940	0.38	16.5	390	900	0.38
55.7	1340	2990	0.37	17.0	410	910	0.37
57.3	1460	2830	0.32	17.5	440	860	0.32
59.0	1490	3070	0.35	18.0	460	940	0.35
60.6	1510	3680	0.40	18.5	460	1120	0.40
62.2	1420	3640	0.41	19.0	430	1110	0.41
63.9	1250	3480	0.43	19.5	380	1060	0.43
65.5	1280	3350	0.42	20.0	390	1020	0.42

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole B-6

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V_s	V_p			V_s	V_p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
67.2	1260	3540	0.43	20.5	380	1080	0.43
68.8	1270	3810	0.44	21.0	390	1160	0.44
70.5	1360	4280	0.44	21.5	420	1300	0.44
72.1	1280	4590	0.46	22.0	390	1400	0.46
73.7	1240	5100	0.47	22.5	380	1560	0.47
75.4	1240	5650	0.47	23.0	380	1720	0.47
77.0	1220	6090	0.48	23.5	370	1860	0.48
78.7	1220	6090	0.48	24.0	370	1860	0.48
80.3	1270	6090	0.48	24.5	390	1860	0.48
81.9	1270	5970	0.48	25.0	390	1820	0.48
83.6	1330	6330	0.48	25.5	410	1930	0.48
85.2	1350	6590	0.48	26.0	410	2010	0.48
86.9	1350	6660	0.48	26.5	410	2030	0.48
87.8	1360	6530	0.48	26.8	410	1990	0.48
90.1	1380	6330	0.47	27.5	420	1930	0.47
91.8	1380	6390	0.48	28.0	420	1950	0.48
93.4	1450	6660	0.48	28.5	440	2030	0.48
95.1	1540	6590	0.47	29.0	470	2010	0.47
96.7	1540	6730	0.47	29.5	470	2050	0.47
97.7	1580	6880	0.47	29.8	480	2100	0.47
98.3	1580	6810	0.47	30.0	480	2070	0.47
100.0	1540	6810	0.47	30.5	470	2070	0.47
101.6	1500	6390	0.47	31.0	460	1950	0.47
103.3	1410	6270	0.47	31.5	430	1910	0.47
104.9	1360	6530	0.48	32.0	420	1990	0.48
106.5	1410	6530	0.48	32.5	430	1990	0.48
108.2	1430	6530	0.47	33.0	440	1990	0.47
109.8	1430	6880	0.48	33.5	430	2100	0.48
111.5	1380	6330	0.47	34.0	420	1930	0.47
113.1	1360	6270	0.48	34.5	420	1910	0.48
114.7	1380	6330	0.48	35.0	420	1930	0.48
116.4	1380	6530	0.48	35.5	420	1990	0.48
118.0	1350	6330	0.48	36.0	410	1930	0.48
119.7	1410	6270	0.47	36.5	430	1910	0.47
121.3	1490	6390	0.47	37.0	450	1950	0.47
122.9	1510	6330	0.47	37.5	460	1930	0.47
124.6	1650	6530	0.47	38.0	500	1990	0.47
126.2	1790	6660	0.46	38.5	550	2030	0.46
127.9	1880	6590	0.46	39.0	570	2010	0.46

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio Based on Source-to-Receiver Travel Time Data - Borehole B-6

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V_s	V_p			V_s	V_p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
129.5	1900	6460	0.45	39.5	580	1970	0.45
131.1	1770	6460	0.46	40.0	540	1970	0.46
132.8	1590	6390	0.47	40.5	480	1950	0.47
134.4	1510	6330	0.47	41.0	460	1930	0.47
136.1	1430	6390	0.47	41.5	430	1950	0.47
137.7	1480	6390	0.47	42.0	450	1950	0.47
139.3	1550	6530	0.47	42.5	470	1990	0.47
141.0	1640	6730	0.47	43.0	500	2050	0.47

APPENDIX B

BOREHOLE GEOPHYSICAL LOGGING SYSTEMS - NIST TRACEABLE CALIBRATION RECORDS

MICRO PRECISION CALIBRATION, INC
2165 N. Glassell St.,
Orange, CA 92865
714-901-5659

ilac-MRA ANAB ACCREDITED ISO/IEC 17025 CALIBRATION LABORATORY AC-1969.03

Certificate of Calibration

Date: May 4, 2020 **Cert No. 551220083593651**

Customer:
GEOVISION
1124 OLYMPIC DRIVE
CORONA CA 92881

		Work Order #:	LA-90046721
		Purchase Order #:	19160-200422-01
MPC Control #:	AM6767	Serial Number:	160023
Asset ID:	160023	Department:	N/A
Gage Type:	LOGGER	Performed By:	KYLE ANDERSON
Manufacturer:	OYO	Received Condition:	IN TOLERANCE
Model Number:	3403	Returned Condition:	IN TOLERANCE
Size:	N/A	Cal. Date:	April 30, 2020
Temp/RH:	22.5°C / 42.9%	Cal. Interval:	12 MONTHS
Location:	Calibration performed at MPC facility	Cal. Due Date:	April 30, 2021

Calibration Notes:

See attached data sheet for calculations. (1 Page)
Calibrated IAW customer supplied data form Rev 2.1
Frequency measurement uncertainty = 0.0005 Hz
Unit calibrated with Laptop Panasonic Model CF-29,s/n: 6AKSB01291
Calibrated To 4:1 Accuracy Ratio

Calibration performed in accordance with approved GEOVision calibration procedures included in work Instruction No. 06
Software: Geometrics seismodule controller ver 11.0.57, pickwin95.exe ver 3.2.0.1

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
DB8748	GPS TIME AND FREQUENCY RECEIVER	58503A	3625A01225	HEWLETT PACKARD	Apr 30, 2021	551220083021224
BD7715	UNIVERSAL COUNTER	53131A	3416A05377	HEWLETT PACKARD	Apr 30, 2021	551220082934517
LAS0052	ARB / FUNC GENERATOR	33250A	MY40029031	AGILENT	Oct 31, 2020	551220083302616

Calibrating Technician: KYLE ANDERSON

QC Approval: Tyler McKeen

STATEMENTS OF PASS OR FAIL CONFORMANCE: The uncertainty of measurement has been taken into account when determining compliance with specification, as per ILAC-G8:03/2009. All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCSL Z540.3-2006 and in case without guard banded the probability of false-accept depending on test uncertainty ratio.

THE CALIBRATION REPORT STATUS;
PASS- Term used when compliance statement is given, and the measurement result is PASS.
PASS^{Z}- Term used when compliance statement is given, and the measurement result is conditional passed or PASS^{Z}.
FAIL- Term used when compliance statement is given, and the measurement result is FAIL.
FAIL^{Z}- Term used when compliance statement is given, and the measurement result is conditional failed or FAIL^{Z}.
REPORT OF VALUE - Term used when reported measurement is not requiring compliance statement in report.
ADJUSTED- When adjustments are made to an instrument which changes the value of measurement from what was measured as found to new value as left.
LIMITED - When an instrument fails calibration but is still functional in a limited manner.

MICRO PRECISION CALIBRATION, INC
2165 N. Glassell St.,
Orange, CA 92865
714-901-5659

Certificate of Calibration

ACCREDITED ISO/IEC 17025 CALIBRATION LABORATORY AC-1969.03

Date: May 4, 2020 **Cert No. 551220083593651**

Procedures Used in this Event

Procedure Name	Description
GEOVISION SEISMIC Rev. 2.1	Seismic Logger/Recorder Calibration Procedure, Rev. 2.1

Calibrating Technician: KYLE ANDERSON

QC Approval: Tyler McKeen

STATEMENTS OF PASS OR FAIL CONFORMANCE: The uncertainty of measurement has been taken into account when determining compliance with specification, as per ILAC-G8:03/2009. All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCSL Z540.3-2006 and in case without guard banded the probability of false-accept depending on test uncertainty ratio.

THE CALIBRATION REPORT STATUS:
PASS- Term used when compliance statement is given, and the measurement result is PASS.
PASS^{z}- Term used when compliance statement is given, and the measurement result is conditional passed or PASS^{z}.
FAIL- Term used when compliance statement is given, and the measurement result is FAIL.
FAIL^{z}- Term used when compliance statement is given, and the measurement result is conditional failed or FAIL^{z}.
REPORT OF VALUE - Term used when reported measurement is not requiring compliance statement in report.
ADJUSTED- When adjustments are made to an instrument which changes the value of measurement from what was measured as found to new value as left.
LIMITED - When an instrument fails calibration but is still functional in a limited manner.

GEOVision
geophysical services

SUSPENSION PS SEISMIC LOGGER/RECORDER CALIBRATION DATA FORM

INSTRUMENT DATA

System mfg.:	Oyo	Model no.:	3403
Serial no.:	160023	Calibration date:	4/30/2020
By:	Micro Precision	Due date:	4/30/2021
Counter mfg.:	Hewlett-Packard	Model no.:	53131A
Serial no.:	3416A05377	Calibration date:	4/23/2020
By:	Micro precision	Due date:	4/30/2021
Signal generator mfg.:	Agilent	Model no.:	33250A
Serial no.:	MY40029031	Calibration date:	10/31/2019
By:	Micro precision	Due date:	10/31/2020
Laptop controller mfg.:	Panasonic	Model no.:	Toughbook CF-29
Serial no.:	6AKSB01291	Calibration date:	N/A

SYSTEM SETTINGS:

Gain:	lowest setting - 2
Filter	10 KHz
Range:	200 to 5 microseconds
Delay:	0 msec
Stack (1 std)	1
System date = correct date and time	4/30/2020 14:36

PROCEDURE:

Set sine wave frequency to target frequency with amplitude of approximately 0.25 volt peak
Note actual frequency on data form.
Set sample period and record data file to disk. Note file name on data form.
Pick duration of 9 cycles using PSLOG.EXE program, note duration on data form, and save as .sps file. Calculate average frequency for each channel pair and note on data form.

Average frequency must be within +/- 1% of actual frequency at all data points.

Maximum error ((AVG-ACT)/ACT*100)% As found 0.22% As left 0.22%

Target Frequency (Hz)	Actual Frequency (Hz)	Sample Period (microS)	File Name	Time for 9 cycles Hn (msec)	Average Frequency Hn (Hz)	Time for 9 cycles Hr (msec)	Average Frequency Hr (Hz)	Time for 9 cycles V (msec)	Average Frequency V (Hz)
50.00	50.00	200	201	180	50.00	180	50.00	180	50.00
100.0	100.0	100	202	90.1	99.9	89.9	100.1	90.2	99.8
200.0	200.0	50	203	45	200.0	45.05	199.8	45.05	199.8
500.0	500.0	20	204	18	500.0	18	500.0	18	500.0
1000	1000	10	205	9.01	999	9.01	999	9	1000
2000	2000	5	206	4.5	2000	4.49	2004	4.495	2002

Calibrated by: Kyle Anderson 4/30/2020 [signature]
Name Date Signature

Witnessed by: Emily Feldman 4/30/2020 [signature]
Name Date Signature

Suspension PS Seismic Recorder/Logger Calibration Data Form Rev 2.1 February 7, 2012