Appendix E:
Geology and Soils Supporting Information

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E.1 - Geotechnical and Geohazards Investigation Report

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Geo-Advantec, Inc.

G Geotechnical Engineering
A Earthquake Engineering
Inspection and Testing
I Engineering Geology

GEOTECHNICAL AND GEOHAZARDS INVESTIGATION REPORT

PROJECT:
NEW OUTDOOR POOL FACILITY AND SOUTH CAMPUS IMPROVEMENTS
LA CAÑADA HIGH SCHOOL
4463 OAK GROVE DRIVE
LA CAÑADA, CALIFORNIA 91011

FOR:
4490 CORNISHON AVENUE
LA CAÑADA, CALIFORNIA 91011

LA CAÑADA UNIFIED SCHOOL DISTRICT
ESTABLISHED 1885

PREPARED BY:
GEO-ADVANTEC, INC.
457 W. ALLEN AVENUE, SUITE 113
SAN DIMAS, CALIFORNIA 91773
PROJECT NO. 19-1093(R.01)
OCTOBER 10, 2019

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Mr. Harold J. Pierre, P.E.
Program Manager
Linik CORP. Builders Management
25239 Avenue Tibbitts
Valencia, California 91355

October 10, 2019
Project No. 19-1093(R.01)

Subject: Geotechnical and Geohazards Investigation Report,
New Outdoor Pool Facility and South Campus Improvements at
La Cañada High School
4463 Oak Grove Drive
La Cañada, California 91011

1. INTRODUCTION

This report presents the results of a Geotechnical and Geohazards Investigation performed by Geo-Advantec, Inc. (GAI) for the proposed New Outdoor Pool Facility and South Campus Improvements project for the La Cañada High School located within the City of La Cañada, California. This geotechnical and geohazard investigation was performed to provide geotechnical information for the design and construction of the proposed developments, as described in the forthcoming sections of this report. This report also includes our recommendations for the design and construction of the proposed developments from a geotechnical standpoint.

The recommendations provided within this submittal are based on the results of our field exploration, laboratory testing, engineering analyses, and our experience from similar projects. Our services were performed in general accordance with our Proposal No. 19-1093(R.01), dated July 2, 2019.

A vicinity map is presented as Figure A-1 within Appendix A. An aerial photo of the site, presented as Figure A-2 within Appendix A, has been used as the base map to depict the approximate locations of the proposed developments, the borings, and the percolation tests performed.

Our professional services have been performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in this or similar localities. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has been prepared for Linik CORP ("Client"), La Cañada Unified School District ("District"), and their design consultant for the subject project. The report has not been prepared for use by other parties and may not contain sufficient information for other parties or the purposes of other uses. The Geotechnical Engineer of Record should be allowed to review the plans for the proposed developments and perform such additional geotechnical analyses as may be required to confirm the applicability of the recommendations contained in this report to the final design.

2. SITE CONDITIONS

The site of the existing La Cañada High School is located in the City of La Cañada, California. The entire campus is bounded by Interstate 210, Oak Grove Drive, and Berkshire Place on the west, east, and south side, respectively. The campus is also bordered with a learning center (Child Education Center) and another high school (St. Francis High School) to the north side. The proposed developments area focuses on the south part of campus, which currently consist of the Spartan Pool, South Gym, Basketball Court, Junior Varsity Baseball Field, and Student Parking Lot. It should be noted that an old leach field (abandoned in 1997) lies beneath part of the existing basketball court and baseball field, where the new proposed swimming pool will be built. The site is relatively flat (roughly 1 percent north to south descending slope) with an approximate elevation of 1,090 feet above mean sea level (AMSL). More detailed information about the location of the subject project is presented on Figures A-1, A-2a, and A-2b within Appendix A of this report.

3. PROPOSED DEVELOPMENTS

Based on the plan and information provided by the Client, it is our understanding that the proposed developments at La Cañada High School includes:

1. Construction of new basketball courts on the footprint of the existing swimming pool.
2. Construction of a new 40-meter swimming pool.
3. Construction of two new buildings ("peripheral buildings") adjacent to the 40-meter swimming pool. The northern building will be utilized for restroom, locker, and office purposes. The smaller southern building will be utilized for restroom, pool equipment storage, and tickets/announcer booth purposes.
4. Expansion of the south parking area to the west side partially into the baseball fields.

Our understanding of the proposed developments is based on the plan and information provided by the Client, and it is the basis for the geotechnical recommendations provided in this submittal.

4. SCOPE OF SERVICES

Our scope of services for this project included the followings:

- Performing a site reconnaissance, evaluating the general site conditions, and marking the proposed boring locations for the purpose of underground utility clearance.
- Conducting six exploratory borings at the proposed locations within vicinity of the proposed developments using truck-mounted hollow-stem drilling rig and sampling at 5 feet intervals.
- Conducting three falling head borehole percolation tests for the proposed on-site stormwater infiltration system.
- Performing laboratory testing on selected soil samples obtained from our exploratory borings.
- Reviewing the field data and laboratory test results and performing engineering analyses.
- Preparing a final geotechnical evaluation report for the site, which includes our findings and recommendations for the design and construction of the proposed developments from a geotechnical point of view.

5. FIELD EXPLORATORY WORKS

GAI conducted field exploratory program using One Way Drilling as the drilling contractor on July 27, 2019, and it consisted of performing a total of six 8-inch diameter borings and three falling head borehole percolation tests. Figure A-2 within Appendix A presents the approximate locations of the borings and percolation tests performed plotted on an aerial photo of the site along with the approximate footprint of the proposed developments.

The borings were conducted using a truck-mounted hollow-stem drilling rig and were drilled down to the planned depths. The borings were located at the vicinity or within the footprint of the proposed developments considering accessibility limitations. Table 5.1 summarizes the area, depth, and samples collected for each boring. Standard Penetration Test (SPT) and Modified California Sampler samples were taken starting at 5 to 7 feet below the ground surface (bgs) and alternating every 5 feet thereafter until the planned depths for Borings B-2 to B-6.

Table 5.1. *Borings and Percolation Tests Summary*

Boring ID	Developments	Depth (ft)	Sample[a]
B-1	Parking Lot	5.0	Bulk
B-2	Parking Lot	8.5	Bulk, MC
B-3	Peripheral Buildings	8.5	Bulk, SPT
B-4	Peripheral Buildings	41.0	Bulk, SPT, MC
B-5	Peripheral Buildings	41.0	Bulk, SPT, MC
B-6	Demolition Area	7.5	Bulk, MC
P-1	Infiltration System	7.0	Bulk
P-2	Infiltration System	7.0	Bulk
P-3	Infiltration System	7.0	Bulk

[a]SPT: Standard Penetration Test
MC: Modified California (Thick wall) Driven Sampler

6. SUBSURFACE CONDITIONS

The soil encountered in our exploratory work was predominantly silty sand with varying amounts of gravel throughout the entire depths. Boring B-4 encountered a thin layer of silty gravel at approximately 15 feet bgs. Clay traces were also encountered in Boring B-4 at 10 feet bgs and Boring B-5 at 40 feet bgs.

The silty sand layers in the upper 10 feet bgs were generally loose to medium dense except for Borings B-3 and B-6, which were medium dense to very dense. From 15 feet bgs to the maximum depth explored (i.e. 41 feet bgs), the silty sand layers were dense to very dense. The encountered soils were generally dry to slightly moist and becoming moist at approximately 25 feet bgs in Boring B-4 and at 35 feet bgs in Boring B-5.

Variations in the soil layer conditions, as well as more detailed information, are indicated on the attached boring logs in Appendix B. Approximate locations of the borings are shown on the boring locations plan, Figure A-2a and A-2b within Appendix A.

The soil conditions described in this report are based on the soils observed in the borings drilled for this investigation and the laboratory test results. It is possible that soil conditions could vary in areas other than the boring locations.

7. LABORATORY TESTING

Laboratory testing, including moisture content, unit weight, gradation, and plasticity index (Atterberg limits) tests were performed on selected samples obtained from the site investigation to aid in the classification of the encountered layers and to evaluate their engineering properties. Also, direct shear, consolidation, R-Value, expansion index, sulfates, chlorides, resistivity, and pH tests (corrosivity tests) have been conducted on selected samples. The following is the list of tests performed:

- Density of Soil in Place by the Drive-Cylinder Method (ASTM D 2937)
- Particle Size Analysis (ASTM D 422)
- Liquid Limit, Plastic Limit, and Plasticity Index (ASTM D 4318)
- Direct Shear Test (ASTM D 3080)
- One-Dimensional Consolidation Properties (ASTM D 2435)
- Resistance R-value and Expansion Pressure (ASTM D 2844)
- Expansion Index (ASTM D 4829)
- Sulfate Content and Chloride Content (CT 417 and CT 422)
- Resistivity and pH Measurements (CT 643)

The results of our laboratory tests are provided in Appendix C, and selected results are shown on the boring logs in Appendix B.

8. GROUNDWATER

As mentioned above, the subject site has an approximate elevation of about 1,090 feet AMSL. We have reviewed the historically highest groundwater contour map (Figure D-2 within Appendix D) excerpted from the *Seismic Hazard Zone Report 014 for the Pasadena 7.5-Minute Quadrangle* published by the California Department of Conservation. Historically highest groundwater depth is noted to be at approximately 40 to 50 feet bgs. Additionally, groundwater was not encountered during our exploratory works to a maximum depth of 41 feet bgs.

Based on the site topography, historically highest groundwater contour map, and data obtained from the exploratory borings conducted at the site, it is our opinion that the groundwater depth at the site is lower than 40 feet from the existing grade, and it is unlikely that groundwater would be encountered during the course of construction for the proposed developments.

9. SITE GEOLOGY

The site is located in the Cresenta Valley, which is bounded by the San Gabriel Mountains to the north and the Verdugo Mountains to the south. The San Fernando Valley is to the west and the San Gabriel Valley is to the east. The Cresenta Valley is part of the Transverse Ranges Geomorphic Province.

The Transverse Ranges Geomorphic Province extends from the Santa Ynez Mountains on the west to the Little San Bernardino Mountains on the east and consists of east west trending mountains and valleys. The Transverse Ranges are formed by a step in the San Andreas Fault, which produces the mountains as a result of the compression from movement on the fault.

Dibblee (1989) showed the site to be underlain by alluvial unconsolidated floodplain deposits of silts, sand, and gravel of the Holocene age. The borings conducted during our site investigation, on July 25, 2019 showed that the site, at the explored locations, is generally underlain by silty sands with varying amounts of gravels to the maximum depth explored. The boring logs are presented within Appendix B of this report, and the site geologic map is presented in Figure G-1.

10. SEISMIC CONSIDERATIONS

10.1. General

The subject site, like the rest of Southern California, is located within a seismically active region as a result of being located near the active margin between the North American and Pacific tectonic plates. The principal source of seismic activity is movement along the northwest-trending regional faults such as the San Andreas, San Jacinto, Newport-Inglewood, and Whittier-Elsinore fault zones.

By definition of the California Geological Survey (CGS), an active fault is one which has had surface displacement within the Holocene Epoch (roughly the last 11,000 years). The CGS has defined a potentially active fault as any fault which has been active during the Quaternary Period (approximately the last 1,600,000 years). These definitions are used in delineating Earthquake Fault Zones as mandated by the Alquist-Priolo Geologic Hazard Zones Act of 1972 and as subsequently revised in 1997 as the Alquist-Priolo Earthquake Fault Zones. The intent of the act is to require fault investigations on sites located within Special Studies Zone to preclude new construction of certain inhabited structures across the trace of active faults. The subject site is not located within an Alquist-Priolo Earthquake Fault Zone. The nearest active fault is the Sierra Madre Fault. The fault is located approximately 1.19 miles (1.92 km) northeast of our investigation location. No evidence of active or potentially active faulting was observed on the subject site during our investigation. Surface rupture is not considered to be a potential hazard to the site.

Table 10.1 below tabulates the faults, their corresponding maximum magnitude, and distances to the site. Figure G-2 in Appendix G illustrates the fault activity map at the vicinity of the project.

Table 10.1. *Active Faults at the Vicinity of the Site*

Fault Name	Maximum Magnitude	Distance to the Site (km)
Sierra Madre fault zone (Sierra Madre B)	7.2	1.92
Verdugo-Eagle Rock	6.8	4.63
Raymond	6.7	7.85
Hollywood	6.7	9.27
Santa Monica	7.3	13.31
Elysian Park (Upper)	6.6	13.73
Clamshell-Sawpit	6.6	16.58
San Gabriel	7.2	16.93
Puente Hills (LA)	6.9	22.63

Historic seismicity on the site was evaluated from earthquakes listed in the USGS database and is included in Figure G-3 within Appendix G. From historical records, the site has experienced moderate to severe ground shaking in the past. There are no records of any failures due to historic earthquakes for the site. No evidence of active or potentially active faulting was observed on the subject site during our investigation. Surface rupture is not considered to be a potential hazard to the site.

Probably the most important fault to the site from a seismic shaking standpoint is the northwest trending Sierra Madre Fault, located approximately 1.19 miles (1.92 kilometers) northeast of the site. The Sierra Madre Fault is zoned as an active fault in the Alquist-Priolo Fault Zoning Act.

Based on the information available at this time, it is our opinion that a M7.2 earthquake may occur on the Sierra Madre Fault. Large earthquakes could occur on other faults in the general area, but because of their greater distance and/or lower probability of occurrence, they are less important to the site from a seismic shaking standpoint.

Due to the proximity of the site to the Sierra Madre Fault, near field effects from strong ground motion associated with a large earthquake along this fault may occur at the site. These near field effects, including “fling” and directivity of strong ground motion, may result in significantly higher accelerations at the site.

10.2. Landsliding and Slope Stability

As mentioned above the site is relatively flat. Based on the *Earthquake Zones of Required Investigation – Pasadena Quadrangle* map, published by the California Geological Survey, the site is not located in an earthquake-induced landslide zone, as shown in Figure D-1 within Appendix D. No evidence for landsliding was observed on or in the immediate vicinity of the site. Therefore, it is our opinion that landsliding is not a potential hazard on the site.

10.3. Liquefaction

Liquefaction may occur when saturated, loose to medium dense, cohesionless soils are densified by ground vibrations. If the soils are not sufficiently permeable to dissipate these pressures during and immediately following an earthquake, the densification will result in increased pore water pressures. When the pore water pressure is equal to or exceeds the overburden pressure, liquefaction of the affected soil layers occurs. For liquefaction to occur, three conditions are required:

- ground shaking of sufficient magnitude and duration;
- a ground water level at or above the level of the susceptible soils during the ground shaking; and
- soils that are susceptible to liquefaction.

Based on the *Earthquake Zones of Required Investigation – Pasadena Quadrangle* map, published by the California Geological Survey, the site does not lie in a seismic hazard zone of liquefaction as shown in Figure D-1 within Appendix D. Therefore, due to the zoning of the site, it is our opinion that liquefaction is not a potential hazard at the subject site.

10.4. Earthquake-Induced Dry Settlement

Strong ground motion during an earthquake will reduce the pore space between soils particles, and it is well known that loose sands tend to compress during dynamic shaking. Soils underlying the site and to the maximum depth explored include some coarse-grained layers of silty sands and well-graded sands with silt. The dry settlement analysis was performed with groundwater level at approximately 40 feet bgs. The results of our analyses are provided in Figures E-1a and E-1b within Appendix E of this report, and it indicates that a maximum total earthquake-induced dry settlement of about 1½ inches is expected to occur at the site.

10.5. Flooding

The site does not lie within a Special Flood Hazard Area (SFHA), i.e. 100-year flood area, nor in a dam inundation area, as shown on the FEMA Flood Map #06037C1375F (Figure A-3 within Appendix A). Therefore, flooding is not considered to be a potential hazard to the site.

10.6. Oil Wells

The project site is not located within any oil and/or gas field, and the search result on the oil wells at the vicinity of the site on the Department of Conservation's Division of Oil, Gas, and Geothermal Resources (DOGGR) is presented in Figure A-4 within Appendix A. The DOGGR records indicate that there are no wells within a one-mile radius of the site. Therefore, it is our opinion that no hazardous materials associated with any oil well/field is expected on the site.

11. CONCLUSIONS AND RECOMMENDATIONS

11.1. General

Based on our understanding of the project, we have determined that the planned developments are feasible from a geotechnical engineering point of view provided the geotechnical recommendations presented in this report are followed. The shallow on-site soils from below the ground surface consist of loose to medium dense silty sands followed by dense to very dense silty sand. Therefore, to reduce any potential future damages, due to likelihood of excessive total and differential settlement under the anticipated loads, the following recommendations should be incorporated into design and construction of the proposed on-site developments. As discussed in the following sections of this report, conventional shallow footings are recommended for the proposed peripheral buildings adjacent to the new 40-meter pool.

<u>It is recommended that a formal review of foundation plans be performed by GAI, when plans become available, to verify the applicability of the recommendations contained herein.</u>

11.2. Grading Requirements

11.2.1. <u>Peripheral Buildings</u>

As discussed, the upper soils strata underlying the site predominantly consists of loose to medium dense silty sands followed by dense to very dense silty sand. Therefore, to provide a more uniform bearing stratum and to minimize any potential settlement to a tolerable level, over-excavation and compaction of the on-site soil below the designated areas for the proposed peripheral buildings is recommended.

It is recommended that the on-site soils below the footprint of proposed buildings be over-excavated, moisture-conditioned, and recompacted, so that the new conventional shallow footings consisting of spread-strip footings be supported entirely on at least 7 feet of compacted fill or engineered fill that extends to 9 feet below the existing grade, whichever provides the deeper fill. As an alternative to conventional shallow footings, the proposed building foundations may also be mat-type foundation supported entirely on at least 3 feet of compacted fill or engineered fill that extends to 5 feet below the existing grade, whichever provides the deeper fill. The over-excavation shall laterally extend at least 5 feet from the outer faces of the perimeter footings in all directions. The over-excavated area shall be backfilled to the designated grade. Adjacent to existing structures, over-excavation shall be performed by employing slot-cut (A-B-C) method.

The backfilled materials shall comply with the requirements outlined in Section 11.4 of this report and shall be moisture-conditioned to a moisture content between the optimum and 3 percent above the optimum moisture content and compacted to at least 95 percent of the maximum dry density obtained per ASTM D1557. Prior to placement of backfill, the bottom of removal shall be observed and confirmed to be competent by the Geotechnical Engineer of Record.

Following the over-excavation, we recommend that the areas to receive engineered fill be scarified to a minimum depth of 8 inches, moisture-conditioned to a moisture content between the optimum and 3 percent above the optimum moisture content, and compacted to at least 90 percent of the maximum dry density obtained per ASTM D1557.

11.2.2. Swimming Pool

The proposed development area for the new swimming pool is within the footprint of an old leach field that was abandoned in 1997 (as mentioned in Section 2). Based on the drawings available to us, the leaching trenches are expected to be about 5 feet deep from the ground surface. The excavation for the swimming pool is expected to be at deeper depth than the bottom of the leaching field trenches. However, contaminated soils are likely to be encountered during excavation and the contractor shall follow the recommendations outlined is Section 11.12.2, and all applicable codes and regulations.

It is recommended that the on-site soils below the footprint of the proposed swimming pool be over-excavated, moisture-conditioned, and recompacted, so that the swimming pool will be supported entirely on at least 2 feet of compacted fill. The over-excavated area shall be backfilled to the designated grade. Adjacent to existing structures, over-excavation shall be performed by employing slot-cut (A-B-C) method.

The backfilled materials shall comply with the requirements outlined in Section 11.4 of this report and shall be moisture-conditioned to a moisture content between the optimum and 3 percent above the optimum moisture content and compacted to at least 95 percent of the maximum dry density obtained per ASTM D1557. Prior to placement of backfill, the bottom of removal shall be observed and confirmed to be competent by the Geotechnical Engineer of Record.

Following the over-excavation, we recommend that the areas to receive engineered fill be scarified to a minimum depth of 8 inches, moisture-conditioned to a moisture content between the optimum and 3 percent above the optimum moisture content, and compacted to at least 90 percent of the maximum dry density obtained per ASTM D1557.

11.2.3. Demolition of Old Swimming Pool and Grading for New Basketball Court

The new basketball court will be built within the footprint of the existing (old) swimming pool. It is recommended that the concrete floor slabs, sidewalls, and other pool construction materials be completely removed during the demolition process. After demolition, the empty swimming pool area shall be backfilled to the designated grade and compacted in layers which, when loose, shall not exceed 8 inches per layer. The backfilled materials shall be compacted to at least 90 percent of the maximum dry density obtained per ASTM D1557.

The top 12 inches of the backfill supporting slab-on-grade for the basketball court shall be compacted to 95 percent of the maximum dry density obtained per ASTM D1557.

The backfilled materials shall comply with the requirements outlined in Section 11.4 of this report and shall be moisture-conditioned to a moisture content between the optimum and 3 percent above the optimum moisture content and compacted to at least 90 percent of the maximum dry density obtained per ASTM D1557.

11.3. General Grading Requirements

All fills, unless otherwise specifically stated in the report, shall be compacted to at least 90 percent of the maximum dry density obtained per ASTM D1557 Method of Soil Compaction. The moisture content during compaction shall be as stated in items 5 and 6 below, unless otherwise specifically stated in the report.

1. No fill shall be placed until the area to receive the fill has been adequately prepared and approved by the Geotechnical Consultant or their representative.
2. Fill soils should be kept free of debris and organic material.
3. Rocks or hard fragments larger than 3 inches may not be placed in the fill without approval of the Geotechnical Consultant or their representative, and in a manner specified for each occurrence.

4. The fill material shall be placed in layers which, when loose, shall not exceed 8 inches per layer. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to insure uniformity of material and moisture.
5. When the moisture content of the fill material is too low to obtain adequate compaction, water shall be added and thoroughly dispersed until the soil has a moisture content between the optimum and 3 percent above the optimum moisture content.
6. When the moisture content of the fill material is too high to obtain adequate compaction, the fill material shall be aerated by blading or other satisfactory methods until the soil has a moisture content between the optimum and 3 percent above the optimum moisture content.
7. Permanent fill and cut slopes should not be constructed at gradients steeper than 2:1 (H:V).

11.4. Fill Materials and Import

In general, the on-site silty sand soils have been determined to have a very low expansion potential and are suitable for backfilling purpose. On-site uncontaminated native soils or imported materials could be used for backfilling purpose. On-site soils or import materials, if used, should have an expansion index (EI) of less than 30 and should contain sufficient fines (binder material) so as to be relatively impermeable and result in a stable subgrade when compacted. The material being used for backfilling purpose should be free of organic materials, debris, and cobbles larger than 3 inches, with no more than 25 percent of the materials being larger than 2 inches in size and no more than 35 percent passing #200 sieve. A bulk sample of potential backfill/import material, weighing at least 30 pounds, should be submitted to the Geotechnical Consultant at least 72 hours before fill operations. Upon approval of the potential backfill earth materials, the contractor will be allowed to start importing/hauling process. All backfill materials should be approved by the Geotechnical Consultant prior to being placed at the site.

11.5. Seismic Coefficients

Under the Earthquake Design Regulations of Chapter 16A, Section 1613A of the CBC 2016, and using the mapped acceleration parameters obtainable from the program available in the Structural Engineers Association of California (SEAOC) website, the following coefficients and factors tabulated in Table 11.1 apply to lateral-force design for structures at the site. Figures G-4 and G-5 within Appendix G show the PSHA Deaggregation at PGA for 2475 years return period and design maps summary report for the site respectively, obtained from the USGS and SEAOC websites.

Table 11.1. *ASCE 7 Mapped Seismic Coefficients*

Site Parameters	Value
Site Class (CBC 2016 – 1613A.3.2)	D (Stiff Soil)
Seismic Design Category based on Risk Category II (CBC 2016-Table 1604A.5 & 1613A.3)	E
Mapped Acceleration Parameter for Short Period (0.2 Second), S_S	2.708
Mapped Acceleration Parameter for 1.0 Second, S_1	0.968
Adjusted Maximum Spectral Response Parameter for Short Period (0.2 Second), S_{MS}	2.708
Adjusted Maximum Spectral Response Parameter for 1.0 Second Period, S_{M1}	1.453
Design Spectral Response Acceleration Parameter, S_{DS}	1.805
Design Spectral Response Acceleration Parameter, S_{D1}	0.968
Mapped Peak Ground Acceleration, PGA	1.007

Longitude: W 118.179020° Latitude: N 34.190908°

11.6. Foundations

11.6.1. General

By the time of preparation of this report, we had not been provided with the order of the anticipated structural loads applicable on the foundations for the proposed buildings. For the purpose of preparing this report, we assumed that the proposed structures will impose column loads of less than 30 kilo-pounds (kips) and continuous footing loads of less than 3 kips per foot (kpf). As recommended, the proposed footings should be founded entirely within the engineered fills. All footings shall be underlain by compacted fill as addressed in grading section of this report (Section 11.2.). GAI should be notified if the final structural loads increase by more than 10 percent of the above-assumed loads, and to reevaluate our analyses and provide revised recommendations, if necessary. The project's Structural Engineer should design foundations and floor slabs in accordance with the requirements of the applicable building code.

11.6.2. Peripheral Buildings

The proposed locker room, restroom and office buildings may be supported on conventional shallow spread/strip footings designed using a bearing value of 2,000 pounds per square foot (psf) provided that the recommendations addressed in the grading section of this report (Section 11.2.)

are strictly followed and observed by the project's Geotechnical Engineer at the time of construction. Spread and strip footings supporting the proposed structures should have a minimum width of 24 and 18 inches, respectively. The bottom of footings shall be located at least 2 feet below the lowest adjacent finish grade, embedded into the recommended compacted fill and underlain by compacted fill extended to the depth recommended. The recommended allowable bearing capacity should not be increased for any additional footing embedment depth or width.

Also, mat-type foundation may be chosen to support the proposed buildings and may be designed using a bearing value of 1,500 pounds per square foot (psf) provided that the recommendations addressed in the grading section of this report (Section 11.2.) are strictly followed and observed by the project's Geotechnical Engineer at the time of construction.

The recommended bearing value is a net value and the weight of concrete in the footings may be taken as 50 pounds per cubic foot (pcf). The weight of soil backfill may be neglected when determining the downward loads from the footings. A one-third increase in the bearing value may be used when considering wind or seismic loads provided the load reduction factor of 0.75 is not applied to wind or seismic loads for load combinations.

Lateral Resistance: Lateral loads may be resisted by soil friction and by the passive resistance utilized by the compacted on-site granular fill. A coefficient of friction of 0.35 may be used between the footings, floor slabs, and the supporting soils comprised of compacted on-site material, as recommended. The passive resistance of level properly compacted on-site material in direct contact with the footings may be assumed to be equal to the pressure developed by a fluid with a density of 300 pcf, to a maximum pressure of 3,000 psf. A one-third increase in the passive value may be used for wind or seismic loads. The frictional resistance and the passive resistance of the soils may be combined provided that the passive resistance is reduced by one-third.

Settlement: Provided that the proposed footings are constructed per the recommendations provided in preceding sections of this report and have been designed using bearing values recommended herein, we estimate that the total maximum static settlement would be less than about ¼ inches and ½ inches for conventional spread/strip footings and mat-foundation system, respectively. Additionally, the effect of excess settlement due to earthquake motions was evaluated and it was concluded that the earthquake-induced dry settlement at the site would be about 1½ inches. However, the over-excavation and recompaction of the loose layers under the proposed foundations will mitigate earthquake-induced dry settlements to a tolerable level of less than 1 inch for conventional spread/

strip footings (Figure E-1b within Appendix E). Therefore, for both spread/strip foundations and mat-foundation system, a combined static plus seismic differential settlement of ½ inches within a horizontal distance of 30 feet may be used for the design purpose.

Modulus of Subgrade Reaction: A modulus of subgrade reaction equal to 120 pounds per cubic inch may be used in design of mat foundation supported on compacted and improved soils, as recommended in section 11.2.1.

11.6.3. Swimming Pool

Bearing Capacity: The swimming pool should be designed as a freestanding structure, where the pool sidewalls can support a pool filled with water, without soil supports. An allowable bearing capacity of 1,500 psf may be used for the base slab of the pool underlain by a minimum of 2 feet of compacted fill. A one-third increase in the bearing value may be used when considering seismic loads provided the load reduction factor of 0.75 is not applied to seismic loads for load combinations.

Lateral Loading: The active pressure acting on the inner wall of the shell from the swimming pool water may be assumed to be 62 psf per foot of depth. The active pressure of drained soils acting on the outer wall of the shell may be assumed to be 45 psf per foot of depth for leveled backfill condition. A drainage system should be provided behind the wall to reduce the potential for development of hydrostatic pressure. If a drainage system is not installed, the walls should be designed to resist a combined soils and hydrostatic pressure equal to that developed by a fluid with a density of 90 pcf for the full height of the wall. A coefficient of friction of 0.35 may be used for resisting lateral loads at the contact surface between the concrete and foundation soils.

Modulus of Subgrade Reaction: A modulus of subgrade reaction equal to 120 pounds per cubic inch may be used in design of mat foundation/floor slab of the proposed swimming pool supported on compacted and improved soils, as recommended in section 11.2.1.

11.7. Floor Slab

Interior slab-on-grade within the building footprints shall be supported on the graded building pads of compacted fill as recommended in the grading section of this report (Section 11.2.1). The building floor slabs should have a nominal thickness of 4 inches and should contain as a minimum No. 4 bars spaced a maximum of 18 inches on center, in both directions. Thicker slabs and additional reinforcement may be required depending on the floor loads and the structural requirements. These conditions are referred to the project's Structural Engineer.

Perimeter grades around the buildings should be sloped in a manner allowing water to drain away from the structures and not pond next to the foundations. Roof down drains should be connected to underground pipes carrying water away from the building areas or have extenders so water does not drain and pond next to the buildings.

11.8. Basketball Court Slab

The slab-on-grade for the proposed basketball court shall be supported on the graded and compacted fill of the demolished old swimming pool area (Section 11.2.3). The slabs should have a nominal thickness of 4 inches and should contain as a minimum No. 4 bars spaced a maximum of 18 inches on center, in both directions.

11.9. Concrete Flatwork

It is recommended that the upper 12 inches of soils below concrete flatwork or hardscapes located around and within the vicinity of the proposed developments, and subjected to pedestrian loads only, be over-excavated, reworked, and recompacted. The backfilled materials shall comply with the requirements outlined in Section 11.4 of this report and shall be moisture-conditioned to a moisture content between the optimum and 3 percent above the optimum moisture content and compacted to at least 90 percent of the maximum dry density obtained per ASTM D1557. The slabs for concrete flatwork or hardscape subjected to pedestrian loads only should have a nominal thickness of 4 inches.

11.10. Pavement for Parking Lot

Traffic Index (TI) values for the parking lot were not provided at the time of preparation of this report. The new pavement sections recommendations presented in the following sections are based upon assumed TI values of 4, 5, and 6. GAI does not take responsibility for the numerical determination of the TI values or the areas where they apply within the project limits. However, for light and regular conventional parking area, we recommend pavement sections for TI value of 4 or 5. For fire lanes and slightly heavier vehicular traffic, we recommend pavement sections for TI value of 6. We would be pleased to provide additional pavement section recommendations for different TI values upon request. Samples of the subgrade soils were obtained within the parking area and one sample was selected and tested for its R-Value.

The pavement section recommendations provided in the following sections are based on the on-site subgrade soils having a design R-Value of 29. Two different options are recommended and provided in Table 11.2 for pavement section thicknesses depending on whether base course will be used.

- **Option 1** consists of constructing the pavement section by placing layers of Hot Asphalt Concrete Mix (ACM) over reworked/recompacted subgrade materials.
- **Option 2** consists of constructing the pavement section by placing layers of ACM over compacted base materials over reworked/recompacted subgrade materials.

It is recommended that the upper 12 inches of the subgrade soils below the pavement structural section (i.e. below asphalt concrete for Option 1, and below base course for Option 2) be scarified, moisture-conditioned, and recompacted. The subgrade soils shall be moisture-conditioned to a moisture content between the optimum and 3 percent above the optimum moisture content and compacted to at least 95 percent of the maximum dry density obtained per ASTM D1557.

Table 11.2. *Asphalt Concrete Pavement Sections*

Traffic Index	Option	Minimum Course Thicknesses (in)		
		Asphalt Concrete	Aggregate Base[a]	Reworked Subgrade[b]
4	1	4.5	--	8.0
	2	3.0	4.0	8.0
5	1	6.0	--	8.0
	2	3.5	5.0	8.0
6	1	7.5	--	8.0
	2	4.0	6.5	8.0

[a]Option 1 is full depth asphalt concrete and does not utilize aggregate base. For Option 2, the base course shall be compacted to at least 95 percent of the maximum dry density obtained per ASTM D1557.

[b]The reworked/recompacted subgrade shall be compacted to at least 95 percent of the maximum dry density obtained per ASTM D1557.

The base course material shall comply with Crushed Aggregate Base (CAB) as defined by *Standard Specifications for Public Works Construction* (SSPWC) Section 200-2.2. In lieu of CAB material, Crushed Miscellaneous Base (CMB) material, as defined by SSPWC Section 200-2.4, may be used. The base course material should be compacted to at least 95 percent of the maximum dry density of that material. The assumed R-Value in design of the pavement sections above for the base material is 78.

11.11. Utility Trench Backfilling

When required, bedding material shall be first placed below the bottom of the utility line, on a firm and unyielding subgrade so the pipe is supported for the full-length of the barrel. The minimum dimensions of bedding material below the bottom of the utility line shall conform to the specification in SSPWC Section 306-6. Bedding material shall also be placed immediately around a utility line extending to a point 12 inches above the top of the line. The bedding material should consist of sand, fine-grained gravel, or cement slurry to support the line and protect it, and shall meet the specification in SSPWC Section 217. Sand or gravel should be compacted in accordance with SSPWC specifications. No jetting or pounding is permitted.

Above the bedding material and up to the finished ground surface, utility trench backfills may consist of low-expansive material (EI less than 30) and should be mechanically compacted to at least 90 percent of the maximum dry density of the soils obtained per ASTM D1557, except below pavements or within the areas with a higher relative compaction such as building pads. A minimum relative compaction of 95 percent will be required in the upper 8 inches of the backfill underneath the pavement areas and the minimum required relative compaction for the upper 2 feet within the building pads shall be as set forth for the building pads. Prior to backfilling, the gradation and expansivity of the backfill material shall be tested, reviewed, and approved by the soils engineer. Both bedding and backfilling materials should be placed in accordance with Sections 306-6 and 306-12 of the SSPWC.

When adjacent to any footings, utility trenches and pipes should be located above an imaginary line measured at a gradient of 1:1 (H:V) projected down from the bottom edges of any footings. Otherwise the pipe should be designed to accept the lateral effect from the footing load, or the footing bottom should be deepened as needed to comply with this requirement, into competent materials.

For bedding and backfilling of trenches and upon approval of the soils engineer, controlled low strength material (CLSM) may be used. CLSM shall comply with the requirements of SSPWC Section 201-6. The backfill material shall be observed, tested, and approved by the Geotechnical Engineer.

11.12. Excavations

11.12.1. General

In general, the on-site earth materials can be excavated using conventional heavy-duty earth-moving equipment and the materials are not expected to pose a rippability problem. However, large cobbles and rocks are expected within the excavations and the contractor should employ proper means to remove all large-size pieces so the materials being used in backfilling complies with the requirement of Section 11.4. Based on the grading recommendations provided, it is expected that the excavation be as deep as about 9 feet bgs for the grading and construction of the peripheral buildings and about 10 feet bgs for the swimming pool. Excavation sloping and benching shall be done in accordance with soil Type C as classified in Chapter 4, Subchapter 4, Article 6, Appendix A of the California Occupational Safety and Health Administration (Cal/OSHA) Title 8 Regulations. For excavation less than 5 feet in depth, the excavation may be performed to a maximum vertical cut of 5 feet without the use of a protective system (e.g. sloping, benching, shoring). For excavation less than 20 feet in depth, the soils at the site are expected to be temporarily stable when excavated at a gradient of 1.5:1 (H:V).

The top of slopes should be barricaded to prevent vehicles and storage loads within 0.7H feet of the top of the slopes, where H is the total depth. A greater setback may be necessary when considering heavy vehicles (e.g. concrete trucks and cranes) and we should be advised of such heavy vehicle loadings so that specific setback requirements can be established. When excavating adjacent to footings of existing buildings, proper means should be employed to prevent any possible damage to the existing structures. Un-shored excavations that are adjacent to existing buildings should not extend below a 1:1 (H:V) plane extending downward from the lower edge of adjacent footings. All regulations of State or Federal OSHA should be followed.

Temporary excavations are assumed to be those that will remain un-shored for a period not exceeding 10 days. In dry weather, the excavation slopes should be kept slightly moist, but not saturated. If excavations are made during the rainy season (normally from November through April), particular care should be taken to protect slopes against erosion. Mitigative measures, such as installation of berms, plastic sheeting, or other devices, may be warranted to prevent surface water from flowing over or ponding at the top of excavations.

11.12.2. Excavations of Contaminated Soils

Any soils which have visible staining or detectable odors should be tested in the field by the contractor or qualified environmental subcontractor with an organic vapor analyzer (OVA) for volatile components, which requires additional considerations in their handling. The stockpiles should be barricaded near the excavation area, away from drainage areas or catch basins, on an impermeable plastic liner (6 mil nominal thickness and tested at 100 psi strength). Caution must be taken to separate contaminated soils from the remainder of the excavated material. If only small amounts of contaminated soils are encountered, it may be stored in 55-gallon steel drums with seal lids.

Any contaminated material (soil, asphalt, railroad ballast, concrete, or debris) that is to be hauled off the site is considered a "waste product" and must be classified as hazardous or nonhazardous waste under all criteria by both State and Federal codes prior to disposal. If the waste soils or other material are determined hazardous, a hazardous waste manifest will be prepared by the contractor or its qualified representative, and the material shall be transported to an appropriate class of facility for recycling or landfill disposal by a registered hazardous material transporter. The project contractor is responsible for conducting all necessary tests on the export soils.

12. INFILTRATION RATE DETERMINATION

12.1. General

We have been requested to perform three percolation tests to determine the infiltration rates within the proposed developments. The locations of the percolation tests were chosen by the Client and are shown on Figure A-2a and A-2b within Appendix A. The depths were chosen based on the subsurface conditions, considering the most permeable layer at the practical depths.

In general, percolation tests are used for design and construction of subsurface sewage disposal system and/or on-site storm drain infiltration system, and the test procedure for these purposes varies in different localities. For the purpose of obtaining an infiltration rate at the subject site, borehole percolation tests were performed following the procedure from the Los Angeles County *Guidelines for Design, Investigation, and Reporting Low Impact Developments Stormwater Infiltration* (Reference 10). The following sections of the report are devoted to providing information regarding the employed test method and the concluded infiltration rate.

12.2. Test Procedure

The borings for the percolation tests were drilled using a hollow-stem truck-mounted drill rig down to a depth determined based on the subsurface profile from other borings within vicinity. Falling head borehole percolation tests were employed to determine the infiltration rates of the soils. Falling head borehole percolation tests include measurements of change in water levels in an open standpipe or hole over consistent time periods.

The procedure for performing a falling head borehole percolation test is summarized below:

1. Drill or auger an 8-inch diameter hole to the depth at which the test is to be executed.
2. Set a 2- to 4-inch-diamter observation (perforated) pipe with a solid end cap.
3. Fill the anulus spaces between the perforated PVC pipe and the native material with well-draining material up to the desired test section.
4. Perform two presoak tests to determine duration of presoaking required. For each presoak test, fill the hole with at least 12 inches of water. If the water seeps completely away within 30 minutes of filling the hole two consecutive times, presoaking can be considered complete and testing can proceed. Otherwise, presoak the hole for at least 4 hours before conducting the infiltration test.
5. Perform a time interval test to determine the duration of each time interval that will be used to measure the water drop readings. Fill the hole with at least 12 inches of water and observe the drop in the water during the next 30 minutes. If no water remains in the hole, the time interval between readings shall be 10 minutes. Otherwise, the time interval between readings shall be 30 minutes.
6. Pour at least 12 inches of water into to the casing, but less than the water level used to presoak the hole. For each successive percolation test reading, the starting water level must be at this approximate initial water depth.
7. Conduct the percolation test by taking readings of the water drop from the initial depth for each time interval (as determined in step 5). After each reading, fill the hole with water back to the approximate initial water depth.
8. Repeat the percolation test readings a minimum of 8 times or until a stabilized rate of drop is obtained, whichever occurs first. This preadjusted rate is then reduced with a factor

accounting for discharging of water from both the sides and bottom of the boring (i.e. non-vertical flow).

12.3. Results and Feasibility

The data and results of the field percolation tests are provided in Figures E-2a to E-2c within Appendix E. A summary of the infiltrate rates, as calculated from Los Angeles County guidelines (Reference 10) and Porchet method (Reference 13) for each test location are provided in Table 12.1. Additional safety factor (e.g. site variability, number of tests, long-term siltation, plugging, and maintenance) was not utilized into the reported infiltration rates. Correction factors or safety factors should be chosen at the design engineer's discretion, considering the entire project scope and guidelines from the requesting agency.

Table 12.1. *Summary of Infiltration Tests*

			Infiltration Rate (in/hr)	
Test	Test Depth (ft)	Subsurface Material	LA County[a]	Porchet[b]
P-1	7.0	Silty Sand with Gravel	1.90	0.98
P-2	7.0	Silty Sand with Gravel	1.24	0.64
P-3	7.0	Silty Sand with Gravel	1.68	0.87

[a]County of Los Angeles, Department of Public Works, Geotechnical and Materials Engineering Division, December 31, 2014. Guidelines for Design, Investigation, and Reporting Low Impact Developments Stormwater Infiltration. GS200.1. (Reference 10)

[b]Orange County, December 20, 2013. Technical Guidance Document (TGD) for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs). Exhibit 7.III. (Reference 13)

According to guidelines of the Los Angeles County *Guidelines for Design, Investigation, and Reporting Low Impact Developments Stormwater Infiltration* (Reference 10), soils with a corrected in-situ infiltration rate of 0.3 inch/hour or greater are considered feasible for retention-based storm water quality control measures.

The subsurface material at the site and to the maximum depth of exploration is relatively similar throughout the entire depth and, therefore, the infiltration rates obtained from the percolation tests at 7 feet bgs may be used for the purposes of drywell at deeper depth. Considering the historically highest groundwater depth at the site at about 40 bgs, the maximum allowable depth for infiltration using deep drywells should not exceed 30 feet bgs in order to provide at least a 10 feet separation between the infiltration depth and the groundwater table.

13. SOIL CORROSIVITY

Corrosivity tests were performed on one sample of on-site soils, and the results of the tests are presented in Appendix C of this report. It is concluded that the amount of sulfate in tested soils in the upper 5 feet bgs is less than 0.1 percent by weight (water soluble sulfate). The resistivity test result indicates existence of a severely corrosive condition. Further interpretation of the corrosivity test results (including the resistivity value) and recommendations for corrosion design and construction are referred to corrosion specialists/consultants and design engineers.

14. SOIL EXPANSIVITY

We have performed one expansivity test on selected soil sample to determine the expansion characteristics of the on-site soils. The sample was obtained from on-site soils in the upper 5 feet bgs, which are susceptible to expansion when facing seasonal cycles of saturation/desiccation. The test results are presented in Table 14.1 below.

Table 14.1. *Expansion Test Summary*

Sample Location	Sample Depth (ft)	Expansion Index (EI)	Expansion Potential (ASTM D4829)
B-1	1 – 5	0	Very Low

The above tabulated test result on the sample obtained from on-site soil within the footprint of the proposed developments indicate a very low expansion potential (based on ASTM D4829).

15. OBSERVATION AND TESTING

<u>This final report has been prepared assuming that GEO-ADVANTEC, INC. will perform all geotechnical-related field observations and testing</u>. If the recommendations presented in this report are utilized, and observation of the geotechnical work is performed by others, the party performing the observations must review this report and assume responsibility for recommendations contained herein. That party would then assume the title “Geotechnical Consultant of Record”.

A representative of the Geotechnical Consultant should be present to observe all grading operations as well as all footing excavations. Upon the Client’s request, a report or final verification letter presenting the results of these observations and related testing should be issued upon completion of the grading operations.

16. CLOSURE

The findings and recommendations presented in this final report were based on the results of our field and laboratory investigations, combined with professional engineering experience and judgment. The report was prepared in accordance with generally accepted engineering principles and practice. We make no other warranty, either expressed or implied.

The soils encountered in the boreholes are believed to be representative of the total under consideration area for the subject proposed developments; however, soil characteristics can vary throughout the site. GAI should be notified if subsurface conditions are encountered which differ from those described in this report.

Samples secured for this investigation will be retained in our laboratory for a period of 45 days from the date of this report and will be disposed after this period unless other arrangements are made.

Should you have any questions concerning this submittal, or the recommendations contained herewith, please do not hesitate to call our office.

Respectfully submitted,
GEO-ADVANTEC, INC.

Giang (Jack) Lee, P.E.
Senior Project Engineer

Ronald C. Hanson, P.G., C.E.G.
Principal Engineering Geologist

Shawn Ariannia, Ph.D., P.E., G.E.
Principal Geotechnical Engineer

Distribution:

1. Addressee (3 wet stamped copy + pdf copy via e-mail)
2. File

APPENDICES

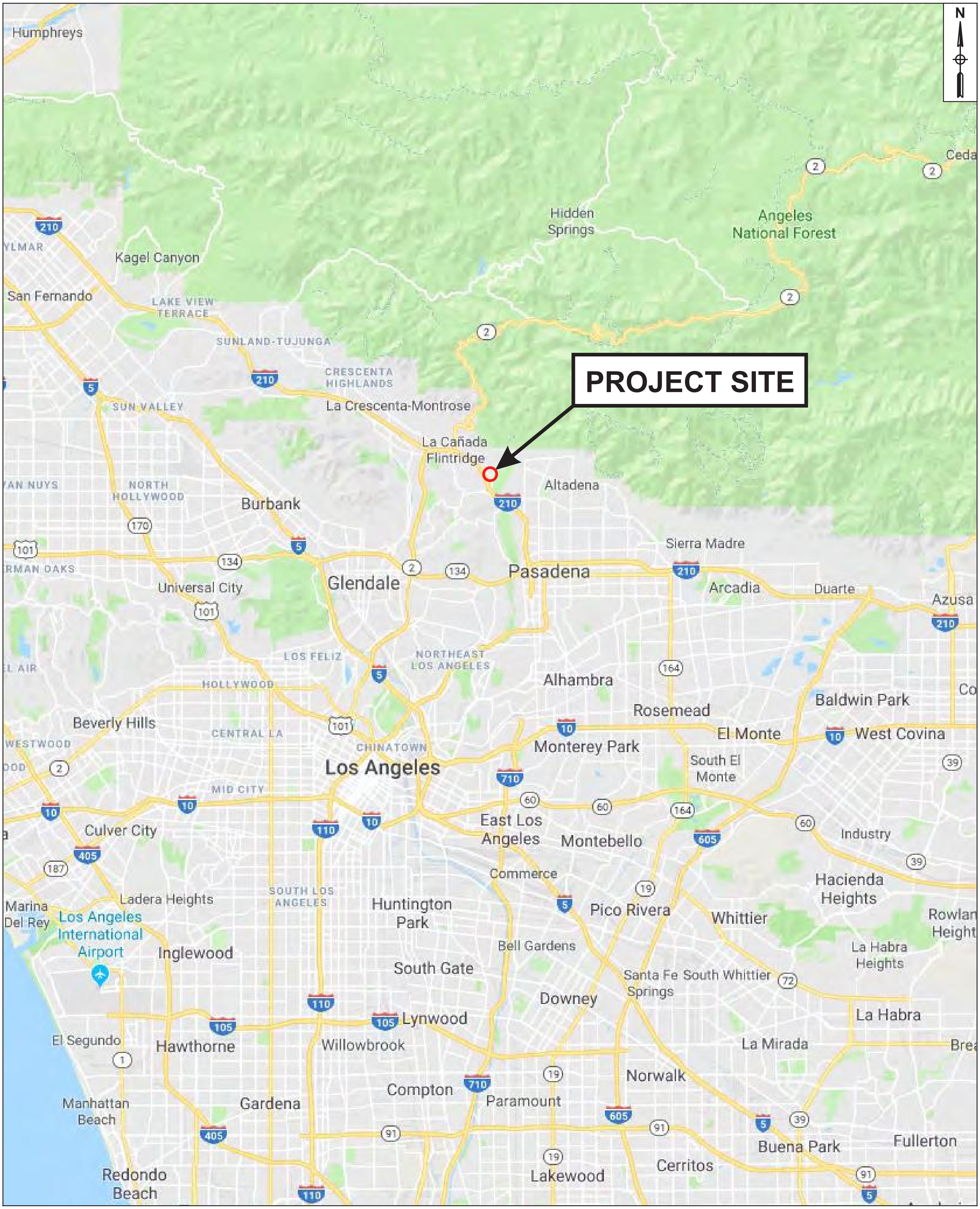
REFERENCES

1. American Society for Testing and Materials (ASTM), 2017, *Annual Book of ASTM Standards, Volume 04.08 and 04.09 Soil and Rock*.
2. Building News, 2018, *The Greenbook: Standard Specifications for Public Works Construction*.
3. California Department of Conservation, Division of Mines and Geology, 1998, *Seismic Hazard Zone Report for the Pasadena 7.5-Minute Quadrangle, Los Angeles County, California,* Seismic Hazard Zone Report 014.
4. California Department of Conservation, Division of Mines and Geology, March 25, 1999, *Earthquake Zones of Required Investigation, Pasadena 7.5 Minute Quadrangle.*
5. California Department of Transportation (Caltrans), 2018, *Highway Design Manual Sixth Edition.*
6. California Department of Transportation (Caltrans), Division of Engineering Services, June 2007, *Method for Determining Field and Laboratory Resistivity and pH Measurements for Soil and Water*, California Test 643.
7. California Department of Transportation (Caltrans), Division of Engineering Services, June 2014, *Method of Testing Soils, Concrete Patching Materials and Waters for Chloride Content*, California Test 422.
8. California Department of Transportation (Caltrans), Division of Engineering Services, June 2014, *Method of Testing Soils, Concrete Patching Materials and Waters for Sulfate Content*, California Test 417.
9. California Geological Survey, 2010, *Fault Activity Map of California by Charles W. Jennings and William A. Bryant.*
10. County of Los Angeles, Department of Public Works, Geotechnical and Materials Engineering Division, December 31, 2014. *Guidelines for Design, Investigation, and Reporting Low Impact Developments Stormwater Infiltration*. GS200.1.
11. Dibblee, Thomas W. Jr., 1989, *Geologic Map of the Pasadena Quadrangles, Los Angeles County, California*, Dibblee Geology Center Map #DF-23.
12. Federal Emergency Management Agency, September 26, 2008, *Flood Insurance Rate map of Los Angeles County, California and Incorporated Areas*, Map Number 06037C1075F.
13. Orange County, December 20, 2013. *Technical Guidance Document (TGD) for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs)*. Exhibit 7.III.

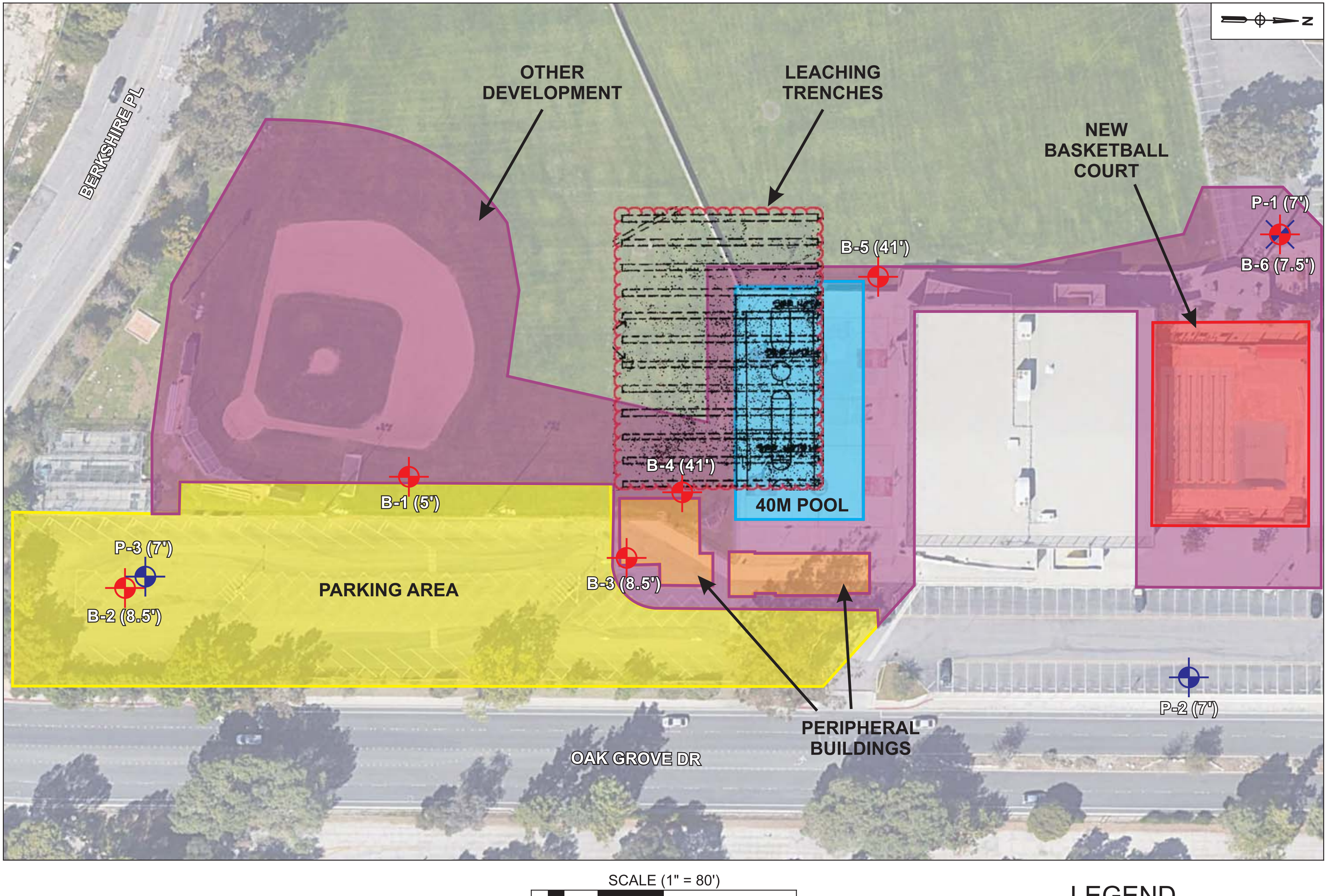
APPENDICES

APPENDIX A

MAPS, PLANS AND FIGURES



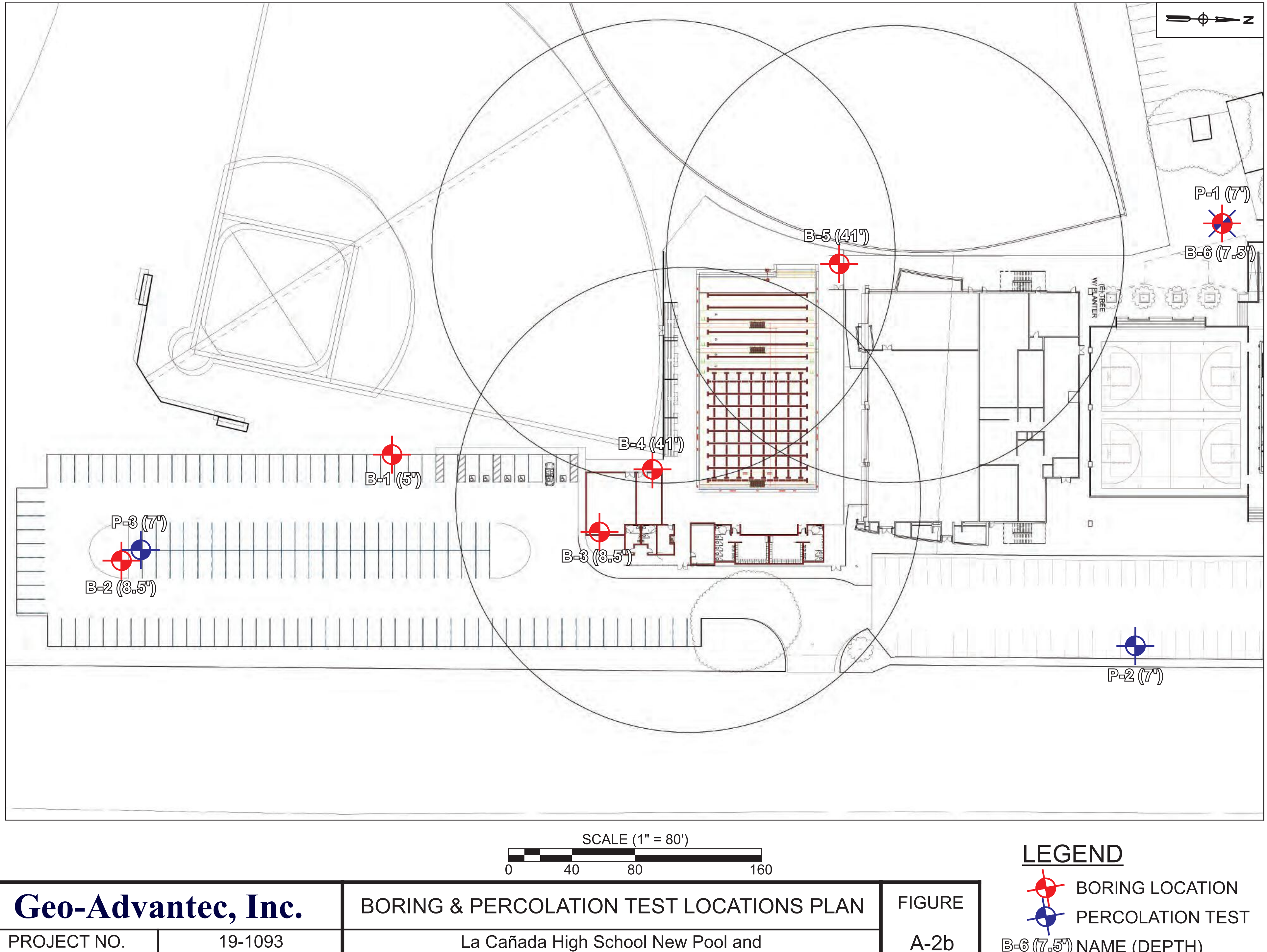
Geo-Advantec, Inc.		VICINITY MAP	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	A-1
DATE	08-23-2019		



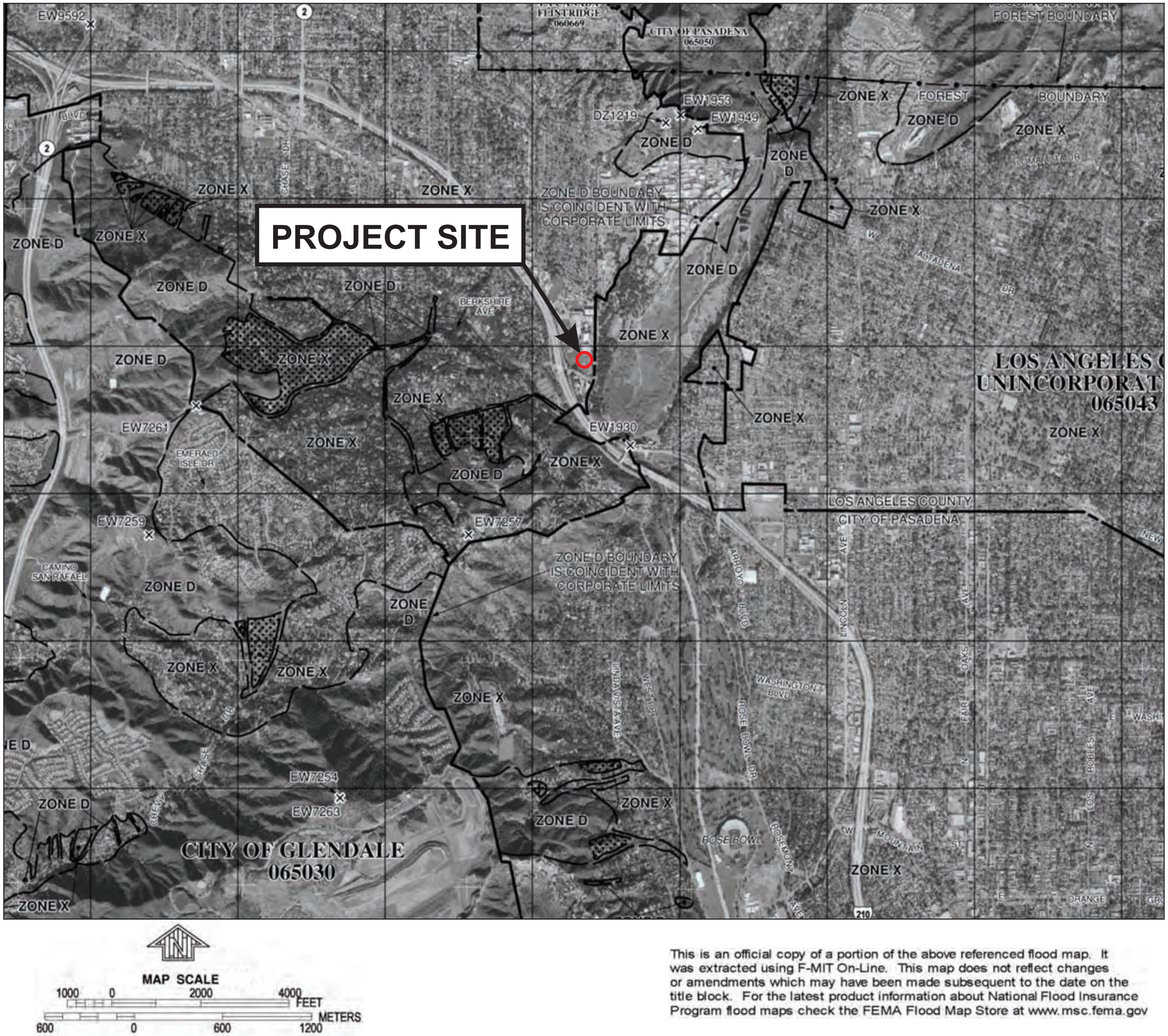
LEGEND

- BORING LOCATION
- PERCOLATION TEST
- B-6 (7.5') NAME (DEPTH)

Geo-Advantec, Inc.		BORING & PERCOLATION TEST LOCATIONS PLAN	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	A-2a
DATE	08-23-2019		



Geo-Advantec, Inc.		BORING & PERCOLATION TEST LOCATIONS PLAN	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	A-2b
DATE	08-23-2019		



This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1375F

FIRM
FLOOD INSURANCE RATE MAP
LOS ANGELES COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 1375 OF 2350
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LOS ANGELES COUNTY	065043	1375	F
GLENDALE, CITY OF	065030	1375	F
LA CANADA FLINTRIDGE, CITY OF	060669	1375	F
LOS ANGELES, CITY OF	060137	1375	F
PASADENA, CITY OF	065050	1375	F
SAN MARINO, CITY OF	065057	1375	F
SOUTH PASADENA, CITY OF	065061	1375	F

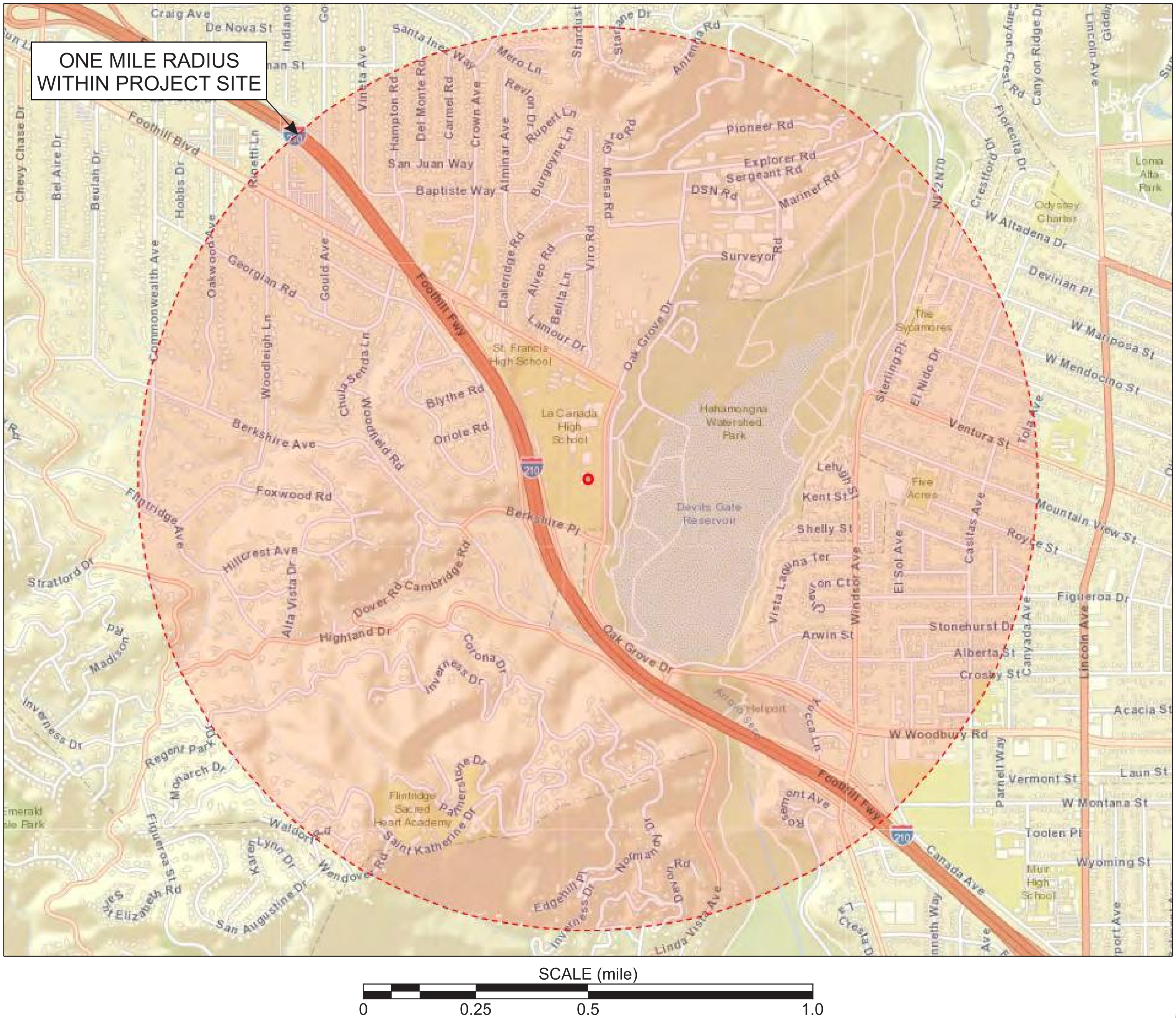
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06037C1375F

EFFECTIVE DATE
SEPTEMBER 26, 2008

Federal Emergency Management Agency

Geo-Advantec, Inc.		FEMA FLOOD MAP	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	A-3
DATE	08-23-2019		



LEGEND

Active	green dot
New	orange dot
Idle	purple dot
Plugged	grey dot
Unknown	
Canceled	pink dot
Oil, Gas	●
Dry Gas	☼
Injector	
Cyclic Steam	
Gas Storage	
Observation	(O)
Water Source	(W)
Multi	(M)
Unknown	(?)

WellSTAR

Geo-Advantec, Inc.		DOGGR OIL WELL MAP	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	A-4
DATE	08-23-2019		

APPENDIX B

FIELD EXPLORATORY BORING LOGS

SOILS CLASSIFICATION

MAJOR DIVISIONS			GRAPHIC LOG	USCS SYMBOL	TYPICAL NAMES
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN 50% OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS LESS THAN 5% FINES		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES MORE THAN 12% FINES		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS 50% OR MORE OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS LESS THAN 5% FINES		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES MORE THAN 12% FINES		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS 50% OR MORE OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT IS 50 OR MORE			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR GRAVELLY ELASTIC SILTS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT AND OTHER HIGHLY ORGANIC SOILS

GRAIN SIZES

SILT AND CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		
	#200	#40	#10	#4	3/4"	3"	12"

SIEVE SIZES

Bulk Bag Sample

Standard Penetration Test (SPT)

California Modified Sampler

Water Level at Time Drilling

Water Level at End of Drilling

Water Level After Specified Hours

Change in material observed in sample or cores

Change in material cannot be accurately located due to limitations in the drilling/sampling methods used

Geo-Advantec, Inc.		KEY TO LOGS	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	
DATE	08-23-2019		

KEY TO LOGS

SPT/CD BLOW COUNTS VS. CONSISTENCY/DENSITY					
FINE-GRAINED SOILS (SILTS, CLAYS, etc.)			GRANULAR SOILS (SANDS, GRAVELS, etc.)		
CONSISTENCY	*BLOWS/FOOT		RELATIVE DENSITY	*BLOWS/FOOT	
	SPT	CD		SPT	CD
SOFT	0-4	0-4	VERY LOOSE	0-4	0-8
FIRM	5-8	5-9	LOOSE	5-10	9-18
STIFF	9-15	10-18	MEDIUM DENSE	11-30	19-54
VERY STIFF	16-30	19-39	DENSE	31-50	55-90
HARD	over 30	over 39	VERY DENSE	over 50	over 90

* CONVERSION BETWEEN CALIFORNIA DRIVE SAMPLERS (CD) AND STANDARD PENETRATION TEST (SPT) BLOW COUNT HAS BEEN CALCULATED USING "FOUNDATION ENGINEERING HAND BOOK" BY H.Y. FANG. (**VALUES ARE FOR 140 Lbs HAMMER WEIGHT ONLY**)

DESCRIPTIVE ADJECTIVE VS. PERCENTAGE	
DESCRIPTIVE ADJECTIVE	PERCENTAGE REQUIREMENT
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	35 - 50%

*THE FOLLOWING "DESCRIPTIVE TERMINOLOGY/ RANGES OF MOISTURE CONTENTS" HAVE BEEN USED FOR MOISTURE CLASSIFICATION IN THE LOGS.

APPROXIMATE MOISTURE CONTENT DEFINITION			
DEFINITION	MOISTURE CONTENT (%)		DESCRIPTION
	FINE-GRAINED SOILS (SILTS, CLAYS, etc.)	GRANULAR SOILS (SANDS, GRAVELS, etc.)	
DRY	<10	2 - 4	Dry to the touch; no observable moisture
SLIGHTLY MOIST	15-24	6-8	Some moisture but still a dry appearance
MOIST	24-28	10-13	Damp, but no visible water
VERY MOIST	30-38	15-20	Enough moisture to wet the hands
WET	>40	20-25	Almost saturated; visible free water

Geo-Advantec, Inc.

CLIENT La Cañada Unified School District
PROJECT NAME La Cañada HS Pool and Site Improvements
PROJECT NUMBER 19-1093
PROJECT LOCATION La Cañada Flintridge, CA
DATE DRILLED 7/25/19
GROUND ELEVATION 1090 ft
DRILLING CONTRACTOR One Way Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
FIRST ENCOUNTER ---
LOGGED BY S. Noorzay **CHECKED BY** J. Lee
AFTER STABILIZED ---
NOTES Refusal at 5 feet (large boulder). No Groundwater Encountered
LATITUDE 34.190208 °
LONGITUDE -118.178932 °

Elevation (ft)	Depth (ft)	Sampler	Blow Counts (N Value)	Gaphic Log	USCS	Description / Interpretation	Dry Unit Weight (pcf)	Moisture Content (%)	ATTERBERG LIMITS: Liquid Limit	ATTERBERG LIMITS: Plastic Limit	ATTERBERG LIMITS: Plasticity Index	Fines Content (%)
1090	0											
						3" Grass over 5" Topsoil						
					SM	**ARTIFICIAL FILL** (SM) Silty SAND with gravel: cobble (4"), loose to medium dense, slightly moist, brown						
					SM	**NATIVE - ALLUVIUM** (SM) Silty SAND with gravel: cobble (4"), loose to medium dense, slightly moist, brown						
1085	5											

Bottom of borehole at 5.0 feet.

Geo-Advantec, Inc.

CLIENT La Cañada Unified School District
PROJECT NAME La Cañada HS Pool and Site Improvements
PROJECT NUMBER 19-1093
PROJECT LOCATION La Cañada Flintridge, CA
DATE DRILLED 7/25/19
GROUND ELEVATION 1088 ft
DRILLING CONTRACTOR One Way Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
FIRST ENCOUNTER ---
LOGGED BY S. Noorzay **CHECKED BY** J. Lee
AFTER STABILIZED ---
NOTES No Groundwater Encountered
LATITUDE 34.189718 ° **LONGITUDE** -118.178695 °

Elevation (ft)	Depth (ft)	Sampler	Blow Counts (N Value)	Gaphic Log	USCS	Description / Interpretation	Dry Unit Weight (pcf)	Moisture Content (%)	ATTERBERG LIMITS			Fines Content (%)
									Liquid Limit	Plastic Limit	Plasticity Index	
	0					6" Asphalt Concrete						
1085					SM	**ARTIFICIAL FILL** (SM) Silty SAND with gravel: cobble, loose to medium dense, slightly moist, gray to brown						
	5				SM	**NATIVE - ALLUVIUM** (SM) Silty SAND with gravel: cobble, loose to medium dense, slightly moist, brown						
1080			7-6-7 (13)			Silty SAND: fine to medium sand, trace fine gravel, loose, slightly moist, dark brown	103.7	7.2				25

Bottom of borehole at 8.5 feet.

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 8/28/19 08:23 - M:\PROJECTS\2019\19-1093-SI-LA CANADA USD_SWIMMING POOL AND SITE IMPROVEMENT AT LCHS\1-MAPS-LOGS-APPENDICES\APPENDIX B\19-1093 BORING LOGS.GPJ

Geo-Advantec, Inc.

CLIENT La Cañada Unified School District
PROJECT NAME La Cañada HS Pool and Site Improvements
PROJECT NUMBER 19-1093
PROJECT LOCATION La Cañada Flintridge, CA
DATE DRILLED 7/25/19
GROUND ELEVATION 1090 ft
DRILLING CONTRACTOR One Way Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
FIRST ENCOUNTER ---
LOGGED BY S. Noorzay **CHECKED BY** J. Lee
AFTER STABILIZED ---
NOTES No Groundwater Encountered
LATITUDE 34.190573 ° **LONGITUDE** -118.178777 °

Elevation (ft)	Depth (ft)	Sampler	Blow Counts (N Value)	Gaphic Log	USCS	Description / Interpretation	Dry Unit Weight (pcf)	Moisture Content (%)	ATTERBERG LIMITS Liquid Limit	Plastic Limit	Plasticity Index	Fines Content (%)
1090	0				SM	3" Asphalt Concrete **ARTIFICIAL FILL** (SM) Silty SAND with gravel: medium dense, slightly moist, gray						
1085	5				SM	**NATIVE - ALLUVIUM** (SM) Silty SAND with gravel: medium dense, slightly moist, brown to orange brown						
			12-13-21 (34)			dense, brown to gray						

Bottom of borehole at 8.5 feet.

Geo-Advantec, Inc.

Boring No. B-4

CLIENT La Cañada Unified School District
PROJECT NAME La Cañada HS Pool and Site Improvements
PROJECT NUMBER 19-1093
PROJECT LOCATION La Cañada Flintridge, CA
DATE DRILLED 7/25/19
GROUND ELEVATION 1091 ft
DRILLING CONTRACTOR One Way Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
FIRST ENCOUNTER ---
LOGGED BY S. Noorzay **CHECKED BY** J. Lee
AFTER STABILIZED ---
NOTES No Groundwater Encountered
LATITUDE 34.190689 ° **LONGITUDE** -118.178859 °

Elevation (ft)	Depth (ft)	Sampler	Blow Counts (N Value)	Gaphic Log	USCS	Description / Interpretation	Dry Unit Weight (pcf)	Moisture Content (%)	ATTERBERG LIMITS Liquid Limit	Plastic Limit	Plasticity Index	Fines Content (%)
1090	0				SM	3" Grass/Topsoil						
						ARTIFICIAL FILL (SM) Silty SAND: some gravel (3"), loose, dry, brown						
					SM	**NATIVE - ALLUVIUM** (SM) Silty SAND with gravel: fine to medium sand, fine to coarse gravel, loose, dry, brown to dark brown						
1085	5		7-18-14 (32)			medium dense, slightly moist to moist		8.7				
1080	10		3-3-5 (8)			trace clay, loose			NP	NP	NP	28
1075	15		15-23-34 (57)		GM	(GM) Silty GRAVEL with sand: dense, dry, brown	134.8	3.1				
1070	20		7-30-34 (64)		SM	(SM) Silty SAND with gravel: fine to coarse sand, very dense, slightly moist to moist, gray to brown						15
1065	25		5-29-50 (79)			dense, moist, light tan brown	107.7	11.9				
1060	30		20-50			very dense, gray to brown						
1055	35		4-34-50 (84)			some cementation with fine gravel, caliche, dense, brown						
1050	40		31-50			no cementation, more fine, very dense, gray to brown						

Bottom of borehole at 41.0 feet.

Geo-Advantec, Inc.

Boring No. B-5

CLIENT La Cañada Unified School District

PROJECT NAME La Cañada HS Pool and Site Improvements

PROJECT NUMBER 19-1093

PROJECT LOCATION La Cañada Flintridge, CA

DATE DRILLED 7/25/19

GROUND ELEVATION 1094 ft

DRILLING CONTRACTOR One Way Drilling

GROUND WATER LEVELS:

DRILLING METHOD Hollow Stem Auger

FIRST ENCOUNTER ---

LOGGED BY S. Noorzay **CHECKED BY** J. Lee

AFTER STABILIZED ---

NOTES No Groundwater Encountered

LATITUDE 34.191015 ° **LONGITUDE** -118.179334 °

Elevation (ft)	Depth (ft)	Sampler	Blow Counts (N Value)	Gaphic Log	USCS	Description / Interpretation	Dry Unit Weight (pcf)	Moisture Content (%)	ATTERBERG LIMITS: Liquid Limit	Plastic Limit	Plasticity Index	Fines Content (%)
	0				SM	2" Grass over 4" Topsoil **ARTIFICIAL FILL** (SM) Silty SAND: some gravel, loose to medium dense, slightly moist, brown						
1090	5		8-3-7 (10)		SM	**NATIVE - ALLUVIUM** (SM) Silty SAND with gravel: medium dense, slightly moist, brown Silty SAND: loose, moist, dark brown	107.4	13.4				
1085	10		10-13-17 (30)			Silty SAND with gravel: fine to coarse sand, fine gravel, medium dense to dense, slightly moist, brown						17
1080	15		15-33-50/5"			Silty SAND: some cementation, very dense, slightly moist to moist, brown	134.7	8.9				
1075	20		20-20-20 (40)			trace gravel, dense, reddish brown						
1070	25		20-37-50/5"			Silty SAND with gravel: fine to coarse sand, fine gravel, very dense, slightly moist, orange brown	118.4	7.1				
1065	30		16-27-29 (56)			tan to yellow brown						20
1060	35		10-32-50/5"			moist, orange brown						
1055	40		37-50			trace clay						

Bottom of borehole at 41.0 feet.

Geo-Advantec, Inc.

Boring No. B-6

CLIENT La Cañada Unified School District
PROJECT NAME La Cañada HS Pool and Site Improvements
PROJECT NUMBER 19-1093
PROJECT LOCATION La Cañada Flintridge, CA
DATE DRILLED 7/25/19
GROUND ELEVATION 1095 ft
DRILLING CONTRACTOR One Way Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
FIRST ENCOUNTER ---
LOGGED BY S. Noorzay **CHECKED BY** J. Lee
AFTER STABILIZED ---
NOTES No Groundwater Encountered
LATITUDE 34.19171 °
LONGITUDE -118.179373 °

Elevation (ft)	Depth (ft)	Sampler	Blow Counts (N Value)	Gaphic Log	USCS	Description / Interpretation	Dry Unit Weight (pcf)	Moisture Content (%)	ATTERBERG LIMITS Liquid Limit	Plastic Limit	Plasticity Index	Fines Content (%)
1095	0											
					SM	4" Asphalt Concrete **ARTIFICIAL FILL** (SM) Silty SAND with gravel: cobble (6"), medium dense, slightly moist, tan brown						
1090	5				SM	**NATIVE - ALLUVIUM** (SM) Silty SAND with gravel: cobble (4"), medium dense to dense, dry to slightly moist, brown						
			50			very dense, dry, orange brown	118.9	2.7				

Bottom of borehole at 7.5 feet.

APPENDIX C

LABORATORY TEST RESULTS

PARTICLE SIZE DISTRIBUTION REPORT

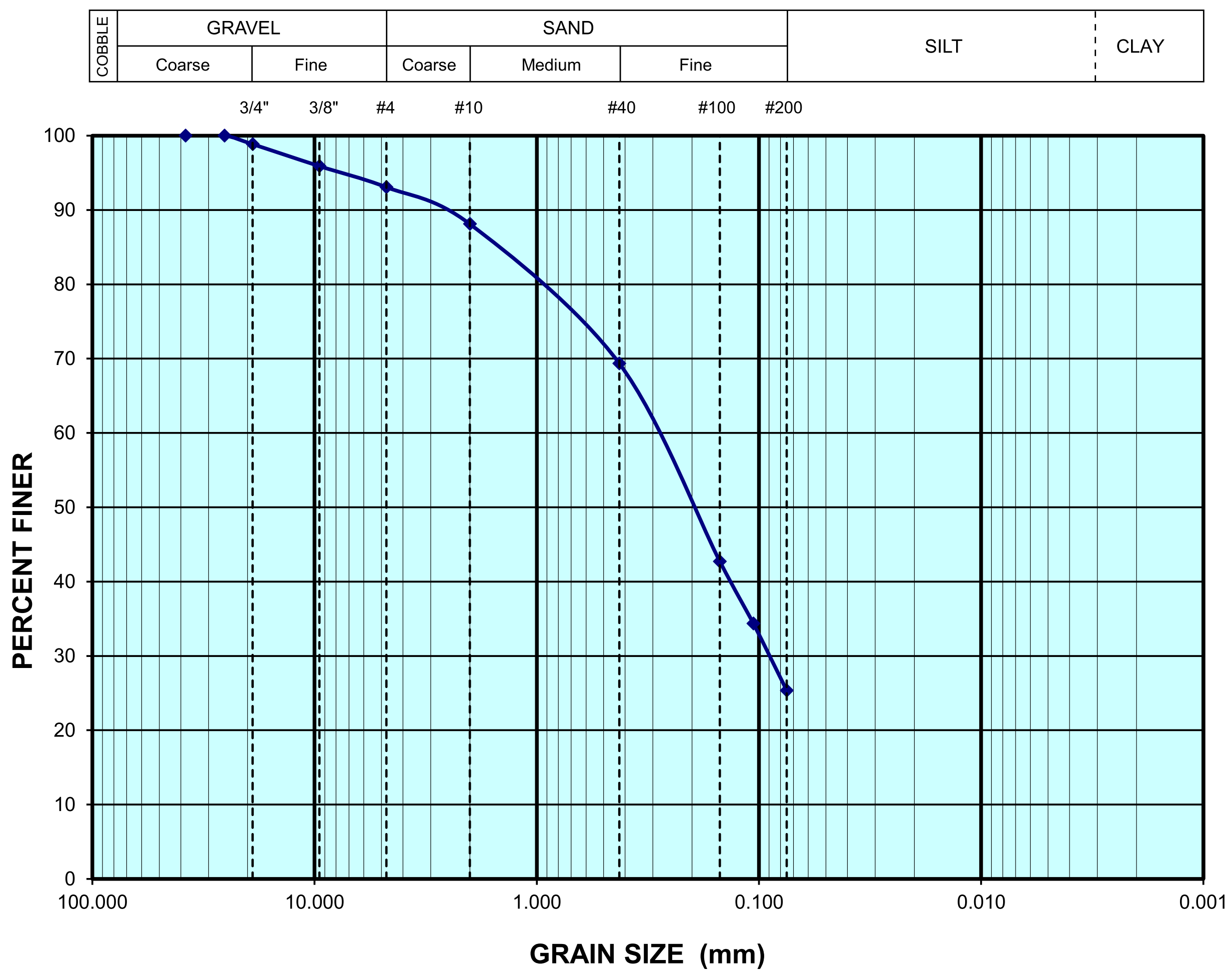
Project: La Cañada HS Pool & Improvements
Site: La Cañada Flintridge
Tech: CC

Project No. 19-1093
Date: 8/15/2019

Sample B-2@7'
Material Silty SAND (SM)

Test Specification: ASTM D422

Sieve	Mesh Opening (mm)	Percent Passing (%)
1 1/2 in	38.1	100.0 %
1 in	25.4	100.0 %
3/4 in	19.0	98.9 %
3/8 in	9.51	95.9 %
No. 4	4.75	93.1 %
No. 10	2.00	88.1 %
No. 40	0.425	69.4 %
No. 100	0.150	42.7 %
No. 140	0.106	34.4 %
No. 200	0.075	25.4 %



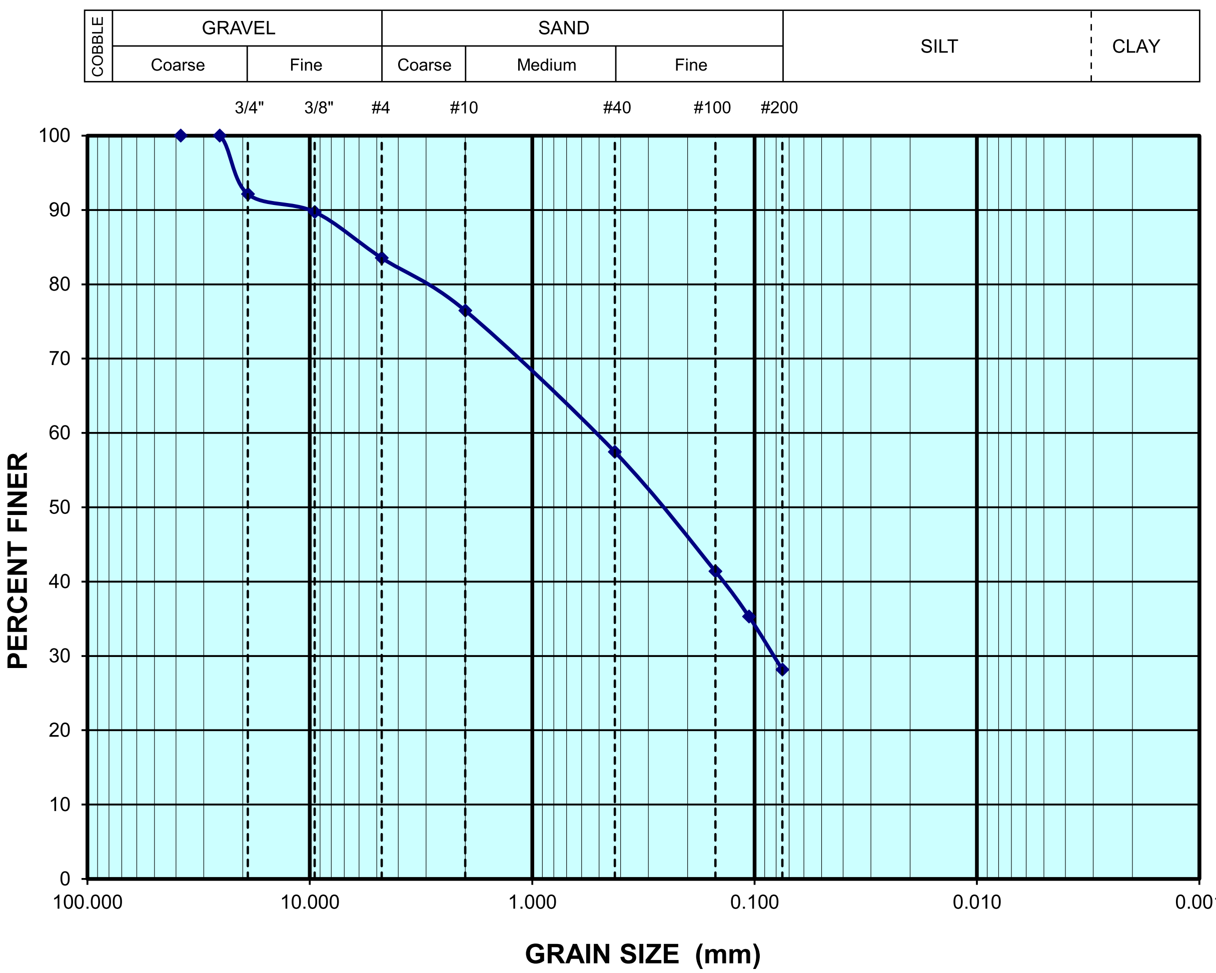
Geo-Advantec, Inc.		SIEVE ANALYSIS	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	
DATE	08-23-2018		

PARTICLE SIZE DISTRIBUTION REPORT

Project: La Cañada HS Pool & Improvements
Project No. 19-1093
Site: La Cañada Flintridge
Date: 8/15/2019
Tech: CC

Sample B-4@10'
Test Specification: ASTM D422
Material Silty SAND with gravel (SM)

Sieve	Mesh Opening (mm)	Percent Passing (%)
1 1/2 in	38.1	100.0 %
1 in	25.4	100.0 %
3/4 in	19.0	92.1 %
3/8 in	9.51	89.7 %
No. 4	4.75	83.5 %
No. 10	2.00	76.5 %
No. 40	0.425	57.5 %
No. 100	0.150	41.4 %
No. 140	0.106	35.3 %
No. 200	0.075	28.1 %



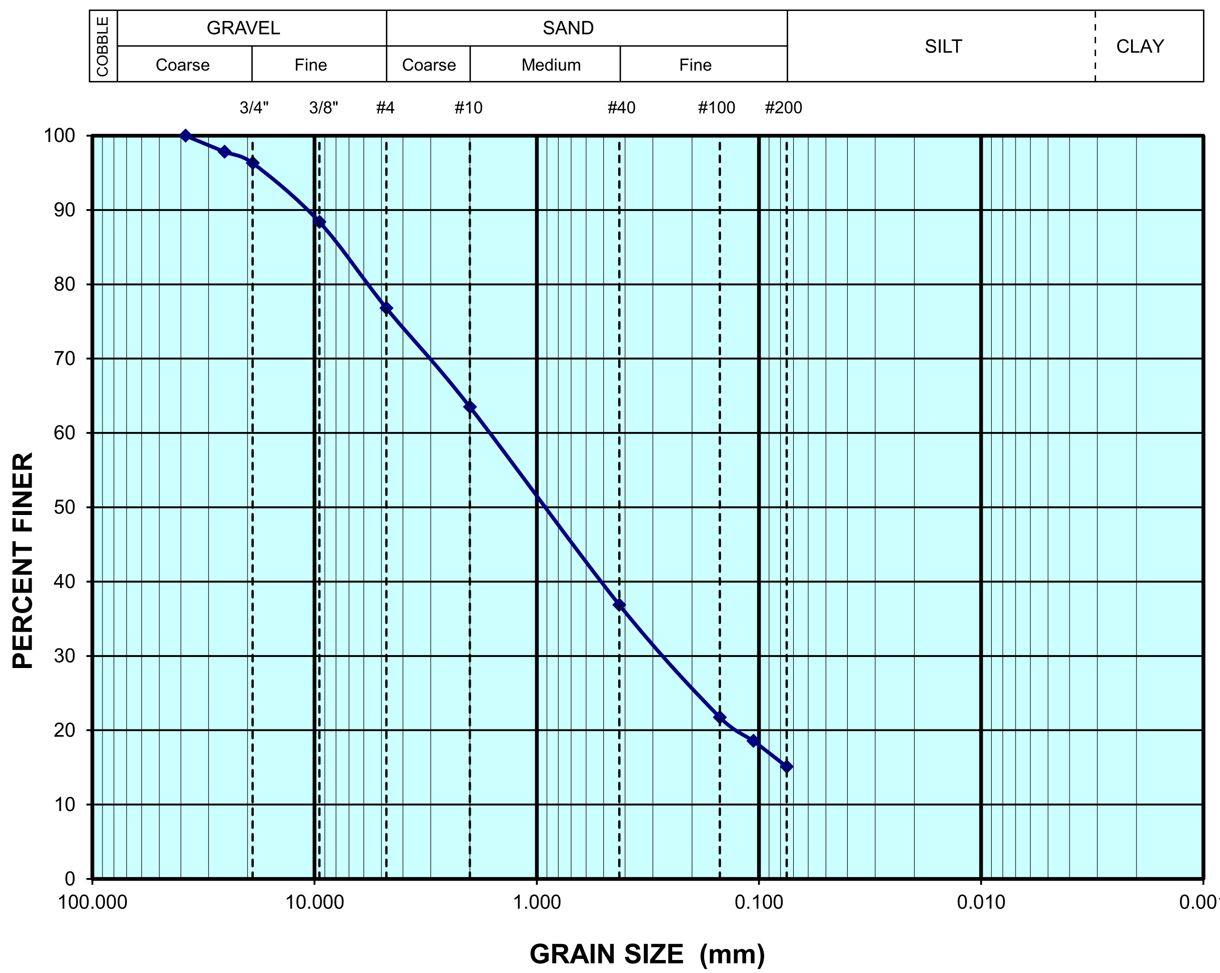
Geo-Advantec, Inc.		SIEVE ANALYSIS	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	
DATE	08-23-2018		

PARTICLE SIZE DISTRIBUTION REPORT

Project: La Cañada HS Pool & Improvements
Project No. 19-1093
Site: La Cañada Flintridge
Date: 8/15/2019
Tech: CC

Sample B-4@20'
Test Specification: ASTM D422
Material Silty SAND with gravel (SM)

Sieve	Mesh Opening (mm)	Percent Passing (%)
1 1/2 in	38.1	100.0 %
1 in	25.4	97.8 %
3/4 in	19.0	96.3 %
3/8 in	9.51	88.4 %
No. 4	4.75	76.8 %
No. 10	2.00	63.5 %
No. 40	0.425	36.9 %
No. 100	0.150	21.7 %
No. 140	0.106	18.6 %
No. 200	0.075	15.1 %



Geo-Advantec, Inc.		SIEVE ANALYSIS	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	
DATE	08-23-2018		

PARTICLE SIZE DISTRIBUTION REPORT

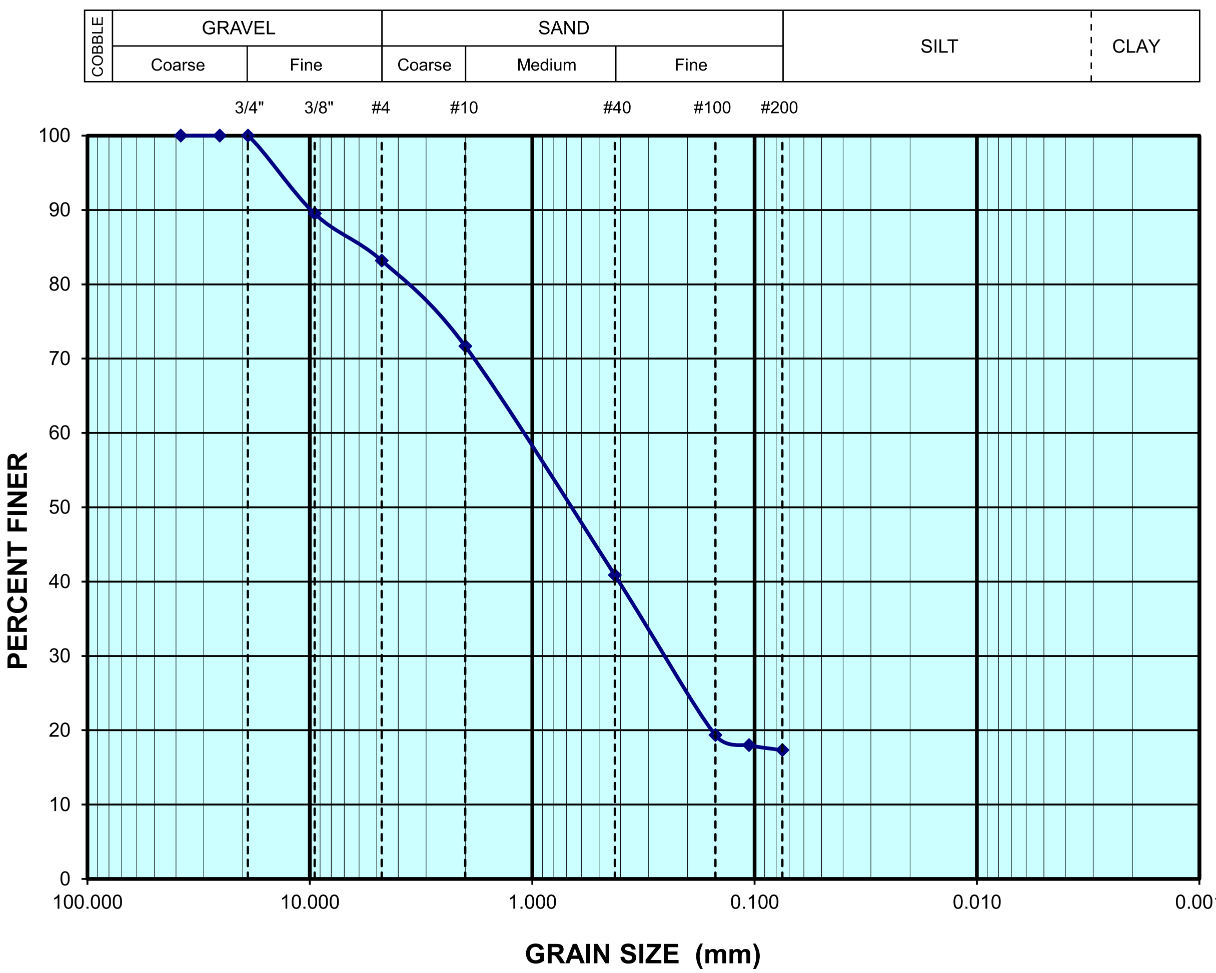
Project: La Cañada HS Pool & Improvements
Site: La Cañada Flintridge
Tech: CC

Project No. 19-1093
Date: 8/15/2019

Sample B-5@10'
Material Silty SAND with gravel (SM)

Test Specification: ASTM D422

Sieve	Mesh Opening (mm)	Percent Passing (%)
1 1/2 in	38.1	100.0 %
1 in	25.4	100.0 %
3/4 in	19.0	100.0 %
3/8 in	9.51	89.5 %
No. 4	4.75	83.2 %
No. 10	2.00	71.7 %
No. 40	0.425	40.9 %
No. 100	0.150	19.3 %
No. 140	0.106	18.0 %
No. 200	0.075	17.3 %



Geo-Advantec, Inc.		SIEVE ANALYSIS	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	
DATE	08-23-2018		

PARTICLE SIZE DISTRIBUTION REPORT

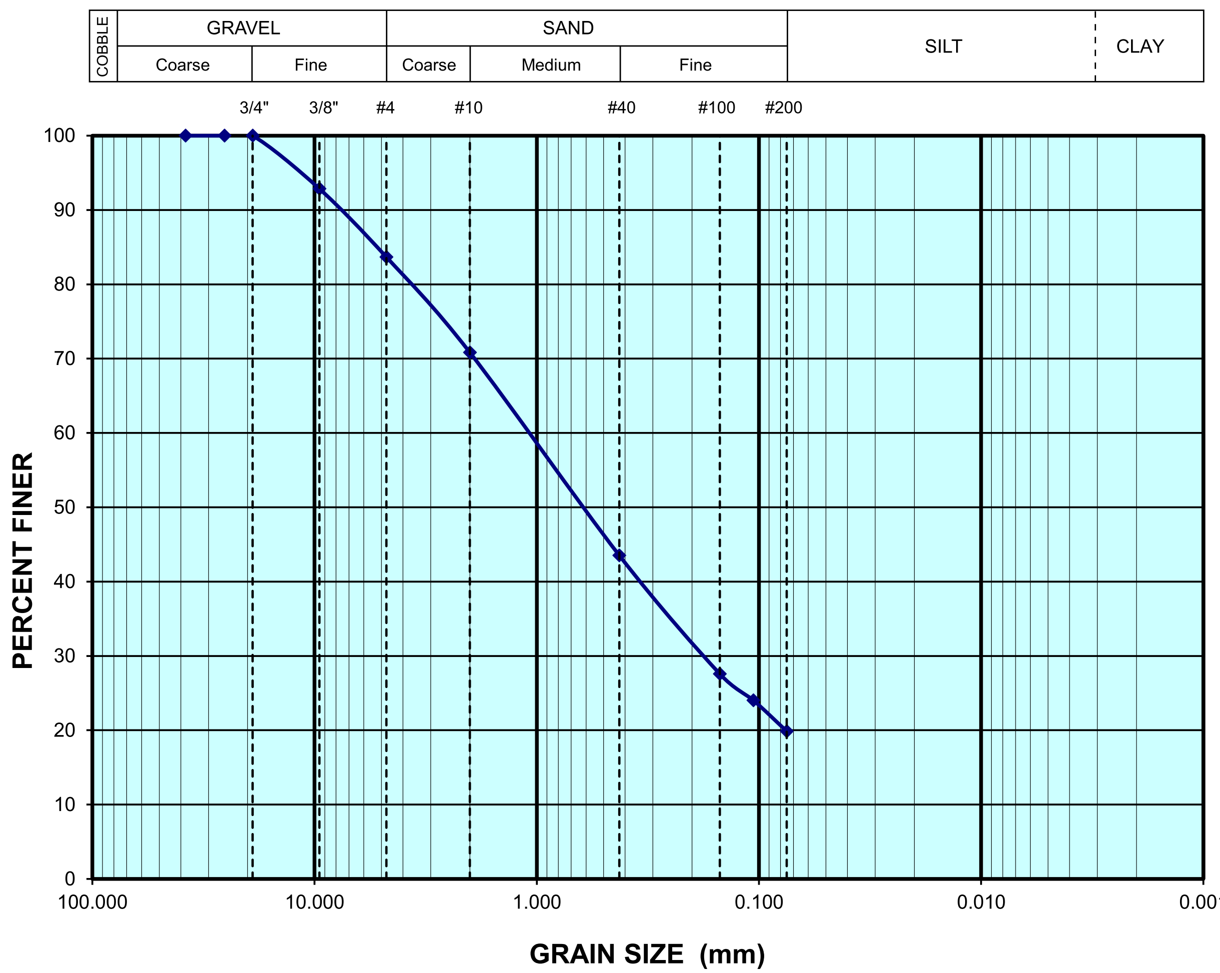
Project: La Cañada HS Pool & Improvements
Site: La Cañada Flintridge
Tech: CC

Project No. 19-1093
Date: 8/15/2019

Sample B-5@30'
Material Silty SAND with gravel (SM)

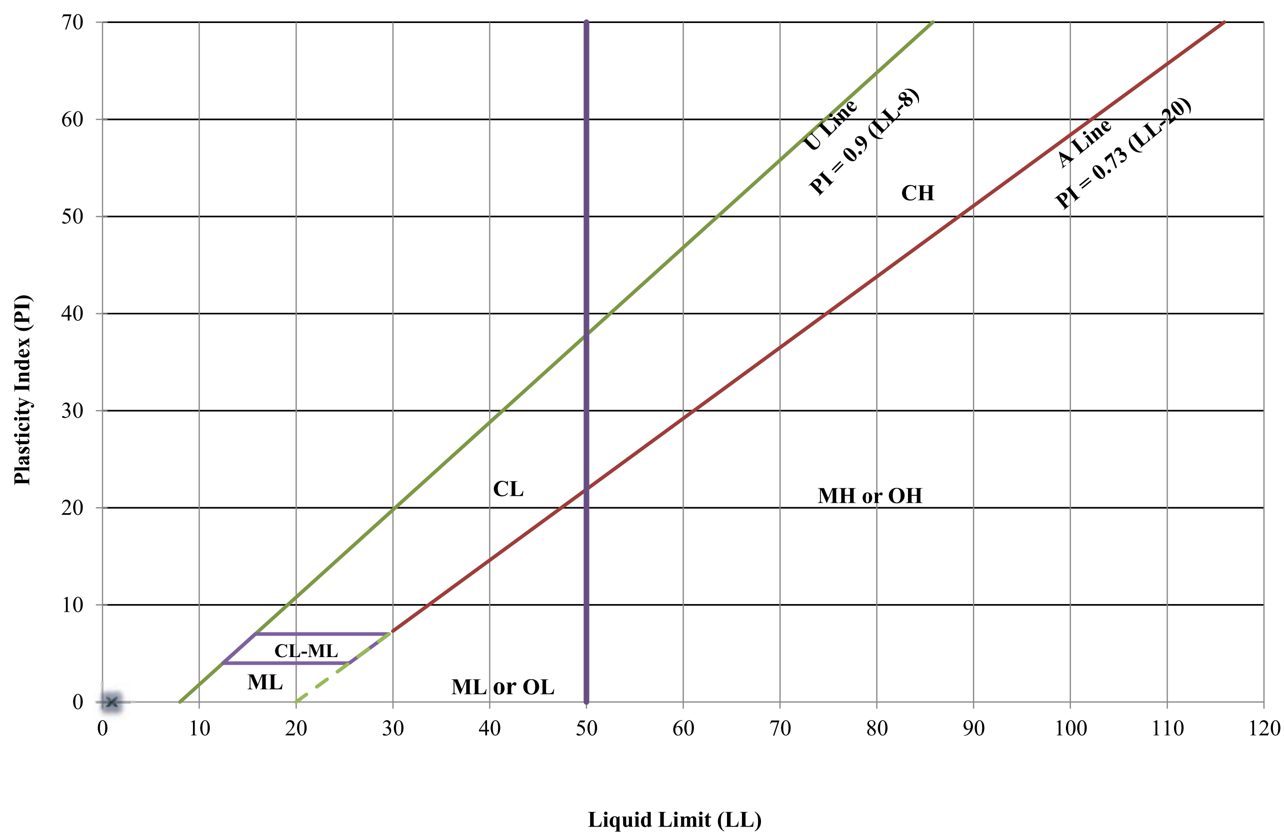
Test Specification: ASTM D422

Sieve	Mesh Opening (mm)	Percent Passing (%)
1 1/2 in	38.1	100.0 %
1 in	25.4	100.0 %
3/4 in	19.0	100.0 %
3/8 in	9.51	92.9 %
No. 4	4.75	83.7 %
No. 10	2.00	70.8 %
No. 40	0.425	43.5 %
No. 100	0.150	27.6 %
No. 140	0.106	24.0 %
No. 200	0.075	19.9 %



Geo-Advantec, Inc.		SIEVE ANALYSIS	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	
DATE	08-23-2018		

PLASTICITY CHART (ASTM D4318)



Symbol	Source	Depth (ft)	Classification	Natural M.C. (%)	Liquid Limit (LL)	Plasticity Index (PI)	%Passing #200 Sieve
×	B-4	10	Silty SAND with gravel (SM)	-	NP	NP	28

Geo-Advantec, Inc.		PLASTICITY CHART	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	
DATE	08-23-2018		

DIRECT SHEAR TEST (ASTM D3080)

Project La Cañada HS Pool & Site Improvement

Project No. 19-1093

Date Tested 8/16/2019

Site Location La Cañada Flintridge

Tested by AP

Boring No. B-5

Depth 5 ft

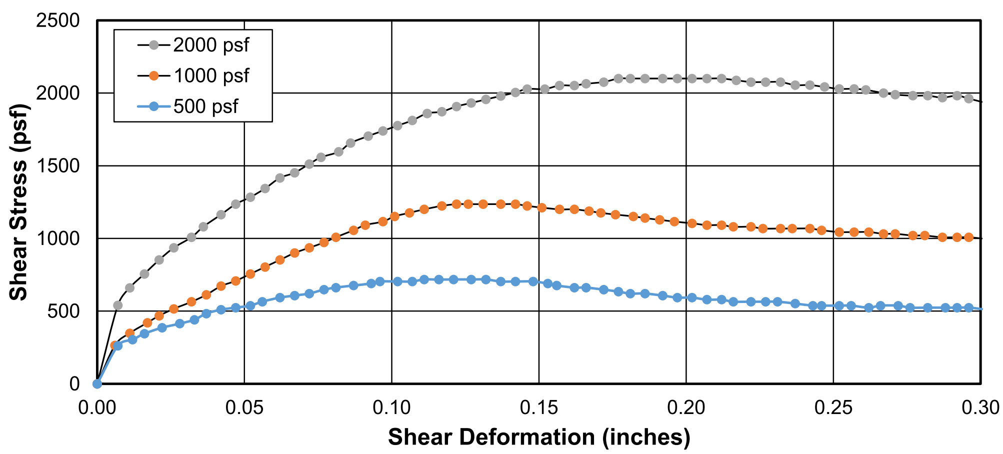
Sample Type Intact CD

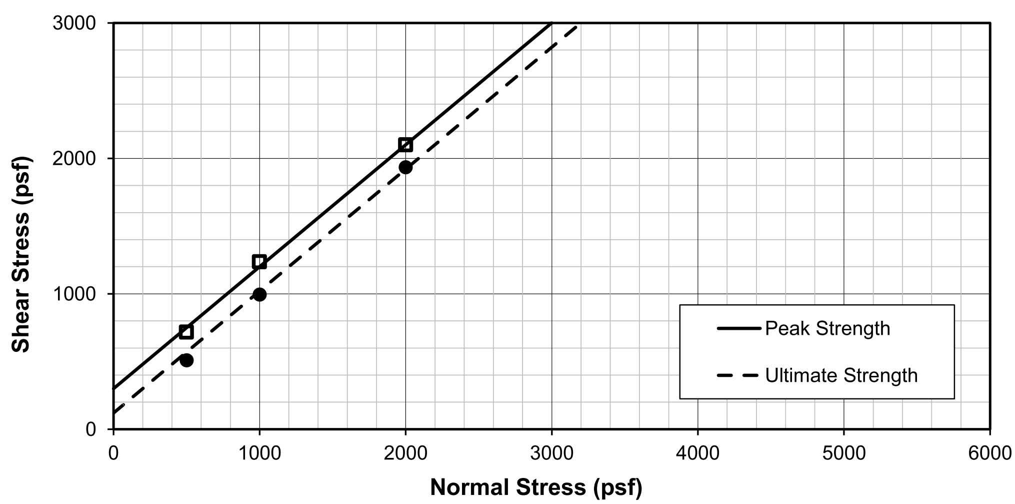
Soil Description Silty SAND with gravel (SM)

Test Condition Inundated

	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Moisture Content (%)	Void Ratio	Saturation (%)
Initial	133.6	117.8	13.4	0.43	84.1
Preshear	136.5	117.7	16.0	0.43	100.0

Normal Stress (psf)	Peak Shear Stress (psf)	Ultimate Shear Stress (psf)
500	718	510
1000	1236	996
2000	2100	1936





STRENGTH TYPE	COHESION (psf)	FRICTION ANGLE (degrees)
Peak Strength	300	42
Ultimate Strength	120	42

Geo-Advantec, Inc.		DIRECT SHEAR TEST RESULTS	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	
DATE	08-23-2018		

CONSOLIDATION TEST (Consolidation Curve)

Project La Cañada HS Pool & Site Improvement

Project No. 19-1093 Date Tested 8/14/2019

Site Location La Cañada Flintridge

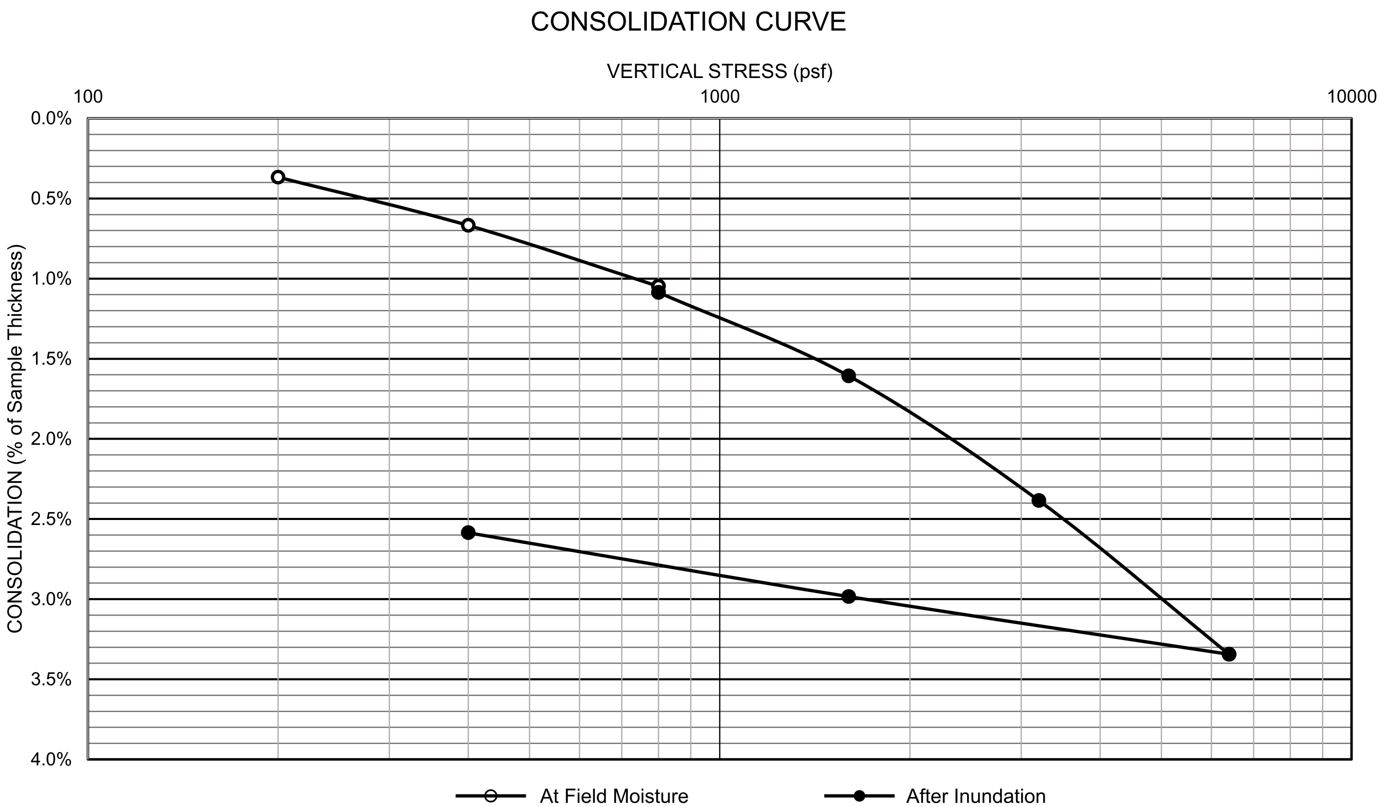
Tested by AP

Boring No. B-5 Sample No. Depth 5 ft

Frame No. Sample Type Intact CD

Soil Description Silty SAND with gravel (SM)

Water added 800 psf



Initial Moisture Content	13.4%
Initial Dry Unit Weight, pcf	118.5
Initial Void Ratio	0.42
Initial Degree of Saturation	85.7%
Assumed Specific Gravity	2.7

Final Moisture Content	19.3%
Final Dry Unit Weight, pcf	110.8
Final Void Ratio	0.52
Final Degree of Saturation	100.0%

Remarks Collapse = 0.04 % upon inundation

Geo-Advantec, Inc.		ONE-DIMENSIONAL CONSOLIDATION TEST	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	
DATE	08-23-2018		

R-VALUE TEST DATA

Project La Cañada HS Pool & Improvements

Project No. 19-1093 Date Tested

Site Location La Cañada Flintridge

Test Specification CT 301

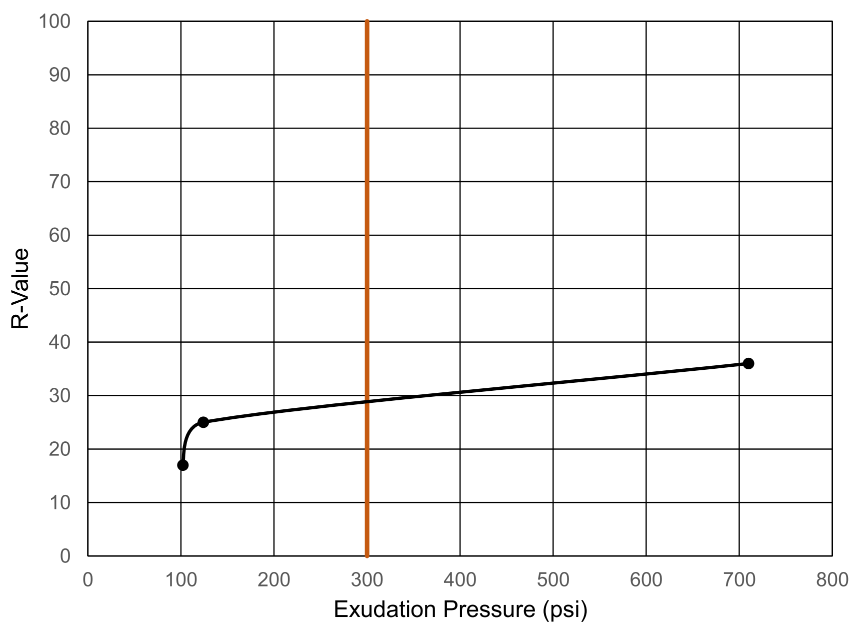
Boring No. B-3 Sample Depth 1 - 5 ft

Test Performed by AP

Soil Description Silty Sand with gravel (SM)

Mold Number	A	B	C	
Exudation Pressure, psi	710	124	102	
Prepared Weight, g	1100	1100	1100	
Final Water Added, g	0	20	25	
Weight, Soil & Mold, g	3156	3174	3177	
Weight, Mold, g	2095	2096	2100	
Height, in	2.42	2.46	2.45	
Expansion, x10-4 inches	0	0	0	
Stability 1,000 (80 psi)	0	0	0	
Stability 2,000 (160 psi)	95	106	118	
Turns Displacement	3.09	3.88	4.2	
(2.5/d)*((Pv/Ph)-1)+1	1.55	1.33	1.21	
100/Above	64	75	83	
R-Value Uncorrected	36	25	17	
R-Value Corrected	36	25	17	

R-VALUE	By Exudation (Uncorrected)	29
	By Exudation (Corrected)	29
Remarks	Moisture: 9.1%	



Geo-Advantec, Inc.		R-VALUE TEST RESULTS	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	
DATE	08-23-2018		

CORROSION TEST RESULTS

Project / Client La Cañada HS Pool & Improvements

Project No. 19-1093 Date Tested 8/15/2019

Site Location La Cañada Flintridge

Test Specification (See notes)

Tested by AP Sample Type bulk

Boring No.	Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)*	pH	Sulfate Content (ppm)	Chloride Content (ppm)
B-6	1-5	SM	1317	7.20	290	176

*Minimum Resistivty values have been normalized to standard ground temperature of 15.5 C per CT-643

**Temperature of soil sample collected from final resistance measurement per CT-643

NOTES:

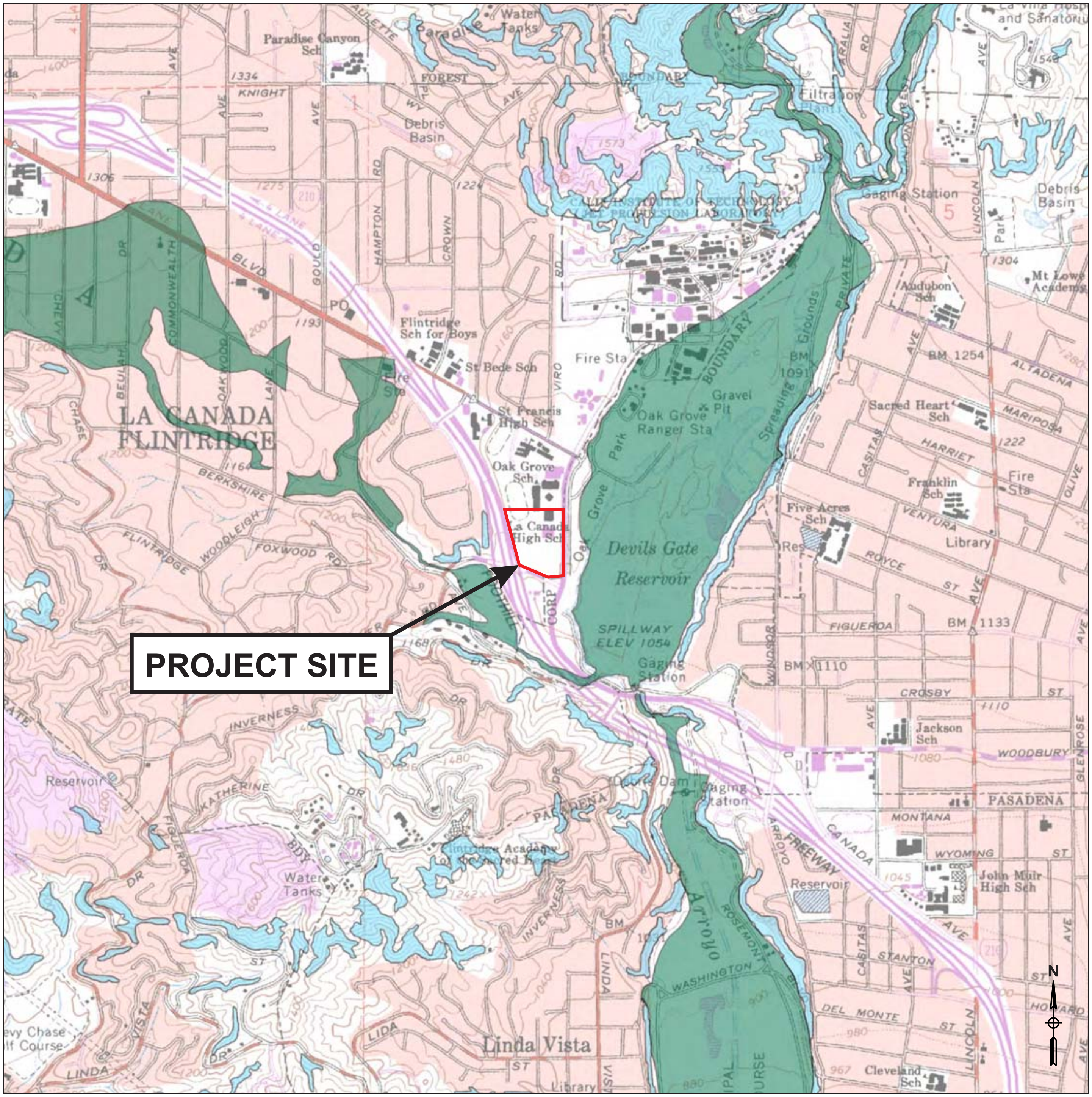
Resistivity Test and pH: California Test Method 643

Sulfate Content: California Test Method 417

Chloride Content: California Test Method 422

APPENDIX D

QUADRANGLE MAP



SCALE (MILES)

0 0.25 0.5 1.0

Earthquake Zones of Required Investigation Pasadena Quadrangle

California Geological Survey

This Map Shows Seismic Hazard Zones
Alquist-Priolo Earthquake Fault Zones Have Not Been Prepared For The Pasadena Quadrangle

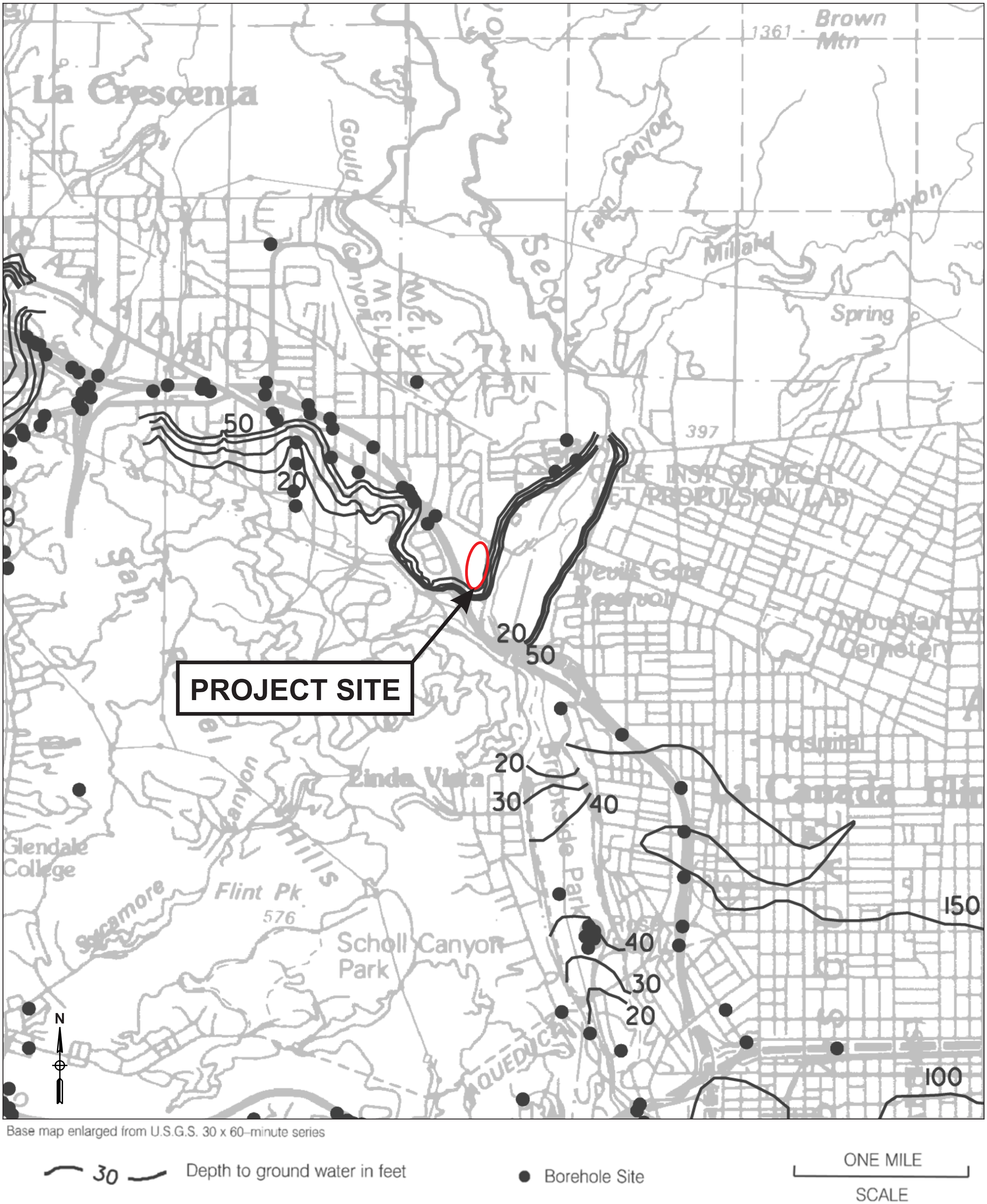
MAP EXPLANATION

SEISMIC HAZARD ZONES

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

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

Geo-Advantec, Inc.		SEISMIC HAZARD ZONES MAP	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	D-1
DATE	08-23-2019		



Geo-Advantec, Inc.		HISTORICALLY HIGHEST GROUNDWATER MAP	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	D-2
DATE	08-23-2019		

APPENDIX E

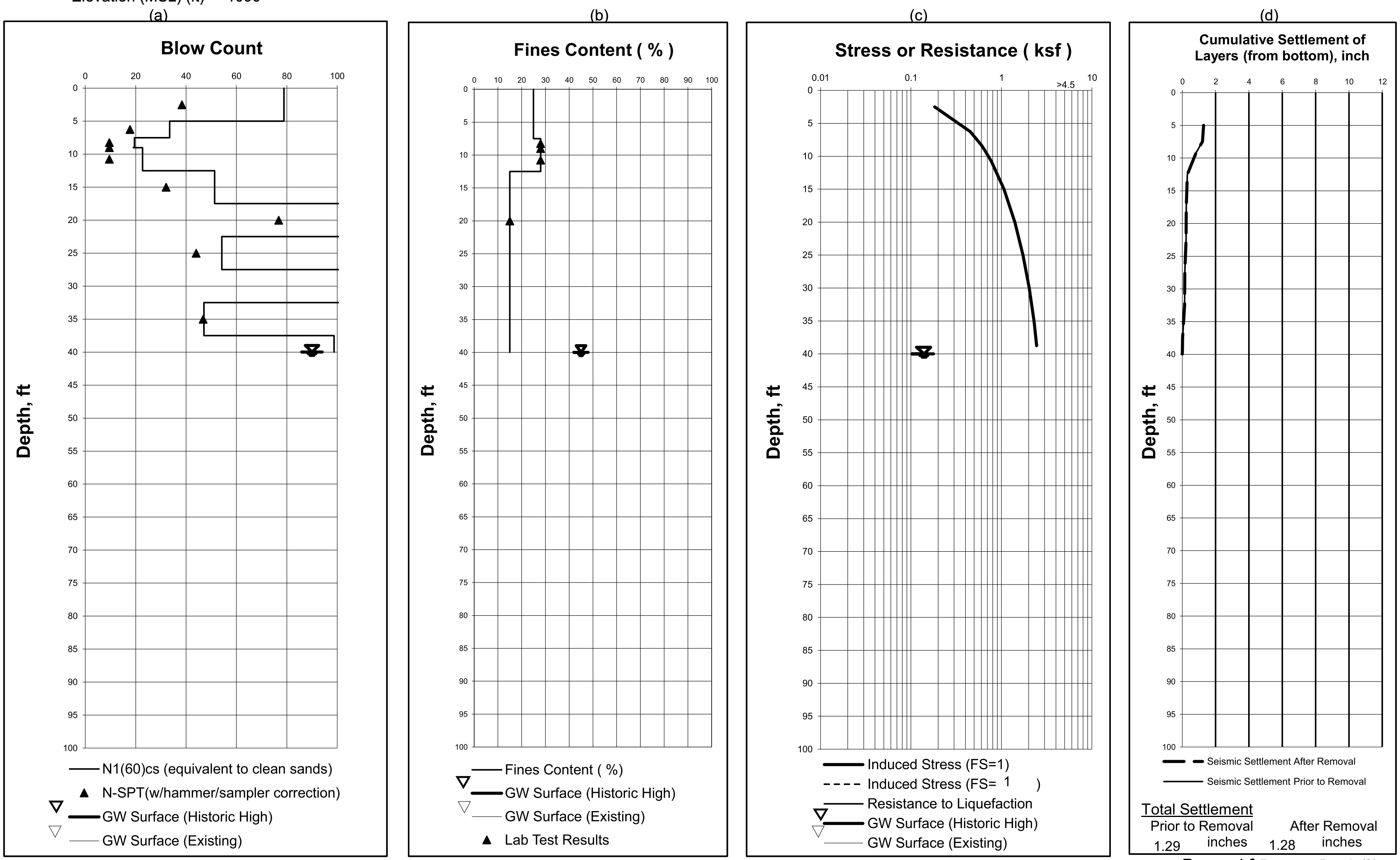
ENGINEERING ANALYSES RESULTS

COMPUTER PROGRAM: EQLique&Settle"2"

Location………. **B-4** **Surcharge** 0.00 ksf

Elevation (MSL) (ft) 1090

NOTE: If the total settlement is very small (e.g.<0.05"), it will not be seen due to the scale used, and should be reported as "negligible".



Weighted Ground Accel. (M=7.5) = 0.87 g Site Magnitude = 7.1

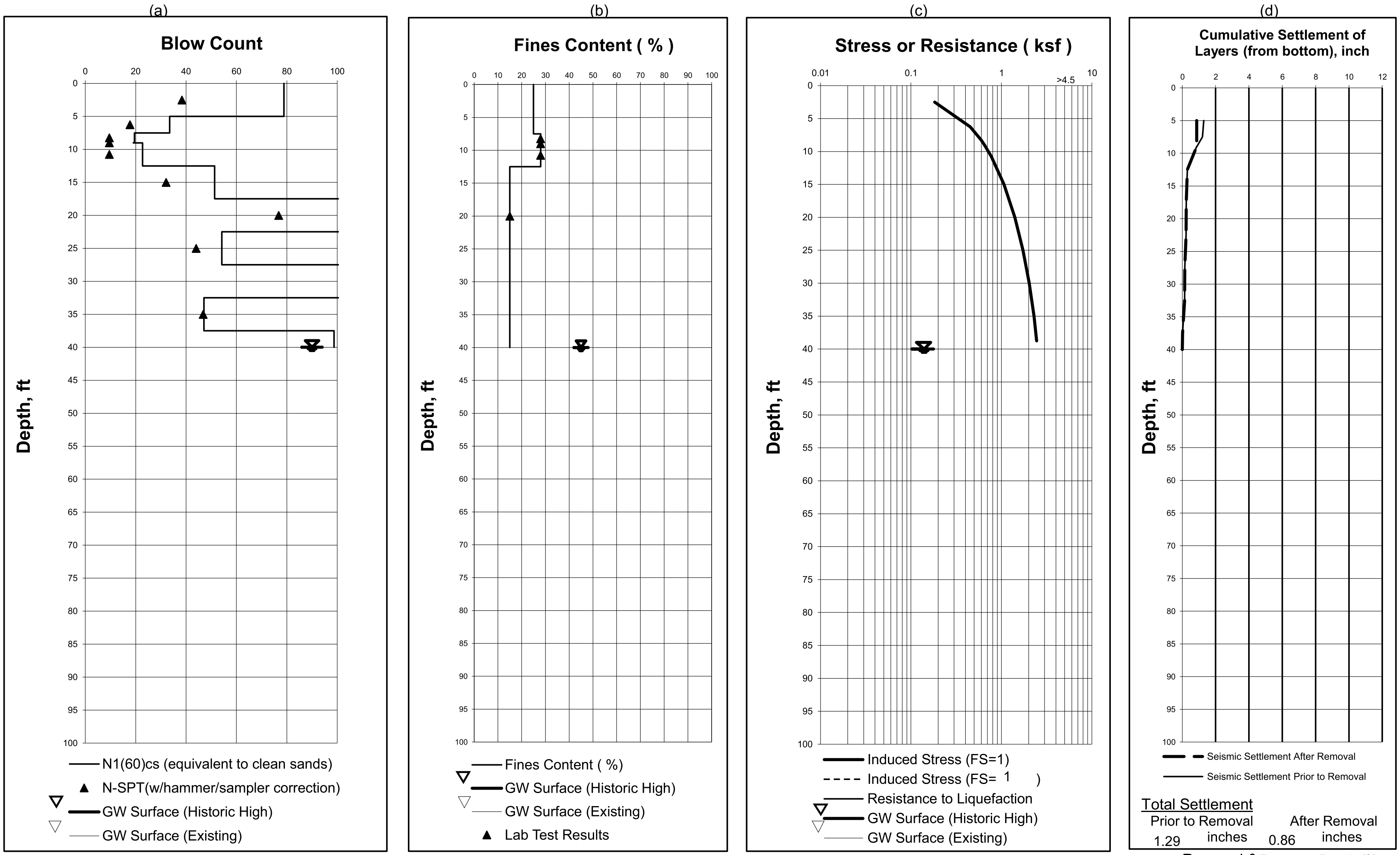
Geo-Advantec, Inc.		LIQUEFACTION & SEISMIC SETTLEMENTS	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	E-1a
DATE	10-10-2019		

COMPUTER PROGRAM: EQLique&Settle"2"

Location.......... **B-4** **Surcharge** 0.00 ksf

Elevation (MSL) (ft) 1090

NOTE: If the total settlement is very small (e.g.<0.05"), it will not be seen due to the scale used, and should be reported as "negligible".



Total Settlement

Prior to Removal 1.29 inches

After Removal 0.86 inches

Removal & Recomp. Depth (ft) = 9

Weighted Ground Accel. (M=7.5) = 0.87 g Site Magnitude = 7.1

Geo-Advantec, Inc.		LIQUEFACTION & SEISMIC SETTLEMENTS	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	E-1b
DATE	10-10-2019		

Project La Canada HS Pool and Site Improvements

Location La Canada, CA

Project No 19-1093

Date Tested 7/29/2019

Tested By MN

Weather Sunny / Hot

Test Hole P-1

Depth of Test Hole (ft) 7.00

Pipe Height Above Grade (ft) 3.00

Diameter of Test Hole (ft) 0.667

Soil Classification SM w/ Gravel

Sandy Soil Criteria Test

Trial No	Start Minute	Initial Depth to Water (ft)	Stop Minute	Final Depth to Water (ft)	Time Diff. (min)	Initial Height of Water (in)	Final Height of Water (in)	Change in Water Level (in)	Greater than or equal to 12 inch in 30 minutes?
1	0	5.29	10	5.69	10	56.50	51.75	4.75	n/a
2	0	5.17	10	5.71	10	58.00	51.50	6.50	n/a

Test Data

Trial No	Start Minute	Initial Depth to Water (ft)	Stop Minute	Final Depth to Water (ft)	Time Diff. (min)	Initial Height of Water (in)	Final Height of Water (in)	Change in Water Level (in)	Percolation Rate (in/hr)	LA County Reduction Factor[a]	LA County Infiltration Rate[b] (in/hr)	Porchet Infiltration Rate[c] (in/hr)
1	0	5.46	10	5.90	10	54.50	49.25	5.25	31.5	13.97	2.26	1.17
2	0	5.13	10	5.52	10	58.50	53.75	4.75	28.5	15.03	1.90	0.98
3	0	5.54	10	6.04	10	53.50	47.50	6.00	36.0	13.63	2.64	1.37
4	0	5.21	10	5.60	10	57.50	52.75	4.75	28.5	14.78	1.93	1.00
5	0	5.35	10	5.75	10	55.75	51.00	4.75	28.5	14.34	1.99	1.03
6	0	5.54	10	6.08	10	53.50	47.00	6.50	39.0	13.56	2.88	1.49
7	0	5.56	10	6.00	10	53.25	48.00	5.25	31.5	13.66	2.31	1.20
										minimum >	**1.90**	**0.98**
										average >	**2.27**	**1.18**

[a]Additional safety factor (e.g. site variability, number of tests, long-term siltation, plugging, and maintenance) was not utilized into the above reported rates.
[b]County of Los Angeles, Department of Public Works, Geotechnical and Materials Engineering Division, December 31, 2014. Guidelines for Design, Investigation, and Reporting Low Impact Development Stormwater Infiltration. GS200.1.
[c]Orange County, December 20, 2013. Technical Guidance Document (TGD) for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs). Exhibit 7.III.

Geo-Advantec, Inc.		PERCOLATION TEST DATA	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	E-2a
DATE	08-23-2019		

Project La Canada HS Pool and Site Improvements

Location La Canada, CA — Test Hole P-2

Project No 19-1093 — Depth of Test Hole (ft) 7.00

Date Tested 7/29/2019 — Pipe Height Above Grade (ft) 3.25

Tested By MN — Diameter of Test Hole (ft) 0.667

Weather Sunny / Hot — Soil Classification SM w/ Gravel

Sandy Soil Criteria Test

Trial No	Start Minute	Initial Depth to Water (ft)	Stop Minute	Final Depth to Water (ft)	Time Diff. (min)	Initial Height of Water (in)	Final Height of Water (in)	Change in Water Level (in)	Greater than or equal to 12 inch in 30 minutes?
1	0	4.13	10	4.52	10	73.50	68.75	4.75	n/a
2	0	4.33	10	4.77	10	71.00	65.75	5.25	n/a

Test Data

Trial No	Start Minute	Initial Depth to Water (ft)	Stop Minute	Final Depth to Water (ft)	Time Diff. (min)	Initial Height of Water (in)	Final Height of Water (in)	Change in Water Level (in)	Percolation Rate (in/hr)	LA County Reduction Factor[a]	LA County Infiltration Rate[b] (in/hr)	Porchet Infiltration Rate[c] (in/hr)
1	0	4.46	10	4.92	10	69.50	64.00	5.50	33.0	17.69	1.87	0.96
2	0	4.10	10	4.48	10	73.75	69.25	4.50	27.0	18.88	1.43	0.73
3	0	4.46	10	4.81	10	69.50	65.25	4.25	25.5	17.84	1.43	0.74
4	0	3.17	10	3.54	10	85.00	80.50	4.50	27.0	21.69	1.24	0.64
5	0	4.13	10	4.50	10	73.50	69.00	4.50	27.0	18.81	1.44	0.74
6	0	3.65	10	4.00	10	79.25	75.00	4.25	25.5	20.28	1.26	0.64
										minimum >	**1.24**	**0.64**
										average >	**1.44**	**0.74**

[a]Additional safety factor (e.g. site variability, number of tests, long-term siltation, plugging, and maintenance) was not utilized into the above reported rates.

[b]County of Los Angeles, Department of Public Works, Geotechnical and Materials Engineering Division, December 31, 2014. Guidelines for Design, Investigation, and Reporting Low Impact Development Stormwater Infiltration. GS200.1.

[c]Orange County, December 20, 2013. Technical Guidance Document (TGD) for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs). Exhibit 7.III.

Geo-Advantec, Inc.		PERCOLATION TEST DATA	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	E-2b
DATE	08-23-2019		

Project La Canada HS Pool and Site Improvements

Location La Canada, CA

Test Hole P-3

Project No 19-1093

Depth of Test Hole (ft) 7.00

Date Tested 7/29/2019

Pipe Height Above Grade (ft) 3.42

Tested By MN

Diameter of Test Hole (ft) 0.667

Weather Sunny / Hot

Soil Classification SM w/ Gravel

Sandy Soil Criteria Test

Trial No	Start Minute	Initial Depth to Water (ft)	Stop Minute	Final Depth to Water (ft)	Time Diff. (min)	Initial Height of Water (in)	Final Height of Water (in)	Change in Water Level (in)	Greater than or equal to 12 inch in 30 minutes?
1	0	6.08	10	6.63	10	52.00	45.50	6.50	n/a
2	0	6.21	10	6.60	10	50.50	45.75	4.75	n/a

Test Data

Trial No	Start Minute	Initial Depth to Water (ft)	Stop Minute	Final Depth to Water (ft)	Time Diff. (min)	Initial Height of Water (in)	Final Height of Water (in)	Change in Water Level (in)	Percolation Rate (in/hr)	LA County Reduction Factor[a]	LA County Infiltration Rate[b] (in/hr)	Porchet Infiltration Rate[c] (in/hr)
1	0	6.38	10	6.81	10	48.50	43.25	5.25	31.5	12.47	2.53	1.32
2	0	6.50	10	7.02	10	47.00	40.75	6.25	37.5	11.97	3.13	1.63
3	0	5.75	10	6.23	10	56.00	50.25	5.75	34.5	14.28	2.42	1.25
4	0	5.83	10	6.17	10	55.00	51.00	4.00	24.0	14.25	1.68	0.87
5	0	6.17	10	6.63	10	51.00	45.50	5.50	33.0	13.06	2.53	1.31
6	0	5.75	10	6.13	10	56.00	51.50	4.50	27.0	14.44	1.87	0.97
7	0	5.96	10	6.52	10	53.50	46.75	6.75	40.5	13.53	2.99	1.55
8	0	6.52	10	7.06	10	46.75	40.25	6.50	39.0	11.88	3.28	1.71
										minimum >	**1.68**	**0.87**
										average >	**2.55**	**1.33**

[a]Additional safety factor (e.g. site variability, number of tests, long-term siltation, plugging, and maintenance) was not utilized into the above reported rates.

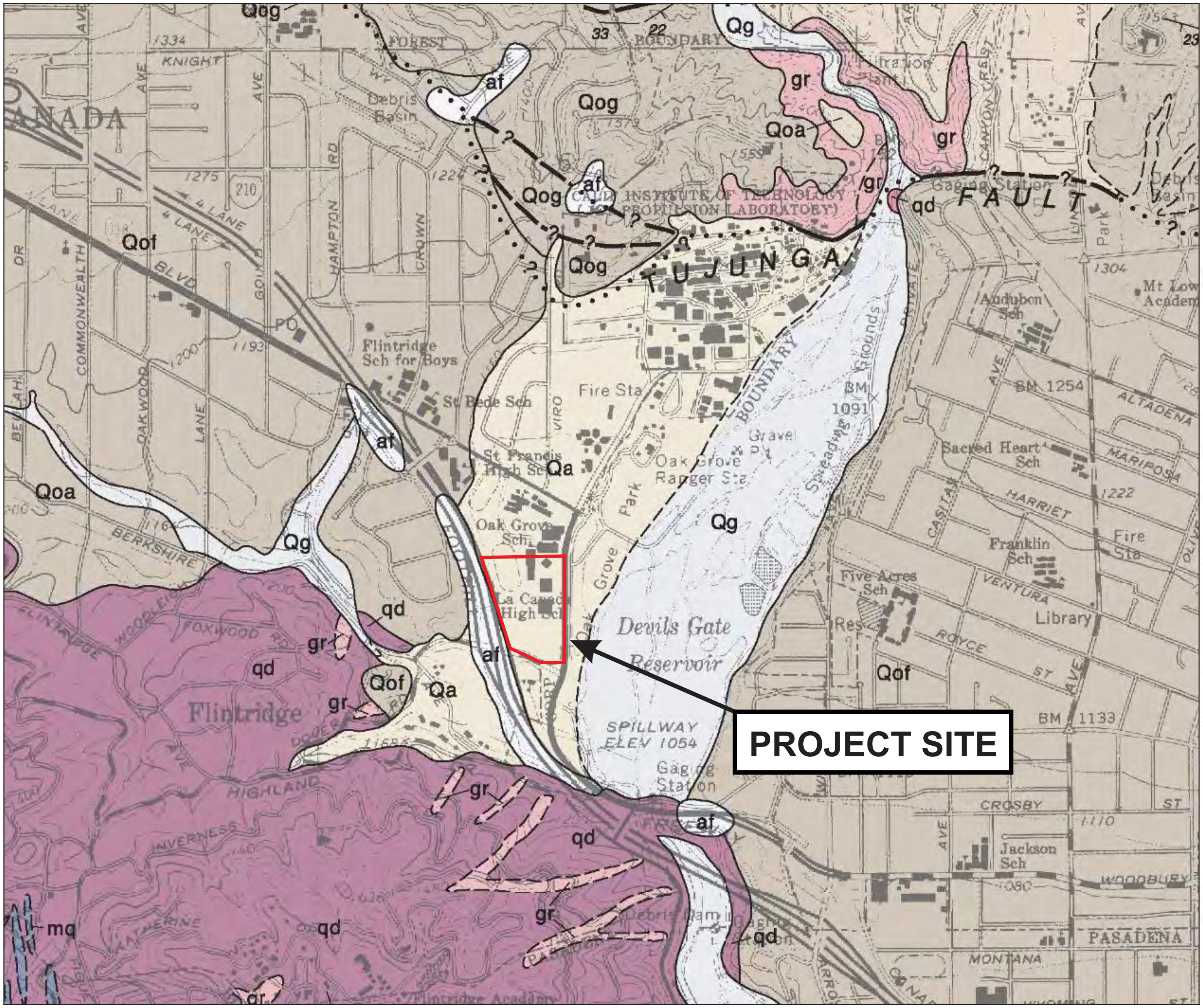
[b]County of Los Angeles, Department of Public Works, Geotechnical and Materials Engineering Division, December 31, 2014. Guidelines for Design, Investigation, and Reporting Low Impact Development Stormwater Infiltration. GS200.1.

[c]Orange County, December 20, 2013. Technical Guidance Document (TGD) for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs). Exhibit 7.III.

Geo-Advantec, Inc.		PERCOLATION TEST DATA	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	E-2c
DATE	08-23-2019		

APPENDIX G

GEOLOGIC AND SEISMIC DATA



APPROX. SCALE (MILES)

0 0.25 0.5 1.0

GEOLOGIC MAP OF THE PASADENA QUADRANGLE

LOS ANGELES COUNTY, CALIFORNIA

BY THOMAS W. DIBBLEE, JR., 1989

EDITED BY HELMUT E. EHRENSPECK, 1989

EDITED BY JOHN A. MINCH, 2010

LEGEND

af | Qg | Qa

SURFICIAL SEDIMENTS

af *Artificial fill*
Qg *Stream channel deposits of gravel, sand and silt*
Qa *Alluvium: unconsolidated floodplain deposits of silt, sand and gravel*

Qls

LANDSLIDE AND TALUS DEBRIS

Qoa | Qof | Qog

OLDER DISSECTED SURFICIAL SEDIMENTS

Qoa *Remnants of older weakly consolidated alluvial deposits of gravel, sand and silt*
Qof *Alluvial fan gravel and sand derived from San Gabriel Mountains; includes some* **Qg** *and* **Qa** *in northern areas*
Qog *Elevated remnants of alluvial gravel and fanglomerate deposits, weakly indurated; in San Gabriel Mountain foothills partly waethered reddish; in that area may locally include Pacoima and Saugus Formations of Smith (1986)*

— UNCONFORMITY —

Ttqdc | Ttsc | Ttqdb

TOPANGA (?) FORMATION

(Topanga Formation of Lamar, 1970; Weber, 1980)

Marine and nonmarine (?); middle and/or late (?) Miocene age

Ttqdc *Gray to brown, crudely bedded conglomerate and breccia, all composed of biotite hornblende quartz diorite in semifriable sandstone matrix*
Ttsc *Light gray to brown, semi-friable sandstone, and interbedded brown sandy to silty shale, semisiliceous shale, and pebble-cobble conglomerate of quartz diorite detritus; Luisian(?) Stage*
Ttqdb *Gray to brown breccia, massive to vaguely bedded, composed of angular detritus and a few rounded cobbles and boulders, all of biotite hornblende quartz diorite; at Adams Hill includes lenses of sandy to silty shale and sandstone* (**Ttsc**)*; probably overlies quartz diorite basement rocks*

Td | Tb | Tl

DIKE ROCKS

Td/Tb *Thin dikes of black to brown, fine-grained basaltic to andesitic intrusive rocks*
Tl *Thin dikes of light gray latite porphyry*

CRYSTALLINE BASEMENT ROCKS

gr

LEUCOCRATIC GRANITIC ROCKS

Late Mesozoic (Cretaceous?) age

gr *Gray-white, medium- to fine-grained massive granitic rock mostly of quartz monzonite and granodiorite composition; composed essentially of quartz, plagioclase feldspar (oligoclase), K-feldspar (mostly microcline) and minor biotite; in part cataclastic northeast of San Gabriel fault; intrusive into quartz diorite and gneissic rocks.*

qd | gqd

QUARTZ DIORITE

(Wilson Diorite of Miller, 1934)

Crook, et al., 1987, include units mapped as hornblende diorite, hornblende biotite diorite, and biotite hornblende diorite by Smith, 1986)

Early Cretaceous age (122 m.y. B.P.)

Gray, medium-grained quartz diorite to diorite, composed essentially of plagioclase feldspar (oligoclase-andesine), hornblende, biotite, and minor quartz; incoherent where weathered

qd *Massive, non-gneissoid quartz diorite*
gqd *Massive to gneissoid quartz diorite, locally includes unmapped biotite-rich gneiss*

Geo-Advantec, Inc.		GEOLOGIC MAP	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	G-1
DATE	08-23-2019		

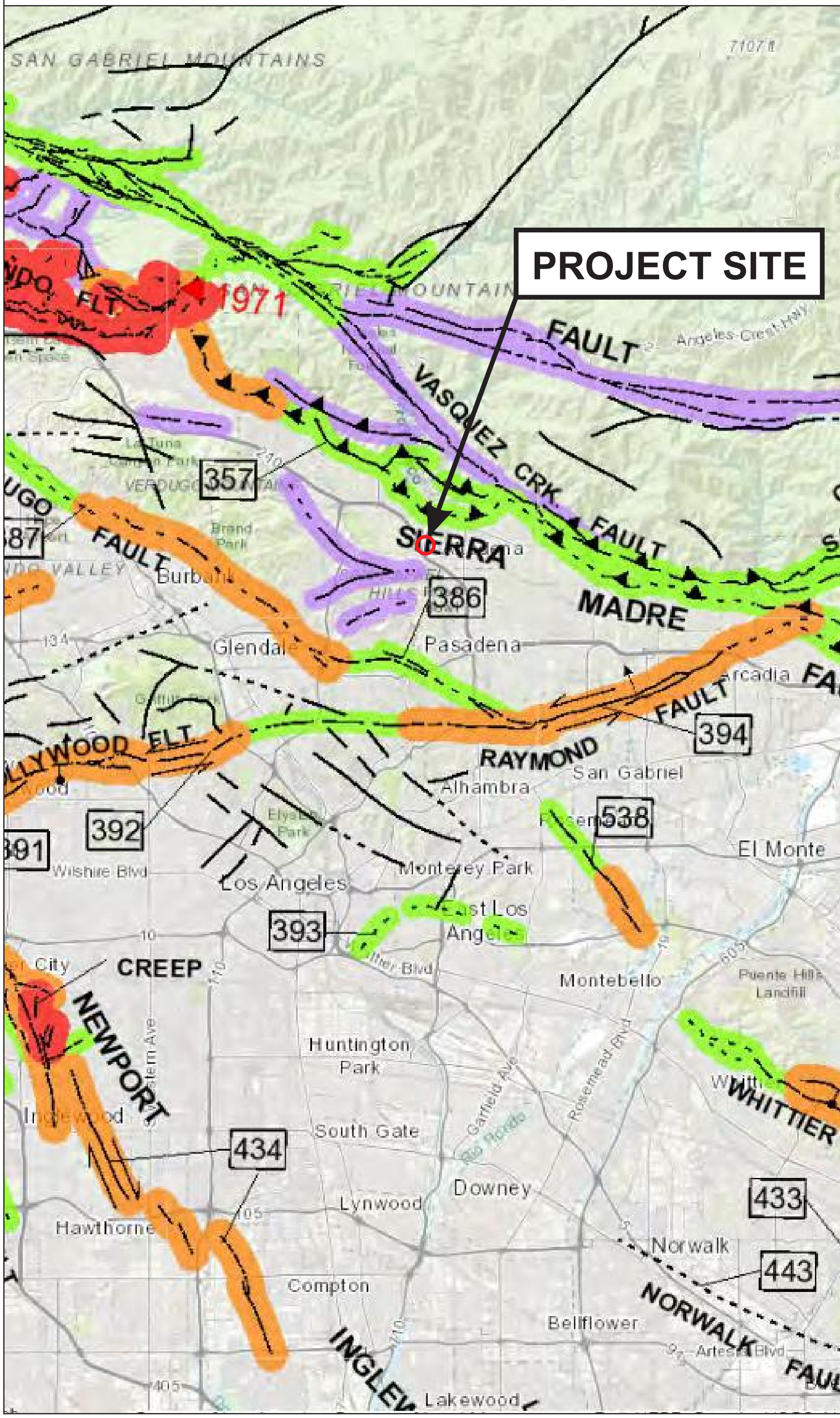
State of California
Department of Conservation

2010 FAULT ACTIVITY MAP OF CALIFORNIA

California Geological Survey, Geologic Data Map No. 6

Compilation and Interpretation by: Charles W. Jennings and William A. Bryant

Graphics by: Milind Patel, Ellen Sander, Jim Thompson, Barbara Wanish and Milton Fonseca



SYMBOL EXPLANATION

Fault traces on land are indicated by solid lines where well located, by dashed lines where approximately located or inferred, and by dotted lines where concealed by younger rocks or by lakes or bays. Fault traces are queried where continuation or existence is uncertain. All offshore faults based on seismic reflection profile records are shown as solid lines where well defined, dashed where inferred, queried where uncertain.

FAULT CLASSIFICATION COLOR CODE
(Indicating Recency of Movement)

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

1906 ▶ ◀ 1906
1838 ▷ ◁ 1838

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.

▶ 1951 ◀

Date bracketed by triangles indicates local fault break.

1992

No triangle by date indicates an intermediate point along faultbreak.

CREEP

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.

1969
1968 ■ ■ 1968

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.

ADDITIONAL FAULT SYMBOLS

Bar and ball on downthrown side (relative or apparent).

Arrows along fault indicate relative or apparent direction of lateral movement.

Arrow on fault indicates direction of dip.

Low angle fault (barbs on upper plate).

OTHER SYMBOLS

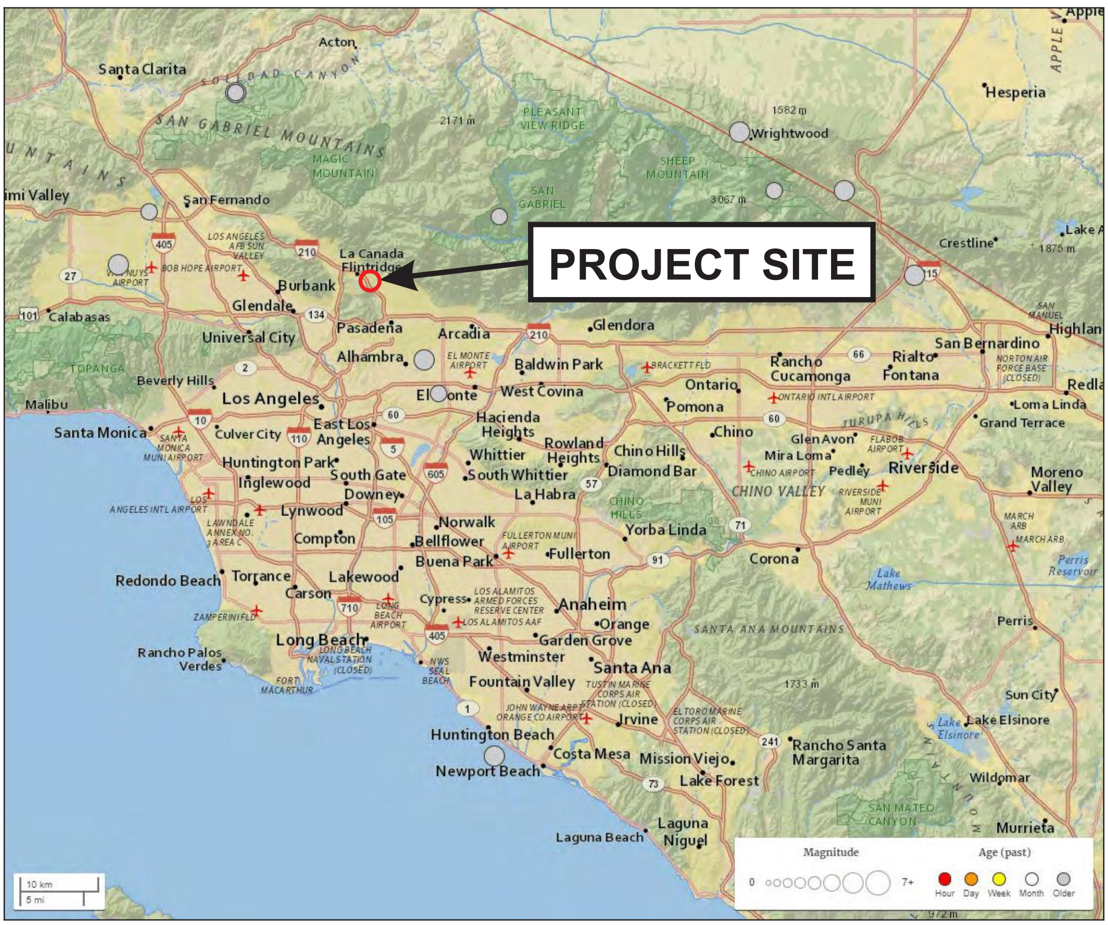
491

Numbers refer to annotations listed in the appendices of the accompanying report.

Structural discontinuity (offshore) separating differing Neogene structural domains. May indicate discontinuities between basement rocks.

Geo-Advantec, Inc.		FAULT ACTIVITY MAP	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	G-2
DATE	08-23-2019		

Time	Latitude	Longitude	Depth	Mag	MagType	Place
1994-01-17T12:31:58.120Z	34.275	-118.493	5.3	5.9	ml	1km ENE of Granada Hills, California
1994-01-17T12:30:55.390Z	34.213	-118.537	18.2	6.7	mw	1km NNW of Reseda, CA
1991-06-28T14:43:54.660Z	34.270	-117.993	8.0	5.8	mw	13km NNE of Sierra Madre, CA
1987-10-01T14:42:20.020Z	34.061	-118.079	8.9	5.9	mw	2km SSW of Rosemead, CA
1971-02-09T14:02:45.740Z	34.416	-118.370	6.0	5.8	mh	10km SSW of Agua Dulce, CA
1971-02-09T14:01:12.450Z	34.416	-118.370	6.0	5.8	mh	10km SSW of Agua Dulce, CA
1971-02-09T14:00:41.920Z	34.416	-118.370	9.0	6.6	mw	10km SSW of Agua Dulce, CA
1933-03-11T01:54:10.660Z	33.631	-118.000	6.0	6.4	mw	Long Beach, California Earthquake
1899-07-22T20:32:00.000Z	34.300	-117.500		6.4	mw	Southern California
1894-07-30T05:12:00.000Z	34.300	-117.600		5.9	ml	Southern California
1858-12-16T10:00:00.000Z	34.200	-117.400		6.0	ml	Near San Bernardino, California
1855-07-11T04:15:00.000Z	34.100	-118.100		6.0	ml	Greater Los Angeles area, California
1812-12-08T15:00:00.000Z	34.370	-117.650		6.9	ml	Southern California



Geo-Advantec, Inc.		HISTORICAL EARTHQUAKES	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	G-3
DATE	08-23-2019		

USGS Dynamic:Conterminous U.S. 2014 (v4.1.1) Edition
Latitude: 34.190908
Longitude: -118.17902
Site Class D: 259 m/s

Deaggregation Targets
Return period: 2475 years
Exceedance Rate: 0.0004040404 year^{-1}
PGA ground motion: 1.0706016 g

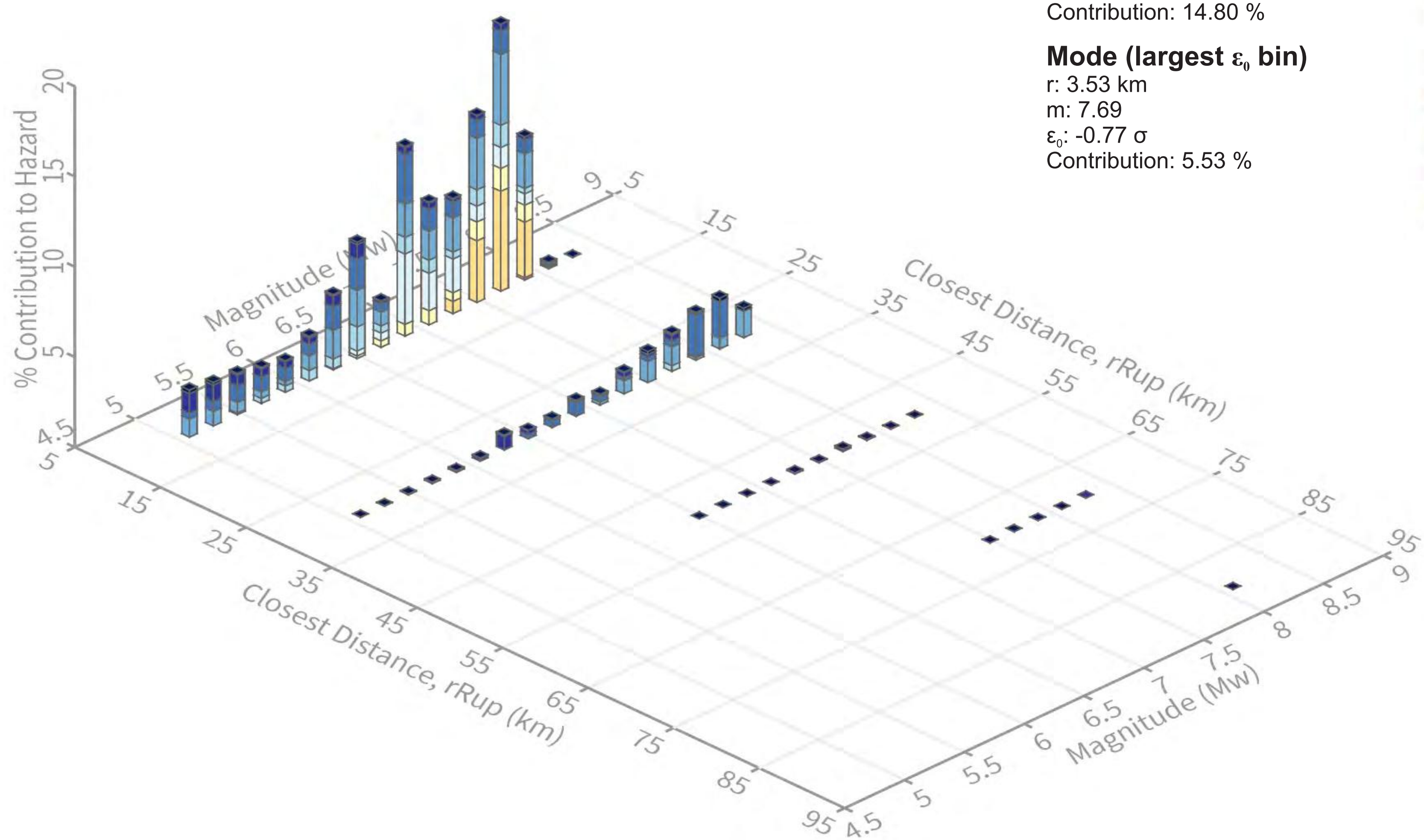
Recovered Targets
Return period: 2853.8985 years
Exceedance Rate: 0.00035039788 year^{-1}

Mean (for all sources)
r: 11.61 km
m: 7.08
ε_0: 0.99 σ

Mode (largest r-m bin)
r: 6.09 km
m: 7.70
ε_0: 0.31 σ
Contribution: 14.80 %

Mode (largest ε_0 bin)
r: 3.53 km
m: 7.69
ε_0: -0.77 σ
Contribution: 5.53 %

ε = (-∞, -2.5)
ε = [-2.5, -2)
ε = [-2, -1.5)
ε = [-1.5, -1)
ε = [-1, -0.5)
ε = [-0.5, 0)
ε = [0, 0.5)
ε = [0.5, 1)
ε = [1, 1.5)
ε = [1.5, 2)
ε = [2, 2.5)
ε = [2.5, +∞)



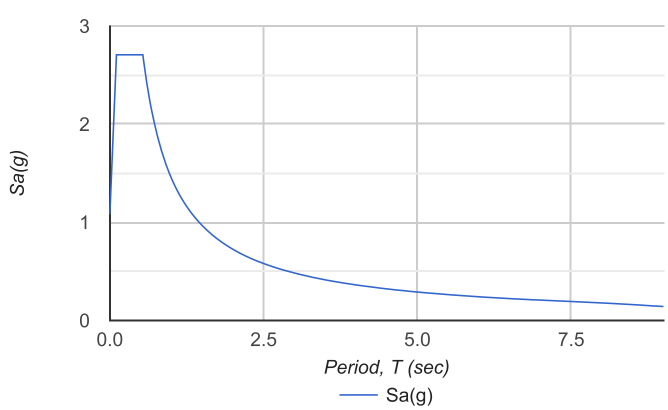
Geo-Advantec, Inc.		PSHA DEAGGREGATION AT PGA	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	G-4
DATE	08-23-2019		

Latitude, Longitude: 34.190908, -118.179020

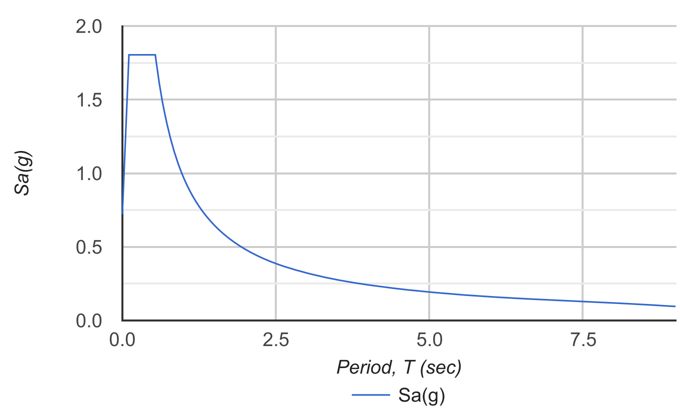
Type	Value	Description
S_S	2.708	MCER ground motion. (for 0.2 second period)
S_1	0.968	MCER ground motion. (for 1.0s period)
S_{MS}	2.708	Site-modified spectral acceleration value
S_{M1}	1.453	Site-modified spectral acceleration value
S_{DS}	1.805	Numeric seismic design value at 0.2 second SA
S_{D1}	0.968	Numeric seismic design value at 1.0 second SA
SDC	E	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	1.5	Site amplification factor at 1.0 second
PGA	1.007	MCEG peak ground acceleration
F_{PGA}	1	Site amplification factor at PGA
PGA_M	1.007	Site modified peak ground acceleration

Date	8/7/2019, 2:57:26 PM
Design Code	ASCE7-10
Risk Category	II
Site Class	D - Stiff Soil

MCER Response Spectrum



Design Response Spectrum



Geo-Advantec, Inc.		SEISMIC DESIGN MAP	FIGURE
PROJECT NO.	19-1093	La Cañada High School New Pool and South Campus Improvements - La Canada Flintridge, CA	G-5
DATE	08-23-2019		

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E.2 - Paleontological Records Search Results

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Natural History Museum
of Los Angeles County
900 Exposition Boulevard
Los Angeles, CA 90007

tel 213.763.DINO
www.nhm.org

Vertebrate Paleontology Section
Telephone: (213) 763-3325

e-mail: smcleod@nhm.org

28 May 2020

FirstCarbon Solutions
250 Commerce, Suite 250
Irvine, CA 92602

Attn: Brittany Hagen, Environmental Services Analyst II

re: Paleontological resources for the proposed New Outdoor Pool Facility and South of Campus Improvement Project, FCS Project # 5153.0002, in the City of La Cañada Flintridge, Los Angeles County, project area

Dear Brittany:

I have conducted a thorough search of our paleontology collection records for the locality and specimen data for the proposed New Outdoor Pool Facility and South of Campus Improvement Project, FCS Project # 5153.0002, in the City of La Cañada Flintridge, Los Angeles County, project area as outlined on the portion of the Pasadena USGS topographic quadrangle map that you sent to me via e-mail on 14 May 2020. We do not have any vertebrate fossil localities that lie directly within the proposed project boundaries, but we do have localities somewhat nearby from sedimentary deposits similar to those that may occur at depth in the proposed project area.

In the entire proposed project area the surficial deposits consist of younger Quaternary Alluvium, derived as alluvial fan deposits from the San Gabriel Mountains to the northeast. These sedimentary deposits typically do not contain significant vertebrate fossils, at least in the uppermost layers, but underlying older and perhaps finer-grained Quaternary deposits may well contain significant vertebrate fossils. Our closest vertebrate fossil locality in older Quaternary deposits is LACM 2027, southeast of the proposed project area, south of Washington Boulevard and west of Allen Avenue near the western end of Brigden Road, that produced a fossil specimen of mastodon, *Mammut*, at unstated depth. Further to the southwest of the proposed project area, in Eagle Rock east of the Pasadena Freeway (I-110) and Eagle Rock Boulevard just south of York Boulevard, our older Quaternary locality LACM (CIT) 342 produced fossil specimens of turkey, *Parapavo californicus*, and mammoth, *Mammuthus*, at a depth of 14 feet below the surface. The fossil turkey specimen from locality LACM (CIT) 342 was published in the scientific literature by L.H. Miller in 1942 (A New Fossil Bird Locality. Condor, 44(6):283-284) and the mammoth specimen was a rare, nearly complete skeleton and was published in the scientific literature by V.L. Roth in 1984 (How Elephants Grow: Heterochrony and the Calibration of Developmental Stages in Some Living and Fossil Species. Journal of Vertebrate Paleontology, 4(1):126-145).

Shallow excavations in the younger Quaternary Alluvium exposed throughout the proposed project area are unlikely to uncover significant vertebrate fossils. Deeper excavations that extend down into older and perhaps finer-grained Quaternary deposits, however, may well uncover significant fossil vertebrate specimens. Any substantial excavations in the proposed project area, therefore, should be monitored closely to quickly and professionally recover any fossil remains discovered while not impeding development. Also, sediment samples should be collected and processed to determine the small fossil potential in the proposed project area. Any fossils recovered during mitigation should be deposited in an accredited and permanent scientific institution for the benefit of current and future generations.

This records search covers only the vertebrate paleontology records of the Natural History Museum of Los Angeles County. It is not intended to be a thorough paleontological survey of the proposed project area covering other institutional records, a literature survey, or any potential on-site survey.

Sincerely,

Samuel A. McLeod

Samuel A. McLeod, Ph.D.
Vertebrate Paleontology

enclosure: invoice