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GEOTECHNICAL AND GEOLOGICAL ENGINEERING INVESTIGATION REPORT

ARROYO HIGH SCHOOL MODERNIZATION
4921 CEDAR AVENUE
EL MONTE, CALIFORNIA, 91732

PREPARED FOR:
EL MONTE UNION HIGH SCHOOL DISTRICT
1003 DURFEE AVENUE
SOUTH EL MONTE, CA 91733

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PROJECT NO. 23-1190

JUNE 9, REVISED JULY 28, 2023

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June 9, Revised July 28, 2023
Project No. 23-1190

El Monte Union High School District
1003 Durfee Avenue
South El Monte, CA 91733

Attention: Ms. Margarita (Margie) Sanchez, Director of Purchasing

SUBJECT: Geotechnical and Geological Engineering Investigation
Proposed Administration, Music & Performing Arts Building
Arroyo High School
4921 Cedar Avenue
El Monte, CA 91733

1. INTRODUCTION

This report presents the results of a Geotechnical and Geological Engineering Investigation performed by Koury Engineering & Testing, Inc., (Koury) for the proposed one-story building and associated improvements at the Arroyo Hills High School located at 4921 Cedar Avenue in the City of El Monte, California. The study was performed to evaluate the surface and subsurface soil conditions in the area of the proposed building and associated improvements in order to provide geotechnical recommendations for design and construction. This report includes our findings and recommendations for design and construction of the proposed building and associated improvements from a geotechnical standpoint.

The recommendations provided within this submittal are based on the results of our field exploration, laboratory testing and engineering analyses. Our services were performed in general accordance with our Proposal No. 23-1190 dated February 21, 2023.

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 exclusively for the El Monte Union High School District and their consultants for the subject project. It has not been prepared for use by

other parties and may not contain sufficient information for the purposes of other parties or other uses.

2. SITE CONDITIONS

The Arroyo High School campus is bounded by Vista Lane and a residential development on the north, Cedar Avenue on the east, and Kings Row on the south and west. The main entrances to the site are from Cedar Avenue from the east and Kings Row from the west. The existing administration building is accessible via the quad area from Cedar Avenue. Two major parking lots located on the northeast and southwest sides of the campus are accessible from Cedar Avenue and Kings Row, respectively. A Vicinity Map with ground contour elevations is presented in Appendix A as Figure A-1.

The area for the proposed building is located within the eastern quadrant of the campus. The site is presently occupied by the existing administration building within the southwest portion of the proposed new building, by the Little Theater building, by classrooms and 4 side-by-side portables located within the remaining portion of the proposed new building. The quad area is partially paved with concrete and landscaped with grass and some small trees. There is also one row of parking bays located on the north side of the quad area, which is separated from the Little Theater building area by a row of fence posts.

The campus generally slopes down toward the west and north from about elevations 328 to 308 feet (NAVD88). The area for the proposed building lies at approximately elevations 321 to 325 feet. For the most part, drainage is presently by sheet flow to the north, northwest and west, to low areas of the site, to local storm drains, and to the streets.

3. PROPOSED IMPROVEMENTS

Koury understands the El Monte Union High School District is planning to construct one single-story Administration, Music and Performing Arts Building within the eastern portion of the campus. The proposed building will be located within the current footprint of the Administration Building, Little Theater Building, several portable classrooms, and areas of hardscaping between some existing buildings and Cedar Avenue. Based on the information provided to us, the proposed building will have a footprint of about 37, 000 square feet and will be oriented in the north-south

direction. The theater portion of the building will have a high ceiling and a mezzanine level. The structure will have a steel frame and masonry construction.

It is understood that the District is planning also to expand the northeastern parking area and to create a new path of travel. The improvements at the campus may include future portable buildings within the hardscape area located west and north of the existing gymnasium building. The exact location and footprint of the proposed portables are not yet available.

The associated improvements will include new utility lines, sidewalks, curbs & gutters, concrete and asphalt pavements, landscaping and hardscaping areas.

Architectural and structural design details for the proposed building were not provided. We understand from the Structural Engineer that maximum building column load (dead and live) will be on the order of 100 kips and wall loads will be generally less than about 2 kips per lineal foot.

4. FIELD EXPLORATION

The field exploration program consisted of drilling ten soil test borings and one percolation borehole. Truck-mounted hollow-stem auger drilling equipment was used to drill the borings on May 9 and 10, 2023. The boring locations are shown on the Boring Location Map, Figure A-2, presented in Appendix A.

The borings for the building were drilled to depths ranging from about 16½ to 51½ feet below the existing ground surface. The borings for the future portable building areas were drilled to maximum depth of 26½ feet. The boring depth for the percolation test was on the order of 15 feet.

Standard penetration test samples, California ring samples, and bulk samples were obtained from the borings for laboratory testing. The depths, blow counts, and description of the samples are shown on the attached boring logs presented in Appendix B of this report. The drilling subcontractor used a 140-lbs automatic hammer falling 30 inches to drive the samplers 18 inches into the soils.

5. LABORATORY TESTING

Laboratory tests, including moisture content, dry unit weight, #200 wash, pocket penetrometer, consolidation and direct shear were performed on selected samples obtained from the borings to aid in the classification of the soils encountered and to evaluate their engineering properties. Soluble sulfate, chloride, resistivity, and PH tests (corrosivity tests) were also performed on one sample. The results of laboratory tests are presented on the boring logs in Appendix B, and/or in Appendix C.

6. SOIL CONDITIONS

The subsurface soil profile consists of fill underlain by young alluvium fan and valley deposits. The fill thickness encountered in the borings ranges from about 1½ to 4½ feet with an average of about 3 feet. Based on the borings drilled, the fill consists predominantly of silty sand. The fill was found to be capped with grass over topsoil in the landscape area, and except for one boring, the pavement sections consisted of about 3 inches of asphalt concrete over 3 to 5 inches of aggregate base at the boring locations.

The young alluvium fan and valley deposits encountered in the borings consist predominantly of interbedded silty sand, clayey sand, sandy clay and poorly graded sand with silt. The young alluvium sand deposits were found to be generally loose within the upper 7 to 10 feet, medium dense from about 10 to 20 feet, and medium dense to dense below 20 feet. The clay soil encountered within the upper 10 feet below the ground surface was generally soft to firm.

The clay is generally moist to very moist with moisture contents ranging from about 18 to 25 percent with an average of about 22 percent. The clayey sand has moisture contents ranging from about 9 to 19 percent with an average of about 16 percent while the non-plastic sand has moisture contents ranging from about 1 to 13½ percent with an average of approximately 5½ percent. With one exception, the dry unit weights of the material sampled range from about 91 to 123 pcf with an average of about 104 pcf.

The #200 sieve wash tests indicated that the clay has fine contents in the range of about 54 to 83 percent with an average of about 68 percent. The laboratory test data indicate that the sand

alluvium has fine contents in the range of 4 to 49 percent with an average of approximately 16 percent for the sample tested.

The standard penetration test blow counts and equivalent blow counts from the modified California sampler indicate clay blow counts ranging from about 3 to 7 with an average around 7 blows per foot of the sampler penetration, thus indicating the presence of soft material. Within the upper 10 feet of the soil profile, for the clay and sand combined, the standard penetration test blow counts and equivalent blow counts from the modified California sampler indicate blow counts ranging from about 3 to 15 with an average of about 8 blows per foot of the sampler penetration, thus further confirming the presence of soft and loose soils near the ground surface. From 7 to 12 feet, the average blow count is about 10. Except where sampling refusal was encountered, the blow counts for the sand below 10 feet range from about 7 to 85 with an average of approximately 27. Below a depth of 20 feet, the sampling blow counts range from about 17 to 85 with an average of about 41, thus confirming the presence of medium dense to dense sand below 20 feet.

One direct shear test indicated peak and ultimate friction angles of about 29 and 30 degrees with corresponding cohesion of 184 and 120 psf, respectively. The consolidation tests on silty sand and clay material indicated low potential for hydrocollapse and moderate consolidation characteristics. The rebound curves for the clay soils indicate low to moderate expansion potential.

The soil conditions described in this report are based on the soils observed in the test borings drilled for this study and the laboratory test results. Variations between and beyond the borings should be anticipated.

7. GROUNDWATER

The proposed improvements are located at approximate elevations of 321 to 325 feet (NAVD88). No groundwater was encountered in the site borings drilled to a maximum depth of 51½ feet. Based on our review of the groundwater map presented in the "Seismic Hazard Zone Report for the El Monte Quadrangle; Seismic Hazard Zone Report 024" (Plate 1.2), published by "Department of Conservation, California Division of Mine and Geology" (now called CGS), the historic high groundwater at the site is on the order of 15 feet below ground surface (Figure A-4 in Appendix A).

A prior 2006 environmental study performed at the southwest corner of Lower Azuza Road and Santa Anita Avenue (4749 Santa Anita Avenue), about 505 feet southwest of the Arroyo High School campus, indicated a high groundwater depth of about 86½ feet. Based on the data gathered, it is concluded that except for local perched groundwater, the present water depth at the site should exceed about 80 feet below the ground surface at the proposed building location.

The groundwater level should be anticipated to fluctuate based on irrigation, rainfall and/or groundwater recharge.

8. SITE GEOLOGY

The site is located in the northern San Gabriel Valley at the southern face of the San Gabriel Mountains. The San Gabriel Mountains to the north, as opposed to the valley basin, consist of relatively hard, igneous, and metamorphic rocks, which support steep slopes and major canyons. The gentler sloping San Rafael Hills, northwest of the City, are composed of the same substance. This difference in terrain of the valley basin and surrounding hills suggests the past uplift along the front of the San Gabriel Mountains.

The western San Gabriel Valley is reportedly underlain by Holocene and Pleistocene alluvium up to 5,000 to 6,000 feet in thickness. The valley floor, south of the Raymond Hill Fault, is underlain by Tertiary rocks. North of the same fault the valley floor is underlain by granite and metamorphic rocks comparable to those in the hills to the west and north.

The borings drilled onsite during our field exploration in May 2023 encountered shallow fill over young alluvial fan and valley deposits consisting mostly of sand, silt and clay (see Figure A-3 for Geologic Map).

9. OIL WELLS

The site is located about 4.5 miles northeast of the Montebello Oil/Gas Field, about 4.4 miles north of Lapworth (ABD) and about 5.2 miles north of Whittier Heights North (ABD) Oil/Gas Fields. There is no known active oil/gas well located in the immediate vicinity of the site. The nearest plugged dry hole is located about one mile northeast of the site. According to the California Division of Oil, Gas and Geothermal Resources, the closest active well is located about 5 miles

southwest side of the site and an idle oil and gas well is located approximately one mile southwest of the site (see Figure A-9). No evidence of hazardous materials related to oil fields was encountered during our field exploration. It is our opinion that no hazardous materials associated with active oil fields should be present on site based on readily available oil/gas well information.

10. SEISMIC CONSIDERATIONS

10.1. General

The Arroyo High School, 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, Chino 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 pre-Holocene fault as any fault which has been active during the Quaternary Period (approximately the last 2,000,000 years, excluding the Holocene). 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 for 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. Based on California Geological Survey maps, the nearest Alquist-Priolo Earthquake Fault Zone is the strike-slip Raymond Fault with a trace located about 3.6 miles northwest of the site while the northeast trending reverse Elysian Park (Upper) is located about 4.9 miles west of the site. The active reverse Sierra Madre Connected Fault is located about 5 miles north of the site. The strike-slip Whittier-Elsinore Fault Zone is located about 7 miles southwest of the site while the north dipping Puente Hills (LA Section) Fault Zone is located about 10½ miles southwest of the site. The East Montebello active fault segment is located about 4.6 miles southwest of the site. The active strike-slip San Andreas Fault Zone is located about 25.8 miles northeast of the site. No evidence of active or potentially active faulting was observed onsite during our investigation. Surface rupture

is not considered to be a significant potential hazard to the site based on the readily available published information to date.

Based on the information available at this time, according to CGS, there is a potential for an Mw6.8 earthquake on the Raymond Fault Zone, an Mw7.3 on the Sierra Madre Connected Fault, an Mw7.8 earthquake on the Whittier-Elsinore, an Mw7.0 earthquake on the Puente Hills (LA Section) Fault Zone, an Mw8.0 earthquake on the San Andreas Fault Zone. 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 considered less important to the site from a seismic shaking standpoint.

Due to the proximity of the site to active faults, near field effects from strong ground motion associated with large earthquakes along these faults may occur at the site. These near field effects, including "fling" and directivity of strong ground motion, may result in high accelerations at the site. Figure A-6, presented in Appendix A, shows the approximate locations of some of the major nearby faults.

According to the EQSEARCH program, within a search radius of 60 miles, about 66 earthquakes of magnitude 5 or greater have been recorded up to the year 2000. Within that same period, there are records of 14 earthquakes of magnitude 6 or greater, 5 earthquakes of magnitude 6.5 or greater, and 3 earthquakes of magnitude 7 or greater within the same search area. The largest and closest earthquake for the search was reported to have occurred in 1812 at a location about 28½ miles from the site. Using the attenuation relationship of Campbell and Bozorgnia for alluvium (1997), the highest acceleration at the site could have been on the order of 0.447g. A summary of the earthquakes with magnitudes 5 and greater is attached in Appendix D.

10.2. Landsliding

The site is not located in an Earthquake Induced Landslide Hazard Zone on the State of California Seismic Hazard Zones Map (Figure A-5 in Appendix A). Based on the Vicinity/Topographic Map, Figure A-1, the proposed building site is located in an area of generally gentle topography. No evidence for landsliding was observed on or in the immediate vicinity of the site at the time of our field exploration. Based on topographic conditions at the proposed building site, landsliding is not considered a significant hazard.

10.3. Lateral Spreading

The damaging effect of liquefaction settlement can be exacerbated when the soils are subject to lateral spreading. The site is generally level or very gently sloping. In addition, because of the absence of shallow groundwater, the potential for lateral spreading is low.

10.4. Liquefaction and Dry Settlement

Liquefaction may occur when saturated, loose to medium dense, cohesionless soils are densified by ground shaking or vibrations. The densification results in increased pore water pressures if the soils are not sufficiently permeable to dissipate these pressures during and immediately following an earthquake. 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;
- Groundwater level at or above the level of the susceptible soils during the ground shaking; and
- Soils that are susceptible to liquefaction.

The Seismic Hazard Zones Map prepared by the State of California (EL Monte Quadrangle, 1999) indicates that the site is located in a generalized liquefaction susceptibility zone (Figure A-5 in Appendix A).

For seismic liquefaction settlement evaluation, we obtained an earthquake magnitude of Mw6.9 from a seismic-hazard deaggregation using the USGS Unified Hazard Tool. Our analysis also utilized a site acceleration of 0.86g (PGA_M) obtained from the ASCE 7-16 Seismic Design Ground Motion Analysis Web site.

The seismic settlement calculations were performed for the deepest site borings B-4 and B-6 using the LiquefyPro software and a historic high groundwater depth of 15 feet below ground surface (see Section 7 for groundwater evaluation). The California sampler blow counts were multiplied by a factor of 0.65 to obtain the equivalent SPT blow counts. The SPT tests were performed with an automatic hammer and unlined SPT samplers with an inner diameter of 1.5 inches. We used a hammer energy factor of 1.25 (Ce=1.25), a borehole diameter factor of 1.0 (Cb=1), and a sampling

method factor of 1.2 (Cs=1.2) for the SPT sampler and 1.0 for the Modified California Ring (CD) Sampler (the CD blow counts were divided by 1.2).

Using the LiquefyPro software and the data from Borings B-4 and B-6, we calculated the dry and liquefaction seismic liquefaction settlement to be on the order of 2½ inches for Boring B-6 and 4 inches for Boring B-4. Most of the seismic settlement is anticipated to occur within the upper 20 feet of the soil subgrade.

Considering the recommendations in Section 7.66 of the SCEC Guidelines for Implementation of SP 117 and our total seismic settlement calculations, it is our opinion that a differential settlement on the order of ¾ inch in 40 feet should be considered for the design seismic event for spread footing foundations. Typical settlement calculations with input and output results are presented in Appendix C.

10.5. Tsunamis and Seiches

The proposed building site is located at approximate elevations 321 to 325 feet (NAVD88), and about 26 miles away from the coastline. Therefore, tsunamis are not considered a hazard. The Los Angeles County Flood Control Basin is located immediately northeast of the school site and at an elevation of about 302 feet (NAVD88). Due to elevation variance between the basin and the proposed building site, the potential for seiches to affect the proposed school building is considered low.

11. FLOODING

The project site lies in Zone X within an area of minimal flood hazard as shown on the FEMA Flood Map #06037C1675F, effective date September 26, 2008 (Figure A-7, Appendix A). The map for the area indicates that the proposed school building lies outside the 1 percent annual chance floodplain. However, the County of Los Angeles GIS Map for the area indicates the site is located within the 500-year flood plain and within the dam inundation areas of the Big Santa Anita and Santa Fe dams. Flooding is considered to be a moderate hazard potential to the site.

12. SOIL COLLAPSE

Soils prone to hydrocollapse are generally young and deposited by flash floods and wind. The site deposits consist generally of young alluvial fan and valley deposits, which normally have a low to

medium propensity to collapse. One consolidation test on silty sand (B-1 @ 8') indicates a soil collapse of less than 0.2 percent upon the presence of water. Appropriate drainage and overexcavation and backfilling with engineering fill is recommended to mitigate the potential for hydrocollapse.

13. CONCLUSIONS AND RECOMMENDATIONS

13.1. General

In our opinion, the planned improvements are feasible from a geotechnical engineering point of view provided the geotechnical recommendations presented in this report are followed. The main concerns from a geotechnical standpoint are the presence of undocumented fill, loose and soft soil near the ground surface, potential for liquefaction and dry seismic settlement, and anticipated high seismic ground shaking. Overexcavation of soil below footings is recommended to mitigate total and differential seismic settlement.

The following sections contain geotechnical recommendations for design and construction of the subject improvements and include our recommendations and discussions about bearing capacity, settlement, flatwork, slabs-on-grade, temporary excavations, and utility trenches.

13.2. Grading

13.2.1. Building Pad

The fill encountered during our site investigation has a thickness ranging from about 1½ to 4½ feet. Prior to grading, any existing pavement, foundation, vegetation, abandoned underground utilities and other debris should be removed from the proposed building area. Within the building pad area, we recommend overexcavating the subgrade to completely remove the existing undocumented fill or 4½ feet below footing bottoms, whichever is greater. Where feasible, the overexcavation should extend laterally at least 5 feet beyond the building perimeter and 5 feet beyond the footing edges, whichever is greater. Following engineering/geological approval, the bottom of the removal excavations should be scarified to a depth of 10 inches, moisture conditioned to at least optimum moisture content for sand and 120 percent of optimum moisture for clay and recompacted to 90% relative compaction as determined by ASTM D1557. All fill placed below the building area

should be compacted to at least 93% relative compaction; any clay soils use for backfill within the building area should be placed at a depth of at least 2 feet below footings.

13.2.2. Exterior Flatwork and Pavement Areas

Similarly to the building footprint area, the site should be stripped of all vegetation, topsoil, abandoned utilities and other existing improvements, and the excavations should be backfilled with engineered fill. We recommend overexcavating at least 24 inches of subgrade material below all new exterior flatwork, and the overexcavation should extend at least 2 feet beyond the edge of pavement, where feasible. Prior to fill placement, the subgrade should be scarified to a depth of 10 inches, moisture conditioned to at least optimum and recompacted to 90 percent relative compaction. Except for vehicular pavement areas, all fill outside the structure areas should be compacted to at least 90% relative compaction. Within vehicular pavement areas, the upper 12 inches of subgrade soils should be compacted to 95% relative compaction.

13.3. General Grading Requirements

1. All fill within building pad area, unless otherwise specifically stated in the report, should be compacted to at least 93% of the maximum dry density as determined by ASTM D1557 Method of Soil Compaction.

2. No fill should be placed until the area to receive the fill has been adequately prepared and approved by the Geotechnical Consultant or his representative.

3. Fill soils should be kept free of debris and organic material.

4. Rocks or hard fragments larger than 3 inches may not be placed in the fill without approval of the Geotechnical Consultant or his representative, and in a manner specified for each occurrence. There should not be any concentrations of particles sizes of 2 inches or greater; proper mixing should be performed.

5. The fill material should be placed in lifts which, when loose, should not exceed 8 inches per lift. Each lift should be spread evenly and should be thoroughly mixed during the spreading to obtain uniformity of material and moisture.

6. When the moisture content of the fill material is lower than the specified value or is too low to obtain adequate compaction, water should be added and thoroughly dispersed until the sand soils have a moisture content within 2½ percent of optimum and the clay soils have a moisture content of at least 120 percent of optimum except as indicated otherwise

in this report and unless determined otherwise by the Geotechnical Engineer at the time of construction.

7. When the moisture content of the fill material is too high to obtain adequate compaction, the fill material should be aerated by blading or other satisfactory methods until the soil has a moisture content as specified herein.

8. Permanent fill and cut slopes should not be constructed at gradients steeper than 2:1(H: V).

13.4. Fill Materials

13.4.1. Onsite Materials

The onsite silty sand encountered in the borings at shallow depths are considered to have a low expansion potential. Except for the topsoil, these soils are considered suitable for backfilling purpose, following proper processing, provided they are free of deleterious materials, construction debris, and oversize particles. Import materials may also be used for backfilling purpose. Clay soils should not be used at shallow depth below the building; however, they may be used at depth of 2 feet or greater below footing bottoms provided they are properly moisture conditioned. Clay soils may also be used in landscape areas and below asphalt pavement provided they are properly moisture conditioned.

Overexcavation and re-compaction will induce fill shrinkage. Many factors such as mixing, relative compaction of the fill, and topographic approximations will affect shrinkage. We cannot estimate the exact amount of shrinkage; however, in our opinion, the shrinkage may be on the order of 8 to 15 percent for fill material excavated and recompacted to 93 percent relative compaction. This estimate does not include the material that will be required to fill in the excavations after the removal of any subsurface structures left in-place from prior use of the site and removal of topsoil.

13.4.2. Import

Import materials, if needed, should contain sufficient fines (binder material) so as to be relatively impermeable and result in a stable subgrade when compacted. The imported materials should have an expansion index (EI) less than 20 and should be free of organic materials, debris, and cobbles larger than 2 inches with no more than 40% passing the #200 sieve. A bulk sample of potential

import material, weighing at least 35 pounds, should be submitted to the Geotechnical Consultant at least 48 hours before fill operations. Other than aggregate base and bedding sand, all proposed import materials should be tested for corrosivity, should be environmentally cleared from contamination and should be approved by the Geotechnical Consultant prior to being imported onsite.

13.5. Temporary Excavations

Temporary excavations adjacent to un-surcharged areas are anticipated to be stable near vertical to a depth up to 4 feet in fill or undisturbed alluvium. The shallow undisturbed site soils are expected to be temporarily stable when excavated at a gradient of 1:1 (H:V) for un-surcharged excavations that are between 4 and 8 feet in depth. For un-surcharged excavations from 8 to 12 feet in depth, we recommend a gradient of 1½:1 (H:V).

The tops of slopes should be barricaded to prevent vehicles and storage loads within 6 feet of the tops of slopes or ½ the excavation depth, whichever is greater. A greater setback may be necessary when considering heavy vehicles, such as concrete trucks and cranes; we should be advised of such heavy vehicle loadings so that specific setback requirements can be established.

When excavating adjacent to existing footings or building supports, proper means should be employed to prevent any possible damage to the existing structures. Un-shored excavations should not extend below a 1½:1 (H:V) plane extending downward from the lower edge of adjacent footings and should start at least 2 feet away from the footings. Where there is insufficient space to slope back an excavation, shoring may be required. All regulations of State and Federal OSHA should be followed. Some sloughing and caving of excavations should be anticipated.

Temporary excavations are assumed to be those that will remain un-shored for a period of time not exceeding one week. In dry weather, the excavation slopes should be kept moist, but not soaked. 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.

13.6. Temporary Shoring

In the event of deep excavations in localized areas, temporary shoring may be required. For level ground condition, a triangular distribution of lateral earth pressure of 35 psf/foot may be utilized for the design of a cantilevered shoring system not exceeding 15 feet in height. A trapezoidal distribution of lateral earth pressure of 24H psf for level ground, where H is the retained height in feet, may be utilized where shoring is to be restrained by rakers or other types of internal bracing and tiebacks. This uniform pressure distribution may be assumed over sixth tenth of the wall height; the pressures should taper to zero at the base and the top of the excavation.

Surcharge loads occurring as a result of vehicular traffic, and any surcharge loading imposed by any other adjacent loading or structures, including slope surcharges, should be added to the above pressure for the design of the proposed shoring system. For vehicular surcharge, the upper 10 feet of shoring adjacent to access road traffic should resist an additional uniform lateral pressure of 100 pounds per square foot, acting as a result of an assumed 300 pounds per square foot traffic surcharge. For design purposes, allowable passive pressure values for the soils below the bottom plane of excavation may be assumed to be 250 pounds per square foot per foot of depth, respectively, up to a maximum of 2,500 pounds per square foot.

13.7. Floor Slabs

13.7.1. General

The grading recommendations for the new building floor slabs are provided in Section 13.2.1. The building floor slabs on grade, as a minimum, should have a nominal thickness of 5 inches and should contain as a minimum No. 4 bars spaced a maximum of 16 inches on centers, in both directions unless determined otherwise by the Structural Engineer. Thicker slabs and additional reinforcement may be required depending on the floor loads and the structural requirements as determined by the Structural Engineer. It is recommended that the compacted subgrade be moistened prior to placement of the vapor retarder.

13.7.2 Moisture Sensitive Floor Covering

Water vapor transmitted through floor slabs is a common cause of floor covering problems. In areas where moisture-sensitive floor coverings (such as tile, hardwood floors, linoleum or

carpeting) are planned, a vapor retarder should be installed below the concrete slabs to reduce excess vapor transmission through the slab.

The function of the recommended relatively impermeable membrane (vapor retarder) is to reduce the amount of soil moisture or water vapor that is transmitted through the floor slab. The membrane should be 15-mil thick, Class A, and care should be taken to preserve the continuity and integrity of the membrane beneath the floor slab. The vapor retarder should conform to ASTM E1745. The vapor retarder should be installed in strict conformance with the manufacture recommendations.

If a capillary break is used, at least 4 inches of free draining crushed rock, with no more than 2 percent passing the No. 200 sieve, should be placed below the vapor retarder. The crushed rock should be vibrated in place to achieve the compaction required by the project specifications. The gradation for the free draining capillary break material should conform to the requirements for No. 4 Concrete Aggregates as specified in Section 200-1.4 of the Standard Specifications for Public Works Construction (Greenbook) or approved equivalent.

Another factor affecting vapor transmission through floor slabs is the water to cement ratio in the concrete used for the floor slab. A high water to cement ratio increases the porosity of the concrete, thereby facilitating the transmission of water vapor through the slab. The project Structural Engineer should provide recommendations for design of concrete for footings and floor slabs in accordance with the latest version of the applicable codes. We recommend a concrete strength of at least 3500 psi with a water cement ratio not exceeding 0.5 unless determined otherwise by the Structural Engineer. The placement of sand above the vapor retarder is the purview of the Structural Engineer.

13.8. Seismic Coefficients

Under the Earthquake Design Regulations of Chapter 16, Section 1613A of the CBC 2022, the following coefficients and factors (mapped values) presented in Table 1 were calculated using the USGS web site and the SEAOC/OSHPD tool (see Figure A-8).

The site class can be determined in accordance with ASCE 7 Chapter 20 using shear wave velocity, SPT blow count or undrained shear strength. For a site to be classified as Site Class D the weighted

average SPT blow count should be between 15 and 50 or the average weighted undrained shear strength should be between 1,000 and 2,000 psf within the upper 100 feet of soil. The SPT blow count test results presented on the boring logs indicate that the requirements for site Class D are met.

Table 1 – Seismic Coefficients and Factors

	Mapped
Site Class (CBC 2022 – 1613A.3.2)	D
Seismic Design Category based on Occupancy Category III (CBC 2022-1604A.5 &1613A.3.5)	D
Mapped Acceleration Parameter for Short Period (0.2 Second), S_S	1.82
Mapped Acceleration Parameter for 1.0 Second, S_1	0.65
Adjusted Maximum Spectral Response Parameter for Short Period (0.2 Second), S_{MS}	1.82
Adjusted Maximum Spectral Response Parameter for 1.0 Second Period, S_{M1}	*
Design Spectral Response Acceleration Parameter, S_{DS}	1.213
Design Spectral Response Acceleration Parameter, S_{D1}	*
Peak Ground Acceleration (PGA_M)	0.86
Period (T_0/T_S)	+.121/.607

Project Site Coordinates: Longitude: W-118.020936° Latitude: N34.094131 (WGS84)
+Based on Fv of 1.7 for period calculation. *See Section 11.4.8 Supplement 3, ASCE 7-16 for exception to site-specific ground motion study.

No site-specific ground motion study is required per ASCE Standard 7-16, Supplement 3, Section 11.4.8 Item 1, where the value of the parameter S_{M1} determined by Equation 11.4-2 is increased by 50% for all applications of S_{M1} in this Standard. The resulting value of the parameter S_{D1} determined by Equation 11.4-4 should be used for all applications of S_{D1}.

13.9. Foundations

General: We understand from the Structural Engineer that the proposed building will have maximum vertical column loads of 100 kips (combined live and dead loads), and the combined dead and live wall loads are not anticipated to exceed 1 kip per lineal foot.

The proposed footings should be supported on at least 4½ feet of engineered fill compacted to 93 percent relative compaction to mitigate seismic settlement. The recommendations for preparation of the soils underlying the footings are provided in the "Grading" section of this report. The

Structural Engineer should design foundations and floor slabs in accordance with the requirements of the applicable building code.

Footings supporting the proposed structures should have a minimum width of 2 feet for isolated footings and 1.5 feet for continuous footings. The bottom of footings should be located at least 24 inches below the lowest adjacent finish grade. A net vertical bearing value of 2,000 psf may be used to design the footings. This bearing value may be increased by 250 psf for each additional foot of width or depth up to a maximum of 2,500 psf. If a footing is located within one footing width of an existing foundation, the allowable bearing pressure should be reduced by 30 percent. A one-third increase in the bearing value may be used when considering wind or seismic loads. In light of the anticipated high seismic shaking and significant seismic settlement, the footings should be reinforced with at least two No. 5 bars top and bottom or other reinforcement as determined by the Structural Engineer.

Footings supporting small ancillary facilities, for which the seismic settlement is not critical, should have a minimum width of 2 feet for isolated footings and 1.5 feet for continuous footings. The bottom of footings should be located at least 18 inches below the lowest adjacent finish grade and the footings should be founded on at least 2½ feet of engineered fill compacted to at least 93 percent relative compaction. A net bearing pressure of 1800 psf may be used for these footings. A one-third increase in the bearing value may be used when considering wind or seismic loads. For exterior equipment pad slab, the overexcavation below the slab should be at least 3 feet.

Subgrade Modulus: The static subgrade modulus (k_s) for square mats or footings (BxB) can be determined using the following formula:

$k_s = k_1 [(B+1)/2B)]^2$, for sand, and

$k_s = k_1 /B$, for clay soils, where B is the mat/footing width.

The static subgrade modulus (k_r) for a rectangular mat or footing (with length L and width B) can be calculated with the following formula: $k_r = k_s [1+(0.5B/L)]/1.5$. For preliminary analysis, a unit vertical modulus of subgrade reaction of 90 pci (k_1 = 90 pci) may be used for static conditions. A value of 10 pci may be used as a lower limit.

Uplift Resistance: The uplift resistance of footings may be calculated using the following expression: $Q_u = Q_{su} + W$

where Q_u represents the uplift capacity, Q_{su} the side resistance in uplift and W the weight of the foundation and soil backfill. $Q_{su} = ½ P D^2 (\gamma K \tan\phi)$ in which P is the footing perimeter, D is the foundation depth, γ is the soil unit weight, K is the coefficient of horizontal soil stress, and ϕ is the soil friction angle. For the soil parameters, it is recommended to use 115 pcf for the soil unit weight γ, a soil friction angle ϕ of 25 degrees, and a value of 0.5 for K. The above equation applies to square and rectangular foundations with L/B (length/width) less than 1.5 because studies have shown that rectangular foundations with L/B greater than 2 indicate shape effects that reduce uplift capacities. A safety factor of at least 1.5 is recommended for uplift capacity calculations.

Lateral Resistance: Lateral load resistance may be derived from passive resistance along the vertical sides of foundations, friction acting at the base of the foundations, or a combination of the two. A coefficient of friction of 0.35 may be used between the footings, floor slabs, and the supporting soils comprised of compacted sand materials. The friction coefficient used for a slab supported on the vapor retarder should not exceed 0.1. The passive resistance of level properly compacted fill soils in direct contact with the footings may be assumed to be equal to the pressure developed by a fluid with a density of 250 pcf, to a maximum pressure of 2,500 psf (allowable). 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. We recommend that the upper 12 inches of soil cover be neglected in the passive resistance calculations if the ground surface is not protected from erosion or disturbance by a slab, pavement or in a similar manner.

Estimated Settlement: Based on the results of our analyses and provided that our recommendations in preceding sections of this report are followed, we estimate that the total static settlement of isolated and/or strip footings under sustained loads will be on the order of 1 inch for the anticipated maximum structural loads. The maximum static differential settlement, over a horizontal distance of 40 feet, is anticipated to be on the order of ½ inch for similarly loaded footings. The seismic settlement is addressed in Section 10.4 of this report. Because the static settlement and seismic settlement will occur at different time, and most of the static settlement will occur during construction, from a geotechnical standpoint, it is our opinion that the total differential settlement should be taken as the addition of the anticipated seismic differential settlement and on half the static differential settlement unless determined otherwise by the Structural Engineer based on the

structure configuration and the structural members being analyzed. At the request of the Structural Engineer, we have estimated the total building differential settlement (static and seismic combined) to be less than 2 inches over a horizontal distance of 100 feet.

13.10. Retaining Walls

Retaining walls in the range of 1½ to 4 feet in height may be associated with the improvements. The pressure behind retaining walls depends primarily on the allowable wall movement, wall inclination, type of backfill materials, backfill slopes, surcharge, and drainage. Determination of whether the active or at-rest condition is appropriate for design will depend on the flexibility of the walls. Walls that are free to rotate at least 0.002 radians at the top (deflection at the top of the wall of at least 0.002 x H, where H is the unbalanced wall height) can be designed for active conditions. The recommended active and at-rest pressures for the site sand backfill are presented in the following table. No clay should be used to backfill behind retaining walls.

Table 2 - Earth Pressures for Retaining Walls

Wall Movement	Backfill Condition	Equivalent Fluid Pressure (onsite clayey sand) (pcf)
Free to Deflect	Level	40
Restrained	Level	65

The above lateral earth pressures do not include the effects of surcharge (e.g. traffic, footings, hydrostatic pressure) or compaction. Any surcharge (live, including traffic, or dead load) located within a 1:1 plane drawn upward from the base of the excavation should be added to the lateral earth pressures. The lateral pressure addition of a uniform surcharge load located immediately behind walls may be calculated by multiplying the surcharge by 0.33 for cantilevered walls and 0.5 for restrained walls. For vehicular surcharge adjacent to driveways or parking areas, a uniform lateral pressure of 100 pounds per square foot, acting as a result of an assumed 300 pounds per square foot traffic surcharge, should be used.

In the event of a large earthquake, the lateral earth pressure on a cantilever wall may be higher. We have calculated the seismic increment of lateral pressure using the Mononobe-Okabe equation

assuming the seismic coefficient to be 1/3 of the peak acceleration (PGA_M). We suggest using a dynamic earth pressure increment of 27 psf/ft for cantilever yielding walls with level backfill assuming the wall will not exceed 10 feet in height. The pressure should be taken as an inverted triangular distribution with the zero-pressure point at the toe of the wall and 27 H for level backfill (psf where H in feet) at the top of the wall, where H is the wall height in feet. The point of application of the dynamic thrust may be taken at 0.6H above the toe of the wall.

A drainage system should be provided behind the walls to reduce the potential for development of hydrostatic pressure. If a drainage system is not installed, the walls should be designed to resist the hydrostatic pressure in addition to the earth pressure.

Walls should be properly drained and waterproofed. Except for the upper 1½ feet, the backfill immediately behind retaining walls (minimum horizontal distance of 12 inches) should consist of free-draining ¾-inch crushed rock wrapped with filter fabric. A 4-inch diameter perforated PVC pipe, placed perforations down at the bottom of the crushed rock backfill, leading to a suitable gravity outlet, should be installed.

All undocumented fill should be removed from the footing area for retaining walls exceeding 3 feet in height. The wall footings should be underlain by at least 2 feet of engineered fill compacted to 90 percent relative compaction. The footing embedment should extend at least 1½ feet below the lowest adjacent grade. The maximum allowable bearing pressure recommended is 2,000 psf.

13.11. Utility Trench Backfill

Bedding material immediately around utility lines and extending to a point 12 inches above the line should consist of either sand, fine-grained gravel, or sand-cement slurry to support and/or to protect the lines. A minimum of 4-inch thick bedding material should be placed below the bottom of the utility lines on a firm and unyielding subgrade. The bedding material should meet the specifications given in the latest edition of the "Standard Specifications for Public Works Construction" (Greenbook) and the project specifications. Sand or gravel should be compacted in accordance with the Greenbook specifications and project specifications, whichever is more stringent.

Above the bedding, up to finished subgrade in areas other than landscape and up to one foot below flatwork and pavements, utility trenches should be backfilled with onsite sand and mechanically compacted to at least 90% of the maximum dry density of the soils.

Below pavements, a minimum relative compaction of 95% is required in the upper 12 inches of the subgrade. For utility trenches within the building, the backfill should be compacted to the minimum required relative compaction indicated under the "Grading" section of this report. The material should be observed, tested and approved by the Geotechnical Consultant. The trench bedding materials should be placed in accordance with Section 306-6 of the "Standard Specifications for Public Works Construction" (Greenbook).

When adjacent to any footings, utility trenches and pipes should be laid above an imaginary line measured at a gradient of 1½:1 (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. Backfill consisting of 2-sack sand-cement slurry may also be used.

Controlled low-strength material (CLSM) consisting of various mixture of water, cement, fly ash or other similar byproducts, and fine aggregate may be used as backfill material. The CLSM should have a compressive strength of at least 100 psi at 28 days when tested per ASTM D4832 unless approved otherwise by the Geotechnical Engineer at the time of construction. The cement content of the CLSM should not be less than 2 sacks per cubic yards. CLSM should not be placed on undocumented fill, on soft or loose soil, or within or below water. Load tickets should be obtained from the trucks delivering the CLSM and at least two cylinders obtained for every 50 cubic yards or fraction of placement. A written record of the location where the CLSM is placed need to be kept.

13.12. Drainage

Foundation, slab, flatwork, and pavement performance depend greatly on proper drainage within and along the boundary of the improvements. Perimeter grades around the building should be sloped in a manner allowing water to drain away from the building and not pond next to the foundations. Roof downdrains should be connected to underground pipes carrying water away from the building area or have extenders so water does not drain and pond next to the building. Per the CBC,

landscape areas within 10 feet of buildings should slope away at gradients of at least 5 percent. Paved areas within 10 feet of buildings should slope away at gradients of at least 2 percent. Proper drainage is recommended for all surfaces to reduce the potential settlement or heave due to water infiltration. We recommend minimizing the size and number of planters adjacent to the building and other foundations and using drought resistant planting in order to avoid distress due to heave or settlement.

13.13. Asphalt Concrete (AC) Pavement

The required pavement structural sections depend on the expected wheel loads, volume of traffic, and subgrade soils. The characteristics of subgrade soils are determined by R-value testing. Based on soil classification and prior experience with similar soils, we anticipate an R-value on the order of 25 for the clayey sand and 12 for the clay encountered in the borings. The R-values should be confirmed with additional tests, if necessary, at the time of construction. The following pavement sections were calculated based on assumed traffic indices of 4, 5, 6 and 7. The project Civil Engineer should determine the traffic index to be used for different areas of the site. A traffic index of 6 to 7 is normally utilized to design fire lanes.

Table 3 - Asphalt Pavement Sections (clayey sand subgrade)

Traffic Index	Asphalt Thickness (Inches)	Base Course (CAB) Thickness (Inches)
4	3.0	4.5
5	3.5	6.0
6	4.0	8.0
7	4.0	11.5

Base course material should consist of Crushed Aggregate Base (CAB) as defined by Section 200-2.2 of the Standard Specifications for Public Works Construction ("Greenbook"). Base course should be compacted to at least 95 percent of the maximum dry density of that material. Crushed Miscellaneous Base (CMB) may be used only if the supplier can demonstrate that the aggregate does not contain contaminated material.

The grading for flatwork is addressed in Section 13.2.2 of this report. The subgrade should be in a "non-pumping" condition at the time of compaction.

Any onsite surficial organic soils within landscaped/turf areas should not be used as subgrade materials. Where feasible, the overexcavation should extend laterally a minimum of 2 feet beyond the perimeters and edges of parking areas, roadways and curbs. Any abandoned footing and/or underground concrete structure within the work limit should be removed entirely and the excavation should be backfilled to grade.

13.14. Portland Cement Concrete (PCC) Pavement

The grading recommendations for vehicular PCC pavement are provided in Section 13.2.2 of this report. Base course material, used in the vehicular pavement sections, should consist of Crushed Aggregate Base (CAB) as defined by Section 200-2.2 of the Standard Specifications for Public Works Construction (Greenbook 2018). The aggregate base course should be compacted to at least 95% of the maximum dry density of that material. Crushed Miscellaneous Base (CMB) may be used only if the supplier can demonstrate that the aggregate does not contain contaminated material.

The recommendations presented herein should be used for design and construction of the slabs and pertaining grading work underlying vehicular pavement areas. A minimum modulus of rupture of 550 psi for concrete has been assumed in designing the PCC pavement sections; this corresponds to a concrete compressive strength of approximately 4,000 psi at 28 days. A qualified design professional should specify where heavy duty and standard duty slabs are used based on the anticipated type and frequency of traffic. Fire access roads are normally considered heavy duty pavement. The recommended vehicular PCC pavement sections are provided in the following table.

Table 4 - Vehicular PCC Pavement Sections

Pavement Type	Portland Cement Concrete Thickness (inches)	Base Course (CAB) Thickness (inches)
Light Duty	6.0	4.0
Heavy Duty	7.0	6.0

These vehicular concrete pavement sections should be increased for bus traffic areas, where applicable. The following recommendations should also be incorporated into the design and construction of PCC pavement.

- The pavement sections should be reinforced with No. 3 rebars spaced at 18 inches on centers each way to reduce the potential for shrinkage cracking.
- Joint spacing in feet should not exceed twice the slab thickness in inches, e.g., 12 feet for a 6-inch thick slab. Regardless of slab thickness, joint spacing should not exceed 15 feet.
- Layout joints should form square panels. When this is not practical, rectangular panels can be used if the long dimension is no more than 1.5 times the short one.
- Control joints should have a depth of at least 1/4 the slab thickness, e.g., 1 inch for a 4-inch thick slab.
- Pavement section design assumes that proper maintenance such as sealing and repair of localized distress will be performed on a periodic basis.

14. SOIL EXPANSIVITY

The subsurface soils encountered at shallow depths consist mostly of silty sand, clayey sand, and sandy clay. The silty sand and clayey sand materials generally have a low susceptibility to expansion when facing seasonal cycles of saturation/desiccation. The sandy clay has a low to moderate expansion potential. Consequently, the recommendations provided in this report regarding drainage, moisture content during compaction and other pertinent recommendations for site improvements should be incorporated into the design and construction. Where encountered, clay soils should not be used for backfilling below the building except as indicated under Section 13.4 of this report. Proper moisture conditioning is essential to control the potential expansion of clay soils.

15. SOIL CORROSIVITY

The corrosion potential of the onsite materials to steel and buried concrete was preliminarily evaluated. Laboratory testing was performed on a soil sample to evaluate pH, minimum resistivity, chloride and soluble sulfate contents. The test results are presented in the following table.

Table 5 - Corrosion Test Results

Boring	Depth (ft)	Minimum Resistivity (ohm-cm)	pH	Soluble Sulfate Content (ppm)	Soluble Chloride Content (ppm)
B-5	0-2	7910	8.1	16	11

These tests are only an indicator of soil corrosivity for the sample tested. Other soils found on site may be more, less, or of a similar corrosive nature. Imported fill materials should be tested to confirm their corrosion potential. Based on the minimum resistivity results from the soil tested, some of the near-surface site soils are mildly corrosive towards buried ferrous metals. The concentrations of soluble sulfates indicate that the potential of sulfate attack on concrete in contact with the onsite soils is "negligible" based on ACI 318 Table 4.3.1. The concentration of soluble chloride is also negligible. Cement Type II may be used in the concrete. Maximum water-cement ratios are not specified for the sulfate concentrations; however, the Structural Engineer should select a concrete with appropriate strength. The exposures to site class in accordance with ACI 318-14, Table 19.3.1.1 are S_0, W_0, and C_1. Further interpretation of the corrosivity test results, including the resistivity value, and providing corrosion design and construction recommendations are the purview of corrosion specialists/consultants.

16. PERCOLATION TESTING

The drilling for the borehole and percolation testing were performed on sunny days. No significant rain had occurred for several weeks prior to percolation testing. The depth of the hole for the percolation test was about 15 feet and the location is as shown on the Boring Location Map, Figure A-2.

Koury performed the test in general conformance with the boring percolation test procedure of the County of Los Angeles as defined in the Low Impact Development BMP Design Handbook dated 9/20/14, and the Administrative Manual of the County of Los Angeles Public Works, Geotechnical & Materials Engineering Division, County Document GS200.1 dated 6/30/21. The test procedure consisted of drilling an 8½-inch diameter borehole to the test depth and placing a 2-inch layer of filter gravel at the bottom of the hole. We also placed a 3-inch diameter perforated pipe in the hole and filter rock within the annulus to prevent caving.

The percolation hole was presoaked for at least one hour per the test method. Following presoaking, percolation testing began by filling the bottom 5 feet of the hole with water and measuring the drop-in water level at intervals of 30 minutes in accordance with the test method. Refilling with water was repeated multiple times, until infiltration equilibrium appeared to have occurred per the test method. The stabilized rate of drop for the last 3 readings was less than 10 percent. The test readings and calculations are presented in Appendix C.

The following table summarizes the results of the falling head percolation test for Percolation Boring P-1. The falling head percolation testing yielded a short-term infiltration rate of about 1.7 inch per hour as summarized in Table 6 (See Appendix C for test data and calculations).

Table 6 – Summary of Falling Head Percolation Testing

Test Number	Depth (ft)	Short Term Infiltration *(in/hour)	Adjusted Long Term Infiltration (in/hour)
P-1	15	1.76	0.35

*No correction factor applied

The in-situ field percolation testing performed provide a short-term infiltration rate, which applies mainly to the initiation of the infiltration process due to the short time of the test (hours instead of days) and the amount of water used. Where appropriate the short-term infiltration rate should be converted to long-term infiltration rate using reduction factors ranging from 3 to 9 depending upon the degree of infiltrate quality, maintenance access and frequency, site variability, subsurface stratigraphy variation, and other factors. The small-scale percolation testing cannot model the complexity of the effect of interbedded layers of different soil composition, and our test results should be considered index values of infiltration rates.

We have applied a correction factor of 5 to estimate long-term infiltration rate as indicated in Table 6 above. The correction factor was selected per the test method to account for the Boring Percolation Testing Method, subsurface soil variability, number of tests, and long-term maintenance. The correction factor and infiltration calculations and assumptions are

presented on the Percolation Test Data Sheets in Appendix C. The design professional may re-adjust this factor, if deemed appropriate. However, reduction factors that are too low may affect the longevity of the BMPs.

Subsurface Soil Consideration for Infiltration: The percolation test boring and adjacent borings disclosed mainly the presence of interbedded silty sand, clayey sand, and sandy lean clay soils. The soils within the zone of percolation consisted predominantly of silty sand and clayey sand. Within this area, soils with better infiltration potential are anticipated encountered at a depth of about 20 feet.

Design Consideration: Based on the soil borings and the results of percolation testing, it is our opinion that portions of the site, with proper consideration for the depth, are generally suitable for storm water infiltration. At the location of Percolation Boring P-1, the site soils generally have a low expansion potential and the effect of infiltration on soil expansion should be negligible. There is moderate potential for settlement of the ground surface due to hydroconsolidation, and some maintenance should be anticipated in the vicinity of the infiltration facilities.

The infiltration facilities should be designed to overflow to the storm drain in the event the drainage capacity is exceeded or in case of future failure to infiltrate sufficiently. The infiltration facilities should extend at least 20 feet below the ground surface and should be located at least 20 feet away from the property line and about 75 feet away from the proposed building to reduce the potential effect that infiltration may have on liquefaction potential and hydroconsolidation. Utility pipelines should be located well outside the infiltration facilities or special measures should be taken to prevent water from entering the bedding and shading materials placed around utilities.

No infiltration facility should be designed to infiltrate water into fill material except if coarse-grained clean sand and filter gravel are used as fill. Any construction method should prevent compaction of the area where infiltration is proposed. Any soil processing and compaction of the onsite soils may reduce the infiltration by factors ranging between about 2 and 10 times. We recommend that the lower 18 inches of the excavations for infiltration facilities be performed using an excavator; no rubber tire equipment should be allowed at the bottom of the excavations. No disturbance to the bottom of the excavations should be allowed. If silt material is encountered at the bottom of the excavations, it should be removed and replaced with coarse clean sand or filter

gravel. The filter rock placed at the bottom of the excavation should be vibrated in place and ample water should be used during the vibration/compaction process. The proposed infiltration design system should be reviewed by the Geotechnical Consultant prior to construction.

17. LIGHT POLES

As a typical foundation, cast-in-place drilled piers (shafts) are usually used to support the axial and lateral loads of this kind of structure. Lateral loads on the foundation shaft for the proposed poles may be resisted by the passive resistance utilized by the surrounding soils. The passive resistance when the ground surface is level, may be assumed to be equal to the pressure developed by a fluid with a density of 150 pcf, with zero point 1.5 feet deep below ground surface to a maximum value 1,500 psf for the upper 12 feet and 200 pcf to a maximum of 2000 psf. These values apply to the design of the poles when they are adversely affected by 0.5 inch of lateral movement at ground level. These lateral resistance values should not be multiplied by 2 as addressed in section 1807A.3.2 of CBC 2022. If the embedment depth is obtained in accordance to the Pole Formula provided in CBC 2022 (Equation 18A-1), the allowable lateral soil-bearing pressure based on a depth of one-third of the embedment depth (S_1 in Section 1807A.3.2.1 of CBC 2022) may be calculated according to the aforementioned lateral resistance values. If movement of 0.5 inch or greater at the ground surface is allowed, the equivalent fluid pressure may be multiplied by 2. For free standing canopies, the pole footings should be tied together with tie beams to decrease the distortion that may occur due to seismic settlement. For vertical bearing, the upper 2½ feet of the side friction should be neglected and a value of 300 psf should be used below that depth.

18. OBSERVATION AND TESTING

This report has been prepared assuming that Koury Engineering & Testing, Inc. will perform all geotechnical-related field observations and testing. 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 the recommendations contained herein. That party would then assume the title of “Geotechnical Consultant of Record”. A representative of the Geotechnical Consultant should be present to observe all grading operations as well as all footing excavations.

19. CLOSURE

The findings and recommendations presented in this report were based on the results of the 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. Subsurface variations between and beyond the borings should be anticipated. Koury should be notified if subsurface conditions are encountered, which differ from those described in this report to determine if revised recommendations are necessary. Samples obtained during 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.

Should you have any questions concerning this submittal, or the recommendations contained herewith, please call our office.

Respectfully submitted,

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APPENDICES

Appendix A: Maps and Plans

Vicinity Map – Figure A-1
Boring Location Map – Figure A-2
Geologic Map – Figure A-3
Historic High Groundwater Map – Figure A-4
Seismic Hazard Zones Map – Figure A-5
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Appendix B: Field Exploratory Boring Logs

Borings B-1 through B-10

Appendix C: Laboratory Test Results and Calculations

Appendix D: Historical Earthquake Data

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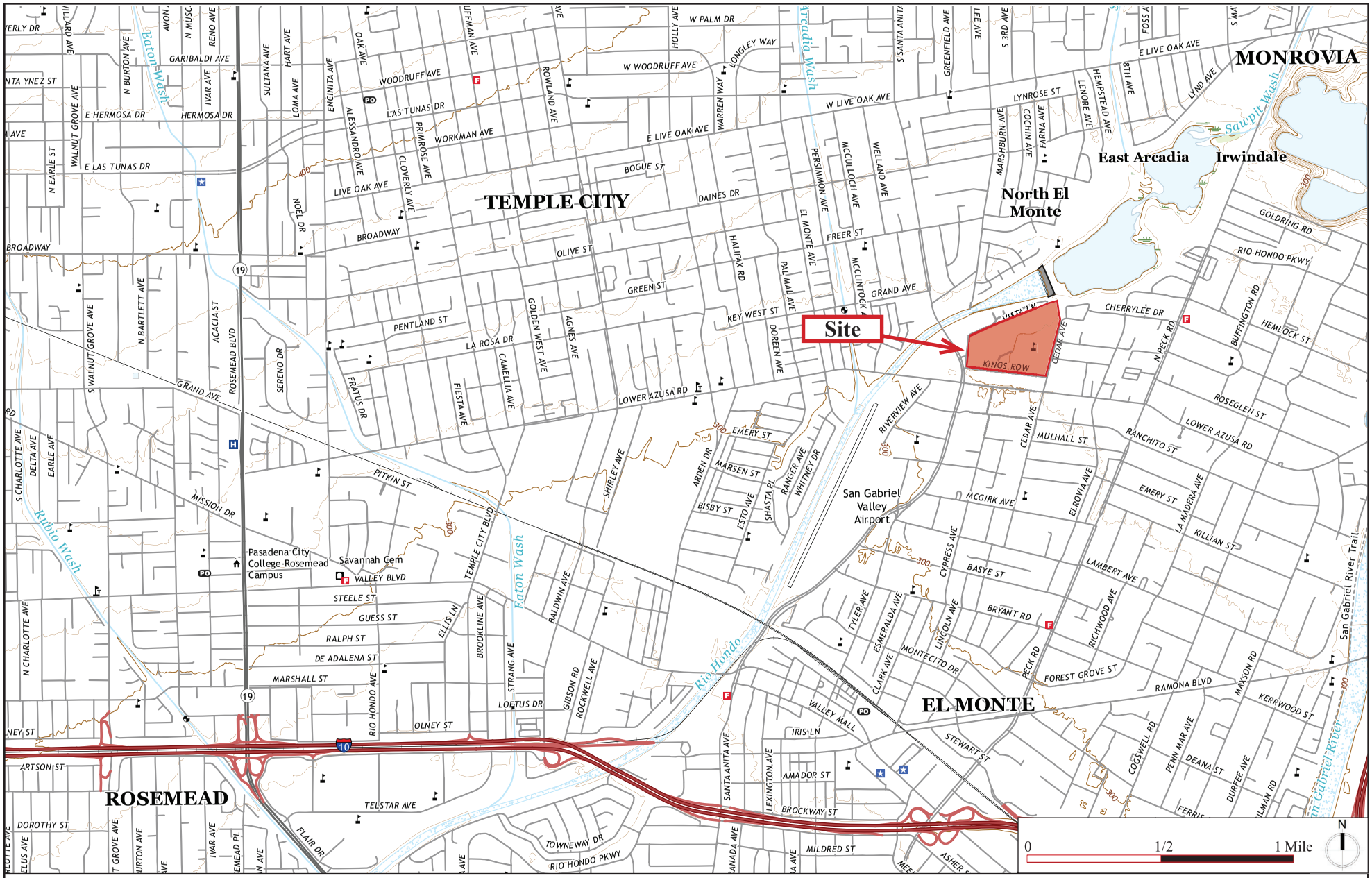
16. USGS, Earthquake Hazards Program, Unified Hazard Tool, Web Site http://earthquake.usgs.gov/hazards/interactive/.

17. Youd, et.al, 2001, "Liquefaction Resistance of Soils: Summary report of NCEER 1996 and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils," Journal of Geotechnical and Geoenvironmental Engineering, October 2001, pp. 817-833.

18. Ziony, J. I. and Jones, L. M., 1989, Map Showing Late Quaternary Faults and 1978-84 Seismicity of the Los Angeles Region, California, USGS Miscellaneous Field Studies Map MF-1964.

APPENDIX A

Maps and Plans



Reference: USGS Topographic Map, El Monte Quadrangle, California-Los Angeles County, 7.5 Minute Series 2018 - Contour Interval 20 feet, NAVD 1988

KOURY PASSION INTEGRITY QUALITY	**Project Name:** Arroyo High School Administration, Music & Performing Arts Building	**Project No.:** 23-1190 **Date:** May 2023	**Drawing Title:** Vicinity Map	**Figure:** A-1



LEGEND

B-10 Approximate Proposed Boring Location

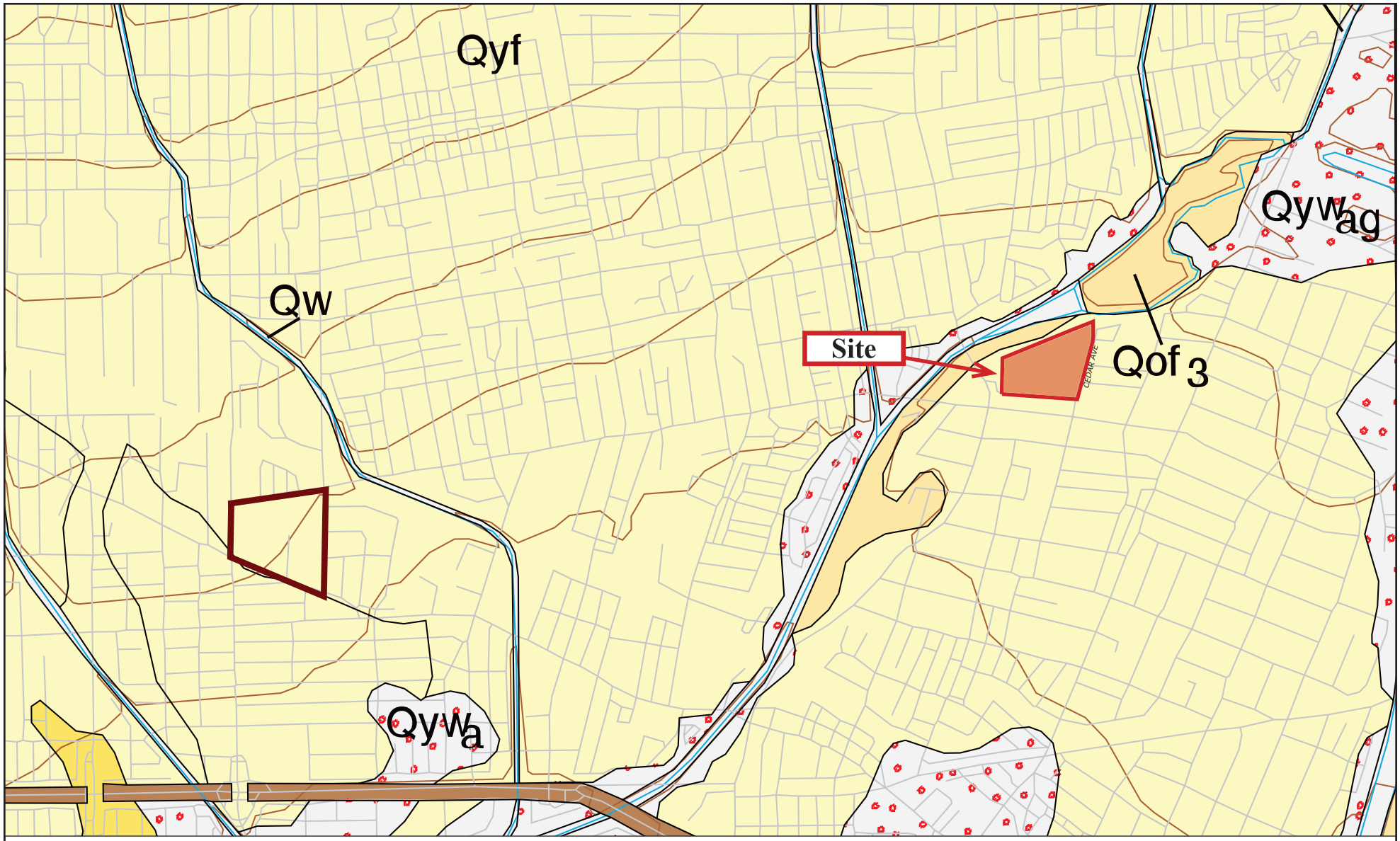
P-1 Approximate Proposed Percolation Boring Location

0 80'

N

References: Google Earth Image & Architectural Site Plan, Sheet A1.21 by HMC Architects

KOURY PASSION INTEGRITY QUALITY	Project Name: Arroyo High School Administration, Music & Performing Arts Building	Project No.: 23-1190 Date: MAY 2023	Drawing Title: Boring Location Map	Figure: A-2



LEGEND

Qyf — **Young Alluvial Fan & Valley Deposits**

0 1/2 1 Mile N

Reference: Geologic Map of the Los Angeles 30'x60' Quadrangle, California-Version 1.0 Compiled by Robert F. Yerkes & Russell H. Campbell, 2005

	Project Name:	Project No.: 23-1190	Drawing Title:	Figure:
KOURY PASSION INTEGRITY QUALITY	Arroyo High School Administration, Music & Performing Arts Building	Date: May 2023	Geologic Map	A-3

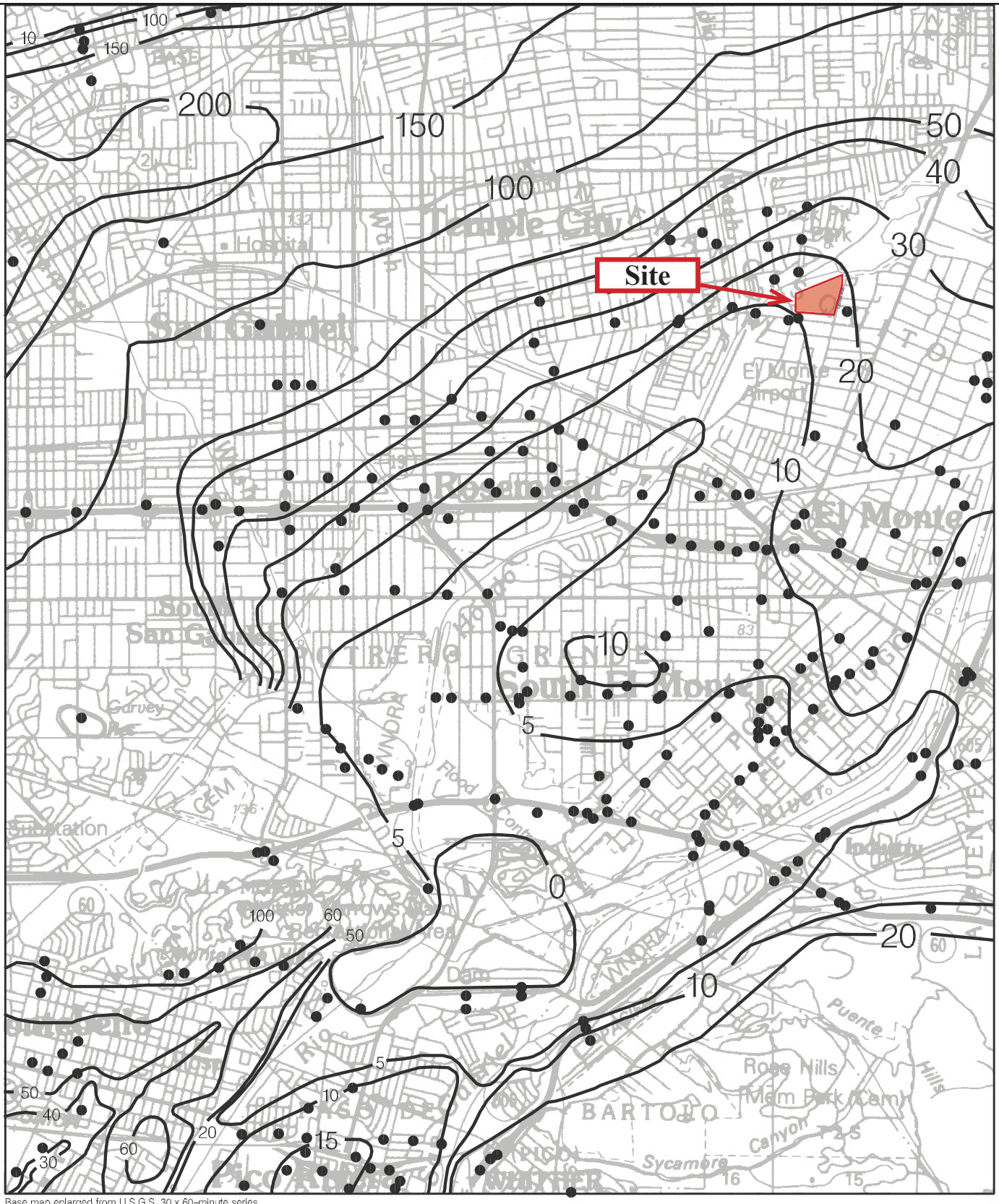
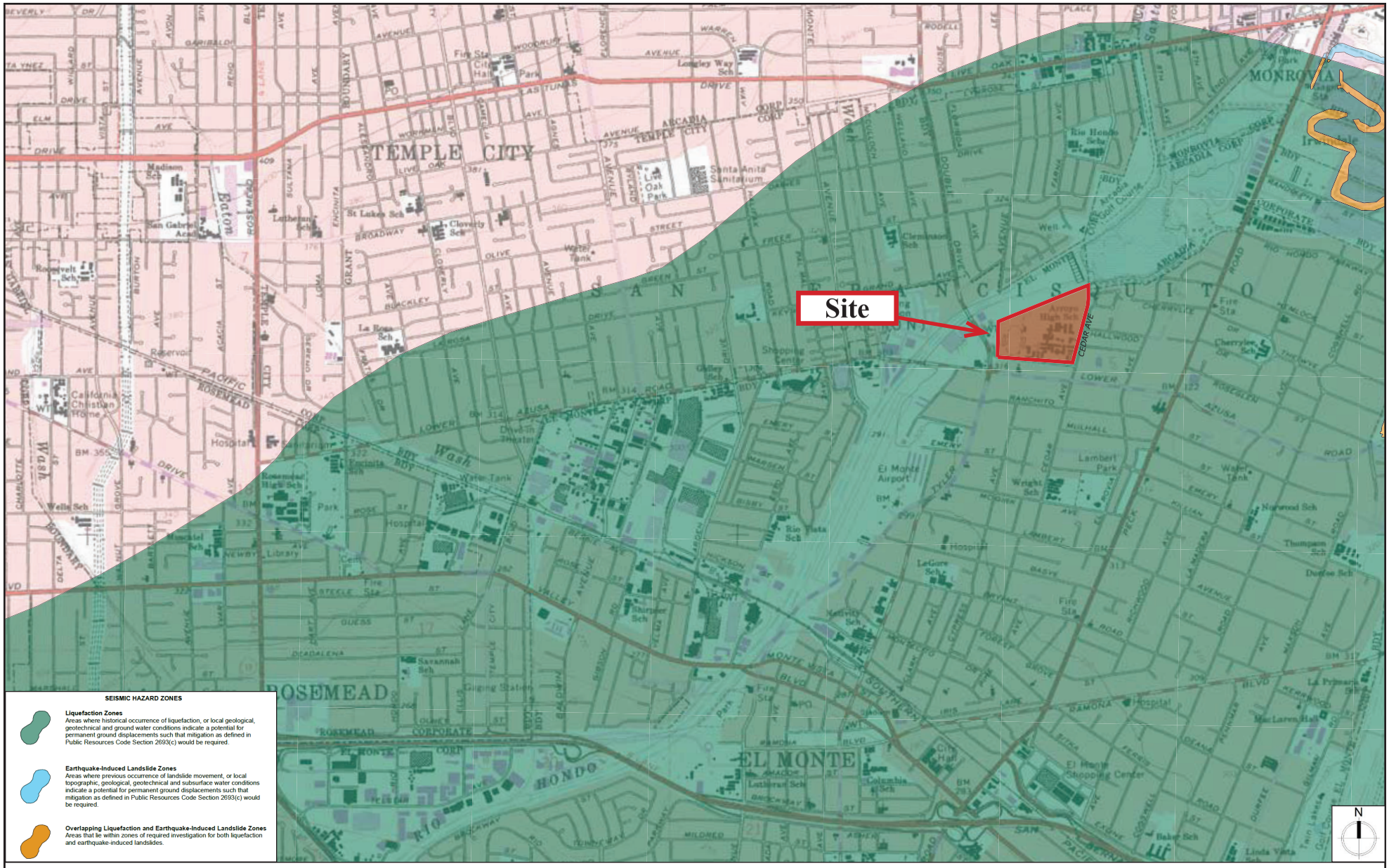


Plate 1.2 Historically Highest Ground Water Contours and Borehole Log Data Locations, El Monte Quadrangle.

● Borehole Site

30 Depth to ground water in feet

KOURY PASSION INTEGRITY QUALITY	Project Name: Arroyo High School Administration, Music & Performing Arts Building	Project No.: 23-1190 Date: May 2023	Drawing Title: Historic High Groundwater Map	Figure: A-4

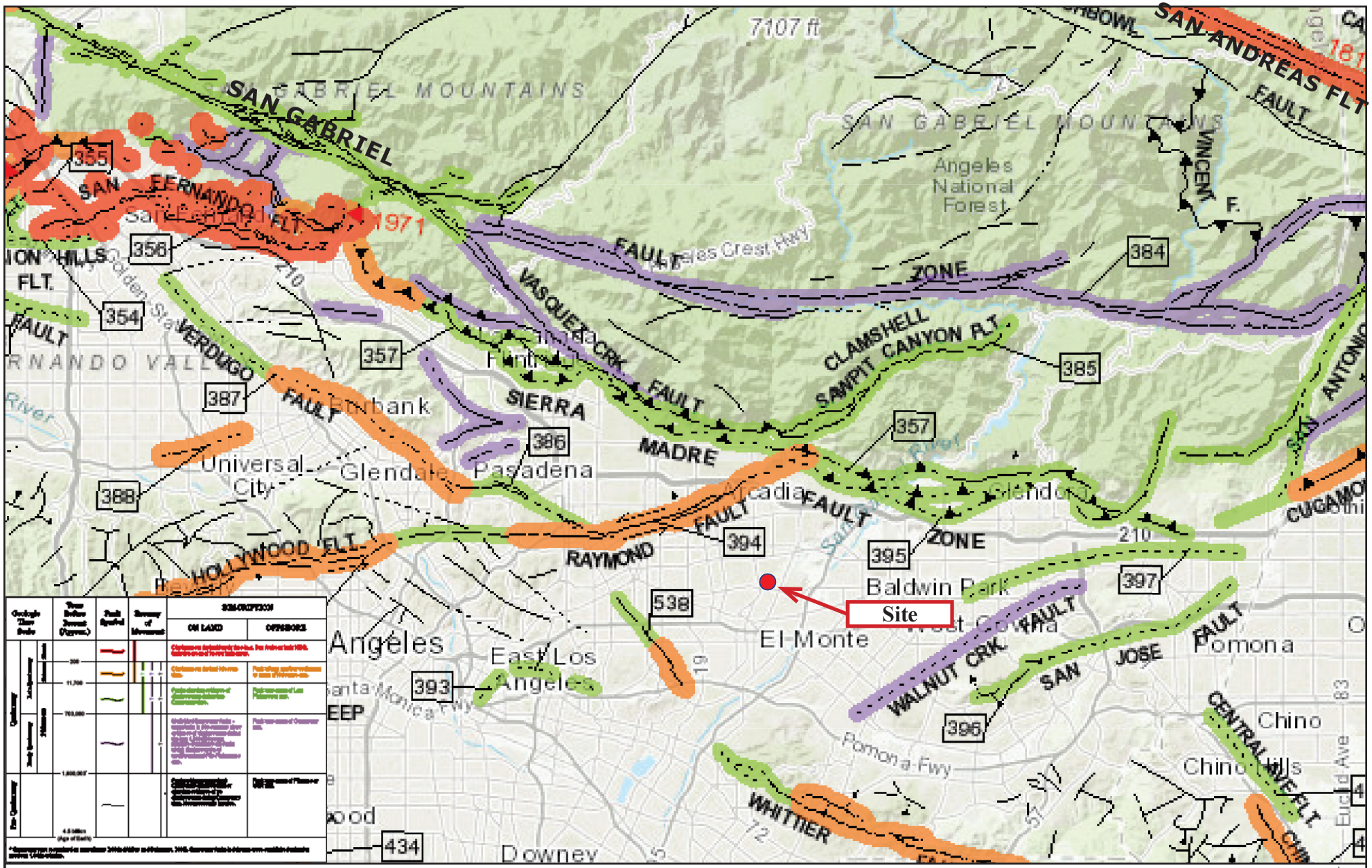


LEGEND

0 1/2 1 Mile

Reference: California Geological Survey, Earthquake Fault Zones & Seismic Hazard Zones, El Monte 7.5 Minute Quadrangle, Official Map Released: March 25, 1999, Revised Official Map: June 15, 2017

KOURY PASSION INTEGRITY QUALITY	Project Name: Arroyo High School Administration, Music & Performing Arts Building	Project No.: 23-1190 Date: May 2023	Drawing Title: Seismic Hazard Zones Map	Figure: A-5



Reference: Fault Activity Map of California (2010) - California Geological Survey
Department of Conservation Web Site @ http://maps.conservation.ca.gov/cgs/fam/

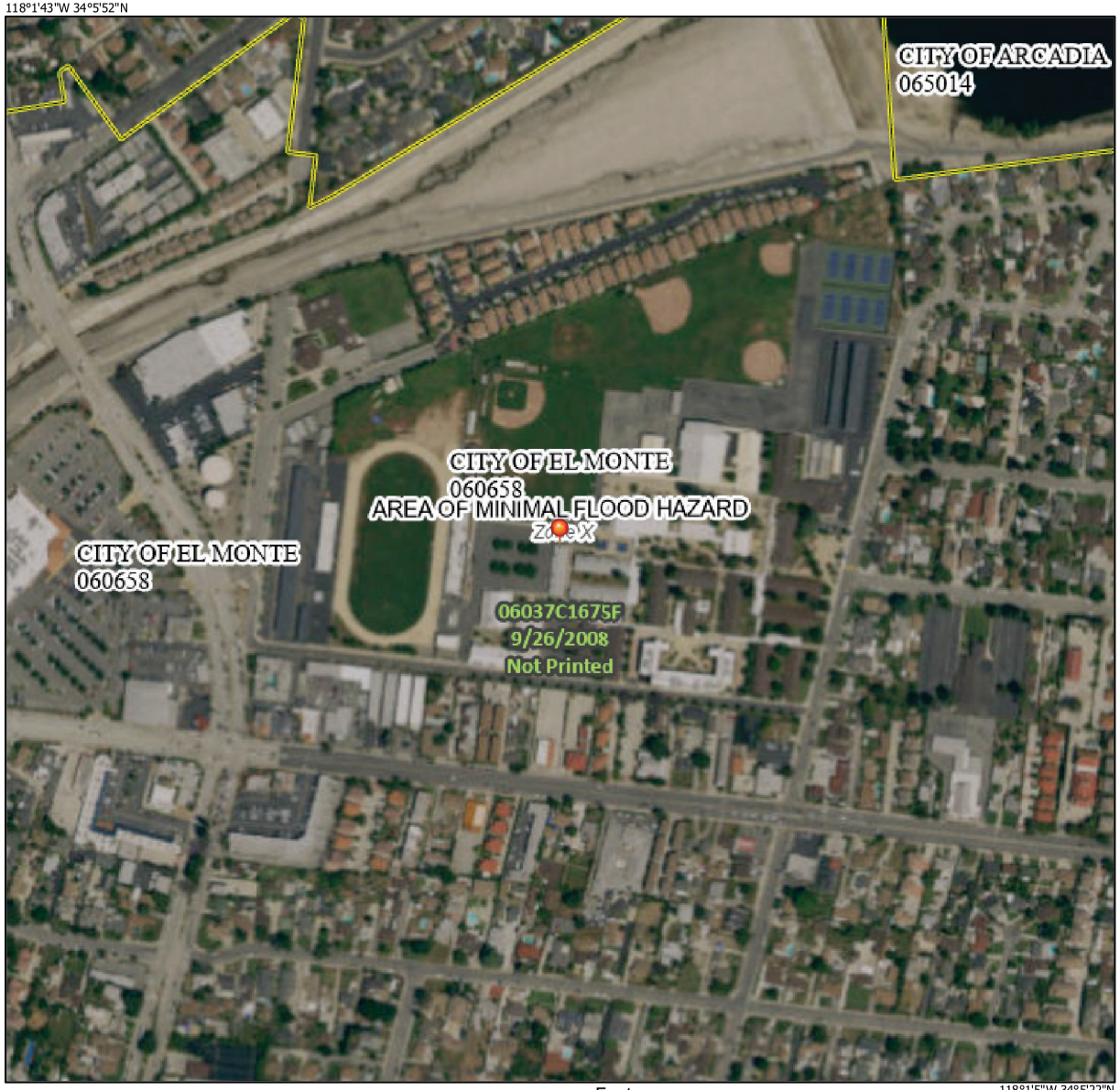
0 5 mi N

KOURY PASSION INTEGRITY QUALITY	Project Name: Arroyo High School Administration, Music & Performing Arts Building	Project No.: 23-1190 Date: May 2023	Drawing Title: Fault Map	Figure: A-6

National Flood Hazard Layer FIRMette

FEMA

118°1'43"W 34°5'52"N



118°1'5"W 34°5'22"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

- SPECIAL FLOOD HAZARD AREAS
  - Without Base Flood Elevation (BFE) *Zone A, V, A99*
  - With BFE or Depth *Zone AE, AO, AH, VE, AR*
  - Regulatory Floodway
- OTHER AREAS OF FLOOD HAZARD
  - 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
  - Future Conditions 1% Annual Chance Flood Hazard *Zone X*
  - Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
  - Area with Flood Risk due to Levee *Zone D*
- OTHER AREAS
  - NO SCREEN Area of Minimal Flood Hazard *Zone X*
  - Effective LOMRs
  - Area of Undetermined Flood Hazard *Zone D*
- GENERAL STRUCTURES
  - Channel, Culvert, or Storm Sewer
  - Levee, Dike, or Floodwall
- OTHER FEATURES
  - 20.2 Cross Sections with 1% Annual Chance
  - 17.5 Water Surface Elevation
  - Coastal Transect
  - Base Flood Elevation Line (BFE)
  - Limit of Study
  - Jurisdiction Boundary
  - Coastal Transect Baseline
  - Profile Baseline
  - Hydrographic Feature
- MAP PANELS
  - Digital Data Available
  - No Digital Data Available
  - Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/17/2023 at 4:20 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

N

KOURY PASSION INTEGRITY QUALITY

Project Name:	Project No.: 23-1190	Drawing Title:	Figure:
Arroyo High School Administration, Music & Performing Arts Building	Date: May 2023	Flood Map	A-7

Arroyo High School [23-1190]

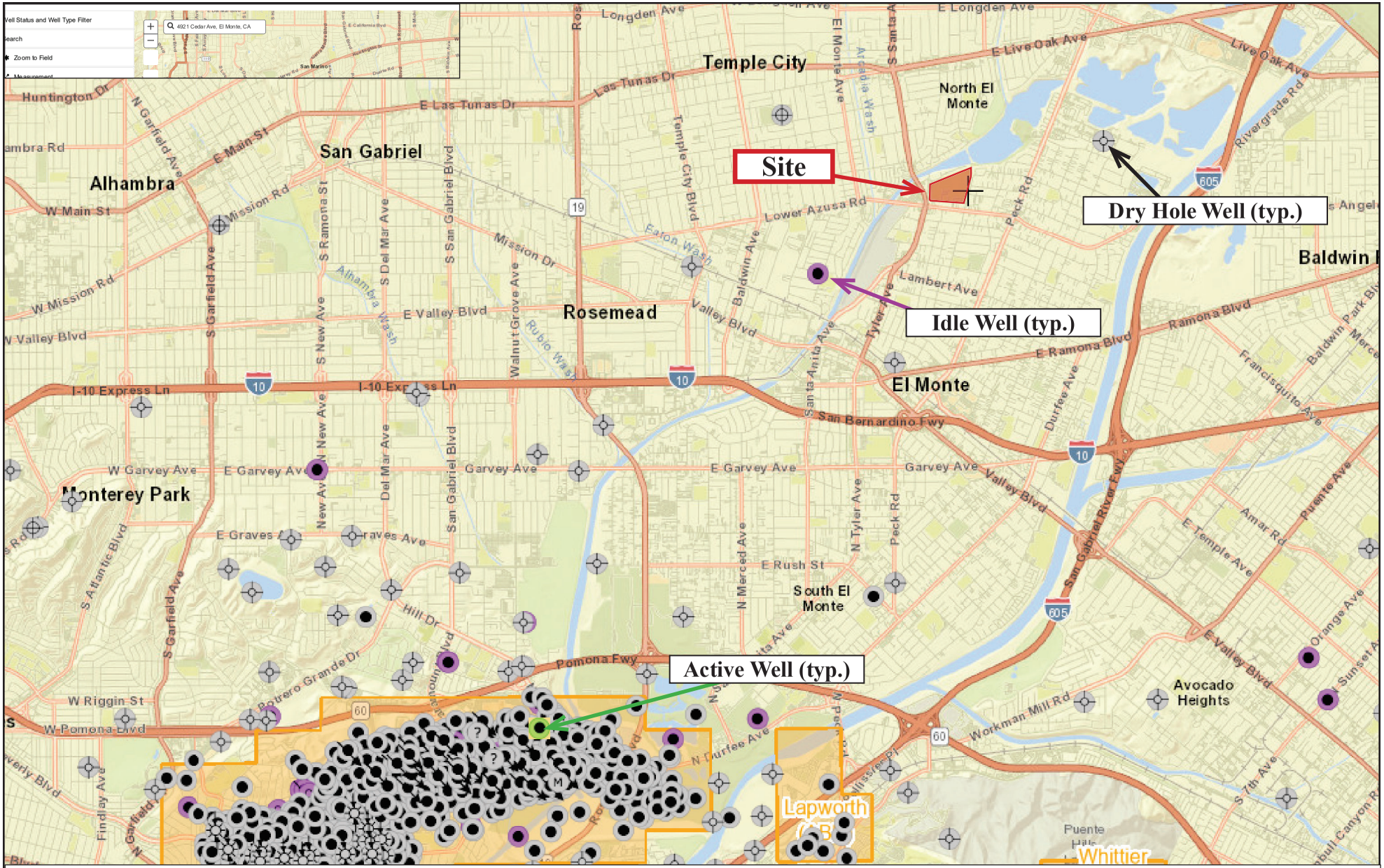
Latitude, Longitude: 34.094131, -118.020936



Date	5/24/2023, 10:20:04 AM
Design Code Reference Document	ASCE7-16
Risk Category	III
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.82	MCE_R ground motion. (for 0.2 second period)
S_1	0.65	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.82	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.213	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.781	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.86	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.82	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.02	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.086	Factored deterministic acceleration value. (0.2 second)
S1RT	0.667	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.744	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.65	Factored deterministic acceleration value. (1.0 second)
PGAd	0.834	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.781	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.901	Mapped value of the risk coefficient at short periods
C_{R1}	0.897	Mapped value of the risk coefficient at a period of 1 s
C_V	1.464	Vertical coefficient



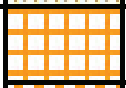
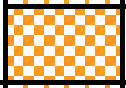
KOURY PASSION INTEGRITY QUALITY	Project Name: Arroyo High School Administration, Music & Performing Arts Building	Project No.: 23-1190 Date: May 2023	Drawing Title: Oil & Gas Map	Figure: A-9

APPENDIX B

Field Exploratory Boring Logs

KEY TO 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		
SIEVE SIZES	#200	#40	#10	#4	3/4"	3"	12"

KEY TO LOGS (continued)

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	DESCRIPTION
DRY	Dry to the touch; no observable moisture
SLIGHTLY MOIST	Some moisture but still a dry appearance
MOIST	Damp, but no visible water
VERY MOIST	Enough moisture to wet the hands
WET	Almost saturated; visible free water

Koury Engineering
14280 Euclid Avenue, Chino, California, 91710
Phone: 909 606 6111

Boring No.: B-1

Latitude	: 34.093633	Drill Supplier	: OneWay Drilling	Job Number	: 23-1190	Sheet	: 1 OF 2
Longitude	: -118.021114	Driller Company	: OneWay Drilling	Client	: El Monte Union High School District		
Elevation	: Not Surveyed	Logged By	: Albert Buffet	Project	: Arroyo High School - New Performing Arts Center		
Total Depth	: 21.5 ft	Date	: 05/10/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732		

Depth (ft)	Samples: Mod Cal Sample	Samples: SPT Sample	Samples: Bulk	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
0.25							Non-Soil	PAV	Grass over topsoil 3 inches of topsoil				
1							Fill	SM	SILTY SAND (SM) : fine to medium grained, loose to medium dense, trace non-plastic clay, trace fine sized gravel, moist, brown.				
2													
3											4.8		
3							Alluvium	CL	SANDY LEAN CLAY (CL) : soft, fine grained sand, low plasticity, moist, brown, (layers of sandy silt).				
4													
5													
5		■		2, 2, 3 (N = 5)							22.0		
6													
7													
7	■				2, 5, 8 (N = 8)		Alluvium	SC	CLAYEY SAND (SC) : fine grained, loose, moist, dark grayish brown, (layers of silty sand).	48	18.5	98	Consolidation
8													
9													
10													
10		■		5, 7, 14 (N = 21)							19.0		
11													
12													
13													
14													
15	■				6, 8, 18 (N = 16)						18.3	107	
16													
17													
18													
18	■				12, 12, 12 (N = 15)		Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, medium dense, moist, light yellowish brown.				
19													

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Phone: 909 606 6111

Boring No.: B-1

Latitude	: 34.093633	Drill Supplier	: OneWay Drilling	Job Number	: 23-1190
Longitude	: -118.021114	Driller Company	: OneWay Drilling	Client	: El Monte Union High School District
Elevation	: Not Surveyed	Logged By	: Albert Buffet	Project	: Arroyo High School - New Performing Arts Center
Total Depth	: 21.5 ft	Date	: 05/10/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732

Sheet : 2 OF 2

Depth (ft)	Samples: Mod Cal Sample	Samples: SPT Sample	Samples: Bulk	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
21		■		6, 9, 11 (N = 20)			Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, medium dense, moist, light yellowish brown.	5	4.2		
22									**B-1 Terminated at 21.5 ft (No Groundwater Encountered fine contents are estimate)**				
23													
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													

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Boring No.: B-2

Latitude	: 34.093784	Drill Supplier	: OneWay Drilling	Job Number	: 23-1190	Sheet	: 1 OF 2
Longitude	: -120.010890	Driller Company	: OneWay Drilling	Client	: El Monte Union High School District		
Elevation	: Not Surveyed	Logged By	: Albert Buffet	Project	: Arroyo High School - New Performing Arts Center		
Total Depth	: 26.5 ft	Date	: 05/10/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732		

Depth (ft)	Samples: Bulk	Samples: SPT Sample	Samples: Mod Cal Sample	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
0.25							Non-Soil	PAV	Grass over topsoil 3 inches of topsoil				
1							Fill	SM	SILTY SAND (SM) : fine to medium grained, loose to medium dense, trace non-plastic clay, trace fine sized gravel, moist, brown.				
2													
3													
3				1, 1, 2 (N = 3)			Alluvium	CL	SANDY LEAN CLAY (CL) : soft, fine grained sand, low plasticity, moist, brown, (layers of clayey sand).	64	22.0		
4													
5					3, 3, 7 (N = 6)								
6										54	18.7	99	PP= 2.2 tsf
7													
7				2, 3, 5 (N = 8)			Alluvium	SC	CLAYEY SAND (SC) : fine grained, fine grained sand, loose, moist, dark grayish brown, (layers of silty sand).	46	14.8		
8													
9													
10					3, 5, 9 (N = 9)								
11										42	15.2	104	
12													
13													
14													
15													
15.5				3, 5, 9 (N = 14)			Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, medium dense, moist, light yellowish brown.	11	9.6		
16													
17													
18													
19													

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Phone: 909 606 6111

Boring No.: B-2

Latitude	: 34.093784	Drill Supplier	: OneWay Drilling	Job Number	: 23-1190	Sheet	: 2 OF 2
Longitude	: -120.010890	Driller Company	: OneWay Drilling	Client	: El Monte Union High School District		
Elevation	: Not Surveyed	Logged By	: Albert Buffet	Project	: Arroyo High School - New Performing Arts Center		
Total Depth	: 26.5 ft	Date	: 05/10/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732		

Depth (ft)	Samples: Bulk	Samples: SPT Sample	Samples: Mod Cal Sample	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
21			■		7, 8, 19 (N = 17)		Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, medium dense, moist, light yellowish brown.	11	5.3	107	
22 22			■										
23			■				Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, medium dense to dense, slightly moist, little fine to medium sized gravel, light yellowish brown, (layers of sand with gravel).				
24			■										
25		▼	■	29, 35, 30 (N = 65)						12	1.7		
26		▼	■										
27									**B-2 Terminated at 26.5 ft (No Groundwater Encountered, fine contents are estimates)**				
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													

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Phone: 909 606 6111

Boring No.: B-3

Latitude	: 34.093721	Drill Supplier	: OneWay Drilling	Job Number	: 23-1190	Sheet	: 1 OF 1
Longitude	: -118.020945	Driller Company	: OneWay Drilling	Client	: El Monte Union High School District		
Elevation	: Not Surveyed	Logged By	: Albert Buffet	Project	: Arroyo High School - New Performing Arts Center		
Total Depth	: 16.5 ft	Date	: 05/10/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732		

Depth (ft)	Samples: Bulk	Samples: SPT Sample	Samples: Mod Cal Sample	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
0.3							Non-Soil	PAV	Grass over topsoil 3 inches of topsoil				
1							Fill	SM	SILTY SAND (SM) : fine to medium grained, loose to medium dense, trace fine sized gravel, moist, brown and dark yellowish brown.				
2													
3											8.0		
3							Alluvium	SM	SILTY SAND (SM) : fine to medium grained, loose to medium dense, moist, little Non-plastic clay, trace fine sized gravel, brown and dark yellowish brown.				
4													
5					5, 5, 6 (N = 7)								
5.5							Alluvium	CL	SANDY LEAN CLAY (CL) : soft, fine grained sand, low plasticity, moist, brown, (thin layers of very moist clayey sand).	62	19.4	102	Consolidation PP= 3.0 tsf
6													
7				2, 2, 3 (N = 5)									
8											24.6		
9													
9							Alluvium	SM	SILTY SAND (SM) : fine to medium grained, loose to medium dense, moist, trace fine to medium sized gravel, dark yellowish brown.				
10					4, 8, 12 (N = 13)								
11											9.2	104	
12													
13													
13							Alluvium	SC	CLAYEY SAND (SC) : fine to medium grained, medium dense, moist, dark yellowish brown and light yellowish brown, (layers of silty sand and poorly graded sand with silt).				
14													
15													
16				3, 5, 11 (N = 16)							15.3		
17									**B-3 Terminated at 16.5 ft (No Groundwater Encountered, fine contents are estimates)**				
18													
19													

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Phone: 909 606 6111

Boring No.: B-4

Latitude	: 34.093910	Drill Supplier	: OneWay Drilling	Job Number	: 23-1190	Sheet	: 1 OF 3
Longitude	: -118.020861	Driller Company	: OneWay Drilling	Client	: El Monte Union High School District		
Elevation	: Not Surveyed	Logged By	: Albert Buffet	Project	: Arroyo High School - New Performing Arts Center		
Total Depth	: 51.5 ft	Date	: 05/10/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732		

Depth (ft)	Samples: Bulk	Samples: SPT Sample	Samples: Mod Cal Sample	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
1							Non-Soil	ASP	Asphalt 3 inches over 10 inches of Aggregate Base				
1.1							Fill	SM	SILTY SAND (SM) : fine to medium grained, medium dense, trace non-plastic clay, trace fine sized gravel, moist, dark yellowish brown.				
2					2, 3, 5 (N = 5)								
2.5							Alluvium	CL	LEAN CLAY WITH SAND (CL) : soft, fine grained sand, trace fine sized gravel, low plasticity, moist, dark yellowish brown mottled with brown, (thin layers of sandy silt and clayey sand).	83	24.4	88	Direct Shear
3													
4							Alluvium	SM	SILTY SAND (SM) : fine to medium grained, loose to medium dense, moist, trace Non-plastic clay, trace fine sized gravel, dark yellowish brown.				
5				2, 2, 3 (N = 5)						25	11.5		
6													
6.5							Alluvium	SC	CLAYEY SAND (SC) : fine to medium grained, loose to medium dense, moist, dark yellowish brown.				
7					4, 6, 11 (N = 11)					35	16.3	101	
8													
9							Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, medium dense to dense, slightly moist, light yellowish brown.				
10				5, 5, 6 (N = 11)						12	3.1		
11													
12													
13													
14													
15					4, 7, 15 (N = 14)					5	1.8	101	
16													
17													
18													
19													

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Boring No.: B-4

Latitude	: 34.093910	Drill Supplier	: OneWay Drilling	Job Number	: 23-1190	Sheet	: 2 OF 3
Longitude	: -118.020861	Driller Company	: OneWay Drilling	Client	: El Monte Union High School District		
Elevation	: Not Surveyed	Logged By	: Albert Buffet	Project	: Arroyo High School - New Performing Arts Center		
Total Depth	: 51.5 ft	Date	: 05/10/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732		

Depth (ft)	Samples: Bulk	Samples: SPT Sample	Samples: Mod Cal Sample	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
21		■		4, 7, 11 (N = 18)			Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, medium dense to dense, slightly moist, light yellowish brown.	5	1.3		
22													
23													
24													
25			■		16, 35, 50 (N = 55)								
26										5	1.9	122	
27													
28													
29													
30		■		9, 14, 20 (N = 34)						9	5.1		
31													
32													
33													
34													
35		■		16, 28, 24 (N = 52)						5	2.1		
36													
37													
38													
39													

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Boring No.: B-4

Latitude	: 34.093910	Drill Supplier	: OneWay Drilling	Job Number	: 23-1190	Sheet	: 3 OF 3
Longitude	: -118.020861	Driller Company	: OneWay Drilling	Client	: El Monte Union High School District		
Elevation	: Not Surveyed	Logged By	: Albert Buffet	Project	: Arroyo High School - New Performing Arts Center		
Total Depth	: 51.5 ft	Date	: 05/10/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732		

Depth (ft)	Samples: Bulk	Samples: SPT Sample	Samples: Mod Cal Sample	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
40													
41				15, 18, 23 (N = 41)			Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, medium dense, moist to slightly moist, light yellowish brown.	5	2.2		
42													
43													
44													
45				15, 28, 50 (N = 78)						8	1.8		
46													
47													
47							Alluvium	SP-SM	As above, but (thin layers of sandy clay).				
48													
49													
50				9, 18, 36 (N = 54)						9	8.3		
51													
52									**B-4 Terminated at 51.5 ft (No Groundwater Encountered, fine contents are estimates)**				
53													
54													
55													
56													
57													
58													
59													

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Boring No.: B-5

Latitude	: 34.094238	Drill Supplier	: OneWay Drilling	Job Number	: 23-1190	Sheet	: 1 OF 2
Longitude	: -118.020745	Driller Company	: OneWay Drilling	Client	: El Monte Union High School District		
Elevation	: Not Surveyed	Logged By	: Albert Buffet	Project	: Arroyo High School - New Performing Arts Center		
Total Depth	: 26.5 ft	Date	: 05/09/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732		

Depth (ft)	Samples: Bulk	Samples: SPT Sample	Samples: Mod Cal Sample	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
0.75							Non-Soil	ASP	Asphalt 3 inches over 4 inches of Aggregate Base				
1							Fill	SM	SILTY SAND (SM) : fine grained, medium dense, little non-plastic clay, trace fine sized gravel, moist, brown, (small pockets of clayey sand).				
2					3, 4, 5 (N = 5)		Alluvium	SM	SILTY SAND (SM) : fine grained, medium dense, moist, dark yellowish brown mottled with brown, (thinly layered).		10.7	132	
3													
4													
5				2, 3, 4 (N = 7)							13.5		
6													
7					5, 9, 15 (N = 15)						7.0	98	
8							Alluvium	SM	SILTY SAND (SM) : fine to medium grained, medium dense, moist, dark yellowish brown mottled with brown, (layers of sandy silt and sand with silt).				
9													
10				4, 4, 5 (N = 9)							10.9		
11													
11.5							Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, medium dense, moist, light yellowish brown, (pockets of sand with gravel).				
12													
13													
14													
15					9, 16, 23 (N = 25)						6.1	104	
16													
17													
18													
19													

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Boring No.: B-5

Latitude	: 34.094238	Drill Supplier	: OneWay Drilling	Job Number	: 23-1190	Sheet	: 2 OF 2
Longitude	: -118.020745	Driller Company	: OneWay Drilling	Client	: El Monte Union High School District		
Elevation	: Not Surveyed	Logged By	: Albert Buffet	Project	: Arroyo High School - New Performing Arts Center		
Total Depth	: 26.5 ft	Date	: 05/09/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732		

Depth (ft)	Samples: Bulk	Samples: SPT Sample	Samples: Mod Cal Sample	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
20													
21		■		8, 10, 14 (N = 24)			Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, medium dense, moist, light yellowish brown.		3.7		
22													
23													
24													
25		■		9, 14, 16 (N = 30)							5.6		
26													
27									**B-5 Terminated at 26.5 ft (No Groundwater Encountered, fine contents are estimates)**				
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													

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Boring No.: B-6

Latitude	: 34.394501	Drill Supplier	: Koury Engineering & Testing, Inc.	Job Number	: 23-1190	Sheet	: 1 OF 3
Longitude	: -118.020704	Driller Company	: Koury Engineering & Testing, Inc.	Client	: El Monte Union High School District		
Elevation	: Not Surveyed	Logged By	: Albert Buffet	Project	: Arroyo High School - New Performing Arts Center		
Total Depth	: 51.5 ft	Date	: 05/09/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732		

General comments: NE corner of proposed building. NE of existing containers within Parking Lot

Depth (ft)	Samples: Bulk	Samples: SPT Sample	Samples: Mod Cal Sample	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
0.75							Non-Soil	ASP	Asphalt 3 inches over 5 inches of Aggregate Base				
1							Fill	SM	SILTY SAND (SM) : fine to medium grained, medium dense, trace non-plastic clay, trace fine to medium sized gravel, moist, brown.				
4							Alluvium	SM	SILTY SAND (SM) : fine grained, medium dense, moist, brown, (trace of rootletts and calcite staining).				
5					5, 6, 8 (N = 9)		Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, loose, moist, light yellowish brown.	12	6.5	97	
7				2, 3, 4 (N = 7)			Alluvium	CL	SANDY LEAN CLAY (CL) : medium stiff, fine grained sand, low plasticity, moist, brown, (layers of sandy silt, pockets of very moist soil.).	65	25.0		
9.5					4, 11, 14 (N = 16)		Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, medium dense, moist, brown mottled with dark yellowish brown, (lenses of sand with silt).	11	6.0	110	
13				6, 9, 9 (N = 18)			Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, medium dense, slightly moist, light yellowish brown, (small pockets of silty sand).	5	3.3		

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Boring No.: B-6

Latitude	: 34.394501	Drill Supplier	: Koury Engineering & Testing, Inc.	Job Number	: 23-1190	Sheet	: 2 OF 3
Longitude	: -118.020704	Driller Company	: Koury Engineering & Testing, Inc.	Client	: El Monte Union High School District		
Elevation	: Not Surveyed	Logged By	: Albert Buffet	Project	: Arroyo High School - New Performing Arts Center		
Total Depth	: 51.5 ft	Date	: 05/09/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732		

General comments: NE corner of proposed building. NE of existing containers within Parking Lot

Depth (ft)	Samples: Bulk	Samples: SPT Sample	Samples: Mod Cal Sample	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
20													
21			■		7, 13, 23 (N = 23)		Alluvium	SP	POORLY GRADED SAND WITH GRAVEL (SP) : fine to coarse grained, medium dense, slightly moist, grayish brown.	4	2.6	112	
22													
23													
24													
25													
25		▼		13, 16, 25 (N = 41)			Alluvium	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM) : fine to coarse grained, medium dense to dense, slightly moist, grayish brown.	5	3.5		
26													
27													
28													
29													
30			■		18, 50, 0 (N = 32)					9	2.6	123	
31													
32													
33													
33							Alluvium	SP	POORLY GRADED SAND (SP) : fine to medium grained, dense, slightly moist, grayish brown.				
34													
35		▼		50 (N = 1)						4	3.5		
36													
37													
38													
38							Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, dense, slightly moist, trace fine sized gravel, grayish brown.				
39													

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Boring No.: B-6

Latitude	: 34.394501	Drill Supplier	: Koury Engineering & Testing, Inc.	Job Number	: 23-1190	Sheet	: 3 OF 3
Longitude	: -118.020704	Driller Company	: Koury Engineering & Testing, Inc.	Client	: El Monte Union High School District		
Elevation	: Not Surveyed	Logged By	: Albert Buffet	Project	: Arroyo High School - New Performing Arts Center		
Total Depth	: 51.5 ft	Date	: 05/09/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732		

General comments: NE corner of proposed building. NE of existing containers within Parking Lot

Depth (ft)	Samples: Bulk	Samples: SPT Sample	Samples: Mod Cal Sample	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
41		■		15, 19, 23 (N = 42)			Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, dense, slightly moist, trace fine sized gravel, grayish brown.	9	4.0		
42													
43													
44													
45			■		50, 0/in (N = 65)					9	3.1		
46													
47													
48													
49													
50		■		48, 43, 42 (N = 85)						8	1.9		
51													
52									**B-6 Terminated at 51.5 ft (No Groundwater Encountered, fine contents are estimates)**				
53													
54													
55													
56													
57													
58													
59													

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Boring No.: B-7

Latitude	: 34.094528	Drill Supplier	: OneWay Drilling	Job Number	: 23-1190	Sheet	: 1 OF 2
Longitude	: -119.021048	Driller Company	: OneWay Drilling	Client	: El Monte Union High School District		
Elevation	: Not Surveyed	Logged By	: Albert Buffet	Project	: Arroyo High School - New Performing Arts Center		
Total Depth	: 21.5 ft	Date	: 05/09/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732		

Depth (ft)	Samples: Bulk	Samples: SPT Sample	Samples: Mod Cal Sample	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
0.25							Non-Soil	PAV	Grass over topsoil 3 inches of topsoil				
1							Fill	SM	SILTY SAND (SM) : fine to medium grained, medium dense, trace non-plastic clay, trace fine to medium sized gravel, moist, dark yellowish brown.				
2													
3													
4													
4.5							Alluvium	SM	SILTY SAND (SM) : fine to medium grained, loose, moist to slightly moist, light yellowish brown.				
5					5, 5, 6 (N = 7)						8.5	97	
6													
7				3, 3, 5 (N = 8)			Alluvium	SC	SANDY LEAN CLAY (SC) : soft, fine grained sand, low plasticity, moist, brown mottled with dark yellowish brown, (pockets of sand with silt and sandy silt).		21.3		
8													
9													
10					4, 5, 7 (N = 7)					83	22.8	91	Consolidation
11													
12													
12.5							Alluvium	SM	SILTY SAND (SM) : fine to medium grained, loose to medium dense, moist, dark yellowish brown.				
13													
14													
15				4, 5, 6 (N = 11)							10.1		
16													
17													
18													
19													

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Boring No.: B-7

Latitude	: 34.094528	Drill Supplier	: OneWay Drilling	Job Number	: 23-1190
Longitude	: -119.021048	Driller Company	: OneWay Drilling	Client	: El Monte Union High School District
Elevation	: Not Surveyed	Logged By	: Albert Buffet	Project	: Arroyo High School - New Performing Arts Center
Total Depth	: 21.5 ft	Date	: 05/09/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732

Sheet : 2 OF 2

Depth (ft)	Samples: Bulk	Samples: SPT Sample	Samples: Mod Cal Sample	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
20													
21			■		12, 18, 40 (N = 37)		Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, medium dense, moist to slightly moist, brown mottled with dark yellowish brown, (pockets of silty sand).		4.2	112	
22									**B-7 Terminated at 21.5 ft (No Groundwater Encountered, fine contents are estimates)**				
23													
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													

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Boring No.: B-8

Latitude	: 34.094169	Drill Supplier	: OneWay Drilling	Job Number	: 23-1190	Sheet	: 1 OF 2
Longitude	: -118.021209	Driller Company	: OneWay Drilling	Client	: El Monte Union High School District		
Elevation	: Not Surveyed	Logged By	: Albert Buffet	Project	: Arroyo High School - New Performing Arts Center		
Total Depth	: 26.5 ft	Date	: 05/09/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732		

Depth (ft)	Samples: Bulk	Samples: SPT Sample	Samples: Mod Cal Sample	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
0.5							Non-Soil	ASP	Asphalt 3 inches over 3 inches of Aggregate Base				
1							Fill	SM	SILTY SAND (SM) : fine grained, medium dense, trace non-plastic clay, trace fine to medium sized gravel, moist, dark yellowish brown.				
2													
2.5					12, 10, 11 (N = 13)		Alluvium	SM	SILTY SAND (SM) : fine to medium grained, medium dense, moist, dark yellowish brown.		9.6	119	
3													
4													
5				4, 5, 6 (N = 11)									
6											8.0		
7					5, 7, 11 (N = 11)								
8											10.9	92	
9													
9							Alluvium	SC	CLAYEY SAND (SC) : fine grained, medium dense, moist, dark yellowish brown, (thin layers of sandy silt).				
10				5, 6, 7 (N = 13)						49	10.1		
11													
12													
13													
13							Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, medium dense, slightly moist, light yellowish brown.				
14													
15					8, 13, 16 (N = 18)								
16											1.6	121	
17													
18													
19													

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Boring No.: B-8

Latitude	: 34.094169	Drill Supplier	: OneWay Drilling	Job Number	: 23-1190
Longitude	: -118.021209	Driller Company	: OneWay Drilling	Client	: El Monte Union High School District
Elevation	: Not Surveyed	Logged By	: Albert Buffet	Project	: Arroyo High School - New Performing Arts Center
Total Depth	: 26.5 ft	Date	: 05/09/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732

Sheet : 2 OF 2

Depth (ft)	Samples: Bulk	Samples: SPT Sample	Samples: Mod Cal Sample	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
21		■		9, 14, 18 (N = 32)			Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, medium dense, slightly moist, light yellowish brown.	5	1.6		
22													
23													
24													
25													
25			■		14, 17, 40 (N = 37)		Alluvium	SM	SILTY SAND (SM) : fine to medium grained, medium dense, slightly moist, light yellowish brown, (thin layers of sandy clay).		8.4	99	
26													
27									**B-8 Terminated at 26.5 ft (No Groundwater Encountered, fine contents are estimates)**				
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													

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Boring No.: B-9

Latitude	: 34.094604	Drill Supplier	: OneWay Drilling	Job Number	: 23-1190	Sheet	: 1 OF 2
Longitude	: -118.022195	Driller Company	: OneWay Drilling	Client	: El Monte Union High School District		
Elevation	: Not Surveyed	Logged By	: Albert Buffet	Project	: Arroyo High School - New Performing Arts Center		
Total Depth	: 21.5 ft	Date	: 05/09/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732		

Depth (ft)	Samples: Bulk	Samples: SPT Sample	Samples: Mod Cal Sample	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
0.5							Non-Soil	ASP	Asphalt 3 inches over 3 inches of Aggregate Base				
1							Fill	SM	SILTY SAND (SM) : fine to medium grained, medium dense, trace non-plastic clay, trace fine to medium sized gravel, moist, brown.				
2.5				3, 4, 5 (N = 9)									
3							Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, medium dense, moist, trace fine sized gravel, light yellowish brown.	9	10.7		
5					5, 6, 8 (N = 9)		Alluvium	SM	SILTY SAND (SM) : fine to medium grained, loose, moist, light yellowish brown, (pockets of sandy clay).	35	14.6	104	
7				3, 4, 8 (N = 12)			Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, medium dense, moist to slightly moist, light yellowish brown.	5	4.0		
10					7, 9, 11 (N = 13)					5	2.0	106	
12							Alluvium	SC	CLAYEY SAND (SC) : fine grained, medium dense, moist, brown dark yellowish brown, (thin layers of sand with silt).				
15				7, 11, 15 (N = 26)						41	20.9		
17							Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, dense to very dense, moist, light yellowish brown.				

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Boring No.: B-9

Latitude	: 34.094604	Drill Supplier	: OneWay Drilling	Job Number	: 23-1190
Longitude	: -118.022195	Driller Company	: OneWay Drilling	Client	: El Monte Union High School District
Elevation	: Not Surveyed	Logged By	: Albert Buffet	Project	: Arroyo High School - New Performing Arts Center
Total Depth	: 21.5 ft	Date	: 05/09/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732

Sheet : 2 OF 2

Depth (ft)	Samples: Bulk	Samples: SPT Sample	Samples: Mod Cal Sample	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
21			■		12, 22, 40 (N = 40)		Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, dense to very dense, moist, light yellowish brown.	6	6.0	106	
22									**B-9 Terminated at 21.5 ft (No Groundwater Encountered, fine contents are estimates)**				
23													
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													

Koury Engineering
14280 Euclid Avenue, Chino, California, 91710
Phone: 909 606 6111

Boring No.: B-10

Latitude	: 34.094692	Drill Supplier	: OneWay Drilling	Job Number	: 23-1190	Sheet	: 1 OF 2
Longitude	: -118.021616	Driller Company	: OneWay Drilling	Client	: El Monte Union High School District		
Elevation	: Not Surveyed	Logged By	: Albert Buffet	Project	: Arroyo High School - New Performing Arts Center		
Total Depth	: 26.5 ft	Date	: 05/09/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732		

Depth (ft)	Samples: Bulk	Samples: SPT Sample	Samples: Mod Cal Sample	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
0.5							Non-Soil	ASP	Asphalt 3 inches over 3 inches of Aggregate Base				
1							Fill	CL	SANDY LEAN CLAY (CL) : medium stiff, fine grained sand, trace fine to medium sized gravel, moist, brown, (pockets of clayey sand and sandy silt).				
1.5							Alluvium	CL	SANDY LEAN CLAY (CL) : stiff, fine grained sand, low plasticity, moist, brown mottled with dark yellowish brown, (thin layers of sandy silt).				
2					4, 4, 5 (N = 5)					67	18.3	96	
3													
4													
5				2, 3, 3 (N = 6)						71	20.5		
6													
7					6, 7, 14 (N = 13)		Alluvium	SC	CLAYEY SAND (SC) : fine grained, medium dense, moist, trace fine sized gravel, brown mottled with dark yellowish brown, (thin layers of sandy clay).	45	13.0	109	
8													
9													
10				4, 5, 6 (N = 11)			Alluvium	SM	SILTY SAND (SM) : fine to medium grained, medium dense, moist, dark yellowish brown.	26	7.7		
11													
12													
13													
14							Alluvium	SM	SILTY SAND (SM) : fine to medium grained, medium dense, moist, trace fine sized gravel, brown and dark yellowish brown, (pockets of very moist soil).				
15					4, 9, 20 (N = 18)					28	14.6	112	
16													
17													
18							Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to medium grained, medium dense, moist, trace fine sized gravel, light yellowish brown, (layers of sand with gravel).				
19													

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Boring No.: B-10

Latitude	: 34.094692	Drill Supplier	: OneWay Drilling	Job Number	: 23-1190
Longitude	: -118.021616	Driller Company	: OneWay Drilling	Client	: El Monte Union High School District
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Total Depth	: 26.5 ft	Date	: 05/09/2023	Location	: 4921 Cedar Avenue, El Monte CA 91732

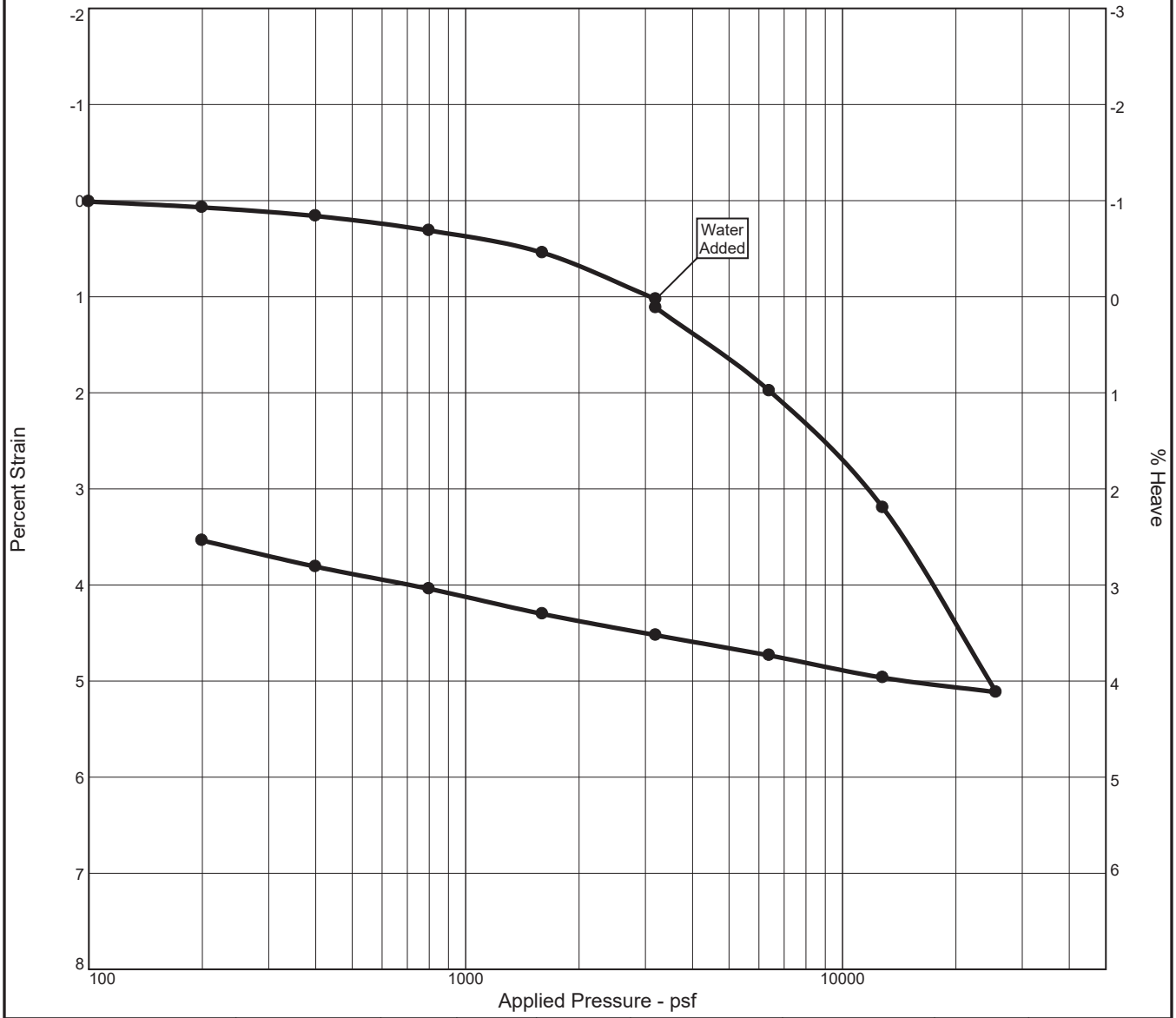
Sheet : 2 OF 2

Depth (ft)	Samples: Bulk	Samples: SPT Sample	Samples: Mod Cal Sample	Blows per 6" (SPT)	Blows per 6" (ModCal)	Graphic Log	Soil Origin	Classification Code	Material Description	Testing: % Fines	Testing: Moisture %	Testing: Dry Density (pcf)	Testing: Other
20													
21				14, 19, 21 (N = 40)			Alluvium	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) : fine to coarse grained, medium dense to dense, moist, light yellowish brown, (layers of sand with gravel).	9	3.0		Gravel 18%
22													
23													
24													
25					19, 32, 39 (N = 46)								
26										6	1.0	120	Gravel 35%
27									**B-10 Terminated at 26.5 ft (No Groundwater Encountered, Fine and Gravel Contents are Estimates)**				
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													

APPENDIX C

Laboratory Test Results and Calculations

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	Initial Void Ratio
Saturation	Moisture								
78.8 %	18.5 %	103.2			2.7	0	11737	0.11	0.633

MATERIAL DESCRIPTION	USCS	AASHTO
Observed as: Silty Sand, yellowish brown	SM	

Project No. 23-1190 **Client:**

Project: Arroyo High School - New Construction & Performing Arts

Location: B1 @ 8 **Sample Number:** 1

Remarks:
Lab #8968

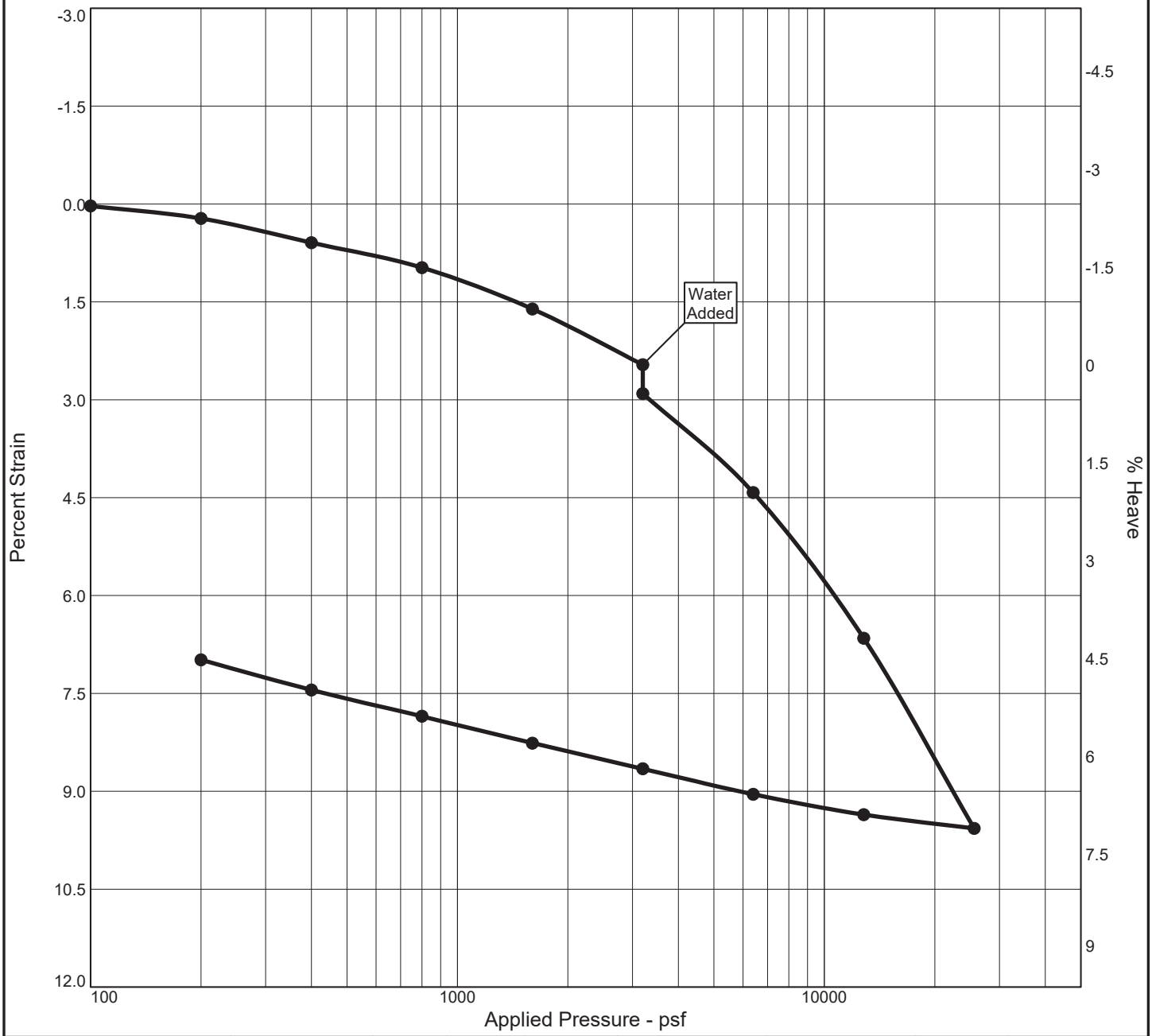
Koury Engineering & Testing, Inc.

Chino, CA

Figure

Tested By: Jacques Roy **Checked By:** _____

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	Initial Void Ratio
Saturation	Moisture								
78.0 %	19.4 %	100.8			2.7		8295	0.16	0.672

MATERIAL DESCRIPTION	USCS	AASHTO
Sandy Clay, Dark Brown	CL	

Project No. 23-1190 **Client:**

Project: Arroyo High School - New Construction & Performing Arts

Location: B-3 @ 6' **Sample Number:** 3

Remarks:
Lab #8969

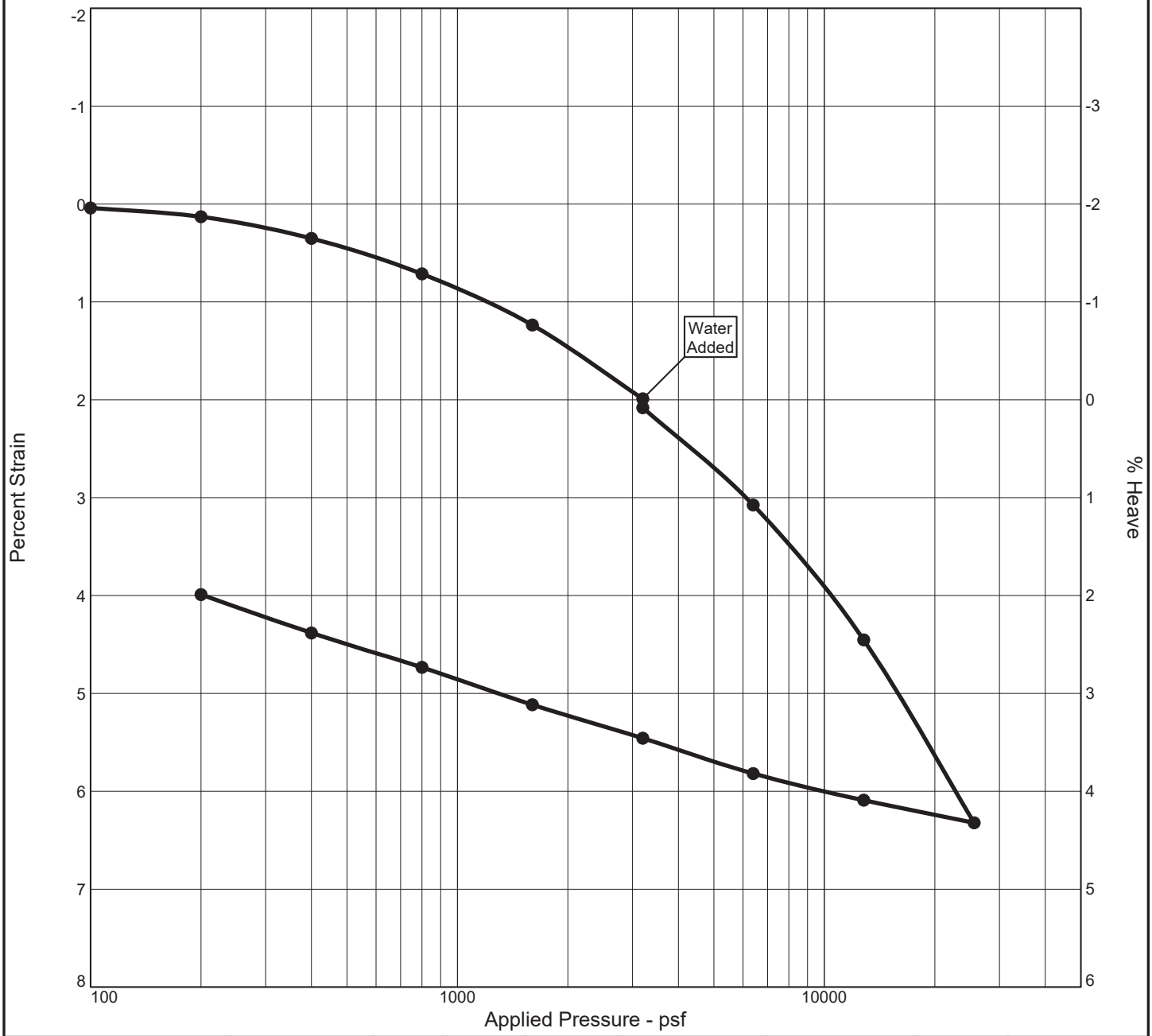
Koury Engineering & Testing, Inc.

Chino, CA

Figure

Tested By: Jacques Roy **Checked By:** _____

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	Initial Void Ratio
Saturation	Moisture								
73.0 %	22.8 %	91.4			2.7		9192	0.12	0.844

MATERIAL DESCRIPTION	USCS	AASHTO
observed as Sandy Lean Clay, Yellowish Brown	CL	

Project No. 23-1190 **Client:**

Project: Arroyo High School - New Construction & Performing Arts

Location: B-7 @ 11' **Sample Number:** 3

Remarks:
Lab #8970

Koury Engineering & Testing, Inc.

Chino, CA

Figure

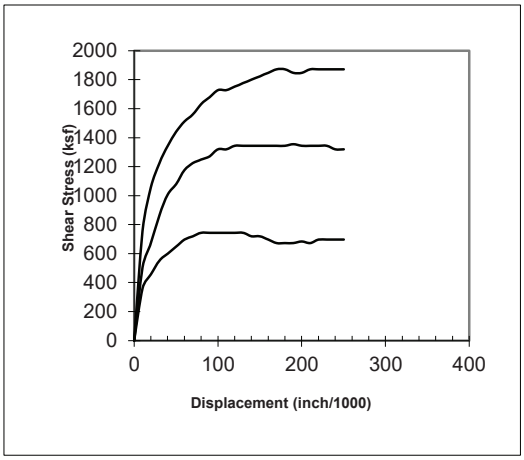
Tested By: Jacques Roy **Checked By:** _____

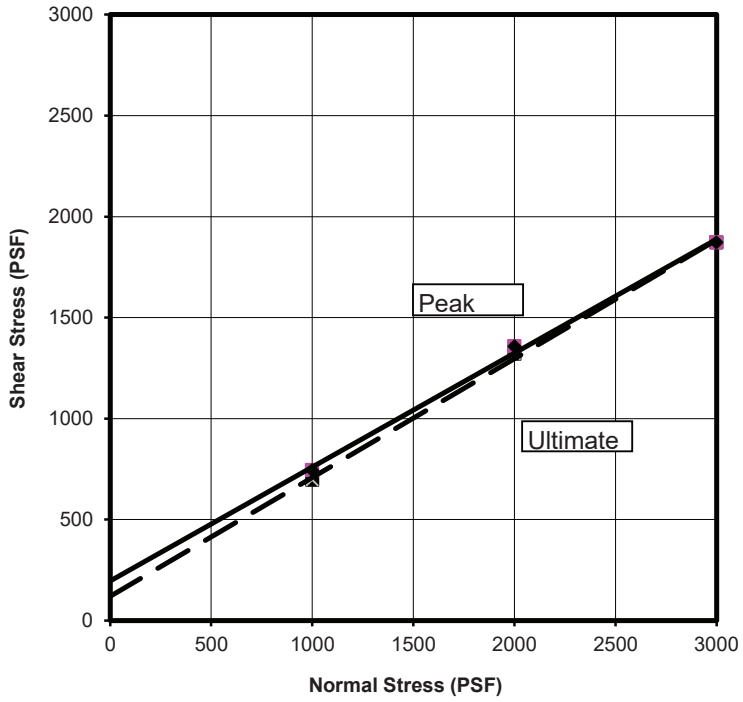
Direct Shear Test Report

Sample Identification	Sample Description	Sample Test State
B-4, 3.0'	Sandy Clay,gry/brn	Soaked-Consolidated

Peak:	**Phi (Degrees)**	**29.4**	Average Dry Density = 88 pcf
	Cohesion (PSF)	**184.0**	Average Moisture Content = 24.4%
Ultimate:	**Phi (Degrees)**	**30.5**	
	Cohesion (PSF)	**120.0**	

☑ **Relatively Undisturbed**
☐ **Remolded**





	Project Name:	Project No.:	Lab #
KOURY	ARROYO HS	23-1190	

Percolation Testing

Job Name: Aquatic Center - El Rancho High School

Job No.: 22-0357

Test Location: Approx 125' W of cl of Cedar Ave & 400 N of Kings Row (34.093532 -118.020992)

Water Table Depth (ft): > 50 **Relatively Impervious Layer Depth (ft):** 0-15

Test Date: 5/12/2023

Test No.: P-1

Depth of Boring (d_b): 180 in

Diameter of Boring (D): 8.5 in

Test Performer: ABB

Trial No.	Initial Time T_1 (min)	Final Time T_2 (min)	Time Interval $\Delta T = T_2 - T_1$ (min)	Initial Depth to Water d_1 (in)	Final Depth to Water d_2 (in)	Initial Height of Water Column $d_{H1} = d_b - d_1$ (in)	Final Height of Water Column $d_{H2} = d_b - d_2$ (in)	Average Height of Water Column $d_{avg} = (d_{H1}+d_{H2})/2$ (in)	Drop in Height $\Delta d_H = d_{H1} - d_{H2}$ (in)	Boring Wet Surface Area (ft^2)	Volume of Water Drop (ft^3)	Calculated Flow Rate (ft^3/min)	Calculated Flow Rate (ft^3/hr)	Infiltration Rate (in/hr)
1	0.0	30.0	30.0	120	163 4/8	60	16 4/8	38 2/8	43 4/8	7.49	1.43	0.05	2.86	4.58
2	0.0	30.0	30.0	120	154 2/8	60	25 6/8	42 7/8	34 2/8	8.35	1.12	0.04	2.25	3.23
3	0.0	30.0	30.0	120	148 2/8	60	31 6/8	45 7/8	28 2/8	8.91	0.93	0.03	1.85	2.50
4	0.0	30.0	30.0	120	144 5/8	60	35 3/8	47 6/8	24 5/8	9.24	0.81	0.03	1.62	2.10
5	0.0	30.0	30.0	120	144	60	36	48	24	9.30	0.79	0.03	1.58	2.03
6	0.0	30.0	30.0	120	143 3/8	60	36 5/8	48 2/8	23 3/8	9.35	0.77	0.03	1.54	1.97
7	0.0	30.0	30.0	120	142 6/8	60	37 2/8	48 5/8	22 6/8	9.41	0.75	0.02	1.50	1.91
8	0.0	30.0	30.0	120	142 6/8	60	37 2/8	48 5/8	22 6/8	9.41	0.75	0.02	1.50	1.91
9	0.0	30.0	30.0	120	142 2/8	60	37 6/8	48 7/8	22 2/8	9.46	0.73	0.02	1.46	1.85
10	0.0	30.0	30.0	120	141 5/8	60	38 3/8	49 2/8	21 5/8	9.52	0.71	0.02	1.42	1.79
11	0.0	30.0	30.0	120	141	60	39	49 4/8	21	9.57	0.69	0.02	1.38	1.73
12														
13														
14														
15														
16														
17														
18														

Notes:

During Testing:	
Average Infiltration Rate (in/hr)=	2.33
Median Infiltration Rate (in/hr)=	1.97
Lowest Infiltration Rate (in/hr)=	1.73
Average Water Depth (ft) =	3.91
Median Water Depth (ft) =	4.03
Total Time of Test Conducted (hr) =	5.50

$RF = RF_t + RF_v + RF_s = 5$ Min 3, Max 9

$RF_t = 2$ Range 1 to 3

$RF_v = 2$ Range 1 to 3

$RF_s = 1$ Range 1 to 3

Average of Last 3 Readings =

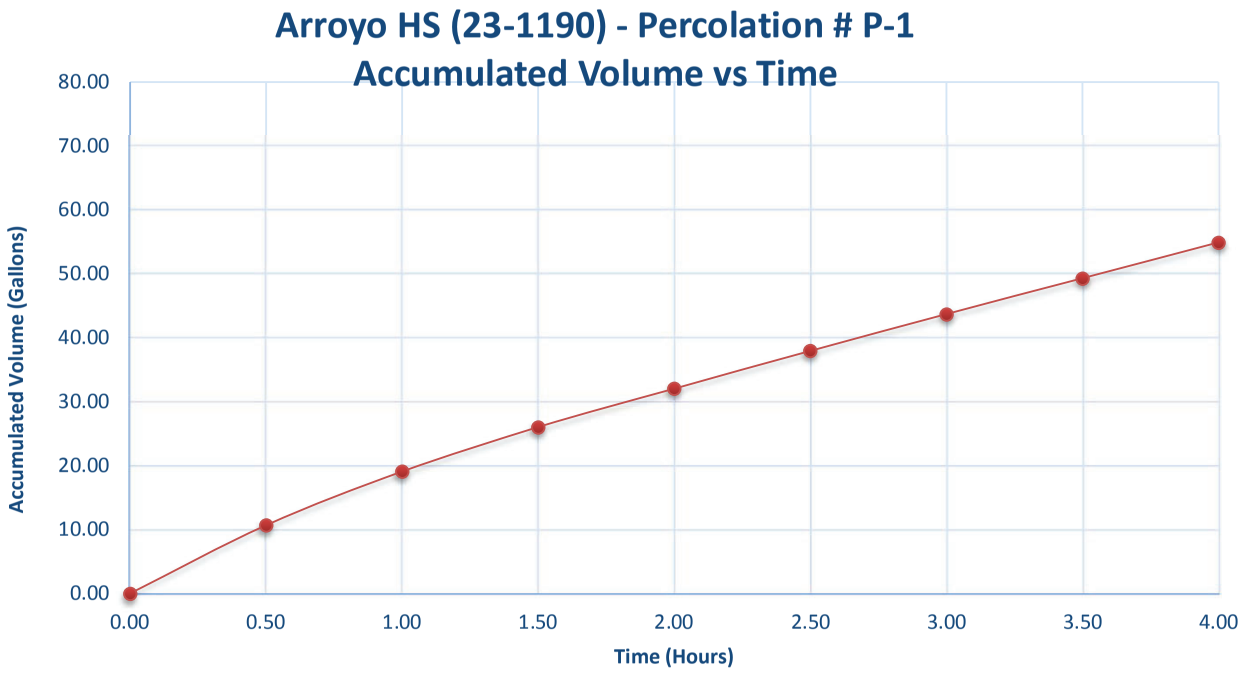
Short Term Infiltration/RF =

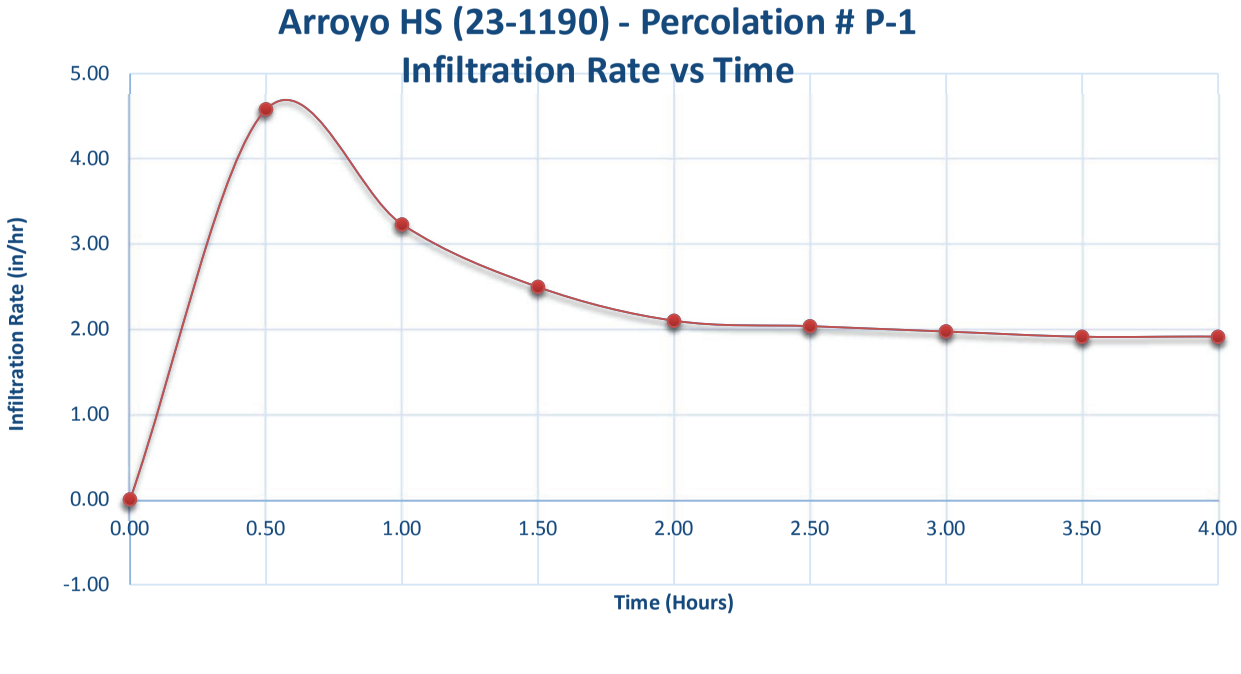
Short Term Infiltration Rate (in/hr) = 1.76

Long Term Infiltration Rate (in/hr) = 0.35

Reduction Factor (RF): For Boring Percolation Testing Method (RF_t), Site Variability, Number of Tests & Borings (RF_v), and Long Term Maintenance (RF_s)

Reference: Administrative Manual - Los Angeles County Public Works, Geotechnical & Materials Engineering Division, GS200.1 dated 06/30/21


Arroyo HS (23-1190) - Percolation # P-1
Accumulated Volume vs Time
Accumulated Volume (Gallons)
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
Time (Hours)

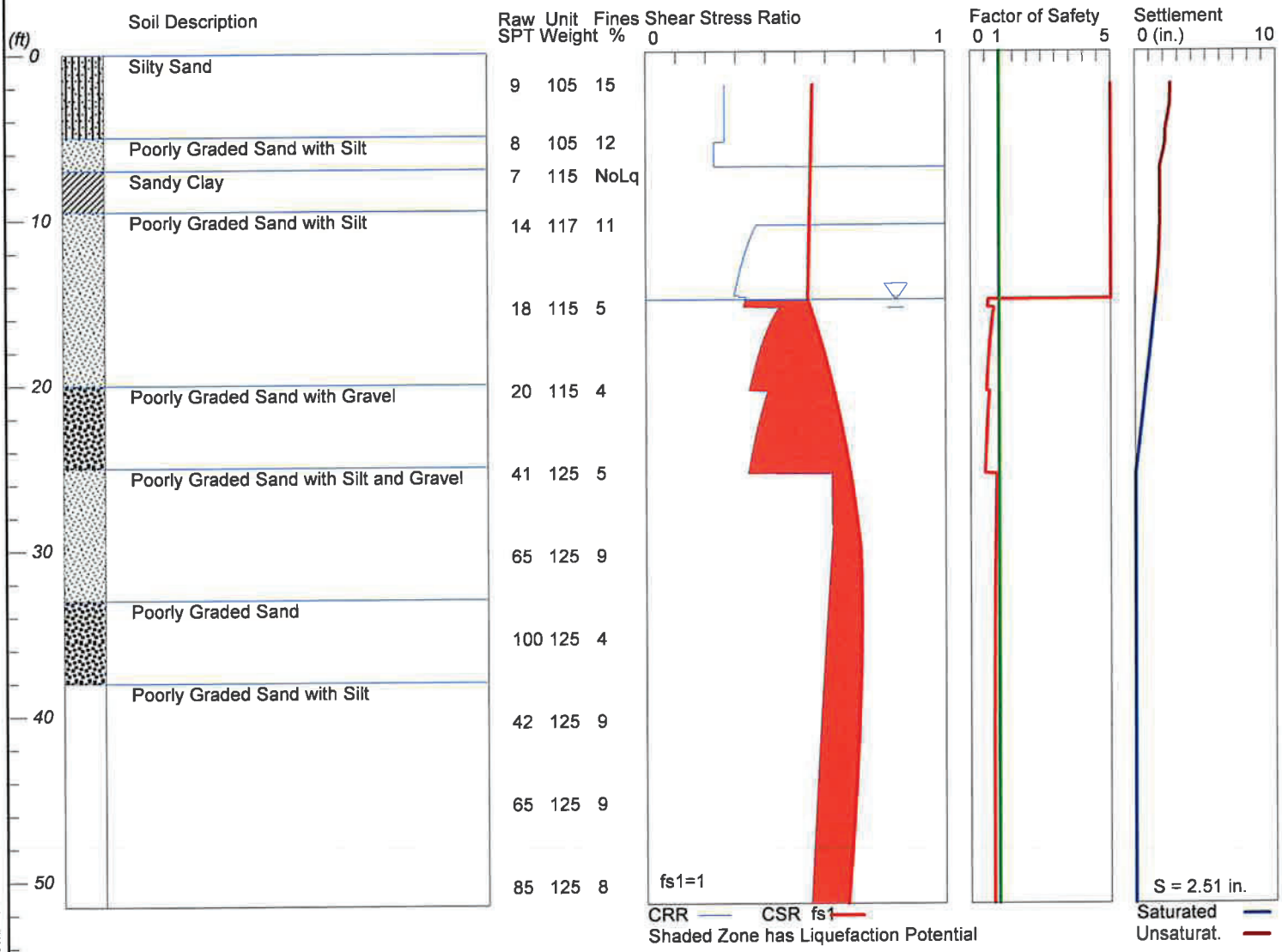

Arroyo HS (23-1190) - Percolation # P-1
Infiltration Rate vs Time
Infiltration Rate (in/hr)
5.00
4.00
3.00
2.00
1.00
0.00
-1.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
Time (Hours)

LIQUEFACTION SETTLEMENT

Arroyo High School

Hole No.=B-6 Water Depth=15 ft

Magnitude=6.9
Acceleration=0.86g



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****

LIQUEFACTION ANALYSIS SUMMARY
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Input File Name: P:\2023\23-1190 Arroyo High School - New Construction Admin & Performing Arts SI\Soils Folder\Calculations\Seismic Settlement\B-6.liq
Title: Arroyo High School
Subtitle: 23-1190

Surface Elev.=
Hole No.=B-6
Depth of Hole= 51.50 ft
Water Table during Earthquake= 15.00 ft
Water Table during In-Situ Testing= 55.00 ft
Max. Acceleration= 0.86 g
Earthquake Magnitude= 6.90

Input Data:
Surface Elev.=
Hole No.=B-6
Depth of Hole=51.50 ft
Water Table during Earthquake= 15.00 ft
Water Table during In-Situ Testing= 55.00 ft
Max. Acceleration=0.86 g
Earthquake Magnitude=6.90
No-Liquefiable Soils: CL, OL are Non-Liq. Soil

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Tokimatsu/Seed
3. Fines Correction for Liquefaction: Modify Stark/Olson
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 1.25
7. Borehole Diameter, Cb= 1.0
8. Sampling Method, Cs= 1.2
9. User request factor of safety (apply to CSR) , User= 1
   Plot one CSR curve (fs1=1)
10. Use Curve Smoothing: No
* Recommended Options

In-Situ Test Data:

Depth ft	SPT	gamma pcf	Fines %
2.00	9.00	105.00	15.00
5.50	8.00	105.00	12.00
7.50	7.00	115.00	NoLiq
10.50	14.00	117.00	11.00
15.50	18.00	115.00	5.00
20.50	20.00	115.00	4.00
25.50	41.00	125.00	5.00
30.50	65.00	125.00	9.00
35.50	100.00	125.00	4.00
40.50	42.00	125.00	9.00
45.50	65.00	125.00	9.00
50.50	85.00	125.00	8.00

Output Results:
Settlement of Saturated Sands=1.42 in.
Settlement of Unsaturated Sands=1.08 in.
Total Settlement of Saturated and Unsaturated Sands=2.51 in.
Differential Settlement=1.254 to 1.655 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.
2.00	0.26	0.56	5.00	1.42	1.08	2.51
2.05	0.26	0.56	5.00	1.42	1.08	2.51
2.10	0.26	0.56	5.00	1.42	1.08	2.51
2.15	0.26	0.56	5.00	1.42	1.08	2.51
2.20	0.26	0.56	5.00	1.42	1.08	2.51
2.25	0.26	0.56	5.00	1.42	1.08	2.51

Liquefy.sum

2.30	0.26	0.56	5.00	1.42	1.08	2.50
2.35	0.26	0.56	5.00	1.42	1.08	2.50
2.40	0.26	0.56	5.00	1.42	1.08	2.50
2.45	0.26	0.56	5.00	1.42	1.08	2.50
2.50	0.26	0.56	5.00	1.42	1.08	2.50
2.55	0.26	0.56	5.00	1.42	1.08	2.50
2.60	0.26	0.56	5.00	1.42	1.08	2.50
2.65	0.26	0.56	5.00	1.42	1.07	2.50
2.70	0.26	0.56	5.00	1.42	1.07	2.50
2.75	0.26	0.56	5.00	1.42	1.07	2.50
2.80	0.26	0.56	5.00	1.42	1.07	2.49
2.85	0.26	0.56	5.00	1.42	1.07	2.49
2.90	0.26	0.56	5.00	1.42	1.07	2.49
2.95	0.26	0.56	5.00	1.42	1.06	2.49
3.00	0.26	0.56	5.00	1.42	1.06	2.49
3.05	0.26	0.56	5.00	1.42	1.06	2.48
3.10	0.26	0.55	5.00	1.42	1.06	2.48
3.15	0.26	0.55	5.00	1.42	1.05	2.48
3.20	0.26	0.55	5.00	1.42	1.05	2.47
3.25	0.26	0.55	5.00	1.42	1.04	2.47
3.30	0.26	0.55	5.00	1.42	1.04	2.46
3.35	0.26	0.55	5.00	1.42	1.03	2.46
3.40	0.26	0.55	5.00	1.42	1.02	2.45
3.45	0.26	0.55	5.00	1.42	1.02	2.44
3.50	0.26	0.55	5.00	1.42	1.01	2.43
3.55	0.26	0.55	5.00	1.42	0.99	2.42
3.60	0.26	0.55	5.00	1.42	0.98	2.41
3.65	0.26	0.55	5.00	1.42	0.97	2.40
3.70	0.26	0.55	5.00	1.42	0.96	2.39
3.75	0.26	0.55	5.00	1.42	0.95	2.38
3.80	0.26	0.55	5.00	1.42	0.94	2.36
3.85	0.26	0.55	5.00	1.42	0.93	2.35
3.90	0.26	0.55	5.00	1.42	0.92	2.34
3.95	0.26	0.55	5.00	1.42	0.91	2.33
4.00	0.26	0.55	5.00	1.42	0.90	2.32
4.05	0.26	0.55	5.00	1.42	0.89	2.31
4.10	0.26	0.55	5.00	1.42	0.87	2.30
4.15	0.26	0.55	5.00	1.42	0.86	2.29
4.20	0.26	0.55	5.00	1.42	0.85	2.28
4.25	0.26	0.55	5.00	1.42	0.84	2.27
4.30	0.26	0.55	5.00	1.42	0.83	2.26
4.35	0.26	0.55	5.00	1.42	0.82	2.24
4.40	0.26	0.55	5.00	1.42	0.81	2.23
4.45	0.26	0.55	5.00	1.42	0.80	2.22
4.50	0.26	0.55	5.00	1.42	0.79	2.21
4.55	0.26	0.55	5.00	1.42	0.78	2.20
4.60	0.26	0.55	5.00	1.42	0.77	2.19
4.65	0.26	0.55	5.00	1.42	0.75	2.18
4.70	0.26	0.55	5.00	1.42	0.74	2.17
4.75	0.26	0.55	5.00	1.42	0.74	2.17
4.80	0.26	0.55	5.00	1.42	0.74	2.16
4.85	0.26	0.55	5.00	1.42	0.74	2.16
4.90	0.26	0.55	5.00	1.42	0.74	2.16
4.95	0.26	0.55	5.00	1.42	0.74	2.16
5.00	0.26	0.55	5.00	1.42	0.73	2.16
5.05	0.26	0.55	5.00	1.42	0.73	2.16
5.10	0.26	0.55	5.00	1.42	0.73	2.15
5.15	0.26	0.55	5.00	1.42	0.73	2.15
5.20	0.26	0.55	5.00	1.42	0.72	2.15
5.25	0.26	0.55	5.00	1.42	0.72	2.15
5.30	0.26	0.55	5.00	1.42	0.72	2.14
5.35	0.26	0.55	5.00	1.42	0.72	2.14
5.40	0.26	0.55	5.00	1.42	0.71	2.14
5.45	0.26	0.55	5.00	1.42	0.71	2.14
5.50	0.23	0.55	5.00	1.42	0.71	2.13
5.55	0.23	0.55	5.00	1.42	0.70	2.12
5.60	0.23	0.55	5.00	1.42	0.69	2.12
5.65	0.23	0.55	5.00	1.42	0.68	2.11
5.70	0.23	0.55	5.00	1.42	0.67	2.10
5.75	0.23	0.55	5.00	1.42	0.66	2.09
5.80	0.23	0.55	5.00	1.42	0.65	2.08
5.85	0.23	0.55	5.00	1.42	0.64	2.07
5.90	0.23	0.55	5.00	1.42	0.63	2.05
5.95	0.23	0.55	5.00	1.42	0.62	2.04
6.00	0.23	0.55	5.00	1.42	0.60	2.03
6.05	0.23	0.55	5.00	1.42	0.59	2.01
6.10	0.23	0.55	5.00	1.42	0.58	2.00
6.15	0.23	0.55	5.00	1.42	0.56	1.99
6.20	0.23	0.55	5.00	1.42	0.55	1.97

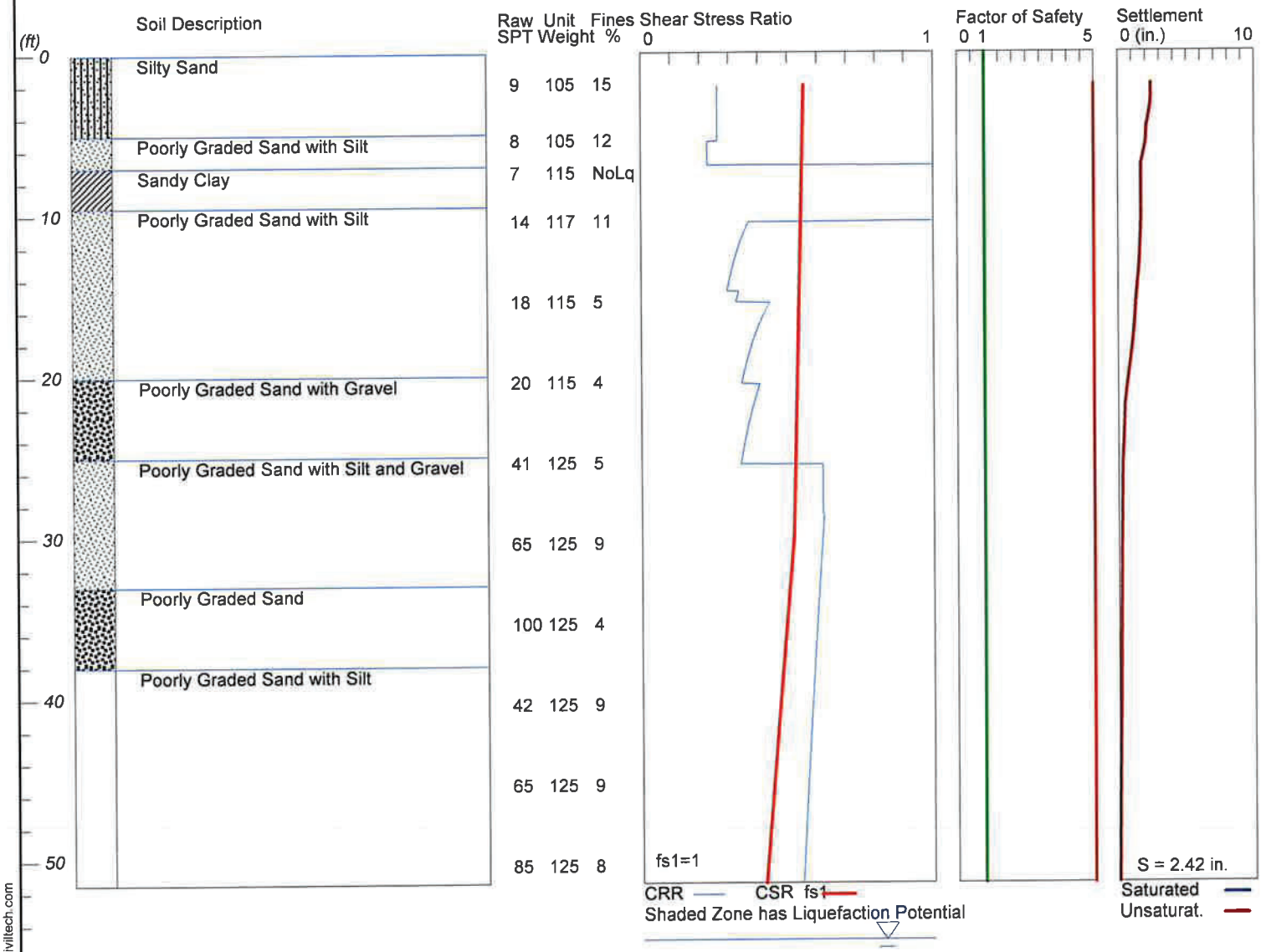
					Liquefy.sum	
6.25	0.23	0.55	5.00	1.42	0.54	1.96
6.30	0.23	0.55	5.00	1.42	0.52	1.95
6.35	0.23	0.55	5.00	1.42	0.51	1.94
6.40	0.23	0.55	5.00	1.42	0.50	1.92
6.45	0.23	0.55	5.00	1.42	0.48	1.91
6.50	0.23	0.55	5.00	1.42	0.47	1.90
6.55	0.23	0.55	5.00	1.42	0.46	1.88
6.60	0.23	0.55	5.00	1.42	0.44	1.87
6.65	0.23	0.55	5.00	1.42	0.43	1.86
6.70	0.23	0.55	5.00	1.42	0.42	1.84
6.75	0.23	0.55	5.00	1.42	0.41	1.83
6.80	0.23	0.55	5.00	1.42	0.39	1.82
6.85	0.23	0.55	5.00	1.42	0.38	1.80
6.90	0.23	0.55	5.00	1.42	0.37	1.79
6.95	0.23	0.55	5.00	1.42	0.35	1.78
7.00	2.00	0.55	5.00	1.42	0.34	1.76
7.05	2.00	0.55	5.00	1.42	0.34	1.76
7.10	2.00	0.55	5.00	1.42	0.34	1.76
7.15	2.00	0.55	5.00	1.42	0.34	1.76
7.20	2.00	0.55	5.00	1.42	0.34	1.76
7.25	2.00	0.55	5.00	1.42	0.34	1.76
7.30	2.00	0.55	5.00	1.42	0.34	1.76
7.35	2.00	0.55	5.00	1.42	0.34	1.76
7.40	2.00	0.55	5.00	1.42	0.34	1.76
7.45	2.00	0.55	5.00	1.42	0.34	1.76
7.50	2.00	0.55	5.00	1.42	0.34	1.76
7.55	2.00	0.55	5.00	1.42	0.34	1.76
7.60	2.00	0.55	5.00	1.42	0.34	1.76
7.65	2.00	0.55	5.00	1.42	0.34	1.76
7.70	2.00	0.55	5.00	1.42	0.34	1.76
7.75	2.00	0.55	5.00	1.42	0.34	1.76
7.80	2.00	0.55	5.00	1.42	0.34	1.76
7.85	2.00	0.55	5.00	1.42	0.34	1.76
7.90	2.00	0.55	5.00	1.42	0.34	1.76
7.95	2.00	0.55	5.00	1.42	0.34	1.76
8.00	2.00	0.55	5.00	1.42	0.34	1.76
8.05	2.00	0.55	5.00	1.42	0.34	1.76
8.10	2.00	0.55	5.00	1.42	0.34	1.76
8.15	2.00	0.55	5.00	1.42	0.34	1.76
8.20	2.00	0.55	5.00	1.42	0.34	1.76
8.25	2.00	0.55	5.00	1.42	0.34	1.76
8.30	2.00	0.55	5.00	1.42	0.34	1.76
8.35	2.00	0.55	5.00	1.42	0.34	1.76
8.40	2.00	0.55	5.00	1.42	0.34	1.76
8.45	2.00	0.55	5.00	1.42	0.34	1.76
8.50	2.00	0.55	5.00	1.42	0.34	1.76
8.55	2.00	0.55	5.00	1.42	0.34	1.76
8.60	2.00	0.55	5.00	1.42	0.34	1.76
8.65	2.00	0.55	5.00	1.42	0.34	1.76
8.70	2.00	0.55	5.00	1.42	0.34	1.76
8.75	2.00	0.55	5.00	1.42	0.34	1.76
8.80	2.00	0.55	5.00	1.42	0.34	1.76
8.85	2.00	0.55	5.00	1.42	0.34	1.76
8.90	2.00	0.55	5.00	1.42	0.34	1.76
8.95	2.00	0.55	5.00	1.42	0.34	1.76
9.00	2.00	0.55	5.00	1.42	0.34	1.76
9.05	2.00	0.55	5.00	1.42	0.34	1.76
9.10	2.00	0.55	5.00	1.42	0.34	1.76
9.15	2.00	0.55	5.00	1.42	0.34	1.76
9.20	2.00	0.55	5.00	1.42	0.34	1.76
9.25	2.00	0.55	5.00	1.42	0.34	1.76
9.30	2.00	0.55	5.00	1.42	0.34	1.76
9.35	2.00	0.55	5.00	1.42	0.34	1.76
9.40	2.00	0.55	5.00	1.42	0.34	1.76
9.45	2.00	0.55	5.00	1.42	0.34	1.76
9.50	2.00	0.55	5.00	1.42	0.34	1.76
9.55	2.00	0.55	5.00	1.42	0.34	1.76
9.60	2.00	0.55	5.00	1.42	0.34	1.76
9.65	2.00	0.55	5.00	1.42	0.34	1.76
9.70	2.00	0.55	5.00	1.42	0.34	1.76
9.75	2.00	0.55	5.00	1.42	0.34	1.76
9.80	2.00	0.55	5.00	1.42	0.34	1.76
9.85	2.00	0.55	5.00	1.42	0.34	1.76
9.90	2.00	0.55	5.00	1.42	0.34	1.76
9.95	2.00	0.55	5.00	1.42	0.34	1.76
10.00	2.00	0.55	5.00	1.42	0.34	1.76
10.05	2.00	0.55	5.00	1.42	0.34	1.76
10.10	2.00	0.55	5.00	1.42	0.34	1.76
10.15	2.00	0.55	5.00	1.42	0.34	1.76

DRY SEISMIC SETTLEMENT

Arroyo High School

Hole No.=B-6 Water Depth=55 ft

Magnitude=6.9
Acceleration=0.86g



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Input File Name: P:\2023\23-1190 Arroyo High School - New Construction Admin & Performing Arts SI\Soils Folder\Calculations\Seismic Settlement\B-6.liq
Title: Arroyo High School
Subtitle: 23-1190

Surface Elev.=
Hole No.=B-6
Depth of Hole= 51.50 ft
Water Table during Earthquake= 55.00 ft
Water Table during In-Situ Testing= 55.00 ft
Max. Acceleration= 0.86 g
Earthquake Magnitude= 6.90

Input Data:
Surface Elev.=
Hole No.=B-6
Depth of Hole=51.50 ft
Water Table during Earthquake= 55.00 ft
Water Table during In-Situ Testing= 55.00 ft
Max. Acceleration=0.86 g
Earthquake Magnitude=6.90
No-Liquefiable Soils: CL, OL are Non-Liq. Soil

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Tokimatsu/Seed
3. Fines Correction for Liquefaction: Modify Stark/Olson
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 1.25
7. Borehole Diameter, Cb= 1.0
8. Sampling Method, Cs= 1.2
9. User request factor of safety (apply to CSR) , User= 1
   Plot one CSR curve (fs1=1)
10. Use Curve Smoothing: No
* Recommended Options

In-Situ Test Data:

Depth ft	SPT	gamma pcf	Fines %
2.00	9.00	105.00	15.00
5.50	8.00	105.00	12.00
7.50	7.00	115.00	NoLiq
10.50	14.00	117.00	11.00
15.50	18.00	115.00	5.00
20.50	20.00	115.00	4.00
25.50	41.00	125.00	5.00
30.50	65.00	125.00	9.00
35.50	100.00	125.00	4.00
40.50	42.00	125.00	9.00
45.50	65.00	125.00	9.00
50.50	85.00	125.00	8.00

Output Results:
Settlement of Saturated Sands=0.00 in.
Settlement of Unsaturated Sands=2.42 in.
Total Settlement of Saturated and Unsaturated Sands=2.42 in.
Differential Settlement=1.210 to 1.598 in.

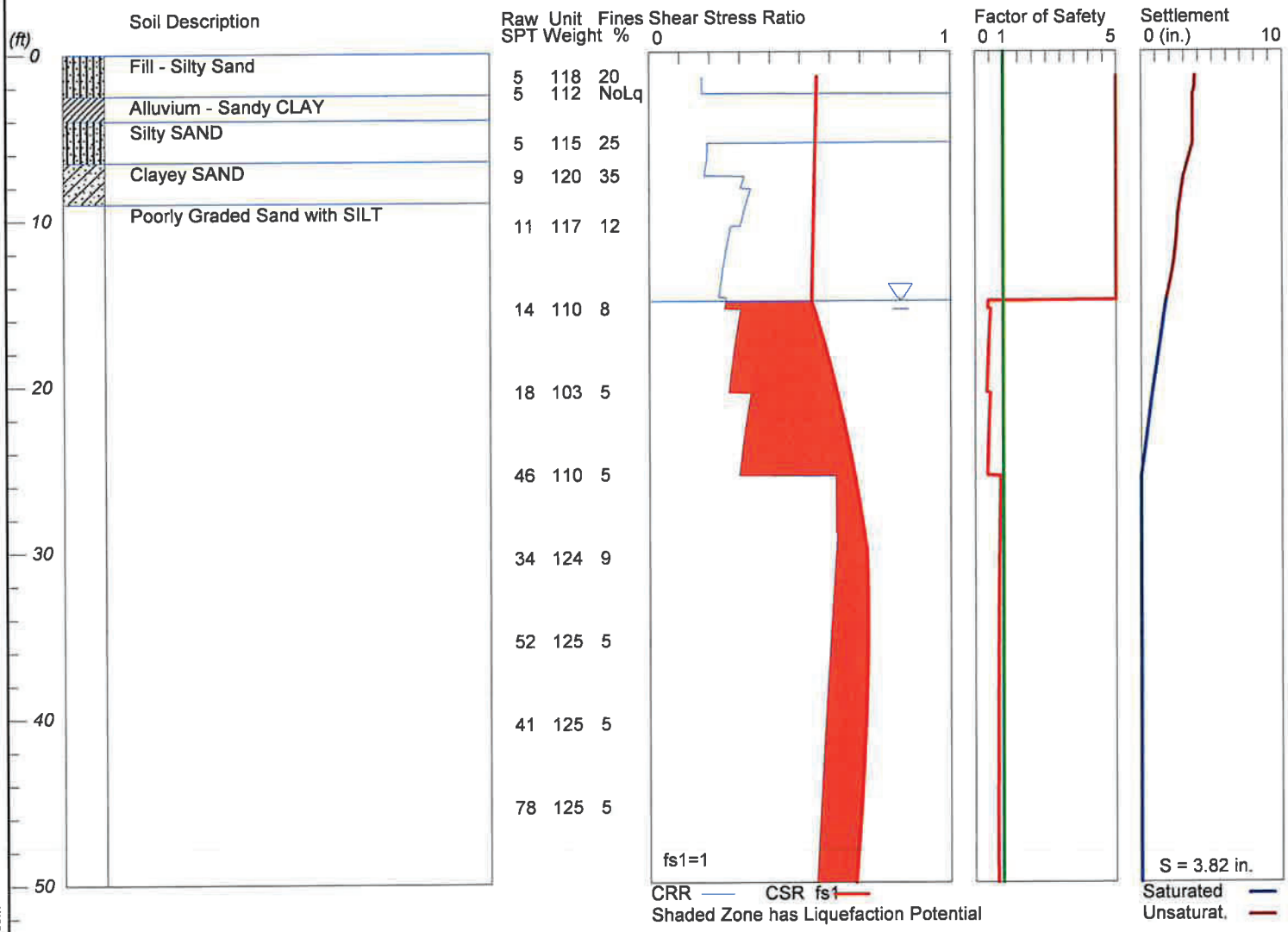
Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.
2.00	0.26	0.56	5.00	0.00	2.42	2.42
2.05	0.26	0.56	5.00	0.00	2.42	2.42
2.10	0.26	0.56	5.00	0.00	2.42	2.42
2.15	0.26	0.56	5.00	0.00	2.42	2.42
2.20	0.26	0.56	5.00	0.00	2.42	2.42
2.25	0.26	0.56	5.00	0.00	2.42	2.42

LIQUEFACTION SETTLEMENT

Arroyo High School

Hole No.=B-4 Water Depth=15 ft

Magnitude=6.9
Acceleration=0.86g



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Input File Name: P:\2023\23-1190 Arroyo High School - New Construction Admin & Performing Arts SI\Soils Folder\Calculations\Seismic Settlement\B-4 Dry Settlement .liq
Title: Arroyo High School
Subtitle: 23-1190

Surface Elev.=
Hole No.=B-4
Depth of Hole= 50.00 ft
Water Table during Earthquake= 15.00 ft
Water Table during In-Situ Testing= 55.00 ft
Max. Acceleration= 0.86 g
Earthquake Magnitude= 6.90

Input Data:
Surface Elev.=
Hole No.=B-4
Depth of Hole=50.00 ft
Water Table during Earthquake= 15.00 ft
Water Table during In-Situ Testing= 55.00 ft
Max. Acceleration=0.86 g
Earthquake Magnitude=6.90
No-Liquefiable Soils: CL, OL are Non-Liq. Soil

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Tokimatsu/Seed
3. Fines Correction for Liquefaction: Stark/Olson et al.*
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 1.25
7. Borehole Diameter, Cb= 1.0
8. Sampling Method, Cs= 1.2
9. User request factor of safety (apply to CSR) , User= 1
   Plot one CSR curve (fs1=1)
10. Use Curve Smoothing: No
* Recommended Options

In-Situ Test Data:

Depth ft	SPT	gamma pcf	Fines %
1.50	5.00	118.00	20.00
2.50	5.00	112.00	NoLiq
5.50	5.00	115.00	25.00
7.50	9.00	120.00	35.00
10.50	11.00	117.00	12.00
15.50	14.00	110.00	8.00
20.50	18.00	103.00	5.00
25.50	46.00	110.00	5.00
30.50	34.00	124.00	9.00
35.50	52.00	125.00	5.00
40.50	41.00	125.00	5.00
45.50	78.00	125.00	5.00

Output Results:
Settlement of Saturated Sands=1.76 in.
Settlement of Unsaturated Sands=2.06 in.
Total Settlement of Saturated and Unsaturated Sands=3.82 in.
Differential Settlement=1.908 to 2.519 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.
1.50	0.18	0.56	5.00	1.76	2.06	3.82
1.55	0.18	0.56	5.00	1.76	2.06	3.82
1.60	0.18	0.56	5.00	1.76	2.06	3.82
1.65	0.18	0.56	5.00	1.76	2.06	3.81
1.70	0.18	0.56	5.00	1.76	2.05	3.81
1.75	0.18	0.56	5.00	1.76	2.05	3.81

					Liquefy.sum	
1.80	0.18	0.56	5.00	1.76	2.05	3.81
1.85	0.18	0.56	5.00	1.76	2.05	3.81
1.90	0.18	0.56	5.00	1.76	2.05	3.80
1.95	0.18	0.56	5.00	1.76	2.04	3.80
2.00	0.18	0.56	5.00	1.76	2.04	3.80
2.05	0.18	0.56	5.00	1.76	2.04	3.79
2.10	0.18	0.56	5.00	1.76	2.03	3.79
2.15	0.18	0.56	5.00	1.76	2.03	3.78
2.20	0.18	0.56	5.00	1.76	2.02	3.78
2.25	0.18	0.56	5.00	1.76	2.01	3.77
2.30	0.18	0.56	5.00	1.76	2.00	3.76
2.35	0.18	0.56	5.00	1.76	1.98	3.74
2.40	0.18	0.56	5.00	1.76	1.97	3.72
2.45	0.18	0.56	5.00	1.76	1.95	3.71
2.50	0.18	0.56	5.00	1.76	1.93	3.69
2.55	2.00	0.56	5.00	1.76	1.91	3.67
2.60	2.00	0.56	5.00	1.76	1.91	3.67
2.65	2.00	0.56	5.00	1.76	1.91	3.67
2.70	2.00	0.56	5.00	1.76	1.91	3.67
2.75	2.00	0.56	5.00	1.76	1.91	3.67
2.80	2.00	0.56	5.00	1.76	1.91	3.67
2.85	2.00	0.56	5.00	1.76	1.91	3.67
2.90	2.00	0.56	5.00	1.76	1.91	3.67
2.95	2.00	0.56	5.00	1.76	1.91	3.67
3.00	2.00	0.56	5.00	1.76	1.91	3.67
3.05	2.00	0.56	5.00	1.76	1.91	3.67
3.10	2.00	0.55	5.00	1.76	1.91	3.67
3.15	2.00	0.55	5.00	1.76	1.91	3.67
3.20	2.00	0.55	5.00	1.76	1.91	3.67
3.25	2.00	0.55	5.00	1.76	1.91	3.67
3.30	2.00	0.55	5.00	1.76	1.91	3.67
3.35	2.00	0.55	5.00	1.76	1.91	3.67
3.40	2.00	0.55	5.00	1.76	1.91	3.67
3.45	2.00	0.55	5.00	1.76	1.91	3.67
3.50	2.00	0.55	5.00	1.76	1.91	3.67
3.55	2.00	0.55	5.00	1.76	1.91	3.67
3.60	2.00	0.55	5.00	1.76	1.91	3.67
3.65	2.00	0.55	5.00	1.76	1.91	3.67
3.70	2.00	0.55	5.00	1.76	1.91	3.67
3.75	2.00	0.55	5.00	1.76	1.91	3.67
3.80	2.00	0.55	5.00	1.76	1.91	3.67
3.85	2.00	0.55	5.00	1.76	1.91	3.67
3.90	2.00	0.55	5.00	1.76	1.91	3.67
3.95	2.00	0.55	5.00	1.76	1.91	3.67
4.00	2.00	0.55	5.00	1.76	1.91	3.67
4.05	2.00	0.55	5.00	1.76	1.91	3.67
4.10	2.00	0.55	5.00	1.76	1.91	3.67
4.15	2.00	0.55	5.00	1.76	1.91	3.67
4.20	2.00	0.55	5.00	1.76	1.91	3.67
4.25	2.00	0.55	5.00	1.76	1.91	3.67
4.30	2.00	0.55	5.00	1.76	1.91	3.67
4.35	2.00	0.55	5.00	1.76	1.91	3.67
4.40	2.00	0.55	5.00	1.76	1.91	3.67
4.45	2.00	0.55	5.00	1.76	1.91	3.67
4.50	2.00	0.55	5.00	1.76	1.91	3.67
4.55	2.00	0.55	5.00	1.76	1.91	3.67
4.60	2.00	0.55	5.00	1.76	1.91	3.67
4.65	2.00	0.55	5.00	1.76	1.91	3.67
4.70	2.00	0.55	5.00	1.76	1.91	3.67
4.75	2.00	0.55	5.00	1.76	1.91	3.67
4.80	2.00	0.55	5.00	1.76	1.91	3.67
4.85	2.00	0.55	5.00	1.76	1.91	3.67
4.90	2.00	0.55	5.00	1.76	1.91	3.67
4.95	2.00	0.55	5.00	1.76	1.91	3.67
5.00	2.00	0.55	5.00	1.76	1.91	3.67
5.05	2.00	0.55	5.00	1.76	1.91	3.67
5.10	2.00	0.55	5.00	1.76	1.91	3.67
5.15	2.00	0.55	5.00	1.76	1.91	3.67
5.20	2.00	0.55	5.00	1.76	1.91	3.67
5.25	2.00	0.55	5.00	1.76	1.91	3.67
5.30	2.00	0.55	5.00	1.76	1.91	3.67
5.35	2.00	0.55	5.00	1.76	1.91	3.67
5.40	2.00	0.55	5.00	1.76	1.91	3.67
5.45	2.00	0.55	5.00	1.76	1.91	3.67
5.50	0.19	0.55	5.00	1.76	1.91	3.67
5.55	0.19	0.55	5.00	1.76	1.89	3.65
5.60	0.19	0.55	5.00	1.76	1.88	3.64
5.65	0.19	0.55	5.00	1.76	1.86	3.62
5.70	0.19	0.55	5.00	1.76	1.85	3.60

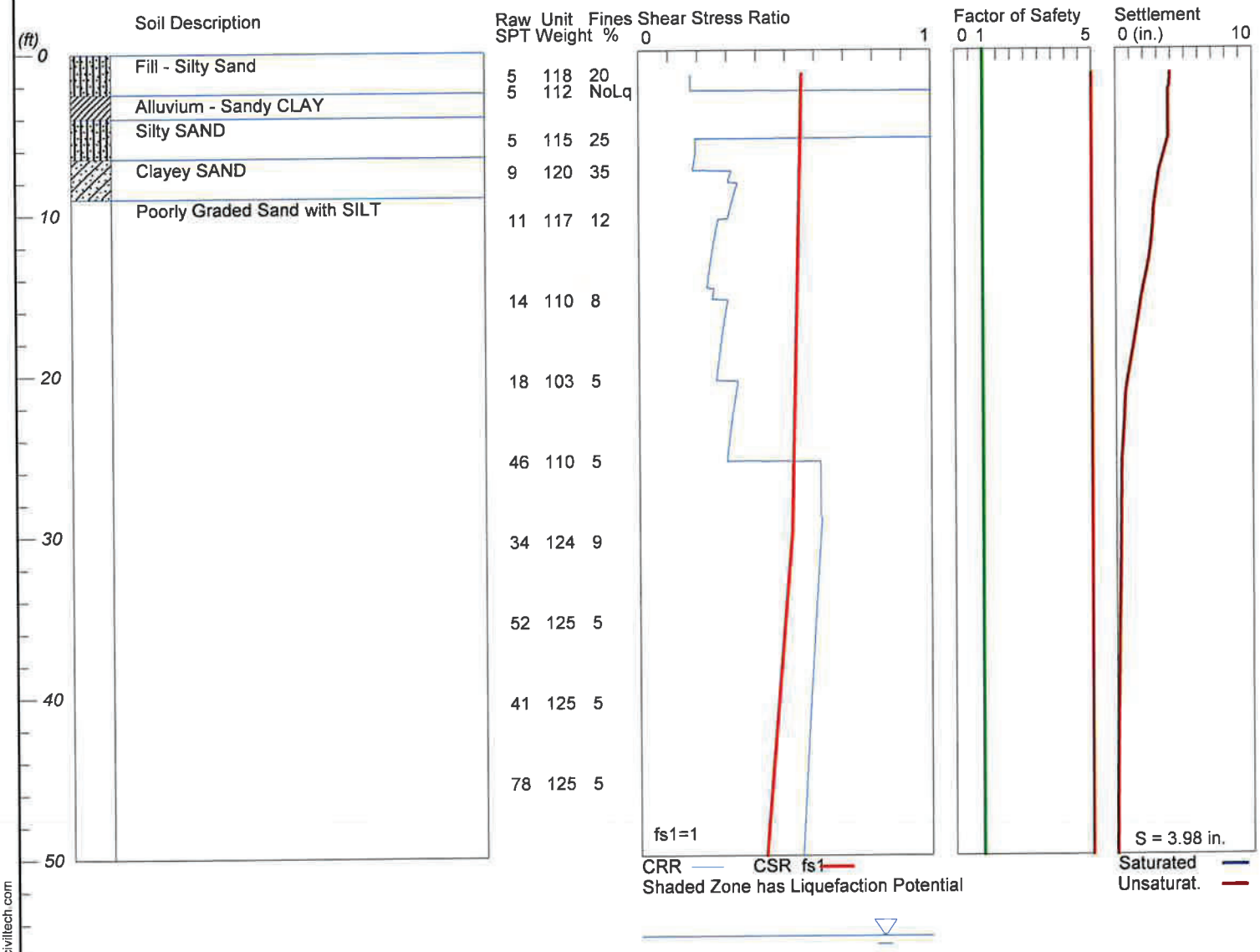
					Liquefy.sum	
5.75	0.19	0.55	5.00	1.76	1.83	3.59
5.80	0.19	0.55	5.00	1.76	1.81	3.57
5.85	0.19	0.55	5.00	1.76	1.80	3.56
5.90	0.19	0.55	5.00	1.76	1.78	3.54
5.95	0.19	0.55	5.00	1.76	1.76	3.52
6.00	0.19	0.55	5.00	1.76	1.75	3.51
6.05	0.19	0.55	5.00	1.76	1.73	3.49
6.10	0.19	0.55	5.00	1.76	1.72	3.47
6.15	0.19	0.55	5.00	1.76	1.70	3.46
6.20	0.19	0.55	5.00	1.76	1.68	3.44
6.25	0.19	0.55	5.00	1.76	1.67	3.42
6.30	0.19	0.55	5.00	1.76	1.65	3.41
6.35	0.19	0.55	5.00	1.76	1.63	3.39
6.40	0.19	0.55	5.00	1.76	1.62	3.38
6.45	0.19	0.55	5.00	1.76	1.60	3.36
6.50	0.19	0.55	5.00	1.76	1.58	3.34
6.55	0.19	0.55	5.00	1.76	1.57	3.33
6.60	0.19	0.55	5.00	1.76	1.55	3.31
6.65	0.19	0.55	5.00	1.76	1.53	3.29
6.70	0.19	0.55	5.00	1.76	1.52	3.28
6.75	0.19	0.55	5.00	1.76	1.50	3.26
6.80	0.19	0.55	5.00	1.76	1.48	3.24
6.85	0.19	0.55	5.00	1.76	1.47	3.23
6.90	0.19	0.55	5.00	1.76	1.45	3.21
6.95	0.19	0.55	5.00	1.76	1.43	3.19
7.00	0.19	0.55	5.00	1.76	1.42	3.18
7.05	0.19	0.55	5.00	1.76	1.40	3.16
7.10	0.19	0.55	5.00	1.76	1.38	3.14
7.15	0.19	0.55	5.00	1.76	1.37	3.13
7.20	0.18	0.55	5.00	1.76	1.35	3.11
7.25	0.18	0.55	5.00	1.76	1.33	3.09
7.30	0.18	0.55	5.00	1.76	1.31	3.07
7.35	0.18	0.55	5.00	1.76	1.30	3.06
7.40	0.18	0.55	5.00	1.76	1.28	3.04
7.45	0.18	0.55	5.00	1.76	1.26	3.02
7.50	0.31	0.55	5.00	1.76	1.25	3.00
7.55	0.31	0.55	5.00	1.76	1.24	3.00
7.60	0.31	0.55	5.00	1.76	1.23	2.99
7.65	0.31	0.55	5.00	1.76	1.22	2.98
7.70	0.31	0.55	5.00	1.76	1.21	2.97
7.75	0.31	0.55	5.00	1.76	1.20	2.96
7.80	0.31	0.55	5.00	1.76	1.19	2.95
7.85	0.31	0.55	5.00	1.76	1.18	2.94
7.90	0.31	0.55	5.00	1.76	1.17	2.93
7.95	0.31	0.55	5.00	1.76	1.17	2.92
8.00	0.31	0.55	5.00	1.76	1.16	2.91
8.05	0.30	0.55	5.00	1.76	1.15	2.91
8.10	0.30	0.55	5.00	1.76	1.14	2.90
8.15	0.30	0.55	5.00	1.76	1.13	2.89
8.20	0.30	0.55	5.00	1.76	1.12	2.88
8.25	0.34	0.55	5.00	1.76	1.11	2.87
8.30	0.34	0.55	5.00	1.76	1.10	2.86
8.35	0.33	0.55	5.00	1.76	1.09	2.85
8.40	0.33	0.55	5.00	1.76	1.09	2.84
8.45	0.33	0.55	5.00	1.76	1.08	2.84
8.50	0.33	0.55	5.00	1.76	1.07	2.83
8.55	0.33	0.55	5.00	1.76	1.06	2.82
8.60	0.33	0.55	5.00	1.76	1.05	2.81
8.65	0.33	0.55	5.00	1.76	1.04	2.80
8.70	0.33	0.55	5.00	1.76	1.04	2.79
8.75	0.33	0.55	5.00	1.76	1.03	2.79
8.80	0.33	0.55	5.00	1.76	1.02	2.78
8.85	0.33	0.55	5.00	1.76	1.01	2.77
8.90	0.32	0.55	5.00	1.76	1.00	2.76
8.95	0.32	0.55	5.00	1.76	0.99	2.75
9.00	0.32	0.55	5.00	1.76	0.98	2.74
9.05	0.32	0.55	5.00	1.76	0.98	2.73
9.10	0.32	0.55	5.00	1.76	0.97	2.73
9.15	0.32	0.55	5.00	1.76	0.96	2.72
9.20	0.32	0.55	5.00	1.76	0.95	2.71
9.25	0.32	0.55	5.00	1.76	0.94	2.70
9.30	0.32	0.55	5.00	1.76	0.93	2.69
9.35	0.32	0.55	5.00	1.76	0.92	2.68
9.40	0.32	0.55	5.00	1.76	0.91	2.67
9.45	0.32	0.55	5.00	1.76	0.91	2.66
9.50	0.32	0.55	5.00	1.76	0.90	2.66
9.55	0.31	0.55	5.00	1.76	0.89	2.65
9.60	0.31	0.55	5.00	1.76	0.88	2.64
9.65	0.31	0.55	5.00	1.76	0.87	2.63

DRY SETTLEMENT

Arroyo High School

Hole No.=B-4 Water Depth=55 ft

Magnitude=6.9
Acceleration=0.86g



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LIQUEFACTION ANALYSIS SUMMARY
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Input File Name: P:\2023\23-1190 Arroyo High School - New Construction Admin & Performing Arts SI\Soils Folder\Calculations\Seismic Settlement\B-4 Liquefaction Settlement .liq
Title: Arroyo High School
Subtitle: 23-1190

Surface Elev.=
Hole No.=B-4
Depth of Hole= 50.00 ft
Water Table during Earthquake= 55.00 ft
Water Table during In-Situ Testing= 55.00 ft
Max. Acceleration= 0.86 g
Earthquake Magnitude= 6.90

Input Data:
Surface Elev.=
Hole No.=B-4
Depth of Hole=50.00 ft
Water Table during Earthquake= 55.00 ft
Water Table during In-Situ Testing= 55.00 ft
Max. Acceleration=0.86 g
Earthquake Magnitude=6.90
No-Liquefiable Soils: CL, OL are Non-Liq. Soil

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Tokimatsu/Seed
3. Fines Correction for Liquefaction: Stark/Olson et al.*
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 1.25
7. Borehole Diameter, Cb= 1.0
8. Sampling Method, Cs= 1.2
9. User request factor of safety (apply to CSR) , User= 1
   Plot one CSR curve (fs1=1)
10. Use Curve Smoothing: No
* Recommended Options

In-Situ Test Data:

Depth ft	SPT	gamma pcf	Fines %
1.50	5.00	118.00	20.00
2.50	5.00	112.00	NoLiq
5.50	5.00	115.00	25.00
7.50	9.00	120.00	35.00
10.50	11.00	117.00	12.00
15.50	14.00	110.00	8.00
20.50	18.00	103.00	5.00
25.50	46.00	110.00	5.00
30.50	34.00	124.00	9.00
35.50	52.00	125.00	5.00
40.50	41.00	125.00	5.00
45.50	78.00	125.00	5.00

Output Results:
Settlement of Saturated Sands=0.00 in.
Settlement of Unsaturated Sands=3.98 in.
Total Settlement of Saturated and Unsaturated Sands=3.98 in.
Differential Settlement=1.991 to 2.629 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.
1.50	0.18	0.56	5.00	0.00	3.98	3.98
1.55	0.18	0.56	5.00	0.00	3.98	3.98
1.60	0.18	0.56	5.00	0.00	3.98	3.98
1.65	0.18	0.56	5.00	0.00	3.98	3.98
1.70	0.18	0.56	5.00	0.00	3.98	3.98
1.75	0.18	0.56	5.00	0.00	3.98	3.98

					Liquefy.sum	
1.80	0.18	0.56	5.00	0.00	3.97	3.97
1.85	0.18	0.56	5.00	0.00	3.97	3.97
1.90	0.18	0.56	5.00	0.00	3.97	3.97
1.95	0.18	0.56	5.00	0.00	3.97	3.97
2.00	0.18	0.56	5.00	0.00	3.96	3.96
2.05	0.18	0.56	5.00	0.00	3.96	3.96
2.10	0.18	0.56	5.00	0.00	3.96	3.96
2.15	0.18	0.56	5.00	0.00	3.95	3.95
2.20	0.18	0.56	5.00	0.00	3.94	3.94
2.25	0.18	0.56	5.00	0.00	3.93	3.93
2.30	0.18	0.56	5.00	0.00	3.92	3.92
2.35	0.18	0.56	5.00	0.00	3.91	3.91
2.40	0.18	0.56	5.00	0.00	3.89	3.89
2.45	0.18	0.56	5.00	0.00	3.87	3.87
2.50	0.18	0.56	5.00	0.00	3.85	3.85
2.55	2.00	0.56	5.00	0.00	3.84	3.84
2.60	2.00	0.56	5.00	0.00	3.84	3.84
2.65	2.00	0.56	5.00	0.00	3.84	3.84
2.70	2.00	0.56	5.00	0.00	3.84	3.84
2.75	2.00	0.56	5.00	0.00	3.84	3.84
2.80	2.00	0.56	5.00	0.00	3.84	3.84
2.85	2.00	0.56	5.00	0.00	3.84	3.84
2.90	2.00	0.56	5.00	0.00	3.84	3.84
2.95	2.00	0.56	5.00	0.00	3.84	3.84
3.00	2.00	0.56	5.00	0.00	3.84	3.84
3.05	2.00	0.56	5.00	0.00	3.84	3.84
3.10	2.00	0.55	5.00	0.00	3.84	3.84
3.15	2.00	0.55	5.00	0.00	3.84	3.84
3.20	2.00	0.55	5.00	0.00	3.84	3.84
3.25	2.00	0.55	5.00	0.00	3.84	3.84
3.30	2.00	0.55	5.00	0.00	3.84	3.84
3.35	2.00	0.55	5.00	0.00	3.84	3.84
3.40	2.00	0.55	5.00	0.00	3.84	3.84
3.45	2.00	0.55	5.00	0.00	3.84	3.84
3.50	2.00	0.55	5.00	0.00	3.84	3.84
3.55	2.00	0.55	5.00	0.00	3.84	3.84
3.60	2.00	0.55	5.00	0.00	3.84	3.84
3.65	2.00	0.55	5.00	0.00	3.84	3.84
3.70	2.00	0.55	5.00	0.00	3.84	3.84
3.75	2.00	0.55	5.00	0.00	3.84	3.84
3.80	2.00	0.55	5.00	0.00	3.84	3.84
3.85	2.00	0.55	5.00	0.00	3.84	3.84
3.90	2.00	0.55	5.00	0.00	3.84	3.84
3.95	2.00	0.55	5.00	0.00	3.84	3.84
4.00	2.00	0.55	5.00	0.00	3.84	3.84
4.05	2.00	0.55	5.00	0.00	3.84	3.84
4.10	2.00	0.55	5.00	0.00	3.84	3.84
4.15	2.00	0.55	5.00	0.00	3.84	3.84
4.20	2.00	0.55	5.00	0.00	3.84	3.84
4.25	2.00	0.55	5.00	0.00	3.84	3.84
4.30	2.00	0.55	5.00	0.00	3.84	3.84
4.35	2.00	0.55	5.00	0.00	3.84	3.84
4.40	2.00	0.55	5.00	0.00	3.84	3.84
4.45	2.00	0.55	5.00	0.00	3.84	3.84
4.50	2.00	0.55	5.00	0.00	3.84	3.84
4.55	2.00	0.55	5.00	0.00	3.84	3.84
4.60	2.00	0.55	5.00	0.00	3.84	3.84
4.65	2.00	0.55	5.00	0.00	3.84	3.84
4.70	2.00	0.55	5.00	0.00	3.84	3.84
4.75	2.00	0.55	5.00	0.00	3.84	3.84
4.80	2.00	0.55	5.00	0.00	3.84	3.84
4.85	2.00	0.55	5.00	0.00	3.84	3.84
4.90	2.00	0.55	5.00	0.00	3.84	3.84
4.95	2.00	0.55	5.00	0.00	3.84	3.84
5.00	2.00	0.55	5.00	0.00	3.84	3.84
5.05	2.00	0.55	5.00	0.00	3.84	3.84
5.10	2.00	0.55	5.00	0.00	3.84	3.84
5.15	2.00	0.55	5.00	0.00	3.84	3.84
5.20	2.00	0.55	5.00	0.00	3.84	3.84
5.25	2.00	0.55	5.00	0.00	3.84	3.84
5.30	2.00	0.55	5.00	0.00	3.84	3.84
5.35	2.00	0.55	5.00	0.00	3.84	3.84
5.40	2.00	0.55	5.00	0.00	3.84	3.84
5.45	2.00	0.55	5.00	0.00	3.84	3.84
5.50	0.19	0.55	5.00	0.00	3.84	3.84
5.55	0.19	0.55	5.00	0.00	3.82	3.82
5.60	0.19	0.55	5.00	0.00	3.80	3.80
5.65	0.19	0.55	5.00	0.00	3.79	3.79
5.70	0.19	0.55	5.00	0.00	3.77	3.77

					Liquefy.sum	
5.75	0.19	0.55	5.00	0.00	3.75	3.75
5.80	0.19	0.55	5.00	0.00	3.74	3.74
5.85	0.19	0.55	5.00	0.00	3.72	3.72
5.90	0.19	0.55	5.00	0.00	3.70	3.70
5.95	0.19	0.55	5.00	0.00	3.69	3.69
6.00	0.19	0.55	5.00	0.00	3.67	3.67
6.05	0.19	0.55	5.00	0.00	3.66	3.66
6.10	0.19	0.55	5.00	0.00	3.64	3.64
6.15	0.19	0.55	5.00	0.00	3.62	3.62
6.20	0.19	0.55	5.00	0.00	3.61	3.61
6.25	0.19	0.55	5.00	0.00	3.59	3.59
6.30	0.19	0.55	5.00	0.00	3.57	3.57
6.35	0.19	0.55	5.00	0.00	3.56	3.56
6.40	0.19	0.55	5.00	0.00	3.54	3.54
6.45	0.19	0.55	5.00	0.00	3.53	3.53
6.50	0.19	0.55	5.00	0.00	3.51	3.51
6.55	0.19	0.55	5.00	0.00	3.49	3.49
6.60	0.19	0.55	5.00	0.00	3.48	3.48
6.65	0.19	0.55	5.00	0.00	3.46	3.46
6.70	0.19	0.55	5.00	0.00	3.44	3.44
6.75	0.19	0.55	5.00	0.00	3.43	3.43
6.80	0.19	0.55	5.00	0.00	3.41	3.41
6.85	0.19	0.55	5.00	0.00	3.39	3.39
6.90	0.19	0.55	5.00	0.00	3.38	3.38
6.95	0.19	0.55	5.00	0.00	3.36	3.36
7.00	0.19	0.55	5.00	0.00	3.34	3.34
7.05	0.19	0.55	5.00	0.00	3.32	3.32
7.10	0.19	0.55	5.00	0.00	3.31	3.31
7.15	0.19	0.55	5.00	0.00	3.29	3.29
7.20	0.18	0.55	5.00	0.00	3.27	3.27
7.25	0.18	0.55	5.00	0.00	3.26	3.26
7.30	0.18	0.55	5.00	0.00	3.24	3.24
7.35	0.18	0.55	5.00	0.00	3.22	3.22
7.40	0.18	0.55	5.00	0.00	3.20	3.20
7.45	0.18	0.55	5.00	0.00	3.19	3.19
7.50	0.31	0.55	5.00	0.00	3.17	3.17
7.55	0.31	0.55	5.00	0.00	3.16	3.16
7.60	0.31	0.55	5.00	0.00	3.15	3.15
7.65	0.31	0.55	5.00	0.00	3.14	3.14
7.70	0.31	0.55	5.00	0.00	3.13	3.13
7.75	0.31	0.55	5.00	0.00	3.13	3.13
7.80	0.31	0.55	5.00	0.00	3.12	3.12
7.85	0.31	0.55	5.00	0.00	3.11	3.11
7.90	0.31	0.55	5.00	0.00	3.10	3.10
7.95	0.31	0.55	5.00	0.00	3.09	3.09
8.00	0.31	0.55	5.00	0.00	3.08	3.08
8.05	0.30	0.55	5.00	0.00	3.07	3.07
8.10	0.30	0.55	5.00	0.00	3.06	3.06
8.15	0.30	0.55	5.00	0.00	3.05	3.05
8.20	0.30	0.55	5.00	0.00	3.04	3.04
8.25	0.34	0.55	5.00	0.00	3.03	3.03
8.30	0.34	0.55	5.00	0.00	3.03	3.03
8.35	0.33	0.55	5.00	0.00	3.02	3.02
8.40	0.33	0.55	5.00	0.00	3.01	3.01
8.45	0.33	0.55	5.00	0.00	3.00	3.00
8.50	0.33	0.55	5.00	0.00	2.99	2.99
8.55	0.33	0.55	5.00	0.00	2.98	2.98
8.60	0.33	0.55	5.00	0.00	2.98	2.98
8.65	0.33	0.55	5.00	0.00	2.97	2.97
8.70	0.33	0.55	5.00	0.00	2.96	2.96
8.75	0.33	0.55	5.00	0.00	2.95	2.95
8.80	0.33	0.55	5.00	0.00	2.94	2.94
8.85	0.33	0.55	5.00	0.00	2.93	2.93
8.90	0.32	0.55	5.00	0.00	2.93	2.93
8.95	0.32	0.55	5.00	0.00	2.92	2.92
9.00	0.32	0.55	5.00	0.00	2.91	2.91
9.05	0.32	0.55	5.00	0.00	2.90	2.90
9.10	0.32	0.55	5.00	0.00	2.89	2.89
9.15	0.32	0.55	5.00	0.00	2.88	2.88
9.20	0.32	0.55	5.00	0.00	2.87	2.87
9.25	0.32	0.55	5.00	0.00	2.87	2.87
9.30	0.32	0.55	5.00	0.00	2.86	2.86
9.35	0.32	0.55	5.00	0.00	2.85	2.85
9.40	0.32	0.55	5.00	0.00	2.84	2.84
9.45	0.32	0.55	5.00	0.00	2.83	2.83
9.50	0.32	0.55	5.00	0.00	2.82	2.82
9.55	0.31	0.55	5.00	0.00	2.81	2.81
9.60	0.31	0.55	5.00	0.00	2.80	2.80
9.65	0.31	0.55	5.00	0.00	2.80	2.80

APPENDIX D

Historical Earthquake Data

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*************************
*                       *
*    E Q S E A R C H    *
*                       *
*     Version 3.00      *
*                       *
*************************

      ESTIMATION OF
  PEAK ACCELERATION FROM
CALIFORNIA EARTHQUAKE CATALOGS
```

JOB NUMBER: 23-1190

DATE: 05-25-2023

JOB NAME: Arroyo High School

EARTHQUAKE-CATALOG-FILE NAME: ALLQUAKE.DAT

MAGNITUDE RANGE:
   MINIMUM MAGNITUDE: 5.00
   MAXIMUM MAGNITUDE: 9.00

SITE COORDINATES:
   SITE LATITUDE: 34.0941
   SITE LONGITUDE: 118.0209

SEARCH DATES:
           START DATE: 1800
           END DATE: 2000

SEARCH RADIUS:
           60.0 mi
           96.6 km

ATTENUATION RELATION: 17) Campbell & Bozorgnia (1994/1997) - Alluvium
   UNCERTAINTY (M=Median, S=Sigma): M   Number of Sigmas: 0.0
   ASSUMED SOURCE TYPE: DS [SS=Strike-slip, DS=Reverse-slip, BT=Blind-thrust]
   SCOND: 0 Depth Source: A
   Basement Depth: 5.00 km   Campbell SSR: 0   Campbell SHR: 0
   COMPUTE PEAK HORIZONTAL ACCELERATION

MINIMUM DEPTH VALUE (km): 3.0

EARTHQUAKE SEARCH RESULTS

Page 1

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
PAS	34.0610	118.0790	10/01/1987	144220.0	9.5	5.90	0.394	X	4.0(6.5)
MGI	34.1000	118.1000	07/11/1855	415 0.0	0.0	6.30	0.447	X	4.5(7.3)
PAS	34.0730	118.0980	10/04/1987	105938.2	8.2	5.30	0.216	VIII	4.6(7.5)
MGI	34.0000	118.0000	12/25/1903	1745 0.0	0.0	5.00	0.125	VII	6.6(10.6)
DMG	34.2000	117.9000	08/28/1889	215 0.0	0.0	5.50	0.123	VII	10.1(16.2)
GSP	34.2620	118.0020	06/28/1991	144354.5	11.0	5.40	0.095	VII	11.6(18.7)
MGI	34.0800	118.2600	07/16/1920	18 8 0.0	0.0	5.00	0.055	VI	13.7(22.1)
T-A	34.0000	118.2500	01/10/1856	0 0 0.0	0.0	5.00	0.051	VI	14.6(23.5)
T-A	34.0000	118.2500	03/26/1860	0 0 0.0	0.0	5.00	0.051	VI	14.6(23.5)
T-A	34.0000	118.2500	09/23/1827	0 0 0.0	0.0	5.00	0.051	VI	14.6(23.5)
MGI	34.0000	118.3000	09/03/1905	540 0.0	0.0	5.30	0.053	VI	17.2(27.7)
GSP	34.1400	117.7000	02/28/1990	234336.6	5.0	5.20	0.044	VI	18.6(29.9)
DMG	33.8500	118.2670	03/11/1933	1425 0.0	0.0	5.00	0.030	V	22.0(35.3)
DMG	33.7830	118.1330	10/02/1933	91017.6	0.0	5.40	0.040	V	22.4(36.1)
DMG	33.7500	118.0830	03/11/1933	2 9 0.0	0.0	5.00	0.026	V	24.0(38.7)
DMG	33.7500	118.0830	03/11/1933	910 0.0	0.0	5.10	0.028	V	24.0(38.7)
DMG	33.7500	118.0830	03/11/1933	323 0.0	0.0	5.00	0.026	V	24.0(38.7)
DMG	33.7500	118.0830	03/13/1933	131828.0	0.0	5.30	0.034	V	24.0(38.7)

DMG	33.7500	118.0830	03/11/1933	230 0.0	0.0	5.10	0.028	V	24.0(38.7)
DMG	33.7830	118.2500	11/14/1941	84136.3	0.0	5.40	0.034	V	25.2(40.5)
DMG	33.7000	118.0670	03/11/1933	85457.0	0.0	5.10	0.024	IV	27.3(44.0)
DMG	33.7000	118.0670	03/11/1933	51022.0	0.0	5.10	0.024	IV	27.3(44.0)
GSP	34.2310	118.4750	03/20/1994	212012.3	13.0	5.30	0.028	V	27.6(44.4)
DMG	34.3000	117.6000	07/30/1894	512 0.0	0.0	6.00	0.048	VI	27.9(44.9)
DMG	34.0000	118.5000	08/04/1927	1224 0.0	0.0	5.00	0.021	IV	28.2(45.3)
MGI	34.0000	118.5000	11/19/1918	2018 0.0	0.0	5.00	0.021	IV	28.2(45.3)
DMG	33.6830	118.0500	03/11/1933	658 3.0	0.0	5.50	0.031	V	28.4(45.7)
DMG	34.3700	117.6500	12/08/1812	15 0 0.0	0.0	7.00	0.101	VII	28.5(45.8)
DMG	34.3080	118.4540	02/09/1971	144346.7	6.2	5.20	0.024	V	28.8(46.3)
DMG	34.2700	117.5400	09/12/1970	143053.0	8.0	5.40	0.027	V	30.0(48.3)
MGI	34.0000	117.5000	12/16/1858	10 0 0.0	0.0	7.00	0.092	VII	30.5(49.1)
GSP	34.2130	118.5370	01/17/1994	123055.4	18.0	6.70	0.073	VII	30.6(49.3)
DMG	34.4110	118.4010	02/09/1971	14 1 8.0	8.0	5.80	0.036	V	30.8(49.6)
DMG	34.4110	118.4010	02/09/1971	141028.0	8.0	5.30	0.024	IV	30.8(49.6)
DMG	34.4110	118.4010	02/09/1971	14 244.0	8.0	5.80	0.036	V	30.8(49.6)
DMG	34.4110	118.4010	02/09/1971	14 041.8	8.4	6.40	0.057	VI	30.8(49.6)
DMG	34.5190	118.1980	08/23/1952	10 9 7.1	13.1	5.00	0.018	IV	31.0(49.9)
MGI	33.8000	117.6000	04/22/1918	2115 0.0	0.0	5.00	0.018	IV	31.5(50.7)
DMG	33.6170	118.0170	03/14/1933	19 150.0	0.0	5.10	0.018	IV	32.9(53.0)
DMG	34.3000	117.5000	07/22/1899	2032 0.0	0.0	6.50	0.056	VI	33.0(53.1)
DMG	33.6170	117.9670	03/11/1933	154 7.8	0.0	6.30	0.048	VI	33.1(53.2)
GSB	34.3010	118.5650	01/17/1994	204602.4	9.0	5.20	0.019	IV	34.2(55.0)
GSP	34.3050	118.5790	01/29/1994	112036.0	1.0	5.10	0.017	IV	35.0(56.4)
DMG	33.5750	117.9830	03/11/1933	518 4.0	0.0	5.20	0.018	IV	35.9(57.8)
DMG	34.3000	118.6000	04/04/1893	1940 0.0	0.0	6.00	0.034	V	36.0(57.9)
DMG	34.2000	117.4000	07/22/1899	046 0.0	0.0	5.50	0.022	IV	36.2(58.3)
DMG	33.9500	118.6320	08/31/1930	04036.0	0.0	5.20	0.017	IV	36.4(58.5)
PAS	33.9190	118.6270	01/19/1989	65328.8	11.9	5.00	0.015	IV	36.7(59.1)
PAS	33.9440	118.6810	01/01/1979	231438.9	11.3	5.00	0.013	III	39.2(63.0)
GSP	34.3780	118.6180	01/19/1994	211144.9	11.0	5.10	0.014	IV	39.3(63.3)
DMG	33.6990	117.5110	05/31/1938	83455.4	10.0	5.50	0.019	IV	40.0(64.3)
MGI	34.1000	117.3000	07/15/1905	2041 0.0	0.0	5.30	0.016	IV	41.2(66.3)
GSP	34.3690	118.6720	04/26/1997	103730.7	16.0	5.10	0.013	III	41.7(67.2)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
GSP	34.3260	118.6980	01/17/1994	233330.7	9.0	5.60	0.020	IV	41.8(67.3)
GSP	34.3940	118.6690	06/26/1995	084028.9	13.0	5.00	0.012	III	42.4(68.2)
GSP	34.3770	118.6980	01/18/1994	004308.9	11.0	5.20	0.014	III	43.3(69.7)
GSB	34.3790	118.7110	01/19/1994	210928.6	14.0	5.50	0.017	IV	44.0(70.8)
DMG	34.0000	117.2500	07/23/1923	73026.0	0.0	6.25	0.030	V	44.6(71.7)
DMG	33.7000	117.4000	05/15/1910	1547 0.0	0.0	6.00	0.025	V	44.8(72.1)
DMG	33.7000	117.4000	05/13/1910	620 0.0	0.0	5.00	0.011	III	44.8(72.1)
DMG	33.7000	117.4000	04/11/1910	757 0.0	0.0	5.00	0.011	III	44.8(72.1)
DMG	33.9000	117.2000	12/19/1880	0 0 0.0	0.0	6.00	0.022	IV	48.9(78.6)
DMG	34.2000	117.1000	09/20/1907	154 0.0	0.0	6.00	0.019	IV	53.1(85.5)
MGI	34.0000	119.0000	12/14/1912	0 0 0.0	0.0	5.70	0.014	IV	56.4(90.7)
DMG	34.0000	119.0000	09/24/1827	4 0 0.0	0.0	7.00	0.039	V	56.4(90.7)
DMG	34.0650	119.0350	02/21/1973	144557.3	8.0	5.90	0.016	IV	58.0(93.4)

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-END OF SEARCH- 66 EARTHQUAKES FOUND WITHIN THE SPECIFIED SEARCH AREA.

TIME PERIOD OF SEARCH: 1800 TO 2000

LENGTH OF SEARCH TIME: 201 years

THE EARTHQUAKE CLOSEST TO THE SITE IS ABOUT 4.0 MILES (6.5 km) AWAY.

LARGEST EARTHQUAKE MAGNITUDE FOUND IN THE SEARCH RADIUS: 7.0

LARGEST EARTHQUAKE SITE ACCELERATION FROM THIS SEARCH: 0.447 g

COEFFICIENTS FOR GUTENBERG & RICHTER RECURRENCE RELATION:
a-value= 1.066
b-value= 0.354

beta-value= 0.814

TABLE OF MAGNITUDES AND EXCEEDANCES:

Earthquake Magnitude	Number of Times Exceeded	Cumulative No. / Year
4.0	66	0.32836
4.5	66	0.32836
5.0	66	0.32836
5.5	25	0.12438
6.0	14	0.06965
6.5	5	0.02488
7.0	3	0.01493

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We are a key member of the construction team while safeguarding the public. We improve operational logistics and provide superior quality control through the continuing development of our engineering staff and technical expertise, utilization of classroom training and field supervisors, thus defining the industry standard.

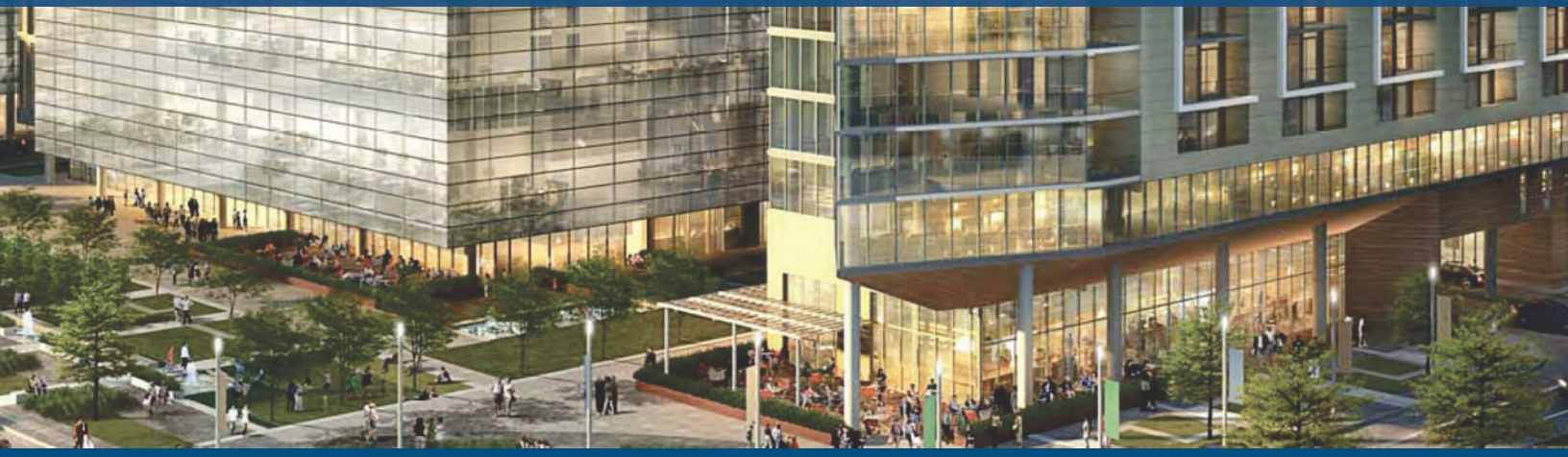
We increase market share and become the largest through superior management practices and planning.

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