Geotechnical Engineering Report

LUTHER BURBANK HIGH SCHOOL ATHLETIC FIELD IMPROVEMENTS

3500 Florin Road
Sacramento, California 95823

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1.0 INTRODUCTION

We have completed a geotechnical engineering study for the proposed athletic field improvements to be constructed at the existing Luther Burbank High School campus located at 3500 Florin Road in Sacramento, California. The purposes of our work have been to explore the existing site, soil and groundwater conditions, and to provide geotechnical engineering conclusions and recommendations for the design and construction of the proposed construction and associated improvements.

1.1 Scope of Work

Our scope of work included the following tasks:

1. a site reconnaissance;
2. review of previous geotechnical reports prepared by our firm on the campus;
3. review of United States Geological Survey (USGS) topographic map, historical aerials, and available groundwater information relevant to the site;
4. subsurface exploration, including six soil borings to depths ranging from approximately 15 to 16½ feet below the ground surface;
5. laboratory testing of selected soil samples;
6. engineering analyses; and,
7. preparation of this report.

1.2 Project Description

We understand the project will consist of the construction of new baseball and softball fields within the southern portion of the Luther Burbank High School campus. Planned improvements include construction of new varsity baseball and softball fields, backstops, dugouts, bullpens, and batting cages. In addition, the existing tennis courts will be replaced in the current location or new tennis courts will be constructed at the site. Associated development is anticipated to consist of asphalt concrete pavements, underground utilities, and exterior concrete flatwork.

1.3 Related Experience

We have reviewed our *Geotechnical Engineering Report* (Wallace-Kuhl & Associates [WKA], Inc. No. 8659.01P, dated December 15, 2009) that was prepared for the Luther Burbank High School Athletic Field Improvements project, as well as a *Supplemental Recommendations* letter (WKA No. 10830.05P, dated April 21, 2016) prepared by for the Luther Burbank High School ERP Pavement Improvements project. Information from this report was reviewed and used during the preparation of this report.

1.4 Figures and Attachments

This report contains a Vicinity Map as Figure 1, a Site Plan showing the approximate boring locations as Figure 2, the Logs of Soil Borings as Figures 3 through 8. An explanation of the symbols and classification system used on the logs is contained in Figure 9. Appendix A contains information of a general nature regarding project concepts, exploratory methods used during the field exploration phase of our investigation, and laboratory test results. Appendix B contains the Logs of Soil Borings from the previous geotechnical investigation performed in 2009.

2.0 FINDINGS

2.1 Site Description

The subject site is located within the southern portion of the Luther Burbank High School campus which is located at 3500 Florin Road in Sacramento, California (Figure 1). The campus is on an approximately 47-acre parcel identified as Sacramento County Assessor Parcel Number 049-0010-089-0000. The project site is bounded to the north by school's asphalt concrete play areas, auxiliary play fields, and urban garden area, beyond which is the school's football field, large parking area, classrooms and other buildings related to the school; to the east by additional auxiliary play fields, beyond which is Florin Road; to the south by a residential subdivision; and to the west by railroad tracks, beyond which is a residential subdivision and vacant grass area.

At the time of our field explorations on August 18, 2023, the site was developed with existing grass-covered baseball and softball fields which includes backstops, dugouts, scoreboard, temporary bleachers, batting cages, and fencing.

Surface elevation of the site is approximately +20 feet North American Vertical Datum of 1988 (NAVD88) and the elevation estimates are based on the United States Geologic Survey (USGS) topographic data shown on the 7.5-Minute Map of the Florin Quadrangle, California, dated 2015.

2.2 Historical Aerial Photograph Review

We reviewed historical aerial photographs from 1947, 1957, 1964, 1966, 1984, 1993, 1999, 2005, 2009, 2010, 2012, 2014, 2016, 2018, 2020 through 2023. Review of the photographs from 1947 through 1957 indicate the entire site to be a grass field without any campus buildings. Aerial imagery from 1964 shows the campus buildings, asphalt concrete play areas, large parking area, and a dirt track north of the site, and the site area itself as an empty grass play field. The 1966 photographs show a baseball infield present. Photographs from 1999 show an addition of dugouts to the baseball field, and the 2012 photographs show a new football field and track to the north of the site where the dirt track had previously been. The photographs from 2019 through 2023 reveals the site is in a similar condition as it was during our field work in August 2023.

2.3 Soil Conditions

On August 18, 2023, six exploratory borings (B1 through B6) were performed at the project site. The approximate locations are shown in the attached Site Plan (Figure 2).

The soil conditions encountered at the boring locations generally consist of stiff to hard clay underlain by medium dense to very dense fine silty sand and very stiff to very hard sandy silt, followed by hard to very hard silty clay with sand extending to the explored depths of about 15 to 16½ feet below ground surface (bgs).

The soil conditions encountered at the boring locations are generally consistent with the soil conditions previously encountered at the site.

For soil conditions at a particular location, refer to the attached Logs of Soil Borings shown in Figures 3 through 8.

2.4 Groundwater

Groundwater was not encountered within the borings performed on August 18, 2023 to the explored depths of about 15 to 16½ feet bgs, and no groundwater was encountered during previously performed explorations by our firm at the site in November of 2009.

To supplement our study, we reviewed available groundwater elevation data obtained from a California Department of Water Resources (DWR) monitoring well as identified as State Well Number 384966N1214476W001, located about one mile east of the site. The ground surface elevation at the well is +24 NAVD88, which is about three to six feet higher than the subject site. Groundwater measurements obtained from the well indicate a "high" groundwater elevation of -28 feet NAVD88 (about 52 feet bgs at the well) occurred on March 6, 1984, and a "low" groundwater elevation of approximately -45 feet (about 70 feet bgs at the well) occurred on September 25, 1981.

3.0 CONCLUSIONS

3.1 2022 CBC and ASCE 7-16 Seismic Design Parameters

The 2022 California Building Code (CBC) currently references the American Society of Civil Engineers (ASCE) Standard 7-16 for seismic design. The seismic design parameters provided in Table 1 were developed based on a Site Classification D, and the latitude and longitude for the site using the web interface developed by the *Structural Engineers Association of California* (SEAOC) and *California's Health Care Access and Information (HCAI)*. Since S_1 is greater than 0.2g, the coefficient values F_v, S_{M1}, and S_{D1} presented in Table 1 below are valid for this project, provided the requirements in Exception Note No. 2 in Section 11.4.8 of ASCE 7-16 apply. If not, a site-specific ground motion hazard analysis is required. However, based on our experience with similar structures we anticipate the exception will be met. However, this should be verified by the project structural engineer.

Table 1: 2022 CBC/ASCE 7-16 Seismic Design Parameters

Latitude: 38.4943° N Longitude: 121.4671° W	ASCE 7-16 Table/Figure	2022 CBC Table/Figure	Factor/Coefficient	Value
0.2-second Period MCE	Figure 22-1	Figure 1613.2.1(1)	S_S	0.574 g
1.0-second Period MCE	Figure 22-2	Figure 1613.2.1(3)	S_1	0.254 g
Soil Class	Table 20.3-1	Section 1613.2.2	Site Class	D
Site Coefficient	Table 11.4-1	Table 1613.2.3(1)	F_a	1.341
Site Coefficient	Table 11.4-2	Table 1613.2.3(2)	F_v	2.092*
Adjusted MCE Spectral Response Parameters	Equation 11.4-1	Equation 16-20	S_{MS}	0.77 g
	Equation 11.4-2	Equation 16-21	S_{M1}	0.531 g*
Design Spectral Acceleration Parameters	Equation 11.4-3	Equation 16-22	S_{DS}	0.513 g
	Equation 11.4-4	Equation 16-23	S_{D1}	0.354 g*
Seismic Design Category	Table 11.6-1	Section 1613.2.5(1)	Risk Category I through IV	D
	Table 11.6-2	Section 1613.2.5(2)	Risk Category I through IV	D

Notes: MCE = Maximum Considered Earthquake
g = gravity
* The value is valid provided the requirements in Exception Note No. 2 in Section 11.4.8 of ASCE 7-16 are met. If not, a site-specific ground motion hazard analysis is required.

3.2 Soil Expansion Potential

Laboratory tests performed on representative near surface clay samples revealed moderate to high plasticity when tested in accordance with the American Society of Testing and Materials (ASTM) International D4318 test method (see Figure A1). Additional laboratory testing of soils collected revealed the near-surface clay soils possesses "medium" expansion potential when testing in accordance with ASTM D4829 test method (see Figures A2 and A3), which is consistent with the test results previously performed at the site.

Based on the laboratory test results, we conclude the native clays are capable of exerting significant expansion pressures on building foundations, interior floor slabs and exterior flatwork.

Recommendations to mitigate the effects of potentially expansive clays, such as granular import material to construct the building pads, lime treatment of the clays, and deepened foundations are provided in this report.

3.3 Bearing Capacity

In our opinion, the native soils are capable of supporting the proposed improvements. Our experience in the area also indicates that engineered fills composed of native soils or approved import soils that are placed and compacted in accordance with general engineering practices will be suitable for support of the proposed improvements.

3.4 Pavement Subgrade Quality

Laboratory tests results indicate the surface and near-surface soil possesses Resistance ("R") values of 5 or less when tested in accordance with California Test 301 (Figure A4). Previous samples tested at the site in November of 2009, also revealed R-values of 5. Based on the laboratory test results and our previous experience at the site with similar soil types we have selected an R-value of 5 for our design.

Based on our experience with similar soil conditions in the vicinity of the site, we anticipate lime-treatment of the near-surface clay soils can improve its support quality and reduce the required base material thickness for pavement sections. Recommendations regarding lime-treatment of the pavement subgrade soils are provided below and in the Pavement Design section of this report.

3.4.1 Chemical-Treatment of Soil

Chemical-treatment of soil can be a very effective and economical method to increase the subgrade quality of clayey soils to support pavements; reduce the moisture content of near-saturated soils, enabling construction to proceed during or shortly after the rainy season; and, to reduce the expansive characteristics of clayey soils.

Based on the pavement subgrade quality of the on-site near-surface clayey soils, we anticipate lime-treatment of the clayey soils can significantly improve the pavement support quality of the soils and reduce the required thickness of the aggregate base materials for new pavements. However, mixing of clayey soils with granular soils that may be encountered at the planned pavement subgrade may be required to adequately lime-treat the site. Alternatively, chemically treating with cement may be considered to increase the subgrade quality of the pavement subgrade soils and reduce the moisture content of near-saturated soils, enabling construction to proceed during or shortly after the rainy season.

For estimating purposes, based upon our experience, it is our opinion that pavements supported on native soils treated with at least four percent (by dry weight of soil) of lime or cement can be designed using an improved R-value of at least 40.

3.5 Groundwater Effect on Development

Groundwater was not encountered in the explored 15 to 16½ feet BGS of the borings performed at the school site on August 18, 2023. Groundwater was not encountered during previously performed explorations by our firm at the site in November of 2009. Review of available groundwater data revealed the groundwater elevation at nearby monitoring wells has ranged from 27 to 45 feet below the existing ground surface during the last 42 years. Groundwater levels at the site should be expected to fluctuate throughout the year based on variations in seasonal precipitation, local pumping, and other factors.

Based on current explorations performed at the site and historical groundwater data, we do not anticipate excavations within about 10 feet of the existing ground surface to encounter permanent groundwater, although locally perched water could be encountered and require localized dewatering (depending on the time of year). If perched groundwater is encountered, the use of sumps or submersible pumps could be used as methods to lower the groundwater level.

If excavations extend deeper than about 10 feet below the ground surface, and perched water is encountered, dewatering may be required. The dewatering method used will depend on the soil conditions, depth of the excavation and amount of groundwater present within the excavation. Dewatering, if required, should be the contractor's responsibility. The dewatering system should be designed and constructed by a dewatering contractor with local experience. We recommend the selected dewatering system lower the groundwater level to at least two feet below the bottom of the proposed excavations.

3.6 Excavation Conditions

The surface and near-surface soils at the site should be readily excavatable with conventional earthmoving and trenching equipment. Based on our borings, excavations associated with building foundations, shallow trenches for utilities, and other excavations less than five feet deep associated with the proposed construction, should stand vertically for short periods of time (i.e. less than one day) required for construction. However, cohesionless, saturated or disturbed soils, if encountered, may result in caving or sloughing; therefore, the contractor should be prepared to brace or shore the excavations, if necessary.

Excavations or trenches exceeding five feet in depth that will be entered by workers should be sloped, braced or shored to conform to current California Occupational Safety and Health Administration (Cal/OSHA) requirements. The contractor must provide an adequately constructed and braced shoring system in accordance with federal, state and local safety regulations for individuals working in an excavation that may expose them to the danger of moving ground.

Temporarily sloped excavations should be constructed no steeper than a one horizontal to one vertical (1H:1V) inclination. Temporary slopes likely will stand at this inclination for the short-term duration of construction, provided significant pockets of loose and/or saturated granular soils are not encountered. Flatter slopes would be required if these conditions are encountered.

Excavated materials should not be stockpiled directly adjacent to an open excavation to prevent surcharge loading of the excavation sidewalls. Excessive truck and equipment traffic should be avoided near excavations. If material is stored or heavy equipment is stationed and/or operated near an excavation, a shoring system must be designed to resist the additional pressure due to the superimposed loads.

3.7 Material Suitability for Engineered Fill Construction

The existing on-site native soils encountered at the boring locations are considered suitable for use as engineered fill construction, provided these materials do not contain significant quantities of organics, rubble and deleterious debris, and are at a proper moisture content capable of achieving the desired degree of compaction.

However, near-surface clays should not be used within the upper 12 inches of the final subgrade within interior and exterior slab-on-grade improvements unless those soils are lime treated as recommended herein. Imported materials, if necessary, should be granular and approved by our office prior to importing the materials to the site.

3.8 Preliminary Soil Corrosion Potential

One sample of near-surface soil was submitted to Sunland Analytical of Rancho Cordova, California, for testing to determine pH, chloride and sulfate concentrations, and minimum resistivity to help evaluate the potential for corrosive attack upon buried concrete. The results of the corrosivity testing are summarized below in Table 2. Copies of the test reports are presented in Figure A5.

TABLE 2: SOIL CORROSIVITY TESTING

Analyte	Test Method	Sample Identification
		B2 (0-5’)
pH	CA DOT 643 Modified*	7.78
Minimum Resistivity	CA DOT 643 Modified*	700 Ω-cm
Chloride	CA DOT 422	101.4 ppm

TABLE 2: SOIL CORROSIVITY TESTING		
Analyte	Test Method	Sample Identification
		B2 (0-5')
Sulfate	CA DOT 417	35.5 ppm

Notes: * = Small cell method; Ω-cm = Ohm-centimeters; ppm = Parts per million

The California Department of Transportation Corrosion and Structural Concrete Field Investigation Branch, Corrosion Guidelines (Version 3.2, dated May 2021), considers a site to be corrosive to foundation elements if one or more of the following conditions exists for the representative soil and/or water samples taken: has a chloride concentration greater than or equal to 500 ppm, sulfate concentration greater than or equal to 1500 ppm, or the pH is 5.5 or less.

Based on this criterion, the on-site soils tested are not considered corrosive to steel reinforcement properly embedded within Portland cement concrete (PCC).

Table 19.3.1.1 – Exposure Categories and Classes, of American Concrete Institute (ACI) 318-19, Section 19.3 – Concrete Durability Requirements, as referenced in Section 1904.1 of the 2022 CBC, indicates the severity of sulfate exposure for the sample tested is Exposure Class S0 (water-soluble sulfate concentration in contact with concrete is low and injurious sulfate attack is not a concern). The project Structural Engineer should evaluate the requirements of ACI 318-19 and determine their applicability to the site.

Universal Engineering Sciences are not corrosion engineers. Therefore, if it is desired to further define the soil corrosion potential at the site, a Corrosion Engineer should be consulted.

4.0 RECOMMENDATIONS

4.1 General

The recommendations in this report are based on assumed excavations and fills on the order of about one to three feet for the development of the site. We consider it essential that our office review grading and structural foundation plans to verify the applicability of the following recommendations, to verify that the intent of our recommendations has been incorporated into the construction documents, and to provide supplemental recommendations, if necessary.

The recommendations presented below are appropriate for typical construction in the spring through fall months. The on-site soils likely will be saturated by rainfall in the winter and spring months and will not be compactable without drying by aeration or chemical treatment. Soils present beneath existing slabs and pavements will be wet regardless of the time of year of construction. Should the construction schedule require work to continue during the wet months, additional recommendations can be provided, as conditions dictate.

Site preparation should be accomplished in accordance with the provisions of this report and the appended specifications. A representative of the Geotechnical Engineer should be present during all earthwork operations to evaluate compliance with the recommendations and the guide specifications included in this report. The Geotechnical Engineer of Record referenced herein is the Geotechnical Engineer that is retained to provide geotechnical engineering observation and testing services during construction.

4.2 Site Clearing

Existing improvements to be abandoned, including but not limited to: existing pavements, foundations (if encountered), and underground utilities, should be completely removed from the site. Areas of new construction should also be cleared of vegetation and irrigation systems. Excavations to remove these items should extend to undisturbed native soils. All trees/large brush designated for removal should include the rootball and roots ½ inch or larger in size.

Where practical, the clearing should extend a minimum of five feet beyond the limits of the proposed structural areas of the site which include the new building, pavements and slab-on-grade concrete.

Depressions resulting from removal of underground structures (e.g., foundations, utilities, etc.) should be cleaned of loose soil and properly backfilled in accordance with the recommendations of this report.

Existing pavements and flatwork (asphalt concrete and concrete), if any, that are not incorporated into the new design should be broken up and removed from the site. Alternatively, pulverized asphalt and

Portland cement concrete rubble and any underlying aggregate base may be used as fill provided it is processed into fragments less than three inches in largest dimension, is mixed with soil to form a compactable mixture, and approved by the Owner.

Soils containing excessive organic soils should be removed and not used within the pavements, slabs, and building areas. For this project, the acceptable organic content is less than four percent (4%) organics by weight as determined by ASTM D2974 (Organic Content by Ignition Method). In our opinion, soils having excessive organic matter contents should be removed to expose undisturbed native soils with acceptable organic contents.

Soils containing organic material may be used in landscape areas. However, the landscape architect should have the final decision as to the placement of soils containing organic material in landscape areas.

Where encountered, any loose, soft or saturated soils should be cleaned out to firm native soil and backfilled with engineered fill in accordance with the recommendations in this report. It is important that the Geotechnical Engineer's representative be present for a sufficient time during clearing operations to verify adequate removal of the surface and subsurface items, as well as the proper backfilling of resulting excavations.

4.3 Subgrade Preparation

Site clearing is expected to disturb the upper one to two feet of the site, and deeper disturbance will result where deeper underground utilities are removed or piers supporting pole mounted structures are removed. Subgrade preparation of the subgrade soils should include all soil that has been disturbed and/or areas where existing structures are removed to provide a uniform layer of engineered fill for support of the planned structures.

Due to the potential expansion characteristics of the native soils, the upper 12 inches of the final subgrade below the proposed building and exterior concrete flatwork should consist of imported non-expansive engineered fill, or the native clay soils should be chemically amended as noted below.

Following site clearing and stripping operations, areas to receive fill or to remain at-grade should be scarified to a depth of at least 12 inches, moisture conditioned to at least two percent above the optimum moisture content and uniformly compacted to not less than 90 percent of the ASTM D1557 maximum dry density or to the highest degree possible for the soil moisture content and stability at the time of construction. Scarification and recompaction should extend at least five feet beyond the perimeter of buildings and two feet beyond the outer edge of pavements. Unstable areas may require a layer of geotextile reinforcement at the time of construction. The need for geotextile reinforcement should be determined by the Geotechnical Engineer once the final subgrade has been exposed. If required, the building pad may be restored to grade with engineered fill compacted in lifts as recommended in this report. All fill soils should be compacted to at least 90 percent relative compaction.

Compaction of all subgrade soils should be performed using a heavy, self-propelled, sheepsfoot compactor capable of achieving the required compaction and must be performed in the presence of the Geotechnical Engineer's representative who will evaluate the performance of subgrade under compactive load. Difficulty in achieving subgrade compaction may be an indication of loose, soft or unstable soil conditions that could require additional excavation. If these conditions exist, additional subgrade stabilization recommendations may be required at the time of construction.

The upper six inches of pavement subgrades should be uniformly compacted to at least 95 percent relative compaction at a moisture content of at least the optimum moisture content, regardless of whether final grade is established by excavation, engineered fill or left at grade. Additional recommendations regarding pavement subgrades are provided in the Pavement Design section of this report.

4.4 Chemical-Treatment Alternative

Where 12-inches of lime-treated soil will be used as non-expansive fill, the upper 12 inches of final subgrade soils should be treated with at least four percent (by dry weight of soil) high-calcium or dolomitic quicklime. At least 4½ pounds of lime per cubic foot to a depth of 12 inches should be utilized to achieve the four percent mixture. Lime-stabilized soils should be compacted to at least 90 percent relative compaction within building pads and 95 percent relative compaction within pavement areas, at a moisture content at least two percent over optimum conditions. If necessary, our firm can provide additional recommendations for subgrade stabilization based on the soil conditions at the time of earthwork construction.

If undisturbed native soils are to be lime-treated, the scarification and compaction procedures outlined in the Subgrade Preparation section of this report are not required within the upper 12 inches of the final subgrade, prior to lime-treatment.

4.5 Engineered Fill Construction

On-site soils are suitable for engineered fill construction in structural areas provided the materials do not contain rubbish, rubble greater than three inches, and significant organic concentrations. Imported fill materials, if required, should be compactable, granular soils with an Expansion Index of 20 or less, and contain no particles greater than three inches in maximum dimension. Imported soils should be approved by our office prior to being transported to the site. In addition, if required for fire lane or vehicular pavement areas, imported fill within the upper three feet of pavement areas should possess an R-value of at least 20. Also, if import fills are required (other than aggregate base), the contractor must provide appropriate documentation that the import is clean of known contamination per Department of Toxic Substances Control (DTSC) and within acceptable corrosion limits.

Engineered fill should be placed in lifts that do not exceed six inches in compacted thickness. Native or imported clayey materials should be thoroughly moisture conditioned to at least two percent above the optimum moisture content and uniformly compacted to at least 90 percent of the ASTM D1557 maximum dry density. Approved granular imported fill materials should be uniformly moisture conditioned to at least the optimum moisture content and compacted to at least 90 percent relative compaction. Relative compaction should be based on the ASTM D1557 maximum dry density.

The upper 12 inches of final building pad subgrades, including adjacent exterior flatwork areas, should consist of non-expansive granular on-site or import soils compacted to at least 90 percent relative compaction at the optimum moisture content or above. Alternatively, the upper 12 inches may consist of lime-treated native clays compacted to at least 90 percent relative compaction at a moisture content of at least two percent above the optimum moisture content.

The upper six inches of untreated pavement subgrades should be uniformly compacted to at least 95 percent of the maximum dry density at a moisture content of at least two percent above the optimum moisture content, and must be stable under construction traffic prior to placement of aggregate base. Alternatively, the upper 12 inches of lime-treated subgrade soils should be compacted to at least 95 percent relative compaction at not less than two percent over the optimum moisture content.

Permanent excavation and fill slopes should be constructed no steeper than two horizontal to one vertical (2:1) and should be vegetated as soon as practical following grading to minimize erosion. Slopes should be over-built and cutback to design grades and inclinations.

4.5.1 Engineered Fill Controlled Low Strength Material

If required, the use of Controlled Low Strength Material (CLSM) should be placed in accordance with Section 1803A.5.9 of the 2019 CBC. The CLSM should possess a compressive strength between 50 and 150 psf as determined by ASTM D4832. A minimum slump is not required for CLSM provided the material submittal is reviewed prior to use. Prior to placement, the area to receive the material should be clean of loose soil, water and debris and approved by a representative of the Geotechnical Engineer. The material should be submitted for review and approval by the Geotechnical Engineer prior to placement. Compressive strength testing of CLSM is not considered necessary provided the placement is observed by the Geotechnical Engineer and the CLSM used at the site is approved by the Geotechnical Engineer before being placed.

4.6 Utility Trench Backfill

Utility trench backfill within structural areas (building, slabs and pavements) should be mechanically compacted as engineered fill in accordance with the following recommendations. Bedding and initial backfill around and over the pipe should conform to the pipe manufacturers recommendations and applicable sections of the governing agency standards. Utility trench backfill should be placed in maximum 12-inch thick lifts (compacted thickness), moisture conditioned to at least two percent above the optimum moisture content and mechanically compacted to at least 90 percent of the ASTM D1557 maximum dry density. Utility trench backfill within the upper six inches of final pavement subgrades should be compacted to at least 95 percent of the maximum dry density. Utility trench backfill should be continuously observed and tested during construction.

Backfill for the upper 12 inches of trenches must match the adjacent materials. That is, if the upper 12 inches of subgrades for the building pad and exterior flatwork consists of granular fill materials, the top 12 inches of trench backfill should consist of the same materials or Class 2 aggregate base. If the top 12 inches of the improvement areas consist of lime-treated soils, the upper 12 inches of trench backfill should consist of similar non-expansive material, such as controlled density fill (CDF) or aggregate base.

All underground utility trenches aligned nearly parallel with foundations should be at least five feet from the outer edge of foundations, wherever possible. If this is not practical, the trenches should not encroach into a zone extending at a one horizontal to one vertical (1:1) inclination below the bottom of the foundations.

Additionally, trenches parallel to existing foundations should not remain open longer than 72 hours. The intent of these recommendations is to prevent loss of both lateral and vertical support of foundations, resulting in possible settlement.

4.7 Foundation Design

The proposed modular buildings may be supported upon a continuous perimeter foundation with continuous and/or isolated interior spread foundations embedded at least 18 inches below lowest adjacent soil grade, provided the subgrade has been prepared in accordance with the Subgrade Preparation and Engineered Fill Construction sections of this report. For this project, lowest soil grade is defined as either the adjacent exterior soil grade or the soil subgrade beneath the building, whichever is lower. Continuous foundations should maintain a minimum width of 12 inches and isolated spread foundations should be at least 24 inches in plan dimension. The project structural engineer should determine the final dimensions and structural reinforcement of the foundations.

Foundations constructed within the building pads prepared as recommended may be sized utilizing a net allowable bearing capacity of 1500 pounds per square foot (psf) for dead plus live loads (based on a Factor of Safety of 2.0). This value may be increased by 1/3 to include wind or seismic forces. The weight of foundation concrete extending below the lowest adjacent soil grade may be disregarded in sizing computations.

Resistance to lateral foundation displacement may be computed using an allowable friction factor of 0.25, which may be multiplied by the effective vertical load on each foundation. Additional lateral resistance may be computed using an allowable passive earth pressure of 150 psf per foot of depth. These two modes of resistance should not be added unless the frictional value is reduced by 50 percent since full mobilization of these resistances typically occurs at different degrees of horizontal movement.

4.8 Drilled. Cast-in-Place Reinforced Concrete Piers (Drilled Piers)

Fence posts, light standards and other ancillary structures that will proportionally support more lateral loading than axial loading may be supported upon a deep foundation system consisting of drilled, cast-in-place reinforced concrete piers (drilled piers). Drilled piers should be at least 18 inches in diameter and extend to at least five feet below the existing ground surface. Piers so established may be designed based on an allowable end bearing capacity of 1200 psf or an allowable friction capacity of 60 psf for dead plus live loads. We recommend that adjacent piers be constructed no closer than two and a half

(2.5) pier diameters apart, as measured between centers of the piers. Drilled pier foundations should be structurally isolated from any adjacent concrete flatwork by a felt strip or similar material.

Uplift resistance of the pier foundations may be computed assuming the following resisting forces, where applicable: 1) the unit weight of foundation concrete (150 pound per cubic foot); and, 2) uplift resistance of 250 psf applied over the shaft area of the pier. Increased uplift resistance can be achieved by increasing the diameter of the pier or increasing the depth of the embedment depth.

Sizing of drilled piers to resist lateral loads can be evaluated using Section 1807.3.2 of the 2022 CBC. An allowable value of 250 pcf for lateral bearing as defined in Table 1806.2 of the CBC may be used for the coefficients S1 and S3 for the non-constrained and constrained conditions, respectively. Per Section 1806.1 of the 2022 CBC, an increase of 1/3 is permitted when using the alternate load combinations in Section 1605.3.2 that include wind or earthquake loads. The upper 12 inches of the subgrade should be neglected unless the drilled pier is surrounded by at least three feet of concrete on all sides.

The bottom of the pier excavations should be free of loose or disturbed soils prior to placement of the concrete. Cleaning of the bearing surface may be done mechanically with the belling bucket, but should be verified by the geotechnical engineer prior to concrete placement. Reinforcement and concrete should be placed in the pier excavations as soon as possible after excavation is completed to reduce the potential of sidewall caving into the excavations.

To reduce lateral movement of the drilled shafts, it is necessary to place the concrete for the drilled shafts in intimate contact with the surrounding soil. Any voids or enlargements in the shafts due to over-excavation or temporary casing installation shall be filled with concrete at the time the shaft concrete is placed.

If the drilled piers are constructed in the "dry" (with dry being less than two inches of water at the base of the excavation), the concrete may be placed by the free-fall method, using a short hopper or back-chute to direct the concrete flow out of the truck into a vertical stream of flowing concrete with a relatively small diameter. The stream should be directed to avoid hitting the sides of the excavation or any reinforcing cages. For the free-fall method of concrete placement, we recommend the concrete mix be designed with a slump of five to seven inches.

In general, we anticipate the drilled pier excavations will be relatively dry for pier excavations. However, perched groundwater may be encountered depending on the time of year when the piers are excavated. Where perched groundwater will not be controlled such that more than six inches of water accumulates at the bottom of the pier excavation and after it is confirmed that the excess water cannot be removed from the caisson excavation by bailing or with pumps, concrete should be placed using a tremie. For concrete placed using the tremie method, a slump of six to eight inches, and a maximum aggregate size of ¾-inch is recommended. The required slump should be obtained by using plasticizers or water-reducing agents. Addition of water on-site to establish the recommended slump should not be allowed.

When extracting temporary casings or tremie methods from the excavation, care should be taken to maintain a head of concrete to prevent infiltration of water and soil into the shaft area. The head of concrete should always be greater than the head of water trapped outside the pier or tremie, taking into account the differences in unit weights of concrete and water.

We estimate total settlement for drilled pier foundations using the recommended maximum net allowable bearing pressure and allowable capacities presented above, will be less than one inch. Differential settlements may be as much as the total settlement between individual pier elements. The settlement estimates are based on the available soil information, our experience with similar structures and soil conditions, and field verification of suitable bearing soils during foundation construction.

4.9 Interior Floor Slab Support

Interior concrete slab-on-grade floors can be supported upon the soil subgrade (either non-expansive imported materials and/or chemically treated native soils) prepared in accordance with the recommendations in this report and maintained in a moist condition and are protected from disturbance. If this is not the case and the subgrade soils become dry and/or disturbed, the building pad will require additional scarification, moisture conditioning and compaction prior to construction of the interior floor slabs.

Interior concrete slab-on-grade floors should be at least five inches thick and be reinforced for crack control. Final slab thickness, reinforcement and joint spacing should be determined by the slab designer. Proper and consistent location of the reinforcement near mid-slab is essential to its performance. The risk of uncontrolled shrinkage cracking is increased if the reinforcement is not properly located within the slab. Temporary loads exerted during construction from vehicle traffic, cranes, construction equipment, storage of palletized construction materials, etc. should be considered in the design of the thickness and reinforcement of the interior slab.

Floor slabs that will receive moisture sensitive floor covering (e.g. vinyl covering, wood-laminate, etc.) should be underlain by a layer of free-draining crushed rock or gravel, serving as a deterrent to migration of capillary moisture. The gravel/crushed rock layer should be between four and six inches thick and graded such that 100 percent passes a one-inch sieve and no appreciable amount passes a No. 4 sieve. Additional moisture protection may be provided by placing a plastic, water vapor retarder (at least 10-mils thick) directly over the gravel/crushed rock. The water vapor retarder should meet or exceed the minimum specifications for plastic water vapor retarders as outlined in ASTM E1745 and be installed in strict conformance with the manufacturer's recommendations.

Floor slab construction over the past 30 years or more has included placement of a thin layer of sand over the vapor retarder membrane where capillary break gravel is used. The intent of the sand is to aid in the proper curing of the slab concrete. However, recent debate over excessive moisture vapor emissions from floor slabs includes concern for water trapped within the sand. Therefore, we consider the use of the sand layer as optional. The concrete curing benefits should be weighed against efforts to reduce slab moisture vapor transmission.

The recommendations presented above are intended to mitigate any significant soils-related cracking of the slab-on-grade floors. More important to the performance and appearance of a Portland cement concrete slab is the quality of the concrete, the workmanship of the concrete contractor, the curing techniques utilized and the spacing of control joints.

4.10 Floor Slab Moisture Penetration Resistance

It is considered likely that floor slab subgrade soils will become wet to near saturated at some time during the life of structures. This is a certainty when slabs are constructed during the wet seasons, or when constantly wet ground or poor drainage conditions exist adjacent to structures. For this reason, it should be assumed that interior slabs intended for moisture-sensitive floor coverings or materials, require protection against moisture or moisture vapor penetration. Standard practice includes the gravel/crushed rock and vapor retarder as suggested above. However, the gravel/crushed rock and plastic membrane offer only a limited, first line of defense against soil-related moisture; they do not moisture-proof the slab. Recommendations contained in this report concerning foundation and floor slab design are presented as minimum requirements, only from the geotechnical engineering standpoint.

It is emphasized that the use of gravel/crushed rock and plastic membrane below the slab will not "moisture proof" the slab, nor does it assure that slab moisture transmission levels will be low enough to prevent damage to floor coverings or other building components. If increased protection against moisture vapor penetration of slabs is desired, a concrete moisture protection specialist should be consulted. The design team should consider all available measures for slab moisture protection. It is commonly accepted that maintaining the lowest practical water-cement ratio in the slab concrete is one of the most effective ways to reduce future moisture vapor penetration of the completed slabs.

4.11 Exterior Flatwork Construction (Non-Pavement)

The upper 12 inches of final soil subgrade for exterior concrete flatwork areas should consist of compactable, onsite native and/or imported very low-expansive (Expansion Index ≤ 20) granular soils or lime-treated on-site clay soils placed and compacted in accordance with the Engineered Fill Construction recommendations included in this report. Exterior flatwork subgrade soils should be maintained in a moist condition and protected from disturbance.

Exterior flatwork should be underlain by at least four inches of Class 2 aggregate base compacted to at least 95 percent relative compaction. The aggregate base can be included in the 12 inches of very-low expansive granular soils (not lime-treated soils), or the very-low expansive layer can be completely composed off Class 2 aggregate base. If the upper 12 inches of final subgrade for exterior flatwork will consist of lime-treated clay soils, the four inches of aggregate base should be placed above the lime-treated soils.

Exterior flatwork concrete should be at least four inches thick. Consideration should be given to thickening the edges of the slabs at least twice the slab thickness where wheel traffic is expected over the slabs. Expansion joints should be provided to allow for minor vertical movement of the flatwork. Exterior flatwork should be constructed independent of other structural elements by the placement of a layer of felt material between the flatwork and the structural element. Doweling of new flatwork into existing improvements (i.e., adjacent buildings, existing flatwork, etc.) is not recommended. The slab designer should determine the final thickness, strength and joint spacing of exterior slab-on-grade concrete. The slab designer should also determine if slab reinforcement for crack control is required and determine final slab reinforcing requirements.

Areas adjacent to exterior flatwork should be landscaped to maintain more uniform soil moisture conditions adjacent to and under flatwork. We recommend final landscaping plans not allow fallow ground adjacent to exterior concrete flatwork.

Practices recommended by the Portland Cement Association (PCA) for proper placement, curing, joint depth and spacing, construction, and placement of concrete should be followed during exterior concrete flatwork construction.

4.12 Site Drainage

Final site grading should be accomplished to provide positive drainage of surface water away from structures and prevent ponding of water adjacent to the foundations. The grade adjacent to the relocated structures should be sloped away from foundations at a minimum two percent slope for a distance of at least five feet, where possible. Ponding of surface water should not be allowed adjacent to the structure or exterior concrete flatwork.

4.13 Pavement Design

We are providing several pavement design alternative designs based on the soil conditions encountered at the site, our experience, and using design Traffic Indices (TIs) considered appropriate for the proposed construction.

Based on laboratory test results for the surface and near-surface clay soils present at the site and our experience in the area, we used a Resistance ("R") value of 5 for untreated pavement subgrades. An assumed R-value of 40 was used for lime-treated pavement subgrades. Pavement sections presented in Table 3 have been calculated using the above R-values and traffic indices (TIs) assumed to be appropriate for this project. The procedures used for pavement design are in general conformance with Chapters 600 to 670 of the *California Highway Design Manual*, 7th Edition. The project civil engineer should determine the appropriate traffic index for pavements based on anticipated traffic conditions. If needed, we can provide additional pavement sections for different traffic indices.

Table 3: Pavement Design Alternatives

Traffic Index (TI)	Pavement Use	Untreated Subgrades R-value = 5			Chemically Treated Subgrades R-value = 40		
		Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)	Portland Cement Concrete (inches)	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)	Portland Cement Concrete (inches)
4.5		2½*	10	--	2½*	4	

Traffic Index (TI)	Pavement Use	Untreated Subgrades R-value = 5			Chemically Treated Subgrades R-value = 40		
		Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)	Portland Cement Concrete (inches)	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)	Portland Cement Concrete (inches)
	Automobile Parking	--	6	4		4	4
6.5	Emergency Vehicle Traffic	3	16	--	3	8	
		4*	14	--	4*	6	
		--	7	5		6	4

* = Asphalt concrete thickness contains the Caltrans safety factor.

We emphasize that the performance of pavement is critically dependent upon uniform and adequate compaction of the soil subgrade, as well as all engineered fill and utility trench backfill within the limits of the pavements. We recommend that final pavement subgrade preparation (i.e., scarification, moisture conditioning and compaction) be performed after underground utility construction is completed and just prior to aggregate base placement.

The upper six inches of untreated pavement subgrade soils and upper 12 inches of lime-treated subgrade soils should be compacted to at least 95 percent relative compaction at no less than the optimum moisture content, maintained in a moist condition and protected from disturbance. All aggregate base should be compacted to at least 95 relative compaction.

It has been our experience that pavement failures may occur where a non-uniform or disturbed subgrade soil condition is created. Subgrade disturbances can result if pavement subgrade preparation is performed prior to underground utility construction and/or if a significant time period passes between subgrade preparation and placement of aggregate base. Therefore, we recommend that final pavement subgrade preparation (i.e., scarification, moisture conditioning, and compaction) be performed just prior to aggregate base placement.

In the summer heat, high axle loads coupled with shear stresses induced by sharply turning tire movements can lead to failure in asphalt concrete pavements. Therefore, PCC pavements should be used in areas subjected to concentrated heavy wheel loading, such as entryways, in front of trash enclosures, and/or within loading areas. Alternate PCC pavement sections have been provided above in Table 3.

We suggest concrete slabs be constructed with thickened edges in accordance with American Concrete Institute (ACI) design standards, latest edition. Reinforcing for crack control, if desired, should be provided in accordance with ACI guidelines. At a minimum, we recommend No. 3 reinforcing bars at 18 inches on center for crack control. Reinforcement must be located at mid-slab depth to be effective. Joint spacing and details should conform to the current PCA or ACI guidelines. PCC should achieve a minimum compressive strength of 3,500 pounds per square inch at 28 days.

All pavement materials and construction methods of structural pavement sections should conform to the applicable provisions of the *Caltrans Standard Specifications*, latest edition.

Chemical-treatment of Pavement Subgrade Soils

On-site clay soils are anticipated to react well with the addition of quicklime (high-calcium or dolomitic) and could enhance the support characteristics of the subgrade and allow for a reduction in the aggregate base section. If lime-treatment of subgrade soils is selected, the lime-treatment of subgrade soils should be performed in general conformance with Section 24 of the *Caltrans Standard Specifications*, latest edition.

For estimating purposes only, we recommend a minimum spread rate of at least 4½ pounds of high calcium or dolomitic quicklime per square foot of treated soil, at a depth sufficient to produce a compacted lime-treated layer 12 inches thick. Please note that sandy soils, if encountered, will likely require blending with clayey soils before amendment with quicklime will be effective. Consideration may also be given to chemically treating sandy soils with cement to provided a uniform subgrade.

After the materials have been thoroughly mixed and re-mixed, the soil-lime mixture should be compacted to at least 95 percent relative compaction at a moisture content at least two percent over optimum conditions. Compaction should be achieved using a heavy, self-propelled sheep's-foot compactor (Rex or equivalent).

The performance of lime-stabilized soils is critically dependent on uniform mixing of the lime into the subgrade soil and providing a proper curing period following amendment of the lime. An experienced lime-stabilization contractor coupled with a comprehensive quality control program is generally required to achieve the best possible stabilized subgrade.

The major disadvantage of lime-treated subgrades supporting pavements results from shrinkage of the treated material, similar to shrinkage of structural concrete. The shrinkage can produce reflective cracking through the asphalt concrete surface. Proper curing techniques can minimize this effect.

4.14 Geotechnical Engineering Construction Observation Services

Site preparation should be accomplished in accordance with the recommendations of this report. Representatives of the Geotechnical Engineer should be present during site preparation and all grading operations to observe and test the fill to verify compliance with our recommendations and the job specifications. Testing frequency will depend on how the site is graded and should be determined during the rough grading operations. These services are beyond the scope of work authorized for this investigation.

In the event that Universal Engineering Sciences is not retained to provide geotechnical engineering observation and testing services during construction, the Geotechnical Engineer retained to provide these services should indicate in writing that they agree with the recommendations of this report or prepare supplemental recommendations as necessary. A final report by the Geotechnical Engineer providing construction testing services should be prepared upon completion of the project.

4.15 Additional Services

Our firm should be retained to review the final plans and specifications to determine if the intent of our recommendations has been implemented in those documents. We would be pleased to submit a proposal to provide these services upon request.

5.0 LIMITATIONS

Our recommendations are based upon the information provided regarding the proposed project, combined with our analysis of site conditions revealed by the field exploration and laboratory testing programs. We have used our engineering judgment based upon the information provided and the data generated from our investigation. This report has been prepared in substantial compliance with generally accepted geotechnical engineering practices that exist in the area of the project at the time the report was prepared. No warranty, either express or implied, is provided.

If the proposed construction is modified or re-sited; or, if it is found during construction that subsurface conditions differ from those we encountered at the boring locations, we should be afforded the opportunity to review the new information or changed conditions to determine if our conclusions and recommendations must be modified.

We emphasize that this report is applicable only to the proposed construction and the investigated site, and should not be utilized for construction on any other site.

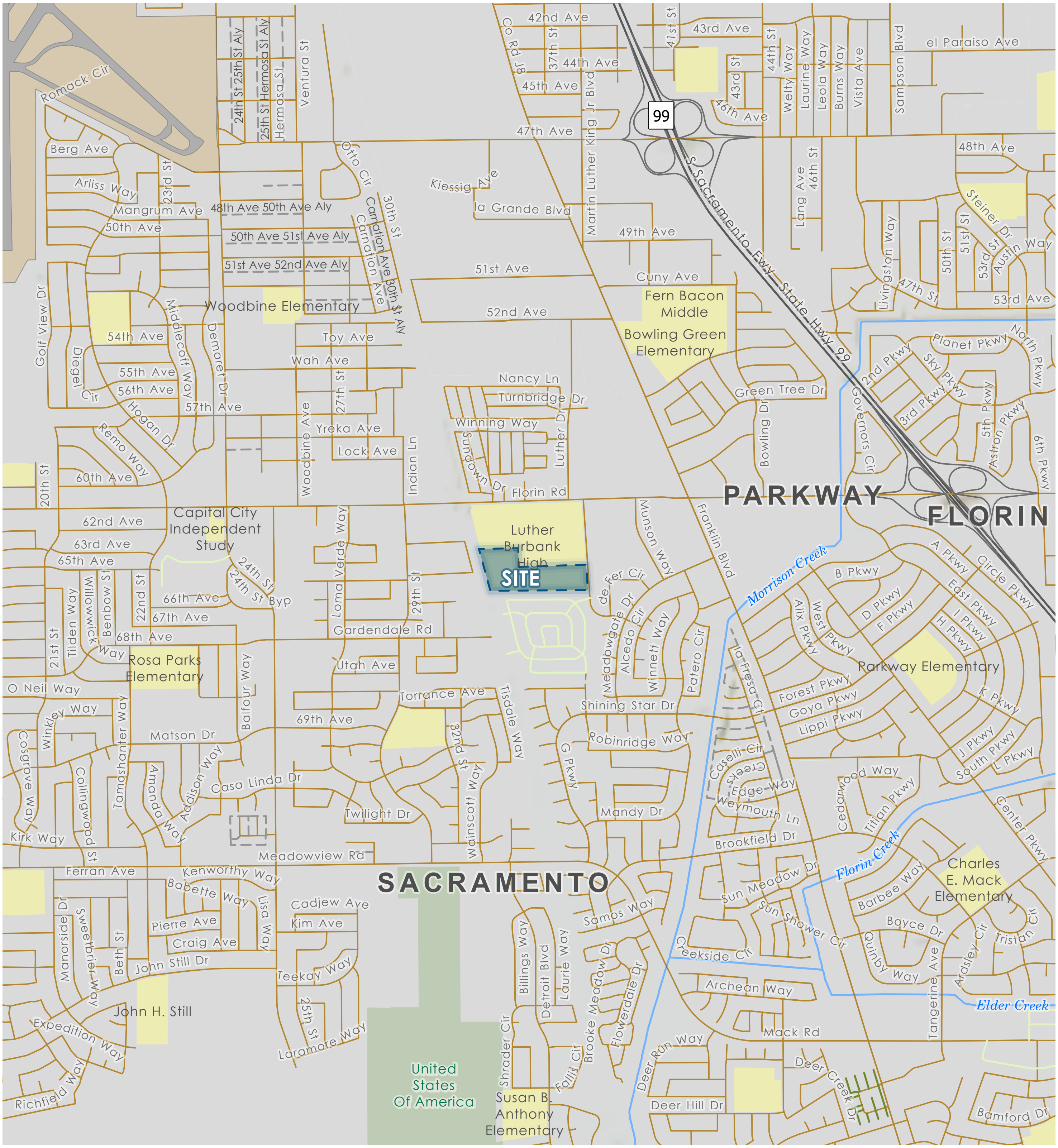
The conclusions and recommendations of this report are considered valid for a period of two years. If design is not completed and construction has not started within two years of the date of this report, the report must be reviewed and updated if necessary.

Universal Engineering Sciences (UES)

LICENSED PROFESSIONAL ENGINEER
DEAN R. STANPHILL
No. 2271
Exp. 12/31/24
GEOTECHNICAL
STATE OF CALIFORNIA

Dean Stanphill, PE
Principal

FIGURES



Spatial Data provided by Esri, NOAA, and USGS.
Projection: NAD 1983 2011 StatePlane California II FIPS 0402 Ft US

VICINITY MAP

LUTHER BURBANK HIGH SCHOOL ATHLETIC FIELD IMPROVEMENTS

Sacramento, California

FIGURE	1
DRAWN BY	KO
CHECKED BY	JRY
PROJECT MGR	JRY
DATE	09/2023
4630.2300086.0016	

Approximate Site Boundary

Approximate Boring Location

+ Approximate Previous Boring Location (WKA No. 8659.01P)

● Approximate Previous Bulk Sample (WKA No. 8659.01P)

N

0 75 150

Feet

Aerial imagery provided by Esri.
Projection: NAD 1983 2011 StatePlane California II FIPS 0402 Ft US

UES

SITE PLAN

LUTHER BURBANK HIGH SCHOOL ATHLETIC FIELD IMPROVEMENTS

Sacramento, California

FIGURE	2
DRAWN BY	KO
CHECKED BY	JRY
PROJECT MGR	JRY
DATE	09/2023
4630.2300086.0016	

Project: Luther Burbank High School Athletic Field Improvements
Project Location: 3500 Florin Rd, Sacramento, California
Project Number: 4630.2300086.0016

LOG OF SOIL BORING B1

Date(s) Drilled	8/18/23	Logged By	KO	Checked By	JRY
Drilling Method	Solid Flight Auger	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole	15.0 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	7"	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet		Sampling Method(s)	2.0" Modified California with 6-inch sleeve	Drill Hole Backfill	Soil Cuttings
Remarks	Bulk (0-5'); RV = 5			Driving Method and Drop	140lb auto. hammer with 30" drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Dark brown, moist, stiff, moderately cemented, lean CLAY (CL)						
				■	B1-1I	18	15.6	98	PP = 4.5+ tsf
			light brown, hard, with sand	■	B1-2I	44	13.7	108	PP = 4.5+ tsf
	5								
			Light brown, moist, very dense, fine silty SAND (SM)						
	10			■	B1-3I	50/6			
			Light brown, moist, hard, sandy SILT (ML) with clay						
	15			■	B1-4I	39			

Boring was terminated at approximately 15 feet below existing ground surface.
Groundwater not encountered.

BORING LOG 4630.23000867.0016 - LUTHER BURBANK HS.GPJ WKA.GDT 10/16/23 2:13 PM

UES™

FIGURE 3

Project:	**Luther Burbank High School Athletic Field Improvements**
Project Location:	**3500 Florin Rd, Sacramento, California**
Project Number:	**4630.2300086.0016**

LOG OF SOIL BORING B2

Date(s) Drilled	**8/18/23**	Logged By	**KO**	Checked By	**JRY**
Drilling Method	**Solid Flight Auger**	Drilling Contractor	**V&W Drilling**	Total Depth of Drill Hole	**15.0 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**7"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet		Sampling Method(s)	**2.0" Modified California with 6-inch sleeve**	Drill Hole Backfill	**Soil Cuttings**
Remarks	**Bulk (0-5'); RV = 5, PI = 33, EI = 90**			Driving Method and Drop	**140lb auto. hammer with 30" drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Dark grayish brown, moist, stiff, lean to fat CLAY (CL-CH) with fine sand						
				■	B2-1I	18	12.8	96	PP = 4.5+ tsf
	5		light brown mottled with very pale orange, moderately cemented, hard, with silt (no sand)	■	B2-2I	51	16.2	102	PP = 4.5+ tsf
			Very pale orange, moist, hard, sandy SILT (ML)						
	10			■	B2-3I	48			
			Very pale orange, moist, very hard, silty CLAY (CL) with sand						
	15			■	B2-4I	60			PP = 4.5 tsf
			Boring was terminated at approximately 15 feet below existing ground surface. Groundwater not encountered.						

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FIGURE 4

Project:	**Luther Burbank High School Athletic Field Improvements**
Project Location:	**3500 Florin Rd, Sacramento, California**
Project Number:	**4630.2300086.0016**

LOG OF SOIL BORING B3

Date(s) Drilled	**8/18/23**	Logged By	**KO**	Checked By	**JRY**
Drilling Method	**Solid Flight Auger**	Drilling Contractor	**V&W Drilling**	Total Depth of Drill Hole	**16.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**7"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet		Sampling Method(s)	**2.0" Modified California with 6-inch sleeve**	Drill Hole Backfill	**Soil Cuttings**
Remarks	**Bulk (0-5')**			Driving Method and Drop	**140lb auto. hammer with 30" drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			SAMPLE DATA / **TEST DATA**						
		CL	Brown, moist, very stiff, silty CLAY (CL) with sand						
				■	B3-1I	43			PP = 4.5+ tsf
	5		light brown, variable cemented, increased sand content	■	B3-2I	42			PP = 4.5+ tsf
		SM	Very pale orange, moist, very dense, silty fine SAND (SM)						
	10			■	B3-3I	57			
		CL	Very pale orange, moist, hard, silty CLAY (CL) with fine sand						
	15			■	B3-4I	69			PP = 4.5+ tsf

Boring was terminated at approximately 16½ feet below existing ground surface.
Groundwater not encountered.

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FIGURE 5

Project: Luther Burbank High School Athletic Field Improvements
Project Location: 3500 Florin Rd, Sacramento, California
Project Number: 4630.2300086.0016

LOG OF SOIL BORING B4

Sheet 1 of 1

Date(s) Drilled	**8/18/23**	Logged By	**KO**	Checked By	**JRY**
Drilling Method	**Solid Flight Auger**	Drilling Contractor	**V&W Drilling**	Total Depth of Drill Hole	**15.0 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**7"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet		Sampling Method(s)	**2.0" Modified California with 6-inch sleeve**	Drill Hole Backfill	**Soil Cuttings**
Remarks	**Bulk (0-5')**			Driving Method and Drop	**140lb auto. hammer with 30" drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
	0	CL	Dark grayish brown, moist, stiff, CLAY (CL)						
				■	B4-1I	17			PP = 4.5+ tsf
			Very pale orange mottled with light brown, very hard, with trace sand	■	B4-2I	50/5	16.0	107	UCC = 4.5+ tsf
	5								
		ML	Very pale orange, moist, very stiff, fine sandy SILT (ML)						
				■	B4-3I	27	14.1	91	
	10								
		CL	Light brown, moist, hard, silty CLAY (CL) with trace sand						
				■	B4-4I	70			PP = 4.5+ tsf
	15		Boring was terminated at approximately 15 feet below existing ground surface. Groundwater not encountered.						

BORING LOG 4630.23000867.0016 - LUTHER BURBANK HS.GPJ WKA.GDT 10/16/23 2:13 PM

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FIGURE 6

Project: Luther Burbank High School Athletic Field Improvements Project Location: 3500 Florin Rd, Sacramento, California Project Number: 4630.2300086.0016	**LOG OF SOIL BORING B5** Sheet 1 of 1

Date(s) Drilled	**8/18/23**	Logged By	**KO**	Checked By	**JRY**
Drilling Method	**Solid Flight Auger**	Drilling Contractor	**V&W Drilling**	Total Depth of Drill Hole	**16.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**7"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet		Sampling Method(s)	**2.0" Modified California with 6-inch sleeve**	Drill Hole Backfill	**Soil Cuttings**
Remarks	**Bulk (0-5'); PI = 25, EI = 70**			Driving Method and Drop	**140lb auto. hammer with 30" drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Light brown, moist, medium dense, medium to coarse sandy CLAY (CL)		B5-1I	18	5.6	17	
	5		Very pale orange, moist, dense, sandy SILT (ML)		B5-2I	50/4	89.0	93	
	10		Very pale orange, moist, medium dense, silty fine SAND (SM)		B5-3I	23			
	15		Light brown mottled with very pale orange, moist, dense, fine sandy SILT (ML)		B5-4I	39			

Boring was terminated at approximately 16½ feet below existing ground surface.
Groundwater not encountered.

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FIGURE 7

Project: Luther Burbank High School Athletic Field Improvements
Project Location: 3500 Florin Rd, Sacramento, California
Project Number: 4630.2300086.0016

LOG OF SOIL BORING B6

Date(s) Drilled	8/18/23	Logged By	KO	Checked By	JRY
Drilling Method	Solid Flight Auger	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole	15.0 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	7"	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet		Sampling Method(s)	2.0" Modified California with 6-inch sleeve	Drill Hole Backfill	Soil Cuttings
Remarks				Driving Method and Drop	140lb auto. hammer with 30" drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0	CL	Brown, moist, stiff, lean CLAY (CL)						
				■	B6-1I	17			PP = 4.5+ tsf
			very pale orange, hard, silty	■	B6-2I	47			PP = 4.5+ tsf
	5								
	7	SM	Brown, moist, medium dense, silty fine to medium SAND (SM)						
				■	B6-3I	24			
	10								
	12	ML	Light brown mottled with very pale orange, moist, very hard, clayey SILT (ML)						
				■	B6-4I	60/6			
	15								

Boring was terminated at approximately 15 feet below existing ground surface.
Groundwater not encountered.

UES

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D2487)

MAJOR DIVISIONS		USCS[4]	CODE	CHARACTERISTICS
COARSE GRAINED SOILS (More than 50% of soil > no. 200 sieve size)	GRAVELS[1] (More than 50% of coarse fraction > no. 4 sieve size)	GW		Well-graded gravels or gravel - sand mixtures, trace or no fines
		GP		Poorly graded gravels or gravel - sand mixtures, trace or no fines
		GM		Silty gravels, gravel - sand - silt mixtures, containing little to some fines[2]
		GC		Clayey gravels, gravel - sand - clay mixtures, containing little to some fines[2]
	SANDS[1] (50% or more of coarse fraction < no. 4 sieve size)	SW		Well-graded sands or sand - gravel mixtures, trace or no fines
		SP		Poorly graded sands or sand - gravel mixtures, trace or no fines
		SM		Silty sands, sand - gravel - silt mixtures, containing little to some fines[2]
		SC		Clayey sands, sand - gravel - clay mixtures, containing little to some fines[2]
FINE GRAINED SOILS (50% or more of soil < no. 200 sieve size)	SILTS & CLAYS LL < 50	ML		Inorganic silts, gravely silts, and sandy silts that are non-plastic or with low plasticity
		CL		Inorganic lean clays, gravelly lean clays, sandy lean clays of low to medium plasticity[3]
		OL		Organic silts, organic lean clays, and organic silty clays
	SILTS & CLAYS LL ≥ 50	MH		Inorganic elastic silts, gravelly elastic silts, and sandy elastic silts
		CH		Inorganic fat clays, gravelly fat clays, sandy fat clays of medium to high plasticity
		OH		Organic fat clays, gravelly fat clays, sandy fat clays of medium to high plasticity
HIGHLY ORGANIC SOILS		PT		Peat
ROCK		RX		Rocks, weathered to fresh
FILL		FILL		Artificially placed fill material

OTHER SYMBOLS

= Drive Sample: 2-1/2" O.D. Modified California sampler

= Drive Sampler: no recovery

= SPT Sampler

= Initial Water Level

= Final Water Level

— — — = Estimated or gradational material change line

——— = Observed material change line

Laboratory Tests

CR = Corrosion
PI = Plasticity Index
EI = Expansion Index
UCC = Unconfined Compression Test (TSF)
TR = Triaxial Compression Test
GR = Gradational Analysis (Sieve/Hydro)
FC = Wash (Fines Content)
PP = Pocket Penetrometer Test (TSF)
PID = Photo Ionization Detector Test (PPM)
RV = Resistance ("R") Value

REF = Refusal (>50 blows in 6 inches)

GRAIN SIZE CLASSIFICATION

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS (b)	Above 12"	Above 300
COBBLES (c)	12" to 3"	300 to 75
GRAVEL (g) coarse fine	3" to No. 4 3" to 3/4" 3/4" to No. 4	75 to 4.75 75 to 19 19 to 4.75
SAND coarse medium fine	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.75 to 0.075 4.75 to 2.00 2.00 to 0.425 0.425 to 0.075
SILT & CLAY	Below No. 200	Below 0.075

Trace - Less than 5 percent
Few - 5 to 10 percent
Little - 15 to 25 percent
Some - 35 to 45 percent
Mostly - 50 to 100 percent

* Percents as given in ASTM D2488

NOTES:

1. Coarse grained soils containing 5% to 12% fines, use dual classification symbol (ex. SP-SM).
2. If fines classify as CL-ML (4<PI<7), use dual symbol (ex. SC-SM).
3. Silty Clays, use dual symbol (CL-ML).
4. Borderline soils with uncertain classification list both classifications (ex. CL/ML).

UES™

UNIFIED SOIL CLASSIFICATION SYSTEM

LUTHER BURBANK HIGH SCHOOL ATHLETIC IMPROVEMENTS

Sacramento, California

FIGURE	9
DRAWN BY	KO
CHECKED BY	JRY
PROJECT MGR	JRY
DATE	09/2023
4630.2300086.0016	

APPENDIX A

General Project Information, Laboratory Testing and Results

APPENDIX A

A. GENERAL INFORMATION

The performance of a geotechnical engineering study for the proposed Luther Burbank High School Athletic Improvements project located at Luther Burbank High School in Sacramento, California was authorized by the Sacramento City Unified School District on July 25, 2023. Authorization was for a study as described in our proposal letter dated July 10, 2023, sent to Sacramento City Unified School District whose mailing address is 425 1st Avenue, Sacramento, California, 95818.

B. FIELD EXPLORATIONS

As part of our study for the proposed improvements, our field exploration included drilling and sampling of six borings (B1 through B6) at the approximate locations shown on Figure 2.

The soil borings were performed on August 18, 2023, to depths ranging from about 15 to 16½ feet below existing site grades utilizing a CME-75 truck-mounted drilling rig equipped with six-inch-diameter solid flight augers. Soil samples were recovered at various intervals with a 2½-inch outside diameter (O.D.), 2-inch inside diameter (I.D.), modified California split-spoon sampler. The sampler was driven by an automatic 140-pound hammer freely falling 30 inches. The number of blows of the hammer required to drive each six-inch interval of the 18-inch long samplers were recorded. The sum of the blows required to drive the sampler the lower 12-inch interval, or portion thereof, is designated the penetration resistance or "blow count" for that particular drive.

The modified California samples were retained in 2-inch diameter by 6-inch long, thin-walled brass tubes contained within the sampler. After recovery, the field representative visually classified the soil recovered in the tubes. After the samples were classified, the ends of the tubes were sealed to preserve the natural moisture contents.

In addition to the driven samples, representative bulk samples of near-surface soils also were collected and retained in plastic bags. Driven and bulk samples were taken to our laboratory for additional soil classification and selection of samples for testing.

Pocket penetrometer testing was performed during drilling operations on select cohesive soil samples obtained at the boring locations. In pocket penetrometer testing, the unconfined compressive strength of a cohesive soil sample is estimated by measuring the resistance of the sample to penetration of a relatively small, calibrated, spring-loaded cylinder. The maximum capacity of the penetrometer is 4.5 tons per square-foot (tsf). The unconfined compressive strength estimated from pocket penetrometer testing on the select cohesive soil samples is included on the boring logs at the depth the sample tested was obtained. The approximate undrained shear strength of the samples tested is one-half of the unconfined compressive strength.

Descriptions of the soils encountered in the boring locations are presented on Figures 3 through 8. An explanation of the Unified Soil Classification System symbols used in the descriptions is presented on Figure 9.

C. LABORATORY TESTING

Two representative near-surface samples were subjected to Atterberg Limits tests (ASTM D4318). The results of this test are presented in Figure A1.

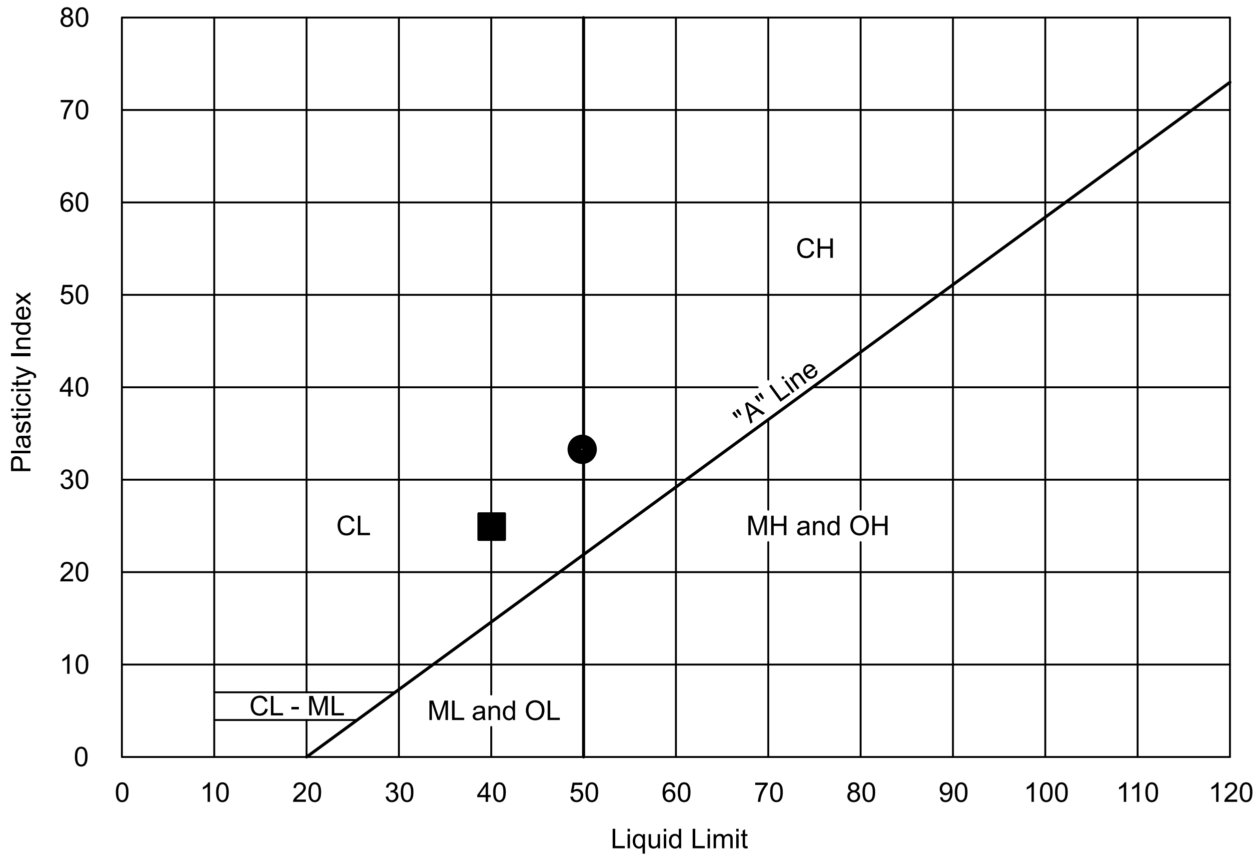
Two representative near-surface soil samples were tested for Expansion Index (ASTM D4829) with results presented in Figures A2 and A3.

Two representative samples of near-surface soil were subjected to Resistance-value ("R") testing in accordance with California Test 301. The results of the R-value tests are presented in Figure A4.

One sample of the near-surface soil was submitted to Sunland Analytical to determine the soil pH, minimum resistivity (California Test 643), Sulfate concentration (California Test 417) and Chloride concentration (California Test 422). The results of these tests are presented on Figures A5.

ATTERBERG LIMITS

ASTM D4318



KEY SYMBOL	LOCATION	SAMPLE DEPTH	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		PASSING No. 200 SIEVE (%)	UNIFIED SOIL CLASSIFI-CATION SYMBOL
				LIQUID LIMIT (%)	PLASTICITY INDEX (%)		
●	B2	0-5'	---	50	33	---	CL-CH
■	B5	0-5'	---	40	25	---	CL

ATTERBERG LIMITS

LUTHER BURBANK HIGH SCHOOL ATHLETIC IMPROVEMENTS

Sacramento, California

UES™

FIGURE	A1
DRAWN BY	KO
CHECKED BY	JRY
PROJECT MGR	JRY
DATE	09/2023
4630.2300086.0016	

EXPANSION INDEX TEST RESULTS

ASTM D4829

MATERIAL DESCRIPTION: Brown, lean to fat CLAY (CL-CH) with fine sand

LOCATION: B2

Sample Depth	Pre-Test Moisture (%)	Post-Test Moisture (%)	Dry Density (pcf)	Expansion Index
0-5'	12.9	28.0	100.9	**90**

CLASSIFICATION OF EXPANSIVE SOIL *

EXPANSION INDEX	POTENTIAL EXPANSION
0 - 20	Very Low
21 - 50	Low
51 - 90	**Medium**
91 - 130	High
Above 130	Very High

* From ASTM D4829, Table 1

UES™

EXPANSION INDEX

LUTHER BURBANK HIGH SCHOOL ATHLETIC IMPROVEMENTS

Sacramento, California

FIGURE	A2
DRAWN BY	KO
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PROJECT MGR	JRY
DATE	09/2023

4630.2300086.0016

EXPANSION INDEX TEST RESULTS

ASTM D4829

MATERIAL DESCRIPTION: Light brown, sandy CLAY (CL)

LOCATION: B5

Sample Depth	Pre-Test Moisture (%)	Post-Test Moisture (%)	Dry Density (pcf)	Expansion Index
0-5'	11.1	23.4	103.7	**70**

CLASSIFICATION OF EXPANSIVE SOIL *

EXPANSION INDEX	POTENTIAL EXPANSION
0 - 20	Very Low
21 - 50	Low
51 - 90	**Medium**
91 - 130	High
Above 130	Very High

* From ASTM D4829, Table 1

UES™

EXPANSION INDEX

LUTHER BURBANK HIGH SCHOOL ATHLETIC IMPROVEMENTS

Sacramento, California

FIGURE	A3
DRAWN BY	KO
CHECKED BY	JRY
PROJECT MGR	JRY
DATE	09/2023

4630.2300086.0016

RESISTANCE VALUE TEST RESULTS

(California Test 301)

MATERIAL DESCRIPTION: Dark brown, lean CLAY (CL)

LOCATION: B1 (0-5')

Specimen No.	Dry Unit Weight (pcf)	Moisture @ Compaction (%)	Exudation Pressure (psi)	Expansion (dial, inches x 1000)	Expansion (psf)	R Value
1	111	18.0	505	14	61	*

*Sample extruded, therefore R-Value = **5**

MATERIAL DESCRIPTION: Brown, lean to fat CLAY (CL-CH) with sand

LOCATION: B2 (0-5')

Specimen No.	Dry Unit Weight (pcf)	Moisture @ Compaction (%)	Exudation Pressure (psi)	Expansion (dial, inches x 1000)	Expansion (psf)	R Value
1	106	20.4	664	21	91	*

*Sample extruded, therefore R-Value = **5**

UES™

RESISTANCE VALUE TEST RESULTS

LUTHER BURBANK HIGH SCHOOL ATHLETIC IMPROVEMENTS

Sacramento, California

FIGURE	A4
DRAWN BY	KO
CHECKED BY	JRY
PROJECT MGR	JRY
DATE	09/2023

4630.2300086.0016

Sunland Analytical

11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 08/25/2023
Date Submitted 08/22/2023

To: Kathlyn Ortega
Univeral Engineering Sciences
3050 Industrial Blvd
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 4630.2300086.0016 Site ID : B2 BULK 0-5FT.
Thank you for your business.

* For future reference to this analysis please use SUN # 90410-187637.

EVALUATION FOR SOIL CORROSION

Soil pH	7.78	
Minimum Resistivity	0.70 ohm-cm (x1000)	
Chloride	101.4 ppm	00.01014 %
Sulfate	35.5 ppm	00.00355 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

CORROSION TEST RESULTS

LUTHER BURBANK HIGH SCHOOL ATHLETIC IMPROVEMENTS

Sacramento, California

FIGURE	A5
DRAWN BY	KO
CHECKED BY	JRY
PROJECT MGR	JRY
DATE	09/2023
4630.2300086.0016	

APPENDIX B

Previous Logs of Soil Borings (November 2009)

Project: Luther Burbank High School Athletic Field Improvements	**LOG OF SOIL BORING D1**
Project Location: Sacramento, California	Sheet 1 of 2
WKA Number: 8659.01P	

Date(s) Drilled	**11/10/09**	Logged By	**MSM**	Checked By	**MSM**
Drilling Method	**Hollow Stem Auger**	Drilling Contractor	**V & W Drilling, Inc.**	Total Depth of Drill Hole	**50.0 feet**
Drill Rig Type	**CME-55**	Diameter(s) of Hole, inches		Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**25.0**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Neat Cement Grout**
Remarks	**Surface covered in asphalt concrete**			Driving Method and Drop	**140 lbs hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
	0		Undocumented Fill (Qafu)	~4 inches asphalt concrete over ~6 inches aggregate base						
				Brown, silty clay (CL/Fill)						
	5		Lower Riverbank Formation (Qrl)	Brown, variably cemented, sandy silt with trace clay (ML)		D1-1I	54	20	84	
	10			Brown, silty fine to medium sand with occasional silt seams (SM)		D1-2I	25	16	83	
	15			Light brown, variably cemented, silt with trace sand and clay (ML)		D1-3I	45			
	20			Brown, sandy silt with trace clay and occasional silty sand seams (ML)		D1-4I	14	37	85	TR GR
	25			∇		D1-5I	13	37	82	PI GR
				Brown, fine to medium sand with silt (SM)						
	30					D1-6I	18	34	87	PI GR
				Gray, silty fine to coarse sand (SM)						

ROCK + SOIL LOG 8659.01P - LUTHER BURBANK HIGH SCHOOL ATHLETIC FIELD IMPROVEMENTS.GPJ WKA.GDT 12/14/09 11:33 AM

Wallace Kuhl & ASSOCIATES INC

FIGURE 9

Project: Luther Burbank High School Athletic Field Improvements
Project Location: Sacramento, California
WKA Number: 8659.01P

LOG OF SOIL BORING D1

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Lower Riverbank Formation (Qrl)			D1-7I	23	23	97	PI GR
	40									
				Gray, silty clay with sand (CL)		D1-8I	55			
				Brown, variably cemented, silty, clayey sand (SC)						
	45					D1-9I	50/6"			
				Brown, variably cemented, silty fine to coarse sand with trace clay (SM)		D1-10I	64			
	50			End of boring at ~50 feet. Groundwater was encountered about 25 feet below the ground surface.						

Project: Luther Burbank High School Athletic Field Improvements
Project Location: Sacramento, California
WKA Number: 8659.01P

LOG OF SOIL BORING D2

Sheet 1 of 1

Date(s) Drilled	11/18/09	Logged By	MSM	Checked By	MSM
Drilling Method	Solid Stem Auger	Drilling Contractor	V & W Drilling, Inc.	Total Depth of Drill Hole	31.5 feet
Drill Rig Type	CME-55	Diameter(s) of Hole, inches		Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	25.0	Sampling Method(s)	Open drive sampler with 6-inch sleeve	Drill Hole Backfill	Auger Cuttings
Remarks	Surface covered in asphalt concrete			Driving Method and Drop	140 lbs hammer, 30 inch drop

ELEVATION, feet	DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE NUMBER	NUMBER OF BLOWS	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0	Undocumented Fill (Qafu)	~3 1/2 inches asphalt concrete over ~5 inches aggregate base; Brown, silty fine to medium sand (SM/Fill)					
	5			D2-1I	29	11	92	
	9	Lower Riverbank Formation (Qrl)	Brown, variably cemented, sandy silt with trace clay (ML)					
	10			D2-2I	45			
	15			D2-3I	73			
	18		Brown, sandy silt with trace clay (ML)					
	20			D2-41	38			
	22.5		Brown, silt with sand and clay (ML)					
	25			D2-5I	19			
	28		Brown and gray, fine to medium sand with silt (SM)					
	30			D2-6I	17	32	88	GR
	31.5		End of boring at ~31 1/2 feet. Groundwater was encountered about 25 feet below the ground surface.					

ROCK + SOIL LOG 8659.01P - LUTHER BURBANK HIGH SCHOOL ATHLETIC FIELD IMPROVEMENTS.GPJ WKA.GDT 12/14/09 11:33 AM

WallaceKuhl & ASSOCIATES INC

FIGURE 10

Project: Luther Burbank High School Athletic Field Improvements
Project Location: Sacramento, California
WKA Number: 8659.01P

LOG OF SOIL BORING D3

Sheet 1 of 1

Date(s) Drilled	11/11/09	Logged By	MSM	Checked By	MSM
Drilling Method	Solid Stem Auger	Drilling Contractor	V & W Drilling, Inc.	Total Depth of Drill Hole	31.5 feet
Drill Rig Type	CME-55	Diameter(s) of Hole, inches		Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	26.0	Sampling Method(s)	Open drive sampler with 6-inch sleeve	Drill Hole Backfill	Auger Cuttings
Remarks	Surface covered in asphalt concrete.			Driving Method and Drop	140 lbs hammer, 30 inch drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Undocumented Fill (Qafu)	~3 1/2 inches asphalt concrete over ~4 inches aggregate base						
				Dark brown, silty clay (CL/Fill)						
	5		Lower Riverbank Formation (Qrl)	Brown, variably cemented, silty fine to medium sand with trace clay (SM)		D3-1I	36			
	10					D3-2I	48	25	83	
	15			Brown, silty with sand and clay (ML)		D3-3I	65			
				Light brown,silt with trace sand and clay (ML)						
	20					D3-4I	41			
				Brown, sandy silt with trace clay (ML)						
	25				▽	D3-5I	26	33	88	
				Dark brown, sandy silt with trace clay (ML)						
	30					D3-6I	27			
				End of boring at ~31 1/2 feet. Groundwater was encountered about 26 feet below the ground surface.						

ROCK + SOIL LOG 8659.01P - LUTHER BURBANK HIGH SCHOOL ATHLETIC FIELD IMPROVEMENTS.GPJ WKA.GDT 12/14/09 11:33 AM

Wallace Kuhl & ASSOCIATES INC

FIGURE 11

Project: Luther Burbank High School Athletic Field Improvements Project Location: Sacramento, California WKA Number: 8659.01P	**LOG OF SOIL BORING D4** Sheet 1 of 1

Date(s) Drilled	**11/11/09**	Logged By	**MSM**	Checked By	**MSM**
Drilling Method	**Solid Stem Auger**	Drilling Contractor	**V & W Drilling, Inc.**	Total Depth of Drill Hole	**16.5 feet**
Drill Rig Type	**CME-55**	Diameter(s) of Hole, inches		Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**N/E**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Auger Cuttings**
Remarks	**Surface covered in grass.**			Driving Method and Drop	**140 lbs hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Undocumented Fill (Qafu)	Dark brown, silty clay (CL/Fill)						
			Lower Riverbank Formation (Qrl)	Brown, silty clay (CL)						
	5			Brown, variably cemented, sandy silt (ML)		D4-1I	50/6"			
				Brown, silty fine sand (SM)						
	10					D4-2I	27	30	77	
				Brown, silt with sand and clay (ML)						
	15					D4-3I	30			
				End of boring at ~16 1/2 feet. Groundwater was not encountered.						

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FIGURE 12

Project: Luther Burbank High School Athletic Field Improvements
Project Location: Sacramento, California
WKA Number: 8659.01P

LOG OF SOIL BORING D5

Date(s) Drilled	11/10/09	Logged By	MSM	Checked By	MSM
Drilling Method	Solid Stem Auger	Drilling Contractor	V & W Drilling, Inc.	Total Depth of Drill Hole	31.5 feet
Drill Rig Type	CME-55	Diameter(s) of Hole, inches		Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	30.0	Sampling Method(s)	Open drive sampler with 6-inch sleeve	Drill Hole Backfill	Auger Cuttings
Remarks	Surface covered in grass. Bulk sample obtained from 0 to 3 feet.			Driving Method and Drop	140 lbs hammer, 30 inch drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Undocumented Fill (Qafu)	Dark brown and brown, silty clay (CL/Fill)						
	3		Lower Riverbank Formation (Qrl)	Light brown, variably cemented, sandy silt (ML)						
	5					D5-1I	50/6"			
	8.5			Brown, silty fine to medium sand (SM)						
	10					D5-2I	24	10	96	
	13.5			Brown, variably cemented, sandy silt (ML)						
	15					D5-3I	50/6"			
	18.5			Brown, silty fine sand (SM)						
	20					D5-4I	28	19	89	
	22.5			Brown and gray, silt with clay (ML)						
	25					D5-6I	80			
	30			▽		D5-7I	48			
				End of boring at ~31 1/2 feet. Groundwater was encountered about 30 feet below the ground surface.						

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FIGURE 13

Project: Luther Burbank High School Athletic Field Improvements
Project Location: Sacramento, California
WKA Number: 8659.01P

LOG OF SOIL BORING D6

Date(s) Drilled	11/10/09	Logged By	MSM	Checked By	MSM
Drilling Method	Solid Stem Auger	Drilling Contractor	V & W Drilling, Inc.	Total Depth of Drill Hole	30.0 feet
Drill Rig Type	CME-55	Diameter(s) of Hole, inches		Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	N/E	Sampling Method(s)	Open drive sampler with 6-inch sleeve	Drill Hole Backfill	Auger Cuttings
Remarks	Surface covered in grass.			Driving Method and Drop	140 lbs hammer, 30 inch drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Undocumented Fill (Qafu)	Dark brown, sandy, silty clay (CL/Fill)						
			Lower Riverbank Formation (Qrl)	Brown, variably cemented, silty clay with sand (CL)						
	5					D6-1I	50/6"			
				Brown, variably cemented sandy silt with trace clay and gravels (ML)						
	10					D6-2I	49	28	87	
	15					D6-3I	75			
	20					D6-4I	80			
				Brown and gray, silt with clay (ML)						
	25					D6-5I	54			
	30					D6-7I	80			
				End of boring at ~30 feet. Groundwater was not encountered.						

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FIGURE 14

Project: Luther Burbank High School Athletic Field Improvements
Project Location: Sacramento, California
WKA Number: 8659.01P

LOG OF SOIL BORING D7

Date(s) Drilled	11/10/09	Logged By	MSM	Checked By	MSM
Drilling Method	Solid Stem Auger	Drilling Contractor	V & W Drilling, Inc.	Total Depth of Drill Hole	11.5 feet
Drill Rig Type	CME-55	Diameter(s) of Hole, inches		Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	N/E	Sampling Method(s)	Open drive sampler with 6-inch sleeve	Drill Hole Backfill	Auger Cuttings
Remarks	Surface covered in grass.			Driving Method and Drop	140 lbs hammer, 30 inch drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Undocumented Fill (Qafu)	Brown and dark brown, silty clay (CL/Fill)						
						D7-1I	33	14	92	
	5		Lower Riverbank Formation (Qrl)	Brown, variably cemented, sandy, clayey silt (ML)		D7-2I	50/6"			
				Brown, silty sand (SM)						
	10					D7-3I	37			
				End of boring at ~11 1/2 feet. Groundwater was not encountered.						

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FIGURE 15

ROCK + SOIL LOG 8659.01P - LUTHER BURBANK HIGH SCHOOL ATHLETIC FIELD IMPROVEMENTS.GPJ WKA.GDT 12/14/09 11:33 AM

Project: Luther Burbank High School Athletic Field Improvements **Project Location: Sacramento, California** **WKA Number: 8659.01P**	**LOG OF SOIL BORING D8** Sheet 1 of 1

Date(s) Drilled	**11/10/09**	Logged By	**MSM**	Checked By	**MSM**
Drilling Method	**Solid Stem Auger**	Drilling Contractor	**V & W Drilling, Inc.**	Total Depth of Drill Hole	**31.5 feet**
Drill Rig Type	**CME-55**	Diameter(s) of Hole, inches		Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**30.0**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Auger Cuttings**
Remarks	**Surface covered in grass.**			Driving Method and Drop	**140 lbs hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
	0		Undocumented Fill (Qafu)	Dark brown, silty clay (CL/Fill)						
						D8-1I	10	16	94	
			Lower Riverbank Formation (Qrl)	Brown, variably cemented, sandy silt (ML)						
	5					D8-2I	50/6"			
				Brown, silty fine to medium sand with occasional silt seams and layers (SM)						
	10					D8-3I	49			
	15					D8-4I	34	29	84	
				Brown, variably cemented, sandy silt with trace clay (ML)						
	20					D8-5I	50/6"			
	25					D8-6I	81			
	30			▽		D8-6I	41			
				End of boring at ~31 1/2 feet. Groundwater was encountered about 30 feet below the ground surface.						

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FIGURE 16

ROCK + SOIL LOG 8659.01P - LUTHER BURBANK HIGH SCHOOL ATHLETIC FIELD IMPROVEMENTS.GPJ WKA.GDT 12/14/09 11:33 AM

Project: Luther Burbank High School Athletic Field Improvements
Project Location: Sacramento, California
WKA Number: 8659.01P

LOG OF SOIL BORING D9

Date(s) Drilled	11/10/09	Logged By	MSM	Checked By	MSM
Drilling Method	Solid Stem Auger	Drilling Contractor	V & W Drilling, Inc.	Total Depth of Drill Hole	16.5 feet
Drill Rig Type	CME-55	Diameter(s) of Hole, inches		Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	N/E	Sampling Method(s)	Open drive sampler with 6-inch sleeve	Drill Hole Backfill	Auger Cuttings
Remarks	Surface covered in grass.			Driving Method and Drop	140 lbs hammer, 30 inch drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Undocumented Fill (Qafu)	Dark brown and brown, silty clay (CL/Fill)						
					■	D9-1I	10	22	96	
			Lower Riverbank Formation (Qrl)	Brown, silty clay (CL)						
	5				■	D9-2I	17	22	98	
				Brown, silty fine sand with occasional variably cemented silt seams and layers (SM)						
	10				■	D9-3I	54			
				Brown, silt with sand and clay (ML)						
	15				■	D9-4I	27			
				End of boring at ~16 1/2 feet. Groundwater was not encountered.						

ROCK + SOIL LOG 8659.01P - LUTHER BURBANK HIGH SCHOOL ATHLETIC FIELD IMPROVEMENTS.GPJ WKA.GDT 12/14/09 11:33 AM

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FIGURE 17

Project: Luther Burbank High School Athletic Field Improvements
Project Location: Sacramento, California
WKA Number: 8659.01P

LOG OF SOIL BORING D10

Date(s) Drilled	11/18/09	Logged By	MSM	Checked By	MSM
Drilling Method	Solid Stem Auger	Drilling Contractor	V & W Drilling, Inc.	Total Depth of Drill Hole	5.8 feet
Drill Rig Type	CME-55	Diameter(s) of Hole, inches		Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	N/E	Sampling Method(s)	Open drive sampler with 6-inch sleeve	Drill Hole Backfill	Auger Cuttings
Remarks	Surface covered in grass			Driving Method and Drop	140 lbs hammer, 30 inch drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Undocumented Fill (Qafu)	Dark brown and brown, silty clay (CL/Fill)						
						D10-1I	11	23	98	
			Lower Riverbank Formation (Qrl)	Brown, variably cemented, sandy silt (ML)						
	5					D10-2I	50/3"			
				End of boring at ~5 3/4 feet. Groundwater was not encountered.						

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FIGURE 18

Project: Luther Burbank High School Athletic Field Improvements	**LOG OF SOIL BORING D11**
Project Location: Sacramento, California	Sheet 1 of 1
WKA Number: 8659.01P	

Date(s) Drilled	**11/11/09**	Logged By	**MSM**	Checked By	**MSM**
Drilling Method	**Solid Stem Auger**	Drilling Contractor	**V & W Drilling, Inc.**	Total Depth of Drill Hole	**26.5 feet**
Drill Rig Type	**CME-55**	Diameter(s) of Hole, inches		Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**25.0**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Auger Cuttings**
Remarks	**Surface covered in decomposed granite.**			Driving Method and Drop	**140 lbs hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
	0		Lower Riverbank Formation (Qrl)	Brown, variably cemented, sandy silt with occasional silty sand seams and layers (ML)						
	5				■	D11-1I	50/6"			
	10				■	D11-2I	55	24	86	
	13			Brown and gray, silt with trace sand and clay (ML)						
	15				■	D11-3I	49	24	93	
	20				■	D11-4I	45			
	22			Brown, silt with sand and trace clay (ML)						
	25			∇	■	D11-5I	22			
	26.5			End of boring at ~26 1/2 feet. Groundwater was encountered about 25 feet below the ground surface.						

ROCK + SOIL LOG 8659.01P - LUTHER BURBANK HIGH SCHOOL ATHLETIC FIELD IMPROVEMENTS.GPJ WKA.GDT 12/14/09 11:33 AM

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FIGURE 19

Project: Luther Burbank High School Athletic Field Improvements Project Location: Sacramento, California WKA Number: 8659.01P	**LOG OF SOIL BORING D12** Sheet 1 of 1

Date(s) Drilled	11/10/09	Logged By	MSM	Checked By	MSM
Drilling Method	Solid Stem Auger	Drilling Contractor	V & W Drilling, Inc.	Total Depth of Drill Hole	31.5 feet
Drill Rig Type	CME-55	Diameter(s) of Hole, inches		Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	30.0	Sampling Method(s)	Open drive sampler with 6-inch sleeve	Drill Hole Backfill	Auger Cuttings
Remarks	Surface covered in grass. Bulk sample obtained from 0 to 3 feet.			Driving Method and Drop	140 lbs hammer, 30 inch drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Undocumented Fill (Qafu)	Dark brown and brown, silty clay (CL/Fill)						
						D12-1I	16	23	92	
			Lower Riverbank Formation (Qrl)	Brown, silty clay (CL)						
	5									
				Brown, variably cemented,silt with trace sand and clay (ML)		D12-2I	36	21	93	
				Brown, variably cemented, silty fine to medium sand with occasional silt seams and layers (SM)						
	10					D12-3I	50/6"			
				Brown, variably cemented, sandy silt with trace clay (ML)						
	15					D12-4I	85			
	20					D12-5I	50/6"			
				Brown and gray, variably cemented silt with sand and clay and occasional silty sand seams and layers (ML)						
	25					D12-6I	55			
				Brown, sandy silt (ML)						
	30			▽		D12-7I	48			
				End of boring at ~31 1/2 feet. Groundwater was encountered about 30 feet below the ground surface.						

Project: Luther Burbank High School Athletic Field Improvements
Project Location: Sacramento, California
WKA Number: 8659.01P

LOG OF SOIL BORING D13

Date(s) Drilled	11/18/09	Logged By	MSM	Checked By	MSM
Drilling Method	Solid Stem Auger	Drilling Contractor	V & W Drilling, Inc.	Total Depth of Drill Hole	11.5 feet
Drill Rig Type	CME-55	Diameter(s) of Hole, inches		Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	N/E	Sampling Method(s)	Open drive sampler with 6-inch sleeve	Drill Hole Backfill	Auger Cuttings
Remarks				Driving Method and Drop	140 lbs hammer, 30 inch drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Undocumented Fill (Qafu)	Dark brown, silty clay with trace organics and occasional sand seams and layers (CL/Fill)		D13-1I	15	23	97	
	5		Lower Riverbank Formation (Qrl)	Brown, silt with clay (ML)						
				Brown, variably cemented sandy silt (ML)		D13-2I	60/9"			
				Brown, silty fine to medium sand (SM)						
	10					D13-3I	25			
				End of boring at ~11 1/2 feet. Groundwater was not encountered.						

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FIGURE 21

Project: Luther Burbank High School Athletic Field Improvements
Project Location: Sacramento, California
WKA Number: 8659.01P

LOG OF SOIL BORING 13A

Sheet 1 of 1

Date(s) Drilled	**11/18/09**	Logged By	**MSM**	Checked By	**MSM**
Drilling Method	**Solid Stem Auger**	Drilling Contractor	**V & W Drilling, Inc.**	Total Depth of Drill Hole	**6.5 feet**
Drill Rig Type	**CME-55**	Diameter(s) of Hole, inches		Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**N/E**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Auger Cuttings**
Remarks	**Surface covered in grass**			Driving Method and Drop	**140 lbs hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Undocumented Fill (Qafu)	Brown and dark brown, silty clay with trace organics (CL/Fill)		D13A-1I	14	19	104	
	5		Lower Riverbank Formation (Qrl)	Brown, sandy silt with trace clay (ML)		D13A-2I	31			
				End of boring at ~6 1/2 feet. Groundwater was not encountered.						

ROCK + SOIL LOG 8659.01P - LUTHER BURBANK HIGH SCHOOL ATHLETIC FIELD IMPROVEMENTS.GPJ WKA.GDT 12/14/09 11:33 AM

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FIGURE 22

Project: Luther Burbank High School Athletic Field Improvements **Project Location:** Sacramento, California **WKA Number:** 8659.01P	**LOG OF SOIL BORING D14** Sheet 1 of 1

Date(s) Drilled	**11/18/09**	Logged By	**MSM**	Checked By	**MSM**
Drilling Method	**Solid Stem Auger**	Drilling Contractor	**V & W Drilling, Inc.**	Total Depth of Drill Hole	**6.0 feet**
Drill Rig Type	**CME-55**	Diameter(s) of Hole, inches		Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**N/E**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Auger Cuttings**
Remarks				Driving Method and Drop	**140 lbs hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Undocumented Fill (Qafu)	Dark brown, silty clay with trace organics (CL/Fill)						
			Lower Riverbank Formation (Qrl)	Brown, silty clay (CL)		D14-1I	19	19	110	
				Brown, variably cemented, sandy silt (ML)						
	5					D14-2I	50/6"			
				End of boring at ~6 feet. Groundwater was not encountered.						

ROCK + SOIL LOG 8659.01P - LUTHER BURBANK HIGH SCHOOL ATHLETIC FIELD IMPROVEMENTS.GPJ WKA.GDT 12/14/09 11:33 AM

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FIGURE 23

Project: Luther Burbank High School Athletic Field Improvements
Project Location: Sacramento, California
WKA Number: 8659.01P

LOG OF SOIL BORING D15

Date(s) Drilled	**11/11/09**	Logged By	**MSM**	Checked By	**MSM**
Drilling Method	**Solid Stem Auger**	Drilling Contractor	**V & W Drilling, Inc.**	Total Depth of Drill Hole	**26.5 feet**
Drill Rig Type	**CME-55**	Diameter(s) of Hole, inches		Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**26.0**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Auger Cuttings**
Remarks	**Surface covered in decomposed granite.**			Driving Method and Drop	**140 lbs hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Lower Riverbank Formation (Qrl)	Brown, variably cemented, silty sand with occasional sandy silt seams and layers (SM)						
	~3.5			Brown, variably cemented, silty sand with clay and occassional silt seams and layers (SM)						
	5					D15-1I	48			
	~8.5			Brown, silt with sand and trace clay (ML)						
	10					D15-2I	34	18	92	
	15					D15-3I	55			
	20					D15-4I	70			
	25				∇	D15-5I	23			
	26.5			End of boring at ~26 1/2 feet. Groundwater was encountered at ~25 feet.						

ROCK + SOIL LOG 8659.01P - LUTHER BURBANK HIGH SCHOOL ATHLETIC FIELD IMPROVEMENTS.GPJ WKA.GDT 12/14/09 11:33 AM

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FIGURE 24

Project: Luther Burbank High School Athletic Field Improvements	**LOG OF SOIL BORING D16**
Project Location: Sacramento, California	Sheet 1 of 1
WKA Number: 8659.01P	

Date(s) Drilled	**11/11/09**	Logged By	**MSM**	Checked By	**MSM**
Drilling Method	**Solid Stem Auger**	Drilling Contractor	**V & W Drilling, Inc.**	Total Depth of Drill Hole	**26.5 feet**
Drill Rig Type	**CME-55**	Diameter(s) of Hole, inches		Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**N/E**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Auger Cuttings**
Remarks	**Surface covered in grass.**			Driving Method and Drop	**140 lbs hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Undocumented Fill (Qafu)	Brown, silty clay (CL/Fill)						
			Lower Riverbank Formation (Qrl)	Dark brown, silty clay (CL)						
	5					D16-1I	35	16	96	
				Brown, variably cemented, silty fine to medium sand (SM)						
	10					D16-2I	50/6"			
	15			Brown and gray, silt with trace sand and clay (ML)		D16-3I	43	18	100	
	20					D16-4I	80			
	25					D16-5I	40			
				End of boring at ~26 1/2 feet. Groundwater was encountered about 25 feet below the ground surface.						

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FIGURE 25

Project: Luther Burbank High School Athletic Field Improvements **Project Location: Sacramento, California** **WKA Number: 8659.01P**	**LOG OF SOIL BORING D17** Sheet 1 of 1

Date(s) Drilled	**11/11/09**	Logged By	**MSM**	Checked By	**MSM**
Drilling Method	**Solid Stem Auger**	Drilling Contractor	**V & W Drilling, Inc.**	Total Depth of Drill Hole	**11.5 feet**
Drill Rig Type	**CME-55**	Diameter(s) of Hole, inches		Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**N/E**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Auger Cuttings**
Remarks	**Surface covered in grass. Bulk sample obtained from 0 to 3 feet.**			Driving Method and Drop	**140 lbs hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Undocumented Fill (Qafu)	Brown and dark brown, silty clay (CL/Fill)						
	5					D17-1I	26	13	92	
			Lower Riverbank Formation (Qrl)	Brown, variably cemented silt with sand and clay (ML)						
	10					D17-2I	70			
				End of boring at ~11 1/2 feet. Groundwater was not encountered.						

ROCK + SOIL LOG 8659.01P - LUTHER BURBANK HIGH SCHOOL ATHLETIC FIELD IMPROVEMENTS.GPJ WKA.GDT 12/14/09 11:33 AM

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FIGURE 26

Project: Luther Burbank High School Athletic Field Improvements **Project Location: Sacramento, California** **WKA Number: 8659.01P**	**LOG OF SOIL BORING D18** Sheet 1 of 1

Date(s) Drilled	**11/11/09**	Logged By	**MSM**	Checked By	**MSM**
Drilling Method	**Solid Stem Auger**	Drilling Contractor	**V & W Drilling, Inc.**	Total Depth of Drill Hole	**11.5 feet**
Drill Rig Type	**CME-55**	Diameter(s) of Hole, inches		Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**N/E**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Auger Cuttings**
Remarks	**Surface covered in grass.**			Driving Method and Drop	**140 lbs hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Undocumented Fill (Qafu)	Brown and dark brown, silty clay (CL/Fill)						
						D18-1I	33	9	96	
			Lower Riverbank Formation (Qrl)	Brown, variably cemented silt, with sand and clay (ML)						
	5									
						D18-2I	50	12	106	
	10									
						D18-3I	76			
				End of boring at ~11 1/2 feet. Groundwater was not encountered.						

ROCK + SOIL LOG 8659.01P - LUTHER BURBANK HIGH SCHOOL ATHLETIC FIELD IMPROVEMENTS.GPJ WKA.GDT 12/14/09 11:33 AM

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FIGURE 27

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		SYMBOL	CODE	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of soil > no. 200 sieve size)	GRAVELS (More than 50% of coarse fraction > no. 4 sieve size)	GW		Well graded gravels or gravel - sand mixtures, little or no fines
		GP		Poorly graded gravels or gravel - sand mixtures, little or no fines
		GM		Silty gravels, gravel - sand - silt mixtures
		GC		Clayey gravels, gravel - sand - clay mixtures
	SANDS (50% or more of coarse fraction < no. 4 sieve size)	SW		Well graded sands or gravelly sands, little or no fines
		SP		Poorly graded sands or gravelly sands, little or no fines
		SM		Silty sands, sand - silt mixtures
		SC		Clayey sands, sand - clay mixtures
FINE GRAINED SOILS (50% or more of soil < no. 200 sieve size)	SILTS & CLAYS LL < 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 & CLAYS LL ≥ 50	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH		Inorganic clays of high plasticity, fat clays
		OH		Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt		Peat and other highly organic soils
ROCK		RX		Rocks, weathered to fresh
FILL		FILL		Artificially placed fill material

OTHER SYMBOLS

= Drive Sample: 2-1/2" O.D. Modified California sampler

= Drive Sampler: no recovery

= SPT Sampler

= Initial Water Level

= Final Water Level

— — — = Estimated or gradational material change line

——— = Observed material change line

Laboratory Tests

PI = Plasticity Index

EI = Expansion Index

UCC = Unconfined Compression Test

TR = Triaxial Compression Test

GR = Gradational Analysis (Sieve)

K = Permeability Test

GRAIN SIZE CLASSIFICATION

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL	3" to No. 4	76.2 to 4.76
coarse (c)	3" to 3/4"	76.2 to 19.1
fine (f)	3/4" to No. 4	19.1 to 4.76
SAND	No. 4 to No. 200	4.76 to 0.074
coarse (c)	No. 4 to No. 10	4.76 to 2.00
medium (m)	No. 10 to No. 40	2.00 to 0.420
fine (f)	No. 40 to No. 200	0.420 to 0.074
SILT & CLAY	Below No. 200	Below 0.074

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UNIFIED SOIL CLASSIFICATION SYSTEM
LUTHER BURBANK HIGH SCHOOL
ATHLETIC FIELD IMPROVEMENTS
Sacramento, California

FIGURE	28
DRAWN BY	TJC
CHECKED BY	PJJ
PROJECT MGR	MSM
DATE	11/09
WKA NO. 8659.01P	