ATTACHMENT D

MITIGATED NEGATIVE DECLARATION

APPENDIX C – GEOTECHNICAL STUDY

Appendix C

Geotechnical Study

June 1, 2023
(Revised January 23, 2024)
Kleinfelder Project No.: 20233104.001A

Costco Wholesale
999 Lake Drive
Issaquah, Washington 98027

Attention: Ms. Kayleen Burnett
Real Estate Project Manager

Subject: Geotechnical Study (Revised)
Proposed Fuel Facility
Costco Business Center
150 S. Bent Avenue
San Marcos, California
CW# 22-1249

Dear Ms. Burnett:

Kleinfelder is pleased to present this report summarizing our geotechnical study for the proposed fuel facility at the Costco Business Center located at 150 South Bent Avenue in San Marcos, California. The purpose of our geotechnical study was to evaluate subsurface soil and groundwater conditions at the project site to provide geotechnical recommendations for design and construction. The conclusions and recommendations presented in this report are subject to the limitations presented in Section 6.

We appreciate the opportunity to provide geotechnical engineering services to you on this project. If you have any questions regarding this report or if we can be of further service, please do not hesitate to contact Brian Crystal at (949) 585-3113, or Andy Franks, Kleinfelder's Client Account Manager for Costco, at (480) 650-4905.

Sincerely,

KLEINFELDER

Hector Marquez, PE
Project Engineer

Brian E. Crystal, PE, GE
Senior Project Manager

24411 Ridge Route Dr., Suite 225, Laguna Hills, CA 92653 p | 949.727.4466 f | 949.727.9242

GEOTECHNICAL STUDY (REVISED)
PROPOSED FUEL FACILITY
COSTCO BUSINESS CENTER
150 S. BENT AVENUE
SAN MARCOS, CALIFORNIA

KLEINFELDER PROJECT NO. 20233104.001A

JUNE 1, 2023
(REVISED JANUARY 23, 2024)

A Report Prepared for:

Costco Wholesale
999 Lake Drive
Issaquah, Washington 98027

Attention: Ms. Kayleen Burnett
Real Estate Project Manager

Geotechnical Study (Revised)
Proposed Fuel Facility
Costco Business Center
150 S. Bent Avenue
San Marcos, California

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June 1, 2023
(Revised January 23, 2024)
Kleinfelder Project No. 20233104.001A

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EXECUTIVE SUMMARY

This report presents the results of our geotechnical study for the proposed fuel facility addition project at the Costco Business Center located at 150 South Bent Avenue in San Marcos, California. We understand that Costco plans to construct a new fuel facility north of the existing business center in an area currently occupied by an asphalt parking lot. Based on our review of the site plan, the new fueling facility will consist of three gasoline refueling islands each with five pumps, three underground storage tanks (UST), a fuel additive UST, a controller enclosure, and a canopy structure. New asphalt concrete and Portland cement concrete pavements will be constructed as well. The purpose of our study is to evaluate subsurface geotechnical soil and groundwater conditions at the project site to provide geotechnical recommendations for the design and construction. We based our study on the Costco Wholesale Development Requirements (CWDRs), Version 2022, dated October 28, 2022.

Subsurface conditions at the site were explored by drilling five (5) borings. Two borings were drilled to a depth of approximately 40 feet below existing ground surface (bgs), one boring to a depth of approximately 25 feet bgs, and another two borings were drilled to a depth of approximately 20 feet bgs. The 25-foot boring was converted to a 2-inch-diameter PVC monitoring well at the completion of drilling. The monitoring well will remain on-site so that groundwater levels can be monitored over time and will need to be abandoned in accordance with San Diego County Department of Environmental Health and Quality (DEHQ) and state requirements (California Department of Water Resources Bulletin 74-81 and 74-90).

Kleinfelder also reviewed our previous geotechnical report (Kleinfelder, 2020) and the Southern California Soil and Testing, Inc. (SCST) geotechnical report (SCST, 2000) for the site. Pertinent field exploration and laboratory data from our 2020 study and SCST's 2000 study were used in conjunction with our current study to form the geotechnical design and construction recommendations presented in this report.

Subsurface conditions at the site generally consist of artificial fill placed during initial development of the site over older alluvial soils underlain by sedimentary deposits of the Santiago Formation. The fill depth was encountered at depths ranging from approximately 2 to 3½ feet bgs in our borings. The fill generally consists of clayey sand to silty, clayey sand. Older alluvial soils underlie the fill (if present) to depths ranging from approximately 10 to 14 feet bgs and generally consist of dense to very dense clayey sand. Underlying the older alluvial soils was sedimentary deposits of the Santiago Formation to the maximum depth explored of approximately 40 feet bgs. The

Santiago Formation deposits generally consisted of dense to very dense poorly-graded sand with clay, clayey sand, and silty sand, or stiff to hard lean to fat clay with varying amounts of sand. A stabilized groundwater level was measured at a depth of approximately 10 feet bgs in the monitoring well.

Based on the results of our field exploration, laboratory testing, and geotechnical analyses, it is our professional opinion that the proposed project is geotechnically feasible, provided the recommendations presented in this geotechnical report are incorporated into the project design and construction. The following key items were developed from our study.

- The proposed fuel facility may be supported on a conventional spread footing foundation system. Light poles may be supported on short, drilled piles within the upper 10 feet bgs.
- Footings are anticipated to be embedded approximately 6 to 7 feet below finished grade and may be designed for a net allowable soil bearing pressure of 3,000 psf for dead plus sustained live loads. A one-third increase in the above bearing pressures can be used for wind or seismic loads.
- Footings may bear on the existing soils at the site. Following excavation to foundation subgrade elevation, exposed subgrade should be observed by a representative of Kleinfelder to evaluate the presence of satisfactory materials at design elevations. If unsatisfactory material, such as soft or disturbed soil, debris or otherwise unsuitable soil is present at the base of the footing excavation, it should be overexcavated and replaced with structural fill, structural concrete, or a 2-sack sand-cement slurry to the depth determined by the Kleinfelder representative.
- For new pavement areas within existing pavement areas, we recommend that the exposed subgrade be proof-rolled with heavy construction equipment (e.g. loader or smooth-drum roller) to disclose areas of soft and yielding material after the area has been stripped of soft earth materials and debris. Where soft or yielding material are observed, the material should be overexcavated and replaced with structural fill. The proof-rolling should extend beyond the proposed improvements a horizontal distance of at least 2 feet, if practicable.
- For new pavement areas within existing landscaped areas, we recommend that the existing soils be overexcavated to a depth of at least 12 inches below existing grade or 12 inches below the finished subgrade elevation, whichever is deeper, after the area has been stripped of construction debris and soft earth materials. Prior to placing fill, the exposed subgrade should be proof-rolled with heavy construction equipment (e.g., loader or smooth-drum roller) to disclose areas of soft and yielding material. Where soft and

yielding material is observed, it should be overexcavated and replaced as structural fill. The overexcavated soil may be reused as structural fill.

- Based on past experience, it is common to encounter wet, unstable soils upon removal of site pavements or flatwork as a result of subsurface moisture becoming trapped beneath relatively impervious asphalt concrete or Portland cement concrete surfaces. The contractor should anticipate that pumping subgrade conditions may be encountered during site grading activities, and the subgrade may need to be stabilized. Recommendations to stabilize wet or pumping subgrade are provided in Section 4.3.
- Groundwater will be encountered within deeper excavations, such as for the proposed USTs. A stabilized groundwater level was measured at a depth of approximately 10 feet bgs in the monitoring well. Temporary dewatering provisions will likely be required for these areas depending on the depth to groundwater and proposed excavation depths. Groundwater impacts are discussed in Section 5.4.
- Groundwater levels in the well should be checked by the contractor prior to the start of construction. The monitoring well will need to be decommissioned prior to the start of construction in accordance with San Diego County DEHQ and state requirements (California Department of Water Resources Bulletin 74-81 and 74-90). A discussion of the well abandonment requirements is provided in Section 4.8
- Excavations for the USTs and foundations should be excavatable with conventional heavy-duty construction equipment. However, the UST excavation bottom conditions will be wet. The exposed soils may be somewhat unstable and sensitive to disturbance by construction activities. Heavy compaction equipment is not recommended in excavation bottom areas. Excavations should be performed with “toothless” buckets to reduce disturbance of the subgrade. All disturbed soils at the subgrade level should be replaced with the gravel bedding for the tank. The bedding should be separated from the subgrade by a filter fabric (Mirafi 140N or equivalent).
- Due to poor draining subgrade conditions, we recommend drainage inlets and catch basins include pavement underdrains as shown in Detail 16_16 of the CWDRs.
- Laboratory testing was performed on one soil sample to evaluate pH, minimum resistivity, chloride and soluble sulfate content. The minimum resistivity of the sample indicates that the soil may be extremely corrosive to metals (Roberge, 2006). The concentrations of soluble sulfates indicate that the subsurface soils represent a Class S0 exposure to sulfate attack on concrete in contact with the soil based on ACI 318 Table 19.3.3.1 (ACI, 2019).

Therefore, in accordance with ACI Building Code 318, no special provisions for selection of cement type are required.

- Based on visual soil classification and laboratory testing of the soil samples collected during our field exploration, the upper subsurface soils (upper 10 feet) consist predominantly of dense to very dense clayey sand. Furthermore, groundwater was encountered as shallow as approximately 10 feet below grade. In accordance with Appendix C of the City of San Marcos BMP Design Manual, the depth to seasonally high groundwater table beneath the base of any infiltration BMP must be greater than 10 feet. Accordingly, due to the shallow depth of groundwater and the low infiltration characteristics of the near surface soils, we do not recommend the use of infiltration BMPs and consider infiltration at this site to be infeasible based on the City's criteria.

The findings, conclusions, and recommendations presented in this executive summary should not be relied upon without consulting our geotechnical report for more detailed description of the geotechnical evaluation performed by Kleinfelder. The conclusions and recommendations presented in this report are subject to the limitations presented in Section 6.

1 INTRODUCTION

This report presents the results of our geotechnical study for the proposed fuel facility project at the Costco Business Center located at 150 South Bent Avenue in San Marcos, California. The location of the project site is presented on Figure 1, Site Vicinity Map. The purpose of our study is to evaluate subsurface soil and groundwater conditions at the project site to provide geotechnical recommendations for design and construction. The scope of our services was presented in our proposal titled "Proposal for Geotechnical Study, Proposed Fuel Facility Addition, Costco Business Center, 150 S. Bent Avenue, San Marcos, California, CW# 22-1249," dated October 4, 2022. We based our study on the Costco Wholesale Development Requirements (CWDRs), Version 2022, dated October 28, 2022.

Our report includes a description of the work performed, a discussion of the subsurface and surficial conditions observed at the site, and recommendations developed from our engineering analyses of field and laboratory data.

1.1 PROJECT DESCRIPTION

Kleinfelder understands that Costco plans to construct a new fuel facility north of the existing business center in an area currently occupied by an asphalt parking lot. Based on our review of the site plan, the new fueling facility will consist of three gasoline refueling islands each with five pumps, three underground storage tanks (UST), a fuel additive UST, a controller enclosure, and a canopy structure. New asphalt concrete and Portland cement concrete pavements will be constructed as well. The project also includes construction of a driveway to provide fuel truck access to the proposed fuel facility from the adjacent Linda Vista Drive. The proposed improvements are shown on Figure 2.

Based on our experience with fuel facilities, the canopy for the service islands is typically founded on spread footings and the design is typically governed by overturning moments from wind and seismic loading. Typical column dead loads are anticipated to be approximately 4 kips and typical live loads are up to approximately 30 kips, which result in bearing pressures of less than 1,000 pounds per square foot (psf).

1.2 SCOPE OF SERVICES

The scope of our geotechnical study consisted of a literature review, engineering evaluation and analysis, and preparation of this report. Studies to assess environmental hazards that may affect the soil and groundwater at the site were beyond our geotechnical scope of work. A description of our scope of services performed for the geotechnical portion of the project follows.

1.2.1 Task 1 – Background Data Review

We reviewed readily-available published and unpublished geologic literature in our files and the files of public agencies, including selected publications prepared by the California Geological Survey (formerly known as the California Division of Mines and Geology) and the U.S. Geological Survey (USGS). We also reviewed readily available seismic and faulting information, including data for designated earthquake fault zones as well as our in-house database of faulting in the general site vicinity.

Kleinfelder also reviewed our previous geotechnical report (Kleinfelder, 2020) and the Southern California Soil and Testing, Inc. (SCST) geotechnical report (SCST, 2000) for the site. Pertinent field exploration and laboratory data from our 2020 study and SCST's 2000 study were used in conjunction with our current study to form the geotechnical design and construction recommendations presented in this report and are attached in Appendix C. The approximate locations of the prior investigations are shown on Figure 2.

1.2.2 Task 2 – Field Exploration

Subsurface conditions at the site were explored by drilling five (5) borings. Two borings were drilled to a depth of approximately 40 feet below existing ground surface (bgs), one boring to a depth of approximately 25 feet bgs, and another two borings were drilled to a depth of approximately 20 feet bgs. The 25-foot boring was converted to a 2-inch-diameter PVC monitoring well at the completion of drilling. The monitoring well will remain on-site so that groundwater levels can be monitored over time. The approximate exploration locations are shown on Figure 2. The logs of the explorations are presented in Appendix A.

Prior to commencement of the fieldwork, various geophysical techniques were used at the boring locations to identify potential conflicts with subsurface structures. Each of our proposed field exploration locations were also cleared for buried utilities through Underground Service Alert (USA).

The borings were drilled using truck-mounted, hollow-stem-auger drilling equipment to the planned depths or to practical refusal, whichever occurred first. A Kleinfelder engineer supervised the field operations and logged the explorations. Selected bulk and drive samples were retrieved and transported to our laboratory for further evaluation. Appendix A presents a description of the field exploration program, exploration logs, and a legend of terms and symbols used on the logs. Soil descriptions used on the logs result from field observations and data, as well as from laboratory test data. Stratification lines on the logs represent the approximate boundary between soil and/or rock types, and the actual transition may vary and can be gradual.

1.2.3 Task 3 – Laboratory Testing

Laboratory testing was performed on selected samples to evaluate the physical and engineering characteristics of the subsurface soils. Laboratory testing consisted of in-situ moisture content and density, wash sieves, sieve analysis, hydrometer testing, direct shear, expansion index, R-Value, and preliminary corrosion testing. A summary of the testing performed, and the test results are presented in Appendix B.

1.2.4 Task 4 – Geotechnical Analyses

Field and laboratory data from previous and current studies were analyzed in conjunction with the existing site conditions, preliminary layout, and anticipated structural loads to provide geotechnical recommendations for design and construction of the proposed fuel facility addition. We evaluated feasible foundation systems, including constructability and compatibility constraints, pavement support, and earthwork. Seismic design parameters based on the 2022 California Building Codes (CBC) are also presented.

1.2.5 Task 5 – Report Preparation

This report summarizes the work performed, data acquired, and our findings, conclusions, and geotechnical recommendations for the design and construction of the proposed improvements. Our report includes the following items:

- Site vicinity map and site plan showing the approximate field explorations;
- Logs of the borings;
- Results of laboratory tests;
- Discussion of general subsurface conditions as encountered in our field exploration conducted for this study, including the depth to groundwater;
- Recommendations for seismic design parameters in accordance with the 2022 CBC;
- Evaluation of the potential for liquefaction and seismic settlement;

- Recommendations for site preparation, earthwork, temporary slope inclinations, fill placement, and compaction specifications;
- Recommendations for the excavation characteristics of subsurface soil deposits;
- Recommendations for the UST excavation side slopes, including temporary shoring recommendations and a discussion of groundwater impacts;
- Recommendations for foundation design (spread footings and drilled piles), allowable bearing capacities, embedment depths, and settlement estimates under various loading conditions;
- Recommendations for flexible and rigid pavement structural sections for light and heavy-duty pavement based on Equivalent Single Axle loading (ESALs), as stated in the CWDRs;
- Discussion of the site's suitability for storm water infiltration; and
- Preliminary evaluation of the corrosion potential of the on-site soils.

2 SITE AND SUBSURFACE CONDITIONS

2.1 SITE DESCRIPTION

The site is bounded by Linda Vista Drive and Grand Avenue to the north, an undeveloped vacant lot to the west, South Bent Avenue to the east, and the existing Costco Business Center and associated parking to the south. The proposed fuel facility site will be located in an area currently occupied by an asphalt parking lot, as shown on Figure 2. At the time of our field investigation, the parking lot was chained off and not open to the public. The site is relatively flat with drainage achieved primarily by sheet flow into on-site catch basins and storm drains, or onto the adjacent bordering streets and into the local storm-drain system.

2.2 SUBSURFACE SOIL CONDITIONS

Subsurface conditions at the site generally consist of artificial fill placed during initial development of the site over older alluvial soils underlain by sedimentary deposits of the Santiago Formation. The fill depth was encountered at depths ranging from approximately 2 to 3½ feet bgs in our borings. The fill generally consists of clayey sand to silty, clayey sand. Artificial fill was not encountered in Boring B-3. Older alluvial soils underlie the fill (if present) to depths ranging from approximately 10 to 14 feet bgs and generally consist of dense to very dense clayey sand. Underlying the older alluvial soils was sedimentary deposits of the Santiago Formation to the maximum depth explored of approximately 40 feet bgs. The Santiago Formation deposits generally consisted of dense to very dense poorly-graded sand with clay, clayey sand, and silty sand, or stiff to hard lean to fat clay with varying amounts of sand.

A stabilized groundwater level was measured at a depth of approximately 10 feet bgs in the monitoring well. Localized zones of perched water, and increased soil moisture content should be anticipated during and following rainy seasons. Irrigation of landscaped areas on or adjacent to the site can also cause perched water and increased soil moisture content.

3 CONCLUSIONS AND RECOMMENDATIONS

3.1 GENERAL

Based on the results of our field exploration, laboratory testing and engineering analyses conducted during this study, it is our professional opinion that the proposed project is geotechnically feasible, provided the recommendations presented in this report are incorporated into the project design and construction.

- The proposed fuel facility may be supported on a conventional spread footing foundation system. Light poles may be supported on short, drilled piles within the upper 10 feet bgs.
- Footings are anticipated to be embedded approximately 6 to 7 feet below finished grade and may be designed for a net allowable soil bearing pressure of 3,000 psf for dead plus sustained live loads. A one-third increase in the above bearing pressures can be used for wind or seismic loads.
- Footings may bear on the existing soils at the site. Following excavation to foundation subgrade elevation, exposed subgrade should be observed by a representative of Kleinfelder to evaluate the presence of satisfactory materials at design elevations. If unsatisfactory material, such as soft or disturbed soil, debris or otherwise unsuitable soil is present at the base of the footing excavation, it should be overexcavated and replaced with structural fill, structural concrete, or a 2-sack sand-cement slurry to the depth determined by the Kleinfelder representative.
- For new pavement areas within existing pavement areas, we recommend that the exposed subgrade be proof-rolled with heavy construction equipment (e.g. loader or smooth-drum roller) to disclose areas of soft and yielding material after the area has been stripped of soft earth materials and debris. Where soft or yielding material are observed, the material should be overexcavated and replaced with structural fill. The proof-rolling should extend beyond the proposed improvements a horizontal distance of at least 2 feet, if practicable.
- For new pavement areas within existing landscaped areas, we recommend that the existing soils be overexcavated to a depth of at least 12 inches below existing grade or 12 inches below the finished subgrade elevation, whichever is deeper, after the area has been stripped of construction debris and soft earth materials. Prior to placing fill, the exposed subgrade should be proof-rolled with heavy construction equipment (e.g., loader or smooth-drum roller) to disclose areas of soft and yielding material. Where soft and

yielding material is observed, it should be overexcavated and replaced as structural fill. The overexcavated soil may be reused as structural fill.

- Based on past experience, it is common to encounter wet, unstable soils upon removal of site pavements or flatwork as a result of subsurface moisture becoming trapped beneath relatively impervious asphalt concrete or Portland cement concrete surfaces. The contractor should anticipate that pumping subgrade conditions may be encountered during site grading activities, and the subgrade may need to be stabilized. Recommendations to stabilize wet or pumping subgrade are provided in Section 4.3.
- Groundwater will be encountered within deeper excavations, such as for the proposed USTs. A stabilized groundwater level was measured at a depth of approximately 10 feet bgs in the monitoring well. Temporary dewatering provisions will likely be required for these areas depending on the depth to groundwater and proposed excavation depths. Groundwater impacts are discussed in Section 5.4.
- Groundwater levels in the well should be checked by the contractor prior to the start of construction. The monitoring well will need to be decommissioned prior to the start of construction in accordance with San Diego County DEHQ and state requirements (California Department of Water Resources Bulletin 74-81 and 74-90). A discussion of the well abandonment requirements is provided in Section 4.8
- Excavations for the USTs and foundations should be excavatable with conventional heavy-duty construction equipment. However, the UST excavation bottom conditions will be wet. The exposed soils may be somewhat unstable and sensitive to disturbance by construction activities. Heavy compaction equipment is not recommended in excavation bottom areas. Excavations should be performed with “toothless” buckets to reduce disturbance of the subgrade. All disturbed soils at the subgrade level should be replaced with the gravel bedding for the tank. The bedding should be separated from the subgrade by a filter fabric (Mirafi 140N or equivalent).
- Due to poor draining subgrade conditions, we recommend drainage inlets and catch basins include pavement underdrains as shown in Detail 16_16 of the CWDRs.
- Laboratory testing was performed on one soil sample to evaluate pH, minimum resistivity, chloride and soluble sulfate content. The minimum resistivity of the sample indicates that the soil may be extremely corrosive to metals (Roberge, 2006). The concentrations of soluble sulfates indicate that the subsurface soils represent a Class S0 exposure to sulfate attack on concrete in contact with the soil based on ACI 318- Table 19.3.3.1 (ACI, 2019).

Therefore, in accordance with ACI Building Code 318, no special provisions for selection of cement type are required.

- Based on visual soil classification and laboratory testing of the soil samples collected during our field exploration, the upper subsurface soils (upper 10 feet) consist predominantly of dense to very dense clayey sand. Furthermore, groundwater was encountered as shallow as approximately 10 feet below grade. In accordance with Appendix C of the City of San Marcos BMP Design Manual, the depth to seasonally high groundwater table beneath the base of any infiltration BMP must be greater than 10 feet. Accordingly, due to the shallow depth of groundwater and the low infiltration characteristics of the near surface soils, we do not recommend the use of infiltration BMPs and consider infiltration at this site to be infeasible based on the City's criteria.

The following opinions, conclusions, and recommendations are based on the properties of the materials encountered in the borings, the results of the laboratory-testing program, and our engineering analyses performed. Our recommendations regarding the geotechnical aspects of the design and construction of the project are presented in the following sections.

3.2 SEISMIC DESIGN CONSIDERATIONS

3.2.1 2022 CBC Seismic Design Parameters

Based on data obtained from our field explorations, published geologic literature and maps, and on our interpretation of the 2022 CBC criteria, it is our opinion that the project site may be classified as Site Class D, Stiff Soil, according to Section 1613 of the 2022 CBC and Table 20.3-1 of ASCE/SEI 7-16 (2016). Approximate coordinates for the site are noted below.

- Latitude: 33.1393 °N
- Longitude: 117.1836 °W

In accordance with Section 11.4.8 of ASCE 7-16, a site-specific ground motion hazard analysis is required for Site Class D sites with an S_1 greater than 0.2 g. However, a site-specific ground motion hazard analysis is not required if the exceptions in Section 11.4.8 of ASCE 7-16 are taken. In accordance with the 2022 CBC, which adopts Supplement 3 of the ASCE 7-16, the exception would be if the values of the parameters S_{M1} and S_{D1} are increased by 50 percent. The assumption that the exception will be used should be verified by the project structural engineer during final design based on the governing code. Based on the assumption that the exception will be taken in accordance with the governing code, the 2022 CBC Seismic Design Parameters (non site-specific) for the project site are provided in Table 1.

Table 1
2022 CBC Seismic Design Parameters

DESIGN PARAMETER	RECOMMENDED VALUE
Site Class	D
S_s (g)	0.897
S_1 (g)	0.330
F_a	1.141
F_v	N/A*
S_{MS} (g)	1.023
S_{M1} (g)	N/A
S_{DS} (g)	0.682
S_{D1} (g)	N/A
PGA_M (g)	0.470

* N/A = Not Applicable; Section 11.4.8 of ASCE 7-16 requires a site-specific ground motion hazard analysis be performed for Site Class D sites with S_1 values greater than or equal to 0.2g unless exceptions are taken in which the values of S_{M1} and S_{D1} are increased by 50 percent. If exceptions are taken, then a Fv value of 1.97 may be used in accordance with Table 11.4-2 of ASCE 7-16 Supplement 3 (per the 2022 CBC).

3.2.2 Liquefaction and Seismic Settlement

The term liquefaction describes a phenomenon in which saturated, cohesionless soils temporarily lose shear strength (liquefy) due to increased pore water pressures induced by strong, cyclic ground motions during an earthquake. Structures founded on or above potentially liquefiable soils may experience bearing capacity failures due to the temporary loss of foundation support, vertical settlements (both total and differential), and/or undergo lateral spreading. The factors known to influence liquefaction potential include soil type, relative density, grain size, confining pressure, depth to groundwater, and the intensity and duration of the seismic ground shaking. Liquefaction is most prevalent in loose to medium dense, silty, sandy, and gravelly soils below the groundwater table. Because of the density and soil composition of the underlying soils, the potential for liquefaction at the site is considered low.

Seismic compression results from the accumulation of contractive volumetric strains in unsaturated soil during earthquake shaking. Loose to medium dense granular material with no fines or with low plasticity fines are most susceptible to seismic compression. Based on the density and soil composition of the underlying soils, the potential for seismic compression (dynamic dry settlement) is considered to be low.

3.3 FOUNDATIONS

3.3.1 General

The proposed fuel facility may be supported on a conventional spread footing foundation system. Light poles may be supported on short, drilled piles within the upper 10 feet bgs. Recommendations for the design and construction of spread footings and short, drilled piles are presented below.

3.3.2 Spread Footing Foundations

Allowable Soil Bearing Pressure

We understand that new spread footing foundations will be embedded approximately 6 to 7 feet below the finished grade. Spread footings founded on existing soils may be designed for a net allowable soil bearing pressure of 3,000 psf for dead plus sustained live loads. A one-third increase in the above bearing pressures can be used for short term load conditions for wind or seismic loads. The footing dimension and reinforcement should be designed by the structural engineer; however, continuous footings should have minimum widths of 18 inches.

Estimated Settlement

We estimate total static settlement for foundations designed and constructed in accordance with the recommendations presented above to be less than ½ inch. Differential static settlement between similarly loaded footings is estimated to be less than ½ inch over 50 feet.

Lateral Resistance

Lateral load resistance may be derived from passive resistance along the vertical sides of the footings, friction acting at the base of the footing, or a combination of the two. An allowable passive resistance of 250 psf per foot of depth may be used for design. Allowable passive resistance values should not exceed 2,500 psf. An allowable coefficient of friction value of 0.35 between the base of the footings and fill soils can be used for sliding resistance using the dead load forces. Friction and passive resistance may be combined without reduction. We recommend that the first foot of soil cover be neglected in the passive resistance calculations if the ground surface is not protected from erosion or disturbance by a slab, pavement or in a similar manner.

3.3.3 Short Drilled Pile Foundations

Axial Capacity

The compressive axial capacity of drilled piles may be estimated based on an average allowable skin friction capacity of 150 pounds per square foot. The upper one foot of the skin friction capacity should be ignored. The uplift capacity may be estimated as 70 percent of the allowable compressive axial capacity. A one-third increase in the allowable capacities may be used for transient loading conditions such as wind or seismic loads.

Settlement

Static settlement of the proposed canopy supported on drilled piles, as recommended, is estimated to be less than ½ inch.

Lateral Resistance

The drilled pile foundations lateral resistance can be designed in general accordance with Section 1807.3 of the 2022 CBC. We recommend a lateral soil bearing pressure of 250 psf per foot of depth below grade. The total lateral soil bearing pressure should not exceed 2,500 psf per pile. Since drilled piles will act as isolated pole foundations, the allowable lateral soil bearing pressure may be increased by a factor of 2 for short-term lateral loads provided the structure will not be adversely affected by ½ inch of lateral movement at the ground surface.

3.4 EXTERIOR FLATWORK

Exterior flatwork should be at least 4.0 inches thick underlain by at least 4.0 inches of Class 2 aggregate base. Flatwork subjected to wheel loads should be designed in accordance with Section 3.6.

Careful control of the water/cement ratio should be performed to avoid shrinkage cracking due to excess water or poor concrete finishing or curing. Unreinforced slabs should not be built in areas where further saturation may occur following construction.

3.5 SITE DRAINAGE

Foundation and slab performance depends greatly on proper irrigation and how well runoff water drains from the site. This drainage should be maintained both during construction and over the entire life of the project. The ground surface around structures should be graded such that water drains away from structures without ponding. The surface gradient needed to do this depends on the landscaping type. Surface gradients should conform to current Costco Wholesale standards and the CBC.

Due to poor draining subgrade conditions, we recommend drainage inlets and catch basins include pavement underdrains as shown in Detail 16_16 of the CWDRs. Drains should be designed and constructed per Costco's standard details and laterals should extend at least 10 feet from the catch basins.

We recommend that landscape planters either not be located adjacent to buildings and pavement areas or be isolated and properly drained to area drains such that cycles of wetting and drying do not impact pavements, flatwork, and other structures. Drought resistant plants and minimum watering are recommended for planters, if used. No planters should be installed immediately adjacent to structures unless they are water-proofed and have a drainpipe connected to an area drain outlet. Planters should be built such that water exiting from them will not seep into the foundation areas or beneath slabs and pavement. Roof water should be directed to fall on hardscape areas sloping to an area drain, or roof gutters and downspouts should be installed and routed to area drains. Roof downspouts and their associated drains should be isolated from other subdrain systems, where used, to avoid flooding. In any event, maintenance personnel should be instructed to keep areas uniformly moist throughout the life of the project (e.g., limit or eliminate cycles of wetting and drying) as cycles of wetting and drying will cause distress in surrounding improvements. Should excessive irrigation, waterline breaks or unusually high rainfall occur, saturated zones and "perched" groundwater may develop. Consequently, the site should be graded so that water drains away readily without saturating the foundation or landscaped areas. Potential sources of water such as water pipes, drains, and the like should be frequently examined for signs of leakage or damage. Any such leakage or damage should be promptly repaired. Wet utilities should also be designed to be watertight and should be inspected and repaired as needed.

3.6 PAVEMENT

We have provided new asphalt concrete and PCC pavement sections for traffic indices provided in the CWDRs (Costco, 2022). Positive drainage of the paved areas should be provided since moisture infiltration into the subgrade may decrease the life of pavements. Curbing located adjacent to paved areas should be founded in the subgrade, not the aggregate base, in order to provide a cutoff, which reduces water infiltration into the base course.

The following pavement sections are based on the soil conditions encountered during our field investigation, our assumptions regarding final site grades, and limited laboratory testing.

3.6.1 Costco Design Parameters

We developed pavement design recommendations using traffic indices provided in the CWDRs (2022) based on the following assumptions:

- A 20-year pavement design life;
- Light-duty pavements subject to 6,600 passenger vehicle trips per year (Traffic Index of 5.0);
- Heavy-duty pavements subject to 30 tractor-trailer truck trips per day (Traffic Index of 7.0);
- For asphalt concrete pavements: a design R-value of 25 was selected based on laboratory testing; and
- For Portland cement concrete (PCC) Pavements: a 28-day flexural strength (modulus of rupture determined by the third-point method) of at least 550 pounds per square inch (psi) (approximate compressive strength of 4,000 psi); a modulus of subgrade reaction (k value) of 125 pounds per square inch per inch (pci); and interlock at the control joints.

3.6.2 Asphalt Concrete Pavement

We recommend pavement repairs match the existing pavement sections plus one additional inch of asphalt concrete.

We have developed new asphalt concrete pavement, also referred to as Hot Mix Asphalt (HMA) pavements sections in accordance the Caltrans Highway Design Manual in lieu of the Asphalt Institute Manual Series (MS-1). Hot Mix Asphalt (HMA) should conform to requirements of the Costco Wholesale Specification Section 321216, Asphalt Paving. Table 2 presents recommended HMA pavement sections. The designer should select the appropriate pavement sections based on project requirements. Prior to placement of aggregate base, pavement subgrade should be prepared in accordance with Section 4.2.2.

Table 2
Asphalt Concrete Pavement Sections
(Design R-Value of 25)

Traffic Use	Traffic Index, TI	Design method	Asphalt Concrete * (inches)	Aggregate Base (inches)
Light-Duty Pavement	5.0	Caltrans	3.0	6.5
Heavy-Duty Pavement	7.0	Caltrans	5.0	9.0

*rounded to the nearest ½ inch.

3.6.3 Asphalt Performance Grade Binder

An asphalt performance grade (PG) binder of 64-10 should be used for the project and is locally available. This recommendation was developed in accordance with Costco Wholesale Asphalt Paving Specification Section 321216. Air temperature data nearest the project site was used with the MERRA Climate Data option and the PG binder was selected using the FHWA program LTTPBind Online web-based tool based on the AASHTO M323-13 standard. The high-end and low-end temperature rating was selected to provide a reliability of at least 98 and 90 percent, respectively.

3.6.4 Portland Cement Concrete Pavement

We designed PCC pavement in accordance with the Portland Cement Association (PCA) Thickness Design for Concrete Pavements (PCA, 1984) using the design parameters stated above. For heavy-duty pavements, we recommend that PCC pavement should be comprised of 7.0 inches of PCC with 6.0 inches of aggregate base.

Longitudinal and transverse joint spacing should not exceed 12 feet and 15 feet, respectively. Joint details should conform to PCA guidelines. Expansion joints in concrete slabs should be sealed with petroleum resistant sealant to prevent minor releases from impacting subsurface soil.

3.6.5 Aggregate Base

Aggregate base materials should meet current Caltrans specifications for Class 2 aggregate base. Please note that Caltrans Class 2 aggregate base may utilize recycled materials. The use of recycled material requires Costco's approval.

3.7 SOIL CORROSION

A preliminary evaluation of the corrosion potential of the on-site soils to steel and buried concrete was completed. Laboratory testing was performed on one soil sample to evaluate pH, minimum resistivity, chloride and soluble sulfate content. The test results are presented in Table 3.

Table 3
Corrosion Test Results

Boring	Depth (ft)	Minimum Resistivity (ohm-cm)	pH	Soluble Sulfate Content (ppm)	Soluble Chloride Content (ppm)
B-2	1-5	680	7.2	190	310

These tests are only an indicator of soil corrosivity for the samples tested. Other soils found on site may be more, less, or of a similar corrosive nature. Imported fill materials should be tested to confirm that their corrosion potential is not more severe than those noted.

Resistivity values below 1,000 ohm-cm are considered extremely corrosive to buried ferrous metals (Roberge, 2006). The concentrations of soluble sulfates indicate that the subsurface soils represent a Class S0 exposure to sulfate attack on concrete in contact with the soil based on ACI 318 Table 19.3.1.1 (ACI, 2019). Therefore, in accordance with ACI Building Code 318, no special provisions for selection of cement type are required.

Kleinfelder's scope of services does not include corrosion engineering and, therefore, a detailed analysis of the corrosion test results is not included. We understand gasoline station equipment is constructed of corrosion resistant synthetic materials. We recommend the gasoline station designer review these results and consult a corrosion expert for further evaluation, if necessary.

3.8 INFILTRATION TESTING AND STORM WATER MANAGEMENT

We have assessed the potential for storm water infiltration into the subgrade soils at the subject project site. Our assessment is based on the data collected during our field exploration and laboratory testing in accordance with the City of San Marcos BMP Design Manual, dated February 2016 (City of San Marcos, 2016).

Based on visual soil classification and laboratory testing of the soil samples collected during our field exploration, the upper subsurface soils (upper 10 feet) consist predominantly of dense to very dense clayey sand. Furthermore, groundwater was encountered as shallow as approximately 10 feet below grade. In accordance with Appendix C of the City of San Marcos BMP Design

Manual, the depth to seasonally high groundwater table beneath the base of any infiltration BMP must be greater than 10 feet. Accordingly, due to the shallow depth of groundwater and the low infiltration characteristics of the near surface soils, we do not recommend the use of infiltration BMPs and consider infiltration at this site to be infeasible based on the City's criteria.

We recommend alternatives to infiltration Best Management Practices (BMPs), such as bio-filtration/bio-retention systems (bio-swales and planter boxes), be implemented at the warehouse site. If bio-filtration/bio-retention systems are employed, we recommend that the BMPs be built such that water exiting from them will not seep into the foundation areas or beneath slabs and pavement. If planters are located within 10 feet of the building or building foundations, or adjacent to slabs and pavements, then some means of diverting water away from the building, building foundation soils, or soils that support slabs and pavements would be required, such as lining the planters.

4 CONSTRUCTION RECOMMENDATIONS

4.1 GENERAL

The following recommendations should be used by the contractor for construction of the project.

4.2 EARTHWORK

4.2.1 General

Site preparation and earthwork operations should be performed in accordance with applicable codes, safety regulations and other local, state or federal specifications, and the recommendations included in this report. The earthwork operations should be observed and tested by a representative of Kleinfelder.

4.2.2 Site Preparation

Abandoned utilities (including any trench backfill), existing pavements, foundations, and other existing improvements within the proposed fuel facility areas should be removed and the excavation(s) backfilled with structural fill. Debris produced by demolition operations, including wood, steel, piping, plastics, etc., should be separated and disposed of off-site. Existing utility pipelines or conduits that extend beyond the limits of the proposed construction and are to be abandoned in place, should be plugged with non-shrinking cement grout to prevent migration of soil and/or water. Demolition, disposal and grading operations should be observed and tested (as appropriate) by a representative of Kleinfelder. Areas to receive fill should be stripped of all dry, loose or soft earth materials and unsuitable fill materials to the satisfaction of a representative of Kleinfelder.

- Existing Pavement Areas: For new pavement areas within the existing pavement areas, we recommend that the exposed subgrade be proof-rolled with heavy construction equipment (e.g. loader or smooth-drum roller) to disclose areas of soft and yielding material after the area has been stripped of soft earth materials and debris. Where soft or yielding material are observed, the material should be overexcavated and replaced with structural fill. The proof-rolling should extend beyond the proposed improvements a horizontal distance of at least 2 feet, if practicable.

- Existing Landscaped Areas: For new pavement areas within existing landscaped areas, we recommend that the existing soils be overexcavated to a depth of at least 12 inches below existing grade or 12 inches below the finished subgrade elevation, whichever is deeper, after the area has been stripped of construction debris and soft earth materials. Prior to placing fill, the exposed subgrade should be proof-rolled with heavy construction equipment (e.g., loader or smooth-drum roller) to disclose areas of soft and yielding material. Where soft and yielding material is observed, it should be overexcavated and replaced as structural fill. The overexcavated soil may be reused as structural fill.

Based on past experience, it is common to encounter wet, unstable soils upon removal of site pavements or flatwork as a result of subsurface moisture becoming trapped beneath relatively impervious asphalt concrete or Portland cement concrete surfaces. Perched groundwater or saturated near surface conditions are also common in clayey soils following winter or heavy rains. The contractor should anticipate that pumping or saturated subgrade conditions may be encountered during site grading activities, and the subgrade may need to be stabilized. Recommendations for stabilization are provided in Section 4.3.

4.2.3 Foundation Excavations

<u>Spread Footings</u>

Following excavation to the foundation subgrade elevations, the exposed subgrade should be observed by a representative of the geotechnical engineer to evaluate the presence of satisfactory materials at design elevations. If unsatisfactory material, such as soft or disturbed soil, debris or otherwise unsuitable soil is present at the base of footing excavations, then unsuitable materials should be overexcavated and replaced (e.g., with structural concrete, 2-sack sand-cement slurry, structural fill) to the depth and extent determined by the geotechnical engineer. As a minimum, the contractor should be prepared to scarify, moisture condition, and re-compact the upper 12 inches of footing subgrade.

<u>Short Drilled Piles</u>

The performance and capacities of piles can be influenced significantly by the selected construction methods and procedures used. Construction methods that create large zones of disturbance around the drilled shafts can lead to lower than expected skin friction due to excessive stress relief around the shaft length. Drilling of the pile shafts should be accomplished using conventional heavy-duty excavation equipment maintained in good condition.

While clayey soils are not prone to caving, isolated pockets of sandy soils may cave during drilling of the pile shafts and temporary steel casing may be needed to stabilize the sides of the pile shaft.

Concrete should be placed immediately after drilling of the hole is complete and the bottom of the drilled hole should be observed to be relatively clean and free of debris and/or loose material. The concrete should be pumped to the bottom of the drilled shaft using a down-hole tremie. If steel casing is used, the casing should be removed as the concrete is placed but the bottom of the casing should be kept at least 5 feet below the top of the concrete.

4.2.4 Structural Fill Material and Compaction Criteria

The on-site soils, minus any debris, organic matter, or other deleterious materials, may be used in the site fills. Rock or other soil fragments greater than 3 inches in size should not be used in the fills. The presence of oversized materials, such as cobbles, should be anticipated.

Due to compaction difficulties and the potential for expansion, we do not recommend compacting the onsite clayey soils to at least 95 percent of the maximum dry unit weight (ASTM D1557), as required in the CWDRs. Onsite clayey soils should be compacted to at least 92 percent of the soil's maximum dry unit weight (ASTM D1557). The upper 12 inches below pavements should be compacted to at least 95 percent (ASTM D1557).

Fill should be placed in loose horizontal lifts not more than 8 inches thick (loose measurement). The moisture content of the fill should be maintained at optimum or above during compaction and until the aggregate base is placed and compacted. Utility trench backfill should be mechanically compacted. Flooding should not be permitted.

Processing of the on-site soils may require ripping the material, disking to break up clumps, and blending to attain uniform moisture contents necessary for compaction. Utility trench backfill should be mechanically compacted. Flooding should not be permitted.

Import materials, if required, should have an Expansion Index (EI) of less than 20 with no more than 30 percent of the particles passing the No. 200 sieve and no particles greater than 3 inches in maximum dimension. The maximum EI for imported soils may be modified by the project geotechnical engineer depending on its proposed use. The contractor should provide documentation that proposed imported fill materials is free of hazardous materials, including petroleum or petroleum byproducts, chemicals and harmful minerals. Kleinfelder should evaluate the proposed imported materials prior to their transportation and use on site.

4.2.5 Excavation Characteristics

The subsurface conditions consist predominantly of artificial fill underlain by older alluvial soils and sedimentary deposits of the Santiago Formation. The excavations for the foundations should be excavatable with conventional heavy-duty construction equipment maintained in good condition.

As previously noted, a stabilized groundwater level was measured at a depth of approximately 10 feet bgs in the monitoring well. The UST excavation bottom conditions will be wet and may be soft. The exposed soils may be somewhat unstable and sensitive to disturbance by construction activities. Heavy compaction equipment is not recommended in excavation bottom areas. Excavations should be performed with “toothless” buckets to reduce disturbance of the subgrade. All disturbed soils at the subgrade level should be replaced with the gravel bedding for the tank. The bedding should be separated from the subgrade by a filter fabric (Mirafi 140N or equivalent).

4.2.6 Temporary Excavations

All excavations must comply with applicable local, state, and federal safety regulations, including OSHA requirements. The responsibility for excavation safety and stability of temporary construction slopes lies solely with the contractor. We are providing this information below solely as a service to our client. Under no circumstances should this information provided be interpreted to mean that Kleinfelder is assuming responsibility for final engineering of excavations or shoring, construction site safety, or the contractors’ activities; such responsibility is not being implied and should not be inferred.

Minor sloughing and/or raveling of slopes should be anticipated as they dry out. Where space for sloped embankments is not available, shoring will be necessary. Recommendations for temporary shoring are presented in Section 4.5. In addition, excavations within a 1:1 plane extending downward from a horizontal distance of 2 feet beyond the bottom outer edge of existing improvements should not be attempted without bracing and/or underpinning the footings, as discussed above. The geotechnical engineer or their field representative should observe the excavations so that modifications can be made to the excavations, as necessary, based on variations in the encountered soil conditions. All applicable excavation safety requirements and regulations, including OSHA requirements, should be met.

All trench excavations should be braced and shored in accordance with good construction practice and all applicable safety ordinances and codes. Stockpiled (excavated) materials should be placed no closer to the edge of an excavation than a distance equal to the depth of the excavation, but no closer than 4 feet.

4.2.7 Trench Backfill

Pipe zone backfill (i.e. material beneath and in the immediate vicinity of the pipe) should consist of imported soil less than ¾-inch in maximum dimension. Trench zone backfill (i.e., material placed between the pipe zone backfill and finished subgrade) may consist of onsite soil or imported fill that meets the requirements for structural fill provided above.

If imported material is used for trench zone backfill, we recommend it consist of silty sand. In general, gravel and cobble should not be used for trench zone backfill due to the potential for soil migration into the relatively large void spaces present in this type of material and water seepage along trenches backfilled with coarse-grained sand and/or gravel.

Recommendations provided above for pipe zone backfill are minimum requirements only. More stringent material specifications may be required to fulfill local building requirements and/or bedding requirements for specific types of pipes. We recommend the project civil engineer develop these material specifications based on planned pipe types, bedding conditions, and other factors beyond the scope of this study.

Trench backfill should be placed and compacted in accordance with recommendations provided for structural fill in Section 4.2.4. Mechanical compaction is recommended; ponding or jetting should be avoided, especially in areas supporting structural loads or beneath concrete slabs supported on grade, pavements, or other improvements.

4.3 UNSTABLE SUBGRADE CONDITIONS

It is common to encounter wet, unstable soils upon removal of site pavements or flatwork as a result of subsurface moisture becoming trapped beneath relatively impervious asphalt concrete or Portland cement concrete surfaces. In addition, should grading be performed during or following periods of rainfall, the moisture content of the near-surface soils will also be significantly above the optimum moisture content. These conditions could seriously impede grading by causing an unstable subgrade condition. The contractor should anticipate that pumping subgrade conditions may be encountered during site grading activities. Typical remedial measures include the following:

- Drying: Drying unstable subgrade involves disking or ripping wet subgrade to a depth of approximately 18 to 24 inches and allowing the exposed soil to dry. Multiple passes of the equipment (likely on a daily basis) will be needed because as the surface of the soil dries, a crust forms that reduces further evaporation. Frequent disking will help prevent the formation of a crust and will promote drying. This process could take several days to several weeks depending on the depth of ripping, the number of passes, and the weather.
- Removal and Replacement with Crushed Rock and Geotextile Fabric: Unstable subgrade could be over-excavated 12 to 24 inches below existing grade and replaced with ¾- or 1-inch crushed rock underlain and/or wrapped by geotextile fabric. The geotextile fabric should consist of a woven geotextile, such as Mirafi HP series or equivalent. The final depth of removal will depend upon the conditions observed in the field once overexcavation begins. The geotextile fabric should be placed in accordance with the manufacturer's recommendations.
- Cement Treatment: Unstable subgrade could be stabilized by mixing the upper 12 to 18 inches of the subgrade with Portland cement, Class C flyash or lime. For estimating purposes, an application rate of 10 to 12 percent Class C flyash, 3 to 5 percent high calcium quick lime, or 3 to 5 percent Portland cement may be used. Final application rates should be determined in the field at the time of construction in consultation with the geotechnical engineer. Chemical treatment should be performed by a specialty contractor experienced in this work. Since soil treatment uses the on-site soil, the expense of importing material can be avoided.

4.4 GROUNDWATER IMPACTS DURING CONSTRUCTION

A stabilized groundwater level was measured a depth of approximately 10 feet bgs in the monitoring well. Temporary dewatering may be required for excavation of deep utilities and the fuel facility USTs. Dewatering of excavations may be achieved by using localized sumps and trenches for nuisance water if "watertight" shoring, such as interlocking sheet piles, is used. If groundwater inflows are significant, larger-diameter wells or a well-point dewatering system may be required. The following are considerations with respect to dewatering proposed excavations, if needed:

- The contractor should retain an experienced engineer for design of a dewatering system. The dewatering system should be installed by a contractor specializing in dewatering under similar soil conditions. It has been our experience that improperly designed or constructed dewatering systems can significantly impact project schedule, cost, and adjacent structures.

- Sump pumping during construction should be anticipated to remove groundwater that bypasses the dewatering system. Gravel filled trenches and sump pits should be lined with filter fabric (Mirafi 140N or equivalent) to reduce the potential of pumping out fines. Turbid (cloudy to muddy) discharge water should be anticipated and additional measures for settlement of solids may be required.
- Drawdown of groundwater during dewatering may result in ground settlement within a radius of influence from the pumping system.
- A dewatering monitoring program should include routine monitoring for suspended solids and treatment facilities to ensure compliance with regulatory criteria. Permitting and monitoring of the discharged water will be required. Contaminated water will be required to be captured and treated to agency requirements prior to discharging into public system from the pumping system.

4.5 TEMPORARY SHORING

Temporary shoring may be required in areas adjacent to existing structures or improvements where excavations cannot be adequately sloped. Temporary shoring may consist of a turn-key shoring system, soldier piles and lagging, or other system. Recommendations for design of temporary shoring are presented below.

The shoring design should be provided by a civil engineer registered in the State of California and experienced in the design and construction of shoring under similar conditions. Once the final excavation and shoring plans are complete, the plans and design should be reviewed by Kleinfelder for conformance with the design intent and geotechnical recommendations provided herein.

4.5.1 Lateral Pressures

For the design of cantilevered shoring, an equivalent fluid pressure of 40 pounds per cubic foot (pcf) may be used for level backfill. Where the surface of the retained earth slopes up away from the shoring, a greater pressure should be used. Design data can be developed for additional cases when the design conditions are established.

In addition to the recommended earth pressure, any surcharge (live, including traffic, or dead load) located within a 1:1 plane drawn upward from the base of the shored excavation should be added to the lateral earth pressures. The lateral contribution of a uniform surcharge load located immediately behind the wall may be calculated by multiplying the surcharge by 0.31 for the level backfill condition. Lateral load contributions of surcharges located at a distance behind the shored wall may be provided once the load configurations and layouts are known. As a minimum, a 2-foot equivalent soil surcharge (250 psf) is recommended to account for nominal construction loads. It should be noted that the above pressures do not include hydrostatic pressure and assume groundwater will not be encountered in the excavation, or dewatering will be used to lower the ground water table below the bottom of the excavation.

4.5.2 Design of Soldier Piles

All soldier piles should extend to a sufficient depth below the excavation bottom to provide the required lateral resistance. We recommend the required embedment depths be calculated based on the principles of force and moment equilibrium. For this method, the allowable passive pressure against soldier piles that extend below the level of excavation may be assumed to be equivalent to a fluid pressure of 175 pcf. The maximum lateral resistance value should not exceed 2,000 psf. To account for arching, the passive resistance may be assumed to act over a width 2.0 times the width of the embedded portion of the pile, provided adjacent piles are spaced at least 2.5 pile diameters, center-to-center.

Drilling of the soldier pile shafts could be accomplished using heavy-duty drilling equipment. Because soldier pile shafts will extend below the groundwater into sandy soils, polymer slurry or temporary steel casing may be required to stabilize the sides of the pile shafts. Concrete for piles should be placed immediately after the drilling of the hole is complete. The concrete should be pumped to the bottom of the drilled shaft using a tremie. Once concrete pumping is initiated, a minimum head of 5 feet of concrete above the bottom of the tremie should be established and maintained throughout the concrete placement to prevent contamination of the concrete by soil inclusions. If steel casing is used, the casing should be removed as the concrete is placed.

To develop full lateral resistance, provisions should be taken to assure firm contact between the soldier piles and undisturbed materials. The concrete placed in the soldier pile excavations may be a lean-mix concrete. However, the concrete used in that portion of the soldier pile that is below the planned excavated level should provide sufficient strength to adequately transfer the imposed loads to the surrounding materials.

4.5.3 Lagging

Continuous treated timber lagging should be used between the soldier piles. The lagging should be installed as the excavation proceeds. If treated timber is used, the lagging may remain in place after backfilling. The lagging should be designed for the recommended earth pressure but limited to a maximum value of 400 psf.

4.5.4 Deflection

Shoring adjacent to existing structures or improvements should be designed and constructed to reduce potential movement. The shoring system designer should evaluate potential deflections in their design.

4.5.5 Monitoring

Some deflection of the shored excavation should be anticipated during the planned excavation. We recommend the project civil engineer perform a survey of all existing utilities and structures adjacent to the shored excavation. The purpose of this survey would be to evaluate the ability of existing utility lines or improvements to withstand horizontal movements associated with a shored excavation and to establish the baseline condition in case of unfounded claims of damage. If existing improvements are not capable of withstanding anticipated lateral movements, alternative shoring systems may be required.

Horizontal and vertical movements of the shoring system should be monitored by a licensed surveyor. The construction monitoring and performance of the shoring system are ultimately the contractor's responsibility. However, at a minimum, we recommend that the top of shoring be surveyed prior to excavation and that the top and bottom of the soldier beams be surveyed on a weekly basis until the shoring is not needed. Surveying should consist of measuring movements in vertical and two perpendicular horizontal directions.

4.6 EXTERIOR FLATWORK

Prior to casting exterior flatwork, the subgrade soils should be moisture conditioned and recompacted or over-excavated, as recommended in Section 4.2.2. The moisture content of the subgrade soils should be maintained at the required level until placement of any flatwork or structural fill. Careful control of the water/cement ratio should be performed to avoid shrinkage cracking due to excess water or poor concrete finishing or curing.

4.7 PAVEMENTS

4.7.1 HMA Design

Hot Mix Asphalt (HMA) should conform to requirements of the Costco Wholesale Specification Section 321216, Asphalt Paving. Section 1.3.C of the HMA specification requires that the HMA section be placed in at least two lifts. The HMA specification allows the use of ½- or ¾-inch Nominal Maximum Aggregate Size (NMAS) mixes for the base course and ⅜- or ½-inch NMAS mixes for surface course. Maximum and minimum HMA compacted lift thicknesses are provided in Table 3.1 in Section 3.3.B of the HMA specification.

4.7.2 Construction Considerations

The pavement sections provided in Section 3.6 are contingent on the following recommendations being implemented during construction.

- Pavement subgrade should be prepared as recommended in Section 4.2.2.
- Subgrade soils should be in a stable, non-pumping condition at the time the aggregate base materials are placed and compacted.
- Aggregate base materials should be moisture conditioned to at least the optimum moisture content and compacted to at least 95 percent relative compaction (ASTM D1557).
- Asphalt paving materials and placement methods should meet current Costco Wholesale Specifications Section 321216.
- Adequate drainage (both surface and subsurface) should be provided such that the subgrade soils and aggregate base materials are not allowed to become wet.

Note that pavement materials and construction must be completed in strict accordance with the Costco's specifications that contain very specific pavement material (asphalt, aggregate and concrete) criteria and construction practices to be used (compaction and material sampling). The general contractor and pavement construction subcontractor should be aware that asphalt and concrete mix designs must be submitted to the design architect and Kleinfelder at least 45 days prior to the scheduled production and laydown for review and approval.

4.8 WELL ABANDONMENT

A 2-inch-diameter monitoring well (MW-1) was installed as part of this study. Monitoring Well MW-1 should be abandoned by the contractor in accordance with San Diego County Department of Environmental Health and Quality (DEHQ) and state requirements (California Department of Water Resources Bulletin 74-81 and 74-90). Well destruction permits from San Diego County DEHQ should be obtained before the well abandonment efforts start. The San Diego County DEHQ well permit obtained as part of the field exploration is also included in Appendix A. The well construction diagram for Monitoring Well MW-1 is shown in Figure 3.

5 ADDITIONAL SERVICES

5.1 PLANS AND SPECIFICATIONS REVIEW

We recommend that Kleinfelder perform a general review of the project plans and specifications before they are finalized to verify that our geotechnical recommendations have been properly interpreted and implemented during design. If we are not accorded the privilege of performing this review, we can assume no responsibility for misinterpretation of our recommendations.

5.2 CONSTRUCTION OBSERVATION AND TESTING

The construction process is an integral design component with respect to the geotechnical aspects of a project. Because geotechnical engineering is an inexact science due to the variability of natural processes, and because we sample only a limited portion of the soils affecting the performance of the proposed structure, unanticipated or changed conditions can be encountered during grading. Proper geotechnical observation and testing during construction are imperative to allow the geotechnical engineer the opportunity to verify assumptions made during the design process. Therefore, we recommend that Kleinfelder be retained during the construction of the proposed improvements to observe compliance with the design concepts and geotechnical recommendations, and to allow design changes in the event that subsurface conditions or methods of construction differ from those assumed while completing this study.

Our services are typically needed at the following stages of grading.

- After demolition;
- During grading;
- During the installation of temporary construction shoring;
- After the overexcavation, but prior to scarification;
- During utility trench backfill;
- During base placement and site paving; and
- After excavation for foundations.

6 LIMITATIONS

This geotechnical study has been prepared for the exclusive use of Costco Wholesale and their agents for specific application to the proposed fuel facility project at the Costco Business Center located at 150 South Bent Avenue in San Marcos, California. The findings, conclusions and recommendations presented in this report were prepared in accordance with generally accepted geotechnical engineering practice. No other warranty, express or implied, is made.

The scope of services was limited to a background data review and the field exploration described in Section 1.2. It should be recognized that definition and evaluation of subsurface conditions are difficult. Judgments leading to conclusions and recommendations are generally made with incomplete knowledge of the subsurface conditions present due to the limitations of data from field studies. The conclusions of this assessment are based on our field exploration and laboratory testing programs, and engineering analyses.

Kleinfelder offers various levels of investigative and engineering services to suit the varying needs of different clients. Although risk can never be eliminated, more detailed and extensive studies yield more information, which may help understand and manage the level of risk. Since detailed study and analysis involves greater expense, our clients participate in determining levels of service, which provide information for their purposes at acceptable levels of risk. The client and key members of the design team should discuss the issues covered in this report with Kleinfelder, so that the issues are understood and applied in a manner consistent with the owner's budget, tolerance of risk and expectations for future performance and maintenance.

Recommendations contained in this report are based on our field observations and subsurface explorations, limited laboratory tests, and our present knowledge of the proposed construction. It is possible that soil or groundwater conditions could vary between or beyond the points explored. If soil or groundwater conditions are encountered during construction that differ from those described herein, the client is responsible for ensuring that Kleinfelder is notified immediately so that we may reevaluate the recommendations of this report. If the scope of the proposed construction changes from that described in this report, the conclusions and recommendations contained in this report are not considered valid until the changes are reviewed, and the conclusions of this report are modified or approved in writing, by Kleinfelder.

The scope of services for this subsurface exploration and geotechnical report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.

Kleinfelder cannot be responsible for interpretation by others of this report or the conditions encountered in the field. Kleinfelder must be retained so that all geotechnical aspects of construction will be monitored on a full-time basis by a representative from Kleinfelder, including site preparation, preparation of foundations, and placement of structural fill and trench backfill. These services provide Kleinfelder the opportunity to observe the actual soil and groundwater conditions encountered during construction and to evaluate the applicability of the recommendations presented in this report to the site conditions. If Kleinfelder is not retained to provide these services, we will cease to be the engineer of record for this project and will assume no responsibility for any potential claim during or after construction on this project. If changed site conditions affect the recommendations presented herein, Kleinfelder must also be retained to perform a supplemental evaluation and to issue a revision to our original report.

This report, and any future addenda or reports regarding this site, may be made available to bidders to supply them with only the data contained in the report regarding subsurface conditions and laboratory test results at the point and time noted. Bidders may not rely on interpretations, opinion, recommendations, or conclusions contained in the report. Because of the limited nature of any subsurface study, the contractor may encounter conditions during construction which differ from those presented in this report. In such event, the contractor should promptly notify the owner so that Kleinfelder's geotechnical engineer can be contacted to confirm those conditions. We recommend the contractor describe the nature and extent of the differing conditions in writing and that the construction contract include provisions for dealing with differing conditions. Contingency funds should be reserved for potential problems during earthwork and foundation construction.

This report may be used only by the client and only for the purposes stated, within a reasonable time from its issuance, but in no event later than one year from the date of the report. Land use, site conditions (both on site and off site) or other factors may change over time, and additional work may be required with the passage of time. Any party, other than the client who wishes to use this report shall notify Kleinfelder of such intended use. Based on the intended use of this report and the nature of the new project, Kleinfelder may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the client or anyone else will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party and the client agrees to defend, indemnify, and hold harmless Kleinfelder from any claims or liability associated with such unauthorized use or non-compliance.

7 REFERENCES

American Concrete Institute (ACI), 2019, Building Code Requirements for Structural Concrete (ACI 318-19) and Commentary (ACI 318R-19).

American Society of Civil Engineers (ASCE), 2016, Minimum Design Load for Buildings and Other Structures (ASCE/SEI 7-16) and Supplements 1, 2, and 3.

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Costco Wholesale, 2022, Costco Wholesale Development Requirements, Version 2022, dated October 28, 2022.

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MG2, 2023, Enlarged Proposed Site Plan, Costco Business Center, 150 S Bent Ave, San Marcos, CA 92069, Sheet DD13-09, dated November 3, 2023.

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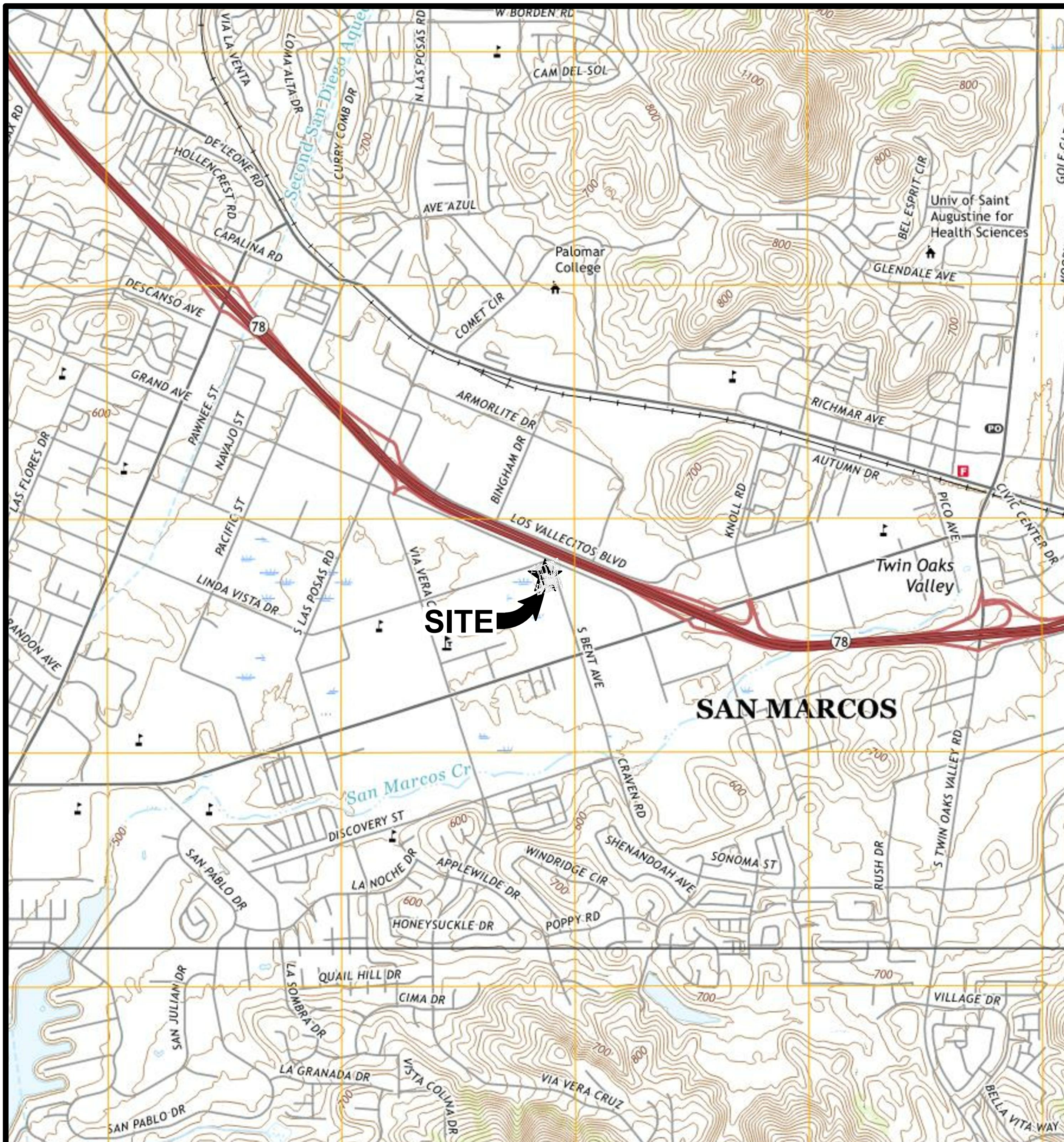
Roberge, P., 2006, Corrosion Basics, 2nd ed.

Southern California Soil and Testing, Inc. (SCST), 2000, Report of Preliminary Geotechnical Investigation, Proposed Commercial Site, Bent Avenue and Linda Vista Drive, San Marcos, California, dated February 16, 2000.

FIGURES

PLOTTED: 1/23/2023 6:50 PM BY: dean fahrney



SOURCE: U.S.G.S. 7.5' topographic series, San Marcos and Rancho Santa Fe, California quadrangles, dated 2018.

N

2,000 1,000 0 2,000

APPROXIMATE SCALE (feet)

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PROJECT:	20233104
DRAWN BY:	DMF
CHECKED BY:	HM
DATE:	01/2023
REVISED:	-

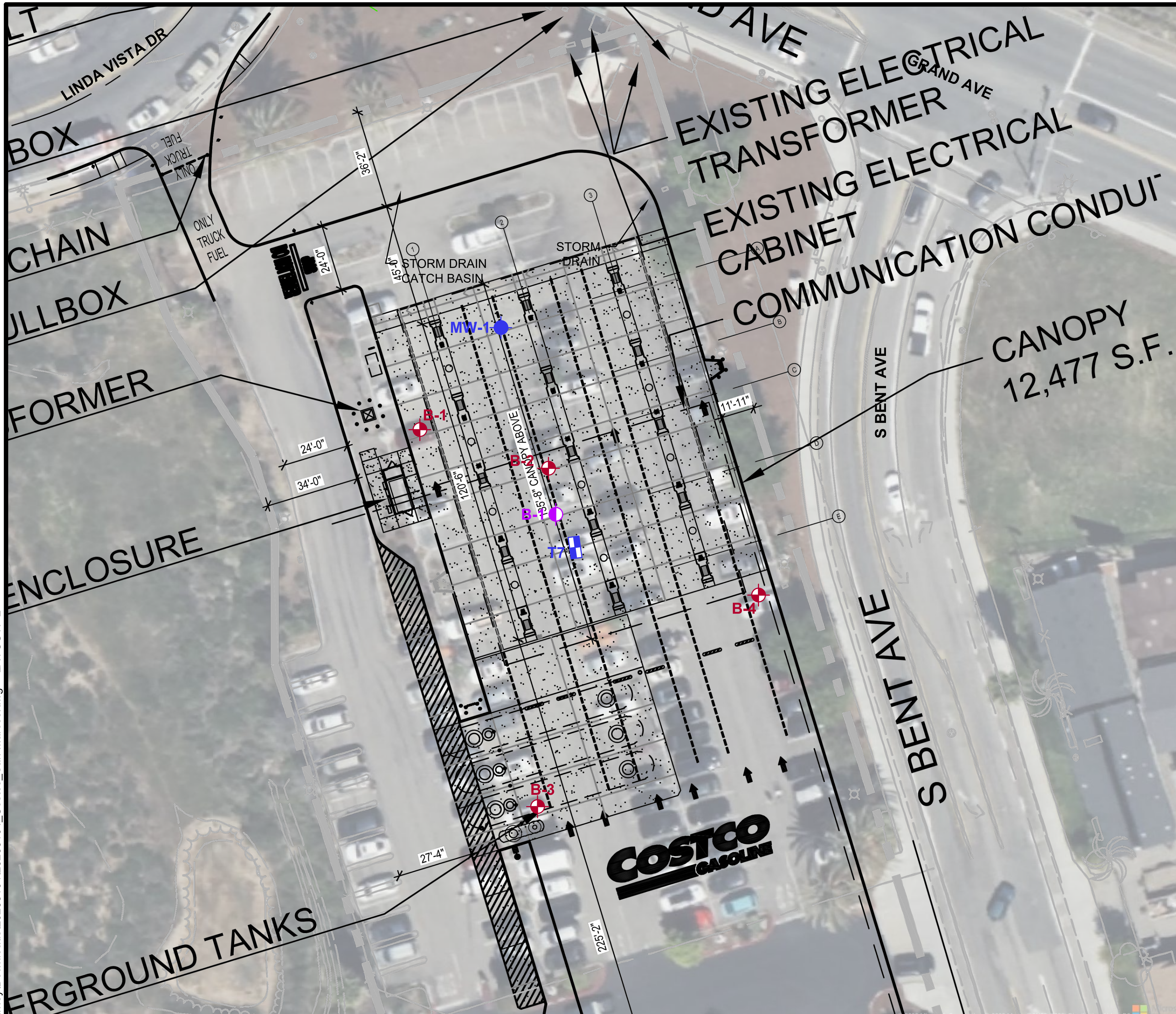
SITE VICINITY MAP

PROPOSED FUEL FACILITY
COSTCO BUSINESS CENTER
150 S. BENT AVENUE
SAN MARCOS, CALIFORNIA

FIGURE 1

CAD FILE: C:\Users\DFahrney\Downloads\20233104\20233104_Costco_San-Marcos.dwg

PLOTTED: 1/22/2024 5:49 PM BY: dean fahrney



N

30 15 0 30

APPROXIMATE SCALE (feet)

EXPLANATION

B-6 APPROXIMATE BORING LOCATION (KLEINFELDER. 2022)

MW-1 APPROXIMATE MONITORING WELL LOCATION (KLEINFELDER. 2022)

B-1 APPROXIMATE BORING LOCATION (KLEINFELDER, 2020)

T7 APPROXIMATE TEST PIT LOCATION (SCST, 2000)

REFERENCE: PROPOSED SITE PLAN (DD11-09) PROVIDED BY MG2, DATED 11/03/2023

CAD FILE: C:\Users\DFahrney\Downloads\20233104\20233104_Costco_San-Marcos.dwg LAYOUT: 2

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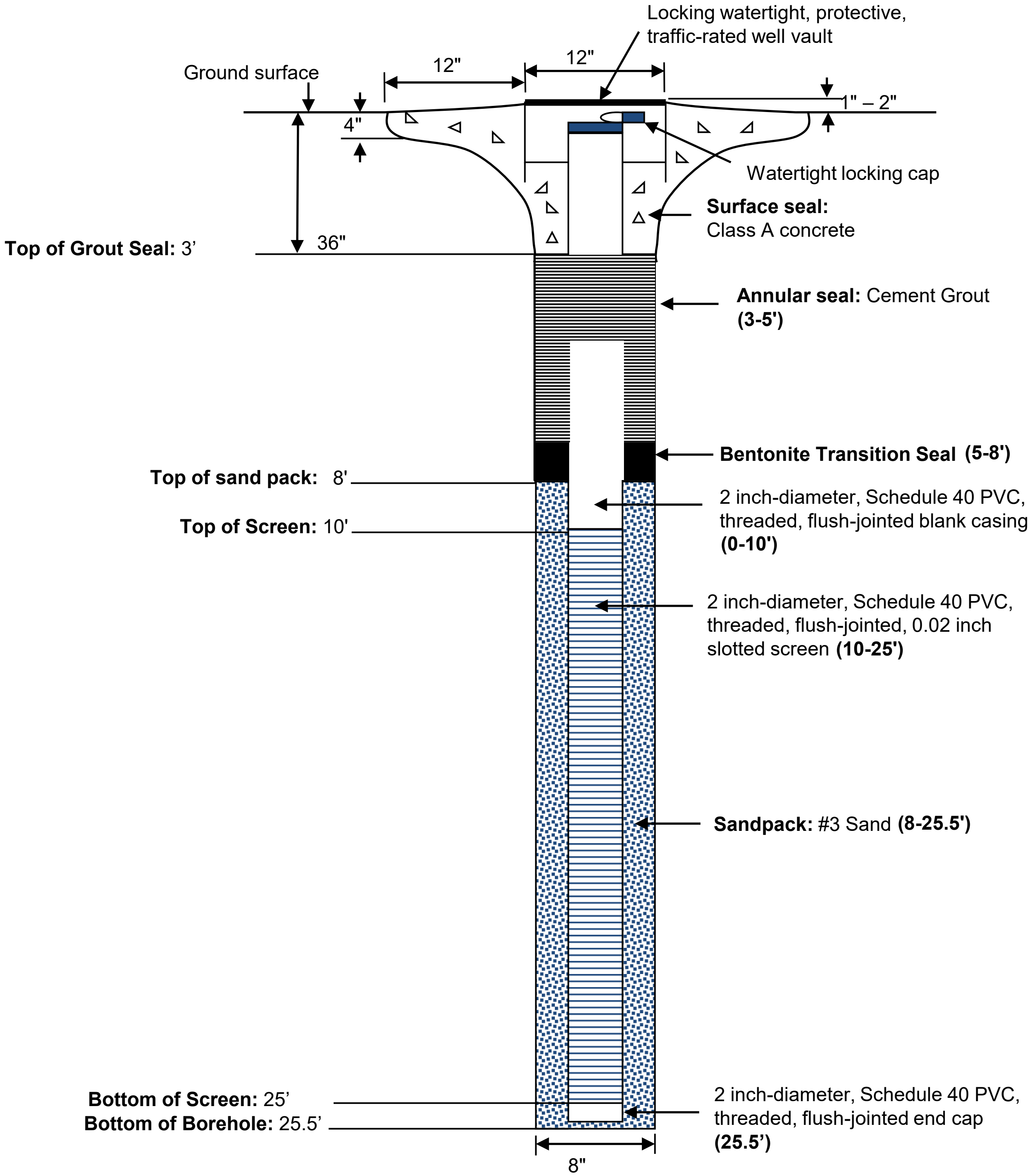
PROJECT: 20233104	EXPLORATION LOCATION MAP	FIGURE
DRAWN BY DMF		
CHECKED BY HM	PROPOSED FUEL FACILITY ADDITION COSTCO BUSINESS CENTER 150 S. BENT AVENUE SAN MARCOS, CALIFORNIA	2
DATE: 01/2023		
REVISED: -		



Note:
PVC – POLYVINYL CHLORIDE (WITH THREADED JOINTS, NO GLUED JOINTS)

Not to Scale

KLEINFELDER Bright People. Right Solutions. www.kleinfelder.com	PROJECT NO. 20233104	**WELL CONSTRUCTION DIAGRAM MW-1**		FIGURE:
	DRAWN: 01/2023			
	DRAWN BY: HM			**3**
	CHECKED BY: BEC	**PROPOSED FUEL FACILITY COSTCO BUSINESS CENTER 150 S. BENT AVENUE SAN MARCOS, CALIFORNIA**		
	FILE NAME:			

APPENDIX A
Field Explorations

DRILLING METHOD/SAMPLER TYPE GRAPHICS

- BULK SAMPLE
- CALIFORNIA SAMPLER (3 in. (76.2 mm.) outer diameter)
- GRAB SAMPLE
- STANDARD PENETRATION SPLIT SPOON SAMPLER (2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)

GROUND WATER GRAPHICS

- WATER LEVEL (level where first observed)
- WATER LEVEL (level after stabilizing period)
- WATER LEVEL (additional levels after exploration)
- OBSERVED SEEPAGE

NOTES

- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Solid lines separating strata on the logs represent approximate boundaries only, dashed lines are inferred or extrapolated boundaries. Actual transitions may be gradual or differ from those represented.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System (ASTM D2488/D2487) designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., CL-ML, GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.
- If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

ABBREVIATIONS

WOH - Weight of Hammer
WOR - Weight of Rod

REFERENCES

1. American Society for Materials and Testing (ASTM), 2011, ASTM D2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System).

UNIFIED SOIL CLASSIFICATION SYSTEM[1]

COARSE GRAINED SOILS (More than 50% retained on No. 200 Sieve)	GRAVELS (More than 50% of coarse fraction retained on No. 4 Sieve)	CLEAN GRAVEL WITH <5% FINES	GW	WELL-GRADED GRAVEL, WELL-GRADED GRAVEL WITH SAND
			GP	POORLY GRADED GRAVEL, POORLY GRADED GRAVEL WITH SAND
		GRAVELS WITH 5% TO 12% FINES	GW-GM	WELL-GRADED GRAVEL WITH SILT, WELL-GRADED GRAVEL WITH SILT AND SAND
			GW-GC	WELL-GRADED GRAVEL WITH CLAY (OR SILTY CLAY), WELL-GRADED GRAVEL WITH CLAY AND SAND (OR SILT CLAY AND SAND)
			GP-GM	POORLY GRADED GRAVEL WITH SILT, POORLY GRADED GRAVEL WITH SILT AND SAND
			GP-GC	POORLY GRADED GRAVEL WITH CLAY (OR SILTY CLAY), POORLY GRADED GRAVEL WITH CLAY AND (OR SILTY CLAY AND SAND)
		GRAVELS WITH > 12% FINES	GM	SILTY GRAVEL, SILTY GRAVEL WITH SAND
			GC	CLAYEY GRAVEL, CLAYEY GRAVEL WITH SAND
			GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL WITH SAND
	SANDS (50% or more of coarse fraction passes the No. 4 Sieve)	CLEAN SANDS WITH <5% FINES	SW	WELL-GRADED SAND, WELL-GRADED SAND WITH GRAVEL
			SP	POORLY GRADED SAND, POORLY GRADED SAND WITH GRAVEL
		SANDS WITH 5% TO 12% FINES	SW-SM	WELL-GRADED SAND WITH SILT, WELL-GRADED SAND WITH SILT AND GRAVEL
			SW-SC	WELL-GRADED SAND WITH CLAY (OR SILTY CLAY), WELL-GRADED SAND WITH CLAY AND GRAVEL (OR SILTY CLAY AND GRAVEL)
			SP-SM	POORLY GRADED SAND WITH SILT, POORLY GRADED SAND WITH SILT AND GRAVEL
			SP-SC	POORLY GRADED SAND WITH CLAY, POORLY GRADED SAND WITH CLAY AND GRAVEL (OR SILTY CLAY AND GRAVEL)
		SANDS WITH > 12% FINES	SM	SILTY SAND, SILTY SAND WITH GRAVEL
			SC	CLAYEY SAND, CLAYEY SAND WITH GRAVEL
			SC-SM	SILTY, CLAYEY SAND, SILTY, CLAYEY SAND WITH GRAVEL

FINE GRAINED SOILS (50% or more passes the No. #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)	ML	SILT, SILT WITH SAND, SILT WITH GRAVEL
		CL	LEAN CLAY, LEAN CLAY WITH SAND, LEAN CLAY WITH GRAVEL
		CL-ML	SILTY CLAY, SILTY CLAY WITH SAND, SILTY CLAY WITH GRAVEL
		OL	ORGANIC CLAY, ORGANIC CLAY WITH SAND, ORGANIC CLAY WITH GRAVEL, ORGANIC SILT, ORGANIC SILT WITH SAND, ORGANIC SILT WITH GRAVEL
	SILTS AND CLAYS (Liquid Limit 50 or greater)	MH	ELASTIC SILT. ELASTIC SILT WITH SAND, ELASTIC SILT WITH GRAVEL
		CH	FAT CLAY, FAT CLAY WITH SAND, FAT CLAY WITH GRAVEL
		OH	ORGANIC CLAY, ORGANIC CLAY WITH SAND, ORGANIC CLAY WITH GRAVEL, ORGANIC SILT, ORGANIC SILT WITH SAND, ORGANIC SILT WITH GRAVEL

NOTE: USE MATERIAL DESCRIPTION ON THE LOG TO DEFINE A GRAPHIC THAT MAY NOT BE PROVIDED ON THIS LEGEND.

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PROJECT NO.: 20233104.001A		GRAPHICS KEY	A-1
DRAWN BY:	SF	Proposed Fuel Facility Costco Business Center 150 S. Bent Avenue San Marcos, California	
CHECKED BY:	HM		
DATE:	1/3/2023		

GRAIN SIZE[1]

DESCRIPTION		SIEVE SIZE	GRAIN SIZE
Boulders		>12 in.	>12 in. (304.8 mm.)
Cobbles		3 - 12 in.	3 - 12 in. (76.2 - 304.8 mm.)
Gravel	coarse	3/4 -3 in.	3/4 -3 in. (19 - 76.2 mm.)
	fine	#4 - 3/4 in.	0.19 - 0.75 in. (4.8 - 19 mm.)
Sand	coarse	#10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)
	medium	#40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)
	fine	#200 - #40	0.0029 - 0.017 in. (0.07 - 0.43 mm.)
Fines		Passing #200	<0.0029 in. (<0.07 mm.)

SECONDARY CONSTITUENT[1]

Term of Use	AMOUNT	
	Secondary Constituent is Fine Grained	Secondary Constituent is Coarse Grained
Trace	<5%	<15%
With	≥5 to <15%	≥15 to <30%
Modifier	≥15%	≥30%

PLASTICITY[1]

DESCRIPTION	CRITERIA
Non-Plastic	A 1/8 in. (3 mm) thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

MOISTURE CONTENT[1]

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

CONSISTENCY - FINE-GRAINED SOIL[2, 3]

CONSISTENCY	SPT - N (# blows / ft)	Pocket Pen (tsf)	UNCONFINED COMPRESSIVE STRENGTH (Q_u)(psf)	VISUAL / MANUAL CRITERIA
Very Soft	<2	PP < 0.25	<500	Easily penetrated several inches by fist
Soft	2 - 4	0.25 ≤ PP <0.5	500 - 1,000	Easily penetrated several inches by thumb
Medium Stiff	4 - 8	0.5 ≤ PP <1	1,000 - 2,000	Can be penetrated several inches by thumb with moderate effort
Stiff	8 - 15	1 ≤ PP <2	2,000 - 4,000	Readily indented by thumb but penetrated only with great effort
Very Stiff	15 - 30	2 ≤ PP <4	4,000 - 8,000	Readily indented by thumbnail
Hard	>30	4 ≤ PP	>8,000	Indented by thumbnail with difficulty

APPARENT DENSITY - COARSE-GRAINED SOIL[2]

APPARENT DENSITY	SPT-N (# blows / ft)
Very Loose	<4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	>50

STRUCTURE[1]

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. (6mm) thick, note thickness.
Laminated	Alternating layers of varying material or color with the layers less than 1/4-in. (6 mm) thick, note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness.
Homogeneous	Same color and appearance throughout

ANGULARITY[1]

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

REACTION WITH HYDROCHLORIC ACID[1]

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

CEMENTATION[1]

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or little finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

REFERENCES

1. American Society for Materials and Testing (ASTM), 2017, ASTM D2488: Standard Practice for Description and Identification of Soils (Visual Manual Procedures).
2. Terzaghi, K and Peck, R., 1948, Soil Mechanics in Engineering Practice, John Wiley & Sons, New York.
3. United States Department of the Interior Bureau of Reclamation (USBR), 1998, Earth Manual, Part I.

PLOTTED: 01/26/2023 01:42 PM BY: HMarquez
OFFICE FILTER: LAGUNA HILLS
PROJECT NUMBER: 20233104.001A
gINT FILE: Klf_gint_master_2023
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2023.GLB [_KLF_GEO_LEG2_SOIL_DESC_KEY]

Date Begin - End:	12/29/2022	**Drilling Company:**	Pacific Drilling		**BORING LOG B-1**
Logged By:	S. Floyd	**Drill Crew:**	Miguel, Girardo, Rory		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Yeti M10	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Overcast	**Auger Diameter:**	6 in. O.D.		

FIELD EXPLORATION / LABORATORY RESULTS

Approximate Ground Surface Elevation (ft.): 545
Surface Condition: Asphalt

Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
	0	**ASPHALT**: (3.5 inches)												Hand auger to 5' bgs
		BASE: (5 inches)												
		Artificial Fill (af) **Clayey SAND (SC)**: fine to medium-grained sand, medium plasticity, dark reddish brown (2.5YR 3/3), moist, angular to subangular gravel	S1					13.0						Hard drilling
540	5	**Old Alluvium Deposits (Qoa)** **Clayey SAND (SC)**: fine to medium-grained sand, low plasticity, brown (7.5YR 5/3), moist, iron oxide staining, subrounded to subangular gravel	S2		BC=9 20 39	18"		11.7	126.2					
		- fine to coarse-grained sand, medium plasticity, reddish gray (2.5YR 6/1), moist, dense, iron oxide staining, calcium carbonate	S3		BC=23 50/6"	12"								
535	10	- fine to coarse-grained sand, very pale brown (10YR 7/4), moist, very dense, moderately cemented, iron oxide staining	S4		BC=5 23 40	18"	SC	11.1	119.1		20	37	18	
		Santiago Formation (Tsa) **Clayey SAND (SC)**: fine to coarse-grained sand, medium plasticity, white (2.5Y 8/1), moist, very dense, weakly cemented	S5		BC=5 16 25	18"								
530	15	- very pale brown (10YR 7/4), dense, moderately cemented, iron oxide staining, clay streaking	S6		BC=6 17 36 PP=3.5	18"		18.1	107.2					Direct Shear
		Sandy Lean CLAY (CL): fine-grained sand, medium plasticity, very pale brown (10YR 7/4), moist, hard, iron oxide staining, sand lenses, sparse black mottling												
525	20	**Clayey SAND (SC)**: fine to coarse-grained sand, low plasticity, pale brown (2.5Y 8/3), wet, very dense, moderately cemented, iron oxide staining	S7		BC=13 27 42	18"		16.2						
520	25	- excavates as same as above			BC=13 45 50/4"	NR								No recovery, note cutting
515	30	- weakly cemented, mottled	S8		BC=20 36 50/3"	12"								

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PROJECT NO.: 20233104.001A		BORING LOG B-1	APPENDIX
DRAWN BY:	SF	Proposed Fuel Facility	A-3
CHECKED BY:	HM	Costco Business Center	
DATE:	1/3/2023	150 S. Bent Avenue San Marcos, California	PAGE: 1 of 2

Date Begin - End:	12/29/2022	**Drilling Company:**	Pacific Drilling		
Logged By:	S. Floyd	**Drill Crew:**	Miguel, Girardo, Rory		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Yeti M10	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Overcast	**Auger Diameter:**	6 in. O.D.		

Approximate Ground Surface Elevation (ft.): 545
Surface Condition: Asphalt

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Clayey SAND (SC): fine to coarse-grained sand, low plasticity, pale brown (2.5Y 8/3), wet, very dense, moderately cemented, iron oxide staining - pale brown (2.5Y 8/3) with red (7.5YR 4/8) streaking	S9		BC=20 50/4"	9"		16.9	115.7					
				S10		BC=17 35 50/5"	14"								
505	40														
500	45														
495	50														
490	55														
485	60														
480	65														

The boring was terminated at approximately 39.9 ft. below ground surface. The boring was backfilled with cement/bentonite grout on December 29, 2022.

GROUNDWATER LEVEL INFORMATION:
- Groundwater was observed at approximately 17.5 ft. below ground surface during drilling.
- Groundwater was observed at approximately 14.5 ft. below ground surface at the end of drilling.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Google Earth.

Date Begin - End:	12/29/2022	**Drilling Company:**	Pacific Drilling
Logged By:	S. Floyd	**Drill Crew:**	Miguel, Girardo, Rory
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Yeti M10
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger
Weather:	Overcast	**Auger Diameter:**	6 in. O.D.

BORING LOG B-2

Hammer Type - Drop: 140 lb. Auto - 30 in.

Approximate Ground Surface Elevation (ft.): 545
Surface Condition: Asphalt

Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Sample Number	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		ASPHALT: (3 inches)											Hand auger to 5' bgs
		BASE: (4.5 inches)	S1						95	47			Corrosion Test
		Artificial Fill (af) **Clayey SAND (SC)**: fine to medium-grained sand, medium plasticity, dark reddish brown (2.5YR 3/3), moist, angular gravel	S2				11.9						
540	5	**Old Alluvium Deposits (Qoa)** **Clayey SAND (SC)**: fine to medium-grained sand, low plasticity, brown (7.5YR 5/3), moist, iron oxide staining, subrounded to subangular gravel	S3	BC=3 3 4	18"								Resistance increase
		- loose - dusky red (10R 3/3) - fine to coarse-grained sand, reddish gray (5YR 5/2), very dense, moderately cemented	S4	BC=50/4.5"	4"		11.0	112.2					
535	10	- medium plasticity, very pale brown (10YR 7/4), clay seams, mottled	S5	BC=15 29 43	16"								
		Santiago Formation (Tsa) **Clayey SAND (SC)**: - fine to coarse-grained sand, medium plasticity, very pale brown (10YR 7/4), moist, very dense, moderately cemented, iron oxide staining, mottled	S6	BC=19 45 36	18"		11.8	116.4					
530	15	- black mottling, white clay seams	S7	BC=6 18 34 PP=3.0	13"	SC				32	40	23	
		- pale brown (2.5Y 8/3)	S8	BC=7 35 50/4"	16"		10.6	115.1					
525	20	- light gray (5Y 7/2), wet, weakly cemented, iron oxide staining	S9	BC=18 22 33	18"								Resistance decrease
520	25	- dense, clay seams	S10	BC=6 12 23	18"		23.4	103.0					
515	30	- very dense	S11	BC=15 35 44	18"								Resistance increase

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PROJECT NO.:	20233104.001A
DRAWN BY:	SF
CHECKED BY:	HM
DATE:	1/3/2023

BORING LOG B-2

Proposed Fuel Facility
Costco Business Center
150 S. Bent Avenue
San Marcos, California

APPENDIX

A-4

BORING LOG B-2

Date Begin - End:	12/29/2022	**Drilling Company:**	Pacific Drilling		
Logged By:	S. Floyd	**Drill Crew:**	Miguel, Girardo, Rory		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Yeti M10	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Overcast	**Auger Diameter:**	6 in. O.D.		

FIELD EXPLORATION / LABORATORY RESULTS

Approximate Ground Surface Elevation (ft.): 545
Surface Condition: Asphalt

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Fat CLAY with Sand (CH): fine-grained sand, high plasticity, very dark gray (5Y 3/1), wet, hard	S12		BC=15 26 50/6" PP=2.5	18"		18.9	112.1					
				S13		BC=17 25 35 PP=3.0	18"								
505	40														
500	45														
495	50														
490	55														
485	60														
480	65														

The boring was terminated at approximately 40 ft. below ground surface. The boring was backfilled with cement/bentonite grout on December 29, 2022.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 15.5 ft. below ground surface during drilling.
▼ Groundwater was observed at approximately 13.5 ft. below ground surface at the end of drilling.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Google Earth.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.: 20233104.001A		BORING LOG B-2	APPENDIX
DRAWN BY:	SF	Proposed Fuel Facility Costco Business Center 150 S. Bent Avenue San Marcos, California	A-4
CHECKED BY:	HM		
DATE:	1/3/2023		PAGE: 2 of 2

PLOTTED: 01/26/2023 02:37 PM BY: HMarquez

Date Begin - End:	12/28/2022	**Drilling Company:**	Pacific Drilling		**BORING LOG B-3**
Logged By:	S. Floyd	**Drill Crew:**	Miguel, Girardo, Rory		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Yeti M10	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Overcast	**Auger Diameter:**	6 in. O.D.		

FIELD EXPLORATION / LABORATORY RESULTS

Approximate Ground Surface Elevation (ft.): 544
Surface Condition: Asphalt

Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		ASPHALT: (2.5 inches)												Hand auger to 5' bgs, remove rock at 1.5' with rig
		BASE: (4.5 inches)												
		Old Alluvium Deposits (Qoa) **Clayey SAND (SC)**: fine to medium-grained sand, low plasticity, brown (7.5YR 5/3), moist, subrounded to subangular gravel	S1				SC			95	46	26	10	Expansion Index
540	5	- medium plasticity, dark brown (7.5YR 3/3), dense, moderately cemented, micaceous	S2		BC=5 15 27	18"		16.3	116.7					
535		- fine to coarse-grained sand, low plasticity, dark grayish brown (10YR 4/2), very dense, moderately cemented, iron oxide staining, calcium carbonate	S3		BC=16 20 50/6"	18"								Hard drilling
	10	- very pale brown (10YR 7/3), weakly cemented	S4		BC=31 50/3"	9"		17.4	103.0					
530		**Santiago Formation (Tsa)**												
	15	**Poorly Graded SAND with Clay (SP-SC)**: fine to coarse-grained sand, low plasticity, pale brown (2.5Y 8/3), moist, very dense, iron oxide staining	S5		BC=19 31 35	18"								
525		- weakly cemented	S6		BC=13 29 50/4"	16"								
	20													
520	25													
515	30													
510														

The boring was terminated at approximately 19.8 ft. below ground surface. The boring was backfilled with cement/bentonite grout on December 28, 2022.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 18.3 ft. below ground surface during drilling.
▼ Groundwater was observed at approximately 15.5 ft. below ground surface at the end of drilling.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Google Earth.

KLEINFELDER
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PROJECT NO.: 20233104.001A		BORING LOG B-3	APPENDIX
DRAWN BY:	SF	Proposed Fuel Facility **Costco Business Center** 150 S. Bent Avenue San Marcos, California	A-5
CHECKED BY:	HM		
DATE:	1/3/2023		PAGE: 1 of 1

gINT FILE: Klf_gint_master_2023 PROJECT NUMBER: 20233104.001A OFFICE FILTER: LAGUNA HILLS
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2023.GLB [_KLF_BORING/TEST PIT SOIL LOG]

BORING LOG B-4

Date Begin - End:	12/28/2022	**Drilling Company:**	Pacific Drilling		
Logged By:	S. Floyd	**Drill Crew:**	Miguel, Girardo, Rory		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Yeti M10	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Overcast	**Auger Diameter:**	6 in. O.D.		

FIELD EXPLORATION / LABORATORY RESULTS

Approximate Ground Surface Elevation (ft.): 545
Surface Condition: Asphalt

Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		ASPHALT: (2.5 inches)												Hand auger to 5' bgs
		BASE: (4 inches)	S1				SC-SM			97	46	22	6	R-Value
		Artificial Fill (af) **Silty, Clayey SAND (SC-SM)**: fine to medium-grained sand, low plasticity, dark reddish brown (2.5YR 3/3), moist, subangular to subangular gravel, micaceous	S2					8.9						Hard hand auger at 2' bgs
540	5	**Old Alluvium Deposits (Qoa)** **Clayey SAND (SC)**: fine to medium-grained sand, medium plasticity, brown (7.5YR 5/3), moist, subrounded to angular gravel, dark gray clay nodules	S3		BC=6 8 13	10"								Resistance increase
		- fine to coarse-grained sand, dark reddish gray (10R 3/1), moist, medium dense, iron oxide staining, calcium carbonate streaking, micaceous	S4		BC=21 50/5"	11"		12.1	111.9					
535	10	dark reddish gray (5YR 4/2), moist, very dense, moderately cemented, iron oxide staining - grayish green (GLEY1 4/2)	S5		BC=36 50/6"	11"								Rig chatter on rock cobbles, angular rock cuttings
530	15	**Santiago Formation (Tsa)** **Poorly Graded SAND with Clay (SP-SC)**: fine to coarse-grained sand, low plasticity, light gray (2.5YR 7/1), moist, very dense, red iron oxide stained mottling, subangular gravel - pale brown (2.5Y 8/3)	S6		BC=16 39 50/3"	15"		13.7	114.6					Resistance decrease
		Sandy Fat CLAY (CH): fine-grained sand, high plasticity, white (2.5Y 8/1), moist, stiff, heavy iron oxide staned mottling/streaks	S7		BC=6 6 7 PP=3.5	16"								
525	20													
520	25													
515	30													

The boring was terminated at approximately 20 ft. below ground surface. The boring was backfilled with cement/bentonite grout on December 28, 2022.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Google Earth.

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PROJECT NO.: 20233104.001A		BORING LOG B-4	APPENDIX
DRAWN BY:	SF	Proposed Fuel Facility **Costco Business Center** 150 S. Bent Avenue San Marcos, California	A-6
CHECKED BY:	HM		
DATE:	1/3/2023		

Date Begin - End:	12/28/2022	**Drilling Company:**	Pacific Drilling		**MONITORING WELL LOG MW-1**
Logged By:	S. Floyd	**Drill Crew:**	Miguel, Girardo, Rory		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Yeti M10	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Overcast	**Auger Diameter:**	8 in. O.D.		

Approximate Ground Surface Elevation (ft.): 545
Surface Condition: Asphalt

Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		ASPHALT: (2 inches)												Hand auger to 5' bgs
		BASE: (6 inches)												
		Artificial Fill (af) **Clayey SAND (SC)**: fine to medium-grained sand, medium plasticity, dark reddish brown (2.5YR 3/3), moist, angular gravel												
		Old Alluvium Deposits (Qoa) **Clayey SAND (SC)**: fine to medium-grained sand, medium plasticity, brown (7.5YR 5/3), moist, iron oxide staining, subrounded to subangular gravel												
540	5		S1		BC=8 9 46	18"		18.5						Consistent resistance
		- fine to coarse-grained sand, low plasticity, very pale brown (10YR 7/3), moist, very dense, iron oxide staining, black mottling												
535	10	- pale brown (2.5YR 7/3)	S2		BC=19 27 23	18"		10.8						
		Santiago Formation (Tsa)												
530	15	**Poorly Graded SAND with Clay (SP-SC)**: - fine to coarse-grained sand, low plasticity, light gray (2.5YR 7/1), moist, very dense, iron oxide staining, red iron oxide stained clay streaking, subrounded gravel	S3		BC=22 31 30	18"		14.9						
525	20	**Clayey SAND (SC)**: fine to medium-grained sand, medium plasticity, pale yellow (5Y 8/2), wet, very dense, iron oxide staining	S4		BC=19 27 26 PP=5.0	18"		15.4						
		Sandy Lean CLAY (CL): fine-grained sand, medium plasticity, pale yellow (5Y 8/2), wet, iron oxide staining												
		Silty SAND (SM): fine-grained sand, low plasticity, white (5Y 8/1), wet, very dense, red iron oxide streaking, black mottling	S5		BC=17 30 34	16"		18.4						
520	25													
515	30													

The monitoring well was terminated at approximately 25.5 ft. below ground surface. The boring was converted to a monitoring well on December 28, 2022.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 18 ft. below ground surface during drilling.
Groundwater was observed at approximately 16.7 ft. below ground surface at the end of drilling.
Groundwater was observed at approximately 10.2 ft. below ground surface 20 days after drilling completion.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Google Earth.

KLEINFELDER Bright People. Right Solutions.	PROJECT NO.: 20233104.001A	MONITORING WELL LOG MW-1	APPENDIX
	DRAWN BY: SF	Proposed Fuel Facility **Costco Business Center** 150 S. Bent Avenue San Marcos, California	A-7
	CHECKED BY: HM		
	DATE: 1/3/2023		PAGE: 1 of 1

PERMIT # LMWP-005705
A.P.N. #: 219-331-43-00
EST #: N/A

COUNTY OF SAN DIEGO
DEPARTMENT OF ENVIRONMENTAL HEALTH & QUALITY
LAND AND WATER QUALITY DIVISION
MONITORING WELL PROGRAM

MONITORING WELL/BORING CONSTRUCTION PERMIT

SITE NAME: COSTCO BUSINESS CENTER

SITE ADDRESS: 150 BENT AVE, SAN MARCOS, CA 92078

PERMIT FOR: **CONSTRUCTION OF ONE GROUNDWATER MONITORING WELL & SOIL BORINGS (4)**

PERMIT APPROVAL DATE: 11/29/2022

PERMIT EXPIRES ON: 3/29/2023

RESPONSIBLE PARTY: COSTCO WHOLESALE (KAYLEEN BURNETT)

PERMIT TERMS:

1. Wells must have a **minimum 3-foot concrete surface seal**. The surface seal shall consist of concrete able to withstand the maximum anticipated load without cracking or deteriorating. The concrete should meet Class A specifications of a minimum 4000-pound compressive strength. **Bentonite slurries are not an acceptable annular sealing material in the unsaturated zone.**

2. All borings must be sealed from the bottom of the boring to the ground surface with an approved sealing material as specified in California Well Standards Bulletin 74-90, Part III, Section 19.D. **Drill cuttings are not an acceptable fill material. Bentonite slurries are not an acceptable fill material in the unsaturated zone.**

3. All borings must be properly destroyed within 24 hours of drilling.

4. Placement of any sealing material at a depth greater than 30 feet must be done using the tremie method.

5. This work is not connected to any known unauthorized release of hazardous substances. Any contamination found in the course of drilling and sampling must be reported to the DEHQ. All water and soil resulting from the activities covered by this permit must be managed, stored and disposed of as specified in the SAM Manual in Section 5, II, D-4. In addition, drill cuttings must be properly handled and disposed in compliance with the Stormwater Best Management Practices of the local jurisdiction.

6. Within 60 days of completing work, submit a well construction report, including all well and/or boring logs and laboratory data to the Well Permit Desk. This report must include all items required by the SAM Manual, Section 5, Pages 6 & 7.

7. This office must be given 24-hour notice of any drilling activity on this site and advanced notification of drilling cancellation. Please contact the Well Permit Desk at (858) 505-6688.

NOTE: **This permit does not constitute approval of a work plan as defined in Section 2722 of Article 11 of C.C.R., Title 23. Work plans are required for all unauthorized release investigations in San Diego County.**

APPROVED BY: Jon Senaha DATE: 11/29/2022

Jon Senaha

APPENDIX B
Laboratory Test Results

Exploration ID	Depth (ft.)	Sample No.	Sample Description	Water Content (%)	Dry Unit Wt. (pcf)	Sieve Analysis (%)			Atterberg Limits			Additional Tests
						Passing 3/4"	Passing #4	Passing #200	Liquid Limit	Plastic Limit	Plasticity Index	
B-1	2.0	S1	CLAYEY SAND	13.0								
B-1	5.0	S2	CLAYEY SAND	11.7	126.2							
B-1	10.0	S4	CLAYEY SAND (SC)	11.1	119.1			20	37	19	18	
B-1	15.0	S6	CLAYEY SAND	18.1	107.2							Direct Shear
B-1	20.0	S7	SANDY LEAN CLAY	16.2								
B-1	35.0	S9	CLAYEY SAND	16.9	115.7							
B-2	1.0	S1	CLAYEY SAND (SC)			100	95	47				Corrosion Test
B-2	2.5	S2	CLAYEY SAND	11.9								
B-2	7.5	S4	CLAYEY SAND	11.0	112.2							
B-2	12.5	S6	CLAYEY SAND	11.8	116.4							
B-2	15.0	S7	CLAYEY SAND (SC)					32	40	17	23	
B-2	17.5	S8	CLAYEY SAND	10.6	115.1							
B-2	25.0	S10	CLAYEY SAND	23.4	103.0							
B-2	35.0	S12		18.9	112.1							
B-3	1.0	S1	CLAYEY SAND (SC)			100	95	46	26	16	10	Expansion Index
B-3	5.0	S2	CLAYEY SAND	16.3	116.7							
B-3	10.0	S4	CLAYEY SAND	17.4	103.0							
B-4	1.0	S1	SILTY, CLAYEY SAND (SC-SM)			100	97	46	22	16	6	R-Value
B-4	2.5	S2	CLAYEY SAND	8.9								
B-4	7.5	S4	CLAYEY SAND	12.1	111.9							
B-4	15.0	S6	POORLY GRADED SAND WITH CLAY	13.7	114.6							
MW-1	5.0	S1	CLAYEY SAND	18.5								
MW-1	10.0	S2	CLAYEY SAND	10.8								
MW-1	15.0	S3		14.9								
MW-1	20.0	S4		15.4								
MW-1	23.5	S5	SANDY LEAN CLAY	18.4								

Refer to the Geotechnical Evaluation Report or the supplemental plates for the method used for the testing performed above.
NP = NonPlastic
NA = Not Available

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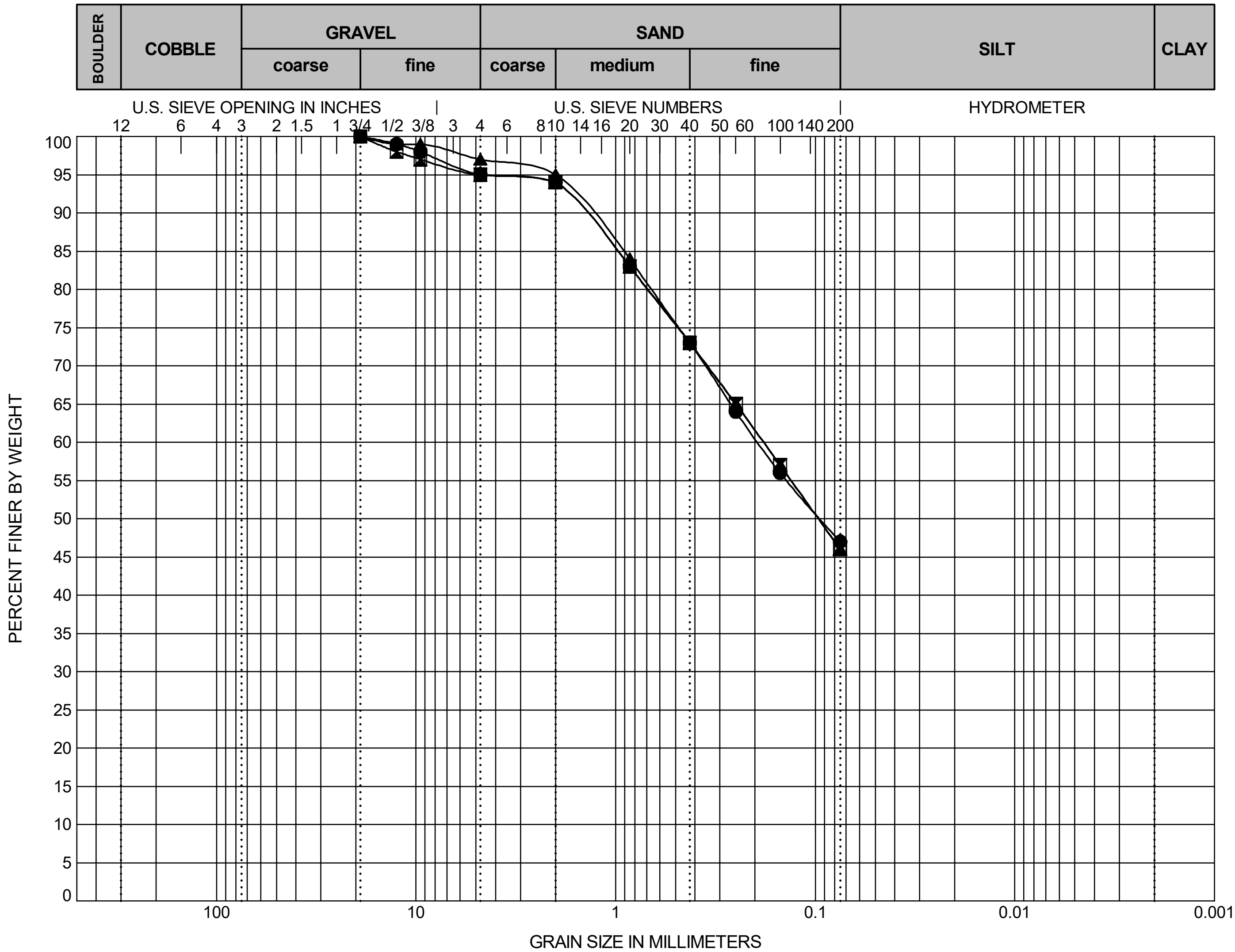
PROJECT NO.: 20233104.001A
DRAWN BY: SF
CHECKED BY: HM
DATE: 1/3/2023

LABORATORY TEST RESULT SUMMARY

Proposed Fuel Facility
Costco Business Center
150 S. Bent Avenue
San Marcos, California

FIGURE

PLOTTED: 01/26/2023 01:39 PM BY: HMarquez



	Exploration ID	Depth (ft.)	Sample Number	Sample Description	LL	PL	PI
●	B-2	1	S1	CLAYEY SAND (SC)	NM	NM	NM
⧗	B-3	1	S1	CLAYEY SAND (SC)	26	16	10
▲	B-4	1	S1	SILTY, CLAYEY SAND (SC-SM)	22	16	6

	Exploration ID	Depth (ft.)	D_{100}	D_{60}	D_{30}	D_{10}	Cc	Cu	Passing 3/4"	Passing #4	Passing #200	%Silt*	%Clay*
●	B-2	1	19	0.194	NM	NM	NM	NM	100	95	47	NM	NM
⧗	B-3	1	19	0.182	NM	NM	NM	NM	100	95	46	NM	NM
▲	B-4	1	19	0.182	NM	NM	NM	NM	100	97	46	NM	NM

*These numbers represent silt-sized and clay-sized content but may not indicate the percentage of the material with the engineering properties of silt or clay. Sieve Analysis and Hydrometer Analysis testing performed in general accordance with ASTM D6913(Sieve Analysis) and ASTM D7928 (Hydrometer Analysis).
NP = Nonplastic
NA = Not Available
NM = Not Measured

Coefficients of Uniformity - $C_u = D_{60} / D_{10}$
Coefficients of Curvature - $C_C = (D_{30})^2 / D_{60} D_{10}$
D_{60} = Grain diameter at 60% passing
D_{30} = Grain diameter at 30% passing
D_{10} = Grain diameter at 10% passing

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PROJECT NO.: 20233104.001A
DRAWN BY: SF
CHECKED BY: HM
DATE: 1/3/2023

SIEVE ANALYSIS

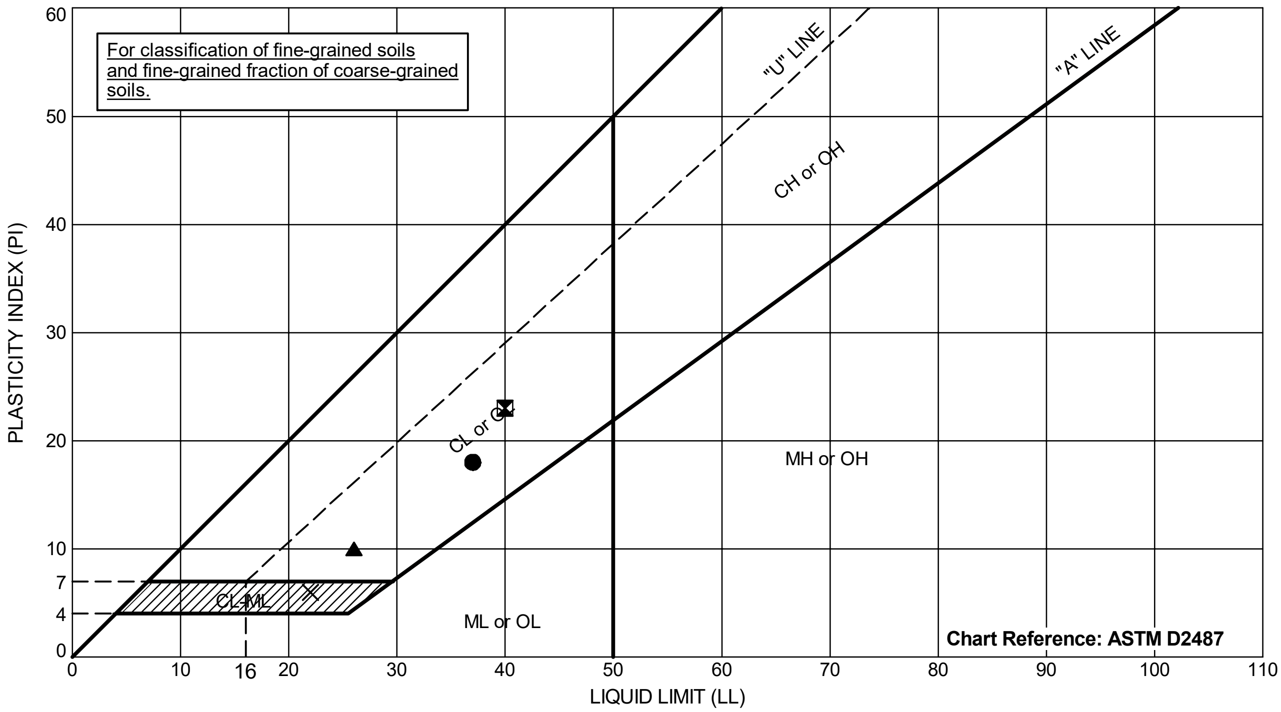
Proposed Fuel Facility Addition
Costco Business Center
150 S. Bent Avenue
San Marcos, California

FIGURE
0

OFFICE FILTER: LAGUNA HILLS

PROJECT NUMBER: 20233104.001A

gINT FILE: Klf_gint_master_2023 PROJECT NUMBER: 20233104.001A
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2023.GLB [_KLF_SIEVE ANALYSIS]



	Exploration ID	Depth (ft.)	Sample Number	Sample Description	Passing #200	LL	PL	PI
●	B-1	10	S4	CLAYEY SAND (SC)	20	37	19	18
⧗	B-2	15	S7	CLAYEY SAND (SC)	32	40	17	23
▲	B-3	1	S1	CLAYEY SAND (SC)	46	26	16	10
×	B-4	1	S1	SILTY, CLAYEY SAND (SC-SM)	46	22	16	6

Testing performed in general accordance with ASTM D4318.
NP = Nonplastic
NA = Not Available
NM = Not Measured

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PROJECT NO.: 20233104.001A

DRAWN BY: SF

CHECKED BY: HM

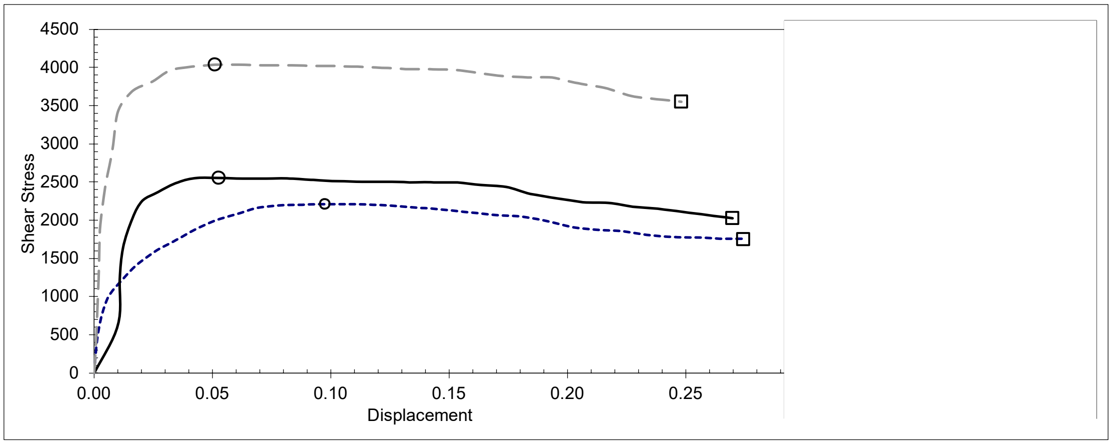
DATE: 1/3/2023

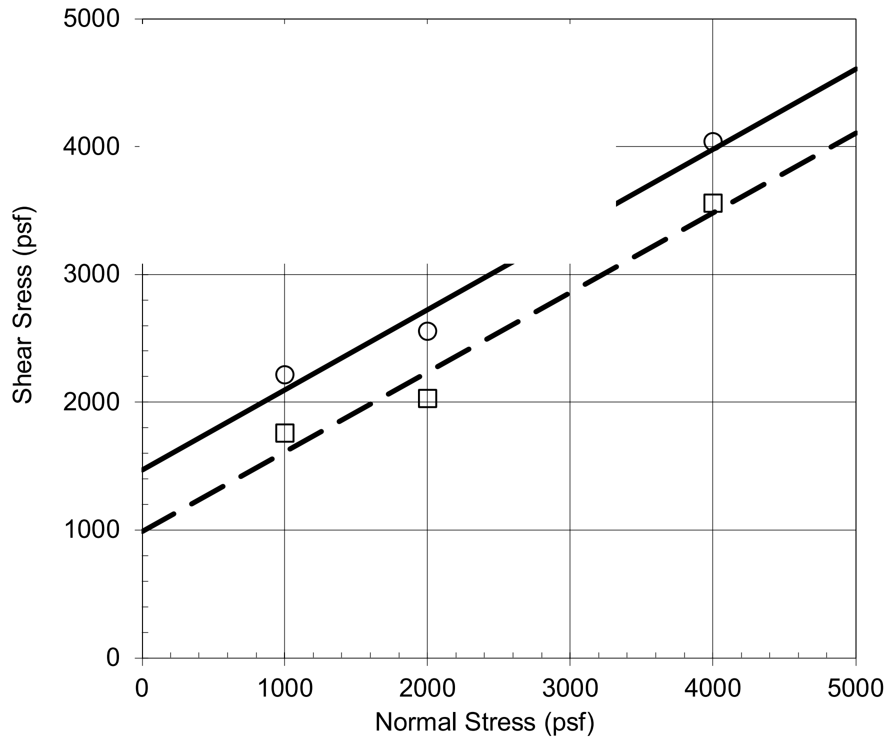
ATTERBERG LIMITS

Proposed Fuel Facility Addition
Costco Business Center
150 S. Bent Avenue
San Marcos, California

FIGURE

0





Lab No.
Strain Rate = 0.00709 inch/min
Date Tested: 1/5/2023

				Interpreted Shear Strength			
				Peak		Ultimate	
Boring No.	Sample No.	Depth	UCSC	Cohesion (psf)	Friction Angle (deg)	Cohesion (psf)	Friction Angle (deg)
B-1	S6	15'	CL	1473	32.1	994	31.9

Sample description: Sandy Lean Clay (CL)

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Checked By:	Tech : Uly	**Direct Shear Test Results (ASTM D 3080)**	Figure
Project # 20233104.001A	26-Jan-23	**Proposed Fuel Facility** **Costco Business Center** **150 S. Bent Avenue** **San Marcos, California**	

Boring No.	Sample No.	Depth (ft)	Sample Description
B-3	1	1-5	Clayey Sand (SC)

Density Determination	Trial #1	Trial #2
Weight Compacted Sample and Ring	776.2	
Weight of Ring	366.2	
Net Weight of Sample	410.0	
Wet Density, pcf	124.3	
Dry Density, pcf	114.1	

Moisture Determination		
Wet Weight of Sample, g	254	
Dry Weight of Sample, g	233.2	
Moisture Content, %	8.9%	

Expansion Index	5	
Corrected Expansion Index	**5**	**(VERY LOW)**
% Saturation	50.4	

Expansion Readings

DATE	TIME	READING	
1/8/2023	12:06 PM	0.1941	
1/8/2023	12:16 PM	0.1937	<< Add Water
1/9/2023	8:00 AM	0.1983	<< Final

Moisture Content after Test

Wet+Ring	**801**
Dry	376.4
	15.5%

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CHECKED BY:

TECH: UP

JOB NUMBER: 20233104.001A

DATE: 1/26/2023

Expansion Index (ASTM D4829)

Proposed Fuel Facility
Costco Business Center
150 S. Bent Avenue
San Marcos, California

FIGURE

Boring No.	Sample No.	Depth	Description	Date Tested
B-4	S-1	1-5	Silty, Clayey Sand (SC-SM)	1/9/2023

TEST SPECIMEN				
MOLD NO.	3	4	5	
FOOT PRESSURE, psi	**50**	**110**	**230**	
INITIAL MOISTURE, %	7.1	7.1	7.1	
"AS-IS" WEIGHT, g	1200	1200	1200	
DRY WEIGHT, g	1120.4	1120.4	1120.4	
WATER ADDED, ml	**60**	**50**	**35**	
COMPACTION MOISTURE, %	12.5	11.6	10.2	
HEIGHT OF BRIQUETTE, in.	**2.45**	**2.45**	**2.5**	
WEIGHT BRIQUETTE/MOLD, g	**3189.6**	**3237.8**	**3250**	
WEIGHT OF MOLD, g	**2104.7**	**2112.2**	**2107.2**	
WEIGHT OF BRIQUETTE, g	1084.9	1125.6	1142.8	
DRY DENSITY, pcf	119.4	124.9	125.8	
STABILOMETER, 1000 lbs	**49**	**47**	**41**	
2000lbs	**121**	**117**	**88**	
DISPLACEMENT, in	**4.31**	**4.06**	**3.83**	
EXUDATION LOAD, lbs	**1358**	**2517**	**5624**	
EXUDATION PRESSURE, psi	108.1	200.4	447.8	
R-VALUE	16	18	35	
	16	18	35	
	0.0454	0.0498	0.0541	
	0.0414	0.0482	0.0541	
	0.0040	0.0016	0.0000	
	174.6	69.8	0.0	

INITIAL MOISTURE	
	527.8
	492.8
	7.1

R-VALUE:	**25**
Location:	B-4 S-1 @ 1'-5'

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Reviewed By:		**Tech:**	UP
Project Number:	20233104.001A	**Date:**	12-Jan-23

Proposed Fuel Facility
Costco Business Center
150 S. Bent Avenue
San Marcos, California

L A B O R A T O R Y   R E P O R T

Telephone (619) 425-1993   Fax 425-7917   Established 1928

C L A R K S O N   L A B O R A T O R Y   A N D   S U P P L Y   I N C.
350 Trousdale Dr. Chula Vista, Ca. 91910 www.clarksonlab.com
A N A L Y T I C A L   A N D   C O N S U L T I N G   C H E M I S T S

Date: January 19, 2023
Purchase Order Number: 20233104.001A
Sales Order Number: 58269
Account Number: KLE

To:

Kleinfelder Inc.
550 West C Street Ste 1200
San Diego, CA 92101
Attention: Uly Panuncialman

Laboratory Number: SO9372   Customers Phone: 831-4600
Fax: 831-4619

Sample Designation:

One soil sample received on 01/09/23 at 3:30pm, marked as .
Project: Costco San Marcos
Project #: 20233104.001A
Boring #: B-2
Sample #: S1
Depth: 0'-5'
Date Sampled 12/28/2022
Analysis By California Test 643, 1999, Department of Transportation Division of Construction, Method for Estimating the Service Life of Steel Culverts.

pH 7.2

Water Added (ml)	Resistivity (ohm-cm)
10	5800
5	1800
5	700
5	680
5	690
5	700

25 years to perforation for a 16 gauge metal culvert.
32 years to perforation for a 14 gauge metal culvert.
44 years to perforation for a 12 gauge metal culvert.
57 years to perforation for a 10 gauge metal culvert.
69 years to perforation for a 8 gauge metal culvert.

Water Soluble Sulfate Calif. Test 417 0.019% (190ppm)

Water Soluble Chloride Calif. Test 422 0.031% (310ppm)

Rosa Bernal
Rosa Bernal
RMB/js

APPENDIX C
Prior Field Exploration and Laboratory Testing
(Kleinfelder, 2020 & SCST, 2000)

SAMPLE/SAMPLER TYPE GRAPHICS

- BULK SAMPLE
- MODIFIED CALIFORNIA SAMPLER (2 or 2-1/2 in. (50.8 or 63.5 mm.) outer diameter)
- STANDARD PENETRATION SPLIT SPOON SAMPLER (2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)

GROUND WATER GRAPHICS

- WATER LEVEL (level where first observed)
- WATER LEVEL (level after exploration completion)
- WATER LEVEL (additional levels after exploration)
- OBSERVED SEEPAGE

NOTES

- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.
- If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

ABBREVIATIONS

WOH - Weight of Hammer
WOR - Weight of Rod

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

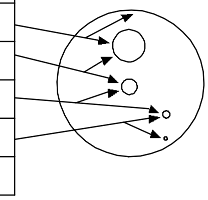
COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	**GRAVELS** (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVEL WITH <5% FINES	$Cu \geq 4$ and $1 \leq Cc \leq 3$	**GW**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			$Cu < 4$ and/ or $1 > Cc > 3$	**GP**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH 5% TO 12% FINES	$Cu \geq 4$ and $1 \leq Cc \leq 3$	**GW-GM**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
			$Cu < 4$ and/ or $1 > Cc > 3$	**GP-GM**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GP-GC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		GRAVELS WITH > 12% FINES		**GM**	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
				GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES
	SANDS (Half or more of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	$Cu \geq 6$ and $1 \leq Cc \leq 3$	**SW**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			$Cu < 6$ and/ or $1 > Cc > 3$	**SP**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH 5% TO 12% FINES	$Cu \geq 6$ and $1 \leq Cc \leq 3$	**SW-SM**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
			$Cu < 6$ and/ or $1 > Cc > 3$	**SP-SM**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SP-SC	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
		SANDS WITH > 12% FINES		**SM**	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
				SC-SM	CLAYEY SANDS, SAND-SILT-CLAY MIXTURES

FINE GRAINED SOILS (Half or more of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)	**ML**	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid Limit 50 or greater)	**MH**	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

NOTE: USE MATERIAL DESCRIPTION ON THE LOG TO DEFINE A GRAPHIC THAT MAY NOT BE PROVIDED ON THIS LEGEND.

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		>12 in. (304.8 mm.)	>12 in. (304.8 mm.)	Larger than basketball-sized
Cobbles		3 - 12 in. (76.2 - 304.8 mm.)	3 - 12 in. (76.2 - 304.8 mm.)	Fist-sized to basketball-sized
Gravel	coarse	3/4 -3 in. (19 - 76.2 mm.)	3/4 -3 in. (19 - 76.2 mm.)	Thumb-sized to fist-sized
	fine	#4 - 3/4 in. (#4 - 19 mm.)	0.19 - 0.75 in. (4.8 - 19 mm.)	Pea-sized to thumb-sized
Sand	coarse	#10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)	Rock salt-sized to pea-sized
	medium	#40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)	Sugar-sized to rock salt-sized
	fine	#200 - #40	0.0029 - 0.017 in. (0.07 - 0.43 mm.)	Flour-sized to sugar-sized
Fines		Passing #200	<0.0029 in. (<0.07 mm.)	Flour-sized and smaller



SECONDARY CONSTITUENT

Term of Use	AMOUNT: Secondary Constituent is Fine Grained	AMOUNT: Secondary Constituent is Coarse Grained
Trace	<5%	<15%
With	≥5 to <15%	≥15 to <30%
Modifier	≥15%	≥30%

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPT - N_{60} (# blows / ft)	Pocket Pen (tsf)	UNCONFINED COMPRESSIVE STRENGTH (Q_u)(psf)	VISUAL / MANUAL CRITERIA
Very Soft	<2	PP < 0.25	<500	Thumb will penetrate more than 1 inch (25 mm). Extrudes between fingers when squeezed.
Soft	2 - 4	0.25 ≤ PP <0.5	500 - 1000	Thumb will penetrate soil about 1 inch (25 mm). Remolded by light finger pressure.
Medium Stiff	4 - 8	0.5 ≤ PP <1	1000 - 2000	Thumb will penetrate soil about 1/4 inch (6 mm). Remolded by strong finger pressure.
Stiff	8 - 15	1 ≤ PP <2	2000 - 4000	Can be imprinted with considerable pressure from thumb.
Very Stiff	15 - 30	2 ≤ PP <4	4000 - 8000	Thumb will not indent soil but readily indented with thumbnail.
Hard	>30	4 ≤ PP	>8000	Thumbnail will not indent soil.

REACTION WITH HYDROCHLORIC ACID

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT-N_{60} (# blows/ft)	MODIFIED CA SAMPLER (# blows/ft)	CALIFORNIA SAMPLER (# blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	<4	<5	0 - 15
Loose	4 - 10	5 - 12	5 - 15	15 - 35
Medium Dense	10 - 30	12 - 35	15 - 40	35 - 65
Dense	30 - 50	35 - 60	40 - 70	65 - 85
Very Dense	>50	>60	>70	85 - 100

FROM TERZAGHI AND PECK, 1948

PLASTICITY

DESCRIPTION	LL		PI
Non-Plastic	NP	Either the LL or the PI (or both) may be used to describe the soil plasticity. The ranges of numbers shown here do not imply that the LL ranges correlate with the PI ranges for all soils.	NP
Low	< 30		< 15
Medium	30 - 50		15 - 25
High	> 50		> 25

LL is from Casagrande, 1948. PI is from Holtz , 1959.

STRUCTURE

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. thick, note thickness.
Laminated	Alternating layers of varying material or color with the layer less than 1/4-in. thick, note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness.

ANGULARITY

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

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PROJECT NO.: 20210190.001A		SOIL DESCRIPTION KEY	FIGURE
DRAWN BY:	ST	PROPOSED COSTCO BUSINESS CENTER 150 S. BENT AVENUE SAN MARCOS, CALIFORNIA	A-2
CHECKED BY:	ZJ		
DATE:	7/8/2020		

BORING LOG B-1

Date Begin - End:	7/07/2020	**Drilling Company:**	Pacific Drilling		
Logged By:	S.Tena	**Drill Crew:**	Miguel, Ryan, Gerardo		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Marl-10	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Sunny	**Auger Diameter:**	6 in. O.D.		

Latitude: 33.13934°
Longitude: -117.18362°
Approximate Ground Surface Elevation (ft.): 546.00
Surface Condition: Asphalt

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION: Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	LABORATORY RESULTS: USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			ASPHALT: (2 INCHES)												
			BASE COURSE: (6.5 INCHES)												
545			**ARTIFICIAL FILL (af)** **Clayey SAND (SC)**: fine to medium-grained, medium plasticity, brown (7.5YR 4/4), moist	S1			100%		11.7						
				S2			100%								
			OLD ALLUVIUM DEPOSITS (Qoa) **Clayey SAND (SC)**: fine to medium-grained, medium plasticity, dark brown (7.5YR 3/2), moist, trace gravel (0.5")												
	5														
540															
	10														
535															
	15														
530															

The boring was terminated at approximately 3.5 ft. below ground surface. The boring was backfilled with auger cuttings and patched with concrete on July 07, 2020.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Google Earth.

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PROJECT NO.: 20210190.001A		BORING LOG B-1	FIGURE
DRAWN BY:	ST	PROPOSED COSTCO BUSINESS CENTER 150 S. BENT AVENUE SAN MARCOS, CALIFORNIA	A-3
CHECKED BY:	ZJ		
DATE:	7/8/2020		PAGE: 1 of 1

LOG OF TEST TRENCH NUMBER T-7

Date Excavated: 1/28/00 | Logged by: MF

Equipment: Backhoe | Project Manager: DBA

Surface Elevation (ft): | Depth to Water (ft): N/A

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: UNDISTURBED	SAMPLES: BULK	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
0–3	SM	STOCKPILED FILL-Light Red-Brown, Dry, Very Loose, Gravel SILTY SAND					
3–4	SM	TOPSOIL-Light Red-Brown, Dry, Loose to Medium Dense, SILTY SAND					
4–5	CL/CH	SUBSOIL-Dark Brown, Moist to Very Moist, Stiff to Very Stiff, SILTY CLAY					
5–6	SM/ML	OLDER ALLUVIUM-Red-Brown to Grey, Humid to Moist, Dense/Hard, SILTY SAND/SANDY SILT					
6		TRENCH ENDED AT 6'					

SOUTHERN CALIFORNIA SOIL & TESTING, INC.

BENT AVENUE COMMERCIAL

BY: DBA/MF/MW | DATE: 2/9/00

JOB NUMBER: 9911220 | PLATE NO.: 15

Exploration ID	Depth (ft.)	Sample No.	Sample Description	Water Content (%)	Dry Unit Wt. (pcf)	Sieve Analysis (%)			Atterberg Limits			Additional Tests
						Passing 3/4"	Passing #4	Passing #200	Liquid Limit	Plastic Limit	Plasticity Index	
B-1	1.01 - 1.5	S2	CLAYEY SAND (SC)	11.7								
B-2	1.0 - 3.0	S1	SANDY LEAN CLAY (CL)			100	99	51	32	14	18	
B-2	1.01 - 1.5	S2	SANDY LEAN CLAY (CL)	9.4								
B-3	1.0 - 3.5	S1	LEAN CLAY WITH SAND (CL)									**Expansion Index=** 31
B-3	1.01 - 1.5	S2	LEAN CLAY WITH SAND (CL)	17.2								
B-4	1.0 - 4.0	S1	CLAYEY SAND (SC)									**ASTM D1557 Method B=**
												Maximum Dry Unit Weight: 125.9 pcf
												Optimum Water Content: 11.2%
B-4	1.01 - 1.5	S2	CLAYEY SAND (SC)	7.1								
B-5	1.0 - 5.0	S1	CLAYEY SAND (SC)			100	94	48				Corrosion Test
B-5	1.01 - 1.5	S2	SILTY SAND (SM)	7.5								
B-5	10.0 - 10.92	S3	POORLY GRADED SAND WITH SILT (SP-SM)	10.1	115.2							
B-5	12.5 - 14.0	S4	CLAYEY SAND (SC)	15.2	113.7							
B-6	1.0 - 5.0	S1	SANDY LEAN CLAY (CL)			100	96	54	33	14	19	**R-Value=** 36
B-6	1.01 - 1.5	S2	SANDY LEAN CLAY (CL)	8.1								
B-6	5.0 - 5.8	S3	CLAYEY SAND (SC)	13.1	98.2							
B-6	7.5 - 8.7	S4	CLAYEY SAND (SC)	13.0	104.5							
B-6	10.0 - 11.5	S5	CLAYEY SAND (SC)	26.3	95.7							
B-6	12.5 - 14.0	S6	CLAYEY SAND (SC)	28.5	98.9							
B-6	15.0 - 16.5	S7	SILTY SAND (SM)					28				
B-6	20.0 - 21.5	S8	SANDY SILT (ML)					56				
B-6	25.0 - 26.5	S9	SILTY SAND (SM)					17				

Refer to the Geotechnical Evaluation Report or the supplemental plates for the method used for the testing performed above.
NP = NonPlastic
NA = Not Available

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PROJECT NO.: 20210190.001A
DRAWN BY: ST
CHECKED BY: ZJ
DATE: 7/8/2020

LABORATORY TEST RESULT SUMMARY

PROPOSED COSTCO BUSINESS CENTER
150 S. BENT AVENUE
SAN MARCOS, CALIFORNIA

FIGURE
B-1