Geotechnical Engineering Report

PG&E TRAINING FACILITY

WKA No. 9974.01

September 22, 2014

Prepared For:

PG&E Corporate Real Estate, Strategy and Services

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East Grant Avenue, West of I-505
Winters, California
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INTRODUCTION

We have completed a modified geotechnical engineering investigation to reflect a change in site layout for the proposed PG&E Training Facility to be constructed south of East Grant Avenue and west of I-505 in Winters, California. The purposes of our work have been to explore the site, soil and groundwater conditions, and to provide geotechnical engineering conclusions and recommendations regarding design and construction of the proposed training facility. This report presents the results of our work.

The initial Geotechnical Engineering Report prepared by our firm (dated January 29, 2014) was based on a different site layout, which required additional borings in areas not previously explored to verify the uniformity of the soil conditions and the applicability of the conclusions and recommendations in the original report.

Work Scope

Our scope of work for this project included the following tasks:

1. two site reconnaissances;
2. review of historic Unite States Geological Survey (USGS) topographic maps, aerial photographs, and available groundwater data within the vicinity of the property;
3. review of reports prepared for nearby projects;
4. subsurface exploration, including the drilling and sampling of a total of 36 borings to maximum depths of 21½ feet below existing site grades;
5. bulk sampling of the subgrade soils within proposed building and pavement areas;
6. laboratory testing of selected soil samples to determine engineering properties of the soil;
7. engineering analyses; and,
8. preparation of this report.

Supplemental Information

Supplemental information used in the preparation of this report included review of the following reports prepared by Wallace-Kuhl & Associates, Inc. for projects near the subject site:

- Geotechnical Engineering Report, prepared by Wallace-Kuhl & Associates, Inc. (WKA No. 7469.03, dated July 29, 2008), prepared for the Monticello Mixed-Use Building.

- Geotechnical Engineering Report, prepared by Wallace-Kuhl & Associates, Inc. (WKA No. 8274.02P, dated October 9, 2009), prepared for the Putah Creek Pedestrian Bridge, located very near the southwest corner of the subject site.

Information contained in these reports was used to assist in the analysis and preparation of this report.

Figures and Attachments

This report contains a Vicinity Map as Figure 1; a Site Plan showing approximate boring locations as Figure 2; and, Logs of Soil Borings completed for this project as Figures 3 through 38. An explanation of the symbols and classification system used on the logs is contained on Figure 39. Appendix A contains general information regarding project concepts, exploratory methods used during our field investigation, and laboratory test results that are not included on the logs. Appendix B contains *Guide Earthwork Specifications* that may be used in the preparation of contract documents. Appendix C contains *Guide Drilled Pier Specifications.*

Project Description

The revised Winters Site Test Fit Plan, dated August 20, 2014, indicates the training facility will involve construction of numerous buildings containing offices, classrooms, and laboratory space; crane certification area; cold pits, hydro testing and pipeline inspection; equipment training area; commercial driver training area; utility village; cathodic protection area; storm water pond at the southeast side of the property; a drainage easement near the western site boundary; and, pavement areas for autos, trucks and other heavy equipment, involving asphalt concrete, Portland cement concrete pavements and gravel wearing surfaces.

We understand the buildings will be one-and two-story structures with interior concrete slabs-on-grade. Construction type could be steel-frame, masonry or concrete tilt-up (non-combustible construction). Structural loads are anticipated to be light to moderate and consistent with these types of construction. The exception to this could be the equipment training area that might be covered, which would be subject to relatively high uplift and overturning forces. We also understand that the excavation areas may involve the construction of retaining walls. The drainage easement and storm water pond likely will be fairly shallow (less than 10 feet deep).

FINDINGS

Site Description

The subject property is located south of East Grant Avenue, west of I-505 in Winters, Yolo County, California (Figure 1). The site is bordered to the north by East Grant Avenue; to the east by the southbound on-ramp to I-505; to the south by Putah Creek; and, to the west by residential development. At the time of our recent site investigation, September 5, 2014, the majority of the property consisted of agricultural land, although a portion of the site adjacent to I-505 was undeveloped land. Vegetation across the agricultural portion of the property consisted of a heavy growth of weeds up to about six feet high. The undeveloped land adjacent to I-505 supported a moderate growth (two to three feet high) of weeds and small shrubs. A sewer lift station, surrounded by a chain-link fence, was observed on the undeveloped portion of the site near the northeast corner of the property. Three rural residential structures were observed adjacent in the northwest of the property, south of East Grant Avenue. Two above ground pressure tanks were observed adjacent to the residential structures, and a dilapidated barn surrounded by a chain-link fence was observed south of the residences. A well was observed to the south of the barn adjacent to the western border of the site, and a power pole and a well were observed near the southeast corner of the property.

The topography of the site is essentially flat with a surface elevation of approximately +125 feet relative to mean sea level (msl), based on topographic information provided on the USGS 7.5-Minute *Topographic Map of the Winters Quadrangle, California*, *dated 1953* (photorevised 1968).

Historical Aerial Photograph Review

Historical topographic maps were reviewed from the years 1993 through 2013. Review of the 1993 photograph shows the approximate westernmost two-thirds of the site to be planted with row crops. Three rural residential structures and barn are visible near the northwest corner of the site, south of East Grant Avenue. A portion of property adjacent to I-505 is undeveloped. A moderate growth of vegetation and scattered shrubs are visible across this portion of the property. A dirt road is visible traversing northwest to southeast between the planted and undeveloped portions of the property.

Review of aerial photographs from 2003 through 2009 indicates the site to have remained relatively unchanged since the 1993 photograph.

Review of an aerial photograph from 2010 shows a disturbed portion of land approximately 70 feet wide traversing across the planted portion of the property southwest to northeast, turning north through the undeveloped portion of the property and terminating near East Grant Avenue.

By 2012, a small structure is visible on the undeveloped portion of the site near the northeast portion of the property within the alignment of the disturbed area visible in the 2010 photograph. Review of a 2013 aerial photograph indicates the site to have remained relatively unchanged since the prior year.

Soil Conditions

The surface and near-surface soils across the site generally consist of loose to medium dense sandy silts and silty sands from the surface to depths of about 3½ to 8½ feet below existing site grades. Minor and variable amounts of clay were observed in the upper soils. Alternating layers of medium stiff to hard silty clays were encountered below the upper silts and sands to the maximum depths of exploration of about 21½ feet below the surface. The additional seven borings revealed relatively consistent subsurface conditions.

For detailed soil conditions at a particular location, please refer to the Logs of Soil Borings presented as Figures 3 through 38. The initial borings are identified as borings D1 through D29. The recent borings are identified as D101 through D107.

Site Geology

The City of Winters is located in the western-central portion of the Great Valley geomorphic province of California adjacent to the eastern slope of the Coast Ranges. The geology in the Great Valley is characterized by thick sequences of alluvial and flood plain deposits consisting of sedimentary material derived from the Coast Ranges to the west and the Sierra Nevada mountain range to the east.

According to *Geologic Map of the Sacramento Quadrangle* prepared by the California Department of Mines and Geology (Wagner, 1981 et. al), the subject site is underlain by Late to Middle Pleistocene deposits of the Modest-Riverbank Formations. The Modesto-Riverbank Formations consist of sands, silts, minor gravels, and clays. The mapping is generally consistent with the materials encountered in our borings.

Groundwater

Free groundwater was not encountered within the test borings performed between December 18 through 30, 2013, or on September 5, 2014, to the maximum depth explored of approximately 21½ feet below existing site grades.

To supplement our groundwater information for the project site, we reviewed groundwater elevation data obtained from a California Department of Water Resources (DWR) monitored well identified as #08N01W22G002M. This well is reported by DWR to be located on the project site. The DWR periodically measured water elevations in this well from October 3, 1957 to October 6, 1971. Based on the available data, the lowest measured groundwater elevation in this well occurred on October 4, 1961, at an elevation of +69.1 feet msl or about 57 feet below existing grade at the well; the highest elevation occurred on January 14, 1970, at an elevation of about +93.3 feet msl or about 33 feet below the existing grade at the well.

CONCLUSIONS

Organic Content

Three bulk samples of near-surface soil were tested to determine the organic content in accordance with ASTM D2974. The samples selected for organic content resulted in values ranging from 2.48% to 3.08% organics. Based on these results we conclude that the surface soils are suitable for use in engineered fill. A summary of these tests is presented below.

TABLE 1
ORGANIC CONTENT

Test Boring	Sample Depth (ft)	Soil Type	Organic Content (%)
D5	0-3	SM	2.48
D18	0-5	ML	3.15
D22	0-3	ML	3.08

Bearing Capacity

The majority of the upper two to three feet of surface soils across the site are disturbed due to agricultural activities and in a relatively loose condition. Those materials are considered

unsuitable for support of the proposed structures and pavements without removal and recompacting, although they are suitable for support of the proposed pavements.

Our work also indicates that engineered fill, properly placed and compacted in accordance with the recommendations of this report, will be capable of supporting the proposed structures and pavement improvements. Specific recommendations to scarify, moisture condition, and recompact the surface soils have been provided in the Site Clearing and Preparation section of this report.

2013 CBC/ASCE 7-10 Seismic Design Criteria

Section 1613 of the 2013 edition of the CBC references ASCE Standard 7-10 for seismic design. The following seismic parameters were determined based on the site latitude and longitude using the public domain computer program developed by the USGS. The following parameters summarized in the table below may be used for seismic design of the proposed development.

TABLE 2
CBC/ASCE 7-10 SEISMIC DESIGN PARAMETERS

Latitude: 38.5275° N Longitude: -121.9565° W	ASCE 7-10 Table/Figure	2013 CBC Table/Figure	Factor/ Coefficient	Value
Short-Period MCE at 0.2s	Figure 22-1	Figure 1613.3.1(1)	S_S	1.650 g
1.0s Period MCE	Figure 22-2	Figure 1613.3.1(2)	S_1	0.560 g
Soil Class	Table 20.3-1	Section 1613.3.2	Site Class	D
Site Coefficient	Table 11.4-1	Table 1613.3.3(1)	F_a	1.000
Site Coefficient	Table 11.4-2	Table 1613.3.3(2)	F_v	1.500
Adjusted MCE Spectral Response Parameters	Equation 11.4-1	Equation 16-37	S_{MS}	1.650 g
	Equation 11.4-2	Equation 16-38	S_{M1}	0.840 g
Design Spectral Acceleration Parameters	Equation 11.4-3	Equation 16-39	S_{DS}	1.100 g
	Equation 11.4-4	Equation 16-40	S_{D1}	0.560 g
Seismic Design Category	Table 11.6-1	Section 1613.3.5(1)	Risk Category I to IV	D
	Table 11.6-2	Section 1613.3.5(2)	Risk Category I to IV	D

Liquefaction

The soil conditions encountered at the borings and our review of geologic information in the Winters area indicates the site is underlain by silty clay or mixtures of sands, silts, clays, and dense gravels, which typically decrease the potential for liquefaction. To our knowledge, there have been no reported instances of liquefaction having occurred in the vicinity of the project site or within the Winters area during major earthquake events. Therefore, it is our opinion that loose cohesionless soils below groundwater do not exist in significant thickness beneath the site and the potential for liquefaction of the soils beneath the site during a seismic event is very low.

Soil Expansion Potential

Laboratory test results on the near-surface silts indicate these materials possess a low expansion potential when tested in accordance with ASTM D4829 test method (see Figures A3, A5 and A6). Additional laboratory tests performed on samples of the underlying silty clays encountered below the near-surface silts and sands indicate that these materials possess a medium expansion potential (see Figures A4 and A7). Based on the laboratory test results and the depth to the clays, we conclude mitigation measures to reduce the detrimental effects of expansion pressures caused by moisture variations within the clay soils will not be necessary for development at this site.

Excavation Conditions

The on-site soils should be readily excavatable with conventional construction equipment. In our opinion, shallow excavations less than five feet in depth will stand at a near-vertical inclination for the short periods of time required for utility construction. However, minor sloughing and "running" conditions could occur if the soils are saturated, or where zones of clean (cohesionless) sands are encountered, especially when subjected to construction vibrations or allowed to dry significantly.

Excavations deeper than five feet that will be entered by workers should be sloped, braced or shored in accordance with current OSHA regulations. The contractor must provide an adequately constructed and braced shoring system in accordance with federal, state and local safety regulations for individuals working in an excavation that may expose them to the danger of moving ground.

Excavated materials should not be stockpiled directly adjacent to open trenches to prevent surcharge loading of the trench sidewalls. Excessive truck and equipment traffic should also be avoided near open trenches. If material is stored or heavy equipment is operated near an excavation, stronger shoring (or flatter slopes) would be required to resist the additional pressure due to the surcharged loads.

Soil Suitability for Use in Fill Construction

The on-site soils encountered in our test borings are considered suitable for use as engineered fill, provided these materials are free of organics, rubble and other deleterious material, and are at moisture contents capable of achieving the desired degree of compaction.

Pavement Subgrade Quality

Laboratory testing of the surface and near-surface soils indicates the soils across the site are variable with respect to their support qualities for pavements. Resistance (“R”) value testing was performed on three representative samples of the anticipated subgrade soils collected during our subsurface investigation. Laboratory testing indicates the on-site materials tested possess Resistance ("R") values ranging from 12 to 28, as shown on Figures A8 through A10. Based on the laboratory test results and our experience with similar soil types, and the anticipated mixing of soils during earthwork construction, we consider an R-value of 20 appropriate for design.

Groundwater

Groundwater was not encountered to the explored 20 foot depth of the test borings performed for this investigation, and we conclude that a permanent groundwater table should not be a significant factor in site development. However, groundwater levels should be expected to fluctuate throughout the year based on variations in precipitation, temperature, evaporation, run-off, and other factors. The groundwater levels discussed herein represent the conditions at the time the measurements were obtained. The actual groundwater levels at the time of construction may vary. However, standard sump pit and pumping procedures should be adequate to control localized groundwater seepage into excavations.

Seasonal Water

During the wet season, infiltrating surface water will create saturated surface soil conditions due to the relatively impermeable nature of the underlying clays. Grading operations attempted

following the on-set of winter rains and prior to prolonged drying periods will be hampered by high soil moisture contents. Such soils, intended for use as engineered fill, will require considerable drying and aeration to reach a moisture content that will permit the specified degree of compaction to be achieved.

Percolation Test Results

At the approximate locations indicated on Figure 2, three percolation tests (P1 through P3) were performed at the site on December 20, 2013. The percolation tests were prepared by drilling four-inch diameter holes approximately 10 feet below the existing ground surface. Following drilling, 2-inch diameter perforated pipes were placed in the test holes and the annular space filled with gravel. The percolation test holes were pre-soaked by filling the holes with water up to the existing ground surface and the test holes were allowed to soak overnight.

Percolation tests were performed the following day by refilling the percolation holes to within a foot or two of the surface. The drop in water was measured initially in 5 minute increments, followed by readings every 10 minutes for the next four hours. Percolation rates were calculated for each time interval and for overall rates (total drop vs. total time). The overall rates for the three tests, based on the last hour range from 0.11 to 0.19 inches per minute (approximately 5 to 9 minutes per inch). Due to the presence of stiff silty clays at a depth of 8 feet, the percolation rates likely relate primarily to horizontal percolation and not vertical percolation. The field data for the percolation tests is contained on Figures A21 through A23 in Appendix A.

The new storm water basin is north and east of the initial basin locations. Due to the relative consistent soil conditions the data from the initial percolations testing is appropriate for the revised basin location.

Preliminary Soil Corrosion Potential

Six samples of near-surface soil were submitted to Sunland Analytical Lab for testing to determine pH, chloride and sulfate concentrations, and minimum resistivity to help evaluate the potential for corrosive attack upon buried concrete. The results of the corrosivity testing are summarized in the following table. Copies of the test reports are presented on Figures A11 through A16.

TABLE 3
SOIL CORROSIVITY TESTING

Analyte	Test Method	Bulk Sample Identification					
		D4 (0' - 3')	D9 (4½'-7')	D15 (0' - 3')	D20 (0' - 3')	D24 (0' - 3')	D103 (0' - 3')
pH	CA DOT 643 Modified*	7.78	7.92	7.79	7.53	7.21	7.18
Minimum Resistivity	CA DOT 643 Modified*	1260 Ω-cm	1150 Ω-cm	990 Ω-cm	800 Ω-cm	1930 Ω-cm	1130 Ω-cm
Chloride	CA DOT 417	46.8 ppm	32.8 ppm	59.6 ppm	59.8 ppm	30.3 ppm	17.1 ppm
Sulfate	CA DOT 422	51.1 ppm	41.2 ppm	69.9 ppm	74.9 ppm	2.9 ppm	41.2 ppm

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

Table 4.2.1 *Exposure Categories and Classes* of the American Concrete Institute (ACI) Manual of Concrete Practice Part 3 - 2010, indicates the severity of sulfate exposure for the samples tested is *Not Applicable*. However, the minimum resistivity test results suggest that the native soils may be moderately to highly corrosive to unprotected buried metal, but not excessively corrosive to steel reinforcement properly embedded within Portland cement concrete.

Wallace-Kuhl & Associates are not corrosion engineers. Therefore, if it is desired to further define the soil corrosion potential at the site, a corrosion engineer should be consulted.

RECOMMENDATIONS

General

The site is essentially level with little topographic relief across the property; therefore, we have assumed maximum excavations and fills on the order of one to three feet for development of the property (excluding the drainage canal and detention basins). The recommendations in this report are based upon this assumption.

In addition, the recommendations presented below are appropriate for typical construction in the late spring through fall months. The on-site soils likely will be saturated by rainfall in the winter and early spring months, and will not be compactable without drying by aeration or the addition of quicklime (or a similar product) to dry the soils. Should the construction schedule require work to continue during the wet months, additional recommendations can be provided, as conditions warrant.

Site Clearing and Preparation

Initially, the site should be cleared of existing structures designated for removal, including but not limited to, concrete slabs, foundations, underground structures and any septic tanks; resulting demolition debris; trees and bushes, including root systems; and, any utilities to be relocated or abandoned within areas to be developed. Tree removal should include the rootball and all surface roots larger than ½-inch in diameter. Domestic and agricultural wells should be identified and removed in conformance with the requirements of the governing agency. Septic tanks should be removed and wasted off-site, and leach fields should be excavated.

Following removal of foundations, slabs, leach fields and existing structural improvements, all disturbed soil from the operations should be excavated to expose firm native soils and grades restored with engineered fill placed in accordance with the recommendations in this report.

Following clearing operations, any remaining surface vegetation and organically contaminated topsoil should be removed by stripping. A stripping depth of three inches should be assumed for removal of the surface organics and shallow root systems. Strippings may be stockpiled for later use or disposed of off-site. Strippings should not be used in general fill construction, but may be used in landscaped areas, provided they are kept at least five feet from any structure, including adjacent flatwork and pavements, are moisture conditioned and receive compactive effort. Due to the height and moderate to heavy concentrations of weeds at the site discing of the organics is not recommended.

The surface and near-surface soils are relatively loose, and clearing operations likely will result in disturbance of the upper few feet of soil. Therefore, all building pads, including adjacent exterior flatwork, should be sub-excavated to a depth of at least 24 inches below the existing grade. The sub-excavations should extend at least five feet beyond the proposed footprint of the buildings and adjacent flatwork. The exposed subgrade then should be thoroughly scarified to a depth of at least 12 inches, brought to a uniform moisture content of at least the optimum moisture content, and compacted to not less than 90 percent of the maximum dry density per

ASTM D1557 specifications. Compaction should be performed using a Cat 825 or an equivalent-sized sheepsfoot compactor.

Based on the relatively flat topography of the site we anticipate a majority of pavement subgrades will be at-grade or achieved by excavations up to one foot in depth. Once the pavement areas are at rough subgrade elevation, the soils should be thoroughly scarified to a depth of about 18 inches and all unsuitable materials removed. The soils should then be moisture conditioned to at least the optimum moisture and compacted to at least 90 percent of the maximum dry density per ASTM D1557 using a Cat 825 or equivalent compactor. Final subgrade preparation should be accomplished after all underground utility construction is complete.

Due to the loose soils at this site it is crucial that a Cat 825 compactor be used for compaction. Smaller compactors are not acceptable for compaction during mass grading for this project.

Compaction of the existing grade must be performed in the presence of our representative who will evaluate the performance of the subgrade under compactive loads and identify any loose or unstable soil conditions that could require removal and replacement.

Engineered Fill Construction

Engineered fill should be placed in lifts that do not exceed six inches in compacted thickness. Native materials should be uniformly moisture conditioned to at least the optimum moisture content and compacted to at least 90 percent of the ASTM D1557 maximum dry density.

On-site soils are considered suitable for use in engineered fill construction, if free of significant concentrations of organics, rubble or debris. Imported fill materials, if required, should be granular materials with non-plastic fines with an Expansion Index of 20 or less, and free of particles greater than three-inches in maximum dimension. Additionally, import fill materials that will be used within pavement areas should have a minimum Resistance value of 20 when tested in accordance with California Test 301. Imported fill should be approved by the Geotechnical Engineer prior to being transported to the site. Additionally the contractor must provide adequate documentation that the imported materials are free of known contaminants and within acceptable corrosion limits.

The upper six inches of final pavement subgrade should be uniformly compacted to at least 95 percent of the ASTM D1557 maximum dry density at a moisture content of at least the optimum moisture, and must be stable under construction traffic prior to placement of aggregate

base. Final pavement subgrade processing and compaction should be performed just prior to placement of aggregate base, after construction of underground utilities is complete. The moisture content of the subgrade soils should be maintained until covered by aggregate base.

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

Site preparation should be accomplished in accordance with the recommendations of this section and the *Guide Earthwork Specifications* provided in Appendix B. A representative of the Geotechnical Engineer should be present during site preparation and all grading operations to observe and test the fill to verify compliance with our recommendations and the project specifications.

Drainage Easement

A drainage easement is planned near the western boundary of the subject site. We understand the bottom of the easement will be approximately 10 feet below existing grades. Excavation for the canal will likely encounter the relatively granular soils, although clay soils could be encountered near the bottom of the canal, depending on final design depth. Conventional excavation equipment will be suitable for excavation and construction of the canal.

Due to the relatively loose condition of the soils within the upper 10 feet, we recommend the side slopes for the easement be constructed no steeper that three horizontal to one vertical (3:1). Following excavation, the slopes should be track-walked with a dozer to improve the density of the soil and help reduce the erosion potential.

Unless the bottom of the easement extends into the underlying silty clays, there is a potential for erosion of the easement bottom, depending on flow volume and velocity.

Utility Trench Backfill

Bedding of utilities and initial backfill around and over the pipe should be in accordance with the manufacturer's recommendations for the pipe materials selected, and applicable City of Winters Standards.

We recommend that native soil be used to backfill utility trenches, especially within building areas. Utility trench backfill should be placed in maximum 12-inch lifts (compacted thickness),

moisture conditioned to at least the optimum moisture content, and mechanically compacted to at least 90 percent of the maximum dry density as determined by ASTM D1557. Within the upper six inches of pavement areas the minimum compaction should be increased to 95 percent of ASTM D1557.

We recommend that underground utility trenches that are aligned nearly parallel with foundations be at least three feet from the outer edge of foundations, wherever possible. As a general rule, trenches should not encroach into the zone extending outward at a horizontal to one vertical (1:1) inclination below the bottom of the foundations. Additionally, trenches parallel to existing foundations should not remain open longer than 72 hours. The intent of these recommendations is to prevent loss of both lateral and vertical support of foundations, resulting in possible settlement.

Foundation Design

Conventional Foundations

The proposed office and classroom buildings may be supported upon continuous and/or isolated spread foundations that extend at least 18 inches into the compacted building pad, as measured from lowest adjacent soil grade. For this project, the building pad subgrade is defined as the soil surface on which capillary break gravel is placed. A continuous, reinforced foundation should be utilized for the perimeter of the structures to act as a “cut-off” to help minimize moisture infiltration and variations beneath the interior slab-on-grade areas of the structures. Continuous foundations should be at least 12 inches wide; isolated spread foundations should maintain a minimum 24-inch dimension.

We recommend that all foundations be adequately reinforced to provide structural continuity, mitigate cracking and permit spanning of local soil irregularities. *As a minimum*, we recommend that continuous foundations be reinforced with at least two No. 4 steel reinforcing bars, placed one each near the top and bottom of the foundations. The structural engineer should determine final foundation dimensions and reinforcing requirements.

Foundations bearing on recompacted native soils, engineered fill, or a combination of these materials may be sized utilizing a maximum allowable soil pressure of 3000 psf for dead load plus live loads, or 4000 psf for all loads, including wind or seismic forces. The weight of foundation concrete extending below lowest adjacent soil grade may be disregarded in sizing computations.

Lateral resistance of foundations may be computed using an allowable friction factor of 0.30 which may be multiplied by the vertical load on the foundation. Additional lateral resistance may be assumed to develop against the vertical face of the foundations and may be computed using a "passive" equivalent fluid pressure of 300 psf per foot of depth. These two modes of resistance should not be added unless the frictional component is reduced by 50 percent since full mobilization of the passive resistance requires some horizontal movement, which significantly diminishes the frictional resistance.

Based on local experience, shallow foundations constructed in accordance with the recommendations of this report could experience maximum total settlements on the order of 1-inch and maximum differential settlements on the order of ½-inch.

Drilled Concrete Piers

The equipment training structures may be supported on shallow spread foundations, although it is likely these foundations will not provide adequate uplift and overturning resistance. Therefore the future covered excavation structures may be supported on drilled, cast-in-place concrete piers extending at least 10 feet below the lowest adjacent soil grade. Piers should have a minimum shaft diameter of 24 inches. Drilled piers may be designed using an allowable end bearing capacity of 6000 pounds per square foot (psf) for dead and dead plus live loads with a 1/3 increase to include the short-term effects of wind or seismic forces.

For constructability purposes, a minimum shaft diameter of 24 inches is recommended. To avoid potential group effects between adjacent caissons when considering either axial or lateral loads, we recommend a minimum spacing of three pier diameters (center-to-center). Due to the granular nature of the upper 8 to 10 feet of soil, belled piers likely would not hold their shape in the upper granular soils, and therefore are not recommended for this project.

Uplift resistance of piers can be evaluated based upon an average skin friction of 400 psf in addition to the weight of the pier. Lateral resistance of pier foundations may be evaluated by applying a *passive* earth pressure equivalent to a fluid pressure of 300 psf per foot of depth, acting over an area equal to 1½ times the pier diameter times the depth of the pier. If the pier is surrounded by slab-on-grade concrete, a constrained condition may be assumed for design. Reinforcement and concrete should be placed in the pier excavations as soon as possible after the drilling is completed to minimize the chances of sidewall caving into the excavations. The near-surface silts and sands could slough during pier construction; therefore, we recommend that the pier contractor be prepared to case the pier holes.

The bottom of the pier excavations should be free of loose or disturbed soils prior to placement of the concrete. Cleaning of the bearing surface may be done mechanically with the auger, and should be verified by the geotechnical engineer prior to concrete placement.

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

In general, we anticipate the drilled pier excavations will be relatively dry. However, if groundwater is encountered which cannot be controlled such that more than six inches of water accumulates at the bottom of the pier excavation, concrete should be placed using a tremie, after it is confirmed that the excess water cannot be removed from the caisson excavation by bailing or with sump pumps.

When extracting temporary casings or tremie methods from the excavation, care should be taken to maintain a head of concrete to prevent infiltration of water and soil into the shaft area.

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

The design parameters recommended above assume the geotechnical engineer is be present to observe foundation drilling to verify that the materials encountered at the drilled pier locations are as anticipated. The geotechnical engineer can verify the bearing materials and conditions from the surface using cuttings from augers. Either observation by the field engineer from the ground surface or a down-hole camera can be used to visually observe the bearing surfaces where necessary to determine if the surface has been adequately cleaned or if standing water is present.

Drilled piers should be constructed in accordance with the recommendations of this report and the *Guide Drilled Pier Specifications* provided in Appendix C.

Interior Floor Slab Support

Interior concrete slab-on-grade floors can be suitably supported upon the soil subgrade prepared in accordance with the recommendations in this report and maintained in that condition (optimum moisture). As a minimum, slabs should be at least 4 inches thick in office and classroom areas (lightly loaded floors) and at least 6 inches thick in warehouse or industrial areas and should contain at least chaired No. 3 steel reinforcing bars placed on 24-inch centers, each way throughout the slab located at mid-slab depth. This slab reinforcement is suggested as a guide "minimum" only. Final slab thickness and reinforcement should be provided by the structural engineer based upon the anticipated floor loads. Temporary loads exerted during construction also should be considered in the design thickness and reinforcement of interior slabs. Proper and consistent location of the reinforcement at mid-slab is essential to its performance. The risk of uncontrolled shrinkage cracking is increased if the reinforcement is not properly located within the slab.

Lightly loaded floor slabs (office and classroom areas) may be underlain by a layer of free-draining crushed rock, serving as a deterrent to migration of capillary moisture. The rock layer should be at least four inches thick and graded such that 100 percent passes a one-inch sieve and none passes a No. 4 sieve. Additional moisture protection may be provided by placing a water vapor retarder membrane (at least 10-mils thick) directly over the crushed rock. The plastic water vapor retarder should meet or exceed the minimum specifications outlined in ASTM E1745, and be installed in strict conformance with the manufacture’s recommendations.

Floor slab construction over the past 25 years or more has included placement of a thin layer of sand over the vapor retarder membrane. The intent of the sand is to aid in the proper curing of the slab concrete. However, recent debate over excessive moisture vapor emissions from floor slabs includes concern for water trapped within the sand. As a consequence, we consider the use of the sand layer as optional. The concrete curing benefits should be weighed against efforts to reduce slab moisture vapor transmission.

For increased support for heavily loaded slab-on-grade floors or slabs subjected to fork lift traffic, slabs may be underlain by at least six inches of Class 2 aggregate base compacted to 95 percent of the maximum dry density as determined by ASTM D1557 test method. A durable vapor barrier (minimum 10-mil) could be placed beneath the aggregate base, if desired to minimize moisture vapor migration through the slab. Slab thickness and reinforcement should be determined by the structural engineer based on anticipated slab loads.

Floor Slab Moisture Penetration Resistance

It is considered likely that floor slab subgrade soils will become saturated at some time during the life of the structure. This is a certainty when slabs are constructed during the wet season, when the subgrade soils are saturated prior to slab construction and when constantly wet ground or poor drainage conditions exist adjacent to structures. For this reason, it should be assumed that interior slabs, particularly those intended for moisture-sensitive floor coverings or materials, require protection against moisture or moisture vapor penetration. Standard practice includes the rock, plastic membrane and sand as suggested above. However, the rock and plastic membrane offer only a limited, first line of defense against soil-related moisture. Recommendations contained in this report concerning foundation and floor slab design are presented as *minimum* requirements only from the geotechnical engineering standpoint.

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

Retaining Wall Design

Retaining walls may be supported upon continuous and/or isolated spread foundations bearing upon undisturbed native surface soils, engineered fill, or a combination of these materials. Retaining walls capable of slight rotation about their base (unrestrained at the top or sides) should be capable of resisting an "active" lateral earth pressure equal to an equivalent fluid pressure of 40 psf per foot of wall backfill for horizontal backfill conditions. Retaining walls that are fixed at the top should be capable of resisting an "at-rest" lateral earth pressure equal to an equivalent fluid pressure of 60 psf per foot for horizontal backfill conditions.

Retaining walls could experience additional surcharge loading if vehicles are parked or at-grade foundations are constructed within a one horizontal to one vertical (1:1) projection from the bottom of the retaining wall. Surcharge loading under these circumstances should be evaluated on a case-by-case basis.

Retaining wall foundations should extend at least 18 inches below lowest adjacent soil grade, and may be designed utilizing the parameters provided in the Foundation Design section of this report.

Retaining walls should be fully drained to prevent the build-up of hydrostatic pressure behind the wall. Retaining walls should be provided with a drainage blanket (Class 2 permeable material, Caltrans Specification Section 68-202F(3)) at least one foot wide extending from the base of wall to within one foot of the top of the wall. The top foot above the drainage layer should consist of compacted aggregate base. Weep holes or perforated rigid pipe should be provided near the base of the wall to allow drainage of accumulated water. Drain pipes, if used, should slope to discharge at no less than a one percent fall to suitable drainage facilities. Open-graded ½- to ¾-inch crushed rock may be used in lieu of the Class 2 permeable material, if the rock and drain pipe are completely enveloped in an approved non-woven geotextile filter fabric. Detailing of wall drainage should be provided by the designer of the retaining wall.

Structural backfill materials for retaining walls, other than the drainage layer, should consist of granular soils free of significant quantities of rubbish, rubble, organics and rock over three inches in size. Structural backfill should be placed in lifts not exceeding 12 inches in compacted thickness, and should be mechanically compacted to at least 90 percent relative compaction. The top 12 inches of backfill (aggregate base) should be compacted to at least 90 percent of the ASTM D1557 maximum dry density.

Exterior Flatwork Construction

Soil subgrades supporting exterior concrete flatwork (i.e., sidewalks, patios, etc.) should be moisture conditioned to the optimum moisture content and uniformly compacted to not less than 90 percent of the ASTM D1557 maximum dry density, prior to the placement of the concrete. Proper moisture conditioning of the subgrade soils is considered essential to the performance of exterior flatwork. Expansion joints should be provided to allow for minor vertical movement of the flatwork. Exterior flatwork should be constructed independent of the perimeter building foundation and isolated column foundations by the placement of a layer of felt material between the flatwork and the foundation.

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

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

Pavement Design

Traffic indices were not specified for the project; therefore, we have assumed typical traffic indices of 4.0 through 10.0. The following pavement sections have been calculated based on the assumed traffic indices and the procedures contained within Chapter 600 to 670 of the Sixth Edition of the of the *California Highway Design Manual*. The project civil engineer should determine the appropriate traffic index based on anticipated traffic conditions.

TABLE 4
PAVEMENT DESIGN ALTERNATIVES
R-value = 20

Traffic Index	Type B Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
4.0	2½	7
	3*	6
5.0	2½	9
	3*	8
6.0	2½	12
	3½*	10
7.0	3	14
	4*	12
8.0	4	15
	4½*	14
9.0	4	19
	5½*	16
10.0	5	20
	6*	18

* = Asphalt thickness includes Caltrans Factor of Safety

We emphasize that the performance of a pavement is critically dependent upon uniform compaction of the subgrade soils, as well as all engineered fill and utility trench backfill within the limits of the pavements. The upper six inches of pavement subgrades should be compacted

to at least 95 percent of the ASTM D1557 maximum dry density at no less than the optimum moisture content. We recommend that pavement subgrade preparation, i.e. scarification, moisture conditioning and compaction, be performed just prior to aggregate base placement. Class 2 aggregate base should be uniformly moisture conditioned to the optimum moisture content and compacted to at least 95 percent of the ASTM D1557 maximum dry density. Subgrade preparation should conform to the recommendations in the previous paragraph. Proofrolling also should be performed on the completed aggregate base section prior to paving operations.

We understand that Portland cement concrete pavements will be used in some of the training areas. Portland cement concrete pavements should be at least 6 inches thick and underlain by 6 inches of Class 2 aggregate base compacted to not less than 95 percent of ASTM D1557. Subgrade preparation and compaction should conform to the recommendations in the previous paragraph. Reinforcing for crack control, if desired, should consist of at least No. 3 reinforcing bars placed on maximum 24-inch centers each way throughout the slab. Reinforcement must be located at mid-slab depth to be effective. Joint spacing and details should conform with the current PCA or ACI guidelines. Portland cement concrete should achieve a minimum compressive strength of 3500 pounds per square inch at 28 days.

We also understand that some training areas will utilize a gravel surface, without an asphalt concrete or Portland cement concrete wearing surface. To provide reasonable year round support we recommend using a geogrid, such as Tensor BX1100 or the equivalent, covered with at least 12 inches of Class 2 aggregate base compacted in lifts to at least 95 percent of the ASTM D1557 maximum dry density. Prior to placement of the geogrid, the soil subgrade should be scarified to at least six inches, moisture conditioned to at least the optimum moisture content, and compacted to not less than 95 percent of ASTM D1557. Without an asphalt or concrete wearing surface there is an increased potential for the underlying subgrade to become saturated and unstable. This likely would increase maintenance costs and should be considered in the design.

Efficient drainage of all surface water to avoid infiltration and saturation of the supporting aggregate base and subgrade soils is important to pavement performance. We suggest considering the use of full-depth curbs where pavements abut landscaped areas to serve as a cut-off against water migrating into the pavement base and subgrade materials. Weep holes also could be provided at drop inlets, located at or slightly below the subgrade-base interface, to allow accumulated water to drain from beneath the pavements.

Materials quality and construction within the structural sections of the pavement should conform to the applicable provisions of the latest editions of the *Caltrans Standard Specifications* and *Yolo County Improvement Standards*, latest editions.

Site Drainage

Site drainage should be accomplished to provide positive drainage of surface water away from the structures and prevent ponding of water adjacent to foundations. The grades adjacent to the structures should be sloped away from foundations at a minimum two percent for a distance of at least five feet. We suggest consideration be given to connecting all roof downspouts to solid drainage pipes that convey water away from the buildings to available drainage features, or discharging downspouts onto concrete or asphalt surfaces that slope away from structures.

Geotechnical Engineering Observation and Testing During Earthwork

Site preparation should be accomplished in accordance with the recommendations of this report. Geotechnical testing and observation during construction is considered a continuation of our geotechnical engineering investigation. Wallace-Kuhl & Associates should be retained to provide testing and observation services during site preparation, earthwork, and foundation construction at the project to verify compliance with this geotechnical report and the project plans and specifications, and to provide consultation as required during construction. These services are beyond the scope of work authorized for this investigation.

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

LIMITATIONS

Our recommendations are based upon the information provided regarding the proposed project, combined with our analysis of site conditions revealed by the field exploration and laboratory testing programs. We have used our engineering judgment based upon the information provided and the data generated from our investigation. This report has been prepared in substantial compliance with generally accepted geotechnical engineering practices that exist in

the area of the project at the time the report was prepared. No warranty, either express or implied, is provided.

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

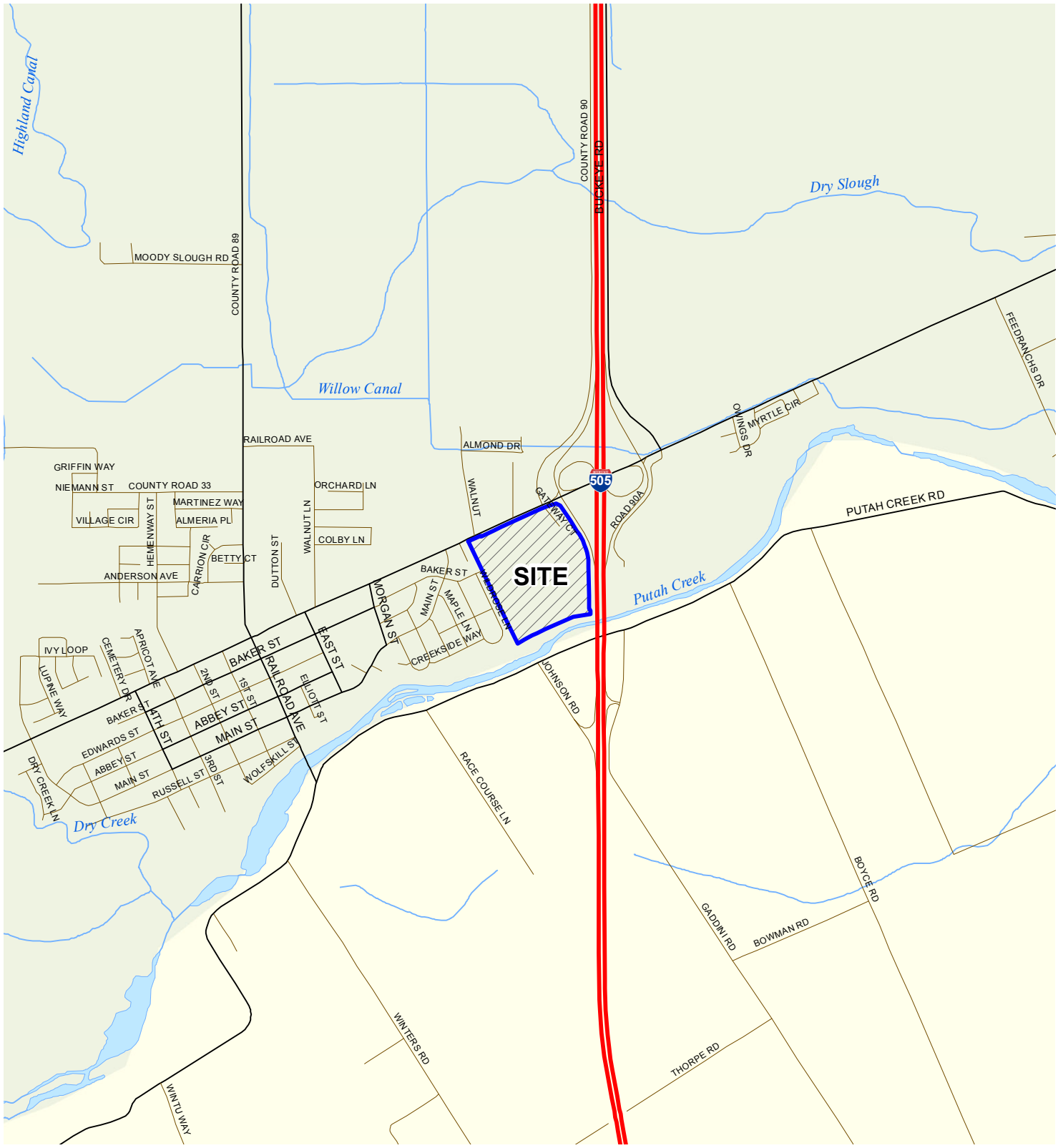
We emphasize that this report is applicable only to the proposed construction and the investigated site, and should not be utilized for construction on any other site. The conclusions and recommendations of this report are considered valid for a period of three years. If design is not completed and construction has not started within three years of the date of this report, the report must be reviewed and updated if necessary.

Wallace - Kuhl & Associates

REGISTERED PROFESSIONAL ENGINEER
STEPHEN L. FRENCH
NO. 323
Exp. 3/31/14
GEOTECHNICAL
STATE OF CALIFORNIA

Gerard J. Follettie
Staff Engineer

Stephen L. French
Senior Engineer



Street data courtesy of ESRI, 2010.
Hydrography courtesy of the U.S. Geological Survey acquired from the GIS Data Depot, December, 2007.
Projection: NAD 83, California State Plane, Zone II

N

0 1,000 2,000
Feet

WallaceKuhl & ASSOCIATES

VICINITY MAP

PG&E TRAINING FACILITY

Winters, California

FIGURE	1
DRAWN BY	TJC
CHECKED BY	GJF
PROJECT MGR	SLF
DATE	9/14
WKA NO.	9974.01

Adapted from a drawing prepared by Dreyfuss & Blackford Architects, dated August 20, 2014.
Projection: NAD 83, California State Plane, Zone II

Legend

- Approximate soil boring location
- Approximate percolation test location

N

0 150 300
Feet

WallaceKuhl & ASSOCIATES

SITE PLAN

PG&E TRAINING FACILITY

Winters, California

FIGURE	2
DRAWN BY	TJC
CHECKED BY	GJF
PROJECT MGR	SLF
DATE	9/14
WKA NO.	9974.01

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D1

Sheet 1 of 1

Date(s) Drilled	**12/30/13**	Logged By	**GJF**	Checked By	**SLF**
Drilling Method	**4" Solid Flight Augers**	Drilling Contractor	**Hillside Drilling**	Total Depth of Drill Hole	**5.0 feet**
Drill Rig Type	**B24**	Diameter(s) of Hole, inches	**4"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Cuttings**
Remarks				Driving Method and Drop	**140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Brown, moist, loose, slightly clayey, sandy silt (ML)		D1 (0-5')				
	5		Boring terminated at 5 feet below existing site grade.						

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Wallace Kuhl & ASSOCIATES

FIGURE 3

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D2

Sheet 1 of 1

Date(s) Drilled: **12/30/13**	Logged By: **GJF**	Checked By: **SLF**
Drilling Method: **4" Solid Flight Augers**	Drilling Contractor: **Hillside Drilling**	Total Depth of Drill Hole: **5.0 feet**
Drill Rig Type: **B24**	Diameter(s) of Hole, inches: **4"**	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet: **Groundwater was not encountered**	Sampling Method(s): **Open drive sampler with 6-inch sleeve**	Drill Hole Backfill: **Cuttings**
Remarks:		Driving Method and Drop: **140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Brown, moist, loose, clayey, sandy silt (ML)		D2 (0-5')				
	5		Boring terminated at 5 feet below existing site grade.						

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Wallace Kuhl & ASSOCIATES

FIGURE 4

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D3

Sheet 1 of 1

Date(s) Drilled	**12/30/13**	Logged By	**GJF**	Checked By	**SLF**
Drilling Method	**4" Solid Flight Augers**	Drilling Contractor	**Hillside Drilling**	Total Depth of Drill Hole	**5.0 feet**
Drill Rig Type	**B24**	Diameter(s) of Hole, inches	**4"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Cuttings**
Remarks				Driving Method and Drop	**140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, loose, sandy silt (ML)		D3 (0-5')				
	5		Boring terminated at 5 feet below existing site grade.						

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FIGURE 5

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D4

Sheet 1 of 1

Date(s) Drilled: **12/30/13**	Logged By: **GJF**	Checked By: **SLF**
Drilling Method: **4" Solid Flight Augers**	Drilling Contractor: **Hillside Drilling**	Total Depth of Drill Hole: **15.0 feet**
Drill Rig Type: **B24**	Diameter(s) of Hole, inches: **4"**	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet: **Groundwater was not encountered**	Sampling Method(s): **Open drive sampler with 6-inch sleeve**	Drill Hole Backfill: **Cuttings**
Remarks: **Bulk D4 (0-3')**		Driving Method and Drop: **140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, loose, fine sandy silt (ML)		D4-1I	7	12.3	89	EI TRIAX
	5		very loose		D4-2I	5	17.5	89	
			Brown, moist, very stiff, silty clay (CL)		D4-3I	33			
	10								
	15		stiff		D4-4I	17			
			Boring terminated at 15 feet below existing site grade.						

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FIGURE 6

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D5

Sheet 1 of 1

Date(s) Drilled: **12/30/13**	Logged By: **GJF**	Checked By: **SLF**
Drilling Method: **4" Solid Flight Augers**	Drilling Contractor: **Hillside Drilling**	Total Depth of Drill Hole: **25.0 feet**
Drill Rig Type: **B24**	Diameter(s) of Hole, inches: **4"**	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet: **Groundwater was not encountered**	Sampling Method(s): **Open drive sampler with 6-inch sleeve**	Drill Hole Backfill: **Cuttings**
Remarks: **Bulk D5 (0-3')**		Driving Method and Drop: **140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, loose, fine sandy silt (ML)						
					D5-1I	6	11.2	97	Organic content 2.48%
	5				D5-2I	12			
	10		Brown, moist, medium dense, silty, sandy, pea gravel (GM)						
			Brown, moist, stiff, silty clay (CL)		D5-3I	17			
	15		very stiff		D5-4I	28			
	20		hard		D5-5I	43			
			Boring terminated at 20 feet below existing site grade.						

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FIGURE 7

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D6

Sheet 1 of 1

Date(s) Drilled: **12/30/13**	Logged By: **GJF**	Checked By: **SLF**
Drilling Method: **4" Solid Flight Augers**	Drilling Contractor: **Hillside Drilling**	Total Depth of Drill Hole: **16.5 feet**
Drill Rig Type: **B24**	Diameter(s) of Hole, inches: **4"**	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet: **Groundwater was not encountered**	Sampling Method(s): **Open drive sampler with 6-inch sleeve**	Drill Hole Backfill: **Cuttings**
Remarks: **Bulk D6 (0-3')**		Driving Method and Drop: **140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, very loose, silty fine sand (SM)		D6-1I	4	13.3	82	
	5		Brown, moist, loose, sandy silt (ML)		D6-2I	9	22.1	91	
	10		Brown, moist, hard, silty clay (CL)		D6-3I	39			
	15		Brown, moist, loose, sandy silt (ML)		D6-4I	10			
			Boring terminated at 16.5 feet below existing site grade.						

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FIGURE 8

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D7

Sheet 1 of 1

Date(s) Drilled	**12/30/13**	Logged By	**GJF**	Checked By	**SLF**
Drilling Method	**4" Solid Flight Augers**	Drilling Contractor	**Hillside Drilling**	Total Depth of Drill Hole	**5.0 feet**
Drill Rig Type	**B24**	Diameter(s) of Hole, inches	**4"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Cuttings**
Remarks				Driving Method and Drop	**140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, loose, slightly clayey, sandy silt (ML)		D7 (0-5')				
	5		Boring terminated at 5.5 feet below existing site grade.						

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FIGURE 9

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D8

Sheet 1 of 1

Date(s) Drilled: **12/30/13**	Logged By: **GJF**	Checked By: **SLF**
Drilling Method: **4" Solid Flight Augers**	Drilling Contractor: **Hillside Drilling**	Total Depth of Drill Hole: **20.0 feet**
Drill Rig Type: **B24**	Diameter(s) of Hole, inches: **4"**	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet: **Groundwater was not encountered**	Sampling Method(s): **Open drive sampler with 6-inch sleeve**	Drill Hole Backfill: **Cuttings**
Remarks:		Driving Method and Drop: **140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Brown, moist, loose, slightly clayey, silty fine sand (SM)						
					D8-1I	9	12.7	96	
	5				D8-2I	6			
			Dark brown, moist, very stiff, silty clay (CL)						
	10				D8-3I	35			
			hard		D8-4I	38			
	15								
					D8-5I	44			
	20		Boring terminated at 20 feet below existing site grade.						

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FIGURE 10

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D9

Sheet 1 of 1

Date(s) Drilled: **12/30/13**	Logged By: **GJF**	Checked By: **SLF**
Drilling Method: **4" Solid Flight Augers**	Drilling Contractor: **Hillside Drilling**	Total Depth of Drill Hole: **15.0 feet**
Drill Rig Type: **B24**	Diameter(s) of Hole, inches: **4"**	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet: **Groundwater was not encountered**	Sampling Method(s): **Open drive sampler with 6-inch sleeve**	Drill Hole Backfill: **Cuttings**
Remarks: **Bulk D9 (4½'-7')**		Driving Method and Drop: **140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, loose, silty fine sand (SM)		D9-1I	6	15.6	84	
	5		Dark brown, moist, very stiff, silty clay (CL)		D9-2I	12			EI
	10				D9-3I	25			
	15				D9-4I	32			
			Boring terminated at 15 feet below existing site grade.						

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FIGURE 11

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D10

Sheet 1 of 1

Date(s) Drilled	**12/30/13**	Logged By	**GJF**	Checked By	**SLF**
Drilling Method	**4" Solid Flight Augers**	Drilling Contractor	**Hillside Drilling**	Total Depth of Drill Hole	**5.0 feet**
Drill Rig Type	**B24**	Diameter(s) of Hole, inches	**4"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Cuttings**
Remarks				Driving Method and Drop	**140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, loose, fine sandy silt (ML)		D10 (0-5')				
	5		Boring terminated at 5 feet below existing site grade.						

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FIGURE 12

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D11

Sheet 1 of 1

Date(s) Drilled: **12/30/13**	Logged By: **GJF**	Checked By: **SLF**
Drilling Method: **4" Solid Flight Augers**	Drilling Contractor: **Hillside Drilling**	Total Depth of Drill Hole: **20.0 feet**
Drill Rig Type: **B24**	Diameter(s) of Hole, inches: **4"**	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet: **Groundwater was not encountered**	Sampling Method(s): **Open drive sampler with 6-inch sleeve**	Drill Hole Backfill: **Cuttings**
Remarks: **Bulk D11 (0-3')**		Driving Method and Drop: **140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Brown, moist, loose, clayey, sandy silt (ML)		D11-1I	9			
	5		Brown, moist, loose, silty fine sand (SM)						
			Brown, moist, loose, sandy silt (ML)		D11-2I	11			
	10		Dark brown, moist, very stiff, silty clay (CL)		D11-3I	28	19.3	105	
	15				D11-4I	33			
	20		hard		D11-5I	45			
			Boring terminated at 20 feet below existing site grade.						

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FIGURE 13

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D12

Sheet 1 of 1

Date(s) Drilled: **12/30/13**	Logged By: **GJF**	Checked By: **SLF**
Drilling Method: **4" Solid Flight Augers**	Drilling Contractor: **Hillside Drilling**	Total Depth of Drill Hole: **15.0 feet**
Drill Rig Type: **B24**	Diameter(s) of Hole, inches: **4"**	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet: **Groundwater was not encountered**	Sampling Method(s): **Open drive sampler with 6-inch sleeve**	Drill Hole Backfill: **Cuttings**
Remarks:		Driving Method and Drop: **140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Brown, moist, loose, sandy silt (ML)		D12-1I	9			
			Brown, moist, loose, silty fine sand (SM)		D12-2I	8	16.2	85	
	5		Brown, moist, medium stiff, clayey silt (ML)						
			Dark brown, moist, very stiff, silty clay (CL)		D12-3I	24			
	10		hard		D12-4I	40			
	15		Boring terminated at 15 feet below existing site grade.						

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FIGURE 14

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D13

Sheet 1 of 1

Date(s) Drilled: 12/19/13	Logged By: GJF	Checked By: SLF
Drilling Method: 4" Solid Flight Augers	Drilling Contractor: Hillside Drilling	Total Depth of Drill Hole: 20.0 feet
Drill Rig Type: B24	Diameter(s) of Hole, inches: 4"	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet: Groundwater was not encountered	Sampling Method(s): Open drive sampler with 6-inch sleeve	Drill Hole Backfill: Cuttings
Remarks: Bulk D13 (0-3')		Driving Method and Drop: 140 lb automatic hammer, 30 inch drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, loose, sandy silt (ML)						
					D13-1I	6	16.2	80	
					D13-2I	11			
	5								
			Brown, moist, very stiff, silty clay (CL)		D13-3I	19			
	10								
			hard		D13-4I	46			
	15								
					D13-5I	45			
	20		Boring terminated at 20 feet below existing site grade.						

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FIGURE 15

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D14

Sheet 1 of 1

Date(s) Drilled	12/30/13	Logged By	GJF	Checked By	SLF
Drilling Method	4" Solid Flight Augers	Drilling Contractor	Hillside Drilling	Total Depth of Drill Hole	16.5 feet
Drill Rig Type	B24	Diameter(s) of Hole, inches	4"	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	Groundwater was not encountered	Sampling Method(s)	Open drive sampler with 6-inch sleeve	Drill Hole Backfill	Cuttings
Remarks	Bulk D14 (0-3')			Driving Method and Drop	140 lb automatic hammer, 30 inch drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, medium dense, clayey, sandy silt (ML)		D14-1I	13			
	5		Brown, moist, loose, silty fine sand (SM)		D14-2I	9	12.2	85	
	10		Dark brown, moist, very stiff, silty clay (CL)		D14-3I	25			
	15		Brown, moist, stiff, clayey silt (ML)		D14-4I	16	22.5	96	
			Boring terminated at 16.5 feet below existing site grade.						

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FIGURE 16

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D15

Sheet 1 of 1

Date(s) Drilled: **12/19/13**	Logged By: **GJF**	Checked By: **SLF**
Drilling Method: **4" Solid Flight Augers**	Drilling Contractor: **Hillside Drilling**	Total Depth of Drill Hole: **20.0 feet**
Drill Rig Type: **B24**	Diameter(s) of Hole, inches: **4"**	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet: **Groundwater was not encountered**	Sampling Method(s): **Open drive sampler with 6-inch sleeve**	Drill Hole Backfill: **Cuttings**
Remarks: **Bulk D15 (0-3')**		Driving Method and Drop: **140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Brown, moist, loose, slightly clayey, silty fine sand (SM)		D15-1I	7			EI
	5		medium dense		D15-2I	15	13.5	96	TRIAX
	10		Brown, moist, very stiff, silty clay (CL)		D15-3I	21			
	15		stiff		D15-4I	16	20.6	92	
			hard		D15-5I	43			
	20		Boring terminated at 20 feet below existing site grade.						

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FIGURE 17

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D16

Sheet 1 of 1

Date(s) Drilled	**12/19/13**	Logged By	**GJF**	Checked By	**SLF**
Drilling Method	**4" Solid Flight Augers**	Drilling Contractor	**Hillside Drilling**	Total Depth of Drill Hole	**15.0 feet**
Drill Rig Type	**B24**	Diameter(s) of Hole, inches	**4"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Cuttings**
Remarks				Driving Method and Drop	**140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Brown, moist, slightly clayey, silty fine sand (SM)						
					D16-1I	7	8.3	76	
					D16-2I	13			
	5		medium dense						
			Brown, moist, very stiff, silty clay (CL)		D16-3I	33			
	10								
					D16-4I	8	24.7	88	
	15		stiff						
			Boring terminated at 15 feet below existing site grade.						

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FIGURE 18

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D17

Sheet 1 of 1

Date(s) Drilled	**12/18/13**	Logged By	**GJF**	Checked By	**SLF**
Drilling Method	**4" Solid Flight Augers**	Drilling Contractor	**Hillside Drilling**	Total Depth of Drill Hole	**16.5 feet**
Drill Rig Type	**B24**	Diameter(s) of Hole, inches	**4"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Cuttings**
Remarks				Driving Method and Drop	**140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, loose, sandy silt (ML)		D17-1I	7			
	5		Brown, moist, stiff, silty clay (CL)		D17-2I	10	13.5	82	
	10		Brown, moist, loose, clayey sand (SC)		D17-3I	9	15.9	94	
	15		Brown, moist, very stiff, silty clay (CL)		D17-4I	30			
			Boring terminated at 16.5 feet below existing site grade.						

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FIGURE 19

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D18

Sheet 1 of 1

Date(s) Drilled	**12/30/13**	Logged By	**GJF**	Checked By	**SLF**
Drilling Method	**4" Solid Flight Augers**	Drilling Contractor	**Hillside Drilling**	Total Depth of Drill Hole	**5.0 feet**
Drill Rig Type	**B24**	Diameter(s) of Hole, inches	**4"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Cuttings**
Remarks				Driving Method and Drop	**140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, loose, sandy silt (ML)		D18 (0-5')				Organic content 3.15%
	5		Boring terminated at 5 feet below existing site grade.						

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FIGURE 20

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D19

Sheet 1 of 1

Date(s) Drilled: **12/18/13**	Logged By: **GJF**	Checked By: **SLF**
Drilling Method: **4" Solid Flight Augers**	Drilling Contractor: **Hillside Drilling**	Total Depth of Drill Hole: **20.0 feet**
Drill Rig Type: **B24**	Diameter(s) of Hole, inches: **4"**	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet: **Groundwater was not encountered**	Sampling Method(s): **Open drive sampler with 6-inch sleeve**	Drill Hole Backfill: **Cuttings**
Remarks: **Bulk D19 (0-3')**		Driving Method and Drop: **140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, loose, fine sandy silt (ML)						
					D19-1I	9	10.3	80	
					D19-2I	7			
	5								
			Brown, moist, very stiff, silty clay (CL)		D19-3I	24			
	10								
			stiff		D19-4I	14			
	15								
			very stiff		D19-5I	24			
	20		Boring terminated at 20 feet below existing site grade.						

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FIGURE 21

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D20

Sheet 1 of 1

Date(s) Drilled	**12/18/13**	Logged By	**GJF**	Checked By	**SLF**
Drilling Method	**4" Solid Flight Augers**	Drilling Contractor	**Hillside Drilling**	Total Depth of Drill Hole	**20.0 feet**
Drill Rig Type	**B24**	Diameter(s) of Hole, inches	**4"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Cuttings**
Remarks				Driving Method and Drop	**140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Brown, moist, loose, silty fine sand (SM)		D20-1I	6			
	5		Brown, moist, loose, clayey, sandy silt (ML)		D20-2I	8			
	10		Brown, moist, medium dense, fine sandy, silty clay (CL)		D20-3I	16	17.8	99	
	15		Brown, moist, stiff, clayey silt (ML)		D20-4I	9			
			Brown, moist, very stiff, silty clay (CL)		D20-5I	33			
	20		Boring terminated at 20 feet below existing grade						

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FIGURE 22

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D21

Sheet 1 of 1

Date(s) Drilled: **12/18/13**	Logged By: **GJF**	Checked By: **SLF**
Drilling Method: **4" Solid Flight Augers**	Drilling Contractor: **Hillside Drilling**	Total Depth of Drill Hole: **20.0 feet**
Drill Rig Type: **B24**	Diameter(s) of Hole, inches: **4"**	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet: **Groundwater was not encountered**	Sampling Method(s): **Open drive sampler with 6-inch sleeve**	Drill Hole Backfill: **Cuttings**
Remarks:		Driving Method and Drop: **140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, loose, clayey fine sand (SC)		D21-1I	9	16.8	75	
			Brown, moist, stiff, silty clay (CL)		D21-2I	14	13.5	128	
	5								
			Brown, moist, stiff, sandy, clayey silt (ML)		D21-3I	11			
	10								
			Brown, moist, hard, silty clay (CL)		D21-4I	50			
	15								
			very hard		D21-5I	50/4"			
	20		Boring terminated at 20 feet below existing site grade.						

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FIGURE 23

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D22

Sheet 1 of 1

Date(s) Drilled	**12/30/13**	Logged By	**GJF**	Checked By	**SLF**
Drilling Method	**4" Solid Flight Augers**	Drilling Contractor	**Hillside Drilling**	Total Depth of Drill Hole	**5.0 feet**
Drill Rig Type	**B24**	Diameter(s) of Hole, inches	**4"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Cuttings**
Remarks				Driving Method and Drop	**140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, loose, slightly clayey, sandy silt (ML)		D22 (0-5')				Organic content 3.08%
	5		Boring terminated at 5 feet below existing site grade.						

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FIGURE 24

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D23

Sheet 1 of 1

Date(s) Drilled: **12/18/13**	Logged By: **GJF**	Checked By: **SLF**
Drilling Method: **4" Solid Flight Augers**	Drilling Contractor: **Hillside Drilling**	Total Depth of Drill Hole: **20.0 feet**
Drill Rig Type: **B24**	Diameter(s) of Hole, inches: **4"**	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet: **Groundwater was not encountered**	Sampling Method(s): **Open drive sampler with 6-inch sleeve**	Drill Hole Backfill: **Cuttings**
Remarks:		Driving Method and Drop: **140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Brown, moist, loose, sandy silt (ML)						
					D23-1I	10			
	5				D23-2I	8			
	10		Brown, moist, very stiff, silty clay (CL)		D23-3I	24			
	15		stiff		D23-4I	15	15.9	106	
			Brown, moist, medium dense, silty sand (SM)						
			Brown, moist, very stiff, silty clay (CL)		D23-5I	29			
	20		Boring terminated at 20 feet below existing site grade.						

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FIGURE 25

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D24

Sheet 1 of 1

Date(s) Drilled	**12/18/13**	Logged By	**GJF**	Checked By	**SLF**
Drilling Method	**4" Solid Flight Augers**	Drilling Contractor	**Hillside Drilling**	Total Depth of Drill Hole	**15.0 feet**
Drill Rig Type	**B24**	Diameter(s) of Hole, inches	**4"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Cuttings**
Remarks	**Bulk D24 (0-3')**			Driving Method and Drop	**140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, loose, sandy silt (ML)		D24-1I	7			
					D24-2I	7			
	5								
			Brown, moist, very stiff, clayey silt (ML)		D24-3I	17	13.9	92	
	10								
					D24-4I	21			
	15		Boring terminated at 15 feet below existing site grade.						

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FIGURE 26

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D25

Sheet 1 of 1

Date(s) Drilled	**12/18/13**	Logged By	**GJF**	Checked By	**SLF**
Drilling Method	**4" Solid Flight Augers**	Drilling Contractor	**Hillside Drilling**	Total Depth of Drill Hole	**16.5 feet**
Drill Rig Type	**B24**	Diameter(s) of Hole, inches	**4"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Cuttings**
Remarks				Driving Method and Drop	**140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Brown, moist, clayey, sandy silt (ML)						
	5								
	10		Brown, moist, very stiff, silty clay (CL)		D25-1I	18	20.6	100	
	15				D25-2I	31	18.3	108	
			Boring terminated at 16.5 feet below existing site grade.						

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FIGURE 27

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D26

Sheet 1 of 1

Date(s) Drilled	**12/18/13**	Logged By	**GJF**	Checked By	**SLF**
Drilling Method	**4" Solid Flight Augers**	Drilling Contractor	**Hillside Drilling**	Total Depth of Drill Hole	**16.5 feet**
Drill Rig Type	**B24**	Diameter(s) of Hole, inches	**4"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Cuttings**
Remarks				Driving Method and Drop	**140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Brown, moist, slightly clayey, silty fine sand (SM)						
	5								
			Brown, moist, very stiff, silty clay (CL)						
	10				D26-1I	18			
	15		stiff		D26-2I	11			
			Boring terminated at 16.5 feet below existing site grade.						

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FIGURE 28

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D27

Sheet 1 of 1

Date(s) Drilled	**12/30/13**	Logged By	**GJF**	Checked By	**SLF**
Drilling Method	**4" Solid Flight Augers**	Drilling Contractor	**Hillside Drilling**	Total Depth of Drill Hole	**5.0 feet**
Drill Rig Type	**B24**	Diameter(s) of Hole, inches	**4"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve**	Drill Hole Backfill	**Cuttings**
Remarks				Driving Method and Drop	**140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, loose, fine sandy silt (ML)		D27 (0-5')				
	5		Boring terminated at 5 feet below existing site grade.						

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FIGURE 29

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D28

Sheet 1 of 1

Date(s) Drilled	12/30/13	Logged By	GJF	Checked By	SLF
Drilling Method	4" Solid Flight Augers	Drilling Contractor	Hillside Drilling	Total Depth of Drill Hole	5.0 feet
Drill Rig Type	B24	Diameter(s) of Hole, inches	4"	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	Groundwater was not encountered	Sampling Method(s)	Open drive sampler with 6-inch sleeve	Drill Hole Backfill	Cuttings
Remarks				Driving Method and Drop	140 lb automatic hammer, 30 inch drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Brown, moist, loose, sandy silt (ML)		D28 (0-5')				
	5		Boring terminated at 5 feet below existing site grade.						

BORING LOG 9974.01 - PG&E TRAINING FACILITY.GPJ WKA.GDT 9/18/14 3:31 PM

Wallace Kuhl & ASSOCIATES

FIGURE 30

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D29

Sheet 1 of 1

Date(s) Drilled: **12/18/13**	Logged By: **GJF**	Checked By: **SLF**
Drilling Method: **4" Solid Flight Augers**	Drilling Contractor: **Hillside Drilling**	Total Depth of Drill Hole: **16.5 feet**
Drill Rig Type: **B24**	Diameter(s) of Hole, inches: **4"**	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet: **Groundwater was not encountered**	Sampling Method(s): **Open drive sampler with 6-inch sleeve**	Drill Hole Backfill: **Cuttings**
Remarks:		Driving Method and Drop: **140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Brown, moist, sandy silt (ML)						
	5								
			Brown, moist, stiff, silty clay (CL)						
	10				D29-1I	12	18.2	95	
	15		stiff		D29-2I	11	17.8	103	
			Brown, moist, loose, sandy silt (ML)						
			Brown, moist, medium stiff, silt clay (CL)						
			Boring terminatated at 16.5 feet below existing site grade.						

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FIGURE 31

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D101

Sheet 1 of 1

Date(s) Drilled	**9/5/14**	Logged By	**GJF**	Checked By	**SLF**
Drilling Method	**Solid Stem Augers**	Drilling Contractor	**V & W Drilling, Inc.**	Total Depth of Drill Hole	**15.0 feet**
Drill Rig Type	**CME 55**	Diameter(s) of Hole, inches	**6"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**California Modified**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Brown, moist, loose, silty fine sand (SM)						
					D101-1I	11	7.9	79	
	5		medium dense		D101-2I	16	11.4	84	
			Brown, moist, very stiff, silty clay (CL)		D101-3I	19			
	10								
			very hard		D101-4I	50/6"			
	15		Boring terminated at 15 feet below existing site grade. Groundwater was not encountered.						

BORING LOG 9974.01 - PG&E TRAINING FACILITY SEPTEMBER.GPJ WKA.GDT 9/22/14 3:16 PM

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FIGURE 32

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D102

Sheet 1 of 1

Date(s) Drilled: **9/5/14**	Logged By: **GJF**	Checked By: **SLF**
Drilling Method: **Solid Stem Augers**	Drilling Contractor: **V & W Drilling, Inc.**	Total Depth of Drill Hole: **21.5 feet**
Drill Rig Type: **CME 55**	Diameter(s) of Hole, inches: **6"**	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet: **Groundwater was not encountered**	Sampling Method(s): **California Modified**	Drill Hole Backfill: **Soil Cuttings**
Remarks:		Driving Method and Drop: **140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Brown, moist, medium dense, silty fine sand (SM)		D102-1I	15	7.3	77	
	5		Brown, moist, very stiff, silty clay (CL)		D102-2I	29	11.8	97	EI=82
	10				D102-3I	29			
	15				D102-4I	19			
	20				D102-5I	29			
			Boring terminated at 21.5 feet below existing site grade. Groundwater was not encountered.						

BORING LOG 9974.01 - PG&E TRAINING FACILITY SEPTEMBER.GPJ WKA.GDT 9/22/14 3:16 PM

Wallace Kuhl & ASSOCIATES

FIGURE 33

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D103

Sheet 1 of 1

Date(s) Drilled	**9/5/14**	Logged By	**GJF**	Checked By	**SLF**
Drilling Method	**Solid Stem Augers**	Drilling Contractor	**V & W Drilling, Inc.**	Total Depth of Drill Hole	**16.0 feet**
Drill Rig Type	**CME 55**	Diameter(s) of Hole, inches	**6"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**California Modified**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Brown, moist, medium dense, silty fine sand (SM)		D103-1I	21	7.5	90	
	5		Brown, moist, very hard, silty clay (CL)		D103-2I	50/5"	12.1	94	
	10		moist, hard		D103-3I	37			
	15		very hard		D103-4I	50/6"			
			Boring terminated at 16 feet below existing site grade. Groundwater was not encountered.						

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FIGURE 34

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D104

Sheet 1 of 1

Date(s) Drilled: **9/5/14**	Logged By: **GJF**	Checked By: **SLF**
Drilling Method: **Solid Stem Augers**	Drilling Contractor: **V & W Drilling, Inc.**	Total Depth of Drill Hole: **14.5 feet**
Drill Rig Type: **CME 55**	Diameter(s) of Hole, inches: **6"**	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet: **Groundwater was not encountered**	Sampling Method(s): **California Modified**	Drill Hole Backfill: **Soil Cuttings**
Remarks:		Driving Method and Drop: **140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, medium dense, silty fine sand (SM)		D104-1I	21	7.3	87	
	5		Brown, moist, very stiff, silty clay (CL)		D104-2I	20			
	10				D104-3I	34			
			very hard		D104-4I	50/6"			
			Boring terminated at 14.5 feet below existing site grade. Groundwater was not encountered.						

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FIGURE 35

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D105

Sheet 1 of 1

Date(s) Drilled	**9/5/14**	Logged By	**GJF**	Checked By	**SLF**
Drilling Method	**Solid Stem Augers**	Drilling Contractor	**V & W Drilling, Inc.**	Total Depth of Drill Hole	**5.0 feet**
Drill Rig Type	**CME 55**	Diameter(s) of Hole, inches	**6"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**California Modified**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Brown, moist, sandy silt (ML)		D105				
	5		Boring terminated at 5 feet below existing site grade.						

BORING LOG 9974.01 - PG&E TRAINING FACILITY SEPTEMBER.GPJ WKA.GDT 9/22/14 3:16 PM

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FIGURE 36

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D106

Sheet 1 of 1

Date(s) Drilled: **9/5/14**	Logged By: **GJF**	Checked By: **SLF**
Drilling Method: **Solid Stem Augers**	Drilling Contractor: **V & W Drilling, Inc.**	Total Depth of Drill Hole: **5.0 feet**
Drill Rig Type: **CME 55**	Diameter(s) of Hole, inches: **6"**	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet: **Groundwater was not encountered**	Sampling Method(s): **California Modified**	Drill Hole Backfill: **Soil Cuttings**
Remarks:		Driving Method and Drop: **140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Brown, moist, sandy silt (ML)	X	D106				
	5		Boring terminated at 5 feet below existing site grade.						

BORING LOG 9974.01 - PG&E TRAINING FACILITY SEPTEMBER.GPJ WKA.GDT 9/22/14 3:16 PM

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FIGURE 37

Project: PG&E Training Facility
Project Location: Winters, California
WKA Number: 9974.01

LOG OF SOIL BORING D107

Sheet 1 of 1

Date(s) Drilled: **9/5/14**	Logged By: **GJF**	Checked By: **SLF**
Drilling Method: **Solid Stem Augers**	Drilling Contractor: **V & W Drilling, Inc.**	Total Depth of Drill Hole: **15.0 feet**
Drill Rig Type: **CME 55**	Diameter(s) of Hole, inches: **6"**	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet: **Groundwater was not encountered**	Sampling Method(s): **California Modified**	Drill Hole Backfill: **Soil Cuttings**
Remarks:		Driving Method and Drop: **140 lb automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Brown, moist, loose, slightly clayey, sandy silt (ML)		D107-1I	9	11.8	74	
	5		Brown, moist, very stiff, silty clay (CL)		D107-2I	18	14.7	89	
	10				D107-3I	17			
	15		very stiff		D107-4I	34			
			Boring terminated at 15 feet below existing site grade. Groundwater was not encountered.						

BORING LOG 9974.01 - PG&E TRAINING FACILITY SEPTEMBER.GPJ WKA.GDT 9/22/14 3:16 PM

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FIGURE 38

UNIFIED SOIL CLASSIFICATION SYSTEM

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

OTHER SYMBOLS

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

= Drive Sampler: no recovery

= SPT Sampler

= Initial Water Level

= Final Water Level

= Estimated or gradational material change line

= Observed material change line

Laboratory Tests

PI = Plasticity Index
EI = Expansion Index
UCC = Unconfined Compression Test
TR = Triaxial Compression Test
GR = Gradational Analysis (Sieve)
K = Permeability Test

GRAIN SIZE CLASSIFICATION

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

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UNIFIED SOIL CLASSIFICATION SYSTEM

PG&E TRAINING FACILITY

Winters, California

FIGURE	39
DRAWN BY	TJC
CHECKED BY	GJF
PROJECT MGR	SLF
DATE	9/14
WKA NO.	9974.01

APPENDICES

APPENDIX A
General Project Information, Laboratory Testing and Results

APPENDIX A

A. GENERAL INFORMATION

The performance of a geotechnical engineering investigation for the proposed PG&E Training Facility to be constructed on the south side of East Grand Avenue, west of Highway I-505, in Winters, California, was authorized by Alfa Tech Consulting Enterprises, Inc. on August 22, 2014. Authorization was for an investigation as described in our proposal letter dated August 22, 2014, sent to our client PG&E Corporate Real Estate, Strategy & Services, whose address is 245 Market Street, San Francisco, California; telephone (415) 403-3048.

The project civil engineering consultant is BKF Engineers, whose mailing address is 980 9th Street, Suite 1770, Sacramento, California 95814; telephone (916) 556-5826.

The project structural engineering consultant is Buehler and Buehler Structural Engineers, Inc., whose mailing address is 600 Q Street, Suite 200, Sacramento, California 95811; telephone (916) 443-0303; facsimile (916) 443-0313.

The project architectural consultant is Dreyfuss & Blackford, whose mailing address is 3540 Folsom Boulevard, Folsom, California 95816; telephone (916) 453-1234.

In performing this investigation, we referenced the Winters Site Test Fit Plan prepared by Dreyfuss and Blackford Architects, dated August 20, 2014.

B. FIELD EXPLORATION

Twenty-nine borings were drilled on December 18, 2013 and seven additional borings were drilled on September 5, 2014, utilizing a CME-55 truck-mounted drill rig at the approximate locations shown in Figure 2. The borings were drilled to a maximum depth of approximately 21½ feet below existing site grades using six-inch diameter, solid flight helical augers. At various intervals, relatively undisturbed soil samples were recovered with a 2½-inch O.D., 2-inch I.D., Modified California sampler driven by a 140-pound hammer freely falling 30 inches. The number of blows of the hammer required to drive the 18-inch long sampler each 6-inch interval was recorded. The sum of the blows required to drive the sampler the lower 12-inch interval, or portion thereof, is designated the penetration resistance or "blow count" for that particular drive.

The samples were retained in two-inch (2”) diameter by six-inch (6”) long thin-walled brass tubes contained within the sampler. Immediately after recovery, the soils in the

tubes were visually classified by the field engineer and the ends of the tubes were sealed to preserve the natural moisture contents. All samples were taken to our laboratory for soil classification and selection of samples for testing.

The Logs of Soil Borings, Figures 32 through 38, contain descriptions of the soils encountered at each boring location. A Boring Legend explaining the Unified Soil Classification System and the symbols used on the logs is contained on Figure 39.

C. LABORATORY TESTING

Selected undisturbed samples of the soils were tested to determine dry unit weight (ASTM D2937), natural moisture content (ASTM D2216), and shear strength by triaxial strength testing (ASTM D4767). The results of the moisture content and unit weight tests are included on the Logs of Borings. The results of the triaxial shear strength testing are presented on Figures A1 and A2.

Five bulk samples of near-surface soil were subjected to Expansion Index testing (ASTM D4829); the results of the test are presented on Figures A3 through A7.

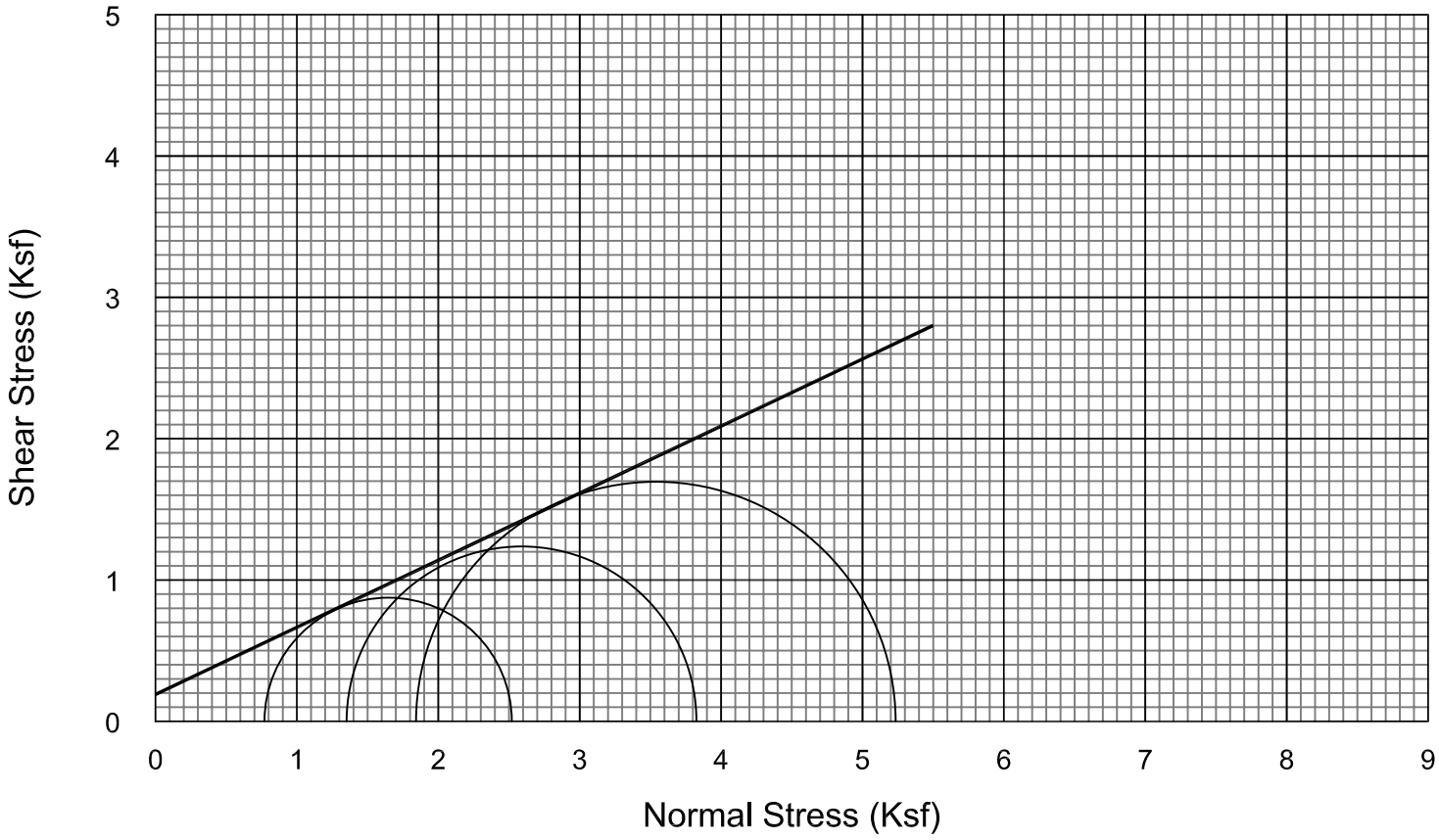
Four bulk samples of anticipated pavement subgrade soil were subjected to Resistance-value ("R-value") testing in accordance with California Test 301. The results of the R-value test, which were used in the pavement design, are presented on Figures A8 through A10.

Six near-surface soil samples were submitted to Sunland Analytical to determine the soil pH and minimum resistivity (California Test 643), Sulfate concentration (California Test 417) and Chloride concentration (California Test 422). The results of these tests are presented on Figures A11 through A16.

Four hydrometer tests were performed on near-surface clays to determine the percentage passing the No. 200 sieve (ASTM D422). The results of the hydrometer tests are presented on Figures A17 through A20.

TRIAXIAL COMPRESSION TEST

ASTM D4767



SAMPLE NO. :	D4-1I
SAMPLE CONDITION :	Undisturbed
SAMPLE DESCRIPTION :	Brown, fine sandy silt

DRY DENSITY (PCF) :	89
INITIAL MOISTURE (%) :	12.3
FINAL MOISTURE (%) :	25.4
ANGLE OF INTERNAL FRICTION (ø) :	25°
COHESION (PSF) :	190

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TRIAXIAL COMPRESSION TEST RESULTS

PG&E TRAINING FACILITY

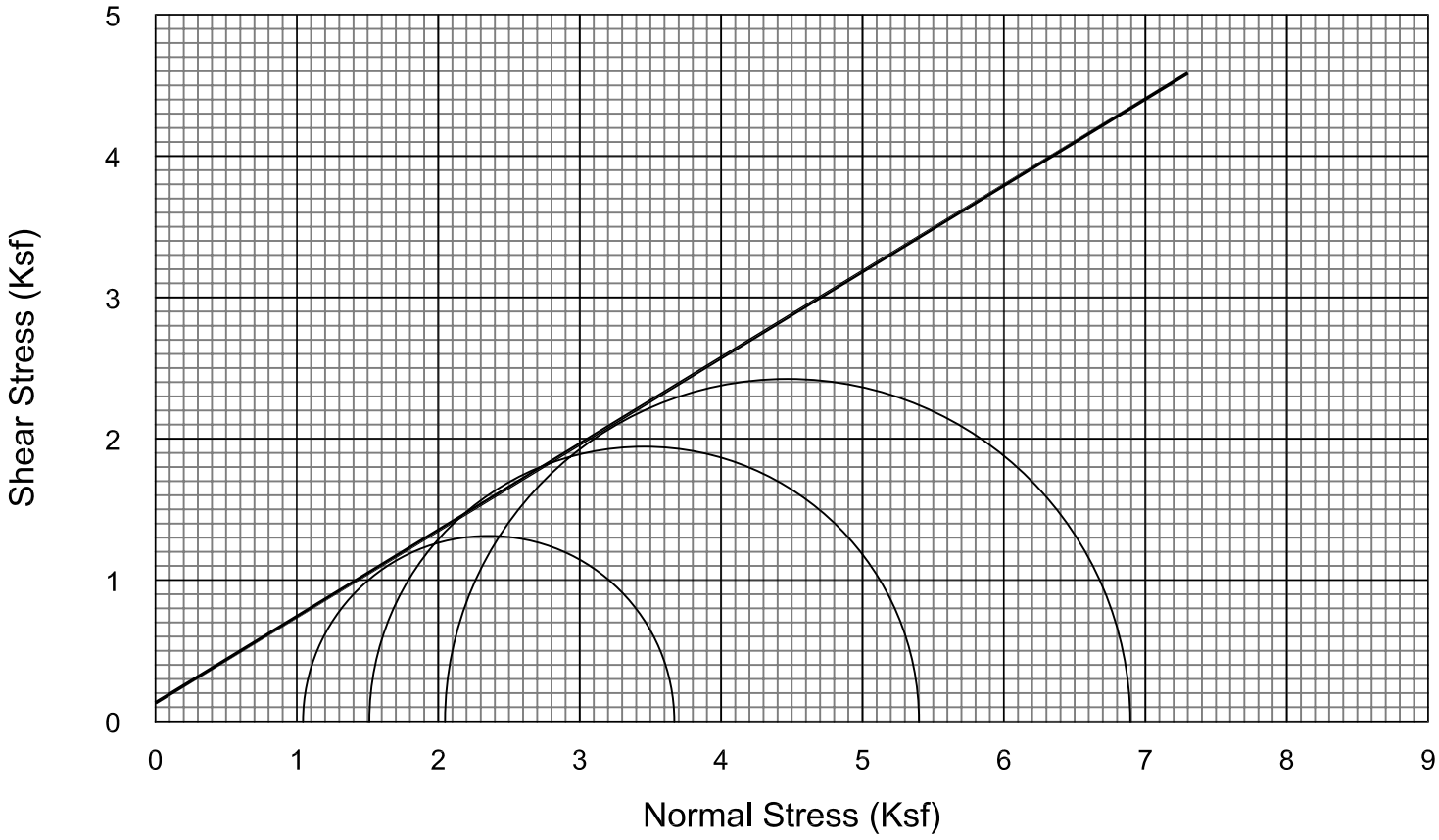
Winters, California

FIGURE	A1
DRAWN BY	TJC
CHECKED BY	GJF
PROJECT MGR	SLF
DATE	9/14

WKA NO. 9974.01

TRIAXIAL COMPRESSION TEST

ASTM D4767



SAMPLE NO. :	D15-2I
SAMPLE CONDITION :	Undisturbed
SAMPLE DESCRIPTION :	Brown, silty fine sand

DRY DENSITY (PCF) :	96.3
INITIAL MOISTURE (%) :	13.5
FINAL MOISTURE (%) :	25.5
ANGLE OF INTERNAL FRICTION (ø) :	31°
COHESION (PSF) :	131

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TRIAXIAL COMPRESSION TEST RESULTS

PG&E TRAINING FACILITY

Winters, California

FIGURE	A2
DRAWN BY	TJC
CHECKED BY	GJF
PROJECT MGR	SLF
DATE	9/14

WKA NO. 9974.01

EXPANSION INDEX TEST RESULTS

ASTM D4829

MATERIAL DESCRIPTION: Brown, fine sandy silt

LOCATION: D4

Sample Depth	Pre-Test Moisture (%)	Post-Test Moisture (%)	Dry Density (pcf)	Expansion Index
0'-3'	11.5	20.3	104.8	**25**

CLASSIFICATION OF EXPANSIVE SOIL *

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

* From ASTM D4829, Table 1

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EXPANSION INDEX TEST RESULTS

PG&E TRAINING FACILITY

Winters, California

FIGURE	A3
DRAWN BY	TJC
CHECKED BY	GJF
PROJECT MGR	SLF
DATE	9/14
WKA NO.	9974.01

EXPANSION INDEX TEST RESULTS

ASTM D4829

MATERIAL DESCRIPTION: Brown, silty clay

LOCATION: D9

Sample Depth	Pre-Test Moisture (%)	Post-Test Moisture (%)	Dry Density (pcf)	Expansion Index
4½'-7'	12.5	26.2	100.5	**69**

CLASSIFICATION OF EXPANSIVE SOIL *

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

* From ASTM D4829, Table 1

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EXPANSION INDEX TEST RESULTS

PG&E TRAINING FACILITY

Winters, California

FIGURE	A4
DRAWN BY	TJC
CHECKED BY	GJF
PROJECT MGR	SLF
DATE	9/14
WKA NO.	9974.01

EXPANSION INDEX TEST RESULTS

ASTM D4829

MATERIAL DESCRIPTION: Brown, clayey, sandy silt

LOCATION: D11

Sample Depth	Pre-Test Moisture (%)	Post-Test Moisture (%)	Dry Density (pcf)	Expansion Index
0'-3'	12.0	21.5	103.7	**36**

CLASSIFICATION OF EXPANSIVE SOIL *

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

* From ASTM D4829, Table 1

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EXPANSION INDEX TEST RESULTS

PG&E TRAINING FACILITY

Winters, California

FIGURE	A5
DRAWN BY	TJC
CHECKED BY	GJF
PROJECT MGR	SLF
DATE	9/14
WKA NO.	9974.01

EXPANSION INDEX TEST RESULTS

ASTM D4829

MATERIAL DESCRIPTION: Brown, slightly clayey, silty fine sand

LOCATION: D15

Sample Depth	Pre-Test Moisture (%)	Post-Test Moisture (%)	Dry Density (pcf)	Expansion Index
0'-3'	12.3	23.9	101.9	**43**

CLASSIFICATION OF EXPANSIVE SOIL *

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

* From ASTM D4829, Table 1

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EXPANSION INDEX TEST RESULTS

PG&E TRAINING FACILITY

Winters, California

FIGURE	A6
DRAWN BY	TJC
CHECKED BY	GJF
PROJECT MGR	SLF
DATE	9/14
WKA NO.	9974.01

EXPANSION INDEX TEST RESULTS

ASTM D4829

MATERIAL DESCRIPTION: Brown, silty clay

LOCATION: D102

Sample Depth	Pre-Test Moisture (%)	Post-Test Moisture (%)	Dry Density (pcf)	Expansion Index
5'-10'	12.0	27.1	102.9	**82**

CLASSIFICATION OF EXPANSIVE SOIL *

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

* From ASTM D4829, Table 1

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EXPANSION INDEX TEST RESULTS

PG&E TRAINING FACILITY

Winters, California

FIGURE	A7
DRAWN BY	TJC
CHECKED BY	GJF
PROJECT MGR	SLF
DATE	9/14
WKA NO.	9974.01

RESISTANCE VALUE TEST RESULTS

(California Test 301)

MATERIAL DESCRIPTION: Brown, sandy silt

LOCATION: D1 (0'-5')

Specimen No.	Dry Unit Weight (pcf)	Moisture @ Compaction (%)	Exudation Pressure (psi)	Expansion Pressure (dial)	Expansion Pressure (psf)	R Value
1	113	15.4	199	2	9	8
2	118	13.8	365	31	134	37
3	121	12.7	379	84	364	57

R-Value at 300 psi exudation pressure = 28

MATERIAL DESCRIPTION: Brown, fine sandy silt

LOCATION: D10 (0'-5')

Specimen No.	Dry Unit Weight (pcf)	Moisture @ Compaction (%)	Exudation Pressure (psi)	Expansion Pressure (dial)	Expansion Pressure (psf)	R Value
1	110	16.9	271	17	74	13
2	114	15.7	335	48	208	28
3	117	14.4	405	52	225	46

R-Value at 300 psi exudation pressure = 20

WallaceKuhl & ASSOCIATES

RESISTANCE VALUE TEST RESULTS

PG&E TRAINING FACILITY

Winters, California

FIGURE	A8
DRAWN BY	TJC
CHECKED BY	GJF
PROJECT MGR	SLF
DATE	9/14
WKA NO.	9974.01

RESISTANCE VALUE TEST RESULTS

(California Test 301)

MATERIAL DESCRIPTION: Brown, fine sandy, clayey silt

LOCATION: D27 (0'-5')

Specimen No.	Dry Unit Weight (pcf)	Moisture @ Compaction (%)	Exudation Pressure (psi)	Expansion Pressure (dial)	Expansion Pressure (psf)	R Value
1	106	17.5	164	11	48	8
2	110	16.5	251	16	69	9
3	114	15.5	544	60	260	31

R-Value at 300 psi exudation pressure = 12

WallaceKuhl & ASSOCIATES

RESISTANCE VALUE TEST RESULTS

PG&E TRAINING FACILITY

Winters, California

FIGURE	A9
DRAWN BY	TJC
CHECKED BY	GJF
PROJECT MGR	SLF
DATE	9/14
WKA NO.	9974.01

RESISTANCE VALUE TEST RESULTS

(California Test 301)

MATERIAL DESCRIPTION: Brown, fine sandy silt

LOCATION: D106 (0'-5')

Specimen No.	Dry Unit Weight (pcf)	Moisture @ Compaction (%)	Exudation Pressure (psi)	Expansion Pressure (dial)	Expansion Pressure (psf)	R Value
1	113	15.9	211	9	39	13
2	116	14.8	292	17	74	25
3	119	13.6	546	82	355	61

R-Value at 300 psi exudation pressure = 26

WallaceKuhl & ASSOCIATES

RESISTANCE VALUE TEST RESULTS

PG&E TRAINING FACILITY

Winters, California

FIGURE	A10
DRAWN BY	TJC
CHECKED BY	GJF
PROJECT MGR	SLF
DATE	9/14
WKA NO.	9974.01

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 01/08/2014
Date Submitted 01/03/2014

To: Joe Follettie
Wallace-Kuhl & Assoc.
3050 Industrial Blvd.
West Sacramento, CA 95691

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

The reported analysis was requested for the following location:
Location : PGETRN.FAC.9974.01 Site ID : D4 0-3FT.
Your purchase order number is 2423.
Thank you for your business.

* For future reference to this analysis please use SUN # 66157-136949.

EVALUATION FOR SOIL CORROSION

Soil pH	7.78	
Minimum Resistivity	1.26 ohm-cm (x1000)	
Chloride	46.8 ppm	00.00468 %
Sulfate	51.0 ppm	00.00510 %

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

WallaceKuhl & ASSOCIATES

CORROSION TEST RESULTS

PG&E TRAINING FACILITY

Winters, California

FIGURE	A11
DRAWN BY	TJC
CHECKED BY	GJF
PROJECT MGR	SLF
DATE	9/14

WKA NO. 9974.01

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 01/08/2014
Date Submitted 01/03/2014

To: Joe Follettie
Wallace-Kuhl & Assoc.
3050 Industrial Blvd.
West Sacramento, CA 95691

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

The reported analysis was requested for the following location:
Location : PGETRN.FAC.9974.01 Site ID : D9 4.5-7FT.
Your purchase order number is 2423.
Thank you for your business.

* For future reference to this analysis please use SUN # 66157-136951.

EVALUATION FOR SOIL CORROSION

Soil pH	7.92	
Minimum Resistivity	1.15 ohm-cm (x1000)	
Chloride	32.8 ppm	00.00328 %
Sulfate	41.2 ppm	00.00412 %

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

WallaceKuhl & ASSOCIATES

CORROSION TEST RESULTS

PG&E TRAINING FACILITY

Winters, California

FIGURE	A12
DRAWN BY	TJC
CHECKED BY	GJF
PROJECT MGR	SLF
DATE	9/14
WKA NO. 9974.01	

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 01/08/2014
Date Submitted 01/03/2014

To: Joe Follettie
Wallace-Kuhl & Assoc.
3050 Industrial Blvd.
West Sacramento, CA 95691

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

The reported analysis was requested for the following location:
Location : PGETRN.FAC.9974.01 Site ID : D15 0-3FT.
Your purchase order number is 2423.
Thank you for your business.

* For future reference to this analysis please use SUN # 66157-136950.

EVALUATION FOR SOIL CORROSION

Soil pH	7.79	
Minimum Resistivity	0.99 ohm-cm (x1000)	
Chloride	59.6 ppm	00.00596 %
Sulfate	69.9 ppm	00.00699 %

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

WallaceKuhl & ASSOCIATES

CORROSION TEST RESULTS

PG&E TRAINING FACILITY

Winters, California

FIGURE	A13
DRAWN BY	TJC
CHECKED BY	GJF
PROJECT MGR	SLF
DATE	9/14
WKA NO. 9974.01	

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 01/08/2014
Date Submitted 01/03/2014

To: Joe Follettie
Wallace-Kuhl & Assoc.
3050 Industrial Blvd.
West Sacramento, CA 95691

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

The reported analysis was requested for the following location:
Location : PGETRN.FAC.9974.01 Site ID : D20 0-3FT.
Your purchase order number is 2423.
Thank you for your business.

* For future reference to this analysis please use SUN # 66157-136952.

EVALUATION FOR SOIL CORROSION

Soil pH	7.53	
Minimum Resistivity	0.80 ohm-cm (x1000)	
Chloride	59.8 ppm	00.00598 %
Sulfate	74.9 ppm	00.00749 %

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

WallaceKuhl & ASSOCIATES

CORROSION TEST RESULTS

PG&E TRAINING FACILITY

Winters, California

FIGURE	A14
DRAWN BY	TJC
CHECKED BY	GJF
PROJECT MGR	SLF
DATE	9/14
WKA NO. 9974.01	

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 01/08/2014
Date Submitted 01/03/2014

To: Joe Follettie
Wallace-Kuhl & Assoc.
3050 Industrial Blvd.
West Sacramento, CA 95691

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

The reported analysis was requested for the following location:
Location : PGETRN.FAC.9974.01 Site ID : D24 0-3FT.
Your purchase order number is 2423.
Thank you for your business.

* For future reference to this analysis please use SUN # 66157-136953.

EVALUATION FOR SOIL CORROSION

Soil pH	7.21		
Minimum Resistivity	1.93 ohm-cm (x1000)		
Chloride	30.3 ppm	00.00303	%
Sulfate	2.9 ppm	00.00029	%

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

WallaceKuhl & ASSOCIATES

CORROSION TEST RESULTS

PG&E TRAINING FACILITY

Winters, California

FIGURE	A15
DRAWN BY	TJC
CHECKED BY	GJF
PROJECT MGR	SLF
DATE	9/14
WKA NO. 9974.01	

Sunland Analytical

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

Date Reported 09/12/2014
Date Submitted 09/09/2014

To: Joe Follettie
Wallace-Kuhl & Assoc.
3050 Industrial Blvd.
West Sacramento, CA 95691

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

The reported analysis was requested for the following location:
Location : 9974.01TPG&E TRAIN. Site ID : D103 0-3 FT.
Your purchase order number is 3599.
Thank you for your business.

* For future reference to this analysis please use SUN # 67916-141049.

EVALUATION FOR SOIL CORROSION

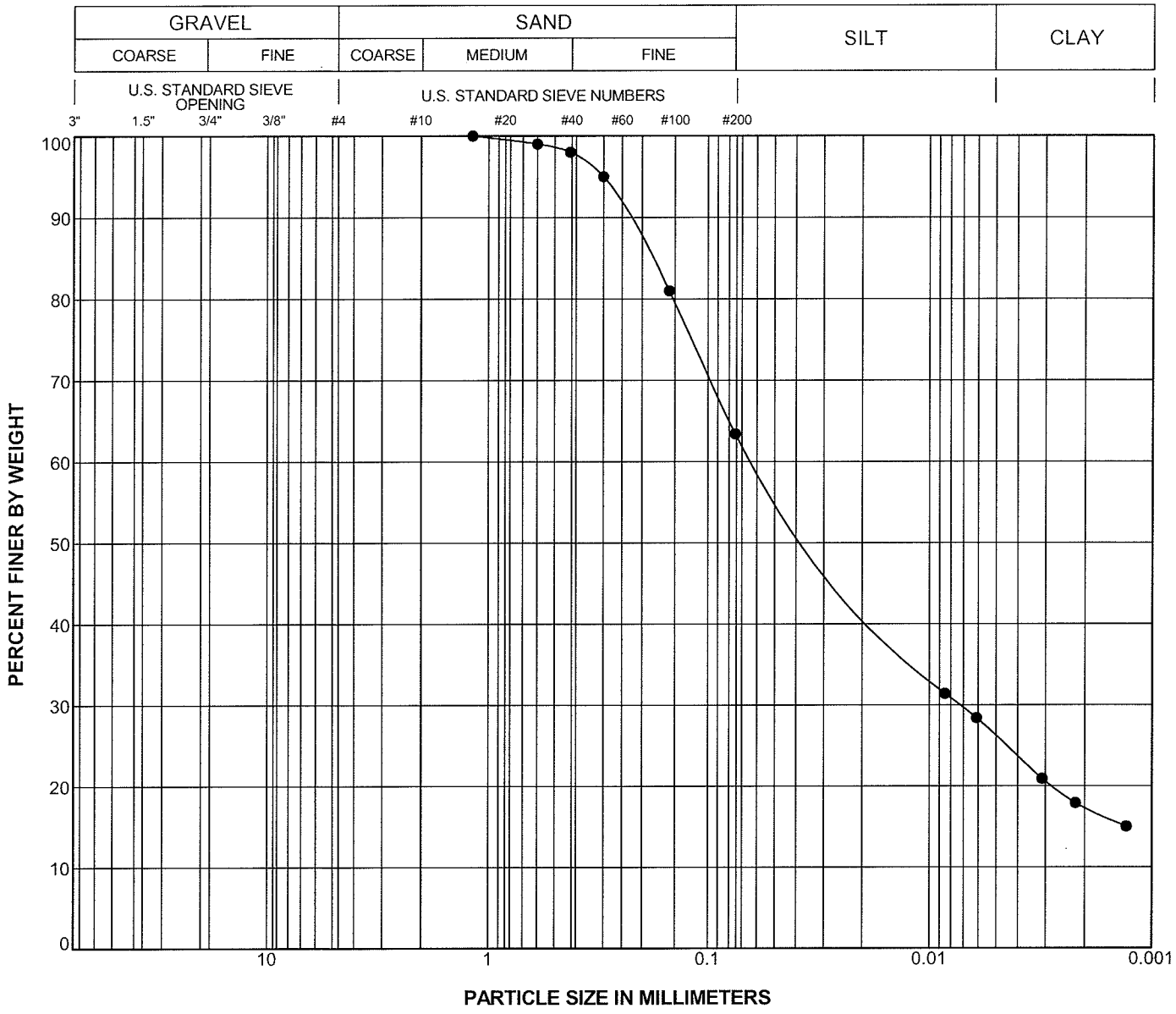
Soil pH	7.18		
Minimum Resistivity	1.13 ohm-cm (x1000)		
Chloride	17.1 ppm	0.00171	%
Sulfate	41.2ppm	0.00412	%

METHODS
pH and Min.Resistivity CA DOT Test #643 Mod.(Sm.Cell)
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

WallaceKuhl & ASSOCIATES

CORROSION TEST RESULTS
PG&E TRAINING FACILITY
Winters, California

FIGURE	A16
DRAWN BY	TJC
CHECKED BY	GJF
PROJECT MGR	SLF
DATE	9/14
WKA NO. 9974.01	



Boring Number	Sample Number	USCS	Depth (feet)	Symbol	LL	PI	Classification
D5	D5	ML	0-3'	●			Brown, fine sandy silt

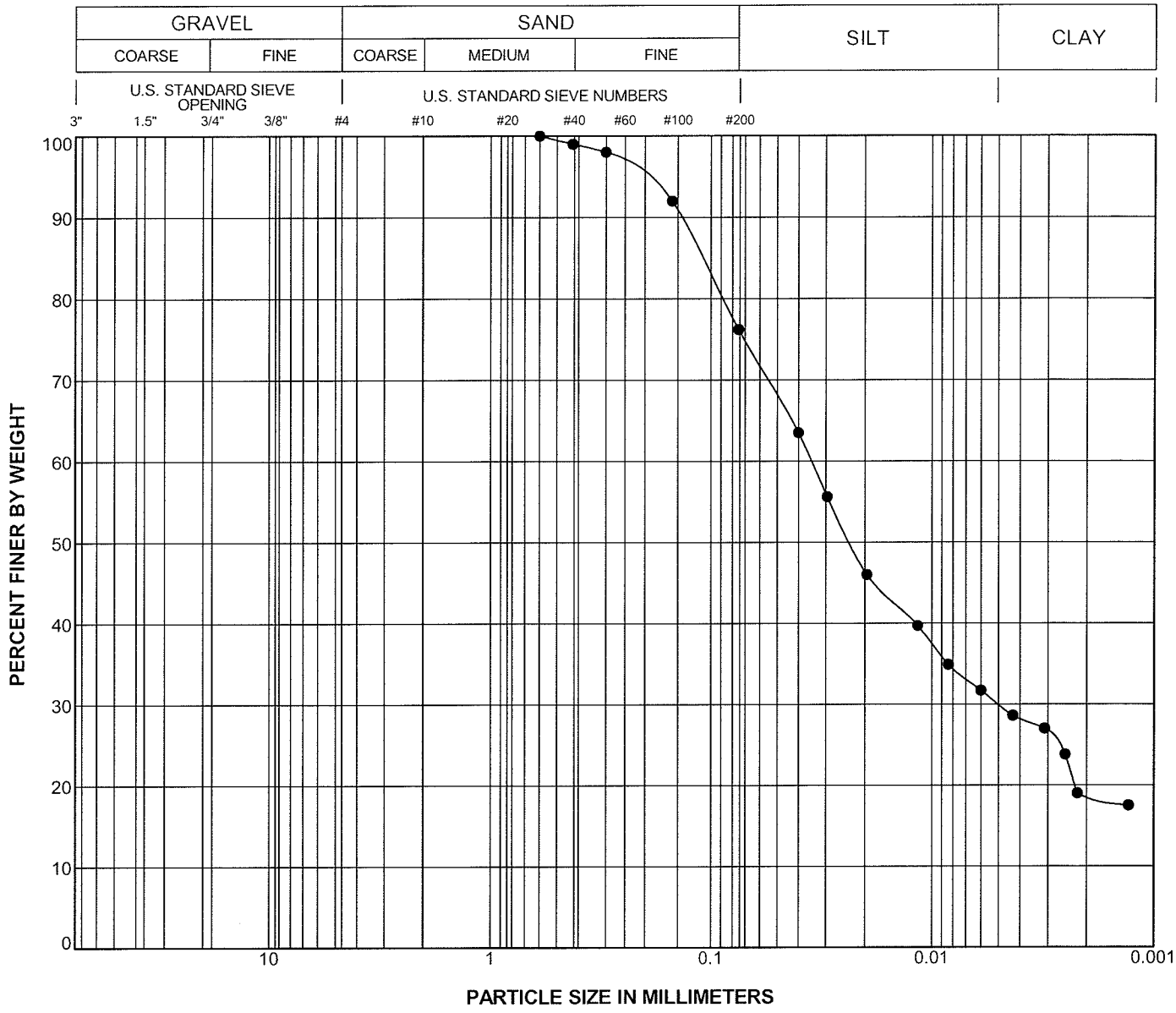
PARTICLE SIZE DISTRIBUTION

Project: PG&E Training Facility
WKA No. 9974.01

FIGURE A17

Wallace Kuhl & ASSOCIATES

GRAIN SIZE 9974.01 - PG&E TRAINING FACILITY.GPJ WKA.GDT 9/18/14 9:41 AM



Boring Number	Sample Number	USCS	Depth (feet)	Symbol	LL	PI	Classification
D19	D19	ML	0-3'	●			Brown, fine sandy silt

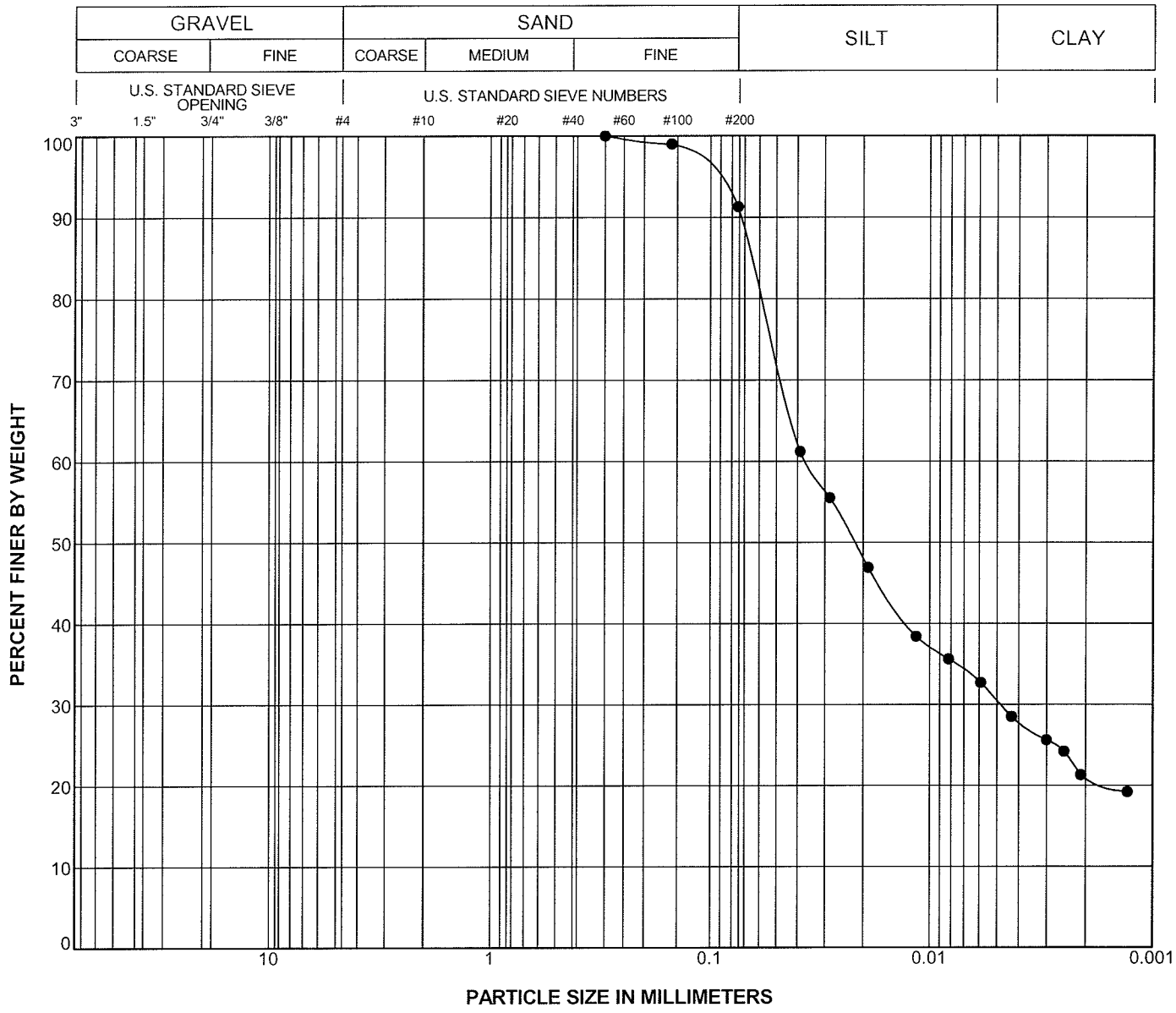
PARTICLE SIZE DISTRIBUTION

Project: PG&E Training Facility
WKA No. 9974.01

FIGURE A18

Wallace Kuhl & ASSOCIATES

GRAIN SIZE 9974.01 - PG&E TRAINING FACILITY.GPJ WKA.GDT 9/18/14 9:41 AM



Boring Number	Sample Number	USCS	Depth (feet)	Symbol	LL	PI	Classification
D26	D26-I	CL	10'	●			Brown, silty clay

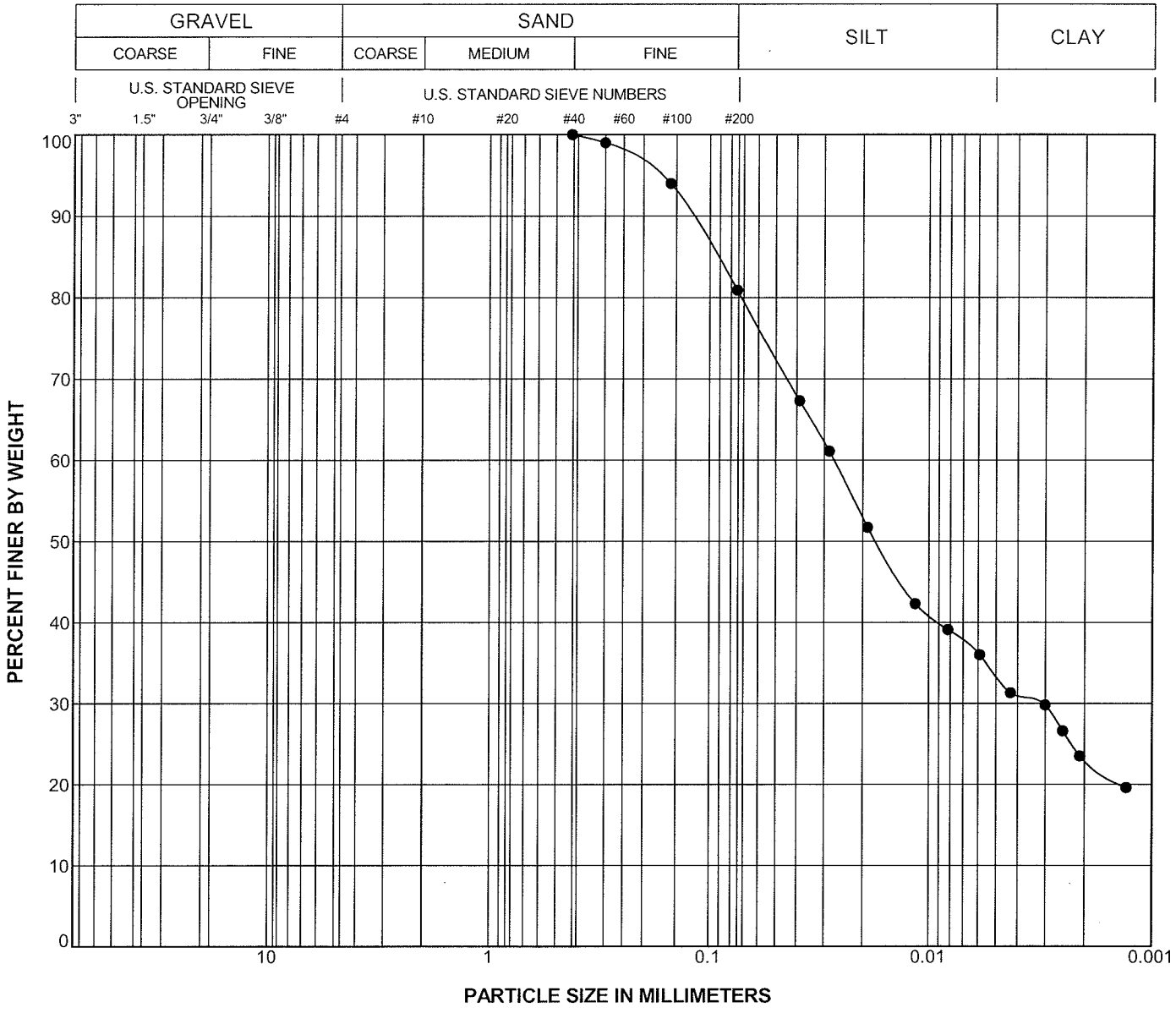
PARTICLE SIZE DISTRIBUTION

Project: PG&E Training Facility
WKA No. 9974.01

FIGURE A19

Wallace Kuhl & ASSOCIATES

GRAIN SIZE 9974.01 - PG&E TRAINING FACILITY.GPJ WKA.GDT 9/18/14 9:42 AM



Boring Number	Sample Number	USCS	Depth (feet)	Symbol	LL	PI	Classification
D27	D27	ML	0-5'	●			Brown, fine sandy silt

PARTICLE SIZE DISTRIBUTION

Project: PG&E Training Facility
WKA No. 9974.01

FIGURE A20

Wallace Kuhl & ASSOCIATES

GRAIN SIZE 9974.01 - PG&E TRAINING FACILITY.GPJ WKA.GDT 9/18/14 9:42 AM

PERCOLATION TEST LOCATION P1			
Time Interval (minutes)	Water Drop (inches)	Incremental Percolation Rate (inches/minute)	Percolation Rate (inches/minute)
0	--	--	--
5	5	1.0	1.0
15	1	0.10	0.43
25	3	0.30	0.38
35	1	0.10	0.30
45	1.5	0.15	0.26
55	1	0.10	0.23
65	1.5	0.15	0.22
75	1	0.10	0.20
85	2	0.20	0.20
95	0	--	0.18
105	0.5	0.05	0.17
115	1.5	0.15	0.17
125	0.5	0.05	0.16
135	1	0.10	0.15
145	0.5	0.05	0.14
155	1	0.10	0.14
165	0.5	0.05	0.14
175	1	0.10	0.14
185	0.25	0.025	0.13
195	0.25	0.025	0.13
205	0.25	0.025	0.12
215	0.25	0.025	0.12
225	0.25	0.025	0.11
235	0.25	0.025	0.11

PERCOLATION TEST LOCATION P2			
Time Interval (minutes)	Water Drop (inches)	Incremental Percolation Rate (inches/minute)	Percolation Rate (inches/minute)
0	--	--	--
5	7	1.4	1.4
15	6.5	0.65	0.9
25	5.5	0.55	0.76
35	3	0.30	0.62
45	3	0.30	0.55
55	2	0.20	0.49
65	1.5	0.15	0.43
75	1	0.10	0.39
85	2	0.20	0.37
95	0	--	0.33
105	1	0.10	0.31
115	1	0.10	0.29
125	0.75	0.075	0.27
135	0.25	0.025	0.25
145	1	0.10	0.24
155	1	0.10	0.23
165	0.5	0.05	0.18
175	0.5	0.05	0.17
185	0	--	0.16
195	0.5	0.05	0.16
205	0.5	0.05	0.15
215	0.5	0.05	0.15
225	0.5	0.05	0.13
235	0.5	0.05	0.13

WallaceKuhl & ASSOCIATES

PERCOLATION TEST RESULTS

PG&E TRAINING FACILITY

Winters, California

FIGURE	A22
DRAWN BY	TJC
CHECKED BY	GJF
PROJECT MGR	SLF
DATE	9/14

WKA NO. 9974.01

PERCOLATION TEST LOCATION P3			
Time Interval (minutes)	Water Drop (inches)	Incremental Percolation Rate (inches/minute)	Percolation Rate (inches/minute)
0	--	--	--
5	13	2.6	2.6
15	8.5	0.85	1.43
25	4	0.40	1.02
35	2.5	0.25	0.80
45	1.5	0.15	0.65
55	1.5	0.15	0.56
65	1	0.10	0.49
75	2	0.20	0.45
85	2	0.20	0.42
95	0.25	0.025	0.38
105	0.75	0.075	0.35
115	1	0.10	0.33
125	0	--	0.30
135	0.25	0.025	0.28
145	0.25	0.025	0.26
155	0.75	0.075	0.25
165	0.5	0.05	0.19
175	0.5	0.05	0.18
185	0.5	0.05	0.18
195	0	--	0.17
205	0.25	0.025	0.16
215	0.25	0.025	0.16
225	0.50	0.05	0.13
235	0.25	0.025	0.13

APPENDIX B
Guide Earthwork Specifications

APPENDIX B
GUIDE EARTHWORK SPECIFICATIONS
PG&E TRAINING FACILITY
East Grant Avenue, West of I-505
Winters, California
WKA No. 9974.01

PART 1: GENERAL

1.1 SCOPE

A. General Description

This item shall include clearing of all surface and subsurface structures associated with current development on site, remnants of former structures, including all foundations, surface debris, trees, vineyards and associated items; below grade irrigation systems; preparation of surfaces to be filled, filling, spreading, compaction, observation and testing of the fill; and all subsidiary work necessary to complete the grading to conform with the lines, grades and slopes as shown on the accepted Drawings.

B. Related Work Specified Elsewhere

1. Trenching and backfilling for sanitary sewer system: Section _____.
2. Trenching and backfilling for storm drain system: Section _____.
3. Trenching and backfilling for underground water, natural gas, and electric supplies: Section _____.

C. Geotechnical Engineer

Where specific reference is made to "Geotechnical Engineer" this designation shall be understood to include either him or his representative.

1.2 PROTECTION

A. Adequate protection measures shall be provided to protect workers and passers-by at the site. Streets and adjacent property shall be fully protected throughout the operations.

B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.

C. Any construction review of the Contractor's performance conducted by the Geotechnical Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on or near the construction site.

D. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.

E. Surface drainage provisions shall be made during the period of construction in a manner to avoid creating a nuisance to adjacent areas.

F. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance.

1.3 GEOTECHNICAL REPORT

A. A Geotechnical Engineering Report (WKA No. 9974.01; dated September 22, 2014) has been prepared for this site by Wallace - Kuhl & Associates, Geotechnical Engineers of West Sacramento, California. A copy is available for review at the office of Wallace - Kuhl & Associates.

B. The information contained in this report was obtained for design purposes only. The Contractor is responsible for any conclusions they may draw from this report. Should the Contractor prefer not to assume such risk, they should employ their own experts to analyze available information and/or to make additional borings upon which to base their conclusions, all at no cost to the Owner.

1.4 EXISTING SITE CONDITIONS

The Contractor shall be acquainted with all site conditions. If unshown active utilities are encountered during the work, the Architect shall be promptly notified for instructions. Failure to notify will make the Contractor liable for damage to these utilities arising from Contractor's operations subsequent to the discovery of such unshown utilities.

1.5 SEASONAL LIMITS

Fill material shall not be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until field tests indicate that the moisture contents of the subgrade and fill materials are satisfactory.

PART 2: PRODUCTS

2.1 MATERIALS

A. All fill shall be of approved local materials from required excavations, supplemented by imported fill, if necessary. Approved local materials are defined as local granular soils, which are free from significant quantities of rubble, rubbish and vegetation, and having been tested and approved by the Geotechnical Engineer prior to use. Clods, rocks or hard lumps exceeding six inches (6") in final size shall not be allowed in the upper two feet (2') of any fill supporting pavements and the buildings.

B. Imported fill materials shall be approved by the Geotechnical Engineer; they shall meet the above requirements; shall have a maximum expansion index not exceeding twenty (20) when tested in accordance with ASTM D4829; and, shall be of three-inch (3") maximum particle size. Imported fill materials used within pavement limits shall possess a minimum Resistance value of twenty (20) when tested in accordance with California Test 301.

C. Capillary barrier material under floor slabs shall be provided to the thickness shown on the Drawings. This material shall be clean gravel or crushed rock of one-inch (1") maximum size, with no material passing a Number four (#4) sieve.

D. Asphalt concrete, aggregate base, aggregate subbase, and other paving products shall comply with the appropriate provisions of the *State of California (Caltrans) Standard Specifications* and *Yolo County Improvement Standards*, latest editions.

PART 3: EXECUTION

3.1 LAYOUT AND PREPARATION

Lay out all work, establish grades, locate existing underground utilities, set markers and stakes, set up and maintain barricades and protection of utilities--all prior to beginning actual earthwork operations.

3.2 CLEARING, GRUBBING AND PREPARING BUILDING PADS AND PAVEMENT AREAS

A. The site shall be cleared of all surface rubble and debris, existing and remnants of former structures designated for removal including, but not limited to, foundations, slabs, irrigation systems, concrete rubble, and debris. Existing utilities designated to be removed or abandoned shall include all trench backfill. The ends of abandoned pipes shall be plugged. Trees and shrubs shall include the entire rootball and all roots larger than one-half inch (½") in diameter. On-site wells, septic tanks, and leach fields shall be properly abandoned in accordance with Yolo County Environmental Health Department requirements.

B. Remaining surface organics shall be removed by stripping. For bid purposes the stripping shall be three inches (3”). Strippings shall be removed from the site or reused in landscape areas. If reused on-site the strippings shall not extend within five feet (5’) of any building or pavement areas. Strippings shall be moisture conditioned and receive compactive effort.

C. The upper twenty-four (24") of soil within building areas shall be sub-excavated. The sub-excavations shall extend at least five feet (5’) beyond the proposed footprint of the buildings, including adjacent flatwork. The exposed soils shall be scarified to a depth of twelve inches (12”). After scarification the soils shall be uniformly moisture conditioned to at least the optimum moisture and compacted

to at least ninety percent (90%) of the ASTM D1557 Compaction Test. Compaction shall be accomplished with a Caterpillar 825 or equivalent sized compactor.

D. Horizontal and vertical control of the limits of over-excavation, scarification and compaction shall be responsibility of the Contractor and/or Project Civil Engineer.

E. After rough subgrade elevation has been achieved in pavement areas an other non-building areas, the exposed soils shall be scarified to a depth of at least eighteen inches (18”) and all exposed unsuitable materials removed and hauled off site. The scarified soils shall then be moisture conditioned to at least the optimum moisture content and be compacted to at least ninety percent (90%) of the ASTM D1557 Compaction Test.

F. The Contractors bid shall include a cost per cubic yard for removal of unsuitable materials from building or pavement areas, and replacement with engineered fill as required.

3.3 PLACING, SPREADING AND COMPACTING FILL MATERIAL

A. The selected soil fill material shall be placed in layers which when compacted shall not exceed six inches (6") in thickness. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to promote uniformity of material in each layer.

B. When the moisture content of the fill material is below the optimum moisture content, water shall be added until the proper moisture content is achieved. Soils shall be thoroughly moisture conditioned to at least the optimum moisture content.

C. When the moisture content of the fill material is too high to permit the specified degree of compaction to be achieved, the fill material shall be aerated by blading or other methods until the moisture content is satisfactory.

D. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to at least ninety percent (90%) as determined by the ASTM D1557 Test Method. Compaction shall be undertaken with a self-propelled sheepsfoot compactor capable of achieving the specified density (Caterpillar 825 or equivalent compactor). Compaction shall be accomplished while the fill material is at the required moisture content, and the moisture content shall be uniform throughout each layer. Each layer shall be compacted over its entire area until the desired density has been obtained.

E. The filling operations shall be continued until the fills have been brought to the finished slopes and grades as shown on the accepted Drawings.

3.4 FINAL SUBGRADE PREPARATION

The upper twelve inches (12") of all final building pad subgrades and the upper six inches (6") of all pavement subgrades and subgrades supporting flatwork shall be properly scarified, brought to a uniform moisture content, and shall be uniformly compacted to not less than:

building pad	90%
flatwork	90%
pavement	95%

as determined by the ASTM D1557 Test Method, regardless of whether final subgrade elevations are attained by filling, excavation or are left at existing grades. The moisture content of the subgrade soils shall be maintained until covered by slabs or pavements.

3.5 TESTING AND OBSERVATION

A. Grading operations shall be observed by the Geotechnical Engineer, serving as the representative of the Owner.

B. Field density tests shall be made by the Geotechnical Engineer after compaction of each layer of fill. Additional layers of fill shall not be spread until the field density tests indicate that the minimum specified density has been obtained.

C. Earthwork shall not be performed without the notification or approval of the Geotechnical Engineer. The Contractor shall notify the Geotechnical Engineer at least two (2) working days prior to commencement of any aspect of the site earthwork.

D. If the Contractor should fail to meet the technical or design requirements embodied in this document and on the applicable plans, the Contractor shall make the necessary readjustments until all work is deemed satisfactory, as determined by the Geotechnical Engineer and the Architect/Engineer. No deviation from the specifications shall be made except upon written approval of the Geotechnical Engineer or Architect/Engineer.

APPENDIX C
Guide Drilled Pier Specifications

APPENDIX C
GUIDE DRILLED PIER SPECIFICATIONS
PG&E TRAINING FACILITY
Winters, California
WKA No. 9974.01

PART I: GENERAL

1.1 SCOPE

Furnish all labor, equipment, tools and materials, and perform all operations in connection with the installation of cast-in-place piers in accordance with these specifications and the applicable Drawings, and subject to the terms and conditions of the contract.

1.2 QUALIFICATIONS

All piers shall be installed by a Foundation Contractor qualified to install the type of pier to be constructed in accordance with the Drawings and Specifications, and under conditions existing at the site. The minimum requirements for qualification shall be five (5) years experience and evidence of satisfactory completion of pier installations comparable in scope to the work specified hereunder and under the subsurface conditions anticipated at this site.

1.3 PROTECTION

a. Adequate protection measures shall be provided to protect workmen and passers-by the site. Streets and adjacent property shall be fully protected throughout the operations.
b. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.
c. Any construction review of the Contractor's performance conducted by the Architect, Structural Engineer or Geotechnical Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.
d. Adjacent streets and sidewalks shall be kept free of mud, dirt, or similar nuisances resulting from pier drilling operations.
e. Provide for surface drainage during the period of construction in a manner to avoid creating a nuisance to adjacent areas. Keep all surface excavations free of water during the entire progress of the work, regardless of the cause, source or nature of the water.
f. Stored materials and construction equipment shall be kept at least ten feet (10') away from the vertical axes of all open drilled pier shafts, at all times.
g. Water as required to suppress dust nuisance.

h. Work shall comply with all Municipal, State, and Federal regulations regarding safety, including the requirements of the Williams-Steiger Occupational Safety and Health Act of 1970.

1.4 GEOTECHNICAL REPORT

a. A Geotechnical Engineering Report (WKA No. 9974.01; dated September 22, 2014) has been prepared for this site by Wallace - Kuhl & Associates, Geotechnical Engineers of West Sacramento, California [(916) 372-1434]. A copy is available for review at the office of Wallace - Kuhl & Associates.
b. The information contained in this report was obtained for design purposes only. The Contractor is responsible for any conclusions he may draw from this report; should he prefer not to assume such risk, he may employ his own experts to analyze available information and/or to make additional borings upon which to base his conclusions, all at no cost to the Owner.

1.5 EXISTING SITE CONDITIONS

The Contractor shall acquaint himself with all site conditions. If unshown active utilities are encountered during the work, the Architect shall be promptly notified for instructions. Failure to notify will make the Contractor liable for damage to these utilities arising from Contractor's operations subsequent to his discovery of such unshown utilities.

PART II: PRODUCTS

2.1 MATERIALS

a. Reinforcing steel shall be as specified in Section ___. The reinforcing steel cage shall be assembled, including centering guides, as shown on the Drawings and approved by the Engineer or his representative in sufficient time prior to completion of drilling operations to permit the assembled cage to be inserted in the completed drill hole without delay.
b. Concrete shall be as specified in Section ___. The Contractor shall make provisions for a supply of concrete that is adequate to complete placement of any given pier in one continuous, uninterrupted operation, so as to form a monolithic concrete structural element.

2.2 EQUIPMENT, TOOLS AND LABOR

a. The Foundation Contractor shall provide a combination of power-driven rotary type rig, and bits and/or augers of the proper size to drill pier excavations to the dimensions shown on the plans; and, shall provide temporary casing as necessary.
b. All other materials, labor, tools and equipment necessary for the construction of any given pier in one continuous operation, shall be furnished by the Contractor.

PART III: EXECUTION

3.1 LAYOUT AND PREPARATION

Lay out all work, establish grades, locate existing underground utilities, set markers and stakes, set up and maintain barricades and protection of utilities; all prior to beginning actual drilling operations.

3.2 TOLERANCES

Pier drilling equipment shall be positioned so that the center of any pier as drilled shall be not more than three inches (3") from the required location, and no pier shall be out of plumb more than two percent (2%) as measured over the total length of the shaft. The drilled shaft diameter of each pier shall be no smaller than shown on the Drawings. The bottom elevation of the pier excavation shall not be less than the elevation shown on the Drawings.

3.3 PIER DRILLING

a. Helical or bucket auger drilling shall be used to excavate each pier.
b. Each pier shall be extended to the depths shown on the approved drawings.
c. Temporary casing may be installed to facilitate drilling, subject to the approval of the Geotechnical Engineer.
d. Every pier excavation shall be inspected for cleanliness and acceptability by the Geotechnical Engineer or his representative. Reinforcing steel and concrete shall not be placed in any pier excavation until the Geotechnical Engineer or his representative has given express approval of its suitability.
e. No pier excavations shall be permitted to stand open for more than two (2) hours after completion.

3.4 REINFORCING STEEL PLACEMENT

Upon completion of drilling, the reinforcing steel cage shall be positioned in the pier shaft as shown on the Drawings and shall be suspended above the bottom of excavation before any concrete is placed in the shaft. In the event that difficulties are encountered in positioning the reinforcing steel cage, or if it cannot be freely rotated (after suspension) indicating caving of the excavation sides, the cage shall be removed and the hole shall be reamed sufficiently to permit the final positioning of the cage without difficulty. The top of the cage shall be braced or supported to assure that it remains concentrically aligned in the shaft excavation during placement of concrete.

3.5 GROUNDWATER PUMPING

a. Pumping of groundwater immediately prior to concrete placement will be acceptable only if a coordinated procedure of drilling, steel placement, pumping and concrete placement can be achieved whereby appreciable caving of the lower soils does not

occur. Determination of an acceptable procedure will be solely the responsibility of the Geotechnical Engineer.

b. If pumping cannot be used to remove the groundwater, as determined by the Geotechnical Engineer, then tremie concrete placement methods shall be used.

3.6 CONCRETE PLACEMENT

Concrete shall be deposited by the use of an elephant trunk or other approved device when the free fall is in excess of six feet (6') and only if there is less than six inches (6") of water in the excavation. If more than six inches (6") of water exists in the pier excavation immediately prior to concrete placement, either (1) dewatering shall be accomplished subject to the limitations of Section 3.5 above, or (2) concrete shall be placed by means of tremie concrete placement methods, using a tremie pipe and associated equipment and materials approved by the Geotechnical Engineer and the Structural Engineer. Additional costs for materials, equipment and labor to use tremie concrete placement methods shall be borne by the Contractor. Concrete shall be vibrated during placement operations so as to provide a dense, monolithic concrete section throughout the full length and diameter of the pier. During and after the vibrating operation, the top of the freshly placed concrete shall be observed to see that it remains constant and that there is no appreciable drop in elevation that would signify loss of concrete through hidden voids.

3.7 TESTING

If the Geotechnical Engineer has reason to suspect that any pier may contain extraneous material or otherwise fail to meet specifications, he may order testing of the pier by coring or other methods. The Contractor shall bear the expense of the investigation and/or testing and shall also, at no cost to the Owner, install proper additional construction as required by the Engineer.

3.8 CLEANUP

The Contractor at all times shall keep the area adjacent to pier drilling operations free of accumulations of excavated material and/or rubbish and trash caused by his employees or work. At the completion of work, he shall remove all excavated materials, trash, and rubbish from and about the area of the premises and all his tools, scaffolding, and surplus materials, and shall leave the site with a clean finished appearance.

3.9 CHANGE OR SUBSTITUTIONS

No changes in any material, equipment or method of installation, or deviation from Drawings or Specifications, will be permitted without written approval of the Engineer or his representative.