Appendix E

Technical Reports for the Geology and Soils Chapter

Geotechnical Engineering Report

ROCKLIN COLLEGE SQUARE

WKA No. 10958.02

June 23, 2016

Prepared For:

Evergreen Sierra East, LLC
2295 Gateway Oaks Drive, Suite 135
Sacramento, California 95833

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Wallace Kuhl & Associates

Corporate Office
3050 Industrial Boulevard
West Sacramento, CA 95691
916.372.1434 phone
916.372.2565 fax

Stockton Office
3422 West Hammer Lane, Suite D
Stockton, CA 95219
209.234.7722 phone
209.234.7727 fax

Geotechnical Engineering Report
ROCKLIN COLLEGE SQUARE
Sierra College Boulevard & Rocklin Road
Rocklin, California
WKA No. 10958.02
June 23, 2016

INTRODUCTION

We have completed a geotechnical engineering report for the planned Rocklin College Square multi-use development to be constructed near the intersection of Sierra College Boulevard and Rocklin Road in Rocklin, California (See Figure 1). The purposes of our study has been to explore the existing soil, rock and groundwater conditions at the site, and to provide geotechnical engineering conclusions and recommendations regarding design and construction of the proposed commercial, residential and medical structures, and associated improvements. This report presents the results of our study.

Wallace-Kuhl & Associated has completed a *Phase I Environmental Site Assessment* (WKA No. 10958.01) and may be referenced for additional information regarding the historical use of the site.

Scope of Services

Our scope of services for this project has included the following tasks:

1. a site reconnaissance;
2. review of previous geotechnical reports and earthwork observation and testing files performed in the general vicinity;
3. review of historic United States Geological Survey (USGS) topographic maps, historical aerial photographs, and available groundwater data in the vicinity of the property;
4. subsurface exploration, including the advancement of 11 borings to depths of approximately 3½ to 15 feet below existing site grades, and 11 test pits to depths of approximately two to 10 feet below existing site grades;
5. bulk sampling of the anticipated pavement subgrade soils;
6. laboratory testing of selected soil samples;
7. engineering analyses; and,
8. preparation of this report.

Related Experience

Supplemental information reviewed during the preparation of this report included the following nearby reports:

- *Geotechnical Engineering Report* (Wallace-Kuhl & Associates, Inc. (WKA, Inc.) No. 5616.07, dated May 25, 2005) prepared for the Rocklin Crossing Retail Center, which is north of the project site near the intersection of Sierra College Boulevard and Interstate 80; and,
- *Geotechnical Engineering Report* (WKA No. 6728.08, dated May 31, 2012) prepared for the Rocklin Commons Retail Center which is also north of the project site near the intersection of Granite Drive and Sierra College Boulevard.

The earthwork files for various phases of construction for Rocklin Crossings and Rocklin Commons also were reviewed to obtain information regarding excavation conditions and other problems encountered during development of these retail centers.

Figures and Attachments

This report contains a Vicinity Map as Figure 1 and Site Plans as Figures 2A and 2B. The Logs of Soil Borings are presented as Figures 3 through 13. Logs of Test Pits are presented as Figures 14 through 16. An explanation of the Unified Soil Classification System symbols used in the soil descriptions is included as Figure 17. Appendix A contains general information regarding this report, a description of the field exploration and laboratory testing accomplished, and the results of laboratory tests. Appendix B contains *Guide Earthwork Specifications* for use in preparing contract documents.

Proposed Development

Review of the *Overall Illustrative Site Plan* (undated) for Rocklin College Square indicates that the project is split into two areas. Site A is located northeast of the intersection of Sierra College Boulevard and Rocklin Road. Site B is located southeast of the intersection of Rocklin Road and El Don Drive.

Site A is indicated to consist of medical office and retail commercial buildings in the southwest portion of the site. Senior housing is proposed in the southeastern portion of the site. The remainder of the property will consist of residential housing. Site B is shown to consist of student housing dormitories, veteran housing, and a cafeteria on the northern portion of the site. Residential development is expected on the southern portion of the property, south of the creek.

The existing park and creek areas within Site B are expected to remain as-is and are not expected to be further developed. Pedestrian bridges are indicated on the overall site plan but those structures are beyond the scope of this report.

We anticipate the residential structures will be one- to three-story, wood-framed structures with interior concrete slab-on-grade lower floors. Structural loads are anticipated to be relatively light to moderate and consistent with these types of construction. Medical and retail buildings are anticipated to consist of wood-frame, masonry or concrete tilt-up construction with slab-on-grade lower floors. Structural loads for these types of construction are anticipated to be moderate. Associated development will include underground utilities, exterior flatwork, new street and parking lot pavements, possible retaining walls, and typical landscaping.

Grading plans for the proposed project were not available at the time of this report; however based on the rolling site topography, we anticipate excavations and fills on the order of two to five feet will be required to develop the property. This does not include excavation depths for underground utility improvements

FINDINGS

Site Description

The two subject sites are located near the intersection of Sierra College Boulevard and Rocklin Road (see Figure 1) in Rocklin, California. Site A is somewhat rectangular in shape and encompasses a total area of approximately 72 acres, identified by Placer County APN's 045-150-011-000, 045-150-052-000, 045-150-023-000, and 045-150-048-000. Site A is bounded to the north by open land with mature trees; to the east by rural homes; to the south by Rocklin Road; and to the west by Sierra College Boulevard, beyond which is the Sierra College campus.

Site B is also somewhat rectangular in shape and is split by a creek and encompasses a total area of approximately 36 acres, identified by Placer County APN's 045-130-063-000, 045-130-062-000, and 045-130-061-000. Site B is bounded to the north by Rocklin Road, beyond which is the Sierra College campus; the east and south by residential homes; and, to the west by the Rocklin Sierra Plaza retail center and residential homes.

At the time of our site reconnaissance performed on May 11 and May 13, 2016, both sites were observed to be generally vacant and covered with light to moderate growth of volunteer weeds and grass. Site A contains a single family residence in the southwestern portion of the property. It is unknown if there is a well and/or septic system associated with the home. Site B contains a creek extending east-west through the site. A drainage swale was observed to feed into the creek, entering the site at Rockling Road and running in a north-south direction. We anticipate water entering this swale will be collected and diverted through a closed pipe system. Site B was also observed to have a recreation park, a gravel parking lot, and a structure for the Rocklin LDS Institute. Granitic rock outcroppings were observed at both sites. Gravel and rock fragments were also observed at both sites in varying quantities.

Site A was noted to have seeps based on review of the *Wetland Delineation Sierra College 72* plan, dated June 7, 2016 and prepared by Madrone Ecological Consulting. At the time of our reconnaissance, only one seep (Seep 4) was observed to have standing water. Dense vegetation was observed at all indicated seep locations.

Topography across the sites is described as gently rolling terrain. Surface elevations across Sites A and B range from about +380 and +300 feet relative to mean sea level (respectively), based on review of the USGS *7.5 Minute Topographic Map of the Rocklin, California Quadrangle* (2012).

Site History

We reviewed historical aerial photographs of the site available from the Google Earth website. Available photographs were from the years 1993, 1999, and 2002 through 2015. Review of the Phase I Environmental Report by WKA indicates that Area A was developed with nine structures from 1938 to at least 1972. Review of the photograph taken in 1993 shows the sites as generally vacant fallow land covered by sparse volunteer vegetation. Site A is shown to support a single-family residence in the southwestern portion of the property, and at one time included a construction staging area north of the residence. Site B has historically been undeveloped land surrounding an office building and residential development visible in the 1993 photograph. A parking lot on the northwest corner and a park on the southwest corner of Site B were constructed between the 1993 and 1999 photographs. Sometime between 2006 and 2007, the office buildings beyond the extent of the northeast portion of Site B were constructed.

Since 2007, the sites have remained relatively unchanged. The parking lot, park, residential home, and office structures were present at the time of our recent site reconnaissance.

General Site Geology

The *Geologic Map of the Sacramento Quadrangle*, dated 1981, prepared by the California Division of Mines and Geology, reveals the project site to be underlain by Mesozoic granodiorite rocks, commonly referred to as the Rocklin and Penryn Plutons. These granitic rock units are a large-scale intrusive body that is part of a series of magmatic intrusions that helped to form portions of the Sierra Nevada Mountains. The rock is typified as a light gray, coarse-grained igneous rock composed of minerals such as quartz, feldspar, hornblende, biotite and may contain occasional xenoliths (an inclusion of a pre-existing rock fragment within the magma) of various sizes and shapes, as well as quartz veins. The Rocklin and Penryn Plutons cover an area of approximately 150 square miles, extending from Folsom north to near the Auburn area. This massive bedrock unit likely extends to depths of thousands of feet beneath the surface.

Alluvial soils exist within Site B which represents depositional processes that have taken place along the creek and drainage swale. The soils are typically thin and consist of a mixture of sand, silt, gravel and cobbles. The mapped geologic conditions are consistent with the lithologic data obtained from the current subsurface investigations performed at the site.

Subsurface Soil Conditions

The subject sites were observed to have granitic outcroppings and larger sized boulders greater than 12 inches in diameter, located above grade. The upper six to eight inches of surface soil across the properties was generally in a relatively loose and disturbed condition. The surface and near-surface soils encountered at the test pit and boring locations generally consist of brown, silty sands and weathered granodioritic rock. The weathered rock is similar to a strong sandy soil and is commonly referred to as “decomposed granite”. Upon excavation, these materials break down primarily into silty fine to coarse sand. The weathered rock becomes less weathered and harder to excavate with increasing depth. Practical refusal to drilling was encountered in 10 of the 11 borings at depths of approximately 3½ to 12 feet below existing site grades. Practical refusal within test pit excavations was encountered in nine of the 11 test pits at depths of approximately two to nine feet below existing site grades. The sidewalls of all test pits were observed to be in a stable condition; caving or sloughing of the excavation sidewalls was not observed.

At the completion of exploration activities, the borings were backfilled with soil cuttings. The test pits were backfilled with excavated material and compacted by using a sheepsfoot compaction wheel.

The approximate locations of the borings and test pits are shown on the Site Plan, Figures 2A and 2B. For specific information regarding the subsurface conditions at a specific location, please refer to the Logs of Soil Borings (Figures 3 through 13) and the Logs of Test Pits (Figures 14 through 16).

Groundwater

Permanent groundwater was not encountered at the boring and test pit locations performed on May 11 and May 13, 2016. Perched groundwater was encountered in Boring D8 at a depth of approximately 11½ feet below existing grade. The perched water was located directly above unweathered granitic rock, which was encountered at approximately 12 feet below grade at the location of Boring D8. It is relatively common to encounter perched water (and seeps) above the impervious granitic rock, especially during winter and spring months.

There are no known Department of Water Resources (DWR) monitoring wells within one mile of the project site. Due to the presence of relatively shallow hard granitic rock, true groundwater levels are difficult to obtain. According to the map *Sacramento Valley Groundwater Elevations, Spring 2003*, prepared by the County of Sacramento, Public Works Agency, Department of Water Resources, regional groundwater within the vicinity of the site is shown at an approximate elevation +100 feet msl, or over 200 feet below existing site grades.

On-site seeps were brought to our attention after our field investigation. On June 22, 2016, an additional site visit was performed to view the seeps identified by the project wetlands expert. The seeps appear to be located within localized 'saddles' where these areas were observed to have localized low spots with isolated vegetative growth. Seep 4, as labeled on the Wetland Delineation Map, was the only seep where standing water was observed, as discussed in the Site Description section of this report. Water was not observed at the other seep locations indicated on the map during our field exploration in May 2016 or the recent site visit in June 2016.

We anticipate the identified seeps relate to perched groundwater conditions, although the potential source of the water is unknown. If additional information about the seeps is needed, an additional investigation will be required, as this study was beyond the scope of services proposed for this report.

CONCLUSIONS

2013 California Building Code/ASCE 7-10 Seismic Design Criteria

Section 1613 of the 2013 edition of the California Building Code (CBC) references the American Society of Civil Engineers (ASCE) Standard 7-10 for seismic design. The following seismic parameters provided in Table 3 were determined based on the site latitude and longitude using the public domain computer program developed by the USGS. The seismic design parameters summarized in Table 1 may be used for seismic design of the proposed subdivision.

TABLE 1 2013 CBC/ASCE 7-10 SEISMIC DESIGN PARAMETERS				
Latitude: 38.7910° N Longitude: 121.2035° W	ASCE 7-10 Table/Figure	2013 CBC Table/Figure	Factor/ Coefficient	Value
0.2-second Period MCE	Figure 22-1	Figure 1613.3.1(1)	S_S	0.477 g
1.0-second Period MCE	Figure 22-2	Figure 1613.3.1(2)	S_1	0.243 g
Soil Class	Table 20.3-1	Section 1613.3.2	Site Class	C
Site Coefficient	Table 11.4-1	Table 1613.3.3(1)	F_a	1.200
Site Coefficient	Table 11.4-2	Table 1613.3.3(2)	F_v	1.557
Adjusted MCE Spectral Response Parameters	Equation 11.4-1	Equation 16-37	S_{MS}	0.573 g
	Equation 11.4-2	Equation 16-38	S_{M1}	0.378 g
Design Spectral Acceleration Parameters	Equation 11.4-3	Equation 16-39	S_{DS}	0.382 g
	Equation 11.4-4	Equation 16-40	S_{D1}	0.252 g
Seismic Design Category	Table 11.6-1	Section 1613.3.5(1)	Risk Category I to III	C
	Table 11.6-2	Section 1613.3.5(2)	Risk Category I to IV	D

Notes: MCE = Maximum Considered Earthquake
g = gravity

Liquefaction Potential

A site liquefaction analysis was beyond the scope of this project. However, the site is underlain by Mesozoic granodiorite rock, commonly referred to as the Rocklin and Penryn Plutons which does not meet the criteria for delineation as a seismic hazard zone susceptible to liquefaction pursuant to the guidelines of California Geological Survey Special Publication 118 *Recommended Criteria for Delineating Seismic Hazards Zones in California*. Furthermore, groundwater at the site is indicated to be greater than 50 feet below existing site grade. Therefore, based upon the known geologic, groundwater, soil and rock conditions, it is our opinion that the potential for liquefaction occurring at the site is negligible.

Bearing Capacity

Considering the variable density of the near-surface soils and the shallow depth to weathered rock observed in our explorations, it may be necessary to sub-excavate and recompact portions of the building pads to provide uniform support for the planned structures. Structures that span surficial soils, engineered fill, and weathered rock may provide relatively uniform bearing capacity. Excavations that span from unweathered rock to any other material should not be allowed.

Sub-excavation is not considered necessary for the areas supporting pavements and exterior flatwork, provided the site preparation recommendations contained in the report are carefully followed.

Our work also indicates that engineered fill composed of native soils or approved imported materials, 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 sub-excavate, scarify, moisture condition, and recompact the surface soils is provided in the Subgrade Preparation section of this report.

Material Suitability

In our opinion, the on-site surface and near-surface soils are considered suitable for use as engineered fill materials provided they are free of debris, significant clay concentrations and organics. Weathered granitic rock is considered suitable for use as engineered fill; unweathered rock, when encountered, would only be suitable for engineered fill if it can be processed into pieces no larger than 12 inches in maximum dimension, and mixed with a sufficient amount of soil to allow for a compactable mixture of soil and rock.

Soil Expansion Potential

Based on the results of our field investigation and laboratory testing, the surface and near-surface soils consist primarily of granular soils that are considered to be relatively non-expansive. Therefore, special site preparation or foundation designs to mitigate expansive soils are not considered necessary for development of this site.

Excavation Conditions

The surface and near-surface soils, and weathered granitic rock, are anticipated to be excavatable with conventional excavation equipment. Cuts within these soils are expected to be relatively stable at near-vertical inclinations for the short time required for foundation and utility construction, unless the soils are saturated, subjected to construction vibrations, or allowed to dry significantly.

Our previous experience in the area and previous seismic refraction surveys performed for the Rocklin Crossings and Rocklin Commons projects suggest that the unweathered granitic rock at the site typically possess shear wave velocities that indicate the rock will be very difficult, if not impossible, to excavate. Our experience also suggests the underlying rock is massive and does not contain significant fractures. Experience gained from these projects indicate that large tractors, such as a Caterpillar D10 equipped with a single-tooth ripper, typically were unable to rip the unweathered granitic rock during mass grading.

For this project, we recommend that refusal, or “hard rock” be defined as materials that cannot be removed by a Cat D10 dozer with a single ripper or excavated with a Cat 345D excavator (or equivalent sized equipment) utilizing a 24-inch bucket equipped with rock teeth. Excavations that cannot be performed with larger excavation equipment will require blasting or use of a rock breaker to help facilitate excavation with heavy-duty excavators. Blasting should be performed in accordance with State and local regulations.

Excavations exceeding five feet in depth that will be entered by workers will require shoring, bracing, sloped excavations, or the use of a traveling shield conforming to current California Occupational Safety and Health Administration (Cal/OSHA) regulations. In our opinion, the surficial silty sand soils at the site should be classified as “Type C” and the underlying weathered granitic rock should be classified as “Type B” in accordance with Cal/OHSA guidelines. Temporary excavation slopes should be made the responsibility of the Contractor since the Contractor is on site and may employ a competent person to observe the nature and stability of the exposed soil. Design of excavation shoring systems should be performed by a qualified engineer.

Excavated materials should not be stockpiled directly adjacent to the open trench to prevent surcharge loading of the trench sidewalls. The stockpiled materials should be kept back from the edge of the trench at least half the trench depth. Excessive truck and equipment traffic also should be avoided near open trenches.

Groundwater Effect on Development

Based on our recent groundwater measurements and review of available historical water levels, it is our opinion that permanent regional groundwater should not be a significant factor in design or construction of the proposed development.

However, it is likely that perched groundwater resulting from rainfall, surface run-off, or seepage may be encountered in excavations. The presence of perched groundwater is more likely to occur if construction is performed in the winter and early spring months. The need for dewatering of deeper excavations should be determined when subsurface conditions are fully exposed. We anticipate standard sump pit and pumping procedures should be adequate to control localized seepage encountered during construction.

Seasonal Water

It should be noted that the near-surface soils will be in a near-saturated condition during and for a considerable period of time following the rainy season. Grading operations attempted following the onset of heavy precipitation 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 aeration to reach a moisture content that will permit the recommended compaction to be achieved. This should be considered in the construction schedule.

Pavement Subgrade Quality

The near-surface soils anticipated to be encountered at pavement subgrade level are considered to be good support quality for asphalt concrete pavements. Laboratory testing of near-surface soils indicate that the surface materials possess Resistance ("R") values in the range of 76 to 80 when tested in accordance with California Test 301. Based on these R-value test results, the anticipated natural variations in soils quality, and our experience in the area, we have selected an R-value of 50 for design of asphalt concrete pavements. This design value is consistent with previous reports performed in the area.

Soil Corrosion Potential

One sample of near-surface soil was 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 Table 2 and copies of the analytical test reports are presented in Figures A5 through A8.

TABLE 2
SOIL CORROSIVITY TESTING

Analyte	Test Method	TP3 (0'-3')	TP8 (0'-3')
pH	CA DOT 643 Modified*	5.27	5.35
Minimum Resistivity	CA DOT 643 Modified*	5,630 □-cm	7,500 □-cm
Chloride	CA DOT 417	7.9 ppm	6.7 ppm
Sulfate	CA DOT 422	6.1 ppm	10.0 ppm
	ASTM D516	6.94 ppm	9.22 ppm

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

The California Department of Transportation Corrosion and Structural Concrete Field Investigation Branch 2012, Corrosion Guidelines (Version 2.0), considers a site to be corrosive to foundation elements if one or more of the following conditions exists for the representative soil and/or water samples taken: has a chloride concentration greater than or equal to 500 ppm, sulfate concentration greater than or equal to 2000 ppm, or the pH is 5.5 or less. Based on this criterion and the low pH values from laboratory testing, the on-site soils have the potential to be corrosive to buried steel reinforcement. Possible remedies for the low pH soils would be to increase the thickness of concrete cover over the reinforcing steel, provide a corrosion resistant mix design, and/or use epoxy coated reinforcing steel.

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 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. Should the construction schedule require work to begin before the soils dry or to continue during the wet months, additional recommendations can be provided, as conditions warrant.

Site Clearing

Prior to site grading, the site should be cleared of all surface and subsurface structures associated with current and previous development of the site, including foundations, oversized rock (greater than about 12 inches in maximum dimension), rubbish, rubble, and deleterious debris, to expose firm and stable soils. Trees or shrubs designated for removal should include the entire rootball and all roots larger than ½-inch in diameter. Structures designated for removal should include the foundations and any associated utilities including the trench backfill. Adequate removal of debris and roots may require laborers handpicking to clear the subgrade soils to the satisfaction of the Geotechnical Engineer’s representative. All debris should be removed from the site.

On-site wells and septic systems, if present, should be abandoned in accordance with Placer County Environmental Health Department requirements.

Existing surface vegetation and organically laden soil within construction areas should be removed by stripping. Stripping should not be used in general fill construction areas supporting structural improvements or interior/exterior concrete slabs. Strippings maybe stockpiled for later use in landscape areas or disposed of off-site. If used in landscape areas, the strippings should be kept at least five feet from the building pad and other surface improvements, moisture conditioned and compacted, and not to exceed a total depth of two feet. Discing of the organics into the surface soils may be a suitable alternate to stripping, depending on the condition and quantity of the organics at the time of grading. The decision to utilize discing in lieu of stripping should be made by the Geotechnical Engineer at the time of earthwork construction. Discing operations, if approved, should be observed by the Geotechnical Engineer's representative and be continuous until the organics are adequately mixed into the surface soils to provide a compactable mixture of soil containing minor amounts of organic matter. Pockets or concentrations of organics will not be allowed.

Depressions resulting from site clearing operations, as well as any loose, soft, disturbed, saturated, or organically contaminated soils, as identified by the Geotechnical Engineer's representative, should be cleaned out to firm, undisturbed soils and backfilled with engineered fill in accordance with the recommendations of this report.

Subgrade Preparation

Following site clearing and organic removal, areas designated to receive engineered fill or remain at-grade, should ripped and cross-ripped to a depth of at least 12 inches, thoroughly moisture conditioned to at least the optimum moisture content and uniformly compacted to at least 90 percent of the ASTM D1557 maximum dry density. The intent of this recommendation is to expose any remaining buried structures associated with previous and existing development, boulders, roots, or debris. All oversized rock fragments exposed that are greater than 12 inches maximum dimension should be removed.

Loose soil conditions were encountered within our explorations at the existing parking lot at Site B. Structural areas within the parking lot should be over-excavated by three feet below existing grade or future pad grade, whichever is lower. Once the excavation is at three feet below existing grade, the Geotechnical Engineer should observe the exposed conditions and determine if further excavation will be required. Once the depth of overexcavation is acceptable, the bottom of the excavation should be ripped to a depth of 12 inches and compacted to at least 90 percent of the ASTM D1557 maximum dry density. The excavations should be backfilled with engineered fill as described in the Engineered Fill Construction section of this report.

When fills are constructed on sloping ground, a level bench (at least 10 feet wide) should be constructed at the toe of the fill. The soils exposed in the bench should be scarified to at least 12 inches, moisture conditioned to at least the optimum moisture content, and compacted to at least 90 percent of ASTM D1557 maximum dry density. Subsequent layers of fill should be benched into the existing slope for a horizontal distance of at least one foot.

Subgrades achieved by excavation should be scarified and processed as recommended above; however, the unweathered rock will not require scarification and compaction. The Geotechnical Engineer should determine whether scarification and compaction is required based on the exposed conditions.

Engineered Fill Construction

On-site soil and rock materials primarily less than 12 inches in maximum dimension may be used as engineered fill. Screening of on-site materials may be necessary to achieve primarily 12-inch minus material.

Imported fill materials, if needed, should be compactable, well-graded, granular soils with a Plasticity Index of 15 or less when tested in accordance with ASTM D4318; an Expansion Index of 20 or less when tested in accordance with ASTM D4829, and should not contain particles greater than four inches in maximum dimension. Import fill materials to be used in pavement areas should have a Resistance ("R") value greater than 50 when tested in accordance with California Test 301. In addition, we recommend that the contractor supply a certification for any imported fill materials, other than aggregate base, that indicates the fill materials are free of known contaminants, and have satisfactory corrosion characteristics. Imported soils should be approved by the Geotechnical Engineer prior to being transported to the site.

Fill materials consisting of predominantly fine-grained native or imported soils (particles less than ¾-inch size) should be placed in lifts not exceeding six inches in compacted thickness, moisture conditioned to near the optimum moisture content, and compacted to at least 90 percent of the ASTM D1557 maximum dry density and tested the Geotechnical Engineer using conventional field density testing procedures.

Fill materials consisting predominantly of particles greater than ¾-inch with rocks generally less than 12 inches in maximum dimension should be placed in lifts not exceeding 12 inches in compacted thickness. The fill materials should be uniformly mixed so as to avoid nesting of larger rocks and to provide a compactable mixture. Compaction of these rocky materials should be undertaken with liberal watering and the fill materials should be uniformly and thoroughly moisture conditioned to the full depth of each lift. Compaction should be achieved by at least four successive coverages with a heavy, self-propelled, sheepsfoot compactor (Caterpillar 825 sheepsfoot or equivalent). Compactive effort should be applied uniformly across the full width of fill construction. Large rocks that cannot be uniformly incorporated into the engineered fill should be broken down into smaller pieces less than 12 inches in maximum dimension or removed from the fill. *The Geotechnical Engineer's representative should be on-site to observe compaction of the rocky fill materials on a nearly full-time basis to verify that this performance specification is being followed.*

To reduce the potential for differential settlement of building foundations, fill differentials that exceed five feet should be avoided on building pads, and pads should not consist of unweathered rock and fill. If either of these conditions exist for the construction of the building pads, over-excavation may be required. The Geotechnical Engineer should review the final grading plans and work with the contractor during construction to determine the areas that could require over-excavation.

The upper six inches of final pavement subgrades should be properly processed, thoroughly moisture conditioned to at least the optimum moisture content and uniformly compacted by at least six complete coverages with a suitably sized compactor, or at least 95 percent of the ASTM D1557 maximum dry density, regardless of whether final grade is achieved by excavation, engineered fill, or left at-grade. Compaction of pavement subgrades should be accomplished just prior to placement of aggregate base materials and while the subgrade materials are at the minimum specified moisture content.

All earthwork operations should be accomplished in accordance with the recommendations contained within this report and the attached earthwork specifications. We recommend that the representative of the Geotechnical Engineer be present during site preparation and fill placement to verify compliance with these recommendations and the project specifications. *This is especially important on this project since a performance criteria has been specified for compaction of rocky fills that cannot be tested using conventional moisture/density testing equipment.*

<u>Subdrains</u>

We anticipate the drainage swale located at Site B will be filled as part of site development, and that a subdrain may be needed to match current drainage conditions within the swale. Typical subdrains may be "blanket drains" consisting of ¾-inch clean crushed rock placed on top of the unweathered granitic rock and covered with a geotextile fabric; or a "trench drain" consisting of the crushed rock wrapped with a geotextile fabric, possibly including a drain pipe. The type of subdrain will depend on the conditions exposed and should be determined during construction.

Subdrains likely will also be required at one of more of the identified seeps. This will depend on how the site is graded and the conditions exposed during construction.

Utility Construction and Trench Backfill

Excavation conditions for underground utility construction are described in the Excavation Conditions section of this report. Seepage into utility excavations due to perched water will likely be encountered at isolated locations throughout the site. The chances of encountering seepage will be greater during the winter and spring months of the year.

Initial backfill and embedment for utility construction should conform to the pipe manufacturer's recommendations and applicable governing agency standards. We recommend only native soils (in lieu of select sand or gravel) be used as intermediate backfill for utility trenches located within the building footprints and extending at least five feet horizontally beyond perimeter foundations to minimize water transmission beneath the structures.

Utility trench backfill should be uniformly moisture conditioned to at least the optimum moisture content and mechanically compacted in lifts to at least 90 percent of the ASTM D1557 maximum dry density. Rocky backfill material should be mechanically compacted in lifts of about 12 inches in compacted thickness. The lift thickness and number of passes to achieve proper compaction will depend on the size of the rocky material and the type of compaction equipment. Jetting as the sole means of compaction is not recommended.

Underground utility trenches that are aligned nearly parallel with foundations should 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 one horizontal to one vertical (1:1) inclination below the bottom of the foundations, and typically 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 of the foundations.

Trench backfill materials and compaction requirements for utility lines within the public right-of-way should conform to current City of Rocklin *Improvement Standards*, latest edition.

Foundation Design

The proposed structures may be supported upon continuous and/or isolated spread foundations based entirely within: 1) undisturbed native surface soils, engineered fill, weathered rock or a combination of these materials; or 2) undisturbed rock, as determined by the Geotechnical Engineer. It is emphasized that the structure should not be supported partially upon unweathered rock and partially upon undisturbed native soils or engineered fill materials. Some deepening of the foundation excavations may be required to expose the consistent bearing materials, as determined by the Geotechnical Engineer. We recommend bid documents to include a unit price per foot of additional foundation excavation, as needed.

Continuous foundations should be at least 12 inches wide and isolated spread foundations should maintain a minimum 24-inch width dimension in either direction. One- and two-story structure foundations should extend at least 12 inches below building pad soil subgrade. Any structure greater than two-stories should be supported by a foundation system that extends at least 18 inches below building pad subgrade. For this project, the building pad subgrade shall be defined as the surface upon which capillary break gravel is placed or any surrounding grade, whichever is lower.

Foundations so established may be sized for an allowable soil bearing pressure of 3000 pounds per square foot (psf) for dead plus live loads. A 1/3 increase of the bearing capacity may be used for foundation designs that include the short-term loading effects of wind and/or seismic forces. The weight of the foundation concrete extending below lowest adjacent soil grade may be disregarded in sizing computations. Foundation size and reinforcement should be determined by the project structural engineer.

Resistance to lateral foundation displacement may be computed using an allowable friction factor of 0.35, which may be multiplied by the effective vertical load on each foundation. Additional lateral resistance may be computed using an allowable passive earth pressure of 350 psf per foot of depth. These two modes of resistance should not be added unless the frictional value is reduced by 50 percent since full mobilization of these resistances typically occurs at different degrees of horizontal movement.

We recommend that all foundation excavations be observed by the Geotechnical Engineer prior to placement of reinforcement and concrete to verify suitable bearing materials and conditions are exposed.

<u>Interior Floor Slab Support</u>

Interior concrete slab-on-grade floors should be at least four inches thick and can be supported upon the soil subgrade prepared in accordance with the recommendations in this report and maintained in a condition of at least the optimum moisture. We recommend that interior floor slabs be reinforced to provide structural continuity, mitigate cracking and permit spanning of local soil irregularities. The project design engineer should determine final floor slab reinforcing requirements. Concrete curing and joint spacing and details should conform to current Portland Cement Association (PCA) and ACI guidelines.

Floor slabs may be underlain by a layer of free-draining crushed rock, serving as a deterrent to migration of capillary moisture. The crushed rock layer should be at least four inches thick and graded such that 100 percent passes a one-inch sieve and less than five percent passes a No. 4 sieve. Additional moisture protection may be provided by placing a vapor retarder membrane (at least 10-mils thick) directly over the crushed rock. The membrane should meet or exceed the minimum specifications as outlined in ASTM E1745, and be installed in strict conformance with the manufacturer's recommendations.

Floor slab construction over the past 30 years or more has included placement of a thin layer of sand over the vapor retarder membrane. 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.

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

Floor Slab Moisture Penetration Resistance

It is considered likely that interior floor slab subgrade soils will become wet to near-saturated at some time during the life of the structures. This is a certainty when slabs are constructed during the wet season or when constantly wet ground or poor drainage conditions exist adjacent to structures. For this reason, it should be assumed that all interior slabs in occupied areas, as well as those intended for moisture-sensitive floor coverings or materials, require protection against moisture or moisture vapor penetration. Standard practice includes the crushed rock and water vapor retarder as suggested above. However, the gravel and 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 crushed rock and vapor retarder membrane will not "moisture proof" the slab, nor does it assure that slab moisture transmission levels will be low enough to prevent damage to floor coverings or other building components. If increased protection against moisture vapor penetration of slabs is desired, a concrete moisture protection specialist should be consulted. The design team should consider all available measures for slab moisture protection. It is commonly accepted that maintaining the lowest practical water-cement ratio in the slab concrete is one of the most effective ways to reduce future moisture vapor penetration of the completed slabs.

Exterior Flatwork (Non-Pavement Areas)

Areas to receive exterior concrete flatwork (e.g., sidewalks) should be uniformly moisture conditioned to at least the optimum moisture content, and compacted to at least 90 percent relative compaction based on ASTM D1557.

Proper moisture conditioning of the subgrade soils is essential to the performance of exterior flatwork. Uniform moisture conditioning of subgrade soils is important to reduce the risk of non-uniform moisture withdrawal from the concrete and the possibility of plastic shrinkage cracks. Practices recommended by the PCA for proper placement and curing of concrete should be followed during exterior concrete flatwork construction. Expansion joints should be provided to allow for minor vertical movement of the flatwork.

We recommend the concrete flatwork be constructed with thickened edges in accordance with ACI design standards, latest edition. Flatwork should be at least four inches thick and reinforced for crack control, if necessary. The flatwork reinforcement should be provided by the civil engineer or project architect. Accurate and consistent location of the reinforcement at mid-slab is essential to its performance. The slab designer should determine if exterior flatwork should be constructed independent of (or connected to) the building foundations.

Retaining Walls

We assume that retaining walls will be required for site development. Walls that are allowed to yield or rotate at the top should be capable of resisting "active" lateral soil pressures equal to an equivalent fluid pressure of 40 psf per foot of retained soil. Rigid or restrained retaining walls that are not allowed to yield at the top should be capable of resisting "at-rest" lateral soil pressures equal to an equivalent fluid pressure of 55 psf per foot of retained soil. These soil pressures assume a horizontal grade behind the walls and that the walls will be fully drained so that hydrostatic pressures will not develop behind the wall.

Retaining walls may be subjected to surcharge loads produced by sloping backfills, nearby building foundations, vehicular traffic and parking, as well as construction equipment and material storage. These additional surcharge loads should be considered in the retaining wall design. Appropriate design parameters can be provided on a case-by-case basis, if desired. Retaining walls may be supported upon shallow foundations extending at least 18 inches below lowest adjacent site grade, and may be designed using the applicable recommendations contained in the Foundation Design section of this report.

The recommended equivalent fluid pressures do not include allowances for hydrostatic pressures. The hydrostatic pressure on the retaining walls should be relieved using 12-inch thick gravel drainage layer behind that walls that extends from the bottom of the wall to within 12 inches of the top of the wall. The top foot above the drainage layer should consist of compacted on-site materials, unless covered by a slab or pavement. The gravel drain should consist of Class 2 permeable material or ¾-inch crushed rock wrapped in a nonwoven geotextile fabric such as Mirafi 140N or equivalent. Weep holes or perforated drain pipes should be provided at the base of the retaining wall to collect and discharge accumulated water. Drain pipes, if used, should drain at a minimum one percent slope to an appropriate drainage system. Proprietary geotextile composites, such as Miradrain 6200 or equivalent, may be used in lieu of gravel drainage.

Approved on-site or imported granular soils should be used to backfill retaining walls. Backfill should be placed in lifts not exceeding 12 inches in compacted thickness and compacted by mechanical methods to at least 90 percent of the ASTM D1557 maximum dry density. The upper six inches of wall backfill (below the aggregate base) supporting pavements should be compacted to at least 95 percent of the maximum dry density. Rocky backfill material should be compacted using mechanical compaction methods in lifts about 12 inches in compacted thickness. The lift thickness and number of passes to achieve proper compaction will depend on the size of the rocky material and the type of compaction equipment.

Surface Drainage

Surface drainage should be accomplished to provide positive drainage of surface water away from the buildings or drain into a nearby drainage collection system. The subgrade adjacent to the buildings should be sloped away from foundations at least two percent gradient for a minimum of 10 feet, where possible. Roof gutter downspouts and surface drains should drain onto pavements or be connected to rigid, non-perforated piping directed to an appropriate drainage point away from the structures. Ponding of surface water should not be allowed adjacent to the buildings or pavements. Landscape berms, if planned, should not be constructed in such a manner as to promote drainage toward the buildings.

Pavement Design

Specific pavement design standards for the City of Rocklin were not available at the time this report was prepared. The following pavement sections are applicable for public and private roads. It is assumed that widening at Rocklin Road and Sierra College Boulevard will be required for future development of the project.

We have assumed typical traffic indices of 4.5, 6.0, and 7.0 for private pavements and traffic indices of 6.0, 7.0, 8.0, 9.0, and 10.0 for public pavements. The project civil engineer should determine the appropriate traffic index based on anticipated traffic conditions. We can provide additional pavement section alternatives based on alternate traffic indices, upon request. The following preliminary pavement sections have been calculated based on the assumed traffic indices using an R-value of 50, and the procedures contained within the 6th Edition of the *California Highway Design Manual*.

TABLE 3
PRIVATE PAVEMENT DESIGN ALTERNATIVES
R-VALUE = 50

Traffic Index (TI)	Type B Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)	Portland Cement Concrete (inches)
4.5	2½	4	--
	--	4	4
6.0	2½	6	--
	3*	4	--
	--	4	5
7.0	3	7	--
	3½*	6	--
	--	4	6

Note: * = Asphalt thickness includes Caltrans Factor of Safety.

TABLE 4
PUBLIC PAVEMENT DESIGN ALTERNATIVES
R-VALUE = 50

Traffic Index (TI)	Type B Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)	Portland Cement Concrete (inches)
6.0	2½	6	--
	3*	4	--
	--	4	5
7	3	7	--
	3½*	6	--
	--	4	6
8	3½	8	--
	4*	7	--
	--	4	6
9	4	9	--
	4½*	8	--
	--	5	6
10	4½	11	--
	5*	10	--
	--	6	6

Note: * = Asphalt thickness includes Caltrans Factor of Safety.

We emphasize that the performance of pavements 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 aggregate base should be compacted to at least 95 percent of the ASTM D1557 maximum dry density. Final subgrade preparation should be performed just prior to placement of the aggregate base.

High axle loads coupled with shear stresses induced by sharply turning tire movements can lead to failure in asphalt concrete pavements. Therefore, we recommend that consideration be given to using an appropriate PCC section in areas subjected to concentrated heavy wheel loading, such as entry driveways and in front of trash enclosures.

We recommend PCC slabs be constructed with thickened edges in accordance with ACI design standards, latest edition. Reinforcing for crack control, if desired, should be determined by the project civil engineer. Joint spacing and details should conform to current PCA or ACI guidelines. Portland cement concrete should achieve a minimum compressive strength of 3500 pounds per square inch at 28 days.

Efficient drainage of all surface water to avoid infiltration and saturation of the supporting aggregate base and subgrade soils is important to pavement performance. Materials quality and construction of the structural section should conform to the applicable provisions of the Caltrans Standard Specifications and the City of Rocklin Standards, latest editions.

Geotechnical Engineering Observation and Testing During Construction

Site preparation should be accomplished in accordance with the recommendations of this report and the *Guide Earthwork Specifications* provided in Appendix B. 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 earthwork and foundation construction 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 study.

Many factors can affect the number of tests that should be performed during the course of construction, such as soil type, soil moisture, season of the year and contractor operations/performance. Therefore, it is crucial that the actual number and frequency of testing be determined by the Geotechnical Engineer during construction based on their observations, site conditions, and difficulties encountered.

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.

Additional Future Services

We recommend that our firm be retained to review the final plans and specifications prior to site grading to determine if the intent of our recommendations has been properly implemented in those documents. Plans recommended for review include the civil drawings and the foundation plans for the various structures.

The recommendations contained within this report are suitable for typical residential and commercial construction in the area. The proposed site plan shows retail and medical office buildings. The future tenant of these structures may have additional geotechnical requirements and may require a "stand alone" report and/or supplemental information. These services are beyond the scope of this report.

LIMITATIONS

Our recommendations are based upon the information provided regarding the proposed construction, combined with our analysis of site conditions revealed by the field exploration and laboratory testing programs. We have used engineering judgment based upon the information provided and the data generated from current and previous investigations. 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, neither expressed nor implied, is provided.

If the proposed construction is modified or relocated or, if it is found during construction that subsurface conditions differ from those we encountered at the test pit 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. This report should not be utilized for construction on any other site. This report is considered valid for the proposed construction for a period of two years following the date of this report. If construction has not started within two years, we must re-evaluate the recommendations of this report and update the report, if necessary.

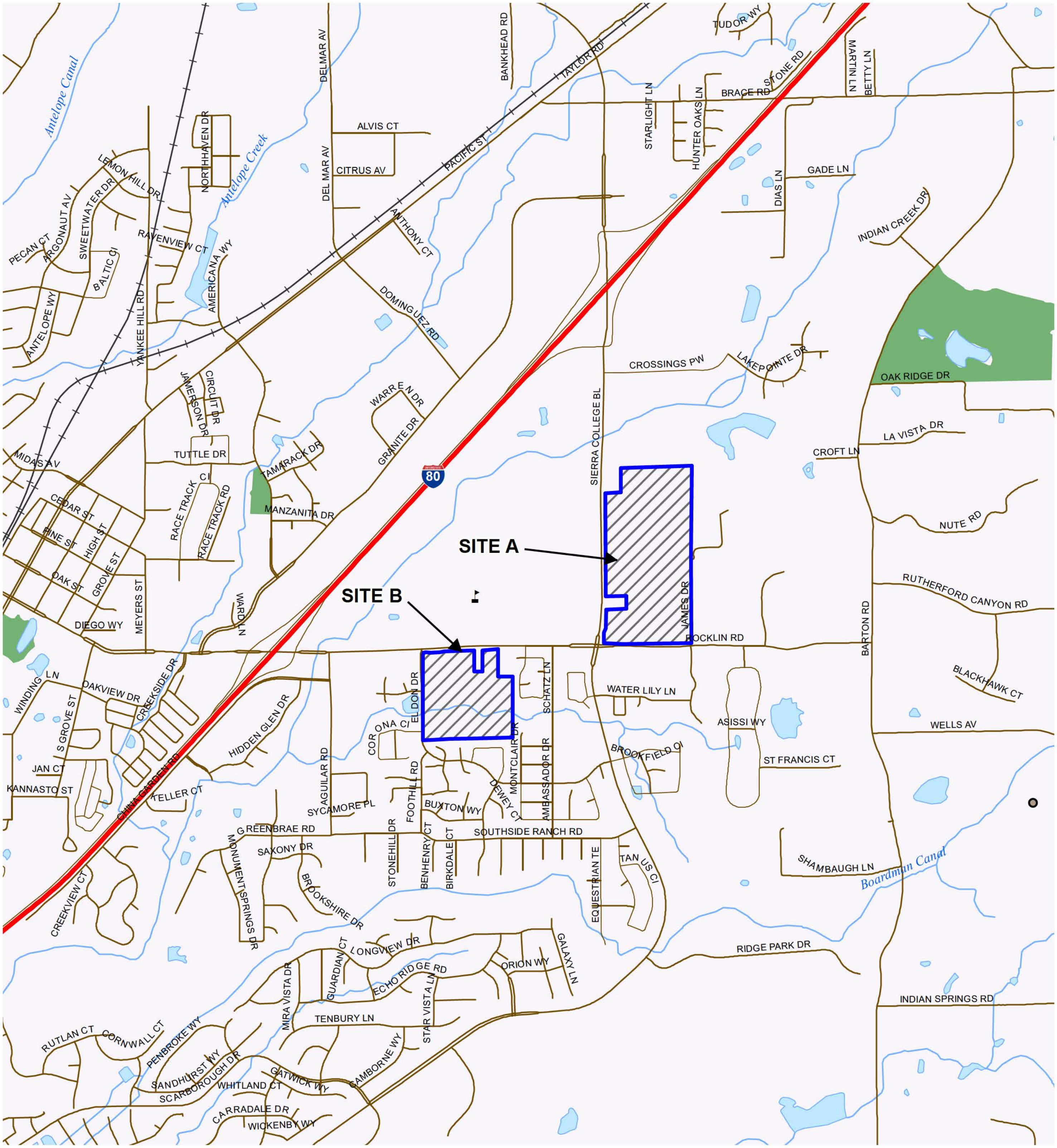
Wallace - Kuhl & Associates

REGISTERED PROFESSIONAL ENGINEER
DAVID C. DEAN
NO. 80671
Exp. 3/31/17
CIVIL
STATE OF CALIFORNIA

David C. Dean
Project Engineer

REGISTERED PROFESSIONAL ENGINEER
STEPHEN L. FRENCH
NO. 323
Exp. 3/31/18
GEOTECHNICAL
STATE OF CALIFORNIA

Stephen L. French
Senior Engineer



Street data courtesy of Placer County.
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

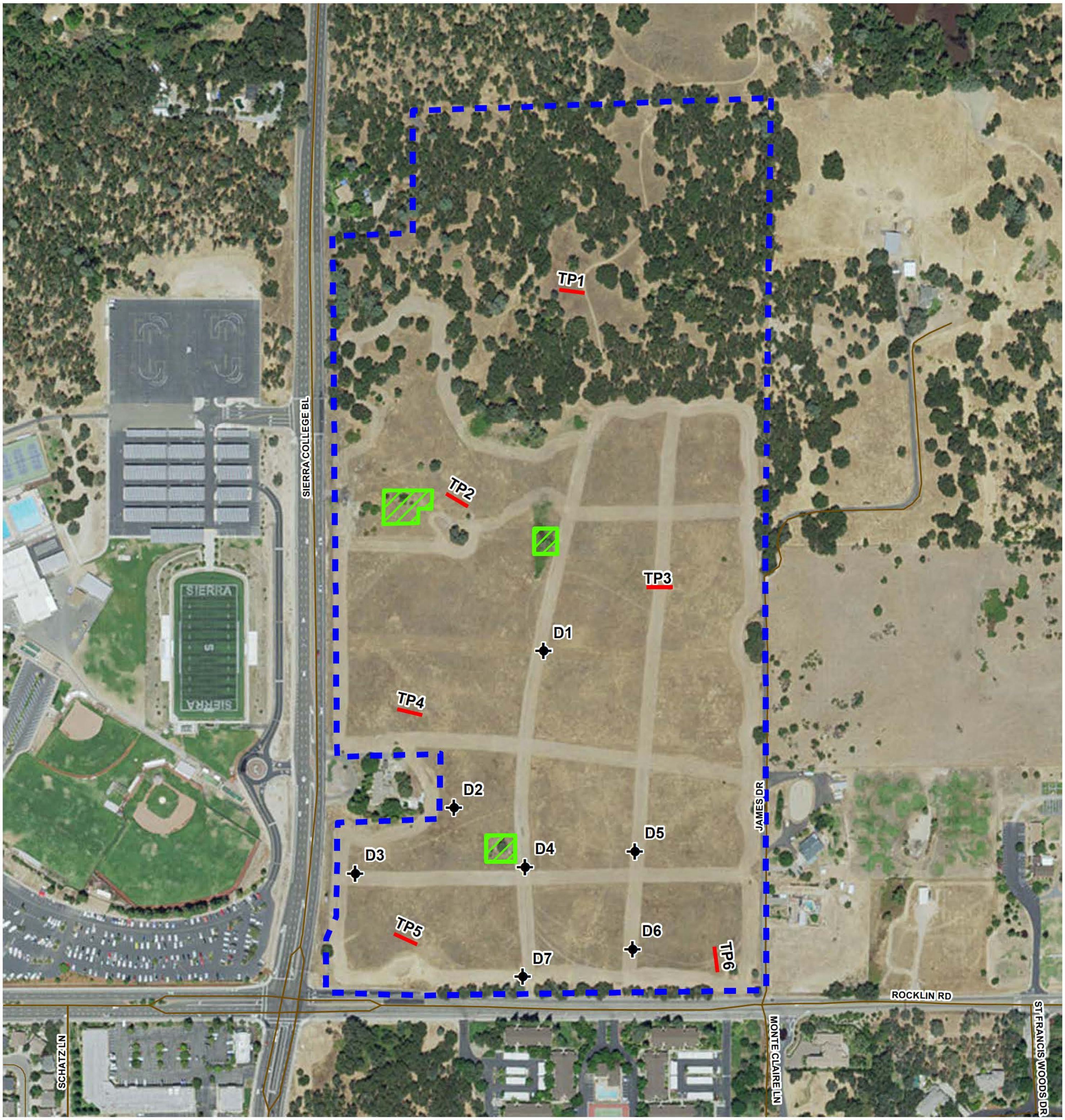
WallaceKuhl & ASSOCIATES

VICINITY MAP

ROCKLIN COLLEGE SQUARE

Rocklin, California

FIGURE	1
DRAWN BY	RWO
CHECKED BY	JRY
PROJECT MGR	DCD
DATE	06/16
WKA NO. 10958.02	



Aerial provided by ESRI.
Projection: NAD 83, California State Plane, Zone II

Legend

- Site A Boundary
- Rock Outcropping Observed
- Approximate Soil Boring Location
- Approximate Test Pit Location

N

0 200 400
Feet

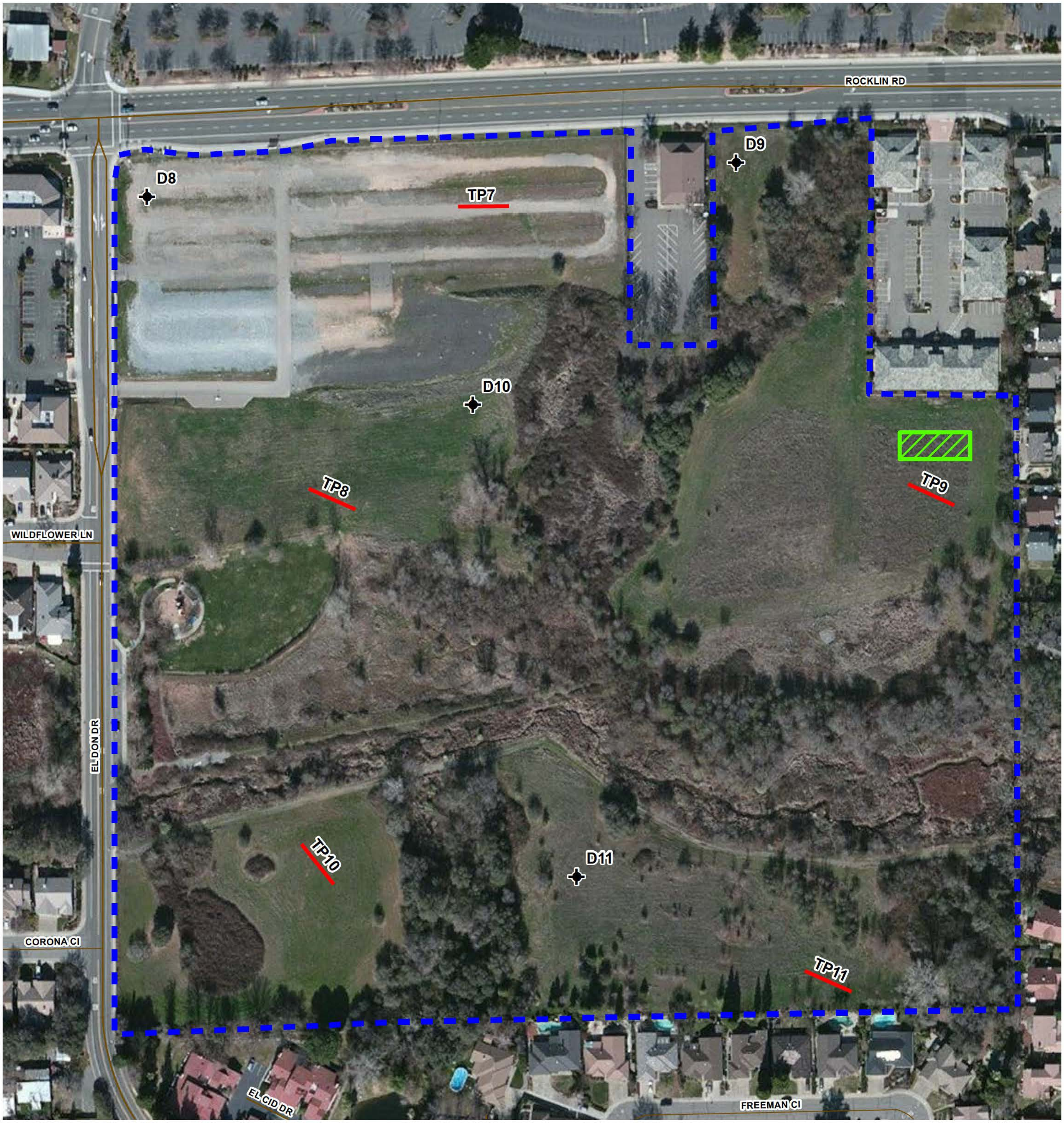
WallaceKuhl & ASSOCIATES

AERIAL SITE MAP

ROCKLIN COLLEGE SQUARE - SITE A

Rocklin, California

FIGURE	2A
DRAWN BY	RWO
CHECKED BY	JRY
PROJECT MGR	DCD
DATE	06/16
WKA NO. 10958.02	



Aerial provided by ESRI.
Projection: NAD 83, California State Plane, Zone II

Legend

- Site Boundary
- Rock Outcropping Observed
- Approximate Soil Boring Location
- Approximate Test Pit Location

N

0 100 200
Feet

FIGURE	2B
DRAWN BY	RWO
CHECKED BY	JRY
PROJECT MGR	DCD
DATE	06/16
WKA NO. 10958.02	

WallaceKuhl & ASSOCIATES

AERIAL SITE MAP

ROCKLIN COLLEGE SQUARE - SITE B

Rocklin, California

Project: Rocklin College Square
Project Location: Rocklin, CA
WKA Number: 10958.02

LOG OF SOIL BORING D1

Date(s) Drilled	**5/13/16**	Logged By	**JRY**	Checked By	**DCD**
Drilling Method	**Solid Stem Auger**	Drilling Contractor	**V & W Drilling**	Total Depth of Drill Hole	**7.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**4**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet		Sampling Method(s)	**Modified California**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140-lb hammer; 30-inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Light brown, slightly moist, medium dense, silty fine to medium SAND (SM)						
				■	D1-1I	26			
			Orange/brown, moist, dense, fine to coarse SAND with silt (weathered granitic rock)	■	D1-2I	83			
	5								
			Boring terminated, practical refusal, at 7.5 feet below existing site grade. Groundwater not observed.						

SAMPLE DATA / TEST DATA

Wallace Kuhl & ASSOCIATES

FIGURE 3

Project: Rocklin College Square Project Location: Rocklin, CA WKA Number: 10958.02	**LOG OF SOIL BORING D2** Sheet 1 of 1

Date(s) Drilled	**5/13/16**	Logged By	**JRY**	Checked By	**DCD**
Drilling Method	**Solid Stem Auger**	Drilling Contractor	**V & W Drilling**	Total Depth of Drill Hole	**3.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**4**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet		Sampling Method(s)	**Modified California**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140-lb 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
			Orange/brown, moist, medium dense, fine to coarse SAND with silt (weathered granitic rock)		D2-1I	48			
			Boring terminated, practical refusal, at 3.5 feet below existing site grade. Groundwater not observed.						

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Wallace Kuhl & ASSOCIATES

FIGURE 4

Project: Rocklin College Square Project Location: Rocklin, CA WKA Number: 10958.02	**LOG OF SOIL BORING D3** Sheet 1 of 1

Date(s) Drilled	**5/13/16**	Logged By	**JRY**	Checked By	**DCD**
Drilling Method	**Solid Stem Auger**	Drilling Contractor	**V & W Drilling**	Total Depth of Drill Hole	**8.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**4**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet		Sampling Method(s)	**Modified California**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140-lb 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
			Light brown, moist, medium dense, silty fine to medium SAND (SM)		D3-1I	51			
			Orange/brown, moist, very dense, fine to coarse SAND with silt (weathered granitic rock)		D3-2I	50/6"			
	5								
					D3-3I	50/6"			
			Boring terminated, practical refusal, at 8.5 feet below existing site grade. Groundwater not observed.						

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FIGURE 5

Project: Rocklin College Square
Project Location: Rocklin, CA
WKA Number: 10958.02

LOG OF SOIL BORING D4

Sheet 1 of 1

Date(s) Drilled	5/13/16	Logged By	JRY	Checked By	DCD
Drilling Method	Solid Stem Auger	Drilling Contractor	V & W Drilling	Total Depth of Drill Hole	8.0 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	4	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet		Sampling Method(s)	Modified California	Drill Hole Backfill	Soil Cuttings
Remarks				Driving Method and Drop	140-lb hammer; 30-inch drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Light brown, moist, dense, silty fine to medium SAND (SM)						
					D4-1I	50/6"			
			Orange/brown, moist, very dense, fine to coarse SAND with silt (weathered granitic rock)						
					D4-2I	50/4"			
	5								
					D4-3I	50/2"			
			Boring terminated, practical refusal, at 8 feet below existing site grade. Groundwater not observed.						

SAMPLE DATA / TEST DATA

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FIGURE 6

Project: Rocklin College Square	**LOG OF SOIL BORING D5**
Project Location: Rocklin, CA	Sheet 1 of 1
WKA Number: 10958.02	

Date(s) Drilled	**5/13/16**	Logged By	**JRY**	Checked By	**DCD**
Drilling Method	**Solid Stem Auger**	Drilling Contractor	**V & W Drilling**	Total Depth of Drill Hole	**7.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**4**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet		Sampling Method(s)	**Modified California**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140-lb 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
			Light brown, moist, medium dense, silty fine to medium SAND (SM)						
					D5-1I	37	5.5	116	TR
					D5-2I	26			
	5		Orange/brown, moist, very dense, fine to coarse SAND with silt (weathered granitic rock)						
					D5-3I	50/4"			
			Boring terminated, practical refusal, at 7.5 feet below existing site grade. Groundwater not observed.						

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FIGURE 7

Project: Rocklin College Square Project Location: Rocklin, CA WKA Number: 10958.02	LOG OF SOIL BORING D6 Sheet 1 of 1

Date(s) Drilled	5/13/16	Logged By	JRY	Checked By	DCD
Drilling Method	Solid Stem Auger	Drilling Contractor	V & W Drilling	Total Depth of Drill Hole	6.3 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	4	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet		Sampling Method(s)	Modified California	Drill Hole Backfill	Soil Cuttings
Remarks				Driving Method and Drop	140-lb 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
			Light brown, moist, medium dense, silty fine to medium SAND (SM)		D6-1I	22			
	5		Orange/brown, moisture, medium dense, fine to coarse SAND with silt (weathered granitic rock)		D6-2I	23			
			Boring terminated, practical refusal, at 6.25 feet below existing site grade. Groundwater not observed.						

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FIGURE 8

Project: Rocklin College Square	**LOG OF SOIL BORING D7**
Project Location: Rocklin, CA	Sheet 1 of 1
WKA Number: 10958.02	

Date(s) Drilled	**5/13/16**	Logged By	**JRY**	Checked By	**DCD**
Drilling Method	**Solid Stem Auger**	Drilling Contractor	**V & W Drilling**	Total Depth of Drill Hole	**14.8 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**4**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet		Sampling Method(s)	**Modified California**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140-lb hammer; 30-inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Light brown, moist, loose to medium dense, silty fine to medium SAND (SM)						
					D7-1I	46	5.4	117	
					D7-2I	16	13.6	115	
	5								
			Orange/brown, moist, very dense, fine to coarse SAND with silt (weathered granitic rock)						
			color change to orange/black		D7-3I	50/6"	7.0	119	
	10								
					D7-4I	50/6"	8.9	118	
			Boring terminated at 14.75 feet below existing site grade. Groundwater not observed.						

BORING LOG 10958.02 - ROCKLIN COLLEGE SQUARE.GPJ WKA.GDT 6/23/16 1:52 PM

Wallace Kuhl & ASSOCIATES

FIGURE 9

Project: Rocklin College Square
Project Location: Rocklin, CA
WKA Number: 10958.02

LOG OF SOIL BORING D8

Date(s) Drilled	**5/13/16**	Logged By	**JRY**	Checked By	**DCD**
Drilling Method	**Solid Stem Auger**	Drilling Contractor	**V & W Drilling**	Total Depth of Drill Hole	**12.0 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**4**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**11.5**	Sampling Method(s)	**Modified California**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140-lb 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 to medium dense, silty fine to medium SAND (SM) - FILL						
					D8-1I	17	16.6	113	
	5				D8-2I	28	14.9	116	
			Light brown, moist, medium dense, silty fine to medium SAND (SM)						
	10				D8-3I	29	10.8	128	
			Boring terminated, practical refusal, at 12 feet below existing site grade. Perched water observed at 11.5 feet below grade.						

Wallace Kuhl & ASSOCIATES

FIGURE 10

Project: Rocklin College Square **Project Location: Rocklin, CA** **WKA Number: 10958.02**	**LOG OF SOIL BORING D9** Sheet 1 of 1

Date(s) Drilled	**5/13/16**	Logged By	**JRY**	Checked By	**DCD**
Drilling Method	**Solid Stem Auger**	Drilling Contractor	**V & W Drilling**	Total Depth of Drill Hole	**5.3 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**4**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet		Sampling Method(s)	**Modified California**	Drill Hole Backfill	**Soil Cuttings**
Remarks	**Bulk Sample (0' - 3')**			Driving Method and Drop	**140-lb 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
			Light brown, moist, medium dense, silty fine to medium SAND (SM)						
					D9-1I	21	5.5	136	TR
			Orange/brown, moist, very dense, fine to coarse SAND with silt (weathered granitic rock)		D9-2I	87			
	5								
			Boring terminated at 5.25 feet below existing site grade. Groundwater not observed.						

BORING LOG 10958.02 - ROCKLIN COLLEGE SQUARE.GPJ WKA.GDT 6/23/16 1:52 PM

Wallace Kuhl & ASSOCIATES

FIGURE 11

Project: Rocklin College Square Project Location: Rocklin, CA WKA Number: 10958.02	**LOG OF SOIL BORING D10** Sheet 1 of 1

Date(s) Drilled	**5/13/16**	Logged By	**JRY**	Checked By	**DCD**
Drilling Method	**Solid Stem Auger**	Drilling Contractor	**V & W Drilling**	Total Depth of Drill Hole	**8.0 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**4**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet		Sampling Method(s)	**Modified California**	Drill Hole Backfill	**Soil Cuttings**
Remarks	**Bulk Sample (5' - 7'), gravel on top 3" - 4"**			Driving Method and Drop	**140-lb 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
			Light brown, moist, silty fine to medium SAND (SM)						
			Orange/brown, moist, very dense, fine to coarse SAND with silt (weathered granitic rock)		D10-1I	50/4"			
	5				D10-2I	50/2"			
			Boring terminated, practical refusal, at 8 feet below existing site grade. Groundwater not observed.						

BORING LOG 10958.02 - ROCKLIN COLLEGE SQUARE.GPJ WKA.GDT 6/23/16 1:52 PM

WallaceKuhl & ASSOCIATES

FIGURE 12

Project: Rocklin College Square Project Location: Rocklin, CA WKA Number: 10958.02	LOG OF SOIL BORING D11 Sheet 1 of 1

Date(s) Drilled	5/13/16	Logged By	JRY	Checked By	DCD
Drilling Method	Solid Stem Auger	Drilling Contractor	V & W Drilling	Total Depth of Drill Hole	5.0 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	4	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet		Sampling Method(s)	Modified California	Drill Hole Backfill	Soil Cuttings
Remarks				Driving Method and Drop	140-lb 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
			Light brown, moist, loose, silty fine to medium SAND (SM)						
					D11-1I	9	7.8	117	
			Orange/brown, moist, very dense, fine to coarse SAND with silt (weathered granitic rock)		D11-2I	50/6"	7.9	100	
	5								
			Boring terminated, practical refusal, at 5 feet below existing site grade. Groundwater not observed.						

Wallace Kuhl & ASSOCIATES

FIGURE 13

LOGS OF TEST PITS
Rocklin College Square
Excavated on May 11, 2016, with a Case 580M backhoe
Logged by: Joey Ybarra
WKA No. 10958.02

TEST PIT 1

0 to 1½'	Light brown, moist, silty fine to medium SAND (SM)
1½ to 9'	Orange/brown, moist, fine to coarse SAND with silt (weathered granitic rock)

Test Pit terminated at 9 feet
Groundwater was not encountered
Bulk samples TP1 retrieved from 0 to 3' and 4' to 5'

TEST PIT 2

0 to 3'	Light brown, moist, silty fine to medium SAND (SM)
3' to 4'	Orange/brown, moist, fine to coarse SAND with silt (weathered granitic rock)
4'	Practical refusal

Test Pit terminated at 4 feet
Groundwater was not encountered
Bulk sample TP2 retrieved from 0 to 2'

TEST PIT 3

0 to 1½'	Light brown, moist, silty fine to medium SAND (SM)
1½' to 9'	Orange/brown, moist, fine to coarse SAND with silt (weathered granitic rock)
9'	Practical refusal

Test Pit terminated at 9 feet
Groundwater was not encountered
Bulk samples TP3 retrieved from 0 to 2' and 4½' to 5½'

TEST PIT 4

0 to 2'	Light brown, moist, silty fine to medium SAND (SM)
2' to 8½'	Orange/brown, moist, fine to coarse SAND with silt (weathered granitic rock)
8½'	Practical refusal

Test Pit terminated at 8½ feet
Groundwater was not encountered
Bulk samples TP4 retrieved from 0 to 2' and 4½' to 5½'

LOGS OF TEST PITS (Continued)
Rocklin College Square
Excavated on May 11, 2016, with a Case 580M backhoe
Logged by: Joey Ybarra
WKA No. 10958.02

TEST PIT 5

0 to 2'	Light brown, moist, silty fine to medium SAND (SM)
2'	Practical refusal

Test Pit terminated at 2 feet
Groundwater was not encountered
Bulk sample TP5 retrieved from 0 to 2'

TEST PIT 6

0 to 3'	Light brown, moist, silty fine to medium SAND (SM)
3' to 8½'	Orange/brown, moist, fine to coarse SAND (SW) with silt (weathered granitic rock)
8½'	Practical refusal

Test Pit terminated at 8½ feet
Groundwater was not encountered
Bulk sample TP6 retrieved from 0 to 2'

TEST PIT 7

0 to ½'	Light brown, moist, silty fine to medium SAND (Fill)
½' to 3'	Reddish brown, slightly moist, silty medium SAND (Fill)
3' to 10'	Orange/brown, moist, fine to coarse SAND with silt (weathered granitic rock)

Test Pit terminated at 10 feet
Groundwater was not encountered
Bulk samples TP7 retrieved from 0 to 3' and 5' to 7'

TEST PIT 8

0 to 2'	Light brown, moist, silty fine to medium SAND (SM) with cobbles
2' to 8'	Orange/brown, moist, medium to coarse SAND with silt (weathered granitic rock)
6'	Increased difficulty to excavate
8'	Practical refusal

Test Pit terminated at 8 feet
Groundwater was not encountered
Bulk sample TP8 retrieved from 0 to 2'

WallaceKuhl & ASSOCIATES

TEST PIT LOGS

ROCKLIN GOLLEGE SQUARE

Rocklin, California

FIGURE	15
DRAWN BY	RWO
CHECKED BY	JRY
PROJECT MGR	DCD
DATE	06/16
WKA NO.	10958.02

LOGS OF TEST PITS (Continued)
Rocklin College Square
Excavated on May 11, 2016, with a Case 580M backhoe
Logged by: Joey Ybarra
WKA No. 10958.02

TEST PIT 9

0 to 2‘	Light brown, moist, silty fine to medium SAND (SM)
2’ to 4’	Orange/brown, moist, fine to coarse SAND with silt (weathered granitic rock)
4'	Practical refusal

Test Pit terminated at 9 feet
Groundwater was not encountered
Bulk samples TP9 retrieved from 0 to 3'

TEST PIT 10

0 to 2‘	Light brown, moist, silty fine to medium SAND (SM)
2’ to 6’	Orange/brown, moist, fine to coarse SAND with silt (weathered granitic rock)
4'	Color change to light brown
6’	Practical refusal

Test Pit terminated at 9 feet
Groundwater was not encountered
Bulk samples TP10 retrieved from 0 to 3' and 5’ to 6’

TEST PIT 11

0 to 1½‘	Light brown, moist, silty fine to medium SAND (SM)
1½’ to 8’	Orange/brown, moist, fine to coarse SAND with silt (weathered granitic rock)
8'	Practical refusal

Test Pit terminated at 8 feet
Groundwater was not encountered
Bulk samples TP11 retrieved from 0 to 3' and 4’ to 5’

UNIFIED SOIL CLASSIFICATION SYSTEM

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

OTHER SYMBOLS

= Drive Sample: 2-1/2" O.D. Modified California sampler
= Drive Sampler: no recovery
= SPT Sampler
= Initial Water Level
= Final Water Level
= Estimated or gradational material change line
= Observed material change line

Laboratory Tests

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

GRAIN SIZE CLASSIFICATION

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

WallaceKuhl & ASSOCIATES

UNIFIED SOIL CLASSIFICATION SYSTEM

ROCKLIN COLLEGE SQUARE

Rocklin, California

FIGURE	17
DRAWN BY	RWO
CHECKED BY	JRY
PROJECT MGR	DCD
DATE	06/16
WKA NO.	10958.02

APPENDICES

APPENDIX A

General Project Information, Laboratory Testing and Results

APPENDIX A

A. GENERAL INFORMATION

The performance of a geotechnical engineering report for the proposed Rocklin College Square development to be constructed near the intersection of Sierra College Boulevard and Rocklin Road in Rocklin, California, was authorized by Mr. Dan Cole on April 19, 2016. Authorization was for an investigation as described in our proposal letter dated April 13, 2016, sent to our client Evergreen Sierra East LLC, whose mailing address is 2295 Gateway Oaks Drive, Suite 135 in Sacramento, California 95833; telephone (916) 837-0596.

In performing this study, we made reference to the *Overall Illustrative Site Plan*, undated. The project manager is Gillum Consulting, whose mailing address is 11358 Amalgam Way, Suite 9 in Gold River, California 95671; telephone (916) 388-8900.

We also made reference to the *Wetland Delineation Sierra College 72* plan, dated June 7, 2016 and prepared by Madrone Ecological Consulting, whose mailing address is 2617 K Street, Suite 175 in Sacramento, California 95833; telephone (916) 822-3231.

B. FIELD EXPLORATION

At the approximate locations shown in Figure 2, 11 soil borings (D1 to D11) were drilled on May 11 and May 13, 2016, utilizing a CME-75 truck-mounted drill rig equipped with six-inch-diameter, solid helical augers. At various intervals, relatively undisturbed soil samples were recovered with a 2½-inch O.D., 2-inch I.D., modified California sampler (ASTM D3550) driven by an automatic 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 is designated the penetration resistance or "blow count" for that particular drive. The actual blow counts recorded with the California sampler are presented on the boring logs.

Concurrently with the drilling, 11 test pits (TP1 to TP11) were excavated utilizing a CASE 580N rubber-tired backhoe equipped with an 18-inch-wide bucket. Test pits were excavated to a depths ranging from about two to 10 feet below existing site grades. Test pits were backfilled with soil cuttings that were compacted in lifts using a sheepsfoot wheel attachment.

The samples obtained with the modified California sampler were retained in 2-inch-diameter by 6-inch-long, thin-walled brass tubes contained within the sampler. Immediately after recovery, the field engineer visually classified the soil in the tubes and the ends of the tubes were sealed to preserve the natural moisture contents. Bulk samples of the surface and near-surface materials also were collected at various locations and depths. Following classification, the plastic bags were sealed to preserve the natural moisture contents. All samples were taken to our laboratory for additional soil classification and selection of samples for testing.

The Logs of Soil Borings (Figures 3 through 13) and Logs of Test Pits (Figures 14 through 16) contain descriptions of the soils encountered in each boring and test pit. A Legend explaining the Unified Soil Classification System and the symbols used on the logs is contained in Figure 17.

C. LABORATORY TESTING

Selected undisturbed soil samples were tested to determine dry unit weight (ASTM D2937) and natural moisture content (ASTM D2216). The results of these tests are included in the boring logs at the depth each tested sample was obtained.

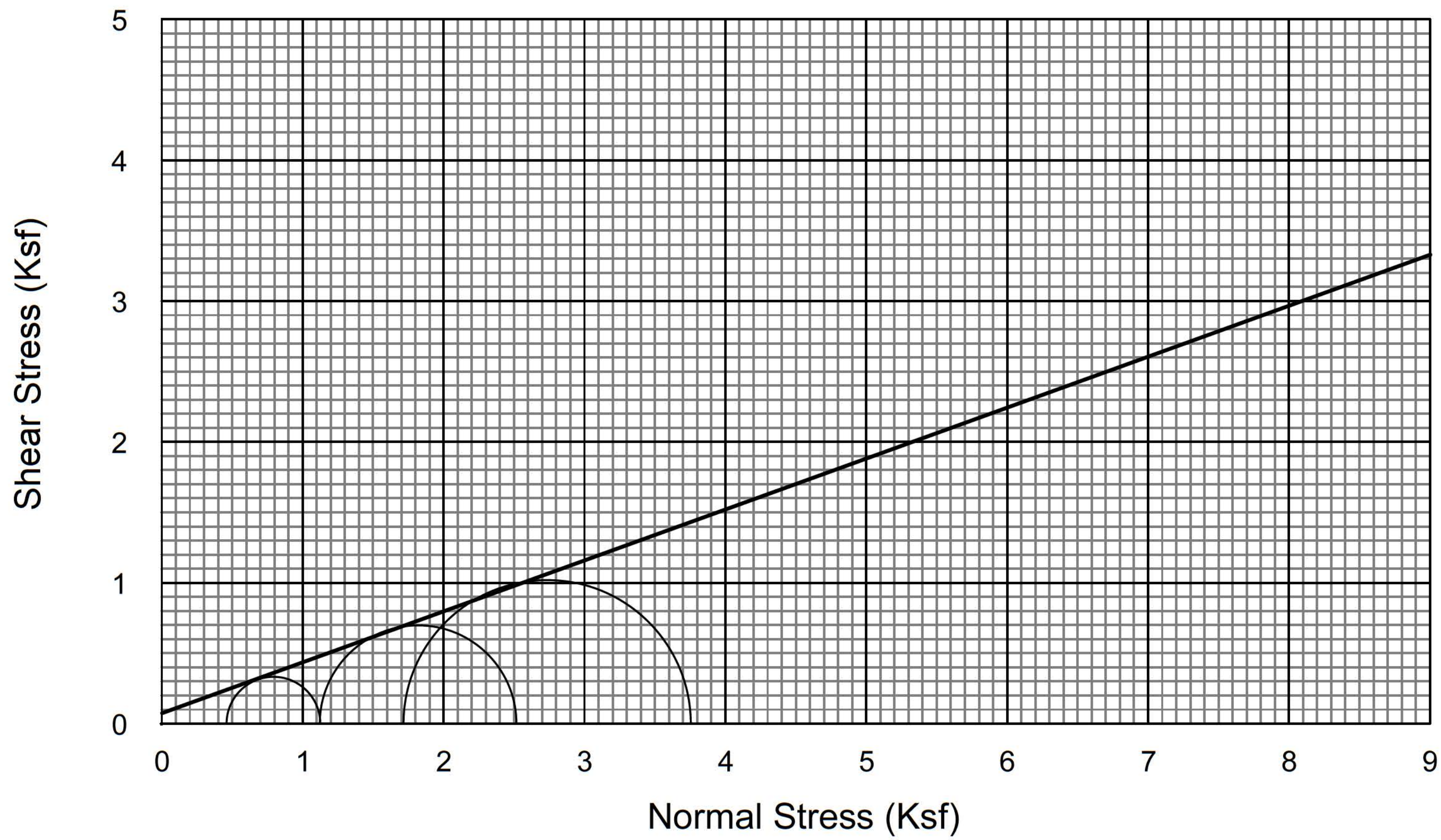
Two samples of the near-surface soil were tested for triaxial shear strength (ASTM D4767), with results presented in Figures A1 and A2.

Four representative bulk samples of anticipated pavement subgrade soils were subjected to Resistance-value ("R") testing in accordance with California Test (CT) 301. Results of the R-value tests, which were used in the pavement design, are contained in Figures A3 and A4.

Two samples of representative near-surface soil was submitted to Sunland Analytical to determine the soil pH and minimum resistivity (CT 643), Sulfate concentration (CT 417 and ASTM D516) and Chloride concentration (CT 422). The test results are presented in Figures A5 through A8.

TRIAXIAL COMPRESSION TEST

ASTM D4767



SAMPLE NO. : D5-1I

SAMPLE CONDITION : Undisturbed

SAMPLE DESCRIPTION : Brown, silty fine to medium sand

DRY DENSITY (PCF) : 116

INITIAL MOISTURE (%) : 5.5

FINAL MOISTURE (%) : 13.9

ANGLE OF INTERNAL FRICTION (ø) : 19.9°

COHESION (PSF) : 95

WallaceKuhl & ASSOCIATES

TRIAXIAL COMPRESSION TEST RESULTS

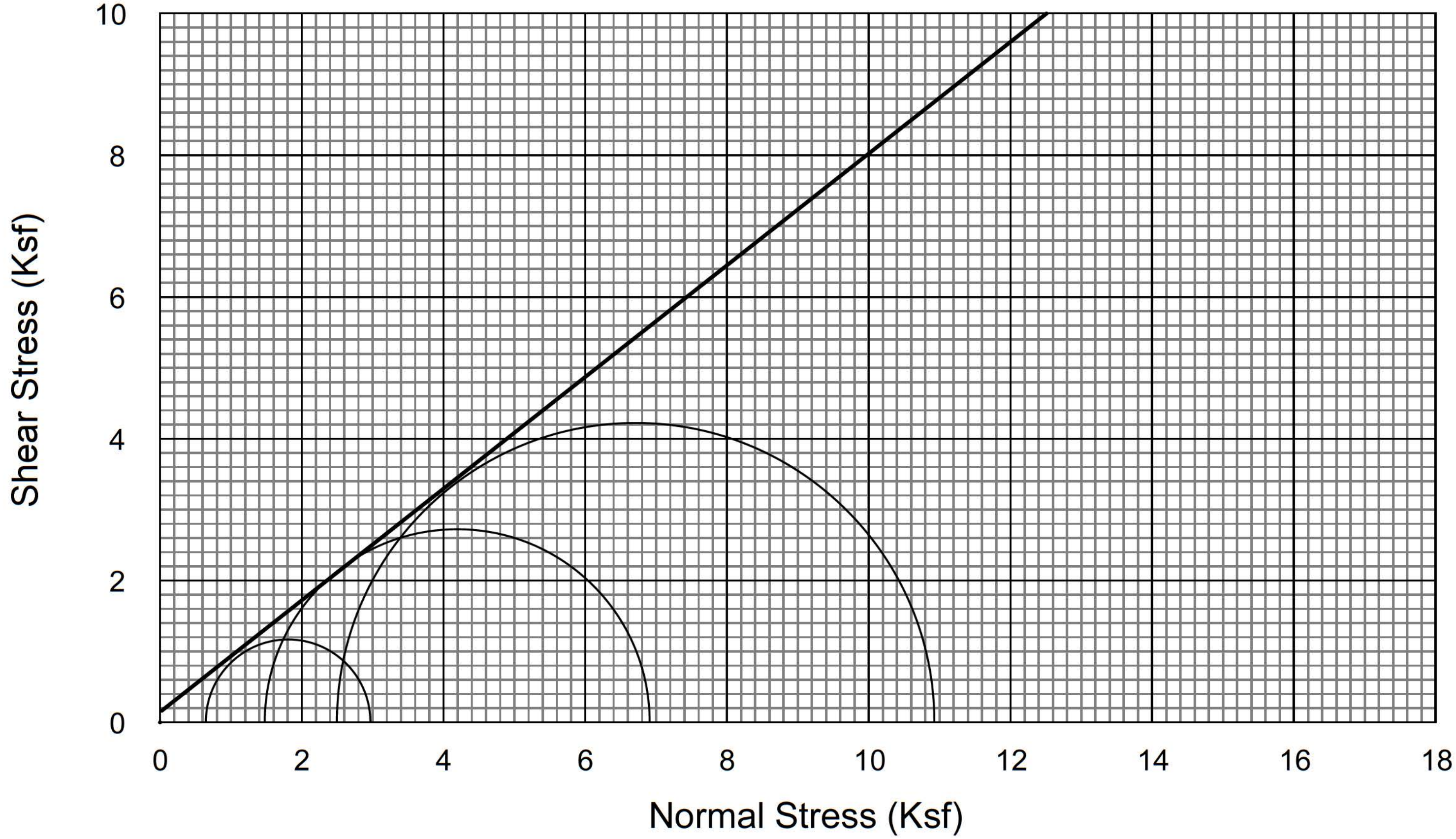
ROCKLIN COLLEGE SQUARE

Rocklin, California

FIGURE	A1
DRAWN BY	RWO
CHECKED BY	JRY
PROJECT MGR	DCD
DATE	06/16
WKA NO.10958.02	

TRIAXIAL COMPRESSION TEST

ASTM D4767



SAMPLE NO. : D9-1I

SAMPLE CONDITION : Undisturbed

SAMPLE DESCRIPTION : Brown, silty fine to medium sand

DRY DENSITY (PCF) : 136
INITIAL MOISTURE (%) : 5.0
FINAL MOISTURE (%) : 5.5

ANGLE OF INTERNAL FRICTION (ø) : 38.2°
COHESION (PSF) : 92

WallaceKuhl & ASSOCIATES

TRIAXIAL COMPRESSION TEST RESULTS

ROCKLIN COLLEGE SQUARE

Rocklin, California

FIGURE	A2
DRAWN BY	RWO
CHECKED BY	JRY
PROJECT MGR	DCD
DATE	06/16
WKA NO. 10958.02	

RESISTANCE VALUE TEST RESULTS

(California Test 301)

MATERIAL DESCRIPTION: Light brown, silty fine to medium sand

LOCATION: TP2 (0' - 2')

Specimen No.	Dry Unit Weight (pcf)	Moisture @ Compaction (%)	Exudation Pressure (psi)	Expansion (dial, inches x 1000)	Expansion (psf)	R Value
1	126	10.2	124	0	0	46
2	125	9.3	247	12	52	78
3	125	8.6	780	21	91	81

R-Value at 300 psi exudation pressure = 80

MATERIAL DESCRIPTION: Light brown, silty fine to medium sand

LOCATION: TP5 (0' - 2')

Specimen No.	Dry Unit Weight (pcf)	Moisture @ Compaction (%)	Exudation Pressure (psi)	Expansion (dial, inches x 1000)	Expansion (psf)	R Value
1	128	8.7	301	0	0	78
2	127	9.2	141	0	0	69
3	128	8.3	504	7	30	81

R-Value at 300 psi exudation pressure = 78

WallaceKuhl & ASSOCIATES

RESISTANCE VALUE TEST RESULTS

ROCKLIN COLLEGE SQUARE

Rocklin, California

FIGURE	A3
DRAWN BY	RWO
CHECKED BY	JRY
PROJECT MGR	DCD
DATE	06/16
WKA NO.	10958.02

RESISTANCE VALUE TEST RESULTS

(California Test 301)

MATERIAL DESCRIPTION: Light brown, silty fine to medium sand

LOCATION: TP9 (0' - 3')

Specimen No.	Dry Unit Weight (pcf)	Moisture @ Compaction (%)	Exudation Pressure (psi)	Expansion (dial, inches x 1000)	Expansion (psf)	R Value
1	126	10.2	128	1	4	38
2	125	9.3	380	10	43	79
3	126	9.7	224	2	9	65

R-Value at 300 psi exudation pressure = 78

MATERIAL DESCRIPTION: Light brown, silty fine to medium sand

LOCATION: TP11 (0' - 3')

Specimen No.	Dry Unit Weight (pcf)	Moisture @ Compaction (%)	Exudation Pressure (psi)	Expansion (dial, inches x 1000)	Expansion (psf)	R Value
4	123	9.0	453	8	35	79
5	124	9.5	156	1	4	72
6	124	9.2	216	5	22	74

R-Value at 300 psi exudation pressure = 76

WallaceKuhl & ASSOCIATES

RESISTANCE VALUE TEST RESULTS

ROCKLIN COLLEGE SQUARE

Rocklin, California

FIGURE	A4
DRAWN BY	RWO
CHECKED BY	JRY
PROJECT MGR	DCD
DATE	06/16
WKA NO.	10958.02

Sunland Analytical

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

Date Reported 05/20/2016
Date Submitted 05/16/2016

To: David Dean
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 : SOIL Site ID : TP-3 @ 0-3 FT.
Thank you for your business.

* For future reference to this analysis please use SUN # 71875-150007.

EVALUATION FOR SOIL CORROSION

Soil pH	5.27	
Minimum Resistivity	5.63 ohm-cm (x1000)	
Chloride	7.9 ppm	00.00079 %
Sulfate	6.1 ppm	00.00061 %

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

WallaceKuhl & ASSOCIATES	CORROSION TEST RESULTS ROCKLIN COLLEGE SQUARE Rocklin, California	FIGURE A5
		DRAWN BY: REO
		CHECKED BY: JRY
		PROJECT MGR: DCD
		DATE: 06/16
		WKA NO. 10958.02

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

Date Reported 05/20/2016
Date Submitted 05/16/2016

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

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

The reported analysis was requested for the following:
Location : SOIL Site ID : TP-3 @ 0-3 FT.
Thank you for your business.

* For future reference to this analysis please use SUN # 71875-150008.

Extractable Sulfate in Water

TYPE OF TEST	RESULTS	UNITS
Sulfate-SO4	6.94	mg/kg

ASTM D-516 from sat.paste extract-reported based on dry wt.

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

Date Reported 05/20/2016
Date Submitted 05/16/2016

To: David Dean
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 : SOIL Site ID : TP-8 @ 0-3 FT.
Thank you for your business.

* For future reference to this analysis please use SUN # 71875-150009.

EVALUATION FOR SOIL CORROSION

Soil pH	5.35		
Minimum Resistivity	7.50	ohm-cm (x1000)	
Chloride	6.7 ppm	00.00067	%
Sulfate	10.0 ppm	00.00100	%

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

WallaceKuhl & ASSOCIATES

CORROSION TEST RESULTS

ROCKLIN COLLEGE SQUARE

Rocklin, California

FIGURE	A7
DRAWN BY	REO
CHECKED BY	JRY
PROJECT MGR	DCD
DATE	06/16
WKA NO.	10958.02

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

Date Reported 05/20/2016
Date Submitted 05/16/2016

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

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

The reported analysis was requested for the following:
Location : SOIL Site ID : TP-8 @ 0-3 FT.
Thank you for your business.

* For future reference to this analysis please use SUN # 71875-150010.

Extractable Sulfate in Water

TYPE OF TEST	RESULTS	UNITS
Sulfate-SO4	9.22	mg/kg

ASTM D-516 from sat.paste extract-reported based on dry wt.

APPENDIX B
Guide Earthwork Specifications

APPENDIX B

GUIDE EARTHWORK SPECIFICATIONS

ROCKLIN COLLEGE SQUARE

Sierra College Boulevard & Rocklin Road
Rocklin, California

WKA No. 10958.02

PART I: GENERAL

1.1 SCOPE

a. General Description

This item shall include all clearing of on-site rubble, debris, and associated items; preparation of surfaces to be filled, filling, spreading, compaction, observation and testing of the fill; and all subsidiary work necessary to complete the grading of the site 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 sewer 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 <u>GEOTECHNICAL REPORT</u>

a. A Geotechnical Engineering Report (WKA No. 10958.02; dated June 23, 2016) has been prepared for this site by Wallace-Kuhl & Associates, Geotechnical Engineers of West Sacramento, California; telephone (916) 372-1434; facsimile (916) 372-2565. A copy is available for review at the office of Wallace-Kuhl & Associates.

b. The information contained in the report was obtained for design purposes only. The Contractor is responsible for any conclusions he/she may draw from this report; should the Contractor prefer not to assume such risk, he/she 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 <u>EXISTING SITE CONDITIONS</u>

The Contractor shall be acquainted with all site conditions. If unshown active utilities are encountered during the work, the Owner 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 <u>SEASONAL LIMITS</u>

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 II: PRODUCTS

2.1 MATERIALS

a. All fill shall be of approved local materials from required excavations, supplemented by imported fill, as necessary. Approved local materials are defined as granular on-site soils and rock fragments, smaller than twelve-inch (12") maximum particle size and free from significant quantities of rubble, rubbish and vegetation, and having been approved by the Geotechnical Engineer prior to use.

b. On-site soils will be suitable for engineered fill construction in structural areas, if free from rubbish, rubble, oversized rock greater than 12 inches (12”), and significant organic concentrations. Imported fill materials shall be approved by the Geotechnical Engineer and meet the above requirements. Imported fill materials shall have an Expansion Index not exceeding twenty (20) when tested in accordance with ASTM D4829; and, shall be of four-inch (4") maximum particle size. Import fill materials that will be used within pavement areas shall have a minimum Resistance value of fifty (50) when tested in accordance with California Test 301. Imported soils shall be free of contamination with proper documentation.

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 less than five percent (5%) passing a Number four (#4) sieve.

d. Asphalt concrete, aggregate base and other paving products shall comply with the appropriate provisions of the State of California (Caltrans) *Standard Specifications*, latest edition.

PART III: EXECUTION

3.1 LAYOUT AND PREPARATION

Layout 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 AREAS TO RECEIVE FILL

a. All rubble, rubbish and other deleterious debris shall be removed and disposed of so as to leave the areas that have been disturbed with a neat and finished appearance, free from unsightly debris. Surface grasses and weeds shall be stripped or blended into the upper twelve inches (12") of soils, only with the approval of the Geotechnical Engineer. Rocks greater than twelve inches (12") in size shall be removed from at-grade and areas to receive fill. Loose, soft or saturated soil deposits, as determined by the Geotechnical Engineer, shall be cleaned out to firm, stable undisturbed soils, and backfilled with suitable materials in accordance with these specifications. The exposed subgrades within construction areas shall be thoroughly ripped and cross-ripped to a depth of twelve inches (12") and all oversized rock fragments that are exposed shall be removed. Cross-ripping operations shall be performed in the presence of the Geotechnical Engineer. Excavations and depressions resulting from the removal of such items, as well as any existing excavations or loose, soft, saturated and organic-laden soil deposits, as determined by the Geotechnical Engineer, shall be cleaned out to firm, undisturbed soil, widened to allow access to construction equipment and backfilled with suitable materials in accordance with these specifications

b. If unstable subgrade conditions are encountered within the bottoms of the excavations, the Geotechnical Engineer shall provide alternative recommendations for stabilizing the subgrade at the time of construction and as conditions warrant.

c. The surfaces upon which fill is to be placed, as well as subgrades achieved by excavation or left at existing grade, shall be scarified to a depth of at least twelve inches (12"), thoroughly moisture conditioned, and uniformly compacted to at least ninety percent (90%) of ASTM D1557. When fill is placed on sloping terrain a level bench, at least ten feet (10') wide should be constructed at the toe of the fill. The soils exposed in the bench should be scarified to twelve inches (12"), moisture conditioned and compacted to at least ninety percent (90%) of ASTM D1557.

Undisturbed unweathered granitic rock as identified by the Geotechnical Engineer will not require scarification and compaction.

d. When the moisture content of the subgrade is below that required to achieve proper compaction, water shall be added until the proper moisture content is achieved.

e. When the moisture content of the subgrade is too high to permit proper compaction to be achieved, the subgrade shall be aerated by blading or other methods until the moisture content is satisfactory for compaction.

f. Compaction operations shall be performed in the presence of the Geotechnical Engineer who will evaluate the performance of the materials under compactive load. Unstable soil deposits, as determined by the Geotechnical Engineer, shall be excavated to a firm base and grades restored with engineered fill in accordance with these specifications.

3.3 <u>PLACING, SPREADING AND COMPACTING FILL MATERIAL</u>

a. Fills consisting primarily of soil shall be placed in level lifts not exceeding a six inch (6") compacted thickness. Fill consisting primarily of soils and rocks less than twelve inches (12") in diameter shall be placed in level lifts not exceeding an twelve-inch (12") compacted thickness. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to promote uniformity of material in each layer. These materials shall be spread and thoroughly mixed with soils to avoid excessive concentrations of rocks.

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

c. When the moisture content of the fill material is too high to permit the proper 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%) relative compaction (ASTM D1557) if a majority of the fill is soil; or if rocky.

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 six inches (6") of the final subgrade supporting buildings, foundations and slabs shall be uniformly compacted to at least ninety percent (90%) of the ASTM D1557 maximum dry unit weight.

The upper six inches (6") of the final subgrade and all aggregate base supporting pavements shall be uniformly compacted to at least ninety-five percent (95%) of the ASTM D1557 maximum dry unit weight.

Compaction shall be achieved regardless of whether final subgrade elevation is attained by filling, excavation or is left at existing grade. Final pavement processing, moisture conditioning and compaction shall be performed just prior to placement of pavement aggregate base.

3.5 TESTING AND OBSERVATION

a. Site clearing and 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 (if practical). Additional layers of fill shall not be spread until the field density tests, or performance criteria as defined in these specifications, indicate that the proper compaction 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. Compaction of rocky fill materials shall not proceed without the presence of the Geotechnical Engineer.

e. 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 Owner. No deviation from the specifications shall be made except upon written approval of the Geotechnical Engineer or Owner.

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United States Department of Agriculture

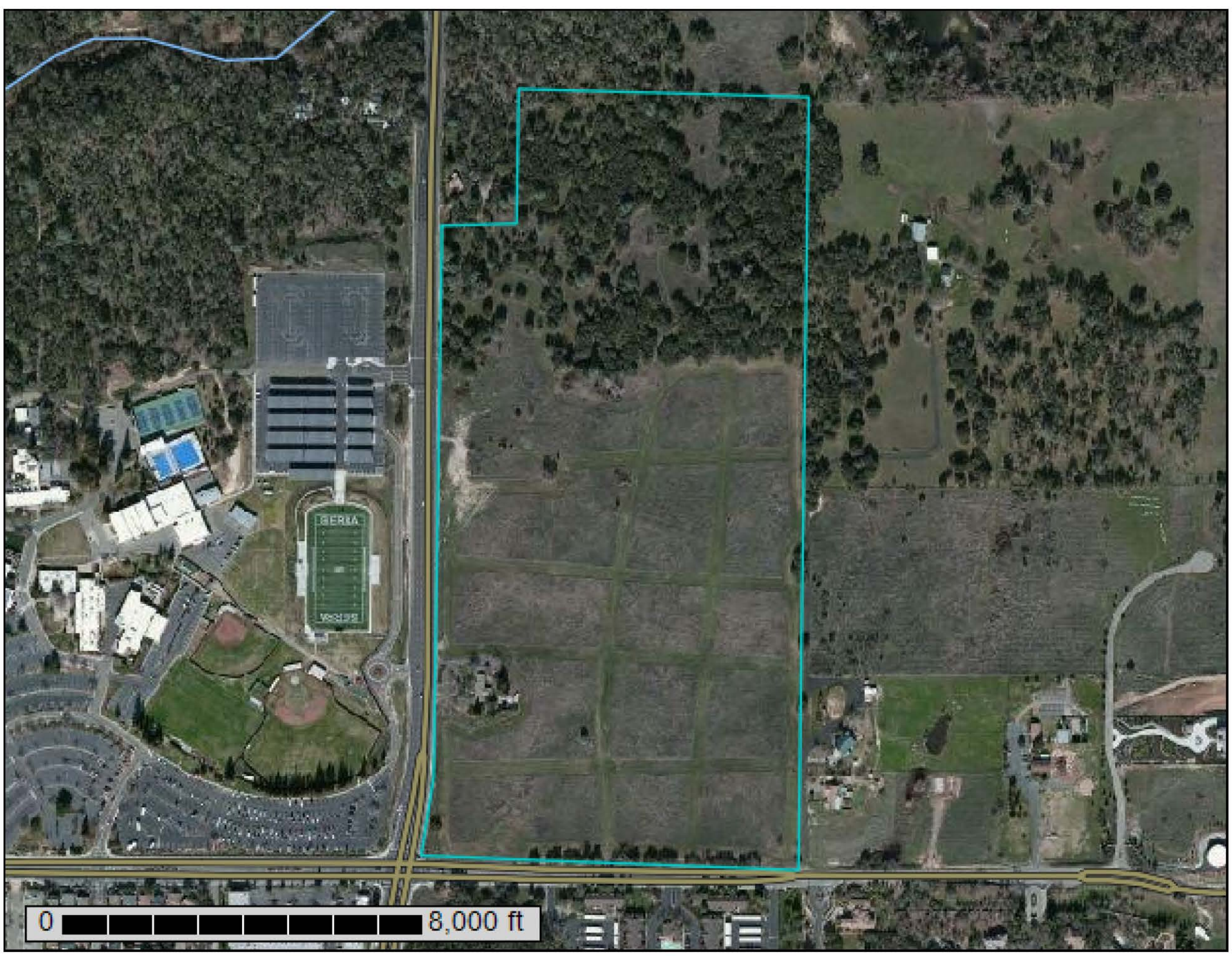
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Placer County, California, Western Part



April 25, 2016

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map


121° 12' 27" W
121° 11' 57" W
38° 47' 48" N
38° 47' 16" N
655700
655800
655900
656000
656100
656200
656300
4295700
4295600
4295500
4295400
4295300
4295200
4295100
4295000
4294900
4294800
106
107
Sierra College
SIERRA
James Dr
Rocklin Rd
Rocklin
Map Scale: 1:4,750 if printed on A portrait (8.5" x 11") sheet.
Meters
0 50 100 200 300
Feet
0 200 400 800 1200
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Placer County, California, Western Part
Survey Area Data: Version 7, Sep 17, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 15, 2011—Apr 29, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Placer County, California, Western Part (CA620)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
106	Andregg coarse sandy loam, 2 to 9 percent slopes	61.4	84.2%
107	Andregg coarse sandy loam, 9 to 15 percent slopes	11.5	15.8%
Totals for Area of Interest		**72.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Placer County, California, Western Part

106—Andregg coarse sandy loam, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: hfyf
Elevation: 200 to 1,500 feet
Mean annual precipitation: 12 to 35 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 200 to 270 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Andregg and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Andregg

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from granite

Typical profile

H1 - 0 to 15 inches: coarse sandy loam
H2 - 15 to 29 inches: coarse sandy loam
H3 - 29 to 33 inches: weathered bedrock

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: 29 to 33 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: GRANITIC (R018XD080CA)

Minor Components

Sierra

Percent of map unit: 5 percent

Caperton

Percent of map unit: 5 percent

Unnamed, mod deep

Percent of map unit: 4 percent

Unnamed

Percent of map unit: 1 percent
Landform: Drainageways

107—Andregg coarse sandy loam, 9 to 15 percent slopes

Map Unit Setting

National map unit symbol: hfyg
Elevation: 200 to 1,500 feet
Mean annual precipitation: 12 to 35 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 200 to 270 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Andregg and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Andregg

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from granite

Typical profile

H1 - 0 to 15 inches: coarse sandy loam
H2 - 15 to 29 inches: coarse sandy loam
H3 - 29 to 33 inches: weathered bedrock

Properties and qualities

Slope: 9 to 15 percent
Depth to restrictive feature: 29 to 33 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: GRANITIC (R018XD080CA)

Minor Components

Caperton, coarse sandy loam

Percent of map unit: 5 percent

Andregg

Percent of map unit: 5 percent

Sierra, sandy loam

Percent of map unit: 3 percent

Unnamed

Percent of map unit: 2 percent

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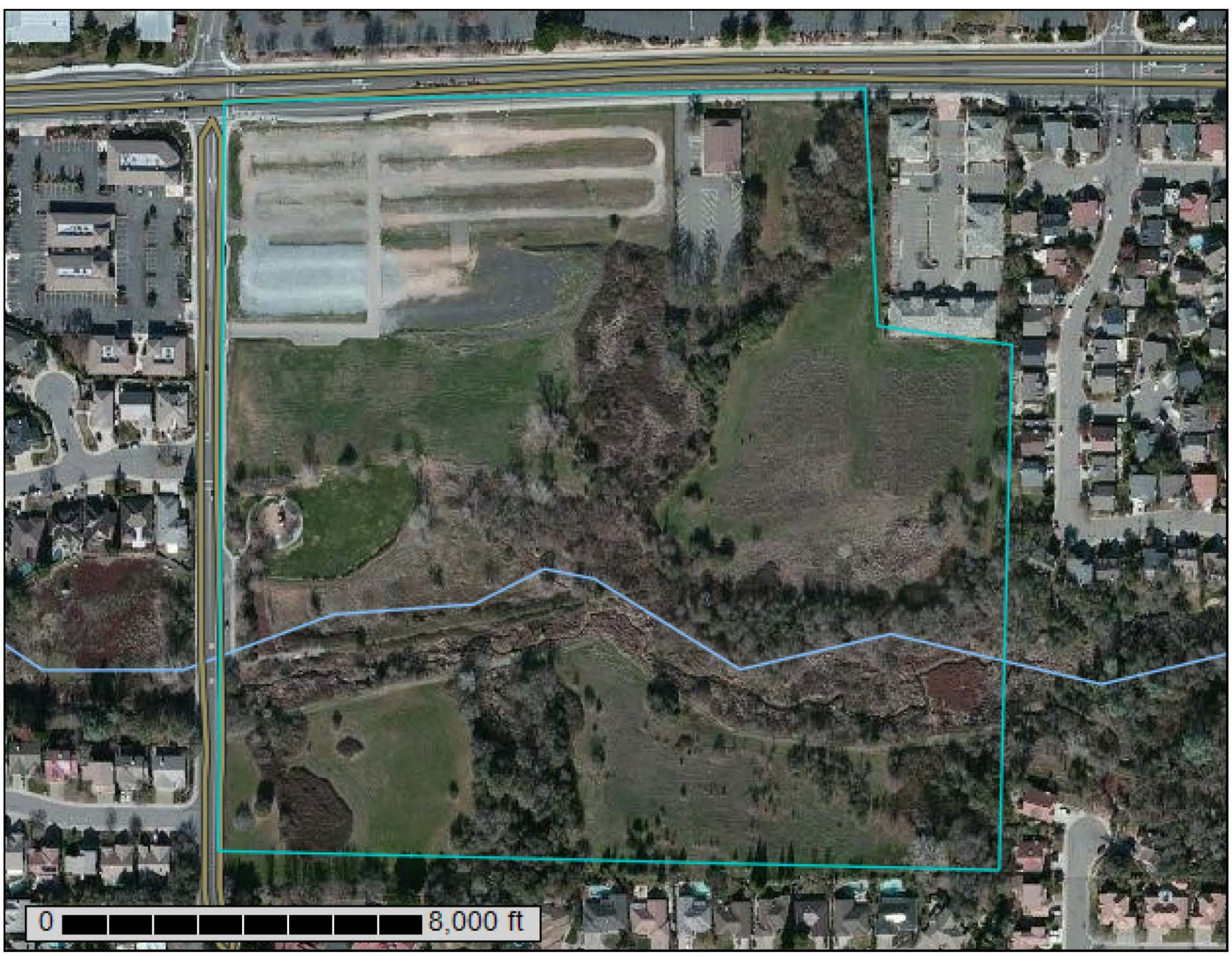
Custom Soil Resource Report for

Placer County, California, Western Part



April 25, 2016

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map


121° 13' 0" W
121° 12' 30" W
38° 47' 20" N
38° 47' 4" N
654890
654960
655030
655100
655170
655240
655310
655380
655450
655520
655590
4294840
4294770
4294700
4294630
4294560
4294490
4294420
Rocklin Rd
Rocklin
El Don
Brittany Ct
Birchwood Ct
106
194
Map Scale: 1:3,330 if printed on A landscape (11" x 8.5") sheet.
Meters
0 45 90 180 270
Feet
0 150 300 600 900
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Placer County, California, Western Part
Survey Area Data: Version 7, Sep 17, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 15, 2011—Apr 29, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Placer County, California, Western Part (CA620)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
106	Andregg coarse sandy loam, 2 to 9 percent slopes	34.6	96.5%
194	Xerofluvents, frequently flooded	1.3	3.5%
Totals for Area of Interest		**35.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Placer County, California, Western Part

106—Andregg coarse sandy loam, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: hfyf
Elevation: 200 to 1,500 feet
Mean annual precipitation: 12 to 35 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 200 to 270 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Andregg and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Andregg

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from granite

Typical profile

H1 - 0 to 15 inches: coarse sandy loam
H2 - 15 to 29 inches: coarse sandy loam
H3 - 29 to 33 inches: weathered bedrock

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: 29 to 33 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: GRANITIC (R018XD080CA)

Minor Components

Sierra

Percent of map unit: 5 percent

Caperton

Percent of map unit: 5 percent

Unnamed, mod deep

Percent of map unit: 4 percent

Unnamed

Percent of map unit: 1 percent
Landform: Drainageways

194—Xerofluvents, frequently flooded

Map Unit Setting

National map unit symbol: hg18
Elevation: 0 to 1,500 feet
Mean annual precipitation: 14 to 20 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 250 to 270 days
Farmland classification: Not prime farmland

Map Unit Composition

Xerofluvents, frequently flooded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Xerofluvents, Frequently Flooded

Setting

Landform: Drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 15 inches: stratified loamy sand to fine sandy loam
H2 - 15 to 37 inches: stratified loamy sand to fine sandy loam to silt loam
H3 - 37 to 55 inches: stratified loam to silty clay loam to clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 30 to 57 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent

Available water storage in profile: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B

Minor Components

Unnamed

Percent of map unit: 10 percent
Landform: Drainageways

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