Appendix E:

Preliminary Geotechnical Foundation Report

Project No. 70655-01
JULY 27, 2017

PRELIMINARY GEOTECHNICAL FOUNDATION REPORT

SR99 CORRIDOR BIKEWAY FACILITY, PHASE 5, OVERCROSSING FEASIBILITY 20TH ST. OVERCROSSING, CHICO, CALIFORNIA

PREPARED FOR:

DOKKEN ENGINEERING
110 BLUE RAVINE ROAD, SUITE 200
FOLSUME, CALIFORNIA 95630
O: 916.858.0642

PREPARED BY:

HOLDREGE & KULL, AN NV5 COMPANY
48 BELLARMINE COURT, SUITE 40
CHICO, CALIFORNIA 95928
O: 530.894.2487 F: 530.894.2437

WWW.HOLDREGEANDKULL.COM   WWW.NV5.COM

HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS
An NV5 Company

July 27, 2017
Project No. 70655-01

Mr. Richard Liptak, PE
Dokken Engineering
110 Blue Ravine Road, Suite 200
Folsom, California 95630

Reference: ***SR99 Corridor Bikeway Facility, Phase 5, Feasibility Study***
20th Street and SR99
Chico, California

Subject: ***Preliminary Geotechnical Foundation Report***

Dear Mr. Liptak,

This report presents our Preliminary Geotechnical Foundation Report for the proposed State Route (SR) 99 Corridor Bikeway Facility, Phase 5 Overcrossing Feasibility Study project along the east side of SR99 at 20th Street in Chico, California. Dokken Engineering has evaluated options for overcrossing and undercrossing alternatives for the Phase 5 bikeway trail improvements for the City of Chico. Because the project is currently in the initial planning stages, no final improvement plans were available at the time of our analysis. The purpose of this report is to provide preliminary geotechnical engineering information to accompany the 20th Street Overcrossing Feasibility Study.

H&K appreciates the opportunity to provide preliminary geotechnical engineering services for this important project. If you have questions or need additional information, please do not hesitate to contact the undersigned below at 530-894-2487.

Sincerely,

HOLDREGE & KULL, AN NV5 COMPANY

SHANE D. CUMMINGS No. 2492 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER CHARLES R. KULL No. 2359 GEOTECHNICAL STATE OF CALIFORNIA

Shane D. Cummings, CEG 2492
Principal Engineering Geologist

Chuck R. Kull, GE 2359, CEG 1622
Principal Engineer

TABLE OF CONTENTS

FIGURES

1 PROJECT DESCRIPTION

The State Route (SR) 99 Corridor Bikeway Facility (Bikeway 99) Phase 5, 20th Street overcrossing Feasibility Study evaluates alternative bike trial routes to establish a north-south gap closure across 20th Street, in Chico, California. The City of Chico contracted with Dokken Engineering to prepare the feasibility study report which included developing crossing alternatives and providing public outreach meeting to present the alternatives to the general public, property owners, and potential stakeholders. The alternative will become the basis for grant funding requests and will serve as the project description for the preliminary engineering phase, to be completed later.

The SR99 bikeway is a regional facility, approximately 7 miles long, that is generally parallel to the SR99 corridor from the southern limits of the City of Chico to the northern City limits. Three phases of the Class 1 bikeway have been constructed with Phase 4 currently undergoing preliminary engineering. Phase 5 will close the gap between Phase 3 at HWY 32 and Phase 4 which travels from Skyway to Business Park Driveway. The feasibility study considers multiple overcrossing alternatives and an undercrossing alternative for crossing East 20th Street. The purpose of this limited scope evaluation is to compile available site and surrounding data and past reports that document potential subsurface conditions.

1.1 PHYSICAL SETTING

1.1.1 Climate

The SR99 Corridor Bikeway Facility Phase 5 is located on the east side of SR99 in the City of Chico. The average high temperature in July and August is 94° F and the average low temperature in December and January is 35° F. The average yearly rainfall is 26.61 inches, with the majority of the rain falling between November and March.

1.1.2 Topography

The SR99 Corridor Bikeway Facility Phase 5 is located in relatively flat terrain with constructed landscape and streetscape slightly sloping terrain at an elevation of approximately 229 feet above mean sea level (MSL) at the southern extent to approximately 220 feet above MSL on the northern extent. The 20th Street overcrossing of SR99 is constructed of an earth fill embankment with 2:1 side slopes and an elevation range from 227 feet at the base of the intersection with the on and off ramps, to approximately 230 feet at the top of the roadway overcrossing.

1.2 *PROPOSED IMPROVEMENTS*

Based on information provided by Dokken Engineering, H&K understands that up to four overcrossing alternatives, two at grade crossing alternatives, and one undercrossing have been evaluated for the final study. At this time, no as-built plans are available for the existing 20th Street overcrossing bridge.

2 PREVIOUS DATA

As-built data for the 20th Street overcrossing of SR99 was not available. There were no geotechnical reports associated with the existing commercial buildings and improvements within the footprint of the Phase 5 bikeway study. However, H&K reviewed geotechnical reports for projects located within the area and stratigraphically the same geologic units.

- Kleinfelder, 2010. *Geologic Hazards Evaluation and Geotechnical Report, Butte Community College – Austin Center, 2480 Notre Dame Boulevard, Chico, California.* April 1.

  The Kleinfelder report was prepared for the design of the remodeling improvements for the Skyway Center. Kleinfelder performed a subsurface investigation by drilling borings through the interior concrete slabs of the existing buildings and in limited areas of the parking lot and driveway areas. Five exploratory borings were advanced using a Simco 2800 drill rig equipped with hollow stem augers and a 140 pound slide hammer. The borings were advanced to depth ranging from 1.5 feet to 3.5 feet below ground surface where refusal in cobbles occurred in each boring. The boring logs indicate that the subsurface soil is predominately a clayey Gravel (GC) with cobbles. Laboratory testing indicates that the soil is low plasticity with a plasticity index from 7 to 14 with less than 27% passing a number 200 mesh sieve. Kleinfelder performed laboratory testing to determine the corrosive potential of the soil to buried metals and concrete. Based on the testing, the site soil is considered corrosive to buried metal objects. Groundwater was not encountered in the borings, however Kleinfelder reported encountering perched water in the two borings advanced into the parking lot and driveway areas. The perched water was located in the aggregate base rock section below the pavement and above the clayey Gravel (GC) native soil unit. Based on the findings of the site investigations, Kleinfelder concluded that the geotechnical conditions that may influence the project design and construction included:

    - Potential for generation of oversized cobbles and boulders from excavations.
    - Perched water.

  Kleinfelder provided recommendations for earthwork grading spread foundations and concrete slab-on-grade floors for new construction.

H&K reviewed the follow daily field reports prepared during site inspections and observations for the Carport PV arrays installed at the Butte College Chico Center

Located at 2320 Forest Avenue, in Chico, California (approximately 1,200 feet northwest of the subject site):

- Holdrege & Kull, 2010. *Geotechnical Field Report, Butte Community College, Chico Center Phase II Solar, DSA Application Number 02-111515, H&K project number 70345A-01PW,* August 16 through August 27.

H&K was contracted with Butte Community College to perform construction quality assurance special inspection and testing during the installation of the carport PV arrays at the Butte College Chico Center. The design build was performed by Chico Electric and DPR Construction. H&K performed fulltime observations during drilling of each pier foundation. The pier design was not based on site specific geologic and geotechnical conditions. Instead the design professional used the lowest allowable bearing capacity presented in the 2010 California Building Code to develop a conservative and acceptable foundation schedule approved for use by DSA. The drilled piers were designed with a 24-inch-diameter and a 12.25-foot embedment depth. Subcontractor Construction Plus first attempted to drill the foundations using a Bobcat S300 equipped with 20-inch-diameter solid flight augers. Refusal in dense cobbles was encountered at approximately 3 feet below ground surface. Cal Electro, Inc from Redding was brought in to complete the drilling using a Texoma 600 Pressure Drill Line Truck equipped with a 24-inch-dimeter augers. A total of 51 drilled piers were completed during a three week period, with most borings averaging approximately 25 to 45 minutes to setup and complete. The piers were advanced into the same clayey Gravel (GC) soil and geologic unit described in the Kleinfelder geotechnical report prepared for the Butte College Skyway Center.

- Holdrege & Kull, 2017. *Geotechnical Engineering Investigation Report, Holiday Inn Express Hotel & Suites, Springfield Drive, Chico, CA, H&K project number 70643-01,* February 1.

H&K performed a site investigation to characterize the existing surface and subsurface soil, rock and groundwater conditions encountered and evaluated the field and laboratory site data, proposed site improvements and used this information to develop geotechnical engineering design recommendations for earthwork and structural improvements. H&K used engineering judgment to extrapolate H&K's observations and conclusions regarding the field and laboratory data to other onsite areas located between and beyond the locations of H&K's subsurface exploratory excavations. H&K excavated of a total of 3 exploratory soil trenches at the project site with a backhoe equipped with a 12-inch-wide bucket. The trenches were excavated to depths ranging from approximately 2 to 10 feet below the existing ground surface (bgs). Bedrock refusal or refusal within competent to highly weathered rock, cobbles or cemented, hard-consolidated soil did occur in all of the subsurface exploratory excavations. At the time of the site investigation the groundwater was encountered at the top surface of a stratigraphically continuous clayey gravel (GC) unit. H&K believes that the encountered groundwater is most likely perched within the GC unit due to the prolonged rain storms events during the 2016/2017 winter. H&K performed a seismic refraction microtremor survey to represent the in-situ shear wave velocity (Vs) profile of the soil underlying the site. The seismic survey data are interpreted by the SeisOpt® ReMi™ Vs100 method to determine the in-situ shear-wave (S-wave) velocity profile of the first 100-feet (30 meters) of soil beneath a site in accordance with the 2016 California Building Code (CBC) Site Class in accordance with Chapter 16, Section 1613.3.2 and Chapter 20 of the American Society of Civil Engineers (ASCE) publication ASCE 7-10. The resulting subsurface shear wave model for the site indicates that the harmonic mean seismic shear wave velocity for the upper 100 feet of the subsurface is 2,260 feet per second (ft/sec). This weighted shear wave velocity corresponds to a soil classification of Site Class C, a Very Dense Soil and Soft Rock profile as described in ASCE 7-10, Chapter 20, Section 20.3, Table 20.3-1. Based on the subsurface soil conditions and the results of the SeisOpt® ReMi™ Vs100 findings, and the age of the geologic units, H&K concluded that the site soils should not undergo liquefaction in the event of earthquake shaking caused by nearby faults. H&Ks' foundation recommendations include conventional spread, strip and perimeter foundations typical for lightly loaded wood frame construction, retaining wall parameters, concrete-slab-on grade floors, and flexible asphalt concrete (AC) pavement designs. The AC pavement design was based on Caltrans Design Method D301 using a site specific resistance value of 11.

- Holdrege & Kull, 2011. *Geotechnical Engineering Investigation Report, for Chico Unified School District Solar Installations at Chapman Elementary School, 1071 East 16th Street, Chico, CA, H&K project number 70361-01-3,* June 3.

H&K performed a site investigation to characterize the existing surface and subsurface soil, rock and groundwater conditions encountered and evaluated the field and laboratory site data, proposed site improvements and used this information to develop geotechnical engineering design recommendations for earthwork and structural improvements for carport cantilevered photovoltaic arrays supported of cast-in-drilled-hole concrete piers across the school parking lot. H&K drilled exploratory borings to up to depths of 7.5 feet where auger refusal was encountered in very dense, cemented gravel and cobbles. , performed SeisOpt® ReMi™ Vs100 survey. H&K performed a seismic refraction microtremor survey at the CES campus using the SeisOpt® ReMi™ Vs30 method to determine the in-situ shear-wave (S-wave) velocity profile of the first 100-feet (30 meters) of soil beneath the site. The resulting subsurface shear wave model for the site indicates that the harmonic mean seismic shear wave velocity for the upper 100 feet of the subsurface was 1,430 feet per second. This weighted shear wave velocity corresponds to the Site Class C, a Very Dense Soil and Soft Rock, as described in Table 1613A.5.2 of the 2010 California Building Code. Groundwater was not encountered during the site investigation, however H&K reported that seasonal infiltration may be encountered if the piers are constructed during or immediately following the wet weather seasons. H&K's primary concern regarding the project site is the presence of variably cemented clayey gravel at relatively shallow depth which may be resistant to excavation. Furthermore, our experience with similar materials in the area has revealed that the presence of coarse gravel and cobble-sized rock fragments can limit the use of relatively small diameter augers. The report included site specific deep foundation recommendations using cast-in-drilled-hole piers.

3 WORK PERFORMED

3.1 PURPOSE

The purpose of this report is to provide preliminary geotechnical engineering input to the preliminary design of the SR99 Corridor Bikeway Facility Phase 5, 20th Street Overcrossing Feasibility Study.

3.2 SCOPE

H&K's scope of work for the preliminary foundation report consisted of the following tasks:

- Site visits to observe the general site conditions;
- Review of generalized soil and groundwater conditions based on existing data from surrounding site and projects;
- Review of preliminary seismic information and qualitative assessment of geologic hazards such as seismicity, fault ground rupture hazards, liquefaction potential, and seismic settlement;
- Provided preliminary foundation types for support of the new structure; and
- Provided preliminary conclusions regarding construction considerations related to the project.

3.3 GENERAL CONDITIONS

Holdrege & Kull prepared the conclusions, preliminary recommendations, and professional opinions of this report in accordance with the generally accepted geotechnical principles and practices at this time and location. This report was prepared for the exclusive use of Dokken Engineering and their authorized agents. It may not contain sufficient information for the purposes of design. If any changes are made to the project as described in this report, the conclusions and preliminary recommendations contained in this report should not be considered valid unless H&K reviews the changes and modifies and approves, in writing, the conclusions and recommendations of this report. This report and the drawings contained in this report are intended for preliminary consideration; they are not intended to act as construction drawings or specifications.

This report should be considered preliminary and did not include a design-level geotechnical investigation, laboratory testing, or detailed engineering analysis. Therefore, we have not identified drainage or subsurface soil/rock conditions onsite.

The scope of services did not include any environmental assessments for the presence or absence of hazardous/toxic materials in the soil, surface water, groundwater, or atmosphere. Any statements, or absence of statements, in this report or data presented herein regarding odors, unusual or suspicious items, or conditions observed are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous/toxic assessments.

4 SITE CONDITIONS

4.1 GEOLOGIC SETTING

The City of Chico and State Route 99 Corridor Bikeway Facility Phase 5 project area is situated in the Sacramento Valley within the Great Valley geologic province west of the boundary with the Cascade geologic province. The Great Valley geologic province is characterized as an asymmetrical synclinal trough composed of up to 80,000 feet thick sequenced of Jurassic and Eocene age marine sedimentary units deposited during periods of inundation and Pliocene to recent Holocene age terrestrial sediments originating from the Sierra Nevada, Cascade, and Coast Mountain Ranges during sea recession and periods of mountain uplift.

The Cascade geologic province is characterized by Pliocene age volcanic sequences of lahars and lava flows that cover the pre-Cenozoic metamorphic and plutonic rocks of the northern Sierra Nevada (Wakabayashi and Sawyer, 2001). The Cascade volcanic rocks are composed of a coalescing sequence of Pliocene age andesitic lahars, and andesitic and basaltic lava flows. The volcanogenic deposits of the Late Pliocene age Tuscan Formation are well exposed in the deep stream incision of Chico Creek and Butte Creek east and southeast of the subject area.

Base on review of the *Geologic Map of the Chico Quadrangle*, published by the California Division of Mines and Geology (Saucedo and Wagner, 1992), the geology immediately underlying the subject site is comprised of Modesto Formation alluvium fluvial deposited during the Pleistocene Epoch (1.5 Million Years to 11,000 before present). The Modesto Formation is characterized as distinct alluvial terraces and some alluvial fans and abandoned channel ridges comprised of unweathered gravel, sand, silt and clay (Helley, J., Harwood, D., 1985). The Modesto Formation alluvium is derived from the Tuscan Formation (Harwood, et al. 1981). According to the *Geologic Map of the Chico Monocline and Northeastern Part of the Sacramento Valley, California* (Harwood, et al. 1981), the Tuscan Formation is a series of Pliocene lahars and interbedded tuffs, overlying Paleozoic age metamorphic, auriferous channel deposits, and marine sedimentary rocks. The Tuscan Formation is a wedge-shaped mass, which tilts and thins southwestward. Superimposed on this form are several folds and numerous fractures with small to negligible offset (Lydon, 1967). The Tuscan Formation extends west into the Sacramento Valley. The Quaternary age alluvial and fluvial deposits of the Sacramento Valley overly the Tuscan Formation.

Regional faulting is associated with the northern extent of the Foothill Fault System which includes the Chico Monocline, Cohasset Ridge Fault, Paradise Fault, Magalia

Fault, and the Cleveland Hill Fault. The Foothill Fault System is a broad zone of northwest trending east dipping normal faults formed along the margin of the Great Valley and the Sierra Nevada geologic provinces on the western flank of the Sierra Nevada and southern Cascade mountain ranges. The northern part of the fault zone is split into three branches: the Melones fault zone to the east, the Cleveland Hills fault to the south, and Chico Monocline to the north and northeast.

H&K reviewed the Official Maps of Earthquake Fault Zones delineated by the California Geological Survey through December 2010, on the internet at *http://www.quake.ca.gov/gmaps/WH/regulatorymaps.htm*. These maps are updates to Special Publication 42, Interim Revision 2007 edition *Fault Rupture Hazard Zones in California*, which describes active faults and fault zones (activity within 11,000 years), as part of the Alquist-Priolo Earthquake Fault Zoning Act. Special Publication 42 and the 2010 on-line update indicate that the site is not located within an Alquist-Priolo active fault zone. There are currently no proposed earthquake fault zone maps in the vicinity of Chico, California

According to the *Fault Activity Map of California and Adjacent Areas* (Jennings, 1994), the closest known active fault which has surface displacement within Holocene time (about the last 11,000 years) is the Cleveland Hills Fault. The 2010 Fault Activity Map of California by the California Geological Survey, (*http://www.quake.ca.gov/gmaps/FAM/faultactivitymap.html#*), Geologic Data Map No. 6 shows the nearest known active faults with surface displacement within Holocene time (about the last 11,000 years) to be the Cleveland Hill Fault. The mapped fault zone is located approximately 25 miles south of the subject site and is associated with ground rupture during the Oroville earthquakes of 1975.

4.2 GROUNDWATER CONDITIONS

4.3 GROUNDWATER CONDITIONS IN THE AREA

Based on geotechnical and environmental investigations performed within the vicinity, it is possible that shallow groundwater may be present within 15 to 20 feet below the existing ground surface. Groundwater dewatering and moisture barrier systems have been designed and installed for subsurface structures, such as basements, within the area. The foundations for an overcrossing are assumed to consist of cast-in-drilled hole (CIDH) piers that would be advanced into the dense gravelly soil below and should expect to encountered groundwater. If an undercrossing is proposed for review, it is possible during the wet weather seasons, shallow groundwater may be encountered in deep excavations which would require dewatering. Dewatering, if necessary, could most likely be controlled with dewatering sumps.

4.4 IDEALIZED SOIL PROFILE

The upper 5 to 10 feet of soil will most likely consist of stiff silty and clay, underlain by medium dense to dense clayey sand and clayey gravel with cobbles, alternating with stiff to hard sandy clay. The dense, cemented, lahar of the Tuscan Formation may be encountered between 60 feet to 80 feet below ground surface.

5 SEISMIC SETTING

Based on the site observations and considering the geology of the region, H&K's opinion is that the risk of seismically induced hazards such as lateral spreading, liquefaction, ground lurching, seismically induced settlement, and surface rupture are remote at the project site. The project site should be considered susceptible to ground shaking as a result of seismic activity associated with faults at locations some distance from the project site.

5.1 PEAK GROUND ACCELERATION

A search of controlling faults in the area was performed in accordance with current Caltrans Seismic Design Criteria (Caltrans 2013). H&K utilized the 2007 Caltrans Deterministic PGA Map (Merriam and Shantz, 2007), and Caltrans ARS Online (Caltrans 2017), a website based on the Caltrans 2007 Fault Database that is continuously updated. ARS Online displays information for faults included in the fault database and calculates both deterministic and probabilistic acceleration response spectra (ARS).

Based on review of the fault database and use of ARS Online, the controlling fault for the project site is the Great Valley 01 Zone. Based on results of Caltrans seismic design procedures using ARS online and comparison with results generated by the 2008 USGS Interactive Deaggregation Tool, a maximum considered (2,475-year return period) peak ground acceleration of 0.246g (determined from US Seismic Design Map at https://earthquake.usgs.gov/designmaps/us/application.php using site class C) should be used for the site.

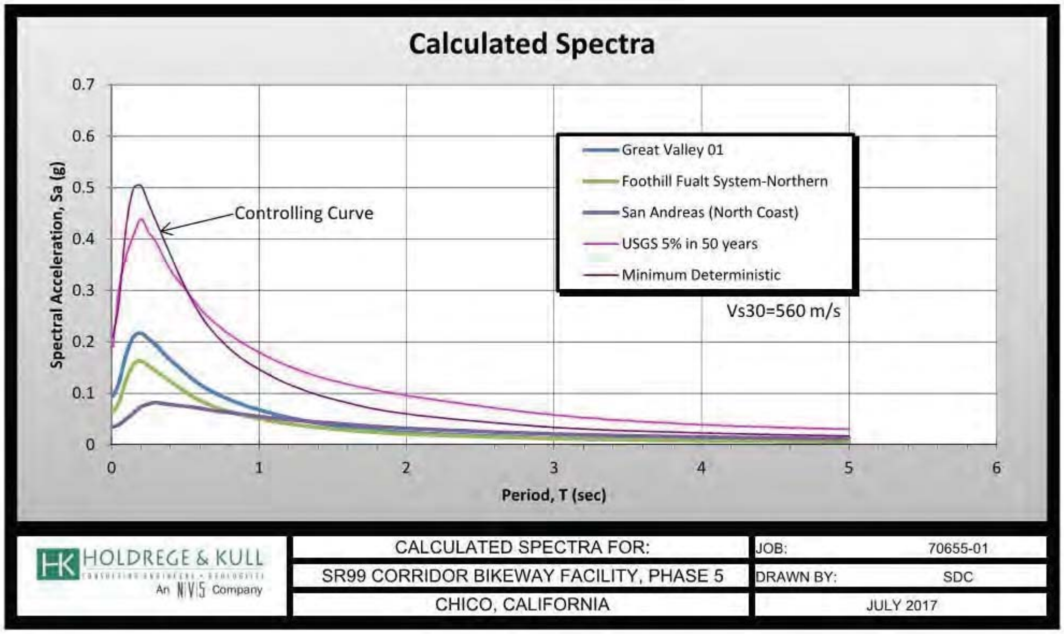
5.2 DESIGN RESPONSE SPECTRA

A design acceleration response spectra (ARS) curve for the site was developed using ARS Online (Caltrans Version 2.3.09), per Caltrans Seismic Design Criteria (2013). Based on the site geology, we estimated that the underlying geologic conditions meet Soil Profile Type "C" as described in Appendix B of Caltrans (2013), which equate to a rock with shear wave velocity 1,200 < Vs100 < 2,500 ft/s (360m/s < Vs30 < 760 m/s). Based on that Soil Profile Type and the causative fault being the Great Valley 01 Fault, the ARS Response Spectra (Figure 5.2.1 below) presents the recommended ARS for the project site.

We have compared the site specific ARS curves with the minimum deterministic ARS curve for California. The site specific deterministic ARS curves for the causative faults are below the minimum deterministic ARS curve for California; therefore, the minimum deterministic ARS curve should be used during project design.

Figure 5.2.1 Acceleration Response Spectra Curve

6 FOUNDATION TYPES



6.1 SHALLOW AND DEEP FOUNDATIONS

Based on our experience, we anticipate that the soil/rock conditions will consist of 5 to 10 feet of stiff silty and clay, over up to 20 feet of dense, slightly cemented clayey gravel and cobbles. Depths to competent material will need to be determined for the new bridge/overcrossing abutments. Based on the depth to competent material, shallow spread foundations may be used for smaller structures. If spread footings are being considered, the permissible net contact stress of 3,000 to 5,000 pounds per square foot (psf) would be reasonable.

Deep foundations should be used to support overcrossing abutments and bents should be embedded into competent clayey gravel or hard sandy clay materials ranging from approximately 25 to 50 feet below existing grade. H&K recommends for cast-in drilled hole (CIDH) pier design methods employing lateral bearing approaches, such as the traditional CBC approach for constrained or non-constrained foundations. For depths greater than 25 feet below the ground surface, H&K anticipates an allowable end bearing capacity of 4,000 to 6,000 psf may be reasonable for CIDH pier design. In order to utilize end bearing values for CIDH pier design, the excavations must be cleaned thoroughly with a spin bucket capable of removing loose material from the bottom of the shaft. If end bearing is used for the design, skin friction should be considered as an additional factor of safety.

6.2 DRIVEN PILES OR MICRO PILE ALTERNATIVES

A deep foundation system such as HP 14x89 driven piles or micropiles could be a cost effective value engineering approach to foundations. H&K anticipates that the piles would be on the order of 20 to 30 feet below the bottom of the abutment footing.

6.3 RETAINING WALLS

We anticipate that retaining walls will be constructed to retain the abutments and ancillary/wing walls for the bridge/overcrossing or walkways. Retaining walls could consist of Caltrans Type 1 walls.

6.4 PRELIMINARY GRADING RECOMMENDATIONS

6.4.1 Import Fill

Prior to importation to the site, the source generator should document that the import fill meets the guidelines set forth by the California Environmental Protection Agency

(CalEPA) Department of Toxic Substances Control (DTSC) in their 2001 *Information Advisory, Clean Imported Fill Material*. This advisory represents the best practice for characterization of soil prior to import for use as engineered fill. The project geotechnical engineer should approve all proposed imported fill soil for use in constructing engineered fills at the site. In general, fill should consist of soil with a Uniform Soil Classification System (USCS) of GP, GM, SM, SP, SW, SC or ML. The soil should have a plasticity index of 15 or less with a maximum grain size of 3 inches, and should be free of organics (less than 3% by weight).

6.5 *CONSTRUCTION CONSIDERATIONS*

Construction sequencing may force the contractor to shore the abutment excavation during construction of the new foundation. Vertical shoring may be necessary in some cases to support the installation of driven piles or ancillary/wing wall footings. We anticipate that soldier beam and wood lagging tie back walls would be used. Vertical and horizontal shoring would be required to support excavations for undercrossing. The undercrossing should anticipate requiring dewatering during construction and designed to resist groundwater infiltration and intrusion during the wet weather seasons.

7 CLOSURE

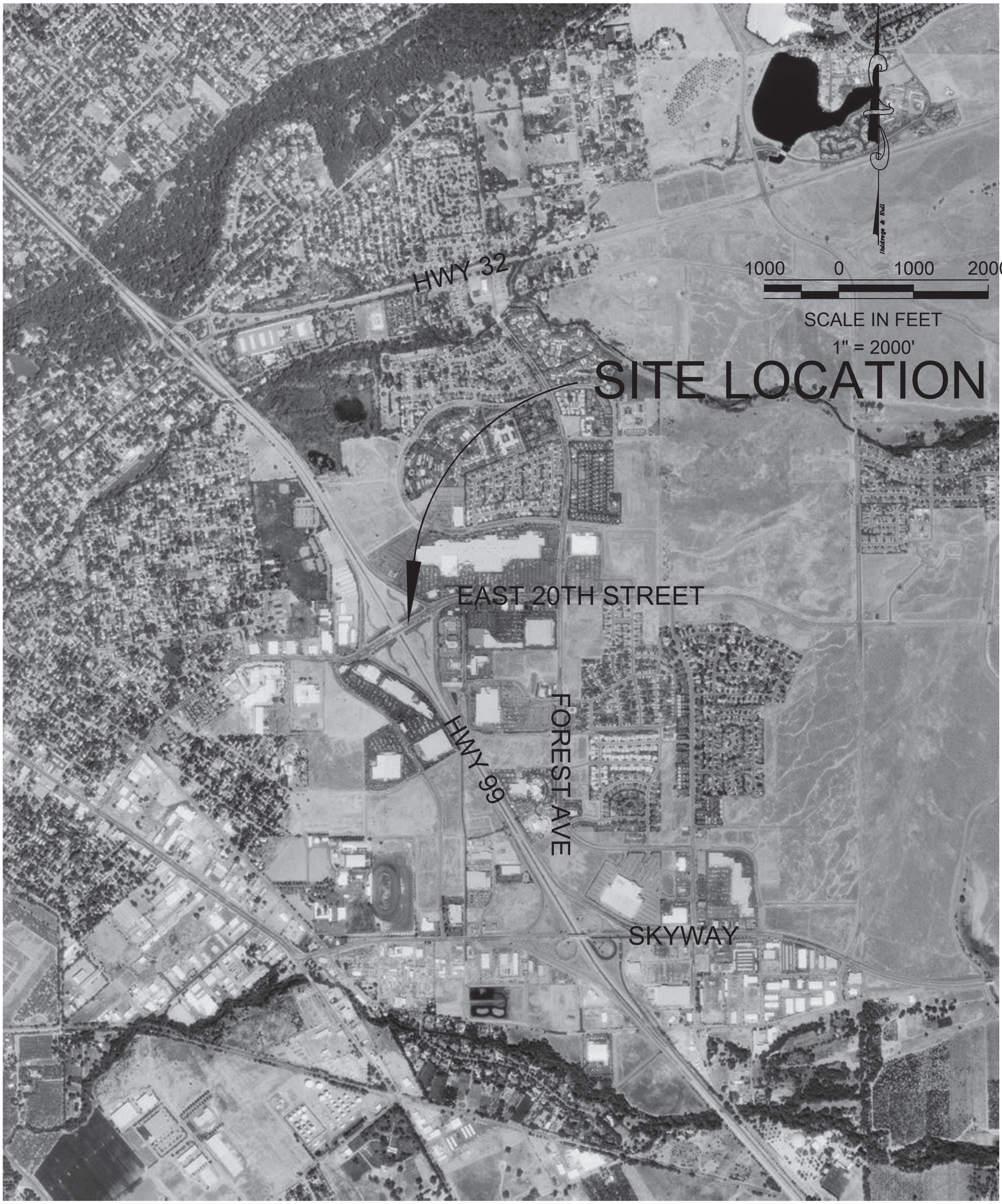
This Preliminary Foundation Report was prepared for Dokken Engineering and their authorized agents for use in planning and preliminary design of the proposed SR99 Corridor Bikeway Facility Phase 5 Project.

The scope of services did not include any environmental assessments for the presence or absence of hazardous/toxic materials in the soil, surface water, groundwater, or atmosphere. Any statements, or absence of statements, in this report or data presented herein regarding odors, unusual or suspicious items, or conditions observed are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous/toxic assessments.

8 LIMITATIONS

The following limitations apply to the findings, conclusions and recommendations presented in this report:

1. H&K's professional services were performed consistent with the generally accepted geotechnical engineering principles and practices employed in the region. No warranty is expressed or implied.
2. These services were performed consistent with H&K's agreement with the client. H&K is not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of our services. H&K does not warrant the accuracy of information supplied by others, or the use of segregated portions of this report. This report is solely for the use of our client unless noted otherwise. Any reliance on this report by a third party is at their sole risk.



70655DOK/FIG1

HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS
48 BELLARMINE CT., STE 40
CHICO, CA 95928
(530) 894-2487 FAX 894-2437

SITE LOCATION MAP

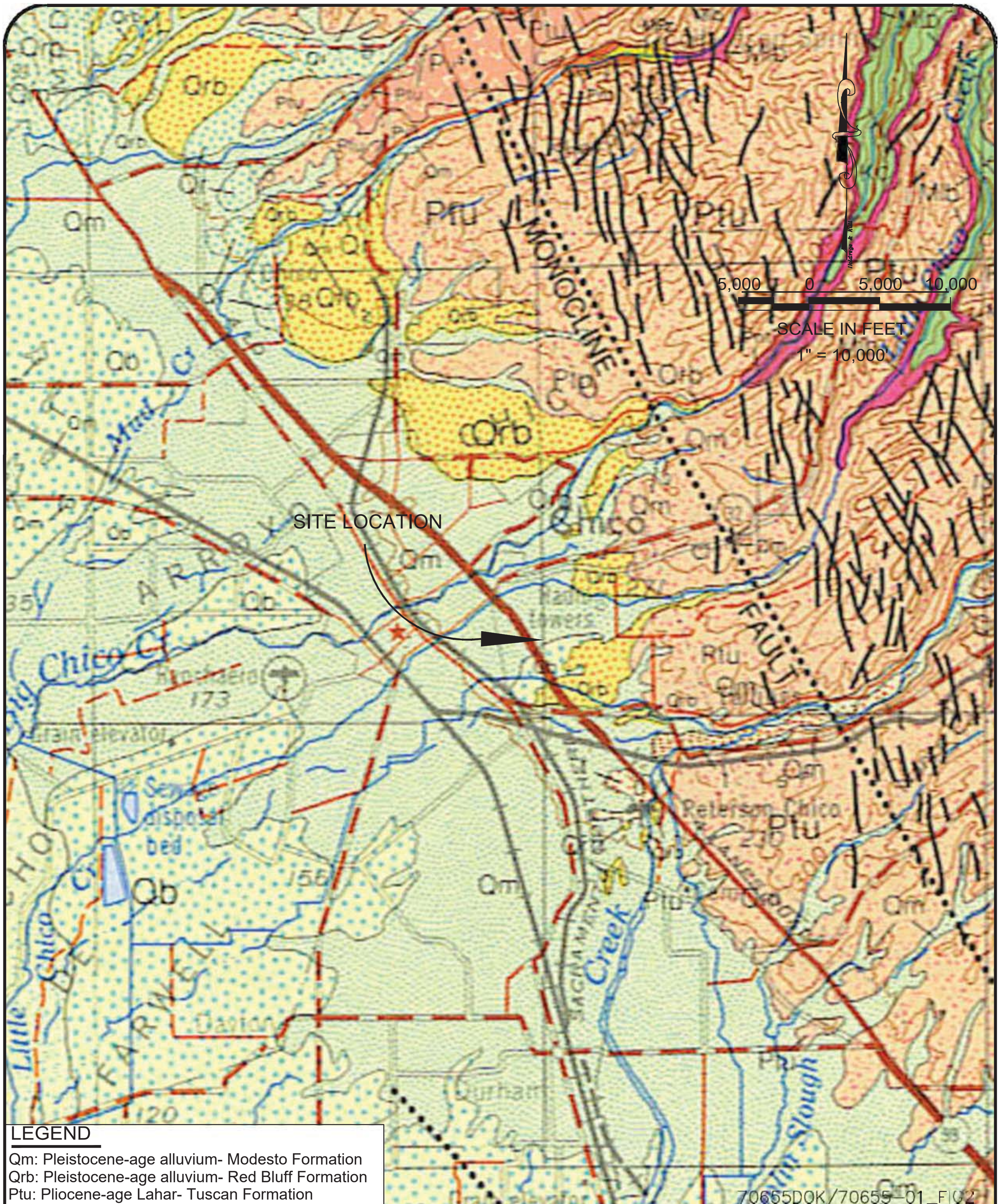
SR99 CORRIDOR BIKEWAY FACILITY
PHASE 5 FEASIBILITY STUDY

CHICO, BUTTE COUNTY, CALIFORNIA

PROJ NO.: 70655-01

DATE: JULY,2017

FIGURE NO.: 1



LEGEND

Qm: Pleistocene-age alluvium- Modesto Formation
Qrb: Pleistocene-age alluvium- Red Bluff Formation
Ptu: Pliocene-age Lahar- Tuscan Formation

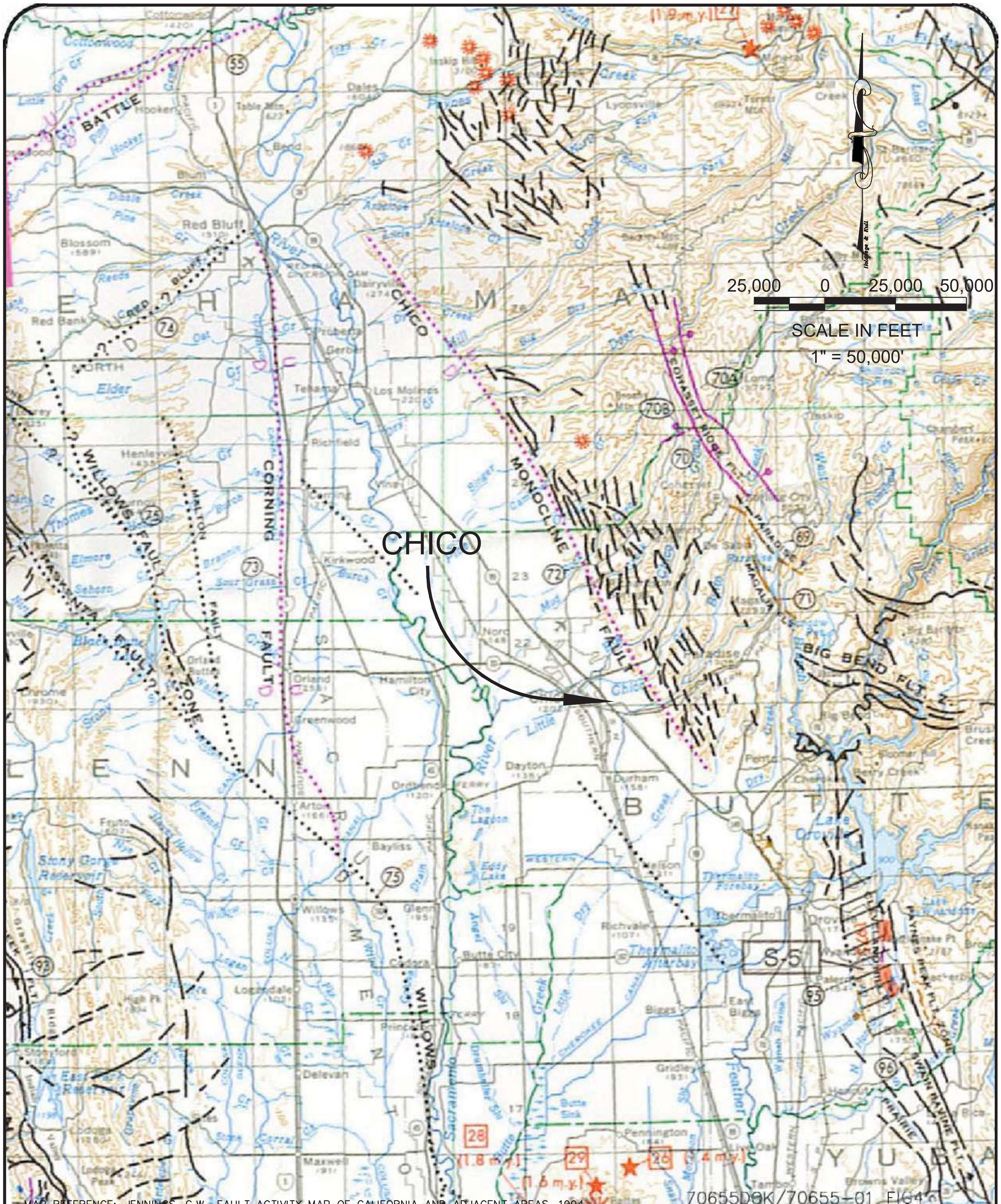
HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS
48 BELLARMINE CT, STE 40
CHICO, CA 95928
(530) 894-2487 FAX 894-2437

GEOLOGIC MAP OF CHICO AREA
SR99 CORRIDOR BIKEWAY, PHASE 5
CHICO, BUTTE COUNTY, CALIFORNIA

PROJ NO.: 70655-01

DATE: JULY,2017

FIGURE NO.: 2



HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS

48 BELLARMINE CT, STE 40
CHICO, CA 95928
(530) 894-2487 FAX 894-2437

FAULT ACTIVITY MAP OF
CHICO AREA
CHICO, BUTTE COUNTY, CALIFORNIA

PROJ NO.: 70655-01

DATE: JULY,2017

FIGURE NO.: 3