Interstate 580 Safety Lighting and Power Supply Installation Project

ALAMEDA COUNTY, CALIFORNIA
DISTRICT 4 – ALA – 580 (PM R1.3/ R6.0)
EA 04-0K680/ EFIS 0416000125

Initial Study with Mitigated Negative Declaration

Prepared by the
State of California, Department of Transportation

The environmental review, consultation, and any other actions required by applicable Federal environmental laws for this project are being, or have been, carried out by Caltrans pursuant to 23 USC 327 and the Memorandum of Understanding dated December 23, 2016 and executed by FHWA and Caltrans

April 2020

This page is left blank intentionally.

General Information about This Document

The California Department of Transportation (Caltrans) has prepared this Initial Study (IS) with Mitigated Negative Declaration (MND), which examines the potential environmental impacts of the proposed Interstate 580 Safety Lighting and Power Supply Installation Project (project) located near the City of Livermore in Alameda County, California. Caltrans is the lead agency under the California Environmental Quality Act (CEQA). This document explains why the project is being proposed, the existing environment that could be affected by the project, potential impacts, and the proposed avoidance and minimization measures, and/or mitigation measures. The IS circulated to the public for 31 days between October 14 and November 14. Comments received during this period are included in Chapter 3. Elsewhere throughout this document, a vertical line in the margin indicates a change made since the draft document circulation. Minor editorial changes and clarifications have not been so indicated.

Alternate formats:
Printed copies of this document are available upon request. For individuals with sensory disabilities, this document can be made available in Braille, in large print, or digital audio. To obtain a copy in one of these alternate formats, please call or write to the California Department of Transportation, District 4-Office of Environmental Analysis, Attn: Sabrina Dunn, Associate Environmental Planner, P.O. Box 23660, MS-8B, Oakland, CA 94623-0660; (510) 286-6025 (Voice), or use the California Relay Service 1 (800) 735-2929 (TTY), 1 (800) 735-2929 (Voice) or 711.

This page is left blank intentionally.

SCH #2019109033
04-ALA-580-PM R1.3/ R6.0
EA 04-0K680
EFIS 0416000125

IMPROVE EXISTING ROADWAY CONDITIONS and ENHANCE TRAFFIC SAFETY by INSTALLING SAFETY LIGHTING along EASTBOUND INTERSTATE 580 from WEST GRANT LINE ROAD UNDERCROSSING to NORTH FLYNN ROAD OVERCROSSING near the CITY of LIVERMORE in ALAMEDA COUNTY (POSTMILE R1.3 to POSTMILE R6.0)

Initial Study with Mitigated Negative Declaration

Submitted Pursuant to: (State) Division 13, California Public Resources Code

THE STATE OF CALIFORNIA
Department of Transportation

Responsible Agencies: California Transportation Commission and California Department of Fish and Wildlife

4/17/2020
Date of Approval

Melanie Brent
Deputy District Director
Division of Environmental Planning and Engineering
California Department of Transportation
CEQA Lead Agency

The following individual may be contacted for more information about this document:

Caltrans, District 4-Office of Environmental Analysis
ATTN: Ms. Sabrina Dunn, Associate Environmental Planner
P.O. Box 23660, MS-8B
Oakland, CA 94623-0660

This page is left blank intentionally.

Mitigated Negative Declaration

Pursuant to: Division 13, Public Resources Code

Project Description

The California Department of Transportation (Caltrans) proposes to construct the Interstate 580 (I-580) Safety Lighting and Power Supply Installation Project to improve existing roadway conditions and enhance traffic safety on the Altamont Pass. This will be accomplished by installing lighting along eastbound I-580 from West Grant Line Road Undercrossing to North Flynn Road Overcrossing near the City of Livermore in Alameda County (Postmile [PM] R1.3 to PM R6.0). The project will also install new power poles and electrical vaults on the southern side of the same expanse of I-580 to provide power for the lighting.

Determination

This Mitigated Negative Declaration (MND) is included to give notice to interested agencies and the public that it is Caltrans' intent to adopt an MND for this project. This does not mean that Caltrans' decision regarding the project is final. This MND is subject to change based on comments received by interested agencies and the public.

Caltrans has prepared an Initial Study (IS) for this project and, following public review, has determined from this study that the proposed project would not have a significant effect on the environment for the following reasons:

The proposed project would have no effect on agriculture and forest resources, air quality, cultural resources, geology and soils, hazards and hazardous materials, hydrology/water quality, land use and planning, mineral resources, noise, population and housing, public services, recreation, transportation and traffic, tribal cultural resources, and utilities and service systems.

With standard conservation measures, avoidance and minimization measures, and mitigation measures, the proposed project would have less than significant effects to aesthetics and less than significant impacts to biological resources, specifically the California tiger salamander (*Ambystoma californiense*; CTS) and California red-legged frog (*Rana draytonii*; CRLF).

Melanie Brent

Melanie Brent
Deputy District Director
Office of Environmental Analysis
California Department of Transportation
District 4

April 17, 2020

Date

This page is left blank intentionally.

Table of Contents

List of Figures

List of Tables

List of Appendices

Chapter 1 Proposed Project

1.1. Introduction

The California Department of Transportation proposes the (Caltrans) Interstate 580 (I-580) Safety Lighting and Power Supply Installation Project (project) to improve existing roadway conditions and enhance traffic safety by installing lighting along eastbound (EB) I-580 from West Grant Line Road Undercrossing to North Flynn Road Overcrossing near the City of Livermore in Alameda County (postmile [PM] R1.3 to PM R6.0). The total length of the project is 4.7 miles. The Project Vicinity Map is shown below in Figure 1.

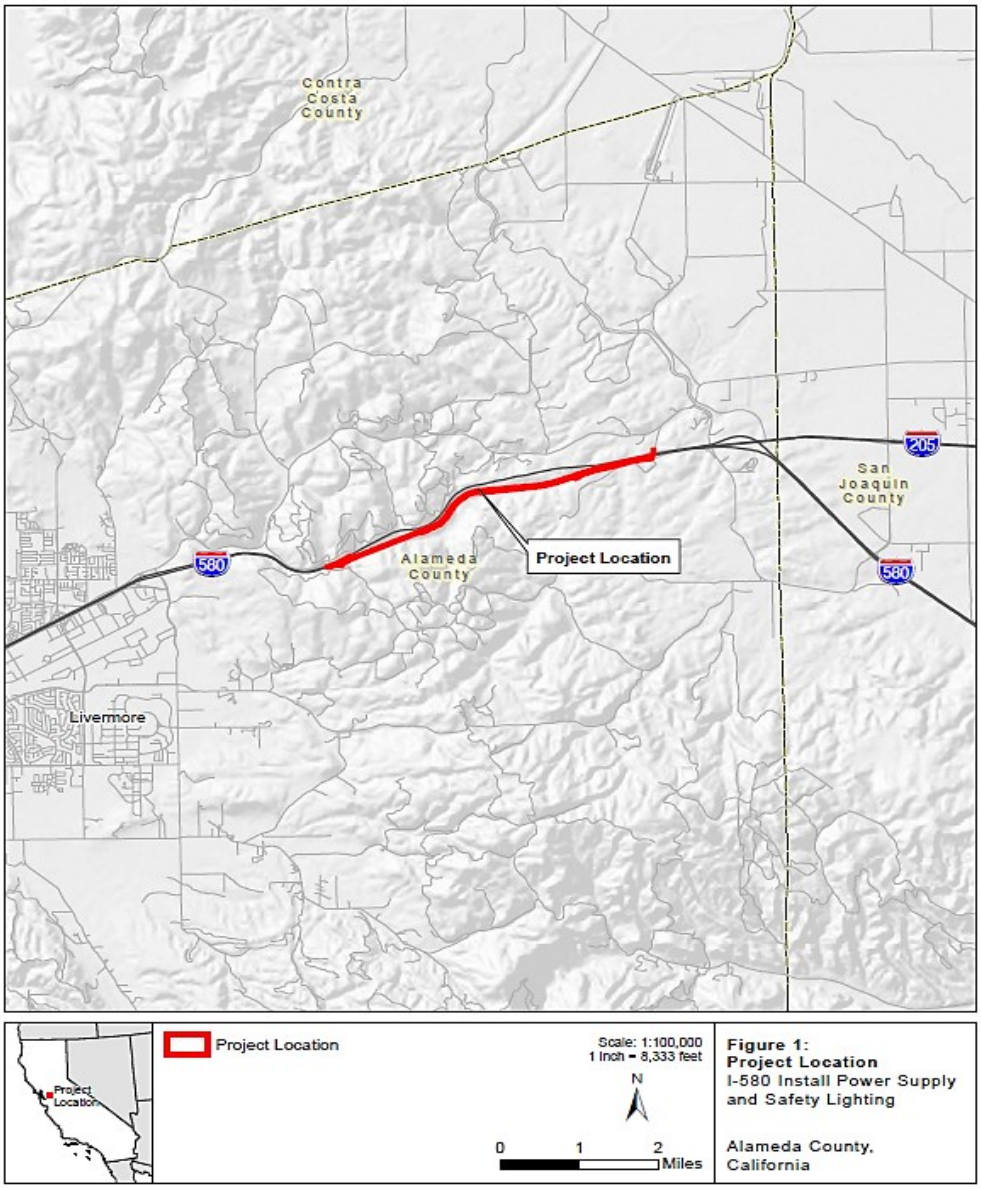


Figure 1. Project Vicinity Map

1.2. National Environmental Policy Act (NEPA) Assignment

California participated in the "Surface Transportation Project Delivery Pilot Program" (Pilot Program) pursuant to 23 U.S. Code (USC) 327 for more than five years, beginning July 1, 2007 and ending September 30, 2012. MAP-21 (P.L. 112-141), signed by President Obama on July 6, 2012, amended 23 USC 327 to establish a permanent Surface Transportation Project Delivery Program. As a result, Caltrans entered into a Memorandum of Understanding (MOU) pursuant to 23 USC 327 (NEPA Assignment MOU) with the Federal Highway Administration (FHWA). The National Environmental Policy Act (NEPA) Assignment MOU became effective October 1, 2012 and was renewed on December 23, 2016 for a term of five years. Under the NEPA Assignment MOU, Caltrans continues to assume FHWA responsibilities under NEPA and other federal environmental laws in the same manner as was assigned under the Pilot Program, with minor changes. With the NEPA Assignment MOU, the FHWA assigned, and Caltrans assumed, all of the U.S. Department of Transportation (USDOT) Secretary's responsibilities under NEPA. This assignment includes projects on the State Highway System and Local Assistance Projects off of the State Highway System within the State of California, except for certain categorical exclusions (CEs) that the FHWA assigned to Caltrans under the 23 USC 326 CE Assignment MOU, projects excluded by definition, and specific project exclusions.

Caltrans, as assigned by FHWA, is the federal lead agency under NEPA for this project. Caltrans is also the state lead agency under the California Environmental Quality Act (CEQA) for this project. In compliance with NEPA, Caltrans completed a CE for this project.

1.3. Background

The I-580 east corridor is an east-west route in Alameda County that begins at the I-580/I-205 interchange near the San Joaquin County/Alameda County border. It traverses westward to the I-580/State Route 238 (SR-238) split, continues along SR-238, and ends at the Interstate 880 (I-880)/SR-238 interchange in San Leandro.

The corridor is 33 miles long and provides direct connections to two major north-south freeways: Interstate 680 (I-680) and I-880. With connections to the interstate network, I-580 is a major gateway for goods movement into and out of the San Francisco Bay Area's five seaports, three commercial airports, and four rail freight terminals, and is the primary route for EB travelers destined for the Sierra Nevada Mountains and Southern California.

The segment of I-580 within the project limits is classified as a rural divided freeway that consists of steep, mountainous terrain with eight lanes, an unpaved median, a paved 8-foot-wide inside shoulder, and a paved 10-foot-wide outside shoulder. The roadway

contains a lengthy downhill section followed by several reverse and compound curves ("S"-curves) situated on a high embankment.

The safety lighting was previously part of the scope of Caltrans' I-580 Pavement Rehabilitation Project (04-3G59U4; State Clearinghouse Number 2013112047). Due to rugged terrain and the absence of a nearby electrical power source, the safety lighting was removed from the scope of work for that project. As a result, this project was initiated to program the scope and cost of installing Pacific Gas and Electric Company (PG&E) facilities within state right-of-way (ROW) to enable the electrical service connection.

1.4. Purpose and Need

The purpose of this project is to improve nighttime visibility and reduce the potential severity of accidents, while also improving maintenance worker safety on I-580 within the project limits.

Current Average Daily Traffic is 68,700 vehicles, 12.5 percent of which is truck traffic. The Caltrans Office of Traffic Safety performed a collision analysis with data obtained during the most recent three-year period available (January 1, 2015 to December 31, 2017). During that period, a total of 580 accidents occurred in this segment of EB I-580. This accident rate, measured in accidents per million vehicle miles (MVM), is higher than the expected accident rate for this type of facility statewide. On EB I-580 at PM R1.622/R5.979, for example, the accident rate is 1.45 accidents per MVM, while the statewide average for this type of facility is 0.31 accidents per MVM. Of the 580 accident records for this section of EB I-580 over three years, 158 (27%) occurred during night hours. Of all 580 accidents, about 36% resulted in injury or fatality.

The FHWA Lighting Handbook (August 2012) provides guidance concerning the application of roadway lighting. The manual discusses findings from the American Association of State Highway and Transportation Officials Highway Safety Manual. In looking at the impact of highway lighting on nighttime injury crashes on all roadway types that previously had no lighting, research has shown a resultant Crash Modification Factor of 0.72 (showing that there would be a reduction of 28 percent in nighttime injury crash types). Based on the 3-year collision analysis data for this segment of EB I-580, this lighting project could be expected to result in about five fewer nighttime injury accidents per year.

1.5. Project Description

The project will install approximately 120 light-emitting diode (LED) lighting fixtures along EB I-580 between North Flynn Road and Grant Line Road. The fixtures will be

installed approximately every 180 feet on existing foundations in the median, about 9 feet from the inside shoulder.

The lighting pole foundations, necessary pull boxes, trench excavations, trenching, and subterranean conduit were completed as part of the I-580 Pavement Rehabilitation Project. Construction for that project is expected to be completed December 2021.

To supply power for the lights, PG&E will install new underground and overhead electrical lines and power poles. A new subterranean electrical line will be installed within existing conduit from the north side of the Grant Line Road westbound (WB) on-ramp to the south side of the Grant Line Road EB off-ramp, where the subterranean power lines would transition to pole-mounted overhead power lines. An existing pull box will be replaced by a 4-foot-by-6.5-foot junction box. A new trench will be excavated to connect the electric line to the first utility pole.

The overhead electrical line would extend westward and would require approximately 48 wooden power poles, installed between about 200 to 400 feet apart. New overhead electrical lines would span approximately 3.2 miles from PM R1.5 to PM R4.7. The power poles and associated electrical lines will be south of, adjacent to, and parallel to EB I-580. Each overhead pole is approximately 22 inches in diameter, with a length of 30 to 40 feet, and will be installed to a depth of 7 feet.

Caltrans will supply power across EB I-580 at two locations. The electrical lines will be directionally bored under EB I-580 to provide power for the freeway lighting. At these two locations, service risers, conduits, and pull/junction boxes will be constructed in 20-foot by 80-foot areas at the south sides and transformer/cabinets will be constructed in 10-foot by 20-foot areas in the median behind the existing concrete barrier. The electrical lines will be installed in the conduit and connected to the lighting system.

Several project features have been developed to reduce potential lighting impacts:

- The 35-foot-tall light fixtures will have front-side shields and adjusted mast arm lengths of 15 feet to focus illumination on the roadway and limit the illumination of areas outside the paved areas on the south side of I-580.
- At PM 2.7, the existing concrete barrier will be extended about 500 feet to the east, towards Grant Line Road, to block light spillage onto roadside aquatic habitat on the south side of I-580.
- To minimize luminosity, 85-watt LED lights are proposed rather than the standard 165-watt bulbs.

The project will extend the existing concrete barrier at PM 2.7 by 500 feet to the east towards Grant Line Road. The concrete barrier will act as both a safety barrier to

prevent errant vehicles hitting an existing concrete headwall and as shade for aquatic features on the southside of I-580 from the newly installed light fixtures.

The estimated duration of construction is 120 working days. Work will take place during daylight hours. The Traffic Management Plan (TMP) and details of the construction staging for the project will be developed and refined during the next phase of project design. TMP development will be supported by detailed traffic studies to evaluate traffic operations. The need for lane closures during off-peak hours or at night, or short-term detour routes, will be identified, as required. The TMP will include press releases to notify and inform motorists, businesses, community groups, local entities, and emergency services of upcoming closures or detours. Various TMP elements such as portable Changeable Message Signs and a Construction Zone Enhanced Enforcement Program may be utilized to minimize delay to the traveling public.

The project is funded from the 2018 State Highway Operation and Protection Program, under Safety Improvements, Program Code 201.010. The total approximate cost of the project for support and capital, including construction costs, is $7,538,000.

1.6. Project Features

The project will install about 120 new LED lights, 48 new wooden electrical poles with associated overhead electrical lines, underground electrical conduit with service risers and pull/junction boxes, and new concrete barrier.

As part of the project, Caltrans would implement standard conservation measures, avoidance and minimization measures (AMMs), and standard best management practices (BMPs) as outlined in the Caltrans' 2018 Standard Specifications and the Caltrans Construction Site Best Management Practices Manual. Measures include minimizing the area of impact, conducting preconstruction surveys, implementing water quality BMPs, and other construction-site BMPs.

1.7. Permits and Approvals Needed

The following permits, licenses, agreements, and certifications are required for project construction:

- United States Fish and Wildlife Service (USFWS) Endangered Species Act Section 7 Consultation and Biological Opinion (BO), and
- California Department of Fish and Wildlife (CDFW) Section 2081 Agreement for Threatened and Endangered Species (Incidental Take Permit) for California tiger salamander.

Caltrans received a BO from USFWS on March 20, 2020. USFWS has actively participated in the NEPA process.

An application for Section 2081 Agreement will be submitted following approval of the Final Environmental Document (FED).

Chapter 2 Affected Environment, Environmental Consequences, and Avoidance, Minimization, and/or Mitigation Measures

2.1 CEQA Environmental Checklist

This checklist identifies physical, biological, social, and economic factors that might be affected by the proposed project. Potential impact determinations include Significant and Avoidable Impact, Less Than Significant Impact with Mitigation Incorporated, Less Than Significant Impact, and No Impact. In many cases, background studies performed in connection with the projects will indicate that there are no impacts to a particular resource. A “no impact” answer reflects this determination. The words "significant" and "significance" used throughout the following checklist are related to CEQA impacts. The questions in this checklist are intended to encourage the thoughtful assessment of impacts and do not represent thresholds of significance.

Standard Conservation Measures and project features, which can include both design elements of the project, standardized measures that are applied to Caltrans projects, such as BMPs, and measures included in the Standard Plans and Specifications or as Standard Special Provisions, are considered to be an integral part of the project and have been considered prior to any significance determinations documented below; see Chapter 1 for a detailed discussion of these features. All AMMs and/or Mitigation Measures are found in Appendix B.

2.1.1 Aesthetics

CEQA Significance Determinations for Aesthetics

This section is summarized from the *Visual Impact Analysis* for the proposed project, which was completed in August 2018.

The portion of I-580 within the project limits is eligible for designation as a scenic highway with views of undeveloped rolling hills covered with naturalized annual grass and scrub plantings on both sides of the highway. Existing vegetation removal is expected to be minimal.

Would the project:

a) Have a substantial adverse effect on a scenic vista?

No Impact – The proposed project area does not include any scenic vistas.

b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

No Impact – It is not anticipated that the project will adversely affect any designated scenic resource, such as a rock outcropping, tree grouping, historic property, etc., as defined by CEQA statutes or guidelines, or by Caltrans' policy.

c) Substantially degrade the existing visual character or quality of the site and its surroundings?

No Impact – The proposed safety lighting work would result in similar views from the roadway to what currently exists. The new safety lighting and PG&E poles would introduce new man-made elements to motorists, but viewers are accustomed to seeing similar lighting standards and utilities along the freeway west of the project area. Existing occasional views of the wind turbines located on the slopes of adjacent hills would remain. Based on preliminary investigation, the primary visual concerns associated with the proposed project involve the preservation of the naturalized annual grassland along the hillsides of this Eligible State Scenic Highway corridor, and the cumulative impacts of both the light and utility poles. Contractor staging areas and operations must be conducted with minimal impacts to existing hillsides and sporadic scrub areas.

The new installations will primarily be seen by EB travelers because WB I-580 is at a different elevation than EB I-580 at several locations. Views of the roadway from surrounding areas would remain similar to existing conditions. There is limited residential development within the project limits and hills along I-580 restrict views of the

project from any nearby residential areas.

The placement of aboveground utility poles on the right-side hillsides along EB I-580 would introduce another visual element familiar to the motoring public. However, the power poles are set back farther from the shoulder than the light standards and would often be screened from view by rolling hills.

d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

Less Than Significant Impact - The proposed project would introduce new lighting elements in an area that is currently illuminated by the vehicle headlights.

Caltrans contacted three lighting manufacturers to develop lighting alternatives that would limit the amount of illumination outside the paved area of I-580. One lighting manufacture (LeoTek) provided a design that utilized a reduced mounting height, short mast arm length, lower wattage bulb, and front side shielding. This option reduces overall illumination but still achieves the required illumination of the roadway. Front side shielding will also reduce the point-light source visible from outside the roadway. In comparison to the standard Caltrans highway lighting, the LeoTek alternative reduces illumination outside of the roadway by an estimated 79 percent and prevents illumination of any area outside the roadway to no greater than 0.5 lux, or the brightness between deep twilight and a full moon.

The placement of new safety lighting should be similar in type to that commonly viewed along freeways. Over time the light poles would become an extension of similar installations west of the project. Views of the roadway from surrounding areas would remain similar to existing conditions. There are no residential views of the proposed project due to the roadway being nestled between the naturalized grassy rolling hills and a lack of development within the project limits. There is no public access adjacent to the highway corridor. Overall, the project elements will not substantially affect the appearance of the highway corridor and will be visually consistent with the character of the surrounding area.

Standard Conservation Measures:

AES-1: Use lighting installations that have a dull exterior finish and are thin in silhouette.

AES-2: Minimize vegetation removal to the maximum extent feasible in order to protect and preserve existing vegetation and scenic quality.

AES-3: Plan contractor staging and operations to protect and preserve naturalized annual grassland and sporadic shrubs to the maximum extent feasible.

AES-4: After construction, treat areas cleared for contractor access and trenching operations with appropriate erosion control measures where required.

AES-5: Provide replacement highway planting, if warranted, in all areas of highway planting removal where ROW allows. Where replacement planting is not possible at the removal location, provide replacement in adjacent planting areas along the project corridor.

AMMs and/or MMs:

Less than significant impacts are anticipated; therefore, no measures are proposed.

2.1.2 Agriculture and Forest Resources

CEQA Significance Determinations for Agriculture and Forest Resources

In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment Project, and the forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board.

Would the project:

a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

No Impact – There is no prime farmland, unique farmland, or farmland of statewide importance within the project limits. All work is expected to occur within Caltrans ROW or in temporary construction easements. The land adjacent to the project limits is classified as "grazing land" by the Department of Conservation. This project does not propose changes in the use of the current roadway and will not necessitate changes in the use of adjacent properties. There are no changes anticipated to prime farmland, unique farmland, or farmland of statewide importance.

b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?

No Impact – There are no areas zoned for agricultural use or parcels under a Williamson Act contract within the project limits. All work is expected to occur within Caltrans ROW or in temporary construction easements. The land adjacent to the project limits is classified as "grazing land" by the Department of Conservation. This project does not propose changes in the use of the current roadway and will not necessitate changes in the use of adjacent properties. No conflicts with areas zoned for agricultural use or parcels under a Williamson Act contract are anticipated as a result of this project.

c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?

No Impact – There are no forest lands or timberlands within the project limits. All work is expected to occur within Caltrans ROW or in temporary construction easements. The land adjacent to the project limits is classified as “grazing land” by the Department of Conservation. This project does not propose changes in the use of the current roadway and will not necessitate changes in the use of adjacent properties. No conflicts are anticipated with areas zoned as forest land or timberland.

d) Result in the loss of forest land or conversion of forest land to non-forest use?

No Impact – There are no forest lands within the project area. The land adjacent to the project limits is classified as “grazing land” by the Department of Conservation. All work is expected to occur within Caltrans ROW or in temporary construction easements. This project does not propose changes in the use of the current roadway and will not necessitate changes in the use of adjacent properties. There are no changes anticipated to forest land.

e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?

No Impact – There are no prime farmland areas, no parcels under a Williamson Act contract, and no forest or timberlands within the project limits. All work is expected to occur within Caltrans ROW or in temporary construction easements. The land adjacent to the project limits is classified as “grazing land” by the Department of Conservation. This project does not propose changes in the use of the current roadway and will not necessitate changes in the use of adjacent properties. No conversion of agricultural land to non-agricultural use or conversion of forest land to non-forest use is anticipated as a result of this project.

AMMs and/or MMs:

No impacts are anticipated; therefore, no measures are proposed.

2.1.3 Air Quality

CEQA Significance Determinations for Air Quality

Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations.

Would the project:

a) Conflict with or obstruct implementation of the applicable air quality plan?

No Impact – The proposed project is exempt from the requirement to determine conformity per 40 Code of Federal Regulation (CFR) 93.126: Table 2 – Lighting improvements. The project will not conflict with or obstruct implementation of the air quality plan of the area, nor will it violate any air quality standards or contribute substantially to an existing air quality violation. Additionally, the project will not substantially increase any criteria pollutants that the area is in non-attainment for. Surrounding land use is rural and undeveloped; therefore, there are no sensitive receptors identified in the project area.

b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?

No Impact - The proposed project is exempt from the requirement to determine conformity per 40 CFR 93.126: Table 2 – Lighting improvements. The project will not conflict with or obstruct implementation of the air quality plan of the area, nor will it violate any air quality standards or contribute substantially to an existing air quality violation. Additionally, the project will not substantially increase any criteria pollutants that the area is in non-attainment for. Surrounding land use is rural and undeveloped; therefore, there are no sensitive receptors identified in the project area.

c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non- attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?

No Impact - The proposed project is exempt from the requirement to determine conformity per 40 CFR 93.126: Table 2 – Lighting improvements. The project will not conflict with or obstruct implementation of the air quality plan of the area, nor will it violate any air quality standards or contribute substantially to an existing air quality violation. Additionally, the project will not substantially increase any criteria pollutants that the area is in non-attainment for. Surrounding land use is rural and undeveloped; therefore, there are no sensitive receptors identified in the project area.

d) Expose sensitive receptors to substantial pollutant concentrations?

No Impact - The proposed project is exempt from the requirement to determine conformity per 40 CFR 93.126: Table 2 – Lighting improvements. The project will not conflict with or obstruct implementation of the air quality plan of the area, nor will it violate any air quality standards or contribute substantially to an existing air quality violation. Additionally, the project will not substantially increase any criteria pollutants that the area is in non-attainment for. Surrounding land use is rural and undeveloped; therefore, there are no sensitive receptors identified in the project area.

e) Create objectionable odors affecting a substantial number of people?

No Impact - The proposed project is exempt from the requirement to determine conformity per 40 CFR 93.126: Table 2 – Lighting improvements. The project will not conflict with or obstruct implementation of the air quality plan of the area, nor will it violate any air quality standards or contribute substantially to an existing air quality violation. Additionally, the project will not substantially increase any criteria pollutants that the area is in non-attainment for. Surrounding land use is rural and undeveloped; therefore, there are no sensitive receptors identified in the project area.

AMMs and/or MMs:

No impacts are anticipated; therefore, no measures are proposed.

2.1.4 Biological Resources

CEQA Significance Determinations for Biological Resources

Caltrans Office of Biological Sciences and Permits prepared a Natural Environment Study (NES) for the proposed project in July 2017. The NES documented the potential effects of the proposed alternatives on nearby biological resources. This section is summarized from the NES, which has been incorporated into this MND by reference.

Caltrans established a biological study area (BSA) to evaluate the effects of the proposed project on natural communities and other biological resources. The BSA encompasses the project footprint along with a buffer to include areas that project construction activities may directly or indirectly impact (Figure 2).

For the proposed project, the BSA consists of approximately 160 acres located within the Altamont Pass I-580 transportation corridor between the San Joaquin County line and the City of Livermore in Alameda County. The BSA is primarily composed of pavement and naturalized annual grassland, interspersed with shrublands. Due to lack of suitable habitat, no special-status plant species are expected to occur in the BSA.

Caltrans conducted a wildlife habitat assessment within the BSA in May 2018. Based on literature review, database searches, and familiarity with the region, a total of 23 special-status wildlife species were initially evaluated to determine their potential to occur within the BSA. Following the wildlife studies, 12 of these species were dropped from consideration because the project area lacks suitable habitat. The following special-status species were determined to have a low to high potential to occur within the BSA:

- California tiger salamander (*Ambystoma californiense*; CTS) – federal threatened, state threatened
- California red-legged frog (*Rana draytonii;* CRLF) – federal threatened, state species of special concern
- American badger (*Taxidea taxus*) – state species of special concern
- Bird Species
    - Tricolored blackbird (*Agelaius tricolor*) – state species of special concern
    - Western burrowing owl (*Athene cunicularia hypugaea*) – state species of special concern
    - White-tailed kite (*Elanus leucurus*) – fully protected species under California Fish and Game Code
    - California horned lark (*Eremophila alpestris actia*) – included on the CDFW's Special Animals List

    - Loggerhead shrike (*Lanius ludovicianus*) – state species of special concern
- Bat Species
    - Pallid bat (*Antrozous pallidus*) – state species of special concern
    - Townsend's big-eared bat (*Corynorhinus townsendii*) – state species of special concern
    - Hoary bat (*Lasiurus cinereus*) – included on the CDFW's Special Animals List

Figure 2. Biological Study Area

Would the project:

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

Less Than Significant Impact with Mitigation Incorporated – The project's NES details project impacts to candidate, sensitive, and special-status species determined to be present in the BSA. Caltrans biologists have determined, through completion of the biological study referenced above, that the project will have a less than significant impact on the American badger, bat species, and bird species; and, with mitigation incorporated, the project will have a less than significant impact on CTS and CRLF.

Protocol-level surveys for CTS and CRLF were not conducted for this project because of access limitations and because existing information strongly suggests that even if individuals were not found during field surveys, that may not be sufficient evidence to conclude that the species are absent from the BSA. Both CTS and CRLF are inferred to be present for the following reasons:

- The project occurs within the known range of these species;
- The presence of suitable habitat;
- There is suitable habitat within or near the project area that is connected to known occupied habitat;
- There are several documented occurrences of CTS in the California Natural Diversity Database near the project area;
- The BSA is potentially accessible to these species.

California tiger salamander (CTS)

The Central California DPS of CTS is listed as federally threatened under the Federal Endangered Species Act (FESA) and state threatened under the California Endangered Species Act (CESA). There are no documented occurrences of CTS inside of the BSA limits. However, there are 13 occurrences located within two miles of the BSA boundaries, four of which are within the dispersal range of the species. Dispersal range refers to the distance a species can travel away from an existing population.

CTS require two different habitats to complete their life cycle. The dry summer and fall months are spent in underground burrows in upland habitat. On rainy fall and winter

nights, CTS leave their burrows to feed and migrate to nearby ponds or seasonal water sources for breeding.

Suitable upland habitat in the form of grassland is present within the BSA, but there is no designated critical habitat or suitable breeding habitat inside of the BSA. Critical habitat is the specific areas within the geographic area occupied by the species at the time it was listed that contain the physical or biological features that are essential to the conservation of endangered and threatened species and that may need special management or protection. There are numerous documented CTS occurrences in ponds within two miles of the BSA boundary, so it is possible that adults may travel into the BSA from surrounding suitable habitat areas.

Due to the presence of known populations and potential breeding ponds within dispersal range of the BSA, Caltrans has inferred the presence of CTS throughout the BSA.

California red-legged frog (CRLF)

The CRLF is listed as federally threatened under the FESA and as a state species of special concern under the CESA. There are seventeen recorded occurrences of CRLF within 2 miles of the BSA boundaries, five of which are within 1 mile of the BSA. Of these five occurrences, four occur in ponds, streams, or wetlands.

Approximately 16 acres of designated CRLF critical habitat is present within and adjacent to the BSA. Critical habitat is determined based on the presence of physical and biological Primary Constituent Elements (PCE) that are essential to the conservation of a species. For CRLF, these elements include:

1. Aquatic breeding habitat. Aquatic breeding habitat consists of standing bodies of fresh water, including: natural and man-made ponds, slow-moving streams or pools within streams, and other ephemeral or permanent water bodies that typically become inundated during winter rains and hold water for a minimum of 20 weeks.

2. Non-breeding aquatic habitat. Non-breeding aquatic habitat consists of freshwater habitats that may not hold water long enough to be suitable for breeding, but that do provide potential for shelter, foraging, predator avoidance, and aquatic dispersal. Non-breeding habitat may include plunge pools within intermittent creeks, seeps, quiet water sanctuary areas during high water flows, and springs of sufficient flow to withstand the summer dry period.

3. Upland habitat. Upland habitat provides shelter, foraging, and predator avoidance areas. These areas are located within 200 feet of the edge of aquatic and riparian habitat and consist of grasslands, woodlands, or wetland/riparian

vegetation. Upland habitat can include features such as boulders, rocks, downed trees, small mammal burrows, and moist leaf litter.

4. Dispersal habitat. Dispersal habitat, which allows for movement between occupied sites, consists of accessible upland or riparian habitat within designated critical habitat units located between occupied locations within 0.70 mile of each other. Dispersal habitat includes natural and altered habitats that do not contain barriers. Barriers may include heavily traveled roads constructed without culverts or bridges. Dispersal habitat does not include moderate-to-high-density urban or industrial development, large reservoirs, or areas that do not contain other PCEs.

The critical habitat within the BSA contains few PCEs for CRLF. No aquatic breeding habitat occurs within the critical habitat mapped within the BSA, although there is non-breeding aquatic habitat and upland habitat within the critical habitat mapped within the BSA; the upland habitat occurs within 200 feet of the edge of aquatic and riparian habitat. The roadway does not contain any PCEs and acts as a barrier to dispersal. Of the total 7.97 acres of suitable habitat that will be directly impacted by the project, 2.88 acres are critical habitat, and there is expected to be approximately 2.84 acres of temporary impacts and 0.04 acre of permanent impacts to critical habitat. The acreage impact to critical habitat for this project is less than 0.001 percent of the total critical habitat area and the disturbance will be minimal, therefore Caltrans does not anticipate an adverse modification to CRLF critical habitat. See Table 1 for overall estimated acreage of temporary and permanent impacts to suitable habitat.

There are four documented occurrences in ponds within 1 mile of the BSA, as well as numerous ponds and streams visible on aerial imagery within 1 mile of the BSA that could contain suitable breeding habitat. Adults and juveniles originating from these ponds and streams may potentially use the BSA for upland refuge. As such, CRLF have potential to occur in grassland, fresh emergent wetland, and other aquatic habitats within the BSA.

Due to the presence of known populations and potential breeding ponds within dispersal distance of the BSA and designated critical habitat in the region, Caltrans has inferred presence of CRLF throughout the BSA.

Project Impacts

The project has the potential to cause direct impacts to CTS and CRLF from construction activities, such as site preparation, handling of stockpiles and stored materials, installation of safety lighting, and installation of the power supply through trenching. Additionally, there may be indirect impacts related to the addition of artificial light from installing the light fixtures.

Baseline illumination for the grassland immediately adjacent to I-580 is not considered a natural condition with no existing artificial lighting. Traffic studies completed in September 2019 found that the minimum traffic volume per hour for the project limits on EB I-580 is 800 vehicles per hour between 3 and 4am. This is equal to one vehicle every 4.5 seconds, or a minimum of 67 vehicles within the project limits at any given time throughout peak dark hours. Traffic volumes between 5pm to 12am range from 1,100 to 5,700 vehicles within the project limits at any given time. Car headlights (dipped or low beam) are not directed down toward the road, are typically designed to travel approximately 40 to 50 meters (131 to 164 feet), and project to the outside shoulder. Areas adjacent to the roadway that will receive fugitive illumination from the proposed project's new lighting are likely lit by traffic passing continuously throughout the night or at a minimum frequency of every 4.5 seconds.

While the project area currently experiences illumination from vehicle headlights, artificial light introduced by the project may still affect CTS and CRLF. Though no research has been done on the effects of light on these species specifically, studies on similar species show altered behavioral and physiological traits that could imply similar effects for these species. In order to account for this possibility and to reduce impacts of the new lighting, Caltrans developed a project-specific lighting fixture to target light onto the pavement and minimize light spillage off the edge of the roadway. The lighting fixtures will have a reduced mounting height, short mast arm length, lower bulb wattage, and front side shielding to reduce illumination of areas outside of the roadway by approximately 79 percent, or to a level of about the same brightness as between deep twilight and a full moon.

Additionally, Caltrans will extend the 56-inch-tall concrete barrier present at one sensitive location (PM 2.65) by about 500 feet to create a shadow effect and eliminate lighting impacts.

Based on the projected lighting analysis, illumination to a level of a quarter of a full moon will travel a maximum distance of approximately 65 feet from the edge of the roadway.

The proposed project would result in approximately 7.93 acres of temporary direct impacts and approximately 0.04 acre of permanent direct impacts to suitable CTS and CRLF habitat from construction activities. See Table 1 below for estimated impacts to suitable habitat types for both species. The Project will not result in the illumination of CTS and CRLF habitat to a level greater than 0.5 lux, or the brightness between deep twilight and a full moon. The Project will result in the illumination of 22.27 acres of potential CTS and CRLF habitat to a level greater that one-quarter of a full moon (0.01 lux). See Table 2 for a summary of lighting impacts.

The project would result in less than significant impacts to American badger, bat species, and bird species habitat.

Table 1. Temporary and Permanent Impacts within the BSA to Suitable Habitat for Listed Species

Species	Suitable Habitat Types	Habitat Impacts (Acres)		
		Temporary	Permanent	Total
California tiger salamander California red-legged frog	Annual Grassland	7.88	0.04	**7.92**
California tiger salamander California red-legged frog	Shrublands	0.05	0.00	**0.05**
	Total	**7.93**	**0.04**	**7.97**

Table 2. Summary of Lighting Impacts to Habitat for Listed Species

Land Cover Type	Lux Values					
	2.0	1.5	1.0	0.5	0.1	0.01
Annual Grassland	0.00 (acres)	0.00	0.00	0.08	2.08	19.17
Shrublands	0.00	0.00	0.00	0.00	0.00	0.22
Fresh Emergent Wetland	0.00	0.00	0.00	0.00	0.00	0.00
Other Waters	0.00	0.00	0.00	0.00	0.00	0.01*
Total	**0.00**	**0.00**	**0.00**	**0.08**	**2.80**	**19.39**

**to be eliminated with the construction of a concrete barrier*

Mitigation

Caltrans received a BO from the USFWS for CTS and CRLF on March 20, 2020. A Biological Assessment (BA) was submitted to USFWS on November 9, 2018. Caltrans will obtain an ITP from CDFW for CTS during the next phase of the project, as the project design is further refined.

As required by FESA, Caltrans would implement reasonable and prudent measures to minimize and avoid take of listed species.

To reduce the potential adverse effects under FESA, Caltrans also proposes compensatory mitigation to offset any adverse impacts caused by the project. Caltrans proposes that compensatory mitigation, in the form of habitat restoration and preservation, would be provided at a 1:1 ratio for temporary habitat impacts, and a 3:1

ratio for permanent habitat impacts. Mitigation for temporary impacts would be accomplished through restoration on-site of 7.93 acres of CTS and CRLF habitat. Mitigation for permanent impacts would be accomplished through preservation of 0.36 acre of suitable habitat off-site through purchase of credits at a USFWS-approved conservation bank that provides habitat for multiple species of concern and sensitive habitats. Caltrans developed the proposed mitigation during Section 7 consultation with USFWS, in which Caltrans agreed to provide off-site compensatory mitigation for federally threatened species habitat at a 3:1 ratio for areas illuminated to a level greater than that of a full moon, or 0.1 lux.

Summary

AMMs and Mitigation Measures (MMs) listed below and in Appendix B, in conjunction with the project-specific lighting fixtures, concrete barrier, and proposed compensatory mitigation, reduce potential impacts to American Badger, bird species, bat species, CTS, and CRLF. The amount and quality of habitat proposed to be impacted by the project is minimal, and impacts from the project would not affect the persistence of local wildlife populations within the Altamont Pass region.

Because the impacts from the project would not jeopardize the continued existence of American badger, bat species, bird species, CTS, and CRLF, and thus would not present a significant impact to the species as a whole, Caltrans has determined that the project will have a “Less than Significant with Mitigation Incorporated” effect on species identified as a candidate, sensitive, or special-status species.

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?

No Impact – This project would not affect riparian habitat or other sensitive natural communities.

c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

No Impact – This project would not affect any federally protected wetlands as defined by Section 404 of the Clean Water Act.

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

No Impact – This project will not affect any migratory wildlife corridors or the movement of any native resident or migratory fish or wildlife species. I-580 represents a major barrier to dispersal of CTS and CRLF; the paved surface of I-580 is not considered to be a viable dispersal corridor because heavy traffic likely causes mortality of almost all individuals attempting to cross. This project will not increase the paved surface of I-580.

This project will not impede the use of native wildlife nursery sites.

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

No Impact – This project will not conflict with any local policies or ordinances protecting the biological resources.

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

No Impact – This project will not conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

Standard Conservation Measures

BIO-1: Work Window for Nesting Birds. To the extent practicable, clearing and grubbing activities should occur outside of the bird nesting season (February 1 to September 30). When it is necessary to conduct clearing during the nesting season, preconstruction surveys would be conducted within the BSA prior to clearing and grubbing of vegetation. If preconstruction surveys indicate the presence of nests of any special-status species, CDFW/USFWS would be consulted to determine the appropriate buffer area to be established around the nesting site for the duration of the breeding season.

BIO-2: Preconstruction Surveys for Nesting Birds. Pre-construction surveys for nesting birds will be conducted by a qualified biologist no more than 72 hours prior to the start of construction for activities occurring during the breeding season (February 1 to September 30).

BIO-3: Non-disturbance Buffer for Nesting Birds. If work is to occur within 300 feet of active raptor nests or 100 feet of active passerine nests, a non-disturbance buffer will be established at a distance sufficient to minimize disturbance based on the nest location, topography, cover, the species' sensitivity to disturbance, and the intensity/type of potential disturbance.

BIO-4: Water Quality Inspection. Biologist(s), in consultation with water quality inspector(s), will inspect the site after a rain event to ensure that the stormwater BMPs are adequate.

BIO-5: Vehicle Use. Project employees will be required to comply with guidance governing vehicle use, speed limits on unpaved roads, fire prevention, and other hazards.

BIO-6: Trash Control. All food-related trash items such as wrappers, cans, bottles, and food scraps will be disposed of in closed containers and removed at least once a day from the work area.

BIO-7: Prohibition of Monofilament Erosion Control. Plastic mono-filament netting (erosion control matting) or similar material will not be used for the project because CRLF and CTS may become entangled or trapped in it. Acceptable substitutes include coconut coir matting or tackified hydroseeding compounds.

BIO-8: Concrete Waste. All grindings and asphaltic-concrete waste will be stored within previously disturbed areas absent of habitat and at a minimum of 150 feet from any aquatic habitat, culvert, or drainage feature.

BIO-9: Revegetation Following Construction. All areas that are temporarily affected during construction will be revegetated with an assemblage of native grass, shrub, and trees. Invasive, exotic plants will be controlled within the Project Construction Area (PCA) to the maximum extent practicable, pursuant to Executive Order 13112.

BIO-9: Care of Injured or Dead Species. Listed species found injured will be cared for by a licensed veterinarian or a wildlife rehabilitation facility. After hours, interim care may be provided by another experienced person, including the on-site biologist, until the animal can be delivered to a facility. Dead individuals of any listed species would be preserved by freezing and held in a secure location. The USFWS and/or CDFW will be notified of the discovery of death or injury to a listed species occurring as a result of project-related activities or if observed at the project site.

AMMs and/or MMs:

AMM BIO-1: Permits. Caltrans will include a copy of the BO and ITP within the construction bid package of the proposed project. The Resident Engineer or their designee will be responsible for implementing the Conservation Measures and Terms and Conditions of the USFWS BO and the CDFW ITP.

AMM BIO-2: Reinitiation of Consultation. Caltrans will reinitiate consultation if the project results in effects to listed species not considered in the USFWS BO or CDFW ITP.

AMM BIO-3: Biological Monitor Approval. Caltrans will submit the names and qualifications of the biological monitor(s) for USFWS/CDFW approval prior to initiating construction activities for the proposed project. Only agency-approved biological monitors would implement the monitoring duties outlined in the BO, including delivery of the Worker Environmental Awareness Training Program.

AMM BIO-4: Biological Monitoring. The agency-approved biologist(s) will be on-site during initial ground-disturbing activities and thereafter as needed to fulfill the role of the approved biologist as specified in project permits. The biologist(s) will keep copies of applicable permits in their possession when on-site. Through the Resident Engineer or their designee, the agency-approved biologist(s) shall be given the authority to communicate either verbally, by telephone, email, or hardcopy with all project personnel to ensure that take of special-status species is minimized and permit requirements are fully implemented. Through the Resident Engineer or their designee, the agency-approved biologist(s) shall have the authority to stop project activities to minimize take of special-status species or if he/she determines that any permit requirements are not fully implemented. If the agency-approved biologist(s) exercises this authority, the agencies shall be notified by telephone and email within 48 hours.

AMM BIO-5: Worker Environmental Awareness Training. All construction personnel will attend a mandatory environmental education program delivered by an agency-approved biologist prior to working on the project. The program would focus on the conservation measures that are relevant to employee's personal responsibility and would include an explanation as how to best avoid take of sensitive species. Distributed materials would include a pamphlet with distinguishing photographs of sensitive species, species' habitat requirements, compliance reminders, and relevant contact information. Documentation of the training, including sign-in sheets, would be kept on file and would be available on request.

AMM BIO-6: Preconstruction Surveys. Prior to any ground disturbance, preconstruction surveys will be conducted by an agency-approved biologist for listed species. These surveys will consist of walking surveys of the project limits and, if possible, accessible adjacent areas within at least 50 feet of the project limits. The biologist(s) will investigate all potential cover sites. This includes thorough investigation of mammal burrows, rocky outcrops, appropriately sized soil cracks, and debris. Native vertebrates found in the cover sites within the project limits will be documented and relocated to an adequate cover site in the vicinity. The entrances

and other refuge features within the project limits will be collapsed or removed following investigation.

AMM BIO-7: Prevention of Wildlife Entrapment. To prevent inadvertent entrapment of special-status species during construction, excavated holes or trenches more than 1 foot deep with walls steeper than 30 degrees will be covered at the close of each working day by plywood or similar materials. Alternatively, an additional 4-foot-high vertical barrier, independent of exclusionary fences, will be used to further prevent the inadvertent entrapment of special-status species. If it is not feasible to cover an excavation or provide an additional 4-foot-high vertical barrier, independent of exclusionary fences, one or more escape ramps constructed of earth fill or wooden planks will be installed. Before such holes or trenches are filled, they will be thoroughly inspected for trapped animals. If at any time a trapped listed animal is discovered, the on-site biologist will immediately relocate the animal to an area outside of the work area. A USFWS/CDFW approved location will be designated prior to the start of construction. The USFWS/CDFW will be notified of the incident by telephone and electronic mail within 48 hours.

AMM BIO-8: Wildlife Exclusion Fencing. The limits of concrete barrier, electrical pole installation, electrical trenching, and underground vault installation will be delineated with high visibility wildlife exclusion fencing. The fencing will be removed only when all construction equipment is removed from the site. No project activities will occur outside the delineated project construction area. Wildlife exclusion fencing will not be installed for temporary access areas within species habitat required for installing/stringing the electrical line between poles. Construction activities occurring outside of suitable habitat for special-status species will not require wildlife exclusion fencing.

AMM BIO-9: Listed Species On-site. The Resident Engineer will immediately contact the agency-approved project biologist(s) if a CRLF or CTS is observed within a construction zone. The Resident Engineer will suspend construction activities within a 50-foot radius of the animal until the animal leaves the site voluntarily or an agency-approved protocol for removal has been established.

AMM BIO-10: Work Window for CTS and CRLF. All work within suitable habitat for CTS and CRLF will occur between April 15 and October 15, when the species are unlikely to be active and there is less potential for an individual to enter the work area.

AMM BIO-11: Material Storage. CTS and CRLF are attracted to cavity-like structures such as pipes and may seek refuge under construction equipment or debris. They may become trapped or injured if such materials are moved. All

construction pipes, culverts, or similar structures, construction equipment, or construction debris left overnight within the work area will be inspected by the agency-approved biological monitor prior to being moved.

AMM BIO-12: Night Work. To the extent practicable, nighttime construction will be minimized.

AMM BIO 13: Night Lighting. Artificial lighting of the project construction area during nighttime hours will be minimized to the maximum extent practicable.

2.1.5 Cultural Resources

CEQA Significance Determinations for Cultural Resources

This section is summarized from the Caltrans District 4 Office of Cultural Resource Studies (OCRS) Completion of Section 106 Compliance memorandum that was prepared for this project, dated October 16, 2018. This section also summarizes the Geologic and Paleontological Environmental Study/ Memorandum prepared for this project, which is dated October 12, 2018.

No significant historical resources are within the project area. The OCRS evaluated the Stone Cut Railroad Underpass, found within the project area, and determined that it is not eligible for the National Register of Historic Places (NRHP); the State Historic Preservation Office (SHPO) concurred with this eligibility determination on October 16, 2018.

Would the project:

a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?

No Impact – No archaeological resources have been recorded in the area that will be affected by the proposed project. A survey for archaeological resources was completed on August 2018.

b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?

No Impact – No archaeological resources have been recorded in the area that will be affected by the proposed project.

c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

No Impact – The excavations for the proposed project will be relatively shallow. There will be no impacts to sensitive paleontological resources or unique geologic features within the project limits.

d) Disturb any human remains, including those interred outside of dedicated cemeteries?

No Impact – There are no known interred human remains within the project vicinity.

Standard Conservation Measures:

CULT-1: If remains are discovered during excavation, all work within 60 feet of the discovery will halt and Caltrans' Cultural Resource Studies Office will be called. Caltrans Cultural Resource Studies Office staff will assess the remains and, if determined human, will contact the County Coroner as per Public Resources Code (PRC) Sections 5097.98, 5097.99, and 7050.5 of the California Health and Safety Code. If the Coroner determines the remains to be Native American, the Coroner will contact the Native American Heritage Commission (NAHC) who will assign a Most Likely Descendant. Caltrans will consult with the Most Likely Descendent on treatment and reburial of the remains. Further provisions of PRC 5097.98 are to be followed as applicable.

AMMs and/or MMs:

No impacts are anticipated; therefore, no measures are proposed.

2.1.6 Geology and Soils

CEQA Significance Determinations for Geology and Soils

This section summarizes the Geologic and Paleontological Environmental Study/ Memorandum prepared for this project, which is dated October 12, 2018.

Would the project:

a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault; strong seismic ground shaking; seismic-related ground failure, including liquefaction; and/or landslides:

No Impact – The proposed work will not further expose the public to adverse effects from earthquakes, liquefaction, landslides, or other geologic hazards.

b) Result in substantial soil erosion or the loss of topsoil?

No Impact – The work activities are not expected to impact soil conditions. There will be no disturbance to the native ground or native subsurface from this project.

c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?

No Impact – The project will be located on artificial fill, alluvium, and bedrock containing unnamed shale, siltstone, and unnamed sandstone. The project is not located on a geologic unit that is unstable, nor is it located on an expansive soil.

d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?

No Impact – The project will be located on artificial fill, alluvium, and bedrock containing unnamed shale, siltstone, and unnamed sandstone. The project is not located on a geologic unit that is unstable, nor is it located on an expansive soil.

e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

No Impact – There are no nearby residences and the project does not propose to install sewers or wastewater treatment systems.

AMMs and/or MMs:

No impacts are anticipated; therefore, no measures are proposed.

2.1.7 Greenhouse Gas Emissions

Would the project:

a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

Caltrans has used the best available information based to the extent possible on scientific and factual information to describe, calculate, or estimate the amount of greenhouse gas (GHG) emissions that may occur related to this project. The analysis included in the climate change section of this document provides the public and decision-makers as much information about the project as possible. It is Caltrans' determination that in the absence of statewide-adopted thresholds or GHG emissions limits, it is too speculative to make a significance determination regarding an individual project's direct and indirect impacts with respect to global climate change. Caltrans remains committed to implementing measures to reduce the potential effects of the project. These measures are outlined in the climate change section that follows.

Climate Change

Climate change refers to long-term changes in temperature, precipitation, wind patterns, and other elements of the earth's climate system. An ever-increasing body of scientific research attributes these climatological changes to GHG emissions, particularly those generated from the production and use of fossil fuels.

While climate change has been a concern for several decades, the establishment of the Intergovernmental Panel on Climate Change (IPCC) by the United Nations and World Meteorological Organization in 1988 led to increased efforts devoted to GHG emissions reduction and climate change research and policy. These efforts are primarily concerned with the emissions of GHGs generated by human activity, including carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), tetrafluoromethane, hexafluoroethane, sulfur hexafluoride (SF_6), and various hydrofluorocarbons (HFCs). CO_2 is the most abundant GHG; while it is a naturally occurring component of Earth's atmosphere, fossil-fuel combustion is the main source of additional, human-generated CO_2.

Two terms are typically used when discussing how we address the impacts of climate change: "greenhouse gas mitigation" and "adaptation." Greenhouse gas mitigation covers the activities and policies aimed at reducing GHG emissions to limit or "mitigate" the impacts of climate change. Adaptation, on the other hand, is concerned with

planning for and responding to impacts resulting from climate change (such as adjusting transportation design standards to withstand more intense storms and higher sea levels). This analysis will include a discussion of both.

Regulatory Setting

This section outlines state efforts to comprehensively reduce GHG emissions from transportation sources.

State

California has been innovative and proactive in addressing GHG emissions and climate change by passing multiple Senate and Assembly bills and executive orders (EOs) including, but not limited to, the following:

EO S-3-05 (June 1, 2005): The goal of this EO is to reduce California's GHG emissions to: (1) year 2000 levels by 2010, (2) year 1990 levels by 2020, and (3) 80 percent below year 1990 levels by 2050. This goal was further reinforced with the passage of Assembly Bill (AB) 32 in 2006 and Senate Bill (SB) 32 in 2016.

AB 32, Chapter 488, 2006, Núñez and Pavley, The Global Warming Solutions Act of 2006: AB 32 codified the 2020 GHG emissions reduction goals outlined in EO S-3-05, while further mandating that the California Air Resources Board (ARB) create a scoping plan and implement rules to achieve "real, quantifiable, cost-effective reductions of greenhouse gases." The Legislature also intended that the statewide GHG emissions limit continue in existence and be used to maintain and continue reductions in emissions of GHGs beyond 2020 (Health and Safety Code [H&SC] Section 38551(b)). The law requires ARB to adopt rules and regulations in an open public process to achieve the maximum technologically feasible and cost-effective GHG reductions.

EO S-01-07 (January 18, 2007): This order sets forth the low carbon fuel standard (LCFS) for California. Under this EO, the carbon intensity of California's transportation fuels is to be reduced by at least 10 percent by the year 2020. ARB re-adopted the LCFS regulation in September 2015, and the changes went into effect on January 1, 2016. The program establishes a strong framework to promote the low-carbon fuel adoption necessary to achieve the governor's 2030 and 2050 GHG reduction goals.

SB 375, Chapter 728, 2008, Sustainable Communities and Climate Protection: This bill requires ARB to set regional emissions reduction targets for passenger vehicles. The Metropolitan Planning Organization (MPO) for each region must then develop a "Sustainable Communities Strategy" (SCS) that integrates transportation, land-use, and housing policies to plan how it will achieve the emissions target for its region.

SB 391, Chapter 585, 2009, California Transportation Plan: This bill requires the State's long-range transportation plan to identify strategies to address California's climate change goals under AB 32.

EO B-16-12 (March 2012): This EO orders State entities under the direction of the Governor, including ARB, the California Energy Commission, and the Public Utilities Commission, to support the rapid commercialization of zero-emission vehicles. It directs these entities to achieve various benchmarks related to zero-emission vehicles.

EO B-30-15 (April 2015): This EO establishes an interim statewide GHG emission reduction target of 40 percent below 1990 levels by 2030 to ensure California meets its target of reducing GHG emissions to 80 percent below 1990 levels by 2050. It further orders all state agencies with jurisdiction over sources of GHG emissions to implement measures, pursuant to statutory authority, to achieve reductions of GHG emissions to meet the 2030 and 2050 GHG emissions reductions targets. It also directs ARB to update the Climate Change Scoping Plan to express the 2030 target in terms of million metric tons of carbon dioxide equivalent ($MMTCO_2e$). The "carbon dioxide equivalent" (CO_2e) is a metric used to express amounts of other gases relative to CO_2, which is the most important GHG. Since GHGs differ in how much heat they each trap in the atmosphere (known as global warming potential, or GWP), CO_2 is used as a base for measurement. The global warming potential of CO_2 is assigned a value of 1, and the GWP of other gases is assessed as multiples of CO_2. Finally, it requires the Natural Resources Agency to update the state's climate adaptation strategy, *Safeguarding California*, every 3 years, and to ensure that its provisions are fully implemented.

SB 32, Chapter 249, 2016: This bill codifies the GHG reduction targets established in EO B-30-15 to achieve a mid-range goal of 40 percent below 1990 levels by 2030.

SB 1386, Chapter 545, 2016: This bill declared "it to be the policy of the state that the protection and management of natural and working lands … is an important strategy in meeting the state's greenhouse gas reduction goals, and would require all state agencies, departments, boards, and commissions to consider this policy when revising, adopting, or establishing policies, regulations, expenditures, or grant criteria relating to the protection and management of natural and working lands."

AB 134, Chapter 254, 2017: This bill allocates Greenhouse Gas Reduction Funds and other sources to various clean vehicle programs, demonstration/pilot projects, clean vehicle rebates and projects, and other emissions-reduction programs statewide.

Senate Bill 743**,** Chapter 386 (September 2013): This bill changes the metric of consideration for transportation impacts pursuant to CEQA from a focus on automobile delay to alternative methods focused on vehicle miles travelled, to promote the state's

goals of reducing GHG emissions and traffic-related air pollution and promoting multimodal transportation while balancing the needs of congestion management and safety.

Senate Bill 150**,** Chapter 150, 2017, Regional Transportation Plans: This bill requires ARB to prepare a report that assesses progress made by each metropolitan planning organization in meeting their established regional GHG emission reduction targets.

Executive Order B-55-18, (September 2018): This EO sets a new statewide goal to achieve and maintain carbon neutrality no later than 2045. This goal is in addition to existing statewide targets of reducing GHG emissions.

Environmental Setting

The proposed project is in a rural area, with a primarily natural-resources based agricultural and tourism economy. I-580 is the main transportation route to and through the area for both passenger and commercial vehicles. The nearest route that connects to this stretch of roadway is Interstate 205 (I-205), six miles to the east. Traffic counts are moderate to high and this segment of I-580 is intermittently congested. The Metropolitan Transportation Commission (MTC) is the Regional Transportation Agency that guides transportation development. The City of Livermore General Plan: Climate Change elements address GHGs in the project area.

State GHG Inventory

ARB collects GHG emissions data for transportation, electricity, commercial/residential, industrial, agricultural, and waste management sectors each year. It then summarizes and highlights major annual changes and trends to demonstrate the state's progress in meeting its GHG reduction goals. The 2019 edition of the GHG emissions inventory found total California emissions of 424.1 $MMTCO_2e$ for 2017, with the transportation sector responsible for 41% of total GHGs (Figure 3). It also found that overall statewide GHG emissions declined from 2000 to 2017 despite growth in population and state economic output (Figure 4).

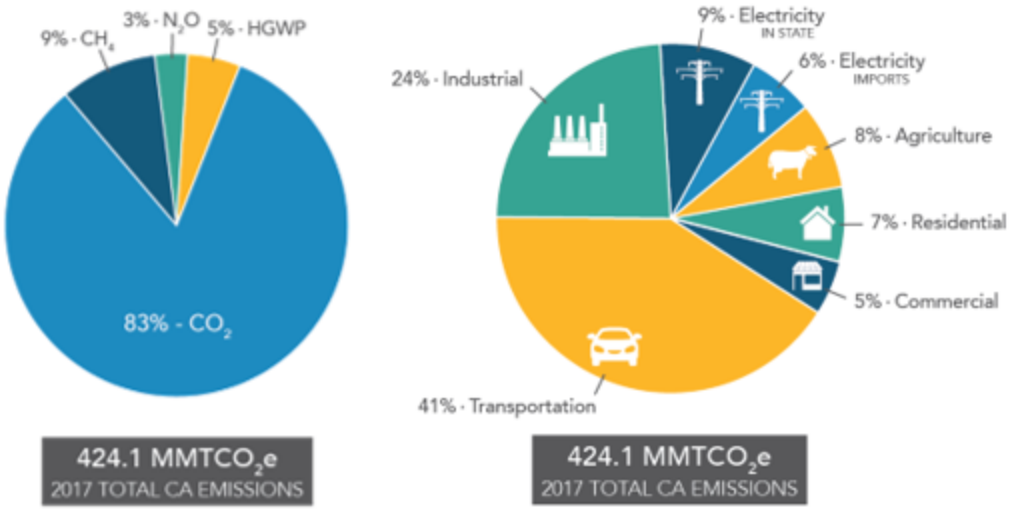


Figure 3.

Source: California 2017 Greenhouse Gas Emissions (California Air Resources Board (ARB). 2019a. California Greenhouse Gas Emissions Inventory–2019 Edition. https://ww3.arb.ca.gov/cc/inventory/data/data.htm. Accessed: August 21, 2019)

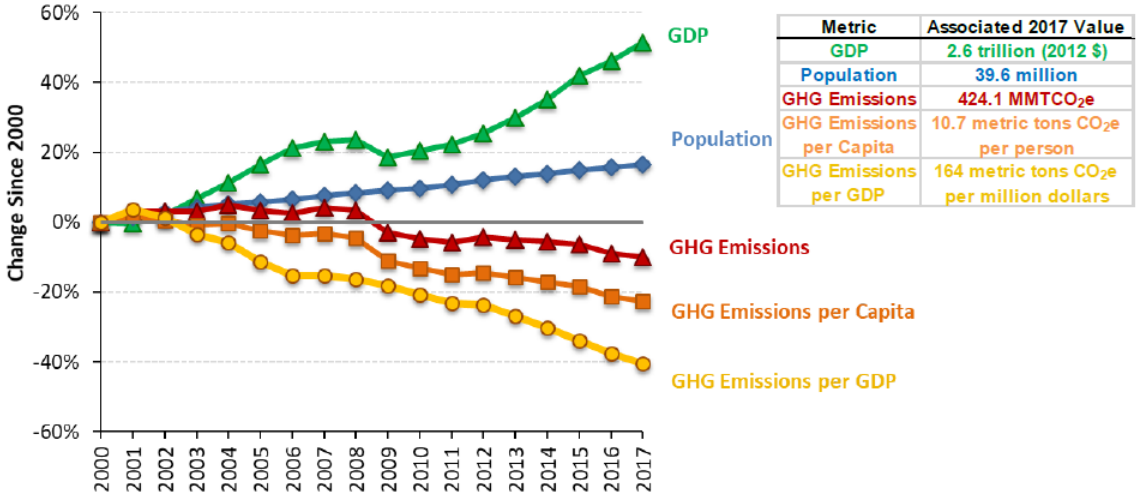


Figure 4. Change in California GDP, Population, and GHG Emissions since 2000

Source: California Air Resources Board (ARB). 2019b. California Greenhouse Gas Emissions for 2000 to 2017. Trends of Emissions and Other Indicators. https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2017/ghg_inventory_trends_00-17.pdf. Accessed: August 21, 2019.

AB 32 required ARB to develop a Scoping Plan that describes the approach California will take to achieve the goal of reducing GHG emissions to 1990 levels by 2020, and to update it every 5 years. ARB adopted the first scoping plan in 2008. The second updated plan, *California's 2017 Climate Change Scoping Plan*, adopted on December

14, 2017, reflects the 2030 target established in EO B-30-15 and SB 32. The AB 32 Scoping Plan and the subsequent updates contain the main strategies California will use to reduce GHG emissions.

Regional Plans

ARB sets regional targets for California's 18 MPOs to use in their Regional Transportation Plans (RTPs)/SCSs to plan future projects that will cumulatively achieve GHG reduction goals. Targets are set at a percent reduction of passenger vehicle GHG emissions per person from 2005 levels. The proposed project is included in the MTC's RTP/SCS, Plan Bay Area. The regional reduction target for MTC is 10% percent by 2020 and 19% by 2035 (California Air Resources Board (ARB). 2019c. SB 375 Regional Plan Climate Targets. https://ww2.arb.ca.gov/our-work/programs/sustainable-communities-program/regional-plan-targets. Accessed: August 21, 2019).

Project Analysis

GHG emissions from transportation projects can be divided into those produced during operation of the State Highway System (SHS) and those produced during construction. The primary GHGs produced by the transportation sector are CO_2, CH_4, N_2O, and HFCs. CO_2 emissions are a product of the combustion of petroleum-based products, like gasoline, in internal combustion engines. Relatively small amounts of CH_4 and N_2O are emitted during fuel combustion. In addition, a small amount of HFC emissions are included in the transportation sector.

The CEQA Guidelines generally address greenhouse gas emissions as a cumulative impact due to the global nature of climate change (PRC § 21083(b)(2)). As the California Supreme Court explained, "because of the global scale of climate change, any one project's contribution is unlikely to be significant by itself" (Cleveland National Forest Foundation *v.* San Diego Assn. of Governments (2017) 3 Cal.5th 497, 512). In assessing cumulative impacts, it must be determined if a project's incremental effect is "cumulatively considerable" (CEQA Guidelines Sections 15064(h)(1) and 15130).

To make this determination, the incremental impacts of the project must be compared with the effects of past, current, and probable future projects. Although climate change is ultimately a cumulative impact, not every individual project that emits greenhouse gases must necessarily be found to contribute to a significant cumulative impact on the environment.

Operational Emissions

The purpose of the proposed project is to install lighting and associated power supply items in the median of I-580 within the project limits, which will not increase the vehicle

capacity of the roadway. Non-capacity increasing projects generally cause minimal or no increase in operational GHG emissions because the project would not increase the number of travel lanes and would result in no increase in vehicle miles traveled (VMT). However, since the project involves direct energy use, there are GHG emissions associated with operation of the lights themselves.

The nightly operation of this project would produce some GHG emissions by consuming grid energy. It is estimated that a single 140-watt roadway LED, as proposed for this project, produces 324 pounds of GHGs per year (U.S. Environmental Protection Agency. 2016. eGRID2016. https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid. Released February 15, 2018). For the 120 lights proposed, this would amount to about 17.6 $MTCO_2e$ emissions per year. SB 100 (DeLeon 2018) declared that 100 percent of total retail sales of electricity in California should come from eligible renewable energy resources and zero-carbon resources by December 31, 2045. This means that GHG emissions from energy consumption will gradually reduce to zero as utilities come into compliance with this regulation. Although some GHG emissions during the construction period would be unavoidable, because of compliance with SB 100 and because the proposed project does not increase roadway capacity or VMT, no significant increase in operational GHG emissions is expected.

Construction Emissions

Construction GHG emissions would result from material processing, on-site construction equipment, and traffic delays due to construction. These emissions will be produced at different levels throughout the construction phase; their frequency and occurrence can be reduced through innovations in plans and specifications and by implementing better traffic management during construction phases.

In addition, with innovations such as longer pavement lives, improved traffic management plans, and changes in materials, the GHG emissions produced during construction can be offset to some degree by longer intervals between maintenance and rehabilitation activities.

The analysis was focused on vehicle-emitted GHGs. CO_2 is the single most important GHG pollutant due to its abundance when compared with other vehicle-emitted GHGs, including CH_4, N_2O, HFCs, and black carbon (BC).

Based on available project information, the construction-related GHG emissions were calculated using the Road Construction Emissions Model (RCEM), version 8.1.0, provided by the Sacramento Metropolitan Air Quality Management District. The estimated total amount of CO_2 produced due to a construction interval of 6 months is 166.59 tons, summary shown below (Table 3).

Table 3. Summary of Construction-related GHG Emission Estimates

	Construction-related GHG Emissions			
	Parameters			TOTAL
	CO_2 (tons)	CH_4 (tons)	N_2O (tons)	CO_2e (MT)[1]
TOTAL	166.59	0.04	0.00	152.52

Gases are converted to CO_2e by multiplying by their global warming potential (GWP). Specifically, GWP is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of carbon dioxide (CO_2).

All construction contracts include Caltrans Standard Specifications Section 7-1.02A and 7-1.02C, Emissions Reduction, which require contractors to comply with all laws applicable to the project and to certify they are aware of and will comply with all ARB emission reduction regulations; and Section 14-9.02, Air Pollution Control, which requires contractors to comply with all air pollution control rules, regulations, ordinances, and statutes. Certain common regulations, such as equipment idling restrictions, that reduce construction vehicle emissions also help reduce GHG emissions.

CEQA Conclusion

While the proposed project will result in GHG emissions during construction, it is anticipated that the project will not result in any increase in operational GHG emissions. The proposed project does not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases. With implementation of construction GHG-reduction measures, the impact would be less than significant.

Caltrans is firmly committed to implementing measures to help reduce GHG emissions. These measures are outlined in the following section.

Greenhouse Gas Reduction Strategies

Statewide Efforts

Major sectors of the California economy, including transportation, will need to reduce emissions to meet the 2030 and 2050 GHG emissions targets. Former Governor Edmund G. Brown promoted GHG reduction goals that involved (1) reducing today's petroleum use in cars and trucks by up to 50 percent; (2) increasing from one-third to 50 percent our electricity derived from renewable sources; (3) doubling the energy efficiency savings achieved at existing buildings and making heating fuels cleaner; (4)

reducing the release of methane, black carbon, and other short-lived climate pollutants; (5) managing farms and rangelands, forests, and wetlands so they can store carbon; and, (6) periodically updating the state's climate adaptation strategy, *Safeguarding California* (Figure 5).

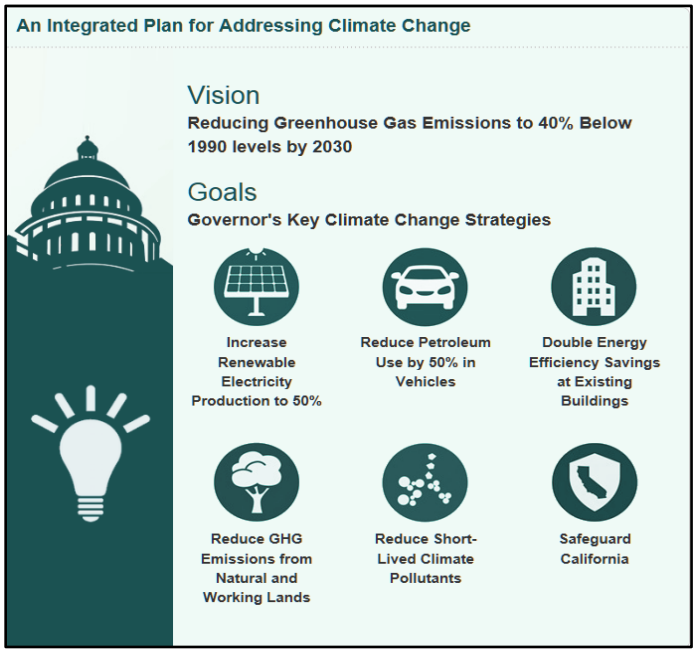


Figure 5. California Climate Strategy

The transportation sector is integral to the people and economy of California. To achieve GHG emission reduction goals, it is vital that the state build on past successes in reducing criteria and toxic air pollutants from transportation and goods movement. GHG emission reductions will come from cleaner vehicle technologies, lower-carbon fuels, and reduction of VMT. A key state goal for reducing GHG emissions is to reduce today's petroleum use in cars and trucks by up to 50 percent by 2030 (State of California. 2019. *California Climate Strategy*. https://www.climatechange.ca.gov/. Accessed: August 21, 2019.).

In addition, SB 1386 (Wolk 2016) established as state policy the protection and management of natural and working lands and requires state agencies to consider that policy in their own decision making. Trees and vegetation on forests, rangelands, farms, and wetlands remove carbon dioxide from the atmosphere through biological processes and sequester the carbon in above- and below-ground matter.

Caltrans Activities

Caltrans continues to be involved on the Governor's Climate Action Team as the ARB works to implement EOs S-3-05 and S-01-07 and help achieve the targets set forth in AB 32. EO B-30-15, issued in April 2015, and SB 32 (2016), set an interim target to cut

GHG emissions to 40 percent below 1990 levels by 2030. The following major initiatives are underway at Caltrans to help meet these targets.

CALIFORNIA TRANSPORTATION PLAN (CTP 2040)

The California Transportation Plan (CTP) is a statewide, long-range transportation plan to meet our future mobility needs and reduce GHG emissions. In 2016, Caltrans completed the *California Transportation Plan 2040*, which establishes a new model for developing ground transportation systems, consistent with CO_2 reduction goals. It serves as an umbrella document for all the other statewide transportation planning documents. Over the next 25 years, California will be working to improve transit and reduce long-run repair and maintenance costs of roadways and developing a comprehensive assessment of climate-related transportation demand management and new technologies rather than continuing to expand capacity on existing roadways.

SB 391 (Liu 2009) requires the CTP to meet California's climate change goals under AB 32. Accordingly, the CTP 2040 identifies the statewide transportation system needed to achieve maximum feasible GHG emission reductions while meeting the state's transportation needs. While MPOs have primary responsibility for identifying land use patterns to help reduce GHG emissions, CTP 2040 identifies additional strategies in Pricing, Transportation Alternatives, Mode Shift, and Operational Efficiency.

CALTRANS STRATEGIC MANAGEMENT PLAN

The Strategic Management Plan, released in 2015, creates a performance-based framework to preserve the environment and reduce GHG emissions, among other goals. Specific performance targets in the plan that will help to reduce GHG emissions include:

- Increasing percentage of non-auto mode share
- Reducing VMT
- Reducing Caltrans' internal operational (buildings, facilities, and fuel) GHG emissions

FUNDING AND TECHNICAL ASSISTANCE PROGRAMS

In addition to developing plans and performance targets to reduce GHG emissions, Caltrans also administers several sustainable transportation planning grants. These grants encourage local and regional multimodal transportation, housing, and land use planning that furthers the region's RTP/SCS; contribute to the State's GHG reduction targets and advance transportation-related GHG emission reduction project

types/strategies; and, support other climate adaptation goals (e.g., *Safeguarding California*).

CALTRANS POLICY DIRECTIVES AND OTHER INITIATIVES

Caltrans Director's Policy 30 (DP-30) Climate Change (June 22, 2012) is intended to establish a Department policy that will ensure coordinated efforts to incorporate climate change into Departmental decisions and activities. *Caltrans Activities to Address Climate Change* (April 2013) provides a comprehensive overview of Caltrans' statewide activities to reduce GHG emissions resulting from agency operations.

Project-Level GHG Reduction Strategies

The following measures will also be implemented in the project to reduce GHG emissions and potential climate change impacts from the project.

- The project will use energy-efficient LED lighting fixtures, which have reduced GHG emissions from energy consumption as compared to fluorescent lighting.
- Construction contractors will comply with Caltrans Standard Specifications to comply with all federal, state, and local air quality requirements, such as proper construction vehicle maintenance and idling restrictions. Measures that reduce vehicle emissions also help reduce GHGs.
- A TMP will be developed to alleviate and minimize delays to the traveling public and potential emissions from idling traffic.

Adaptation

Reducing GHG emissions is only one part of an approach to addressing climate change. Caltrans must plan for the effects of climate change on the state's transportation infrastructure and strengthen or protect the facilities from damage. Climate change is expected to produce increased variability in precipitation, rising temperatures, rising sea levels, variability in storm surges and their intensity, and in the frequency and intensity of wildfires. Flooding and erosion can damage or wash out roads; longer periods of intense heat can buckle pavement and railroad tracks; storm surges combined with a rising sea level can inundate highways. Wildfire can directly burn facilities and indirectly cause damage when rain falls on denuded slopes that landslide after a fire. Effects will vary by location and may, in the most extreme cases, require that a facility be relocated or redesigned. Accordingly, Caltrans must consider these types of climate stressors in how highways are planned, designed, built, operated, and maintained.

State Efforts

Climate change adaptation for transportation infrastructure involves long-term planning and risk management to address vulnerabilities in the transportation system. *California's Fourth Climate Change Assessment* (2018, http://www.climateassessment.ca.gov) is the state's effort to "translate the state of climate science into useful information for action" in a variety of sectors at both statewide and local scales. It adopts the following key terms used widely in climate change analysis and policy documents:

- *Adaptation* to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.
- *Adaptive capacity* is the "combination of the strengths, attributes, and resources available to an individual, community, society, or organization that can be used to prepare for and undertake actions to reduce adverse impacts, moderate harm, or exploit beneficial opportunities."
- *Exposure* is the presence of people, infrastructure, natural systems, and economic, cultural, and social resources in areas that are subject to harm.
- *Resilience* is the "capacity of any entity – an individual, a community, an organization, or a natural system – to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience". Adaptation actions contribute to increasing resilience, which is a desired outcome or state of being.
- *Sensitivity* is the level to which a species, natural system, or community, government, etc., would be affected by changing climate conditions.
- *Vulnerability* is the "susceptibility to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt." Vulnerability can increase because of physical (built and environmental), social, political, and/or economic factor(s). These factors include, but are not limited to: ethnicity, class, sexual orientation and identification, national origin, and income inequality. Vulnerability is often defined as the combination of sensitivity and adaptive capacity as affected by the level of exposure to changing climate.

Several key state policies have guided climate change adaptation efforts to date. Recent state publications produced in response to these policies draw on these definitions.

EO S-13-08, issued by then-governor Arnold Schwarzenegger in November 2008, focused on sea-level rise and resulted in the *California Climate Adaptation Strategy* (2009), updated in 2014 as *Safeguarding California: Reducing Climate Risk*

(Safeguarding California Plan). The Safeguarding California Plan offers policy principles and recommendations and continues to be revised and augmented with sector-specific adaptation strategies, ongoing actions, and next steps for agencies.

EO S-13-08 also led to the publication of a series of sea-level rise assessment reports and associated guidance and policies. These reports formed the foundation of an interim *State of California Sea-Level Rise Interim Guidance Document* (SLR Guidance) in 2010, with instructions for how state agencies could incorporate "sea-level rise (SLR) projections into planning and decision making for projects in California" in a consistent way across agencies. The guidance was revised and augmented in 2013. *Rising Seas in California – An Update on Sea-Level Rise Science* was published in 2017 and its updated projections of sea-level rise and new understanding of processes and potential impacts in California were incorporated into the *State of California Sea-Level Rise Guidance Update* in 2018.

EO B-30-15, signed in April 2015, requires state agencies to factor climate change into all planning and investment decisions. This EO recognizes that effects of climate change other than sea-level rise also threaten California's infrastructure. At the direction of EO B-30-15, the Office of Planning and Research published *Planning and Investing for a Resilient California: A Guidebook for State Agencies* in 2017, to encourage a uniform and systematic approach. Representatives of Caltrans participated in the multi-agency, multidisciplinary technical advisory group that developed this guidance on how to integrate climate change into planning and investment.

AB 2800 (Quirk 2016) created the multidisciplinary Climate-Safe Infrastructure Working Group, which in 2018 released its report, *Paying it Forward: The Path Toward Climate-Safe Infrastructure in California*. The report provides guidance to agencies on how to address the challenges of assessing risk in the face of inherent uncertainties still posed by the best available science on climate change. It also examines how state agencies can use infrastructure planning, design, and implementation processes to address the observed and anticipated climate change impacts.

Caltrans Adaptation Efforts

CALTRANS VULNERABILITY ASSESSMENTS

Caltrans is conducting climate change vulnerability assessments to identify segments of the State Highway System vulnerable to climate change effects including precipitation, temperature, wildfire, storm surge, and sea-level rise. The approach to the vulnerability assessments was tailored to the practices of a transportation agency, and involves the following concepts and actions:

- *Exposure* – Identify Caltrans assets exposed to damage or reduced service life from expected future conditions.
- *Consequence* – Determine what might occur to system assets in terms of loss of use or costs of repair.
- *Prioritization* – Develop a method for making capital programming decisions to address identified risks, including considerations of system use and/or timing of expected exposure.

The climate change data in the assessments were developed in coordination with climate change scientists and experts at federal, state, and regional organizations at the forefront of climate science. The findings of the vulnerability assessments will guide analysis of at-risk assets and development of adaptation plans to reduce the likelihood of damage to the State Highway System, allowing Caltrans to both reduce the costs of storm damage and to provide and maintain transportation that meets the needs of all Californians.

Project Adaptation Analysis

SEA LEVEL RISE ANALYSIS

The proposed project is outside the coastal zone and not in an area subject to sea-level rise. Accordingly, direct impacts to transportation facilities due to projected sea-level rise are not expected.

FLOODPLAINS

The project is not located in a floodplain or adjacent to any streams or water bodies that could be affected by climate change so as to present a hazard to the new facility or be affected by the new facility.

WILDFIRE

The project is located within Moderate to High Fire Hazard Severity Zones in a State Responsibility Area (SRA) as designated by Cal Fire. The project will not exacerbate existing wildlife risks or contribute to new risks. Consideration of methods for reducing wildfire risks—such as installing more of the utility features underground and use of metal power pole, instead of wooden poles—will be done in the next phase of project development.

2.1.8 Hazards and Hazardous Materials

CEQA Significance Determinations for Hazards and Hazardous Materials

Would the project:

a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

No Impact – Shallow soils along the roadside often contain aerially deposited lead (ADL) from past gasoline emissions. The average lead concentrations in the 7-foot drill cuttings from PG&E pole-related excavations are expected to be well below the threshold defining lead-containing soil. Soil that is excavated will be treated as "clean."

The trenching work for electrical system installation will disturb shallow roadside soils that likely contain regulated levels of lead. However, the minimal volumes of soils displaced by these activities can be addressed on-site, avoiding off-site disposal. The project will implement BMPs according to special provision 12-11.09 "Minimal Disturbance of Regulated Material Containing ADL."

b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

No Impact – Based on the preliminary investigations, there is no potential for release of hazardous materials into the environment.

c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

No Impact – The project is not located within 0.25 mile of a school.

d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?

No Impact – The project is not located on a site included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?

No Impact – The project is not located within an airport land use plan or within two miles of a public airport or public use airport. Nor is the project located in the vicinity of a private airstrip.

f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?

No Impact – The project is not located within an airport land use plan or within two miles of a public airport or public use airport. Nor is the project located in the vicinity of a private airstrip.

g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

No Impact – The project will not impair the implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.

h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

No Impact – The project is surrounded by grazing lands, rural dwellings, and generally undeveloped, grassy areas. The project will take place in existing Caltrans ROW and will not change existing land use. Consideration of methods for reducing wildfire risks—such as installing more of the utility features underground and use of metal power pole, instead of wooden poles—will be done in the next phase of project development. The project will not increase the risks of exposure to fire hazards for the surrounding community.

Standard Conservation Measures:

HAZ-1: Caltrans Standards will be followed for the proper handling and disposal of any unanticipated hazardous waste discovered during construction.

HAZ-2: The project will implement BMPs according to special provision 12-11.09 “Minimal Disturbance of Regulated Material Containing ADL.”

AMMs and/or MMs:

No impacts are anticipated; therefore, no measures are proposed.

2.1.9 Hydrology and Water Quality

CEQA Significance Determinations for Hydrology and Water Quality

This section summarizes the Location Hydraulics Study memorandum prepared for this project, which is dated October 3, 2018. This section also summarizes the Water Quality Study that was prepared for this project, which is dated May 2018.

This project is under jurisdiction of the San Francisco Bay Regional Water Quality Control Board (RWQCB) and the Central Valley RWQCB. This project would result in less than an acre of disturbed soil area (DSA) and will require a Water Pollution Control Plan (WPCP). The project lies in Hydrological Sub Areas 204.30 and 543.00 in hilly rural terrain. Runoff drains into Mountain House Creek and Arroyo Las Positas, both listed as 303(d) impaired water bodies.

Would the project:

a) Violate any water quality standards or waste discharge requirements?

No Impact – Water quality impacts are minimum because there is less than one acre of DSA. There will be no permanent water quality impacts.

b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?

No Impact – Project work activities will not substantially deplete groundwater supplies or interfere substantially with groundwater recharge.

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?

No Impact – There will be no encroachment into creeks or other water bodies. Existing drainage patterns will not be substantially altered and will not result in substantial erosion, siltation, or flooding on- or off-site. After construction, areas cleared for contractor access and trenching operations will be treated with appropriate erosion control measures.

d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

No Impact – There will be no encroachment into creeks or other water bodies. Existing drainage patterns will not be substantially altered and will not result in substantial erosion, siltation, or flooding on- or off-site. After construction, areas cleared for contractor access and trenching operations will be treated with appropriate erosion control measures.

e) Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?

No Impact – The proposed project will add minimal new impervious area and will not create or contribute to existing runoff water that would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff.

f) Otherwise substantially degrade water quality?

No Impact – The project will not substantially degrade water quality. Potential temporary impacts include sediment from disturbed soil areas and impacts to pH from runoff of fresh concrete. Temporary construction site BMPs will avoid these impacts. Permanent treatment is not necessary.

g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

No Impact – The project does not lie within an existing Federal Emergency Management Agency Base Floodplain. Therefore, there will be no impacts to housing or structures in any 100-year flood hazard areas, and there will be no impacts to people or structures from flooding.

h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?

No Impact – The project does not lie within an existing Federal Emergency Management Agency Base Floodplain. Therefore, there will be no impacts to housing or structures in any 100-year flood hazard areas, and there will be no impacts to people or structures from flooding.

i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

No Impact – The project does not lie within an existing Federal Emergency Management Agency Base Floodplain. Therefore, there will be no impacts to housing or structures in any 100-year flood hazard areas, and there will be no impacts to people or structures from flooding.

j) Inundation by seiche, tsunami, or mudflow

No Impact – The project is not located in an area that would be subject to inundation by seiche, tsunami, or mudflow.

Standard Conservation Measures:

HYDRO-1: Standard BMPs. The potential for adverse effects to water quality will be avoided by implementing temporary and permanent BMPs outlined in Section 7-1.01G of the Caltrans Standard Specifications. Caltrans erosion control BMPs will be used to minimize any wind- or water-related erosion. BMPs to be implemented within the PCA will include, at a minimum:

a. No discharge of pollutants from vehicle and equipment cleaning will be allowed into storm drains or water courses.
b. Vehicle and equipment fueling, and maintenance operations must be at least 50 feet away from water courses.
c. Concrete wastes will be collected in washouts, and water from curing operations will be collected, disposed of, and not allowed into water courses.
d. Dust control will be implemented, including use of water trucks and tackifiers to control dust in excavation and fill areas, rocking temporary access road entrances and exits, and covering temporary stockpiles when weather conditions require.
e. Coir rolls will be installed along or at the base of slopes during construction to capture sediment, and temporary organic hydro-mulching would be applied to all unfinished disturbed and graded areas.
f. Work areas where temporary disturbance has removed the pre-existing vegetation will be restored and reseeded with a native seed mix.
g. Graded areas will be protected from erosion using a combination of silt fences, fiber rolls along toe of slopes or along edges of designated staging areas, and erosion-control netting (such as jute or coir) as appropriate.

h. A Revegetation Plan will be prepared for restoration of temporary work areas.

HYDRO-2: Prior to commencement of construction activities, a WPCP will be prepared by the Contractor and approved by Caltrans. The WPCP addresses potential temporary impacts via implementation of appropriate BMPs, such as those mentioned above, to the maximum extent practicable.

AMMs and/or MMs:

No impacts are anticipated; therefore, no measures are proposed.

2.1.10 Land Use and Planning

CEQA Significance Determinations for Land Use and Planning

Would the project:

a) Physically divide an established community?

No Impact – The project area is predominantly rural, with a few residences, at distance from one another, adjacent to the interstate. New structures proposed by the project would be contained within the median. The proposed project would not physically divide an established community.

b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

No Impact – The project does not conflict with any applicable land use plan, policy, or regulation.

c) Conflict with any applicable habitat conservation plan or natural community conservation plan?

No Impact – There are no habitat conservation plans, natural community conservation plans, or other similar plans applicable to the project site.

AMMs and/or MMs:

No impacts are anticipated; therefore, no measures are proposed.

2.1.11 Mineral Resources

CEQA Significance Determinations for Mineral Resources

a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

No Impact – There are no known minerals of value within the project work location.

b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?

No Impact – There are no known minerals of value within the project work location.

AMMs and/or MMs:

No impacts are anticipated; therefore, no measures are proposed.

2.1.12 Noise

CEQA Significance Determinations for Noise

There are a few dispersed residences located near the project area. Noise generated by the project will be temporary construction noise, and standard Caltrans noise abatement measures will be applied to reduce noise. Work will be confined to daytime hours and the work location will move periodically from one location to the next, so the duration of noise at any given location will be temporary.

Would the project result in:

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

No Impacts – The proposed project will not introduce a permanent increase in existing noise levels. Noise associated with this project is due to construction, which will be temporary and periodic.

b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

No Impact – The project will not involve activities that result in ground vibration.

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

No Impact – All noise impacts are temporary and associated with construction. Noise associated with construction is controlled by Caltrans Standard Specification, Section 14-8.02, Noise Control. The proposed project will not introduce a permanent increase in noise levels.

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

No Impact – All noise impacts are temporary and associated with construction. Noise associated with construction is controlled by Caltrans Standard Specification, Section 14-8.02, Noise Control. The proposed project will not introduce a permanent increase in noise levels.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the

project expose people residing or working in the project area to excessive noise levels?

No Impact – The project is not located within an airport land use plan or within two miles of a public airport or public use airport. The project is not located in the vicinity of a private airstrip.

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

No Impact – The project is not located within an airport land use plan or within two miles of a public airport or public use airport. The project is not located in the vicinity of a private airstrip.

AMMs and/or MMs:

No impacts are anticipated; therefore, no measures are proposed.

2.1.13 Population and Housing

CEQA Significance Determinations for Population and Housing

Would the project:

a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

No Impact – The project will not induce growth. No new commercial or residential establishments will be built and the project will not add travel lanes to I-580; therefore, the project will not increase roadway capacity.

The project also will not displace any housing units or people. There are no houses within the project construction area and no ROW will be acquired.

b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?

No Impact – The project will not induce growth. No new commercial or residential establishments will be built and the project will not add travel lanes to I-580; therefore, the project will not increase roadway capacity.

The project also will not displace any housing units or people. There are no houses within the project construction area and no ROW will be acquired.

c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?

No Impact – The project will not induce growth. No new commercial or residential establishments will be built and the project will not add travel lanes to I-580; therefore, the project will not increase roadway capacity.

The project also will not displace any housing units or people. There are no houses within the project construction area and no ROW will be acquired.

AMMs and/or MMs:

No impacts are anticipated; therefore, no measures are proposed.

2.1.14 Public Services

CEQA Significance Determinations for Public Services

a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services: Fire protection, police protection, schools, parks, other public facilities?

No Impact – Construction of the project will not result in the provision of new or physically altered governmental facilities. Furthermore, the project will not result in a need for new or physically altered governmental facilities in order to maintain acceptable service ratios.

AMMs and/or MMs:

No impacts are anticipated; therefore, no measures are proposed.

2.1.15 Recreation

CEQA Significance Determinations for Recreation

a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

No Impact – Brushy Peak Regional Preserve is the only publicly owned recreation facility within 0.5 mile of the project work area. The described work activities will not impact this park, nor will it result in the construction of, increased use of, or expansion of existing neighborhood or regional parks or other recreational facilities.

b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

No Impact – The described work activities will not impact nor will it result in the construction of, increased use of, or expansion of existing neighborhood or regional parks or other recreational facilities.

AMMs and/or MMs:

No impacts are anticipated; therefore, no measures are proposed.

2.1.16 Transportation and Traffic

The TMP for the project will be developed in the next stage of project development. The TMP will be supported by detailed traffic studies to evaluate traffic operations. The need for necessary lane closures during off-peak hours or at night, or for short-term detour routes will be identified as required.

CEQA Significance Determinations for Transportation/Traffic

Would the project:

a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?

No Impact – The proposed project is consistent with the California Transportation Plan 2040 and Alameda County General Plan.

b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?

No Impact – The project is not a capacity increasing project, so it will have no effect on congestion management programs.

c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?

No Impact – The project will not impact air traffic patterns.

d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

No Impact – The project will not substantially increase hazards due to a design feature or incompatible uses.

e) Result in inadequate emergency access?

No Impact – The TMP will ensure that emergency services have adequate access.

f) Conflict with adopted policies, plans or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?

No Impact – As referenced under land use planning, the project does not conflict with the California Transportation Plan 2040 or the Alameda County General Plan.

AMMs and/or MMs:

No impacts are anticipated; therefore, no measures are proposed.

2.1.17 Tribal Cultural Resources

CEQA Significance Determinations for Tribal Cultural Resources

Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:

a) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or

No Impact – Caltrans Cultural staff coordinated with the NAHC and determined that there would be no impacts to tribal cultural resources. See Chapter 3 for more details.

b) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.

No Impact – Caltrans Cultural staff coordinated with the NAHC and determined that there would be no impacts to tribal cultural resources. See Chapter 3 for more details.

AMMs and/or MMs:

No impacts are anticipated; therefore, no measures are proposed.

2.1.18 Utilities and Service Systems

CEQA Significance Determinations for Utilities and Service Systems

Would the project:

a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?

No Impact – The project is not expected to exceed wastewater treatment requirements of the Central Valley RWQCB (Region 5).

b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

No Impact – The project does not require or result in the construction of new water or wastewater treatment facilities, or the expansion of existing facilities.

c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

No Impact – The project does not require or result in the construction of new storm water drainage facilities or expansion of existing facilities.

d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

No Impact – The project does not require water supplies to serve the project from existing entitlements or where the project would impact new or expanded entitlements.

e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

No Impact – The project does not require the services of a wastewater treatment provider where the project would impact the capacity of the provider.

f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?

No Impact – The project does not require the services of a landfill where the project would impact the capacity of a landfill.

g) Comply with federal, state, and local statutes and regulations related to solid waste?

No Impact – The project is anticipated to comply with federal, state, and local statutes and regulations related to solid waste.

AMMs and/or MMs:

No impacts are anticipated; therefore, no measures are proposed.

2.1.19 Mandatory Findings of Significance

CEQA Significance Determinations for Mandatory Findings of Significance

a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?

Less Than Significant Impact with Mitigation – The proposed project would result in approximately 7.93 acres of temporary impact and approximately 0.04 acre of permanent impact to suitable CTS and CRLF habitat. With the mitigation measures employed as described in the Biological Resources section of this Initial Study, the impacts to these resources will be reduced to a level of insignificance.

b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?

No Impact – All past, present, and future projects went through, or are required to undergo an environmental review to identify, account for, and mitigate for potential significant impacts. All projects have or will incorporate standard conservation measures, including standard Caltrans BMPs, which will protect surrounding habitat and water quality. Therefore, Caltrans does not anticipate any cumulative effects as a result of the proposed project.

c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

No Impact – The project does not have environmental effects which will cause substantial adverse effects on human beings.

Chapter 3 Comments and Coordination

Early and continuing coordination with the general public and public agencies is an essential part of the environmental process. It helps planners determine the necessary scope of environmental documentation and the level of analysis required, and to identify potential impacts and avoidance, minimization, and/or mitigation measures and related environmental requirements. Agency and tribal consultation and public participation for this project have been accomplished through a variety of formal and informal methods. This chapter summarizes the results of Caltrans' efforts to fully identify, address, and resolve project-related issues through early and continuing coordination.

The Initial Study with Mitigated Negative Declaration (IS MND) for the I-580 Safety Lighting and Power Supply Installation Project was released on October 14, 2019. Caltrans published a Notice of Availability for the project on October 17, 2019 via a quarter-page ad that was run in the East Bay Times.

3.1 Native American Coordination

Caltrans contacted the NAHC on March 26, 2018 to request a review of their Sacred Lands file. The NAHC responded on April 17, 2018 stating that there were no Sacred Lands within the Area of Potential Effects (APE). They provided the following list of interested individuals to contact with further information:

- Ms. Ann Marie Sayers, Chairperson for the Indian Canyon Mutsun Band of Costanoan
- Ms. Irenne Zwierlein, Chairperson of the Amah Mutsun Tribal Band of Mission San Juan Buatista
- Ms. Rosemary Cambra, Chairperson for the Muwekma Ohlone Indian Tribe of the San Francisco Bay Area
- Ms. Katherine Erolinda Perez of the North Valley Yokuts Tribe
- Mr. Andrew Galvan of the Ohlone Indian Tribe
- Mr. Tony Cerda, Chairperson of the Costanoan Rumsen Carmel Tribe

Letters were mailed to interested individuals on March 20 and April 17, 2018. Follow-up emails and phone calls were made on April 24 and May 15, 2018. Over the phone, one individual expressed concern over the depth of construction for the utility poles; the concern was resolved after explaining that the pole foundations are existing and are in areas of low sensitivity for archaeological resources. Another individual requested, and received, copies of the record search results.

3.2 Agency Coordination

The Information for Planning and Conservation online tool was used to generate a species list from the Sacramento Office of the USFWS for the project area on May 15, 2018. Caltrans initiated technical assistance with USFWS in October 2018. A request for formal consultation and a BA was submitted to USFWS on November 9, 2018. USFWS submitted a 30-day letter to Caltrans on December 5, 2018, requesting additional lighting analysis and project information. Caltrans submitted a revised BA and a response to the 30-day letter on August 19, 2019.

3.3 Comments Received and Responses

Caltrans filed a Notice of Completion for the Draft IS with Proposed MND with the State Clearinghouse on October 21, 2019. The filing of the Notice of Completion began a public review and comment period that extended from October 14, 2019 through November 14, 2019. State and local agencies, organizations, and members of the public submitted comments. Each comment letter or email that was received was reviewed and substantive comments were identified. This chapter presents the comments that were received and the response to those comments.

Comment 1, California Department of Fish and Wildlife

State of California
Department of Fish and Wildlife

Memorandum

Date: November 12, 2019

To: Ms. Sabrina Dunn
California Department of Transportation
District 4
Office of Environmental Analysis, MS-8B
Post Office Box 23660
Oakland, CA 94623-0660

Original signed by Craig Weightman for
From: Mr. Gregg Erickson, Regional Manager
California Department of Fish and Wildlife-Bay Delta Region, 2825 Cordelia Road, Suite 100, Fairfield, CA 94534

Subject: Interstate 580 Safety Lighting and Power Supply Installation Project, Mitigated Negative Declaration, SCH #2019109033, County of Alameda

The California Department of Fish and Wildlife (CDFW) has reviewed the above Interstate 580 Safety Lighting and Power Supply Installation Project (Project) Mitigated Negative Declaration (MND) as proposed by the lead agency, the California Department of Transportation (Caltrans) pursuant the California Environmental Quality Act (CEQA) and CEQA Guidelines.[1] Pursuant to our jurisdiction, CDFW is submitting comments on the MND as a means to inform Caltrans as the Lead Agency, of our concerns regarding potentially significant impacts to sensitive resources associated with the proposed Project.

CDFW ROLE

CDFW is a Trustee Agency with responsibility under CEQA §15386 for commenting on projects that could impact fish, plant and wildlife resources. CDFW is also considered a Responsible Agency if a project would require discretionary approval, such as the California Endangered Species Act (CESA) Permit, the Native Plant Protection Act, the Lake and Streambed Alteration (LSA) Agreement and other provisions of the Fish and Game Code that afford protection to the State's fish and wildlife trust resources.

1-1 Pursuant to our jurisdiction, CDFW is concerned the Project will have a significant impact on nocturnal wildlife species such as the American badger (*Taxidea taxus)*, a California species of special concern (SSC), pallid bat (*Antrozous pallidus*), a California SSC, Townsend's big-eared bat (*Corynorhinus townsendii*), a California SSC, California tiger salamander (*Ambystoma californiense*) a species listed as threatened under CESA and Federal Endangered Species Act (ESA), and California red-legged frog (*Rana draytonii*), a species listed as threatened under ESA and listed as a California SSC. The Project proposes to install 120 light emitting diode (LED) lighting fixtures along a 4.7-mile segment of Interstate 580 (I-580) in the Altamont Pass

1-2 that currently does not have overhead lighting. The new light fixtures will likely cause disruptions to species nocturnal behavior. The Project location consists of grass covered hills with a lack of development and no residential homes. CDFW is providing comments and recommendations on the MND regarding those activities involved in the Project that are within

[1] CEQA is codified in the California Public Resources Code in section 21000 et seq. The "CEQA Guidelines" are found in Title 14 of the California Code of Regulations, commencing with section 15000.

Comment 1 (Continued)

CDFW's area of expertise and relevant to its statutory responsibilities (Fish and Game Code, § 1802), and/or which are required to be approved by CDFW (CEQA Guidelines, §§ 15086, 15096 and 15204).

PROJECT DESCRIPTION AND ENVIRONMENTAL SETTING

Caltrans proposes to construct the Project to improve existing roadway conditions and enhance traffic safety on the Altamont Pass. This will be accomplished by installing lighting along eastbound I-580 from Livermore in Alameda County at post mile (PM) 1.3 to PM 6.0 from West Grant Line Road undercrossing to North Flynn Road overcrossing. The Project will also install new power poles and electrical vaults on the southern side of the same expanse of I-580 to provide power for the lighting.

The Project will install 120 LED lighting approximately every 180 feet on existing foundations in the median about 9 feet from the inside shoulder along with 48 new, wooden electrical poles along east bound I-580. The 35-foot-tall light fixtures will have front side shields and adjusted mast arm lengths of 15 feet to focus illumination on the roadway. At PM 2.7, the existing concrete barrier will be extended about 500 feet to the east, towards Grant Line Road, to block light spillage onto roadside aquatic habitat on the south side of I-580. 85-watt LEDs are proposed instead of the Caltrans standard 165-watt bulbs.

The biological study area (BSA) consists of approximately 160 acres located within the Altamont Pass I-580 transportation corridor between the San Joaquin County line and the City of Livermore in Alameda County. The BSA is primarily composed of pavement and naturalized annual grassland, interspersed with shrubland habitat.

REGULATORY REQUIREMENTS

Lake and Streambed Alteration
CDFW requires an LSA Notification, pursuant to Fish and Game Code section 1600 et. seq., for Project activities affecting lakes or streams and associated riparian habitat. Notification is required for any activity that may substantially divert or obstruct the natural flow; change or use material from the bed, channel, or bank including associated riparian or wetland resources; or deposit or dispose of material where it may pass into a river, lake or stream. Work within ephemeral streams, washes, watercourses with a subsurface flow, and floodplains are subject to notification requirements. CDFW will consider the CEQA document for the Project and may issue an LSA Agreement. CDFW may not execute the final LSA Agreement until it has complied with CEQA as a Responsible Agency.

California Endangered Species Act
CESA prohibits unauthorized take of candidate, threatened, and endangered species. Therefore, if "take" or adverse impacts to California tiger salamander or any other species listed under CESA cannot be avoided either during Project activities or over the life of the Project, a CESA Incidental Take Permit (ITP) must be obtained (pursuant to Fish and Game Code Section 2080 *et seq.*). Issuance of a CESA ITP is subject to CEQA documentation; therefore, the CEQA document should specify impacts, mitigation measures, and a mitigation monitoring and reporting program. If the proposed Project will impact any CESA-listed species, early consultation is encouraged, as significant modification to the Project and mitigation measures may be required to obtain a CESA ITP. More information on the CESA permitting process can be found on the CDFW website at https://www.wildlife.ca.gov/Conservation/CESA.

Comment 1 (Continued)

Additional Fish and Game Code Regulations

CDFW also has jurisdiction over actions that may result in the disturbance or destruction of active nest sites or the unauthorized take of birds. Fish and Game Code sections protecting birds, their eggs, and nests include 3503 (regarding unlawful take, possession or needless destruction of the nests or eggs of any bird), 3503.5 (regarding the take, possession or destruction of any birds-of-prey or their nests or eggs), and 3513 (regarding unlawful take of any migratory nongame bird). Fully protected species may not be taken or possessed at any time (Fish and Game Code Section 3511). Migratory birds are also protected under the federal Migratory Bird Treaty Act.

IMPACTS SUMMARY

1-3 The current MND does not adequately address significant impacts that will be created by artificial lighting and light pollution, and does not provide suitable avoidance and minimization measures that would reduce impacts below a level of significance as required by CEQA. The negative impacts to fish and wildlife resources created by artificial lighting and light pollution has been well documented and studied on nocturnal wildlife and migratory bird species and the MND should be updated to discuss these findings as a significant impact and not as an indirect impact as noted in the Biological Resources section. Animals can experience increased orientation or disorientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors (Longcore & Rich, 2004). Artificial light disrupts interspecific interactions evolved in natural patterns of light and dark, with serious implications for community ecology (Longcore & Rich, 2004).

IMPACTS

Light Pollution Impacts on Nocturnal Species

1-4 The CEQA document does not adequately analyze Project related impacts on nocturnal wildlife species or migratory birds regarding the potential significant impacts of artificial lighting and light pollution. Artificial lighting and light pollution are potential significant impacts to nocturnal wildlife because the impact types can degrade the quality of the environment and substantially reduce the number of individuals. Species including but not limited to, American badger, pallid
1-5 bat and Townsend's big-eared bat, as well as migratory birds should be analyzed and discussed with additional mitigation incorporated to reduce the impacts to less-than-significant.

According to page 7 of the MND, the 120 LED lighting fixtures would increase the lighting in the Altamont Pass areas outside the roadway to a level of 0.5 lux, which is equivalent to the brightness of a full moon (Kyba et. al., 2017). Unlike the brightness of a full moon which occurs roughly once per month, the permanent and continuously powered lighting fixtures would create an unnatural light regime equivalent to a full moon 365 days a year, creating an unnatural, well lit environment in an area with no previous overhead lighting. The MND discusses indirect
1-6 impacts to sensitive amphibian species but does not adequately address the direct impacts that would occur as a result of light fixture installation to other nocturnal species and migratory birds.

American Badger

1-7 The negative impacts to nocturnal species and migratory birds should be identified in the updated MND as significant based on the following evidence. The Durham County Badger Group states that artificial light impacts reproduction in badgers and has been shown to cause a reduction in the population size, as well as problems in foraging (Natural England, 2002).

Comment 1 (Continued)

American badgers are known to inhabit the area and are noted as a species present within the Project vicinity on page 12 of the MND. Additional light pollution equivalent to that of a full moon, every night of the year would therefore have a significant impact on reproduction and
1-7 population. Caltrans proposes to install the fixtures with a reduced mounting height, short mast arm length, lower bulb wattage, and front side shielding in order to reduce illumination of areas outside of the roadway by approximately 79 percent compared to standard Caltrans roadway lighting fixtures. These avoidance and minimization measures alone would not reduce impacts below a level of significant.

Bat Species
Many bat species are attracted to insects that congregate around light sources (Frank, 1988). Although it may seem that this is a positive effect, the increased food concentration benefits only those species that exploit light sources and could therefore result in altered community structure. Faster-flying species of bats congregate around lights to feed on insects, but other, slower-flying species avoid lights (Blake *et al*. 1994; Rydell and Baagøe,1996). Studies have also found that the presence of light pollution in a habitat interferes with the roosting and foraging behavior of bats. As a result of such pollution, species do not forage during dusk when their food preference is at its highest supply (Jones *et al.* 1994, Downs *et al.* 2003). Pallid bat and Townsend's big-eared bat are known to inhabit the area and are noted as a species present within the vicinity of the Project on page 12 of the MND. Additional light pollution equivalent to
1-8 that of a full moon would therefore have a significant direct impact on the foraging and roosting behavior of bats known to occur within the vicinity of the Project.

Migratory Birds
Migratory birds also have the potential to be significantly and directly impacted by the completion of this Project. The majority of land birds migrate at night (Wilson, 2011). One method of migrant navigation is by reference to stars (Emlen,1975). Light pollution from all sources reduces the visibility of stars and may entrap migrating birds in dangerous environments especially during inclement weather, causing collision, apparent confusion and mortality (Ogden, 1996). Increased and focused light pollution in this section of the Altamont Pass has the potential to confuse migratory birds and increase bird strikes with man-made structures such as wind turbines due to attraction to the illuminated objects (Poot *et al.* 2008).
1-9 Therefore, the appropriate avoidance and minimization measures to reduce the output of artificial lighting and focus it towards the road should be incorporated as specified in the avoidance and minimization section of this memorandum.

Furthermore, song is normally heard during hours of brightness, sunrise and sunset; however, when artificial light extends the hours of brightness the birds continue to sing. This can result in sleep loss for the birds (Kempenaers *et al.* 2010, Dominoni *et al.* 2013a, Dominoni *et al.* 2013b, Schlict *et al.* 2014, Da Silva *et al.* 2014) as well as an increased potential for predation. The migration direction of the European robin (*Erithacus rubecula*) is known to be determined by the use of blue and green photoreceptors. The altering of the natural light in the atmosphere may hinder the migration path of this species (Wiltschko *et al.* 2007). Therefore, bird species with similar photoreceptors have the potential to have their migration direction become disrupted. In order to reduce this impact below a level of significance, the installation and use of the proper lights that emit appropriate wavelengths and spectrums of lighting during the appropriate times
1-10 of the night should be incorporated into the Project as specified in the avoidance and minimization section of this memorandum. Due to the constant illumination created by the Project, mitigation for the area of permanent illumination may be the only appropriate measure to reduce impacts below a level of significant.

Comment 1 (Continued)

California Tiger Salamander (CTS)

1-11 The MND does not adequately discuss or address if the Project has the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, or substantially reduce the number or restrict range of CTS as a result of installation of artificial lighting and the creation of additional light pollution. The updated MND

1-12 should adequately analyze direct impacts on CTS regarding the potential significant impacts of artificial lighting and light pollution. Artificial lighting and light pollution are potential significant impacts to CTS because the impact types have the potential to degrade the quality of the environment and substantially reduce the number of individuals. Furthermore, the MND does

1-13 not mitigate biological impacts on CTS to a level of less-than-significant as required by CEQA using adequate avoidance and minimization measures.

The negative impacts to CTS should be identified in the updated MND as significant based on the following evidence. Artificial lighting has been proven to disrupt the production of melatonin in *Ambystoma* salamanders if they are exposed to it, altering metabolic rates and reducing tolerance to high temperatures (Perry et al. 2008). Additionally, *Ambystoma* salamanders could miss the cue to migrate if there is artificial light, which could affect breeding. *Ambystoma tigrinum*, was one species of focus in the study, which is a sister clade to *Ambystoma californiense,* meaning the two clades are the result of splitting from a single genetic lineage. The two species also share the same life cycle type and have been proven to hybridize in the field. CDFW disagrees with the conclusion made on page 17 of the MND; "Additionally, there may be indirect impacts related to the addition of artificial light from installing the light fixtures. Artificial light introduced by the project might have the potential to alter dispersal and breeding

1-14 behaviors for CTS. Though no research has been done on the effects of light on these specific species, studies on similar species show altered behavioral and physiological traits that could imply similar effects for these species."

A field study was conducted to examine the effects of artificial night lighting on the foraging activity of the redback salamander, *Plethodon cinereus*, (Rohacek, et. al., 2010) a fossorial species with similar life cycle traits to CTS. *Plethodon cinereus* emergence from subterranean dens or leaf litter during nocturnal rain events is similar to the behavior of CTS. The *Plethodon* study yielded results concluding the redback salamander displayed an aversion to light level increases of only 0.01 lux and foraged less in illuminated habitats compared to darker ones. The proposed Project has a net increase of 0.5 lux to areas outside the roadway, and therefore has the potential to negatively impact the nocturnal habitats of CTS and would likely create a significant impact on the nocturnal activity of *Ambystoma californiense*. This has direct implications for the Project because numerous CTS incidents of take in the roadway of I-580 have been documented in this part of the Altamont Pass (Caltrans E-Mail to CDFW on December 20, 2018; ITP 2081-2015-039-03); therefore, CTS are getting close enough to the road to be significantly impacted by the proposed change in artificial lighting.

Another study examined the effects of LED illumination on habitat preference and aversion behavior to artificial light in the blue-spotted salamander (BSS; *Ambystoma laterale x jeffersonium*) (Fueka, 2017). Findings showed BSS had a preference for deciduous litter in dark trials and coniferous litter in illuminated trials. Coniferous litter is determined to be less than preferred habitat type because of the decreased levels of moisture retention. The findings discuss that the altered preference in the presence of artificial lighting could result in BSS seeking out sub-par habitat in areas far from their natal ponds with drier moisture levels and different invertebrate regimes that could further negatively impact the salamander. BSS shares

Comment 1 (Continued)

a similar life cycle and genetic relatedness as CTS and BSS belong to the *Ambystomatidae* family. Therefore, it could be inferred artificial lighting and light pollution impacts has the
1-15 potential to alter habitat preferences and lead CTS away from breeding ponds and preferred habitat types which could result in a loss of individuals.

Based on the Perry 2008 study, it is assumed that the impacts which occur to a genetically related species with the exact same life cycle would cause similar significant impacts to the sister clade (i.e. *Ambystoma californiense*). Specifically, the current environmental setting of the Project site with no overhead lighting when compared to the future proposed condition of
1-16 constant artificial lighting is a significant impact that should be avoided, minimized and mitigated as specified in the avoidance and minimization section of this letter to reduce impacts below a level of significance.

California Red-Legged Frog (CRLF)

The MND does not adequately discuss or address if the Project has the potential to degrade the
1-17 quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, or substantially reduce the number or restrict range of CRLF as a result of installation of artificial lighting and the creation of additional light pollution.

The negative impacts to CRLF should be identified in the updated MND as significant based on the following evidence. Frogs and salamanders are particularly susceptible to artificial light pollution. Light pollution "may affect physiology, behavior, ecology, and evolution of frog and salamander populations" (Wise, 2007). For example, artificial light levels and timing influences melatonin production in salamanders. Melatonin regulates hormones, reproductive development and behavior, skin coloration, an animal's ability to regulate body temperature, and
1-18 night vision (Gern, 1983).

Artificial lighting causes changes in individual frogs, such as timing delays in transitioning from tadpole to frog, can affect that individual's ability to survive. Remaining a tadpole longer may result in waterbodies becoming dry before metamorphosis can occur, increased predation, and reduced survival. Reduced survival at the population level can result in smaller populations or populations that disappear altogether. Ecological light pollution affects entire communities, not just individuals, and puts many species at risk (Gern, 1983). Therefore, any artificial light installation that causes additional light pollution from baseline conditions has the potential to create significant impacts to CRLF that should be avoided and minimized using the measures specified in the section of this memorandum below. Additionally, because baseline conditions have no artificial overhead lighting, the potentially significant impact can only be reduced below a level of significant using mitigation for the increased areas of light pollution.

Artificial Lighting and Light Pollution Mitigation Measures
To reduce impacts to less-than-significant: CDFW recommends that in addition to the avoidance and minimization measures provided in the Biological Resources Section of the MND that the following avoidance and minimization measures are included in the updated environmental document:

1-19 *Light Intensity Limits*
All LED's or bulbs installed as a result of the Project shall be rated to emit or produce light at or under 3,000 kelvin that results in the output of a warm white color spectrum.

Comment 1 (Continued)

1-20 *Vehicle Light Barriers*
Solid concrete barriers at a minimum height of 3.5 feet should be installed in areas where they have the potential to reduce illumination from overhead lights and from vehicle lights into areas outside of the roadway. Additional barrier types should be employed when feasible, such as plastic inserts (privacy slats) into the spacing of cyclone fencing to create light barriers into areas outside the roadway.

1-21 *Reflective Signs and Road Striping*
Retro-reflectivity of signs and road striping should be implemented throughout the Project to increase visibility of roads to drivers and reduce the need for electrical lighting. Reflective highway markers have also been proven effective to reduce raptor collisions on highways in California's central valley if installed along highway verges and medians.

1-22 *Isolux Light Pollution Comparison*
The lead agency should submit to natural resource agencies, 30 days prior to the initiation of construction Isolux Diagrams that note current light levels present during pre-Project conditions and the predicted Project light levels that will be created upon completion of the Project. Within 60 days of Project completion, the lead agency shall conduct a ground survey that compares predicated light levels with actual light levels achieved upon completion of the Project through comparison of Isolux diagrams. If an increase from the projected levels to the actual levels is discovered additional avoidance, minimization or mitigation measures may be required in coordination with the natural resource agencies.

1-23 *California Tiger Salamander Light Pollution Impacts Avoidance and Minimization*
Compensatory mitigation in areas that receive illumination increases of 0.01 lux or greater in areas of no previous impact from artificial lighting should be provided and the amount of compensation should be determined in consultation with the natural resource agencies.

CONCLUSION

Thank you for the opportunity to provide comments and recommendations regarding those activities involved in the Project that may affect California's fish and wildlife. Likewise, we appreciate the opportunity to provide comments regarding those aspects of the Project that CDFW, by law, may be required to carry out or approve through the exercise of its own regulatory authority under the Fish and Game Code.

Questions regarding this letter or further coordination should be directed to Mr. Robert Stanley, Senior Environmental Scientist (Specialist), at (707) 428-2093 or Robert.Stanley@wildlife.ca.gov; or Mr. Craig Weightman, Environmental Program Manager at (707) 944-5577 or Craig.Weightman@wildlife.ca.gov.

cc: State Clearinghouse #2019109033

Response to Comment 1, California Department of Fish and Wildlife

1-1
Thank you for your comments.

The project's NES, incorporated into this MND by reference, details project impacts and effects determinations to the American badger, CRLF, CTS, pallid bat, Townsend's big-eared bat, and migratory birds. Caltrans biologists have determined, through completion of the biological study referenced above, that illumination associated with the project will not affect the persistence of local populations of any of these species or result in a significant impact to the American badger, pallid bat, Townsend's big-eared bat, or migratory birds. Temporary and permanent impacts to state and federally threatened species habitat associated with construction activities and electrical equipment will be mitigated though habitat restoration and the preservation of suitable species habitat at an off-site location. Illumination of state and federally threatened species habitat to a level greater than that of a full moon, or a natural level, will also be mitigated through the preservation of suitable species habitat at an off-site location. Through the implementation of avoidance and minimization measures and project specific lighting units that will reduce illumination outside of the roadway, the project is not expected to significantly impact the American badger, pallid bat, or Townsend's big-eared bat.

1-2
The 4.7-mile segment of I-580 in the Altamont Pass currently features overhead lighting at the truck pullout, North Flynn Road, Carrol Road, and Grant Line Road on- and off-ramps. Figure 6 in the NES shows the location of the existing lighting. Of the 4.7-mile project limits on EB I-580, approximately 3.5 miles do not currently have highway lighting. Please refer to Biological Resources section for an updated discussion on the project area's existing light conditions.

Caltrans has incorporated multiple design changes to reduce illumination outside the roadway by an estimated 79 percent. Caltrans biologists have determined, through completion of the biological study referenced above, that illumination associated with the project will not result in a significant impact to nocturnal species or migratory birds, or affect the persistence of local populations of any of these species.

1-3
The MND summarizes lighting impact conclusions that the project's NES describes in detail.

In comparison to the standard Caltrans highway lighting, the lighting units developed for this project reduce illumination outside the roadway by an estimated 79 percent and

prevent illumination to any unpaved area to a level greater than 0.5 lux (brightness between deep twilight and a full moon).

Through the Section 7 process with USFWS, Caltrans also proposes that areas illuminated to a level greater than that of a full moon will be mitigated at a permanent ratio of 3:1 though the preservation of suitable habitat at an off-site location.

These features, included in the project's design, will minimize project impacts to wildlife resources to below a level of significance as required by CEQA.

1-4
Please refer to our response to Comment 1-3.

1-5
Please refer to our response to Comment 1-1.

1-6
Please refer to our responses to Comments 1-1 and 1-2.

1-7
The project's NES details project impacts. Caltrans biologists have determined, through completion of the biological study referenced above, that illumination associated with the project will not result in a significant impact to nocturnal species or migratory birds.

During the Section 7 consultation with USFWS, Caltrans has agreed to provide off-site compensatory mitigation for federally threatened species habitat at a 3:1 ratio for areas illuminated to a level greater than that of a full moon. This compensatory mitigation, in addition to the proposed avoidance and minimization measures, will reduce the level of impact to less than significant.

1-8
Please refer to our response to Comment 1-7.

1-9
The design for this project will utilize a reduced mounting height of 35 feet, shorter mast arm lengths of 15 feet to focus illumination on the roadway, lower wattage bulbs, low color temperature bulbs (2,700 k) and front-side shielding. This option will reduce overall illumination but still achieve an adequate level of roadway illumination. Front side shielding will reduce the point-light source visible from outside the roadway. Placing the lighting in the median will minimize the amount of fugitive light.

1-10
This project will utilize LED bulbs with a color temperature of 2,700 k and a natural wavelength.

Please also refer to our response to Comment 1-7.

1-11
The project's NES details project impacts and effects determinations to wildlife species. Caltrans biologists have determined, through completion of the biological study referenced above, that illumination associated with the project will not result in a significant impact to nocturnal species or affect the persistence of local populations of any species.

1-12
The project's NES details project impacts, artificial illumination impacts, and effects determinations to CTS.

1-13
Please refer to our response to Comment 1-3.

1-14
Please refer to our response to Comment 1-7.

During Section 7 consultation with USFWS, Caltrans proposed additional mitigation in the form of directional wildlife fencing at PM 4 to prevent wildlife from entering the roadway of I-580 and to help facilitate the movement of wildlife species across I-580.

1-15
There is currently no literature that would indicate that CTS are attracted to light and that adding artificial lighting would prevent them from moving to breeding ponds. This project will not result in the illumination of aquatic CTS breeding habitat.

Please also refer to our response to Comment 1-3.

1-16
Please refer to our responses to Comments 1-3 and 1-9.

1-17
The MND provides a summary of technical studies that have analyzed the impacts to resources in and near the project area. The project's NES details project impacts, artificial illumination impacts, and effects determinations to CRLF.

1-18
Please refer to our responses to Comments 1-3 and 1-17.

1-19
The project will utilize LED bulbs with a color temperature of 2,700 k and a natural wavelength.

1-20
The project will extend the existing concrete barrier at PM 2.7 by 500 feet to the east towards Grant Line Road. The concrete barrier will act as both a safety barrier to prevent errant vehicles hitting the existing concrete headwall of Mountain House Creek culvert and to provide shading on the southside of I-580 from the newly installed light fixtures (see Figure 8).

1-21
Both reflective lane delineators and new road striping were recently installed in this area. The WB and EB Lanes of Interstate 580 on the Altamont Pass between Greenville Road and Grant Line Road underwent pavement rehabilitation in the past three years. This project included new road striping and highly reflective lane delineators.

1-22
Caltrans is currently developing a standardized pre- and post-construction lighting analysis report and methodology. This standardized report will be used to verify the lighting analysis used in the NES. The standardized methodology is being developed based on actual field observations of unlit and newly illuminated areas in District 4. This standardized lighting analysis is due to be completed by the Summer of 2020 and will be utilized by the Interstate 580 Altamont Lighting project which is scheduled for construction in late 2021.

1-23
During the Section 7 consultation with USFWS, Caltrans agreed to provide off-site compensatory mitigation for federally threatened species habitat at a 3:1 ratio for areas illuminated to a level greater than that of a full moon. This compensatory mitigation in addition to the proposed avoidance and minimization measures will reduce the level of impact to less than significant.

Comment 2, Alameda County Supervisor, District 1

BOARD OF SUPERVISORS

SCOTT HAGGERTY
SUPERVISOR, FIRST DISTRICT

November 12, 2019

Department of Transportation, District 4
P.O. Box 23660, MS 8B
Oakland, Ca 94623-0660

Re: **Support for Interstate 580 Safety Lighting and Power Supply Installation Project**

To Whom it May Concern:

On behalf of the First District residents of Alameda County, I write to express my support for the California Department of Transportation project to construct safety lighting and subsequent power supply on the Eastbound I-580 corridor from West Grant Line Road Undercrossing to North Flynn Road Overcrossing.

With an average of 82,000 daily trips recorded in 2016 between the North San Joaquin Valley and the Bay Area, the Altamont Pass represents one of the most congested corridors in the Northern California megaregion. As highway congestion continues to worsen, frequency of accidents on the highway remains a serious concern. Of particular alarm is the project's initial study statistic that this segment of I-580 experiences a higher collision frequency than similar highways in California, with a collision rate of 1.45 accidents per million vehicle miles (MVM), compared to the expected rate of 0.31 per MVM. For this reason, I support the Caltrans effort to combat this statistic by providing greater nighttime visibility, thus increasing the safety of both commuters and maintenance workers alike.

While Alameda County continues to advocate for the Valley Link Project, which is anticipated to relieve traffic congestion within the Altamont Pass, precautionary measures must be implemented for the safety of commuters and maintenance workers. Projects such as the Caltrans I-580 Safety and Power Supply Project will support this vital effort, and I commend Caltrans for initiating the project.

If I may be of any assistance, please feel free to contact me at 510-272-6691 or District1@acgov.org.

Sincerely,

Scott Haggerty
Alameda County Supervisor
District 1

1221 OAK STREET · SUITE 536 · OAKLAND, CALIFORNIA 94612 · 510 272-6691 · FAX 510 208-3910
4501 PLEASANTON AVENUE · PLEASANTON, CALIFORNIA 94566 · 925 551-6995 · FAX 925 484-2809
www.acgov.org

Response to Comment 2, Alameda County Supervisor, District 1

Caltrans appreciates your comment in support of the Caltrans I-580 Safety Lighting and Power Supply Installation Project.

Chapter 4 List of Preparers

This document was prepared by the following Caltrans staff and consultants:

CALIFORNIA DEPARTMENT OF TRANSPORTATION

Environmental Analysis
Stefan Galvez-Abadia, Division Chief
Brian Gassner, Branch Chief
Cristin Hallissy, Branch Chief
Sabrina Dunn, Associate Environmental Planner
Marissa Brown, Associate Environmental Planner
Juliane Smith, Environmental Planner

Project Management
Issa Bouri, Project Manager

Design- Project Development, East
Edmund Choy, Senior Transportation Engineer
Huda Nassori, Transportation Engineer

Biological Sciences and Permits
John Yeakel, Branch Chief

Cultural Resource Studies
Noah Stewart, Senior Environmental Planner (Architectural Historian)
Michael Meloy, Associate Environmental Planner (Architectural Historian)
Kathryn Rose, Senior Environmental Planner
Britt Schlosshardt, Environmental Planner (Archaeology)

Landscape Architecture
Lydia Mac, Senior Landscape Architect
Keith Suzuki, Landscape Associate

Geotechnical Design West
Chris Risden, Senior Engineering Geologist
Ron Karpowicz, Engineering Geologist

Environmental Engineering
Christopher Wilson, Senior Transportation Engineer (Hazardous Waste)
Shilpa Mareddy, Transportation Engineer (Air and Noise)
Jonathan Wellen, Transportation Engineer (Water Quality)

Engineering Services, Hydraulics
Craig Tomimatsu, Senior Transportation Engineer

Office of Environmental Management
Brenda Powell Jones, Senior Environmental Planner
Barbara Wolf, Climate Change Policy Advisor

GARCIA AND ASSOCIATES
Dennis Coghlan, Biologist
John McCarthy, Environmental Planner
Meera Velu, Environmental Scientist

Chapter 5 Distribution List

Elected Officials

U.S. Senate

The Honorable Dianne Feinstein
United States Senate, California
One Post Street, Suite 2450
San Francisco, CA 94104

The Honorable Kamala Harris
United States Senate, California
333 Bush Street, Suite 3225
San Francisco, CA 94104

U.S. House of Representatives

The Honorable Eric Swalwell
United States Congress, 15th District
3615 Castro Valley Boulevard
Castro Valley, CA 94546

California State Assembly

The Honorable Steve Glazer
California State Senate – 7th District
51 Moraga Way, Suite 2
Orinda, CA 94563

The Honorable Rebecca Bauer-Kahan
California State Assembly – 16th District
2440 Camino Ramon, Suite 345
San Ramon, CA 94583

County Officials

The Honorable Scott Haggerty
Alameda County Board of Supervisors,
District 1, County Administration Building
1221 Oak Street, #536
Oakland, CA 94612

Local Officials

Mayor John Marchand
City Hall
1052 S. Livermore Avenue
Livermore, CA 94550

Vice Mayor Bob Woerner
City Hall
1052 S. Livermore Ave.
Livermore, CA 94550

Councilmember Bob Coomber
City Hall
1052 S. Livermore Avenue
Livermore, CA 94550

Councilmember Trish Munro
City Hall
1052 S. Livermore Avenue
Livermore, CA 94550

Councilmember Robert W. Carling
City Hall
1052 S. Livermore Avenue
Livermore, CA 94550

Federal Agencies

Natural Resources Conservation Service,
Alameda County Conservation District
3583 Greenville Road, Suite 2
Livermore, CA 94550

U.S. Army Corps of Engineers, Sacramento District
ATTN: Regulatory Branch
1325 J Street, Room 1350
Sacramento, CA 95814

U.S. Environmental Protection Agency,
Pacific Southwest, Region 9
75 Hawthorne Street
San Francisco, CA 94105

Ryan Olah
Division Chief
U.S. Fish and Wildlife Service
2800 Cottage Way, Room W-2605
Sacramento, CA 95825

State Agencies

State Clearinghouse, Executive Officer
1400 Tenth Street, Room 156
P.O. Box 3044
Sacramento, CA 95812

Bay Area Air Quality Management District
Jack Broadbent
Chief Executive Officer
939 Ellis Street
San Francisco, CA 94109

California Air Resources Board
Executive Officer Richard Corey
1001 I Street
P.O. Box 2815
Sacramento, CA 95812

California Department of Conservation
Director David Bunn
801 K Street, MS 24-01
Sacramento, CA 95814

Gregg Erickson
Regional Manager
California Department of Fish & Wildlife
2825 Cordelia Road, Suite 100
Fairfield, CA 94534

California Highway Patrol,
Special Projects Section
P.O. Box 942898
Sacramento, CA 92298

California Office of Historic Preservation
1416 Ninth Street, Room 1442
Sacramento, CA 95814

California Public Utilities Commission
Executive Director Paul Clanon
505 Van Ness Avenue
San Francisco, CA 94102

California Transportation Commission
Executive Director Susan Bransen
1120 N Street
Sacramento, CA 95814

Department of Toxic Substances Control
1001 I Street
Sacramento, CA 95814-2828
P.O. Box 806
Sacramento, CA 95812

Native American Heritage Commission
Executive Secretary
1550 Harbor Blvd, Suite 100
West Sacramento, CA 95691

Regional Water Quality Control Board
District 2
1515 Clay Street, Suite 1400
Oakland, CA 94612

Alameda County Planning Commission
224 W. Winton, Room 111
Hayward, CA 94544

California Office of Emergency Services
3650 Schriever Avenue
Mather, CA 95655

California Transportation Commission
1120 N Street, MS-52
Sacramento, CA 95814

Regional Agencies

Association of Bay Area Governments
Kenneth Kirkey
Planning Director
101 Eighth Street
Oakland, CA 94604-2050

Metropolitan Transportation Commission
Doug Kimsey
Planning Director
101 Eighth Street – Metrocenter
Oakland, CA 94607

County Agencies

Alameda County
Clerk of the Board of Supervisors
1221 Oak Street, Suite 536
Oakland, CA 94612

Alameda County Transportation Commission
1111 Broadway, Suite 800
Oakland, CA 94607

Local Agencies

Cheri Sheets, City Engineer
City Hall
1052 S. Livermore Avenue
Livermore, CA 94550

This page is left blank intentionally.

Appendix A. Title VI Policy Statement

STATE OF CALIFORNIA—CALIFORNIA STATE TRANSPORTATION AGENCY Gavin Newsom, Governor

DEPARTMENT OF TRANSPORTATION
OFFICE OF THE DIRECTOR
P.O. BOX 942873, MS-49
SACRAMENTO, CA 94273-0001
PHONE (916) 654-6130
FAX (916) 653-5776
TTY 711
www.dot.ca.gov

Making Conservation a California Way of Life.

November 2019

NON-DISCRIMINATION POLICY STATEMENT

The California Department of Transportation, under Title VI of the Civil Rights Act of 1964, ensures "*No person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance.*"

Related federal statutes, remedies, and state law further those protections to include sex, disability, religion, sexual orientation, and age.

For information or guidance on how to file a complaint, or obtain more information regarding Title VI, please contact the Title VI Branch Manager at (916) 324-8379 or visit the following web page: https://dot.ca.gov/programs/business-and-economic-opportunity/title-vi.

To obtain this information in an alternate format such as Braille or in a language other than English, please contact the California Department of Transportation, Office of Business and Economic Opportunity, at 1823 14th Street, MS-79, Sacramento, CA 95811; (916) 324-8379 (TTY 711); or at Title.VI@dot.ca.gov.

Toks Omishakin
Director

"Provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability"

This page is left blank intentionally.

Appendix B. Avoidance and Minimization Measures and/or Mitigation Measures

Avoidance and minimization measures (AMMs) and proposed compensatory mitigation measures (MMs) for biological resources for the project are listed below. For detailed descriptions of the following measures, refer to the appropriate topic section in Chapter 2.

In order to be sure that all of the environmental measures identified in this document are executed at the appropriate time, the following mitigation program would be implemented: During project design, avoidance, minimization, and/or mitigation measures will be incorporated into the project's final plans, specifications, and cost estimates, as appropriate. All permits will be obtained prior to implementation of the project. During construction, environmental and construction/engineering staff will ensure that the commitments are fulfilled. Following construction and appropriate phases of project delivery, long-term mitigation maintenance and monitoring will take place, as applicable. Some measures may apply to more than one resource area. Duplicative or redundant measures have not been listed.

Avoidance, Minimization, and/or Mitigation Measures

Biological Resources

AMM BIO-1: Permits. Caltrans will include a copy of the Biological Opinion (BO) and Incidental Take Permit (ITP) within the construction bid package of the proposed project. The Resident Engineer or their designee will be responsible for implementing the Conservation Measures and Terms and Conditions of the U.S. Fish and Wildlife Service (USFWS) BO and the California Department of Fish and Wildlife (CDFW) (ITP).

AMM BIO-2: Reinitiation of Consultation. Caltrans will reinitiate consultation if the project results in effects to listed species not considered in the USFWS BO or CDFW ITP.

AMM BIO-3: Biological Monitor Approval. Caltrans will submit the names and qualifications of the biological monitor(s) for USFWS/CDFW approval prior to initiating construction activities for the proposed project. Only agency-approved biological monitors would implement the monitoring duties outlined in the BO, including delivery of the Worker Environmental Awareness Training Program.

AMM BIO-4: Biological Monitoring. The agency-approved biologist(s) will be on-site during initial ground-disturbing activities, and thereafter as needed to fulfill the role of the approved biologist as specified in project permits. The biologist(s) will keep copies of applicable permits in their possession when on-site. Through the Resident Engineer or their designee, the agency-approved biologist(s) shall be given the

authority to communicate either verbally, by telephone, email, or hardcopy with all project personnel to ensure that take of special-status species is minimized and permit requirements are fully implemented. Through the Resident Engineer or their designee, the agency-approved biologist(s) shall have the authority to stop project activities to minimize take of special-status species or if he/she determines that any permit requirements are not fully implemented. If the agency-approved biologist(s) exercises this authority, the agencies shall be notified by telephone and email within 48 hours.

AMM BIO-5: Worker Environmental Awareness Training. All construction personnel will attend a mandatory environmental education program delivered by an agency-approved biologist prior to working on the project. The program would focus on the conservation measures that are relevant to employee's personal responsibility and would include an explanation as how to best avoid take of sensitive species. Distributed materials would include a pamphlet with distinguishing photographs of sensitive species, species' habitat requirements, compliance reminders, and relevant contact information. Documentation of the training, including sign-in sheets, would be kept on file and would be available on request.

AMM BIO-6: Preconstruction Surveys. Prior to any ground disturbance, preconstruction surveys will be conducted by an agency-approved biologist for listed species. These surveys will consist of walking surveys of the project limits and, if possible, accessible adjacent areas within at least 50 feet of the project limits. The biologist(s) will investigate all potential cover sites. This includes thorough investigation of mammal burrows, rocky outcrops, appropriately sized soil cracks, and debris. Native vertebrates found in the cover sites within the project limits will be documented and relocated to an adequate cover site in the vicinity. The entrances and other refuge features within the project limits will be collapsed or removed following investigation.

AMM BIO-7: Prevention of Wildlife Entrapment. To prevent inadvertent entrapment of special-status species during construction, excavated holes or trenches more than 1 foot deep with walls steeper than 30 degrees will be covered at the close of each working day by plywood or similar materials. Alternatively, an additional 4-foot-high vertical barrier, independent of exclusionary fences, will be used to further prevent the inadvertent entrapment of special-status species. If it is not feasible to cover an excavation or provide an additional 4-foot-high vertical barrier, independent of exclusionary fences, one or more escape ramps constructed of earth fill or wooden planks will be installed. Before such holes or trenches are filled, they will be thoroughly inspected for trapped animals. If at any time a trapped listed animal is discovered, the on-site biologist will immediately relocate the animal to an area outside of the work area. A USFWS/CDFW approved location will be designated prior to the start of construction. The USFWS/CDFW will be notified of the incident by telephone and electronic mail within 48 hours.

AMM BIO-8: Wildlife Exclusion Fencing. The limits of concrete barrier, electrical pole installation, electrical trenching, and underground vault installation will be delineated with high visibility wildlife exclusion fencing. The fencing will be removed only when all construction equipment is removed from the site. No project activities will occur outside the delineated project construction area. Wildlife exclusion fencing will not be installed for temporary access areas within species habitat required for installing/stringing the electrical line between poles. Construction activities occurring outside of suitable habitat for special-status species will not require wildlife exclusion fencing.

AMM BIO-9: Listed Species On-site. The Resident Engineer will immediately contact the agency-approved project biologist(s) if a California red-legged frog (CRLF) or California tiger salamander (CTS) is observed within a construction zone. The Resident Engineer will suspend construction activities within a 50-foot radius of the animal until the animal leaves the site voluntarily or an agency approved-protocol for removal has been established.

AMM BIO-10: Work Window for CTS and CRLF. All work within suitable habitat for CTS and CRLF will occur between April 15 and October 15, when the species are unlikely to be active and there is less potential for an individual to enter the work area.

AMM BIO-11: Material Storage. CTS and CRLF are attracted to cavity-like structures such as pipes and may seek refuge under construction equipment or debris. They may become trapped or injured if such materials are moved. All construction pipes, culverts, or similar structures, construction equipment, or construction debris left overnight within the work area will be inspected by the agency-approved biological monitor prior to being moved.

AMM BIO-12: Night Work. To the extent practicable, nighttime construction will be minimized.

AMM BIO-13: Night Lighting. Artificial lighting of the project construction area during nighttime hours will be minimized to the maximum extent practicable.

Mitigation Measures (MMs)

Caltrans proposes to include compensatory mitigation for potential impacts to species listed under FESA and CESA. To develop an appropriate mitigation proposal that meets the regulatory requirements of CEQA and FGC 2081, Caltrans proposes that compensatory mitigation in the form of habitat restoration and preservation will be provided on-site for temporary habitat impacts at a 1:1 ratio, and off-site at a 3:1 ratio for permanent habitat impacts.

MM BIO-1: Caltrans will compensate for the project's temporary impacts to 7.93 acres of CTS and CRLF habitat with on-site compensatory mitigation at a 1:1 ratio.

MM BIO-2: Caltrans will compensate for the project's permanent impacts to 0.04 acre of CTS and CRLF habitat with off-site compensatory mitigation from a USFWS-approved conservation bank within Alameda County at a 3:1 ratio.

This page is left blank intentionally.

Appendix C. List of Acronyms and Abbreviations

Abbreviation	Definition
AB	Assembly Bill
ADL	Aerially deposited lead
AMM	Avoidance and Minimization Measure
APE	Area of Potential Effects
ARB	California Air Resources Board
BA	Biological Assessment
BC	Black carbon
BMP	Best Management Practice
BO	Biological Opinion
BSA	Biological Study Area
Caltrans	California Department of Transportation
CDFW	California Department of Fish and Wildlife
CE	Categorical exclusion
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CH_4	Methane
CO_2	Carbon Dioxide
CRLF	California Red-legged Frog
CTP	California Transportation Plan
CTS	California Tiger Salamander
DPS	Distinct Population Segment
DSA	Disturbed Soil Area
EB	Eastbound
EO	Executive Order
FED	Final Environmental Document
FESA	Federal Endangered Species Act
FHWA	Federal Highway Administration
GHG	Greenhouse gas
GWP	Global warming potential
H&SC	Health and Safety Code
HFC	Hydrofluorocarbons
I-	Interstate
IPCC	Intergovernmental Panel on Climate Change
IS	Initial Study
ITP	Incidental Take Permit
LCFS	Low Carbon Fuel Standard
LED	Light emitting diode
MM	Mitigation Measure
MND	Mitigated Negative Declaration
MPO	Metropolitan Planning Organization

Abbreviation	Definition
MTC	Metropolitan Transportation Commission
MVM	Million vehicle miles
N_2O	Nitrous Oxide
NAHC	Native American Heritage Commission
NEPA	National Environmental Policy Act
NES	Natural Environment Study
NRHP	National Register of Historic Places
OCRS	Office of Cultural Resource Studies
PCA	Project Construction Area
PCE	Primary Constituent Elements
PG&E	Pacific Gas and Electric Company
PM	Postmile
project	I-580 Safety Lighting and Power Supply Installation Project
PRC	Public Resources Code
RCEM	Road Construction Emissions Model
ROW	Right-of-way
RTP	Regional Transportation Plan
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SCS	Sustainable Communities Strategy
SF_6	Sulfur Hexafloride
SHPO	State Historic Preservation Officer
SHS	State Highway System
SLR	Sea-level rise
SR	State Route
TMP	Traffic Management Plan
USC	United States Code
USDOT	U.S. Department of Transportation
USFWS	U.S. Fish and Wildlife Service
VMT	Vehicle miles travelled
WB	Westbound
WPCP	Water Pollution Control Plan

This page is left blank intentionally.

Appendix D. U.S. Fish and Wildlife Service Species List

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
Phone: (916) 414-6600 Fax: (916) 414-6713

In Reply Refer To:
Consultation Code: 08ESMF00-2019-SLI-0256
Event Code: 08ESMF00-2020-E-04973
Project Name: I-580 Safety Lighting and Power Source Installation Project

April 10, 2020

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, under the jurisdiction of the U.S. Fish and Wildlife Service (Service) that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Please follow the link below to see if your proposed project has the potential to affect other species or their habitats under the jurisdiction of the National Marine Fisheries Service:

http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
(916) 414-6600

Project Summary

Consultation Code: 08ESMF00-2019-SLI-0256

Event Code: 08ESMF00-2020-E-04973

Project Name: I-580 Safety Lighting and Power Source Installation Project

Project Type: TRANSPORTATION

Project Description: The California Department of Transportation (Caltrans) proposes to improve existing roadway conditions and enhance traffic safety by installing lighting along eastbound Interstate 580 (I-580) from West Grant Line Road Undercrossing to North Flynn Road Overcrossing near the City of Livermore in Alameda County. Additionally, the project proposes to install 48 new power poles parallel and south of eastbound I-580 in order to provide power to the project.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/37.73327034620432N121.62474374227406W

Counties: Alameda, CA

Endangered Species Act Species

There is a total of 13 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
San Joaquin Kit Fox *Vulpes macrotis mutica* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2873	Endangered

Reptiles

NAME	STATUS
Alameda Whipsnake (=striped Racer) *Masticophis lateralis euryxanthus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5524	Threatened
Giant Garter Snake *Thamnophis gigas* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4482	Threatened

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii* There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2891 Species survey guidelines: https://ecos.fws.gov/ipac/guideline/survey/population/205/office/11420.pdf	Threatened
California Tiger Salamander *Ambystoma californiense* Population: U.S.A. (Central CA DPS) There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2076	Threatened

Fishes

NAME	STATUS
Delta Smelt *Hypomesus transpacificus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/321	Threatened

Insects

NAME	STATUS
San Bruno Elfin Butterfly *Callophrys mossii bayensis* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/3394	Endangered
Valley Elderberry Longhorn Beetle *Desmocerus californicus dimorphus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7850 Habitat assessment guidelines: https://ecos.fws.gov/ipac/guideline/assessment/population/436/office/11420.pdf	Threatened

Crustaceans

NAME	STATUS
Conservancy Fairy Shrimp *Branchinecta conservatio* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8246	Endangered
Vernal Pool Fairy Shrimp *Branchinecta lynchi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/498	Threatened
Vernal Pool Tadpole Shrimp *Lepidurus packardi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2246	Endangered

Flowering Plants

NAME	STATUS
Large-flowered Fiddleneck *Amsinckia grandiflora* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5558	Endangered
Palmate-bracted Bird's Beak *Cordylanthus palmatus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1616	Endangered

Critical habitats

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
California Red-legged Frog *Rana draytonii* https://ecos.fws.gov/ecp/species/2891#crithab	Final

This page is left blank intentionally.

Appendix E. National Marine Fisheries Service Species List

NMFS Species List

Date: 4-10-2020

Caltrans EA: 04-0K680

Project: Interstate 580 Safety Lighting and Power Project

Description: The California Department of Transportation (Caltrans) proposes to improve existing roadway conditions and enhance traffic safety by installing lighting along eastbound Interstate 580 (I-580) from West Grant Line Road undercrossing (Post mile [PM] 1.3) to North Flynn Road overcrossing (PM 6.0) near the city of Livermore in Alameda County. The project will also install concrete barrier, 48 new power poles, and two underground electrical vaults on the southern side of eastbound I-580 to provide power for the safety lighting.

Quads Searched: Altamont and Midway

Quad Name **Altamont**

Quad Number **37121-F6**

ESA Anadromous Fish

SONCC Coho ESU (T) -
CCC Coho ESU (E) -
CC Chinook Salmon ESU (T) -
CVSR Chinook Salmon ESU (T) -
SRWR Chinook Salmon ESU (E) -
NC Steelhead DPS (T) -
CCC Steelhead DPS (T) -
SCCC Steelhead DPS (T) -
SC Steelhead DPS (E) -
CCV Steelhead DPS (T) - **X**
Eulachon (T) -
sDPS Green Sturgeon (T) -

ESA Anadromous Fish Critical Habitat

SONCC Coho Critical Habitat -
CCC Coho Critical Habitat -
CC Chinook Salmon Critical Habitat -
CVSR Chinook Salmon Critical Habitat -
SRWR Chinook Salmon Critical Habitat -
NC Steelhead Critical Habitat -

CCC Steelhead Critical Habitat -

SCCC Steelhead Critical Habitat -

SC Steelhead Critical Habitat -

CCV Steelhead Critical Habitat -

Eulachon Critical Habitat -

sDPS Green Sturgeon Critical Habitat -

ESA Marine Invertebrates

Range Black Abalone (E) -

Range White Abalone (E) -

ESA Marine Invertebrates Critical Habitat

Black Abalone Critical Habitat -

ESA Sea Turtles

East Pacific Green Sea Turtle (T) -

Olive Ridley Sea Turtle (T/E) -

Leatherback Sea Turtle (E) -

North Pacific Loggerhead Sea Turtle (E) -

ESA Whales

Blue Whale (E) -

Fin Whale (E) -

Humpback Whale (E) -

Southern Resident Killer Whale (E) -

North Pacific Right Whale (E) -

Sei Whale (E) -

Sperm Whale (E) -

ESA Pinnipeds

Guadalupe Fur Seal (T) -

Steller Sea Lion Critical Habitat -

Essential Fish Habitat

Coho EFH - X

Chinook Salmon EFH - X

Groundfish EFH -

Coastal Pelagics EFH -

Highly Migratory Species EFH -

MMPA Species (See list at left)

ESA and MMPA Cetaceans/Pinnipeds

See list at left and consult the NMFS Long Beach office 562-980-4000

MMPA Cetaceans -

MMPA Pinnipeds -

Quad Name **Midway**

Quad Number **37121-F5**

ESA Anadromous Fish

SONCC Coho ESU (T) -

CCC Coho ESU (E) -

CC Chinook Salmon ESU (T) -

CVSR Chinook Salmon ESU (T) -

SRWR Chinook Salmon ESU (E) -

NC Steelhead DPS (T) -

CCC Steelhead DPS (T) -

SCCC Steelhead DPS (T) -

SC Steelhead DPS (E) -

CCV Steelhead DPS (T) - **X**

Eulachon (T) -

sDPS Green Sturgeon (T) -

ESA Anadromous Fish Critical Habitat

SONCC Coho Critical Habitat -

CCC Coho Critical Habitat -

CC Chinook Salmon Critical Habitat -

CVSR Chinook Salmon Critical Habitat -

SRWR Chinook Salmon Critical Habitat -

NC Steelhead Critical Habitat -

CCC Steelhead Critical Habitat -

SCCC Steelhead Critical Habitat -

SC Steelhead Critical Habitat -

CCV Steelhead Critical Habitat -

Eulachon Critical Habitat -

sDPS Green Sturgeon Critical Habitat -

ESA Marine Invertebrates

Range Black Abalone (E) -

Range White Abalone (E) -

ESA Marine Invertebrates Critical Habitat

Black Abalone Critical Habitat -

ESA Sea Turtles

East Pacific Green Sea Turtle (T) -

Olive Ridley Sea Turtle (T/E) -

Leatherback Sea Turtle (E) -

North Pacific Loggerhead Sea Turtle (E) -

ESA Whales

Blue Whale (E) -

Fin Whale (E) -

Humpback Whale (E) -

Southern Resident Killer Whale (E) -

North Pacific Right Whale (E) -

Sei Whale (E) -

Sperm Whale (E) -

ESA Pinnipeds

Guadalupe Fur Seal (T) -

Steller Sea Lion Critical Habitat -

Essential Fish Habitat

Coho EFH - X

Chinook Salmon EFH - X

Groundfish EFH -

Coastal Pelagics EFH -

Highly Migratory Species EFH -

MMPA Species (See list at left)

ESA and MMPA Cetaceans/Pinnipeds

See list at left and consult the NMFS Long Beach office 562-980-4000

MMPA Cetaceans -

MMPA Pinnipeds -

This page is left blank intentionally.

Appendix F. U.S. Fish and Wildlife Service Biological Opinion

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Suite W-2605
Sacramento, California 95825-1846

In Reply Refer to:
08ESMF00-
2019-F-0511-1

MAR 18 2020

Ms. Cristin Hallissy
California Department of Transportation
Environmental Division, MS-8E
111 Grand Avenue
Oakland, California 94612

Subject: Formal Consultation on the Interstate 580 Safety Lighting and Power Source Installation Project, Alameda County, California (Caltrans EA 04-0K680)

Dear Ms. Hallissy:

This letter is in response to the California Department of Transportation's (Caltrans) November 9, 2018, request to initiate formal consultation with the U.S. Fish and Wildlife Service (Service) on the proposed Interstate 580 (I-580) Safety Lighting and Power Source Installation Project in Alameda County, California. Henceforth, the project will be referred to as the "proposed project". Your request was received by the Service on November 23, 2018, a revised Biological Assessment (BA) was received on August 19, 2019, and additional analysis was received on October 28, 2019. At issue are the proposed project's effects on the federally threatened central California distinct population segment (DPS) of the California tiger salamander (*Ambystoma californiense*; Central California tiger salamander), threatened California red-legged frog (*Rana draytonii*), California red-legged frog critical habitat, and endangered San Joaquin kit fox (*Thamnophis sirtalis tetrataenia*). Critical habitat has been designated for the Central California tiger salamander but does not occur within the proposed action area. Critical habitat has not been designated for the San Joaquin kit fox. This response is provided under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. § 1531 et seq.)(Act), and in accordance with the implementing regulations pertaining to interagency cooperation (50 CFR 402).

Fixing America's Surface Transportation Act (FAST Act) was signed into law on December 4, 2015. Providing funding from 2016 to 2020, the FAST Act includes provisions to promote streamlined and accelerated project delivery. Caltrans is approved to participate in the FAST Act project delivery program through the National Environmental Policy Act (NEPA) Assignment Memorandum of Understanding (MOU). The MOU allows Caltrans to assume the Federal Highway Administration's (FHWA) responsibilities under NEPA as well as FHWA's consultation and coordination responsibilities under federal environmental laws for most highway projects in California. Caltrans is exercising this authority as the federal nexus for section 7 consultation under the Act on this project.

The federal action we are consulting on includes the installation of permanent overhead safety lighting along a 4.7-mile segment of eastbound I-580 in the Altamont Hills, east of the City of Livermore. The proposed project will also include the addition of other components such as associated electrical infrastructure and a concrete barrier. You submitted a revised August 2019 BA as well as additional revisions on October 28, 2019, for our review and requested concurrence with

the findings presented therein. These findings conclude that the proposed project may affect and is likely to adversely affect the Central California tiger salamander, California red-legged frog, and San Joaquin kit fox. Caltrans concluded that the proposed project is not likely to adversely affect California red-legged frog critical habitat.

In considering your request, we based our evaluation on the following: (1) Caltrans' November 9, 2018, request for consultation and your revised August 2019 BA; (2) Caltrans' August 19, 2019 electronic mail (e-mail) message response to our December 5, 2018 e-mail message; (3) the August 13, 2015, reinitiation of consultation issued for Caltrans' *I-580 and I-205 Pavement Rehabilitation Project* (Service file 08ESMF00-2014-F-0311-R001); (4) Caltrans' October 28, 2019, response to our previous inquiries; (5) the East Alameda Conservation Strategy (EACCS, ICF 2010); (6) other consultations completed by the Service within the I-580 corridor; (7) relevant life history information for the subject species; (8) literature review concerning the effects of artificial lighting on various animal species; (9) personal communication with subject species experts and staff from the National Park Service's Natural Sounds and Night Skies Division; (10) personal communications with our counterparts at the California Department of Fish and Wildlife; and (11) other information available to the Service.

The remainder of this document provides our biological opinion on the effects of the proposed project on the Central California tiger salamander, California red-legged frog, California red-legged frog critical habitat, and San Joaquin kit fox.

Consultation History

November 23, 2018	The Service received Caltrans' November 9, 2018, request for consultation along with a November 2018 BA.
December 5, 2018	The Service sent Caltrans a request for additional information based on our review of the November 2018 BA. The e-mail message served as the equivalent of a 30-day letter.
August 19, 2019	The Service received an e-mail message from Caltrans providing additional information in response to our December 5, 2018, request. The message included a revised August 2019 BA.
September 5, 2019	The Service sent Caltrans comments and a request for additional information concerning our review of their August 19, 2019, message and revised August 2019 BA. The Service informed Caltrans that additional correspondence would be provided concerning the effects of artificial lighting.
October 28, 2019	The Service received additional information from Caltrans in response to our September 5, 2019 request. In their response, Caltrans revised their determination to state that the proposed action was likely to adversely affect the San Joaquin kit fox

BIOLOGICAL OPINION

Description of the Action

The proposed project includes a 4.7 mile segment of I-580 from the West Grant Line Road undercrossing (Post mile [PM] 1.3) to North Flynn Road overcrossing (PM 6.0). Within this

segment, Caltrans proposes to introduce overhead safety lighting and extend an existing concrete barrier.

According to the revised August 2019 BA, the proposed project will include the following components:

1. Site Preparation. The following site preparation activities will be conducted prior to ground disturbing activities to protect sensitive biological resources.

   Exclusion Fencing. Before ground disturbance activities commence, high-visibility wildlife exclusion fencing (suitable for amphibians exclusion) will be installed for the construction of the concrete barrier, electrical pole installation, electrical trenching, and underground vault installation to protect the Central California tiger salamander and California red-legged frog and to discourage them from entering the project footprint. The final project plans will outline how the fencing will be installed. The bid solicitation package special provisions will specify acceptable fencing material

   Vegetation Removal. Any vegetation that is within the ground work areas or in areas where permanent structures are proposed will be cleared and grubbed.

   Native vegetation will be cleared only when necessary and will be cut above soil level except in areas that will be excavated. This will allow plants that reproduce vegetatively to resprout later.

2. Addition of Safety Lighting. The proposed project includes the installation of 120 new light-emitting diode (LED) lighting fixtures along 4.7 miles of eastbound I-580. The lights will be placed every 200 feet and in the median, close to the inside shoulder. The lighting fixtures will be single luminaire with a 2700K LED, mounted on a 15-foot-long mast arm installed at a height of 35 feet. All lighting fixtures will be fitted with manufacture installed front-side shields to limit the illumination of areas outside the paved areas of I-580. The associated light foundations, pull boxes, and subterranean conduit are already in place. The power sources to the lights, which PG&E will install under an encroachment permit, will originate from outside of the Caltrans right-of-way (ROW). Electrical cable will also be installed.

3. Addition of Power Infrastructure. In order to provide power to the new lights, PG&E will install new underground and overhead electrical lines and power poles. New subterranean electrical line will be installed within existing conduit from the north side of the Grant Line Road westbound on-ramp to the south side of the Grant Line Road off-ramp, where the subterranean power lines will transition to pole mounted overhead power lines. An existing pull box will be replaced by a 4-foot by 6.5-foot junction box. A new trench will be excavated to connect the electric line to a utility pole.

   The overhead electrical lines will extend westward and will include the installation of 48 wooden power poles, installed approximately 200 feet apart. New overhead electrical lines will be installed from PM 1.5 to PM 4.7, totaling approximately 3.2 miles or 16,896 linear feet. The power poles and associated electrical lines will be south of, adjacent to, and parallel to eastbound I-580. The temporary work zone for pole installation, pull sites, and staging will be between 15 to 20 feet wide for the length of the overhead alignment. Temporary access from the pavement of I-580 to the overhead line work zone will be established at seven locations with a width of 50 feet at each location. Each of the overhead poles will be

22 inches in diameter with a length of 30 to 40 feet and will be installed to a depth of 7 feet. PG&E will access all of the work sites from the roadway using special equipment.

Caltrans will also supply the power across the eastbound I-580 at two locations, where the electrical lines will be directionally bored under eastbound I-580 to provide the power for the freeway lighting. At these two locations, service risers, conduits, and pull/junction boxes will be constructed in 20-foot by 80-foot areas at the south sides, and transformer/cabinets will be constructed in 10-foot by 20-foot areas in the median behind the existing concrete barrier. The electrical lines will be installed in the conduit and connected to the lighting system.

4. Extension of Concrete Barrier. The existing concrete barrier at PM 2.7 will be extended by 500 feet to the east towards Grant Line Road. The concrete barrier will act as both a safety barrier to prevent errant vehicles hitting an existing concrete headwall and to provide shading of aquatic features on the south side of I-580 from the newly installed light fixtures and vehicle head-lighting.

5. Site Clean-up, Restoration, and Mitigation. Temporarily disturbed areas and staging areas will be cleaned up and recontoured to original grade or designed contours wherever feasible. Permanent erosion control, including soil stabilization measures such as hydroseeding and coir netting, will be applied to all temporarily affected areas to minimize erosion after construction. All construction-related materials, including Environmentally Sensitive Area fencing and exclusion fencing, will be removed after construction, site clean-up, and restoration activities are complete.

   Vegetation removed due to the project will be replaced according to Caltrans policy. Appropriate native species will be used to the maximum extent possible. Groundcover will be selected for drought tolerance and disease resistance.

   All areas that are temporarily affected during construction will be revegetated with an assemblage of native vegetation suitable for the area. Invasive, exotic plants will be controlled within the project footprint to the maximum extent practicable, pursuant to Executive Order 13112.

Access and Staging
Access will be gained directly from I-580 and staging will be located within the existing I-580 right-of-way.

Equipment
Standard equipment that will likely be used for construction include compressors, concrete pumps, small excavators, flatbed trucks, augers, jackhammers, ready mix trucks, soil compactors, sweepers, trenchers, and water trucks.

Scheduling
Caltrans anticipates construction to begin in 2021 and to be completed in 180 working days. Construction activities will take place during both the day and night time periods.

Compensation
Caltrans proposes to offset the adverse effects of the associated construction and permanent illumination of habitat by implementing a suite of actions that will minimize the artificial lighting of

off-pavement areas, enhance safe passage across I-580, enhance connectivity across I-580, and conserve occupied habitat. The proposed actions are as follows:

1. *Off-site compensation.* Caltrans has proposed off-site habitat preservation/bank credit purchase to compensation for the loss of habitat values associated with ground disturbance and the addition of permanent off-pavement illumination exceeding the equivalence of a full moon event (generally measured at 0.1 lux), as shown in Table 1.

Table 1. Off-Site Compensation

Habitat Type	Direct Habitat Impact (Acres)		Compensation (Acres)		
	Temporary	Permanent	1:1.1 ratio	3:1 ratio	Total Compensation
Annual Grassland	7.88	0.04	8.67	0.12	8.79
Shrublands	0.05	0.00	0.06	0.00	0.06
Total	**7.93**	**0.04**	**8.73**	**0.12**	**8.85**
Habitat Type	**Lighting Impact <0.1 lux (Acres)**		**Compensation (Acres)**		
			n/a	**3:1 ratio**	**Total Compensation**
Annual Grassland	n/a	0.08	n/a	0.24	0.24
Grand Total		**0.12**	**8.73**	**0.36**	**9.09**

The proposed conservation will provide occupied habitat for the Central California tiger salamander and California red-legged frog in Alameda County and will be within the Service's described range for the San Joaquin kit fox. This conservation may be located within an existing Service-approved compensation bank, a turn-key compensation property, or a portion of a larger Caltrans' advanced compensation bank. Caltrans will present an adequate site to the Service and demonstrate that adequate funds have been secured to complete the action (such as acquisition and endowment) prior to the start of project construction. If needed, a Service-approved conservation easement, management plan, and endowment will be finalized prior to the completion of the project construction.

2. *Modifications to the lighting design.* To minimize off-target, off-pavement illumination, Caltrans will work to modify the off-the-shelf pole height and mast arm length. They will also add shielding and include the use of non-standard, lower wattage, 2700K LED bulbs. Caltrans estimates that the modifications will reduce the modeled standard off-pavement illumination by 79 percent.

   To arrive at a more optimal design, Caltrans worked with lighting manufacturers to develop an LED light unit and mounting pole that would reduce light from being cast outside the paved area of I-580 while still achieving a level of illumination that would reduce the frequency and severity of vehicle accidents. The optimal design utilized a reduced mounting height, shorter mast arm length, lower wattage bulb, and front-side shielding. According to the modeling, this option will reduce overall illumination but still achieved an adequate level of roadway illumination. Front-side shielding will reduce the point-light source visible from outside the roadway, and 2700K LED units have a longer wavelength and are considered less disruptive at night to wildlife. Placing lights in the median will also reduce illumination of species habitat on the outside shoulder. Placing the lights in the median will incur the additional cost of directional drilling under I-580 to provide electrical service.

Caltrans utilized AGi32 version 17.5 (Lighting Analysts Inc.) in connection with ArcGIS to model and quantify the isoline projections from the standard Caltrans lighting units with back-side shielding and the project-specific modified lighting units. According to Caltrans, the isoline model for the preferred lighting design demonstrated a projected 100% reduction in 2.0, 1.5, and 1.0 lux and an overall reduction of 79 percent of illuminated unpaved areas in comparison to the standard Caltrans lights.

3. *Post-construction field-truthing.* Caltrans will conduct on-the-ground illumination measurements following project completion to arrive at an accurate measure of the off-pavement illumination. Values and associated analysis and compensation/mitigation values will be modified as needed.

   Caltrans will provide a standardized pre- and post-construction lighting analysis methodology for Service approval prior to the start of construction. The results of the analysis will be presented in a standardized report that will be used to verify the projected isolines and lighting analysis developed in AGi32 and ArcGIS.

4. *Enhancement of safe passage.* Caltrans will install permanent fencing at specific locations to work in conjunction with retaining walls and concrete barriers to deter wildlife from entering the roadway and direct them towards existing I-580 over or under-crossings that would enable safe passage and enhance connectivity across the travel corridor.

   The final directional fencing plan will be presented to the Service for approval prior to the start of project construction.

5. *Installation of ground-level shielding.* To further reduce off-pavement illumination from both the installed overhead lights and vehicle head-lighting, Caltrans will extend the existing concrete barrier at PM 2.7 by 500 feet to the east towards Grant Line Road. The concrete barrier will act as both a safety barrier to prevent errant vehicles hitting the existing concrete headwall of the Mountain House Creek culvert and to provide shading of aquatic features on the south side of I-580 from the newly installed light fixtures.

Conservation Measures

Caltrans proposes to reduce adverse effects to the Central California tiger salamander, California red-legged frog, San Joaquin kit fox, migratory birds, other wildlife, and associated ecosystem processes by implementing the following measures:

1. **Permits**. Caltrans will include a copy of this Biological Opinion within the construction bid package of the proposed project. The Resident Engineer or their designee will be responsible for implementing the *Conservation Measures* and *Terms and Conditions* of this Biological Opinion.

2. **Biological Monitor Approval**. Caltrans will submit the names and qualifications of proposed biological monitor(s) for Service approval prior to initiating construction activities for the proposed project. Only Service-Approved Biological Monitors will implement the monitoring duties outlined in this Biological Opinion including delivery of the Worker Environmental Awareness Training Program.

3. **Preconstruction Surveys**. Prior to any ground disturbance, preconstruction surveys will be conducted by Service-Approved Biological Monitor for the Central California tiger salamander, California red-legged frog, and San Joaquin kit fox. These efforts will consist of

walking surveys of the project limits and, if possible, accessible adjacent areas within at least 50 feet of the project limits. The biologist(s) will investigate all potential cover sites. This includes thorough investigation of mammal burrows, rocky outcrops, appropriately sized soil cracks, and debris. Native vertebrates found in the cover sites within the project limits will be documented and relocated to an adequate cover site in the vicinity. The entrances and other refuge features within the project limits will be collapsed or removed following investigation.

4. **Preconstruction Surveys for Nesting Birds**. Preconstruction surveys for nesting birds will be conducted by a qualified biologist no more than 72 hours prior to the start of construction for activities occurring during the general breeding season (February 1 to September 30).

5. **Biological Monitoring**. The Service-Approved Biological Monitor(s) will be on-site during initial ground-disturbing activities, and thereafter as needed to fulfill the role of the approved biologist as specified in this BO. The Service-Approved Biological Monitor(s) will keep a copy of this BO in their possession when onsite. Through the Resident Engineer or their designee, the Service-Approved Biological Monitor (s) will be given the authority to communicate either verbally, by telephone, e-mail message or hardcopy with all project personnel to ensure that take of special-status species is minimized and the *Terms and Conditions* of this BO are fully implemented. Through the Resident Engineer or their designee, the Service-Approved Biological Monitor will have the authority to stop project activities to minimize take of special-status species or if they determine that the *Terms and Conditions* are not fully implemented. If the Service-Approved Biological Monitor exercises this authority, the Service will be notified by telephone and e-mail within 48 hours.

6. **Listed Species On-Site**. The Resident Engineer will immediately contact a Service-Approved Biological Monitor if a Central California tiger salamander, California red-legged frog, San Joaquin kit fox or their sign is observed within a construction zone. The Resident Engineer will suspend construction activities within a 50-foot radius of the animal until the animal leaves the site voluntarily or is relocated by the Service-Approved Biological Monitor.

7. **Care of Injured or Dead Animals**. Injured Central California tiger salamander, California red-legged frog, and San Joaquin kit fox will be cared for by a licensed veterinarian or a wildlife rehabilitation facility. After hours, interim care may be provided by another experienced person, including a Service-Approved Biological Monitor, until the animal can be delivered to a facility. Dead individuals of any listed species will be preserved by freezing and held in a secure location. The Service will be notified of the discovery of death or injury to a listed species within 24 hours of the initial discovery.

8. **Work Window**. All work within suitable habitat for Central California tiger salamander or California red-legged frog will occur between April 15 and October 15.

9. **Work Window for Nesting Birds**. To the extent practicable, clearing and grubbing activities will occur outside of the general bird nesting season (February 1 to September 30). When it is necessary to conduct clearing during the nesting season, preconstruction surveys will be conducted prior to clearing and grubbing of vegetation. If preconstruction surveys indicate the presence of nests of any native species, the Service's Region 8 Migratory Bird Division will be consulted to determine the appropriate buffer area to be established around the nesting site for the duration of the breeding season.

10. **Worker Environmental Awareness Training**. All construction personnel will attend a mandatory environmental education program delivered by a Service-Approved Biological Monitor prior to working on the project. The program will focus on the conservation measures that are relevant to employee's personal responsibility and will include an explanation as how to best avoid take of the Central California tiger salamander, California red-legged frog, and San Joaquin kit fox. Distributed materials will include a pamphlet with distinguishing photographs of the Central California tiger salamander and California red-legged frog, their habitat requirements, compliance reminders, and relevant contact information. Documentation of the training, including sign-in sheets, will be kept on file and will be available on request.

11. **Prevention of Wildlife Entrapment**. To prevent inadvertent entrapment of the Central California tiger salamander and California red-legged frog during construction, excavated holes or trenches more than one foot deep with walls steeper than 30 degrees will be covered at the close of each working day by plywood or similar materials. Alternatively, an additional 4-foot-high vertical barrier, independent of exclusionary fences will be used to further prevent the inadvertent entrapment of the Central California tiger salamander or California red-legged frog. If it is not feasible to cover an excavation or provide an additional 4-foot-high vertical barrier, independent of exclusionary fences, one or more escape ramps constructed of earth fill or wooden planks will be installed. Before such holes or trenches are filled, they will be thoroughly inspected for trapped animals. If at any time a trapped Central California tiger salamander or California red-legged frog is discovered, the Service-Approved Biological Monitor will immediately relocate the animal to an area outside of the work area. A Service-approved relocation area will be designated prior to the start of construction. The Service will be notified of the incident by telephone and e-mail within 48 hours of the initial observation.

12. **Non-disturbance Buffer for Nesting Birds**. If work is to occur within 300 feet of active raptor nests or 100 feet of active passerine nests, a non-disturbance buffer will be established at a distance sufficient to minimize disturbance based on the nest location, topography, cover, the species' sensitivity to disturbance, and the intensity/type of potential disturbance.

13. **Material Storage**. All construction pipes, culverts, or similar structures, construction equipment or construction debris left overnight within the work area will be inspected for Central California tiger salamander, California red-legged frog, and San Joaquin kit fox by the Service-Approved Biological Monitor prior to being moved.

14. **Water Quality Inspection**. Water quality inspector(s) will inspect the site after a rain event to ensure that the implementation of stormwater *Best Management Practices* (BMPs) are adequate.

15. **Vehicle Use**. Project employees will be required to comply with guidance governing vehicle use, speed limits on unpaved roads, fire prevention, and other hazards.

16. **Night Work**. To the extent practicable, nighttime construction will be minimized.

17. **Night Lighting During Construction**. The use of artificial lighting will be minimized to the maximum extent practicable. Artificial lighting will include shielding, bulbs with color ratings that minimize effects to wildlife, and be directed towards the active work area and away from surrounding habitat.

18. **Trash Control**. All food-related trash items such as wrappers, cans, bottles, and food scraps will be disposed of in closed containers and removed at least once a day from the work area.

19. **Firearms**. No firearms will be allowed in the action area except for those carried by authorized security personnel, or local, state, or federal law enforcement officials.

20. **Pets**. To prevent harassment, injury or mortality of sensitive species, no pets will be permitted on the project site.

21. **Storm Water Pollution Prevention Plan**. Dedicated fueling and refueling practices will be outlined as part of the project's *Storm Water Pollution Prevention Plan* (SWPPP). The SWPPP will comply with the Caltrans' *Storm Water Management Plan* (SWMP). The SWMP features guidance for Caltrans design staff to include provisions in construction contracts for measures to protect sensitive areas and to prevent and minimize stormwater and non-stormwater discharges. Dedicated fueling areas will be protected from stormwater run-on and run-off and will be located at least 50 feet from downslope drainage facilities and water courses. Fueling will be performed on level-grade areas. On-site fueling will only be used where it is impractical to send vehicles and equipment off-site for fueling. When fueling must occur on-site, the contractor will designate an area to be used subject to the approval of the Caltrans Resident Engineer. Drip pans or absorbent pads will be used during on-site vehicle and equipment fueling.

    Caltrans will implement temporary and permanent BMPs outlined in Section 13 of the Caltrans' 2018 *Standard Specifications*. Caltrans erosion control BMPs will be used to minimize wind- or water-related erosion. Caltrans will also implement the *National Pollution Discharge Elimination System Statewide Storm Water Permit* issued to them by the State Water Resources Control Board.

    The SWPPP will reference the Caltrans *Construction Site BMPs Manual*. This manual is comprehensive and includes many other protective measures and guidance to prevent and minimize pollutant discharges and can be found online at: http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm.

    Protective measures will be included in the contract, including, at a minimum:

    a. No discharge of pollutants from vehicle and equipment cleaning will be allowed into storm drains or water courses.

    b. Vehicle and equipment fueling and maintenance operations will be located at least 50 feet away from water courses.

    c. Concrete wastes will be collected in washouts, and water from curing operations will be collected and disposed of and will not be allowed into water courses.

    d. Dust control will be implemented, including use of water trucks and tackifiers to control dust in excavation and fill areas, rocking temporary access road entrances and exits, and covering temporary stockpiles when weather conditions require.

    e. Coir rolls will be installed along or at the base of slopes during construction to capture sediment, and temporary organic hydro-mulching will be applied to all unfinished, disturbed, and graded areas.

f. Work areas where temporary disturbance has removed the pre-existing vegetation will be restored and re-seeded with a native seed mix appropriate for the area.

g. Graded areas will be protected from erosion using a combination of silt fences, fiber rolls along toe of slopes or along edges of designated staging areas, and erosion-control netting (such as jute or coir) as appropriate.

h. A *Revegetation Plan* will be prepared for restoration of temporary work areas.

22. **Prohibition of Monofilament Erosion Control**. Plastic mono-filament netting (erosion control matting) or similar material will not be used for the project because Central California tiger salamander and California red-legged frog may become entangled or trapped in it. Acceptable substitutes include coconut coir matting or tackified hydroseeding compounds.

23. **Concrete Waste**. All grindings and asphaltic-concrete waste will be stored within previously disturbed areas absent of habitat and at a minimum of 150 feet from any aquatic habitat, culvert, or drainage feature.

24. **Reinitiation of Consultation**. Caltrans will reinitiate consultation if one of the associated conditions listed in the *Reinitiation–Closing Statement* of this Biological Opinion are triggered.

25. **Service Access**. If requested, before, during, or upon completion of groundbreaking and construction activities, Caltrans will allow access by Service personnel into the project footprint to inspect the project and its activities.

Action Area

The action area is defined in 50 CFR § 402.02, as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." For the proposed project, the action area encompasses a 9.21-acre construction footprint (1.24 acres barren soil + 7.97 acres vegetated landscape) plus a 300 foot habitat buffer to account for noise, vibration, and visual disturbance and a 21.55-acre off-pavement area that will be subject to permanent lighting at levels up to 0.01 lux.

Analytical Framework for the Jeopardy Determinations

Section 7(a)(2) of the Endangered Species Act requires that federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. "Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR § 402.02).

The jeopardy analysis in this Biological Opinion considers the effects of the proposed federal action, and any cumulative effects, on the range wide survival and recovery of the listed species. It relies on four components: (1) the *Status of the Species*, which describes the range wide condition of the species, the factors responsible for that condition, and its survival and recovery needs; (2) the *Environmental Baseline*, which analyzes the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species; (3) the *Effects of the Action*, which are all consequences to listed species or critical habitat that are caused

by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-federal activities in the action area on the species.

Analytical Framework for the Adverse Modification Determination

Section 7(a)(2) of the Act requires that federal agencies insure that any action they authorize, fund, or carry out is not likely to destroy or to adversely modify designated critical habitat. A final rule revising the regulatory definition of "destruction or adverse modification" (DAM) was published on August 27, 2019 (84 FR 44976). The final rule became effective on October 28, 2019. The revised definition states:

> *Destruction or adverse modification* means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species."

The DAM analysis in this biological opinion relies on four components: (1) the *Status of Critical Habitat*, which describes the current range wide condition of the critical habitat in terms of the key components (i.e., essential habitat features, primary constituent elements, or physical and biological features) that provide for the conservation of the listed species, the factors responsible for that condition, and the intended value of the critical habitat overall for the conservation/recovery of the listed species; (2) the *Environmental Baseline*, which analyzes the current condition of the critical habitat in the action area without the consequences to designated critical habitat caused by the proposed action, the factors responsible for that condition, and the value of the critical habitat in the action area for the conservation/recovery of the listed species; (3) the *Effects of the Action*, which determines all consequences to designated critical habitat that are caused by the proposed federal action on the key components of critical habitat that provide for the conservation of the listed species, and how those impacts are likely to influence the conservation value of the affected critical habitat; and (4) *Cumulative Effects*, which evaluate the effects of future non-federal activities that are reasonably certain to occur in the action area on the key components of critical habitat that provide for the conservation of the listed species and how those impacts are likely to influence the conservation value of the affected critical habitat. The *Effects of the Action* and *Cumulative Effects* are added to the *Environmental Baseline* and in light of the status of critical habitat, the Service formulates its opinion as to whether the action is likely to destroy or adversely modify designated critical habitat. The Service's opinion evaluates whether the action is likely to impair or preclude the capacity of critical habitat in the action area to serve its intended conservation function to an extent that appreciably diminishes the range wide value of critical habitat for the conservation of the listed species. The key to making that finding is understanding the value (i.e., the role) of the critical habitat in the action area for the conservation/recovery of the listed species based on the *Environmental Baseline* analysis.

Status of the Species and Critical Habitat

Central California Tiger Salamander
For the most recent comprehensive assessment of the species' range-wide status, please refer to the 2017 *Recovery Plan for the Central California Distinct Population Segment of the California Tiger Salamander* (Service 2017) and the 2014 *5-Year Review* (Service 2014). No change in the species' listing status was recommended in the 2014 5-year review. The referenced documents do not include the threat, recovery, survey data, and other relevant updates for the species since their issuance. Since that time,

actions have been implemented that have resulted in additional adverse effects to the species. In association with those actions, conservation measures have been implemented for the purpose of minimizing those adverse effects and in some cases, restoring or enhancing California tiger salamander habitat. While there have been continued losses of Central California tiger salamander habitat throughout the four recovery units, including the Central Valley recovery unit where the proposed project is located, to date no project has proposed a level of effects for which the Service has issued a biological opinion of jeopardy for the species.

Response to Light: The following is relevant to the life history of both the Central California tiger salamander and the California red-legged frog, relevant to the proposed action.

Studies suggest that lighting can negatively influence amphibian larval development, stunt growth, and cause them to avoid lit breeding habitat. Approaching headlights can cause frogs to become immobile. Artificial light can increase stress response triggering metabolic reactions. Insects attracted to lighting can in turn attract amphibians that would prey upon them. Adult frogs may be less likely to call during breeding season. Artificial lighting can interfere with cycles. Lighting can cause disorientation, and artificial night lighting likely increases the risk of amphibian predation (Dananay and Benard 2018; Longcore and Rich 2004; Perry et al. 2008; Rohacek et al. 2010; Wise 2007; Gern et al. 1983).

Along with many other amphibian species, the listed salamander and frog are especially adept at functioning in the nocturnal world. The anatomy of the amphibian eyes is particular adapted to detection in low light conditions. Their specialized rod photoreceptors allow them to distinguish color at lighting levels magnitudes dimmer than we, or their would-be mammalian predators, can distinguish (Yovanovich et al. 2017). This is an adaptation suited for their nocturnal-based activity. Central California tiger salamanders in particular, spend the majority of their lives underground or under cover where they forage, take refuge, and interact with other species. Recent study reveals that *Ambystoma* salamanders exhibit biofluorescence detectable in low light conditions (Lamb and Davis 2020). Although its purpose in salamanders is not well understood, the phenomenon is considered an important component of the life histories of species exhibiting this character. Munoz (2018) surmises salamander florescence may aid in subterranean and nocturnal settings and in intra-specific detection. Given that their above ground activity is primarily limited to the darkest nights of the year and their physiology is adapted for low light conditions, the lit environment is relatively foreign to them.

A variety of amphibians, including ranid frogs, have been shown to be more active during new moons rather than full moon illumination (Fitzgerald and Bider 1974). Based on their study of butter frog movement, Henrique and Grant (2019) determined that their subject species only moved at night and tended to remain near cover sights during daylight hours. The distances the frogs moved at night were positively related to darker phases of the moon, higher temperatures, and greater rainfall. They described the first quarter moon illumination as being within the more illuminating phases of the moon when butter frogs were more likely to move shorter distances. Henrique and Grant attributed the measured resulting behavior to critical life history events and needs. Those being the combination of darkness for predator avoidance and reproduction synchronization, and rain events for water balance and metabolic regulation. This combination of factors can be linked to the similar needs of the Central California tiger salamander and California red-legged frog.

A movement study of pepper frogs also demonstrated a tendency to remain close to retreat sites during the day and engage increased activity, including purposeful movements, at night (under night sky conditions)(Tozetti and Toledo 2005). Tozetti and Toledo also noted the tendency for daytime movements to be relegated to areas of cover, while movement in the open was reserved for the

night. A similar strategy is a reasonable expectation for Central California tiger salamanders and California red-legged frogs moving through the open grasslands of the action area.

Despite the paucity of species-specific studies on the mater, we do know that the Central California tiger salamander and California red-legged frog are more active above ground in their upland habitats at night. Whether the reason for this is due to increased prey abundance, cooler temperatures, the formation of dew, predator avoidance, or a combination of these factors and more, it appears that this nocturnal activity is purposeful. During these periods, both species may be foraging, in search of alternative refuge, dispersing, or moving to or from breeding habitat.

The Central California tiger salamander, in particular, is primarily active above ground in great numbers during periods of winter rain. This is a critical time for the species when adults are moving in large numbers to breeding ponds. The Service inquired with species' experts to determine if an association had been noted between moon phase and California tiger salamander movement behavior. Our contacts noted that observed above-ground movement to breeding ponds was exclusive to rainy winter nights when the moon phase was largely unobservable due to cloud cover (Pete Trenham, Chris Searcy, Brad Shaffer, and Mark Allaback, pers. comm., 2019). Observers also noted that tiger salamanders have a tendency to remain motionless or retreat when exposed to illumination from flashlights (Jeff Alvarez and Mark Allaback, pers. comm., 2019). Bellis (1962) noted similar behavior in wood frogs.

California Red-Legged Frog

Listing Status: The California red-legged frog was listed as a threatened species on May 23, 1996 (Service 1996). Critical habitat was designated for this species on April 13, 2006 (Service 2006), with revisions to the critical habitat designation published on March 17, 2010 (Service 2010a). At that time, the Service recognized the taxonomic change from *Rana aurora draytonii* to *Rana draytonii* (Shaffer et al. 2010). A recovery plan was published for the California red-legged frog on September 12, 2002 (Service 2002b).

Description: The California red-legged frog is the largest native frog in the western United States (Wright and Wright 1949), ranging from 1.5 to 5.1 inches in length (Stebbins 2003). The abdomen and hind legs of adults are largely red, while the back is characterized by small black flecks and larger irregular dark blotches with indistinct outlines on a brown, gray, olive, or reddish background color. Dorsal spots usually have light centers (Stebbins 2003); dorsolateral folds are prominent on the back. The California red-legged frog is sexually dimorphic; the females are larger than the males (Dodd 2013a, b). California red-legged frog tadpoles range from 0.6 inch to 3.1 inches in length and the background color of the body is dark brown and yellow with darker spots (Storer 1925).

Current Status and Distribution: The historical range of the California red-legged frog extended from central Mendocino County and western Tehama County south in the California Coast Range to northern Baja California, Mexico, and in the Sierra Nevada/Cascade Ranges from Shasta County south to Madera County (Jennings and Hayes 1994). The species historically occurred from sea level to elevations of about 5,200 feet in 46 counties; however, currently the taxon is extant in 238 streams or drainages within only 22 counties, representing a loss of 70 percent of its former range (Service 2002b). Isolated populations persist in several Sierra Nevada foothill locales and in Riverside County (Barry and Fellers 2013; Backlin et al. 2017; CDFW 2019; Gordon, R. and J. Bennett, pers. comm., 2017). The species is no longer considered extant in California's Central Valley due to significant declines caused by habitat modifications and exotic species (Fisher and Shaffer 1996). Currently, the California red-legged frog is widespread in the San Francisco Bay nine-county area (CDFW 2018). They are still locally abundant within the California coastal counties from Mendocino County to Los Angeles County and presumed extirpated in Orange and San Diego

counties (CDFW 2019; Yang, D. and J. Martin, pers. comm., 2017; Gordon, R. and J. Bennett, pers. comm., 2017). Baja California represents the southernmost edge of the species' current range (Peralta-García et al. 2016).

Barry and Fellers (2013) conducted a comprehensive study to determine the current range of the California red-legged frog in the Sierra Nevada, concluding that it differs little from its historical range; however, the current Sierra Nevada populations appear to be small and tend to fluctuate. Since 1991, eleven California red-legged frog populations have been discovered or confirmed, including eight probable breeding populations (Barry and Fellers 2013; Mabe, J., pers. comm., 2017). Microsatellite and mitochondrial DNA analysis by Richmond et al. (2014) confirmed the Sierra Nevada populations of the California red-legged frog are genetically distinct from each other, as well as from other populations throughout the range of this species. The research concluded that the Sierra Nevada populations are persisting at low levels of genetic diversity and no contemporary gene flow across populations exist. On a larger geographic scale, range contraction has left a substantial gap between Sierra Nevada and Coast Range populations, similar to the gap separating the Southern California and Baja California populations (Richmond et al. 2014).

Habitat and Life History:

Habitat

The California red-legged frog generally breeds in still or slow-moving water associated with emergent vegetation, such as cattails, tules (hardstem bulrush), or overhanging willows (Storer 1925; Fellers 2005). Aquatic breeding habitat predominantly includes permanent water sources such as streams, marshes, and natural and manmade ponds in valley bottoms and foothills (Jennings and Hayes 1994; Bulger et al. 2003; Stebbins 2003). Since the 1850's, manmade ponds may actually supplement stream pool breeding habit and can be capable of supporting large populations of this species. Breeding sites may hold water only seasonally, but sufficient water must persist at the beginning of the breeding season and into late summer or early fall for tadpoles to successfully complete metamorphosis. Breeding habitat does not include deep lacustrine water habitat (e.g., deep lakes and reservoirs 50 acres or larger) (Service 2010a). Within the coastal lagoon habitats, salinity is a significant factor on embryonic mortality or abnormalities (Jennings and Hayes 1990). Jennings and Hayes (1990) conducted laboratory studies and field observations concluding salinity levels above 4.5 parts per thousand detrimentally affected the California red-legged frog embryos. Aquatic breeding habitat does not need to be available every year, but it must be available at least once within the frog's lifespan for breeding to occur (Service 2010a).

Non-breeding aquatic habitat consists of shallow (non-lacustrine) freshwater features not suitable as breeding habitat, such as seasonal streams, small seeps, springs, and ponds that dry too quickly to support breeding. Non-breeding aquatic and riparian habitat is essential for providing the space, food, and cover necessary to sustain the California red-legged frog. Riparian habitat consists of vegetation growing nearby, but not typically in, a body of water on which it depends, and usually extends from the bank of a pond or stream to the margins of the associated floodplain (Service 2010a). Adult California red-legged frogs may avoid coastal habitat with salinity levels greater than 6.5 parts per thousand (Jennings and Hayes 1990).

Cover and refugia are important habitat characteristic preferences for the species (Halstead and Kleeman 2017). Refugia may include vegetation, organic debris, animal burrows, boulders, rocks, logjams, industrial debris, or any other object that provides cover. Agricultural features such as watering troughs, spring boxes, abandoned sheds, or haystacks may also be utilized by the species. Incised stream channels with portions narrower and depths greater than 18 inches may also provide important summer sheltering habitat. During periods of high water flow, California red-legged frogs

are rarely observed; individuals may seek refuge from high flows in pockets or small mammal burrows beneath banks stabilized by shrubby riparian growth (Jennings and Hayes 1994). Accessibility to cover habitat is essential for the survival of California red-legged frogs within a watershed and can be a factor limiting frog population numbers and survival.

Breeding

The California red-legged frog typically breeds between November and April; however, breeding may occur later in the Sierra Nevada Range (Barry 2002). Females deposit their egg masses on emergent vegetation, floating on or near the surface of the water. The California red-legged frog is often a prolific breeder, laying eggs during or shortly after large rainfall events in late winter and early spring. Egg masses containing 300-4,000 eggs hatch after six to fourteen days (Storer 1925; Jennings and Hayes 1994; Fellers 2005). Historically, the California red-legged frog in the Sierra Nevada likely bred within stream pools, which tend to be small with limited forage, constraining the size and number of populations (Barry and Fellers 2013).

California red-legged frog tadpoles undergo metamorphosis three to seven months following hatching. Most males reach sexual maturity in two years, while it takes approximately three years for females (Jennings and Hayes 1985; Fellers 2005). Under favorable conditions, California red-legged frogs may live eight to ten years (Jennings et al. 1992). Of the various life stages, tadpoles likely experience the highest mortality rates; only one percent of each egg mass completes metamorphosis (Jennings et al. 1992).

Diet

The California red-legged frog has a variable diet that changes with each of its life history stages. The feeding habits of the early stages are likely similar to other ranids, whose tadpoles feed on algae, diatoms, and detritus by grazing on the surface of rocks and vegetation (Fellers 2005). Hayes and Tennant (1985) found invertebrates to be the most common food items of adult California red-legged frogs collected in southern California; however, they speculated that this was opportunistic and varied based on prey availability. Vertebrates, such as Pacific tree frogs and California mice, represented over half of the prey mass eaten by larger frogs, although invertebrates were the most numerous food items. Feeding typically occurs along the shoreline and on the surface of the water; juveniles appear to forage during both daytime and nighttime, whereas adults appear to feed at night (Hayes and Tennant 1985).

Movement

California red-legged frogs do not have a distinct breeding migration (Fellers 2005), rather they may move seasonally from non-breeding pools or refugia to breeding pools. Some individuals remain at breeding sites year-round while others disperse to neighboring water features or moist upland sites when breeding is complete and/or when breeding pools dry (Service 2002b; Bulger et al. 2003; Fellers and Kleeman 2007; Tatarian and Tatarian 2008; Tatarian 2008). Studies in the several San Francisco Bay counties showed movements are typically along riparian corridors (Fellers and Kleeman 2007; Tatarian 2008). Although, some individuals, especially on rainy nights and in more mesic areas, travel without apparent regard to topography, vegetation type, or riparian corridors, and can move directly from one site to another through normally inhospitable habitats such as heavily grazed pastures or oak-grassland savannas (Bulger et al. 2003).

California red-legged frogs show high site fidelity (Tatarian and Tatarian 2008) and typically do not move significant distances from breeding sites (Bulger et al. 2003; Fellers and Kleeman 2007; Tatarian and Tatarian 2008; Tatarian 2008). When traveling between aquatic sites, California red-legged frogs typically travel less than 0.31 mile (Fellers and Kleeman 2007; Tatarian and Tatarian 2008), although they have been documented to move more than two miles in Santa Cruz County

(Bulger et al. 2003). Various studies have found that the frogs typically do not make terrestrial forays further than 200 feet from aquatic habitat (Bulger et al. 2003; Fellers and Kleeman 2007; Tatarian and Tatarian 2008; Tatarian 2008). Upland movements are typically associated with precipitation events and usually last for one to four days (Tatarian 2008).

Threats: Factors associated with declining populations of the California red-legged frog throughout its range include degradation and loss of habitat through agriculture, urbanization, mining, overgrazing, recreation, timber harvesting, non-native species, impoundments, water diversions, erosion and siltation altering upland and aquatic habitat, degraded water quality, use of pesticides, and introduced predators (Service 2002b, 2010a). Urbanization often leaves isolated habitat fragments and creates barriers to frog dispersal.

Non-native species pose a major threat to the recovery of California red-legged frogs. Several researchers have noted the decline and eventual local disappearance of California and northern red-legged frogs in systems supporting bullfrogs (Jennings and Hayes 1990; Twedt 1993), red swamp crayfish, signal crayfish, and several species of warm water fish including sunfish, goldfish, common carp, and mosquitofish (Moyle 1976; Barry 1992; Hunt 1993; Fisher and Shaffer 1996). The decline of the California red-legged frog due to these non-native species has been attributed to predation, competition, and reproduction interference (Twedt 1993; Bury and Whelan 1984; Storer 1933; Emlen 1977; Kruse and Francis 1977; Jennings and Hays 1990; Jennings 1993).

Chytridiomycosis, an infectious disease caused by the chytrid fungus, *Batrachochytrium dendrobatidis* (*Bd*), has been found to adversely affect amphibians globally (Davidson et al. 2003; Lips et al. 2006). While *Bd* prevalence in wild amphibian populations in California is unknown (Fellers et al. 2011), chytrid is expected to be widespread throughout much of the California red-legged frog's range. The chytrid fungus has been documented within the California red-legged frog populations at Point Reyes National Seashore, two properties in Santa Clara County, Yosemite National Park, Hughes Pond, Sailor Flat, Big Gun Diggings, and Spivey Pond (Padgett-Flohr and Hopkins 2010; Tatarian and Tatarian 2010; Fellers et al. 2011; Barry and Fellers 2013). However, no chytrid-related mortality has been reported in these populations, suggesting that California red-legged frogs are less vulnerable to the pathogenic effects of chytrid infection than other amphibian species (Tatarian and Tatarian 2010; Barry and Fellers 2013; Fellers et al. 2017). While chytrid infection may not directly lead to mortality in California red-legged frogs, Padgett-Flohr (2008) states that this infection may reduce overall fitness and could lead to long-term effects. Therefore, it is difficult to estimate the full extent and risk of chytridiomycosis to the California red-legged frog populations.

Negative effects to wildlife populations from roads and pavement may extend some distance from the actual road. The phenomenon can result from any of the effects already described in this BO, such as vehicle-related mortality, habitat degradation, and invasive exotic species. Forman and Deblinger (1998, 2000) described the area affected as the "road effect" zone. Along a four-lane road in Massachusetts, they determined that this zone extend for an average of approximately 980 feet to either side of the road for an average total zone width of approximately 1,970 feet. They describe the boundaries of this zone as asymmetric and in some areas diminished wildlife use attributed to road effects was detected greater than 0.6 mile from Massachusetts Route 2. The "road-zone" effect can also be subtle. Van der Zande et al. (1980) reported that lapwings and black-tailed godwits feeding at 1,575-6,560 feet from roads were disturbed by passing vehicles. The heart rate, metabolic rate and energy expenditure of female bighorn sheep increase near roads (MacArthur et al. 1979). Trombulak and Frissell (2000) described another type of "road-zone' effect due to contaminants. Heavy metal concentrations from vehicle exhaust were greatest within 66 feet of roads, but elevated levels of metals in both soil and plants were detected at 660 feet of roads. The "road-zone" apparently varies with habitat type and traffic volume. Based on responses by birds, Forman and Deblinger (2000)

estimated the effect zone along primary roads of 1,000 feet in woodlands, 1,197 feet in grasslands, and 2,657 feet in natural lands near urban areas. Along secondary roads with lower traffic volumes, the effect zone was 656 feet. The "road-zone" effect with regard to California red-legged frogs has not been adequately investigated.

The necessity of moving between multiple habitats and breeding ponds means that many amphibian species, such as the California red-legged frog, are especially vulnerable to roads and well-used large paved areas in the landscape. Van Gelder (1973) and Cooke (1995) have examined the effect of roads on amphibians and found that because of their activity patterns, population structure, and preferred habitats, aquatic breeding amphibians are more vulnerable to traffic mortality than some other species. Large, high-volume highways pose a nearly impenetrable barrier to amphibians and result in mortality to individual animals as well as significantly fragmenting habitat. Hels and Buchwald (2001) found that mortality rates for anurans on high traffic roads are higher than on low traffic roads. Vos and Chardon (1998) found a significant negative effect of road density on the occupation probability of ponds by the moor frog in the Netherlands. In addition, incidents of very large numbers of road-killed frogs are well documented (*e.g.*, Ashley and Robinson 1996), and studies have shown strong population level effects of traffic density (Carr and Fahrig 2001) and high traffic roads on these amphibians (Van Gelder 1973; Vos and Chardon 1998). Most studies regularly count road kills from slow moving vehicles (Hansen 1982; Rosen and Lowe 1994; Drews 1995; Mallick et al. 1998) or by foot (Munguira and Thomas 1992). These studies assume that every victim is observed, which may be true for large conspicuous mammals, but it certainly is not true for small animals, such as the California red-legged frog. Amphibians appear especially vulnerable to traffic mortality because they readily attempt to cross roads, are slow moving and small, and thus cannot easily be avoided by drivers (Carr and Fahrig 2001).

Recovery Plan: The *Recovery Plan* for the California red-legged frog identifies eight recovery units (Service 2002b). The goal of the recovery plan is to protect the long-term viability of all extant populations within each recovery unit. Within each recovery unit, delineated core areas, designed to protect metapopulations, represent contiguous areas of moderate to high California red-legged frog densities. The management strategy identified within this *Recovery Plan* will allow for the recolonization of habitats within and adjacent to core areas naturally subjected to periodic localized extinctions, thus assuring the long-term survival and recovery of California red-legged frogs.

California Red-Legged Frog Critical Habitat

Critical habitat is defined in Section 3 of the Act as: (1) The specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (a) essential to the conservation of the species and (b) that may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. In determining which areas to designate as critical habitat, the Service considers those physical and biological features that are essential to a species' conservation and that may require special management considerations or protection [50 CFR 424.12(b)].

The Service designated critical habitat for the California red-legged frog on April 13, 2006 (71 FR 19244) (Service 2006) and a revised designation to the critical habitat was published on March 17, 2010 (75 FR 12816) (Service 2010a).

The Primary Constituent Elements (PCE) defined for the California red-legged frog provide aquatic habitat for breeding and non-breeding activities and upland habitat for shelter, foraging, predator avoidance, and dispersal across its range. The PCE's and, therefore, the resulting physical and

biological features essential for the conservation of the species were determined from studies of California red-legged frog ecology. Based on the above needs and our current knowledge of the life history, biology, and ecology of the species, and the habitat requirements for sustaining the essential life-history functions of the species, the Service determined that the PCE's essential to the conservation of the California red-legged frog are:

1. Aquatic Breeding Habitat. Standing bodies of fresh water (with salinities less than 7.0 parts per thousand), including: natural and manmade (e.g., stock) ponds, slow-moving streams or pools within streams, and other ephemeral or permanent water bodies that typically become inundated during winter rains and hold water for a minimum of 20 weeks in all but the driest of years.

2. Non-Breeding Aquatic Habitat. Freshwater and wetted riparian habitats, as described above, that may not hold water long enough for the subspecies to hatch and complete its aquatic life cycle but that do provide for shelter, foraging, predator avoidance, and aquatic dispersal for juvenile and adult California red-legged frogs. Other wetland habitats that would be considered to meet these elements include, but are not limited to: plunge pools within intermittent creeks; seeps; quiet water refugia during high water flows; and springs of sufficient flow to withstand the summer dry period.

3. Upland Habitat. Upland areas adjacent to or surrounding breeding and non-breeding aquatic and riparian habitat up to a distance of 1 mile in most cases and comprised of various vegetational series such as grasslands, woodlands, wetland, or riparian plant species that provide the frog shelter, forage, and predator avoidance. Upland features are also essential in that they are needed to maintain the hydrologic, geographic, topographic, ecological, and edaphic features that support and surround the wetland or riparian habitat. These upland features contribute to the filling and drying of the wetland or riparian habitat and are responsible for maintaining suitable periods of pool inundation for larval frogs and their food sources, and provide breeding, non-breeding, feeding, and sheltering habitat for juvenile and adult frogs (e.g., shelter, shade, moisture, cooler temperatures, a prey base, foraging opportunities, and areas for predator avoidance). Upland habitat should include structural features such as boulders, rocks and organic debris (e.g., downed trees, logs), as well as small mammal burrows and moist leaf litter.

4. Dispersal Habitat. Accessible upland or riparian dispersal habitat within designated units and between occupied locations within a minimum of 1 mile of each other that allow for movement between such sites. Dispersal habitat includes various natural habitats and altered habitats such as agricultural fields, which do not contain barriers (e.g., heavily traveled road without bridges or culverts) to dispersal. Dispersal habitat does not include moderate- to high-density urban or industrial developments with large expanses of asphalt or concrete, nor does it include large reservoirs over 50 acres in size, or other areas that do not contain those features identified by PCE's 1, 2, or 3 as essential to the conservation of the subspecies.

With the revised designation of critical habitat, the Service intends to conserve the geographic areas containing the physical and biological features that are essential to the conservation of the species, through the identification of the appropriate quantity and spatial arrangement of the PCE's sufficient to support the life-history functions of the species. Because not all life-history functions require all the PCE's, not all areas designated as critical habitat will contain all the PCE's. Refer to the final designation of critical habitat for California red-legged frog for additional information (75 FR 12816).

San Joaquin Kit Fox
For the most recent comprehensive assessment of the species' range-wide status, please refer to the species' 2010 5-Year Review (Service 2010b). No change in the species' listing status was recommended in the 2010 5-year review. The referenced document does not include the threat, recovery, survey data, and other relevant updates for the species since its issuance. Since that time, actions have been implemented that have resulted in additional adverse effects to the species. In association with those actions, conservation measures have been implemented for the purpose of minimizing those adverse effects and in some cases, conserving, restoring, or enhancing San Joaquin kit fox habitat. While there have been continued losses of San Joaquin kit fox habitat throughout the core and satellite areas, including the satellite area where the proposed project is located, to date no project has proposed a level of effects for which the Service has issued a biological opinion of jeopardy for the species.

Little is comparatively known concerning the effects of artificial lighting on the San Joaquin kit fox. The listed fox currently occupies a variety of situations, including the highly urbanized and well illuminated City of Bakersfield, the modestly illuminated but rurally situated oil fields west of Bakersfield, and the relatively unilluminated region of the Carrizo Plain or the Altamont Hills. Cypher et al. (2005) concluded, that San Joaquin kit foxes exhibit a relatively high tolerance to disturbance. Their ability to adapt to different lighting regimes is aided by their eye structure. Unlike many other canids, foxes have cat-like, vertically-slit pupils that allow them the enhanced ability to regulate the amount of light hitting their pupils. The referenced distribution across a range of situations suggests the fox is adaptable but does not necessarily indicate that artificial lighting has no effect on the species, its habitat, its prey, or detectability by would be predators.

Instead, the variability in its behavior appears to be the result of a cost-benefit strategy, with prey availability and predator avoidance as the primary factors. This is a common strategy for mesopredators such as the kit fox. Absent predation risk, the mesopredator's peak activity would coincide with that of its preferred prey item. Given a predator risk, the mesopredator would be expected to modify its behavior to find an acceptable balance between prey procurement and predator avoidance. For example, researchers in Israel determined that the red fox was more active and also more successful capturing prey on darker nights and were less active on more moonlit nights, when their predator, the hyena was most active (Mukherjee et al. 2009). Mesopredators were found to follow the same moonlight aversion pattern in India (Bhatt et al. 2018). Primary predation risks for San Joaquin kit foxes in the action area include both diurnal species such as the golden eagle and "circadian flexible" species such as red fox, badgers, free-ranging dogs, and coyote. The kit fox is wary of these species and is expected to avoid their encounters.

For reference, the island fox of the Channel Islands is primarily diurnal, exhibiting an activity schedule that allows it to take advantage of a wider range of food resources in an environment where it had no predators, other than the occasional loss of a kit to red-tailed hawk (Service 2015). Populations of the island fox were decimated in the 1990s with the arrival of a non-native aerial predator, the golden eagle. The fox's long-standing diurnal behavior was suddenly a determent to its survival. Subsequent removal of golden eagles from the islands is credited as a critical measure in the species' recovery. San Joaquin kit foxes within the action area face a similar predation risk from golden eagles and other large raptors, contributing to the risk associated with diurnal activity. Altamont Pass is a major bird migratory route with a large concentrations of raptors. It is considered to have one of the highest density of breeding golden eagles in the world. At least two golden eagle pair activity centers have been identified in the past, in close proximity to the action area (Kolar and Wiens 2017). Golden eagles and other raptors are also drawn to the area due to the ground squirrel prey base. San Joaquin kit foxes occupying or moving through the proposed action area are competing with the golden eagle for food resources as well as risking falling prey to eagles.

Conversely, prey, such as small nocturnal mammals, are well known to be more active during low light conditions rather than a full moon, thereby avoiding detectability (Kotler et al. 2002; Prugh and Golden 2014; Daly et al. 1992). This "lunar phobic" response is particularly evident in open habitat, such as the grassland vegetation that dominates the proposed action area (Prugh and Golden 2014). The San Joaquin kit fox is an opportunistic predator whose diet includes a variety of prey items such as insects, small rodents, birds, squirrels, and hares. Despite this diversity, there appears to be particular prey species that are critical to their life history. As stated in the San Joaquin kit fox's *5 year review*, kangaroo rats are the fox's key prey species in the southern San Joaquin Valley (Service 2010b). Kit fox populations are more robust in areas where kangaroo rats are most abundant, and declines in kangaroo rat populations appear to have been detrimental to the fox. Kangaroo rats are less prevalent in the northern part of the fox's range, including the proposed action area. It has been noted that kit foxes in the northern part of the range subsist primarily on California ground squirrels (Service 2010b). A fox population crash in nearby eastern Contra Costa County was associated with a ground squirrel eradication program (Service 2010b).

Applying the standard predator-prey, cost benefit behavior scheme, we would expect San Joaquin kit foxes in the southern San Joaquin Valley region to be primarily active at night to coincide with the activity of its nocturnal kangaroo rat prey. Foxes in Bakersfield are an exception, given that they primarily subsist on anthropogenic food sources, but are more likely to be active at night to avoid interactions with people. San Joaquin kit foxes in the northern part of the range, and within the action area, are largely dependent on California ground squirrels, a diurnal species. Like most fox species, the San Joaquin kit fox is considered to be a nocturnal animal. The intersection of these factors supports what is perceived as crepuscular activity patterns for the fox in the north. Therefore, the fox is likely concentrating its foraging behavior to early morning and early afternoon periods to coincide with ground squirrel activity while avoiding the vulnerability of being active throughout the day. Interestingly, small nocturnal mammals have been shown to shift to crepuscular activity during full moon events to likely avoid detection of nocturnal predators (Daly et al. 1992).

Spotlighting has been used as a survey method for detecting the San Joaquin kit fox. Service biologists have anecdotally observed that the listed fox appears to be relatively undeterred when spotlighted, given that the observers are a given distance away. Ohrens et al. (2019) determined that flashing lights were effective in deterring pumas from livestock, but not Andean foxes.

Environmental Baseline

The proposed action area is located in the Altamont Hills, with the I-580 corridor bridging the Central and Livermore Valleys. Both the east and west bound directions have four lanes of travel with an open median of varied width (up to 0.17 mile). Due to the recent lane additions, east bound I-580 includes several retaining walls along its north shoulder. As in described EACCS, the I-580 corridor is a major barrier for the north-south movement of terrestrial wildlife in Alameda County, and maintaining a connection is crucial to the grassland habitat complex and the wildlife populations that depend on it (ICF International 2010). The area is dominated by annual grassland vegetation with pockets of scrub, wetlands, stock ponds, and riparian corridors. It is overwhelming rural, relatively unpopulated, and primarily utilized for livestock grazing and wind power generation. The EACCS provides a comprehensive description of the habitat values throughout the region (ICF International 2010).

The proposed action area is located within a 4.7 mile segment of the eastbound I-580 corridor. The road corridor includes paved lanes, road shoulders, compacted soil edge, and the outer vegetated zone. The landscape areas within the ROW are subject to annual vegetation management that may include use of herbicide. The area adjacent to the road shoulder is often accessed by vehicles and

equipment as a safe zone for addressing maintenance and emergency situations. The ROW is subject to the greatest levels of road effects that radiate out from and typically diminish with distance from I-580. These effects are generated from traffic related noise, vibration, exhaust, head lighting, heavy metal and other solid deposition, toxic liquid discharges, and discarded waste. Chemicals also leach from pavement and are transported into the local environment. This concentration of discharged substances along the transportation corridor results in changes in soil chemistry that has a variety impacts of the natural environment (Zeng et al. 2012). Paved surfaces absorb and reflect heat, creating elevated heat "islands". It is also likely that noxious weeds are introduced or spread along the ROW and surrounding environment through deposition from passing vehicles. As a result, transportation corridors typically have a higher percentage of non-native plant species composition (Zeng et al. 2012). Animal-vehicle collision is a consistent threat posed by roadways in both urban and rural areas. This is especially true with well-used multi-lane highways such as I-580. Roads are the source of reliable stress, injury, and mortality for wildlife ranging from insects to large mammals that attempt to enter the roadway. Collision with vehicles as well as the physical and behavioral barriers associated with roads fragment the landscape and isolate and diminish wildlife populations within those areas.

Despite the adverse effects that roads have on wildlife, common and rare species continue to occupy, frequent, or occasionally pass through urban and rural road ROWs. Some species are compelled to risk vehicle collision to access resources on either side of the road. Others are attracted to the disturbed habitats, roadkill, food-related trash, landscape vegetation, water sources, and utility perches within the ROW. Despite the perceived degradation, road ROWs can represent habitat for wildlife. This is especially true for species that have experienced large-scale habitat loss and degradation. In heavily developed areas, roadside vegetation represents a thin but contiguous corridor of habitat. Road ROWs are often considered unlikely places for wildlife to inhabit and their discovery in these areas often confound the biologists that study them.

The species covered in this BO and the following baseline are consistent with what was described for the referenced *I-580 and I-205 Pavement Rehabilitation Project* (Service file 08ESMF00-2014-F-0311-R001).

Central California Tiger Salamander
The proposed action area is located within the Central California tiger salamanders' range and contains the upland grassland habitat and the nearby aquatic breeding habitat associated with its life history. A map depicting the species' range is included in the Service's online profile for the species at https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=2076#rangeInfo. The proposed action area is also located within the DPS's Central Valley Recovery Unit (Unit 3) and the more specifically, it's Concord/Livermore Management Unit (Service 2017).

The proposed action area is within the suitable Central California tiger salamander habitat modelling results completed for the EACCS (ICF International 2010) and has been consistently the subject of consultation for federal nexus projects within the area. Their rolling grassland habitat with scattered breeding ponds is well represented in the vicinity and past surveys in the area have confirmed their widespread occupation of the area. Caltrans mapped 7.97 acres of Central California tiger salamander habitat (grassland and scrub vegetation types) that would be affected by ground disturbance associated with the proposed project.

Caltrans did not conduct protocol or roadkill surveys for the Central California tiger salamander within the action area but there are numerous Central California tiger salamander occurrences in the California Natural Diversity Database (CNDDB) in the vicinity of the proposed project. The action area includes suitable upland and dispersal habitat for the species populated by burrowing mammals.

It is also within navigable dispersal distance, generally given as at least 1.24 miles, to suitable and confirmed breeding habitat. Caltrans informed the Service of three Central California tiger salamanders found within the roadway in April 2019 during construction of a former I-580 project. The terms of that project's consultation were violated because the salamanders were captured and moved by a construction worker, unbeknownst to the Service-Approved Biologist. From the proposed construction footprint, there are at least four CNNDB records on the south side of the I-580 corridor, within 0.5 mile of the pavement (Central California tiger salamander occurrences 543, 132; 1,224, 330; CDFW 2019). Two of these four locations include confirmed breeding habitat provided by stock ponds (Central California tiger salamander occurrences 132; 330, CDFW 2019). For the sake of this analysis, these referenced records were confined to the same side of the I-580 corridor as the proposed project to highlight their overland connectivity to the proposed footprint. This was done based on the baseline barriers to salamander movement between east and westbound I-580.

The road effects zone applies to the Central California tiger salamander in the action area. Within the action area, the eastbound I-580 travel way includes four lanes of traffic and frequent, steep road cuts, retaining walls, and solid concrete barriers along the shoulder. As a result, access to the eastbound lanes are limited and over-road crossing potential for salamanders that do enter the eastbound I-580 roadway and escape vehicle collision is unlikely. With few navigable under-crossings and no directional barriers to guide them there, there is little north-south connectivity across the I-580 corridor. The species' recovery plan describes the action area segment of I-580 as an impassable barrier creating an isolated metapopulation (Service 2017). The EACCS also notes that I-580 largely precludes connectivity between breeding ponds that would otherwise be a strong basis for interaction between individuals on the north and south sides of the I-580 corridor (ICF International 2010). There is no existing overhead lighting that would influence their nighttime activity. Head-lighting from night-time traffic is likely substantial. These baseline conditions likely create a risk for Central California tiger salamanders that diminishes with distance from the I-580 travel corridor.

The Central California tiger salamander is reasonably certain to occur within the action area due to: (1) the project being located within the species' range and current distribution; (2) the action area includes areas that have been identified as important for the species' conservation; (3) the project area is modeled for the species' presence in the EACCS; (4) the habitat within the action area is similar to that which is found in nearby areas with confirmed Central California tiger salamander occupancy; (5) the species was recently found within the paved surfaces of this given segment of I-580 corridor; (6) individuals being found in locations well within the species' movement capabilities to the project footprint; (7) confirmed and suitable breeding habitat is located well within the species' known movement capabilities to the project footprint; (8) the action area being contiguous with an expanse of occupied landscape; (9) there are no significant barriers to salamander movement between confirmed occupied areas south of the action area and the action area; (10) the lack of significant disturbance or history of significant threats to the species in the general vicinity; and (11) the biology and ecology of the animal.

California Red-legged Frog

There is a high degree of overlap between the range, suitable habitat, and occupied habitat for California red-legged frog and Central California tiger salamander in Alameda County. As with the listed salamander, the proposed action area is located within the California red-legged frogs' range and contains the upland grassland habitat and the nearby aquatic breeding habitat associated with its life history. A map depicting the species' range is included in the Service's online profile for the species at https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=2891#rangeInfo. The proposed action area is also located within the frog's South and East San Francisco Bay Recovery Unit (Unit

4) and the more specifically, it's East San Francisco Core Unit (Service 2002b, 2006). As noted in the species' *Recovery Plan*, Contra Costa and Alameda Counties contain the majority of known California red-legged frog localities within the San Francisco Bay area.

Again, as with the salamander, the proposed action area is within the suitable California red-legged frog habitat modelling results completed for the EACCS (ICF International 2010) and has been consistently the subject of consultation for federal nexus projects within the area.

Caltrans did not conduct protocol or roadkill surveys for the California red-legged frog within the action area but there are numerous occurrences of the species in the CNDDB in the vicinity of the proposed project. The frog has similar subterranean and breeding pond life history needs with the Central California tiger salamander. Therefore, the action area includes suitable upland and dispersal habitat for the species and is within navigable dispersal distance, generally given as at least 2 miles, to suitable and confirmed breeding habitat. From the proposed construction footprint, there are at least three CNNDB records on the south side of the I-580 corridor, within 600 feet of the pavement (California red-legged frog occurrences 131, 132, and 133; CDFW 2019). All three of these nearby records include observations of adults and larvae in both stock ponds and in-stream pools. Caltrans mapped 7.97 acres of California red-legged frog habitat (grassland and scrub vegetation types) that would be affected by ground disturbance associated with the proposed project.

The road effects zone described for the Central California tiger salamander, including the influence of vehicle head-lighting, is true for the California red-legged frog.

The California red-legged frog is reasonably certain to occur within the action area due to: (1) the project being located within the species' range and current distribution; (2) the action area includes areas that have been identified as important for the species' conservation; (3) the project area is modeled for the species' presence in the EACCS; (4) the habitat within the action area is similar to that which is found in nearby areas with confirmed California red-legged frog occupancy; (5) individuals being found in locations well within the species' movement capabilities to the project footprint; (6) confirmed and suitable breeding habitat is located well within the species' known movement capabilities to the project footprint; (7) the action area being contiguous with an expanse of occupied landscape; (8) there are no significant barriers to frog movement between confirmed occupied areas south of the action area and the action area; (9) the lack of significant disturbance or history of significant threats to the species in the general vicinity; and (10) the biology and ecology of the animal.

California Red-Legged Frog Critical Habitat

Due to the complexities of determining the footprint of the resulting artificial illumination, it is difficult to state how much California red-legged frog critical habitat will be within the proposed action area. Based on Caltrans' modeling, the Service is aware that at least 12.98 acres of California red-legged frog critical habitat unit ALA-2 will be subject to permanent illumination due to the introduction of artificial lighting. Of that estimated 12.98 acres, Caltrans determined that it included approximately 0.25 acre of non-breeding aquatic habitat (PCE 2) and 12.73 acres of upland (PCE 3)/dispersal habitat (PCE 4).

Also known as the Arroyo Valle Unit, ALA-2 is comprised of approximately 153,624 acres in southwestern Alameda County. The unit overlays federal (6,892 acres), state (3,932 acres), local (39,525 acres), and private (103,276 acres) lands. ALA-2 is currently occupied by the California red-legged frog. The unit contains high-quality California red-legged frog habitat, representing all four PCEs. The unit also provides connectivity between other populations to the north and south along the Coast Range (Service 2010a).

As stated in the designation, the physical and biological features essential to the conservation of California red-legged frog in the ALA-2 unit may require special management considerations or protection due urbanization, alteration of aquatic and riparian habitats, and erosion and siltation of ponded habitat, which may alter aquatic or upland habitats and thereby result in the direct or indirect loss of egg masses or adults.

San Joaquin Kit Fox

The action area is located with the range of the San Joaquin kit fox. A map depicting the species' range is included in the Service's online profile for the species at https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=2873#rangeInfo. The Service also considers the action area to be within the Livermore Satellite subpopulation (S1) that roughly extends from Patterson to Concord (Service 2010b).

The proposed action area includes the rolling grassland habitat with friable soils for excavation and numerous ground squirrel prey that fulfill the species' life history needs. The EACCS identifies the proposed action area as being within a large contiguous zone of core San Joaquin kit fox habitat (ICF International 2010) and the listed fox has been consistently the subject of consultation for federal nexus projects within the area.

Focused San Joaquin kit fox surveys were not completed for the proposed project and there have been few such surveys in this portion of the species' range in recent years. As a result, we have little knowledge of the species occupation of suitable habitat in the area. The Service considers the fox to occupy this northern extent of its range in low numbers. Given the low population and the animal's tendency to make frequent movements within a large home range, the species can be difficult to detect. However, there are several recorded San Joaquin kit fox records within the CNDDB throughout the bounds of the Livermore Satellite (CDFW 2019). Caltrans mapped 7.97 acres of grassland and scrub vegetation types that would be affected by ground disturbance associated with the proposed project, which could be utilized by the listed fox.

The general discussion of a road effects zone applies to amphibians, reptiles, and mammals, such as the San Joaquin kit fox. The EACCS makes note of the importance of maintaining connectivity for the fox north and south of I-580 by improving passage and securing habitat conservation (ICF International 2010). The species' *5 year review* includes a brief summary of challenges that roads provide for the San Joaquin kit fox (Service 2010b). As stated in the review "(road) effects such as disturbance, introduction of non-native species, and exposure to contaminants may reduce suitability of habitat adjacent to roads, thereby increasing both the loss of suitable habitat and the effect of such features as barriers to kit fox movement and connectivity." The 2010 review also describes I-580 as a barrier to movement within and between satellite populations.

The San Joaquin kit fox is reasonably certain to occur within the action area due to: (1) the project being located within the species' range; (2) previous observations of the species in the general area, north and south of the proposed action area; (3) connectivity across the action area has been identified as important for the species' conservation; (4) the habitat within the action area is similar to areas where it has been observed; (5) the action area being contiguous with an expanse of occupied landscape immediately north and south; (6) there are no significant barriers to fox movement between confirmed occupied areas south of the action area and the action area; and (7) the biology and ecology of the animal.

Baseline Lighting Conditions

Dark skies have become an endangered resource as the glow from developed areas extends well beyond our urban boundaries. "Light pollution" has become a common term and technology has

been developed and applied over time to minimize unintended illumination of the human environment. Similar concepts are now being applied to conservation of the nocturnal environment that provides an important function in the life histories of both plant and wildlife species. There is a primary consensus that we remain largely "in the dark" in terms of quantifying the effects of artificial lighting on the natural world. Comparatively, adequate investigation on the effects of artificial lighting is lacking. FHWA acknowledges the effects of the artificial road lighting on the environment and underlines the need to minimize intensity, glare, spill light (off-target lighting), and sky glow in their 2012 Lighting Handbook (Lutkevich et al. 2012). Caltrans has begun their own investigation into the effects to inform future specifications (Caltrans 2019). Bhardwaj et al (2020) and Bliss-Ketchum et al (2016) provide a brief review of past investigations concerning the effects of artificial lighting on the effectiveness of wildlife crossing structures.

We do know that both plants and animals can sense the daily and seasonal patterns of sunlight and darkness in their environment and that information becomes a primary impetus for a variety of internal processes that drive their life cycle. Beyond environments such as caves, subsurface, and the deep ocean, circadian rhythms are key to the established life cycles and inter species interactions throughout the tropic levels. This reliance on daily and seasonal cycling of light and dark periods is one of the fundamental basis of terrestrial ecosystems, the life history of the living things within them, and how those living things interact with one another. Artificial disruption of the lighting regime will inherently have consequences on the system and those that evolved to inhabit it. Though our ability to quantify the effects of artificial lighting on individual species is becoming more enhanced, there is a great deal of information describing the effects on a variety of taxa.

The disruption created by artificial night lighting extends down to the primary producers in the ecosystem. Plants utilize light for photosynthesis but they also have photoreceptors that are triggered by light period cues to drive seasonal processes. These photoreceptors also utilize and react to seasonal changes in the spectral characteristics of natural light. Artificial lighting can disrupt the day length triggers that influence bud break, flowering, growth, and dormancy periods for plants (Candeias 2018; Bennie et al. 2016). Even in the tropics, where photoperiods differ by only an hour between seasons, the change stimulates blooming in flowering trees (Bennie et al. 2016). Low light levels and light pulses have also been found to elicit responses in plants (Bennie et al. 2016). Disruption of natural phenology can result in significant effects on the processes associated with condition of individual plants, their populations, and their function in the ecosystems they inhabit. Study has shown that this is a factor in roadside lighting of grassland communities, such as the dominant vegetative cover in the action area (Bennie et al. 2018). In turn, this disruption can modify the herbivory, pollination, and seed dispersal interactions/ relationships with animals. When the primary producers are compromised, the consequences move up the chain, with the potential to influence both diurnal and nocturnal wildlife.

Much of what we know about the influences of light on the nocturnal world is based on behavior and function linked to lunar cycles. In the natural environment, the moon is the brightest source of light at night and is therefore a reasonable measure by which to understand nocturnal behavior and how the addition of artificial light might influence it. Caltrans used this basis for their effects analysis and included the following lunar phase table in their August 2019 BA, as shown in Figure 1, to provide a general illumination value relative to lunar phases. The values given in the table are approximations, as the illumination levels associated with each moon phase are represented by a range, as the phase transitions over days rather than a fixed measure. The values also assume cloudless night conditions and do not represent actual conditions, whereas the illumination values change through the seasons and through the evening as the moon moves across the horizon.

It should also be noted that although isoline models differentiate between illumination lux values on the ground, the effects associated with individual isolines cannot be isolated from the whole. For instance, with artificial lighting, we would not expect a Central California tiger salamander to behave as if they are experiencing a quarter moon when located within the area measured to have a 0.01 lux value when the area with a full moon equivalency is only a matter of feet away. As observers, even in the dimly lit margins of the artificial light, we are still influenced by the glare of its source.

Figure 1. Illumination levels provided in Caltrans' August 2019 BA.

Table 3. Approximate Illumination Levels Under Natural Outdoor Conditions

Condition	Illumination (lux)	Foot-candle (FC)
Direct Sunlight	107,527	10,000
Full Daylight	10,752	1000
Overcast Day	1,075	100
Very Dark Day	107	10
Twilight	10.8	1

Condition	Illumination (lux)	Foot-candle (FC)
Deep Twilight	1.08	0.1
Full Moon	0.108	0.01
Quarter Moon	0.0108	0.001
Starlight	0.0011	0.0001
Overcast Night	0.0001	0.0001

Certainly, other extenuating factors influencing illumination of the environment and the organisms within it include cloud cover, canopy cover, vegetation type, topography, and the stature or behavior of the animal. Skies are often darkest on cloudy nights, independent of moon phase. Moon light is more intense on open grasslands than it is on the floor of a dense forest. The bottom of a steeply incised canyon experiences a different lunar photoperiod than the bluff above. The trotting coyote is more apparent than the slithering California king snake.

Heavy cloud cover contributes to the darkest nights of the year. As referenced in Figure 1, overcast nights are darker than moonless nights (0.0001 lux vs. 0.0011 lux). These conditions are significantly altered with the addition of artificial lighting. Kyba et al. (2011), conducted measurements that indicated, with the addition of artificial lighting, overcast nights are brighter than cloudless, moonlit nights. Clouds are highly reflective, bouncing light back to the ground, magnifying the intensity of sky glow. Therefore, the artificial lighting has the potential to be more pronounced on overcast winter evenings when listed amphibians, in particular, the Central California tiger salamander, are engaged in increased above-ground activity and critical movement to breeding ponds.

In today's world, the benefits associated with nocturnal activity have begun to extend to species that have not been classically associated with the "night shift". Darkness is increasingly becoming a refuge for diurnal species. Gaynor et al. (2018) determined that mammal species across continents and habitat types have become increasingly nocturnal to avoid interactions with humans at the determent of a wide range of life history functions. Therefore, addition of artificial lighting can result in unexpected large scale ecological shifts that extend beyond the interactions between animals within the system.

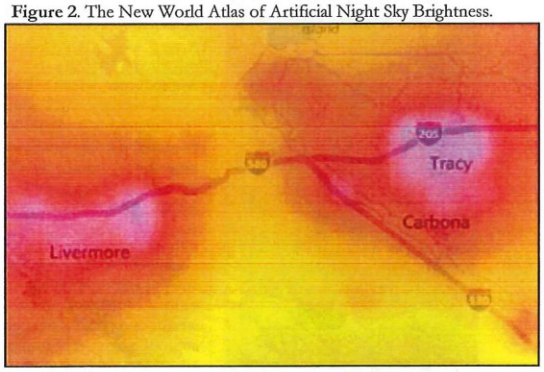
The natural cycle of light and dark are clearly critical to the majority of ecosystems and the individuals that function within them. Within those systems there is a large spectrum of lighting conditions which result in a complex range of conditions that support an interconnected web of plant and animals species. Disruption of those cycles and that balance results in predictable consequences as well as outcomes we have yet to understand.

The primary purpose of the project is to illuminate an approximately 4.7 mile segment of eastbound I-580 with no existing fixed roadway lighting. According to Caltrans, the current sources of illumination within the action area include street lighting at the adjacent North Flynn Road truck

pullout/on-ramp, Grant Line Road off-ramp, and vehicle head-lighting. Vehicle headlights are designed to illuminate the roadway immediately in front of the vehicle. Headlights are optimally aimed to reduce peripheral illumination and glare that is disruptive to oncoming drivers. However, as noted by Gaston and Holt (2018), headlights emit a broad spectrum of light and produce a pulsing effect as vehicles pass in succession. With a relatively straight alignment and existing retaining walls and concrete shoulder barriers, off-pavement headlight spill is limited. Sky glow from the neighboring communities of the San Joaquin and Livermore valleys is detectable over the Altamont Pass. The baseline measurements attributable to these light sources was unavailable at the time of analysis. Caltrans' plan to conduct on-the-ground measurements prior to construction may provide information that will be relevant to affects analysis, thereby triggering a potential reinitation of consultation.

Overall, baseline artificial lighting in the proposed action area is relatively minimal. As shown in Figure 2, the Altamont Pass is a relatively dark passage flanked by two urban centers (https://www.lightpollutionmap.info/#zoom= 9&lat=4535258&lon=-13540190&layers= B0FFFFFTFFFFFFFF). (Similar maps can be found at https://www.darkskymap.com/ and https://blue-marble.de/nightlights/2012.)

Figure 2. The New World Atlas of Artificial Night Sky Brightness.



It is likely that general Central California tiger salamander, California red-legged frog, San Joaquin kit fox movement, activity periodicity, and general behavior is relatively unaffected by the existing low levels of artificial lighting with the proposed action area. The baseline artificial lighting is also unlikely to have a significant influence on the behavior, abundance, or detectability of their potential prey items that they forage upon within the proposed action area.

Head lighting from passing vehicles does likely elicit a significant response from any of these three listed species approaching the I-580. Vehicle lights likely result in a "freeze" response and/or disorientation that greatly increases the risk of Central California tiger salamander, California red-legged frog, San Joaquin kit fox encountering collision with passing vehicles.

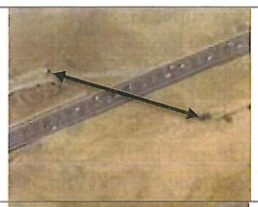
Baseline Movement/Passage Conditions

The I-580 corridor is a well referenced barrier to wildlife movement and habitat connectivity. With steep topography, few cross culverts, and few road intersections, there is relatively limited baseline potential for wildlife to use infrastructure to safely pass over or under I-580. Recent lane additions in both direction of travel have resulted in the addition of retaining walls and concrete barriers placed along the road shoulder. These features limit access to I-580 resulting in lower mortality risk and less connectivity. Given the high volume of traffic, both night and day, wildlife attempting to cross over the highway have a high risk of vehicle collision.

Using aerial imagery, the Service was not able to identify existing infrastructure with a high likelihood of wildlife crossing value. Based on our rudimentary investigation we identified the following potential crossing features within the proposed action area in Table 2 from east to west.

Table 2. Potential crossing features within proposed action area.

Type	Location (closest PM)	Image	Notes
Grant Line Road undercrossing	PM 1.50		Passage under east and westbound I-580. Two-lane county road with modest traffic. Approximately 200 feet long. Passage over paved and gravel shoulder substrate. May be effective passage at night for wildlife such as coyote, foxes, and badgers. Risky and highly exposed passage for amphibians.
Drainage culvert	PM 1.90		Approximately 490 foot long drainage culvert passing under east and westbound I-580. Culvert too lengthy and small to conceivably be used by wildlife.
Possible travel culvert	PM 2.00		Approximate 322 foot long box culvert passing under east and westbound I-580. Based on aerial photography, may be used for rancher to move cattle from one side of the I-580 corridor to the other. Lengthy but has potential to provide passage for a range of wildlife. May provide winter passage for amphibians if exhibits sufficient humidity on rainy nights.
Mountain House Creek culvert	PM 2.60		Hydraulic culvert for creek. Approximately 170 feet long and passing under eastbound I-580, connecting the area south of I-580 and the wide median between east and westbound I-580. The creek passes through an approximately 780-foot long culvert under westbound I-580, approximately 0.2 mile to the east. May accommodate passage for small to medium-sized wildlife between the area south of eastbound 580 and the median. Unlikely that wildlife would utilize the westbound culvert for movement.
Abandoned rail underpass and tunnel	PM 3.90		The southern approach to the abandoned railroad tunnel crosses under eastbound I-580, providing a relatively open passage between the area south of the I-580 corridor and the median between west and eastbound I-580. It is inconceivable that wildlife would utilize the approximately 0.2 mile-long tunnel between the median and habitat north of westbound I-580 for movement.
Rail overcrossing and undercrossing	PM 4.0		The railroad includes a bridge overcrossing of eastbound I-580 and an undercrossing of westbound I-580. The openness of the crossings are sufficient for passage of a wide range of wildlife, however the corridor includes rail infrastructure and coarse gravel. The rails can restrict movement of the California tiger salamander and the substrate hampers movement of small animals. Wildlife such as coyotes, badger, and ground squirrels would be more likely to utilize the over and undercrossings for movement.

Mountain House Creek culvert	PM 4.80		This approximately 595 foot long skewed culvert is designed for hydrologic connectivity south of east bound I-580 and the median. It empties into a lined channel on the median side. Vegetation appears to block the view of the southern inlet. It is unlikely that wildlife would use a culvert of this length and configuration for movement.
Carrol Road overpass	PM 5.90		This two-lane, approximately 440 feet long, overpass over east and westbound I-580 provides risky passage for wildlife. Amphibians would be highly vulnerable.

Ideal road passage for wildlife is provided by structures that "bridge" the ecosystem rather than provide a viaduct for a given species to move from point A to B. The effectiveness of a span, box, or pipe undercrossing is largely dependent upon their openness ratio, that being the length relative to the height and width. Wildlife are more likely to make use of undercrossings with short lengths, large dimensions, a clear line of sight, and a traversable substrate. They are unlikely to use even the most optimally designed structure unless directional fencing or other barriers are in place to guide them there and prevent them from accessing the pavement.

The road, rail, and drainage crossings described in Table 2 were not designed to accommodate wildlife movement and it is unlikely that they provide such. There are no discernable movement barriers that would direct animals to these structures. If there were, it is still unlikely that they would select to use them. The large box culvert at PM 2.00 is likely the most functional existing structure in the 4.7 mile segment of I-580 for safe passage. Investigation of its use is worthy. If deemed to be functional, there may be opportunity to enhance its use by wildlife.

It is likely that the vast majority of north-south movements across the I-580 corridor occur on pavement. Given the number of lanes and heavy traffic loads, there is an associated high risk of mortality. This risk is increased for small, less agile, and less detectable species such as the Central California tiger salamander and the California red-legged frog.

Effects of the Action

Effects of the Action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action.

The effects of the proposed project include those effects occurring within the action area during and following construction of the proposed project. For this project, effects will be associated with the described installation of 120 new LED lighting fixtures along a continuous 4.7 mile segment of eastbound I-580 and the lasting effects associated with the permanent illumination of the action area. The effects of habitat loss/degradation were analyzed based on the term of the loss, restoration potential, and the associated changes to functional value. As a result, habitat loss was characterized as permanent or temporary.

Permanent habitat loss/degradation was defined as those areas where baseline ecological function for a listed species and the ecological processes that it depends on, have been lost or significantly reduced. According to Caltrans, proposed ground-disturbing construction activities will result in the permanent loss of 0.04 acre of grassland habitat shared by the Central California tiger salamander, California red-legged frog, and San Joaquin kit fox. According to Caltrans' calculations, the addition of artificial lighting will result in permanent degradation of approximately 21.55 acres of shared habitat for the three listed species and the resources they depend on. The 21.55 acre value is a conservative estimate based on lighting levels up to 0.01 lux. The actual degradation continuum extends beyond the 0.01 lux isoline to include all areas of habitat subject to a change in baseline lighting regime. We do not have that acreage value but know that it exceeds 21.55 acres.

Temporary habitat loss was considered for any landscape cover that will be restored to baseline habitat values (for the given species) within one year following the initial disturbance. Based on the link to the successful restoration timeline, the temporary habitat loss category typically applies to habitat types that are dominated by annual plant species or other situations that can become quickly established. Caltrans estimated that the proposed construction activities would result in the temporary habitat loss of 7.93 acres of landscape habitat utilized by the three listed species. These areas will be utilized during construction for workspace and will be actively restored at the end of the project. The affected grass and shrub vegetative cover has the potential to provide baseline vegetative character within less than a year following the initial ground disturbance. However, these areas will be subject to newly added artificial lighting and therefore will not be capable of attaining baseline habitat values for the Central California tiger salamander, California red-legged frog, and San Joaquin kit fox. Adverse effects due to noise, vibration, and visual disturbance will be limited to the 180 days of anticipated working days.

Caltrans proposes to minimize construction related effects by implementing the *Conservation Measures* included in the *Description of the Action* section. Effective implementation of *Conservation Measures* will likely minimize effects to the Central California tiger salamander, California red-legged frog, and San Joaquin kit fox during construction but incidental take is still likely to occur. Therefore, the proposed project has the potential to result in a variety of adverse effects to these listed species.

Ground-disturbing construction activities associated with vegetation clearing, light fixture placement, installation of electrical support, placement of 500 feet of concrete barrier, as well as equipment staging and the preparation and use of workspace could result in killing, injuring, and disrupting Central California tiger salamander and California red-legged frog in the action area. The adverse effects to the San Joaquin kit fox will likely be limited to disruption of typical behaviors and movement/utilization of the action area.

Vegetation clearing will daylight previously shaded areas, likely changing the micro climate below with increased exposure and decreased moisture. This could affect the movement and available cover sites for the Central California tiger salamander and California red-legged frog. Removal of understory vegetation will result in the loss of foraging habitat and cover from predators and the elements. The ground disturbance associated with vegetation removal may result in exposure, stranding, crushing, maiming, or otherwise disturbing the Central California tiger salamander and California red-legged frog. The noise and vibration associated with the vegetation removal will be disruptive and may result in Central California tiger salamanders and California red-legged frogs avoiding the action area, therefore modifying their behavior and creating a barrier to resource areas. Noise and vibration may also result in Central California tiger salamanders and California red-legged frogs taking cover in inconspicuous areas rather than fleeing potential harm. This will make them more difficult to find, avoid, and rescue from harm's way.

Educating project personnel will encourage compliance with the conservation measures and increase the possibility that Central California tiger salamanders, California red-legged frogs, and San Joaquin kit foxes in the work area will be identified and addressed appropriately for avoidance. Worker education is limited by the effectiveness of the presentation and the willingness of the construction personnel to participate in compliance.

Pre-construction surveys by a Service-Approved Biological Monitor will assist in clearing Central California tiger salamanders, California red-legged frogs, and San Joaquin kit foxes from the work areas prior to the introduction of a potential construction-related threat. Biological clearance of work areas prior to the start of each day's work and during construction will increase the chances of identifying listed species in the work area that would be susceptible to injury. Biological clearance of work areas is limited by the experience of the biologist, the complexity and abundance of potential cover sites, the small size and inconspicuous nature of the species, and the challenges of completing a thorough clearance given the construction schedule.

Despite being "cleared" prior to construction, Central California tiger salamanders and California red-legged frogs can continue to move into the work site undetected. Listed salamanders and frogs could routinely move through as well as back and forth from the adjacent upland. They may be actively moving around, through or within the work area during the evening as well as when work is taking place. This places greater emphasis on thorough biological clearance of work areas and under staged equipment and materials prior to the start of each day's activities.

Monitoring and covering steep-walled excavations should minimize the potential for the Central California tiger salamander and California red-legged frog to be affected by predation, desiccation, entombment, or starvation. Proper trash disposal is often difficult to enforce and is a common non-compliance issue. Improperly disposed edible trash could attract predators, such as raccoons, skunks, crows, and ravens, to the site, which could subsequently prey on the Central California tiger salamander, and California red-legged frog.

Discovery, capture, and relocation of individual Central California tiger salamanders and California red-legged frogs may avoid injury or mortality due to construction activities; however, capturing and handling animals may result in stress and/or inadvertent injury during handling, containment, and transport. Relocation often results in stress and increased risk as animals experience disorientation and exposure after being removed from their purposeful location.

Central California tiger salamanders, California red-legged frogs, San Joaquin kit foxes and their prey could also be affected by contamination due to chemical or sediment discharge. Exposure pathways could include inhalation, dermal contact, direct ingestion, or secondary ingestion of contaminated soil, plants or prey species. Exposure to contaminants could cause short- or long-term morbidity, possibly resulting in reduced productivity or mortality. However, Caltrans proposes to reduce these risks by limiting the equipment used in the stream bed to hand tools, implementing BMPs and the SWPPP that consist of refueling, oiling, or cleaning of vehicles and equipment a minimum of 50 feet from riparian and aquatic areas; installing coir rolls, straw wattles and/or silt fencing to capture sediment and prevent runoff or other harmful chemicals from entering the aquatic habitat; and locating staging, storage and parking areas away from aquatic habitat. Caltrans' commitment to use erosion control devices other than mono-filament should be effective in avoiding the associated risk of entrapment that can result in death by predation, starvation, or desiccation (Stuart et al. 2001).

The completed project is unlikely to increase the local risk of California red-legged frog mortality from vehicle collision. The addition of 500 feet of concrete barrier along the road shoulder will prevent Central California tiger salamanders and California red-legged frogs from accessing that

segment of the I-580 and likely dissuade San Joaquin kit foxes from entering that portion of the roadway. The added concrete barrier may also provide local attenuation of the vehicle related noise. However, the barrier can also entrap animals that access the roadway elsewhere and attempt to exit within the areas with the added barrier. Artificial lighting may dissuade the three listed species from attempting to move through the lit segment of I-580 and it may result in their increased risk of predation, due to increased detectability, prior to entering the roadway. These factors aside, it has already been established that animals entering the eastbound I-580 lanes have a high risk of experiencing animal-vehicle collision. It is unlikely that the proposed project will result in additional risk of road mortality. The inclusion of the 500 foot concrete barrier and the yet to be determined placement of directional/barrier fencing may be effective in reducing future road mortality risk for the Central California tiger salamander, California red-legged frog, and San Joaquin kit fox. The benefits of a directional/barrier fence proposal and a possible incorporation of an existing crossing cannot be fully analyzed until an adequate proposal is presented and approved.

With the exception of the culvert at PM 2.0, it is unlikely that the existing cross structures described in Table 2 have potential to be used by wildlife, including Central California tiger salamander, California red-legged frog, and San Joaquin kit fox, even if directional fencing was installed to guide them there. Although not meeting the design goals that would apply to the Central California tiger salamander, California red-legged frog, or San Joaquin kit fox, the culvert at PM 2.0 may have some degree of functional use. The crossing assessment of the I-580 Altamont Pass corridor, emphasizes the need for future wildlife-specific crossing structures to alleviate the previously identified and multi-layered effects of this formidable barrier to movement and habitat connectivity.

Caltrans' proposed purchase of 9.09 acres of Service-approved conservation bank credits for the Central California tiger salamander and California red-legged frog within the range of the San Joaquin kit fox in Alameda County will contribute to the overall conservation of the species by protecting and managing their habitat in perpetuity.

Artificial Lighting
Based on our review of existing literature and anecdotal information, relative to the baseline conditions, the proposed addition of artificial lighting will eliminate the natural lighting regime within the action area. This area will cease to experience the daily and seasonal lighting conditions that are key drivers in the life history of the host of species that inhabit the Altamont Pass.

The adverse effects of lighting has been well documented and it is reasonable to expect the proposed project to result in similar consequences for the Central California tiger salamander, California red-legged frog, or the San Joaquin kit fox. These consequences are likely to include:

1. Avoidance of artificial lit areas during the evening resulting in loss of resources and space for foraging and movement.

2. Decreased forage availability within the lit areas resulting in reduced health.

3. Increased risk of being detected by predators resulting in increased predation.

4. Increased activity by otherwise diurnal predators resulting in increased predation.

5. Disruption of normal behaviors, including important seasonal movements resulting in loss of breeding output, decreased food gathering, and reduced health.

6. Increased stress response resulting in reduced health.

The influence of artificial lighting is likely to have a more significant effect on the Central California tiger salamander and California red-legged frog based on their greater reliance on natural nocturnal conditions. The San Joaquin kit fox is more adaptable and as discussed, less nocturnal in the northern portion of its range. However, the fox will be affected by a diminished availability of nocturnally active prey as well as greater exposure to predators such as coyotes. Artificial lighting has been shown to alter grassland communities and it is reasonable to expect those effects may extend to the diurnal ground squirrels within the action area.

Caltrans is proposing to use what it has determined to be the best available lighting system to minimize the unintended effects of illuminating approximately 4.7 miles of the eastbound I-580 corridor on wildlife and meet their traffic safety goals. The results of their efforts to work with lighting manufactures will result in the use of lower wattage, 2,700K LED bulbs, which have been shown to minimize the effects of standard artificial lighting on wildlife. The described modification of the lighting poles, their placement in the median, and the addition of bulb and ground level shielding, further reduces the modeled illumination of the proposed action area. The resulting design represents a commendable wildlife-friendly lighting scheme that incorporates the latest technology. The design for the proposed project will likely be referenced as a preferred alternative on future highway lighting projects where effects to wildlife are a factor.

Caltrans commitment to conduct on-the-ground illumination measurements following project completion will be useful in testing the reliability of isoline modeling and with providing a more accurate measure of the project's effects. The resulting information will provide greater quantification that can then be applied to more appropriate compensation.

California Red-Legged Frog Critical Habitat

According to the information provided in the 2019 revised BA, the Service concludes, the proposed project will result in a minimum of 12.98 acres of permanent effects to California red-legged frog ALA-2 Unit. According to Caltrans' modeling, 12.98 acres of the ALA-2 Unit will experience constant illumination of 0.01 lux or more. Of this 12.98 acres, 2.84 acres of upland (PCE 3)/dispersal habitat (PCE 4) will be subject to temporary ground disturbance and 0.04 acre will be permanently modified from grassland to hardscape ground cover. Based on our knowledge of the listed frog's nighttime correlation with upland habitat use, particularly grassland habitat, not in proximity to wetland or riparian habitat, the degradation of habitat due to illumination is likely to extend beyond 0.01 lux. This would result in more than 12.98 acres of critical habitat subject to considerable change from baseline. Caltrans estimated that the 12.98 acres of 0.01 lux illuminated habitat would include approximately 0.25 acre of non-breeding aquatic habitat (PCE 2) and 12.73 acres of upland (PCE 3)/dispersal habitat (PCE 4). Although habitat will not be physically removed, functionality of PCEs 2, 3, and 4 will be modified by the probable and inherent behavioral modifications and predation risks associated with artificial illumination. Relative to the entirety of the critical habitat unit, the projected habitat loss is minimal. Therefore, the conservation values and functions of the PCEs will not be altered and the conservation function of the critical habitat will remain.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this BO. Future Federal actions that are unrelated to the I-580 Safety Lighting and Power Source Installation Project is not considered in this section because they require separate consultation pursuant to section 7 of the Act. During this consultation, the Service did not identify any future non-federal actions that are reasonably certain to occur in the action area of the proposed project.

Conclusion

After reviewing the current status of the Central California tiger salamander, California red-legged frog, and San Joaquin kit fox; the environmental baseline for the action area, the effects of the proposed I-580 Safety Lighting and Power Source Installation Project; and the cumulative effects, it is the Service's biological opinion that the I-580 Safety Lighting and Power Source Installation Project, as proposed, is not likely to jeopardize the continued existence of the Central California tiger salamander, California red-legged frog, or San Joaquin kit fox. The Service reached this conclusion because the project-related effects to the species, when added to the environmental baseline and analyzed in consideration of all potential cumulative effects, will not rise to the level of precluding recovery or reducing the likelihood of survival of the species based on the following:

1) Adverse effects to the Central California tiger salamander, California red-legged frog, and San Joaquin kit fox will be reduced by implementation of the described *Conservation Measures.*

2) The project will result in the permanent loss or degradation of at least 21.55 acres of Central California tiger salamander, California red-legged frog, and San Joaquin kit fox habitat out of thousands of acres of their habitat range wide.

3) Construction-related threats to the California tiger salamander and California red-legged frog are primarily limited to the proposed vegetation clearing activities.

4) The habitat loss/degradation is located within a corridor subject to baseline degradation associated with the use and maintenance of I-580.

5) Construction related disturbance is expected to be limited to disturbance for the San Joaquin kit fox.

6) The handling and relocation of all the Central California tiger salamander and California red-legged frogs as a conservation measure is not anticipated to substantially increase their risk of mortality or substantially interfere with their foraging, sheltering, and breeding activities.

7) Implementation of Caltrans' plan to minimize the artificial lighting of off-pavement areas, reduce animal-vehicle collision, and conserve occupied habitat will reduce the effects of the proposed action on the Central California tiger salamander, California red-legged frog, San Joaquin kit fox, and the ecosystem processes that they depend on.

After reviewing the current status of designated critical habitat for the California red-legged frog, the environmental baseline for the action area, the effects of the proposed I-580 Safety Lighting and Power Source Installation Project, and the cumulative effects, it is the Service's biological opinion that the I-580 Safety Lighting and Power Source Installation Project, as proposed, is not likely to destroy or adversely modify designated critical habitat. The Service reached this conclusion because the project-related effects to the designated critical habitat, when added to the environmental baseline and analyzed in consideration of all potential cumulative effects, will not rise to the level of precluding the function of the California red-legged frog critical habitat to serve its intended conservation role for the species based on the following:

1) The effects to California red-legged frog critical habitat are small and discrete, relative to the entire area designated, and are not expected to appreciably diminish the value of the critical habitat or prevent it from sustaining its role in the conservation of the California red-legged frog.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by Service regulations at 50 CFR 17.3 as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined by the same regulations as an act which actually kills or injures wildlife. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this *Incidental Take Statement.*

In June 2015, the Service finalized new regulations implementing the incidental take provisions of section 7(a)(2) of the Act. The new regulations also clarify the standard regarding when the Service formulates an *Incidental Take Statement* [50 CFR 402.14(g)(7)], from "…if such take may occur" to "…if such take is reasonably certain to occur." This is not a new standard, but merely a clarification and codification of the applicable standard that the Service has been using and is consistent with case law. The standard does not require a guarantee that take will result; only that the Service establishes a rational basis for a finding of take. The Service continues to rely on the best available scientific and commercial data, as well as professional judgment, in reaching these determinations and resolving uncertainties or information gaps.

The measures described below are non-discretionary, and must be undertaken by the Caltrans so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Caltrans has a continuing duty to regulate the activity covered by this incidental take statement. If the Caltrans (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, Caltrans must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

Amount or Extent of Take

Central California Tiger Salamander

The Service anticipates that incidental take of the Central California tiger salamander will be difficult to detect because when this amphibian is not in their breeding ponds, or foraging, migrating, or conducting other surface activity, it inhabits burrows or other cover sites; these cover sites may be located a distance from the breeding ponds; and the adult migrations occur on a limited period during rainy nights in the fall, winter, or spring. Finding an injured or dead Central California tiger salamander is unlikely due to their relatively small body size, rapid carcass deterioration, and likelihood that the remains will be removed by a scavenger. Losses of the Central California tiger salamander may also be difficult to quantify due to a lack of baseline survey data and seasonal/annual fluctuations in their numbers due to environmental or human-caused disturbances. There is a reasonable likelihood of harm, injury and mortality as a result of the proposed construction activities, and capture and relocation efforts.

The Service is authorizing take incidental to the proposed action as the non-lethal harm of all Central California tiger salamanders within the action area, and the capture of all Central California tiger salamanders within the construction footprint.

Since the Service cannot estimate the number of individual Central California tiger salamanders that will be incidentally taken for the reasons listed, the Service is providing a mechanism to quantify when take would be considered to be exceeded as a result of implementing the proposed project. The Service will use detection of one (1) dead or injured Central California tiger salamander to determine when take is exceeded due to injury or mortality. By setting a threshold of one (1) individual detected, the Service has set an incidental take limit that is measurable, irrefutable, and indicates that the species are being affected at a level where conservation measures and project implementation need to be evaluated and possibly modified. The Service concludes that incidental take of the Central California tiger salamander will be considered exceeded if one (1) dead or injured individual Central California tiger salamander is detected by biological monitors or other project personnel. The Service is also authorizing incidental take relative to the non-lethal harm of all Central California tiger salamanders within the action area, associated with capture and relocation.

California Red-Legged Frog

The Service anticipates that incidental take of the California red-legged frog will be difficult to detect due to their small size, wariness, and cryptic nature. The project footprint includes vegetative cover, rocks, and debris which provide cover for the California red-legged frog. Furthermore, finding an injured or dead California red-legged frog is unlikely due to their relatively small body size, rapid carcass deterioration, and likelihood that the remains will be removed by a scavenger or indistinguishable amongst the disturbed soil and debris. Losses of the California red-legged frog may also be difficult to quantify due to a lack of baseline survey data and seasonal/annual fluctuations in their numbers due to environmental or human-caused disturbances. There is a reasonable likelihood of harm, injury and mortality as a result of the proposed construction activities, and capture and relocation efforts.

The Service is authorizing take incidental to the proposed action as the non-lethal harm of all California red-legged frogs within the action area, and the capture of all California red-legged frogs within the construction footprint.

Since the Service cannot estimate the number of individual California red-legged frogs that will be incidentally taken for the reasons listed, the Service is providing a mechanism to quantify when take would be considered to be exceeded as a result of implementing the proposed project. The Service will use detection of one (1) dead or injured California red-legged frog to determine when take is exceeded due to injury or mortality. By setting a threshold of one (1) individual detected, the Service has set an incidental take limit that is measurable, irrefutable, and indicates that the species are being affected at a level where conservation measures and project implementation need to be evaluated and possibly modified. The Service concludes that incidental take of the California red-legged frog will be considered exceeded if one (1) dead or injured individual California red-legged frog is detected by biological monitors or other project personnel. The Service is also authorizing incidental take relative to the non-lethal harm of all California red-legged frogs within the action area, associated with capture and relocation.

San Joaquin Kit Fox

The Service anticipates that incidental take of the San Joaquin kit fox will be difficult to detect or quantify because this mammal inhabits dens or burrows when it is not foraging, mating, or conducting other surface activity; the animal may range over a large territory; it is primarily active at night, and it is a highly intelligent animal that often is extremely shy around humans. Losses of this

species also may be difficult to quantify due to seasonal fluctuations in their numbers. There is a reasonable likelihood of harm as a result of the proposed construction activities, and capture and relocation efforts. The proper implementation of avoidance measures should be effective in preventing incidental take due to injury or mortality.

The Service is authorizing take incidental to the proposed action as the non-lethal harm of all San Joaquin kit foxes within the action area.

Upon implementation of the following *Reasonable and Prudent Measures*, the incidental take of the Central California tiger salamander, California red-legged frog, and San Joaquin kit foxes associated with the proposed project in proportion to the amount and type of take outlined above will become exempt from the prohibitions described under section 9 of the Act. No other forms of take are exempted under this opinion.

Effect of the Take

In the accompanying biological opinion, the Service determined that this level of anticipated take for the Central California tiger salamander, California red-legged frog and San Joaquin kit fox is not likely to result in jeopardy to the species.

Reasonable and Prudent Measure

The Service has determined that the following reasonable and prudent measure is necessary and appropriate to minimize the effect of the action on the Central California tiger salamander, California red-legged frog, and San Joaquin kit fox. Caltrans will be responsible for the implementation and compliance with this measure:

> Minimize the adverse effects to the Central California tiger salamander, California red-legged frog, and San Joaquin kit fox, and their habitat in the action area by implementing their proposed project, including the conservation measures as described, with the following terms and conditions.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, Caltrans must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measure described above. These terms and conditions are nondiscretionary.

The following *Terms and Conditions* implement the *Reasonable and Prudent Measure*:

1. Caltrans shall include a copy of all relevant permits within the construction bid package of the proposed project. The Resident Engineer or their designee shall be responsible for implementing the *Conservation Measures* and *Terms and Conditions* of this document.

2. At least 15 days prior to the onset of any ground-disturbing activities, including vegetation removal, Caltrans will submit to the Service, for approval, the name(s) and credentials of proposed biological monitors. Information included in a request for authorization will include, at a minimum: (1) relevant education; (2) relevant training concerning Central California tiger salamander, California red-legged frog, and San Joaquin kit fox identification, survey techniques, handling individuals of different age classes, and handling of different life stages by a permitted biologist or recognized species expert authorized for such activities by

the Service; (3) a summary of field experience conducting requested activities (to include project/research information); (4) a summary of BOs under which they were authorized to work with the Central California tiger salamander, California red-legged frog, and San Joaquin kit fox and at what level (such as construction monitoring versus handling), this will also include the names and qualifications of persons under which the work was supervised as well as the amount of work experience on the actual project; (5) a list of Federal Recovery Permits [10(a)1(A)] held or under which they are authorized to work with the Central California tiger salamander, California red-legged frog, and San Joaquin kit fox (to include permit number, authorized activities, and name of permit holder); and (6) any relevant professional references with contact information. No project construction will begin until Caltrans has received written Service approval for biologists to conduct specified activities.

3. Each Central California tiger salamander and California red-legged frog encounter shall be treated on a case-by-case basis in coordination with the Service but general guidance is as follows: (1) leave the non-injured animal if it is not in danger or (2) move the animal to a nearby location if it is in danger.

   These two options are further described as follows:

   a. When a Central California tiger salamander and California red-legged frog is encountered in the action area the first priority is to stop all activities in the surrounding area that have the potential to result in the harm, harassment, injury, or death of the individual. Then the monitor needs to assess the situation in order to select a course of action that will minimize adverse effects to the individual. Contact the Service once the site is secure. The contacts for this situation are Ryan Olah (*ryan_olah@fws.gov*) or John Cleckler (*john_cleckler@fws.gov*). They can also be reached at (916) 414-6623 and (916) 414-6639, respectively. Contact the Service prior to the start of construction to confirm the status of this contact information.

      The first priority is to avoid contact with the animal and allow it to move out of the project footprint and hazardous situation on its own to a safe location. The animal should not be picked up and moved because it is not moving fast enough or it is inconvenient for the construction schedule. This guidance only applies to situations where an animal is encountered on the move during conditions that make their upland travel feasible. This does not apply to animals that are uncovered or otherwise exposed or in areas where there is not sufficient adjacent habitat to support the life history of the Central California tiger salamander and California red-legged frog should they move outside the construction footprint.

      Avoidance is the preferred option if the animal is not moving and is using aquatic habitat or is within some sort of burrow or other refugia. The area shall be well marked for avoidance by construction and a Service-Approved Biological Monitor shall be assigned to the area when work is taking place nearby.

   b. The animal shall be captured and moved when it is the only option to prevent its death or injury.

      If appropriate habitat is located immediately adjacent to the capture location then the preferred option is short distance relocation to that habitat. This must be coordinated with the Service but the general guidance is the salamander or frog shall not be moved outside of the area it would have traveled on its own. Captured

salamanders or frogs should be released as close to their capture location as feasible possible for their continued safety. Under no circumstances should an animal be relocated to another property without the owner's written permission. It is Caltrans' responsibility to arrange for that permission.

The release must be coordinated with the Service and will depend on where the individual was found and the opportunities for nearby release. In most situations the release location is likely to be into the mouth of a small burrow or other suitable refugia and in certain circumstances pools without non-native predators may be suitable.

Only Service-Approved Biological Monitors for the project can capture Central California tiger salamanders or California red-legged frogs. Nets or bare hands may be used to capture them. Soaps, oils, creams, lotions, repellents, or solvents of any sort cannot be used on hands within 2 hours before and during periods when they are capturing and relocating either species. To avoid transferring disease or pathogens between sites during the course of surveys or handling of amphibians, Service-approved biologists must use the following guidance for disinfecting equipment and clothing. These recommendations are adapted from the *Declining Amphibian Population Task Force's Code* (http://www.open.ac.uk/daptf/).

i. All dirt and debris, including mud, snails, plant material (including fruits and seeds), and algae, must be removed from nets, traps, boots, vehicle tires and all other surfaces that have come into contact with water and/or an amphibian. Cleaned items should be rinsed with fresh water before leaving each site.

ii. Boots, nets, traps, etc., must then be scrubbed with either a 70 percent ethanol solution, a bleach solution (0.5 to 1.0 cup of bleach to 1.0 gallon of water), QUAT 128 (quaternary ammonium, use 1:60 dilution), or a 6 percent sodium hypochlorite 3 solution and rinsed clean with water between sites. Avoid cleaning equipment in the immediate vicinity of a pond or wetland. All traces of the disinfectant must be removed before entering the next aquatic habitat.

iii. Used cleaning materials (liquids, etc.) must be disposed of safely, and if necessary, taken back to the lab for proper disposal.

iv. The Service-Approved Biological Monitor must limit the duration of handling and captivity. While in captivity, salamanders or frogs shall be kept individually in a cool, dark, moist, aerated environment, such as a clean and disinfected bucket or plastic container with a damp sponge. Containers used for holding or transporting should not contain any standing water.

Reporting Requirements

In order to monitor whether the amount or extent of incidental take anticipated from implementation of the project is approached or exceeded, Caltrans shall adhere to the following reporting requirements. Should this anticipated amount or extent of incidental take be exceeded, Caltrans must reinitiate formal consultation as per 50 CFR 402.16.

1. For those components of the action that will result in habitat degradation or modification whereby incidental take in the form of harm is anticipated, Caltrans shall provide a precise accounting of the total acreage of habitat impacted to the Service after completion of construction.

2. Caltrans shall immediately contact the Coast-Bay Division Chief of the Endangered Species Program at the Sacramento Fish and Wildlife Office (SFWO) at (916) 414-6623 to report direct encounters between listed species and project workers and their equipment whereby incidental take in the form of, harm, injury, or death occurs. If the encounter occurs after normal working hours, Caltrans shall contact the Coast-Bay Division Chief at the earliest possible opportunity the next working day. When injured or killed individuals of the listed species are found, Caltrans shall follow the steps outlined in the *Salvage and Disposition of Individuals* section below.

3. For those components of the action that will require the capture and relocation of any listed species, Caltrans shall immediately contact the Coast-Bay Division Chief to report the action. If capture and relocation need to occur after normal working hours, Caltrans shall contact the Coast-Bay Division Chief at the earliest possible opportunity the next working day.

4. Sightings of any listed or sensitive animal species shall be reported to the CNDDB (http://www.dfg.ca.gov/biogeodata/cnddb/).

5. Construction compliance reports shall be addressed to the Coast-Bay Division Chief of the Endangered Species Program at the SFWO.

6. Caltrans shall submit post-construction compliance reports prepared by the Service-approved biologist to the Service within 60 calendar days following completion of each construction season or within 60 calendar days of any break in construction activity lasting more than 60 calendar days. This report shall detail (1) dates that relevant project activities occurred; (2) pertinent information concerning the success of the project in implementing avoidance and minimization measures; (3) an explanation of failure to meet such measures, if any; (4) known project effects on the Central California tiger salamander, California red-legged frog, and San Joaquin kit fox; (5) occurrences of incidental take of any listed species; (6) documentation of employee environmental education; and (7) other pertinent information.

Disposition of Individuals Taken

Injured listed species must be cared for by a licensed veterinarian or other qualified person(s), such as the Service-Approved Biological Monitor. Dead individuals must be sealed in a resealable plastic bag with an outside-attached note containing with the date and time when the animal was found, the location where it was found, and the name of the person who found it, and the bag containing the specimen frozen in a freezer located in a secure site, until instructions are received from the Service regarding the disposition of the dead specimen. The Service contact person is the Coast-Bay Division Chief of the Endangered Species Program at the SFWO at (916) 414-6623.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service recommends the following actions:

1. Caltrans should work with the Service and other agencies such as the California Department of Fish and Wildlife, to analyze the opportunities to establish habitat and movement connectivity across the I-580 corridor within the Altamont Pass. Such an effort would

include identifying areas with topography conducive to a future undercrossing as well as analyzing the current use of existing features.

2. Caltrans District 4 should work with the Service to develop a conservation strategy that would identify the current safe passage potential along Bay Area highways and the areas where safe passage for wildlife could be enhanced or established.

3. Caltrans should assist the Service in implementing recovery actions identified in the *Recovery Plan for the Central California Distinct Population Segment of the California Tiger Salamander* (Service 2017), *Recovery Plan for the California Red-legged Frog* (Service 2002) and the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (Service 1998).

4. Caltrans should consider participating in the planning for a regional habitat conservation plan for the Central California tiger salamander, California red-legged frog, and San Joaquin kit fox, other listed species, and special-status species.

5. Caltrans should consider establishing functioning preservation and creation conservation banking systems to further the conservation of the Central California tiger salamander, California red-legged frog, and San Joaquin kit fox, and other appropriate species. Such banking systems also could possibly be utilized for other required mitigation (i.e., seasonal wetlands, riparian habitats, etc.) where appropriate. Efforts should be made to preserve habitat along roadways in association with wildlife crossings.

6. Roadways can constitute a major barrier to critical wildlife movement. Therefore, Caltrans should incorporate culverts, tunnels, or bridges on highways and other roadways that allow safe passage by the Central California tiger salamander, California red-legged frog, San Joaquin kit fox, other listed animals, and wildlife. Photographs, plans, and other information should be included in the BAs if "wildlife friendly" crossings are incorporated into projects. Efforts should be made to establish upland culverts designed specifically for wildlife movement rather than accommodations for hydrology. Transportation agencies should also acknowledge the value of enhancing human safety by providing safe passage for wildlife in their early project design.

7. Adequate wildlife road mortality data is a critical factor in assessing where wildlife and the travelling public are most at risk due to animal-vehicle collision along California's highways. Caltrans should make its wildlife road mortality data available or provide it to a database service such as the California Roadkill Observation System (https://www.wildlifecrossing.net/california/) to enhance road ecology-based planning, add to our resources of "best available science", and increase public safety.

8. Caltrans should ensure that their container plants used for restoration are sourced from nurseries utilizing the Working Group for Phytophthoras in Native Habitats' *Guidelines to Minimize Phytophthora Pathogens in Restoration Nurseries* (available at http://www.suddenoakdeath.org/wp-content/uploads/2016/04/Restoration.Nsy_.Guidelines.final_.092216.pdf).

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION--CLOSING STATEMENT

This concludes formal consultation on the I-580 Safety Lighting and Power Source Installation Project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and: (a) if the amount or extent of taking specified in the incidental take statement is exceeded; (b) if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (c) if the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion; or (d) if a new species is listed or critical habitat designated that may be affected by the identified action.

If you have questions concerning this consultation or implementation of its measures, please contact John Cleckler, Caltrans Liaison, john_cleckler@fws.gov, (916) 414-6639 or Ryan Olah, Coast-Bay Division Chief, ryan_olah@fws.gov, (916) 414-6623, at the letterhead address, by telephone, or by e-mail.

Sincerely,

for Jennifer M. Norris, Ph.D.
Field Supervisor

cc:
Robert Stanley, California Department of Fish and Wildlife, Fairfield, California
John Yeakel and Denis Coghlan, Caltrans District 4, Oakland, California

Literature Cited

Andrews, K.M. and J. W. Gibbons. 2005. How do Highways Influence Snake Movement? Behavioral Responses to Roads and Vehicles. Copeia 2005(4):772-782.

Ashley, E.P., A. Kosloski, and S.A Petrie. 2007. Incidence of Intentional Vehicle-Reptile Collisions. Human Dimensions of Wildlife. 137-143. 10.1080/10871200701322423.

Ashley, E.P., and J.E. Robinson. 1996. Road mortality of amphibians, reptiles and other wildlife on the Long Point Causeway, Lake Erie, Ontario. Canadian Field Naturalist 110:403–412.

Backlin, A.R., J.Q. Richmond, E.A. Gallegos, C.K. Chistensen, and R.N. Fisher. 2017. An extirpated lineage of a threatened frog species resurfaces in southern California. Oryx: 1–5.

Barry, S. 1992. Letter to Marvin L. Plenert, Regional Director, U.S. Fish and Wildlife Service, Portland, Oregon, regarding proposed listing.

_____. 2002. Dobbins and Cottage/Deadwood Watersheds, Plumas National Forest, Herpetological Surveys, 2001-2002. Department of Zoology, University of California, Davis

Barry, S.J. and G.M. Fellers. 2013. History and status of the California red-legged frog (*Rana draytonii*) in the Sierra Nevada, California, USA. Herpetological Conservation and Biology 8(2): 456-502.

Bennie, J., T.W. Davies, D. Cruse, F. Bell, and K.J. Gaston. 2018. Artificial light at night alters grassland vegetation species composition and phenology. Journal of Applied Ecology 55: 442-450.

Bennie, J., T.W. Davies, D. Cruse, and K.J. Gaston. 2016. Ecological effects of artificial light at night on wild plants. Journal of Ecology 104: 611-620.

Bhardwaj, M., K. Soanes, J. Lahoz-Monfort, L.F. Lumsden, and R. Van der Ree. 2020. Artificial lighting reduces the effectiveness of wildlife-crossing structures for insectivorous bats. Journal of Environmental Management. 262. 110313.

Bhatt, U.M., B. Habib, H.K. Sarma, and S.L. Lyngdoh. 2018. Catch me if you can: Species interactions and moon illumination effect on mammals of tropical semi-evergreen forests of Manas National Park, Assam India. https://www.biorxiv.org/content/10.1101/449918v1.full

Bliss-Ketchum, L.L., C.E. de Rivera, B.C. Turner, and D.M. Weisbaum. 2016. The effect of artificial light on wildlife use of a passage structure. Biological Conservation 199: 25-28.

Bonnet, X., G. Naulleau, and R. Shine. 1999. The dangers of leaving home: dispersal and mortality in snakes. Biological Conservation 89:39–50.

Bulger, J.B., N.J. Scott Jr., and R.B. Seymour. 2003. Terrestrial activity and conservation of adult California red-legged frogs *Rana aurora draytonii* in coastal forests and grasslands. Biological Conservation 110(2003): 85–95.

Bury, R.B. and J.A. Whelan. 1984. Ecology and management of the bullfrog. Fish and Wildlife Resource Publication 155.

California Department of Fish and Wildlife (CDFW). 2019. BIOSIS. Natural Heritage Division, Sacramento, California.

Caltrans. 2019. Assessing the Impacts of LED Lighting to Wildlife. Caltrans Division of Research, Innovation and System Information. Preliminary Investigation (PI-0046). Prepared by CTC & Associates. Sacramento, CA.

Candeias, M. 2018. Light Pollution and Plants. In Defense of Plants. August 7, 2018. Web. Accessed October 22, 2019. http://www.indefenseofplants.com/blog/2018/8/6/light-pollution-and-plants?fbclid=IwAR3xZvB3SjJwLuEgnmApStpUchzWm7gmcpTg0NgGhXn-WLkoz6x5oqslqeM.

Carr, L.W., and L. Fahrig. 2001. Effect of road traffic on two amphibian species of differing vagility. Conservation Biology 15:1,071–1,078.

Clark R.W., W.S. Brown, R. Stechert, K.R. Zamudio. 2010. Roads, interrupted dispersal, and genetic diversity in timber rattlesnakes. Conservation Biology 24:1059–1069

Cooke, A.S. 1995. Road mortality of common toads (*Bufo bufo*) near a breeding site, 1974–1994. Amphibia-Reptilia 16:87–90.

Cypher, B.L., C.D. Bjurlin, and J.L. Nelson. 2005. Effect of Two-Lane Road on Endangered San Joaquin Kit Foxes. Prepared for Caltrans. California State University, Stanislaus, Endangered Species Recovery Program, Fresno, CA. 25 pages.

Daly, M., P.R. Behrends, M.I. Wilson, and L.F. Jacobs. 1992. Behavioural modulation of predation risk: moonlight avoidance and crepuscular compensation in a nocturnal desert rodent, Dipodomys merriami. Animal Behaviour. 44(1): 1-9.

Dananay KL, Benard MF. 2018 Artificial light at night decreases metamorphic duration and juvenile growth in a widespread amphibian. Proc. R. Soc. B 285: 20180367

Davidson, E.W., M. Parris, J.O. Collins, J.E. Longcore, A.P. Pessier, and J. Brunner. 2003. Pathogenicity and transmission of *Chytridiomycosis* in tiger salamanders (*Ambystoma tigrinum*). Copeia 2003(3): 601-607.

Dodd, C.K. 2013a. Frogs of the United States and Canada. Volume 1. John Hopkins University Press, Baltimore, Maryland.

_____. 2013b. Frogs of the United States and Canada. Volume 2. John Hopkins University Press, Baltimore, Maryland.

Drews, C. 1995. Road kills of animals by public traffic in Mikumi National Park, Tanzania, with notes on baboon mortality. African Journal of Ecology 33:89–100.

Emlen, S.T. 1977. "Double clutching" and its possible significance in the bullfrog. Copeia 1977(4): 749-751.

Fellers, G. 2005. Rana draytonii Baird and Girard, 1852b California red-legged frog. Pages 552-554 in M. Lannoo (editor). Amphibian declines the conservation status of United States species. University of California Press. Berkeley, California.

Fellers, G.M., and P.M. Kleeman. 2007. California Red-Legged Frog (*Rana draytonii*) Movement and Habitat Use: Implications for Conservation. Journal of Herpetology 41: 276-286.

Fellers, G.M., R.A. Cole, D.M. Reintz, and P.M. Kleeman. 2011. Amphibian chytrid fungus (*Batrachochytrium dendrobatidis*) in coastal and montane California, USA Anurans. Herpetological Conservation and Biology 6(3): 383-394.

Fellers, G.M., P.M. Fleeman, D.A.W. Miller, and B.J. Halstead. 2017. Population Trends, Survival, and Sampling Methodologies for a Population of *Rana draytonii*. Journal of Herpetology 51(4): 567-573.

Fisher, R.N. and H.B. Shaffer. 1996. The decline of amphibians in California's Great Central Valley. Conservation Biology 10(5): 1387-1397.

FitzGerald, G. J. and Bider, J. R. 1974. Influence of moon phase and weather factors on locomotory activity in *Bufo americanus*. Oikos 25: 338-340.

Forman, T.T., and R.D. Deblinger. 1998. The ecological road-effect zone for transportation planning and a Massachusetts highway example. Pages 78–96 in G.L. Evink, P. Garrett, D. Zeigler, and J. Berry (editors). Proceedings of the international conference on wildlife ecology and transportation. Publication FL-ER-69-98. Florida Department of Transportation, Tallahassee.

_____. 2000. The Ecological Road-Effect Zone of a Massachusetts (U.S.A) Suburban Highway. Conservation Biology 14:36–46.

Gaston, K.J. and L.A. Holt. 2018. Nature, Extent and Ecological Implications of Night-Time Light From Road Vehicles. Journal of Applied Ecology 55(5) 2296-2307.

Gaynor, K.M., C.E. Hojnowski, N.H. Carter, and J.S. Brashares. 2018. The influence of human disturbance on wildlife nocturnality. Science. 360: 1232-1235.

Gern, W., D. Norris, and D. Duvall. 1983. The Effect of Light and Temperature on Plasma Melatonin in Neotenic Tiger Salamanders (*Ambystoma tigrinum*). Journal of Herpetology. 17. 228-234. 10.2307/1563824.

Halstead, B.J. and P.M. Kleeman. 2017. Frogs on the Beach: Ecology of California red-legged frogs (*Rana draytonii*) in Coastal Dune Drainages. Herpetological Conservation and Biology 12: 127-140.

Hansen, L. 1982. Trafikdræbte dyr i Danmark (Road kills in Denmark, in Danish). Dansk Ornitologisk Forenings Tidsskrift 76:97--110.

Hayes, M.P., M.R. Jennings, and G.B. Rathbun. 2006. Rana Draytonii (California Red-Legged Frog) Prey. Herpetological Review 37(4):449. Available at http://researcharchive.calacademy.org/research/bmammals/Rathbun/PDFs/Hayes_HerpReview_2006.pdf.

Hayes, M.P. and M.R. Tennant. 1985. Diet and feeding behavior of the California red-legged frog *Rana aurora draytonii* (Ranidae). The Southwestern Naturalist 30(4):601-605.

Hels, T., and E. Buchwald. 2001. The effect of road kills on amphibian populations. Biological Conservation 99:331–340.

Henrique, R.S. and T. Grant. 2019. Influence of Environmental Factors on Short-Term Movements of Butter Frogs (*Leptodactylus latrans*). Herpetologica 75(1): 38-46.

Herrmann, H.W., K.M. Pozarowski, A. Ochoa, and G.W. Schuett. 2017. An interstate highway affects gene flow in a top reptilian predator (Crotalus atrox) of the Sonoran Desert. Conservation Genetics. DOI 10.1007/s10592-017-0936-8.

Hunt, L. 1993. Letter to Marvin L. Plenert, Regional Director, U.S. Fish and Wildlife Service, Portland, Oregon, regarding proposed listing.

ICF International (ICF). 2010. East Alameda County Conservation Strategy. Final Draft. October. (ICF 00906.08.) San Jose, CA. Prepared for: East Alameda County Conservation Strategy Steering Committee, Livermore, CA.

Jennings, M.R. 1993. Letter to Peter C. Sorensen, U.S. Fish and Wildlife Service, Sacramento, California.

Jennings, M.R. and M.P. Hayes. 1985. Pre-1900 overharvest of California red-legged frogs (*Rana aurora draytonii*): The inducement for bullfrog (*Rana catesbeiana*) introduction. Herpetological Review 31(1): 94-103.

_____. 1990. Final report of the status of the California red-legged frog (*Rana aurora draytonii*) in the Pescadero Marsh Natural Preserve. Final report prepared for the California Department of Parks and Recreation, Sacramento, California through Agreement (4-823-9018). Department of Herpetology, California Academy of Sciences, Golden Gate Park, San Francisco, California. 30 pages.

_____. 1994. Amphibian and reptile species of special concern in California. California Department of Fish and Game, Rancho Cordova, California.

Jennings, M.R., M.P. Hayes, and D.C. Holland. 1992. A petition to the U.S. Fish and Wildlife Service to place the California red-legged frog (*Rana aurora draytonii*) and the western pond turtle (*Clemmys marmorata*) on the List of Endangered and Threatened Wildlife and Plants. 21 pages.

Kolar, P.S., and Wiens, J.D., 2017, Distribution, nesting activities, and age-class of territorial pairs of golden eagles at the Altamont Pass Wind Resource Area, California, 2014–16: U.S. Geological Survey Open-File Report 2017–1035, 18 pages.

Kotler, B.P., J.S. Brown, S.R.X. Dall, S. Gresser, D. Ganey, and A. Bouskila. 2002. Foraging games between gerbils and their predators: temporal dynamics of resource depletion and apprehension in gerbils. Evolutionary Ecology Research 4:495-518.

Kruse, K.C. and M.G. Francis. 1977. A predation deterrent in larvae of the bullfrog, *Rana catesbeiana.* Transactions of the American Fisheries Society 106(3): 248-252.

Kyba, C.C.M., T. Ruhtz, J. Fischer, and F. Hölker. 2011. Cloud Coverage Acts as an Amplifier for Ecological Light Pollution in Urban Ecosystems. PLoS ONE 6(3): e17307. https://doi.org/10.1371/journal.pone.0017307.

Lamb, J.Y. and M.P. Davis. 2020. Salamanders and other amphibians are aglow with biofluorescence. *Scientific Reports* 10: 2821.

Lips, K.R., F. Brem, R. Brenes, J.D. Reeve, R.A. Alford, J. Voyles, C. Carey, L. Livo, A.P. Pessier and J.P Collins. 2006. Emerging infectious disease and the loss of biodiversity in a Neotropical amphibian community. Proceedings of the National Academy of Sciences of the United States of America 103(9): 3165-3170.

Longcore, T. and C. Rich. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment. 2. 191-198.

Lutkevich, P., D. McLean, and J. Cheung. 2012. FHWA Lighting Handbook. Report No. FHWA-SA-11-22. August 2012. FHWA Office of Safety, Washington, DC. 96 pages.

MacArthur, R.A., R.H. Johnston, and V. Geist. 1979. Factors in influencing heart rate in free-ranging bighorn sheep: a physiological approach to the study of wildlife harassment. Canadian Journal of Zoology 57:2,010–2,021.

Mallick, S.A., G.J. Hocking, and M.M. Driessen. 1998. Road-kills of the eastern barred bandicoot (*Perameles gunnii*) in Tasmania: an index of abundance. Wildlife Research 25:139–145.

Moyle, P.B. 1976. Fish introductions in California: a history and impact of native fishes. Biological Conservation 9(1): 101-118.

Munguira, M.L., and J.A. Thomas. 1992. Use of road verges by butterfly and moth populations, and the effect of roads on adult dispersal and mortality. Journal of Applied Ecology 29:316–329.

Mukherjee, S., M. Zelcer, and B. Kotler. 2009. Patch use in time and space for a meso-predator risky world. Oecologia 159: 661-8.

Munoz, D. 2018. *Plethodon cinereus* (Eastern Red-backed Salamander). Fluorescence. *Herpetological Review* 49: 512–513.

Peralta-García, A., B.D. Hollingsworth, J.Q. Richmond, J.H. Valdez-Villavicentio, G. Ruiz-Campos, R.N. Fisher, P. Cruz-Hernandez, P. Galina-Tessaro. 2016. Status of the California red-legged frog (*Rana draytonii*) in the state of Baja California, México. Herpetological Conservation and Biology 11(1): 168-180.

Padgett-Flohr, G. 2008. Pathogenicity of *Batrachochytrium dendrobatidis* in two threatened California amphibians: *Rana draytonii* and *Ambystoma californiense*. Herpetological Conservation and Biology 3(2): 182-191.

Padgett-Flohr, G.E. and R.L. Hopkins, II. 2010. Landscape epidemiology of *Batrachochytrium dendrobatidis* in central California. Ecography 33: 688–697.

Perry, G., B. Buchanan, R. Fisher, M. Salmon, and S. Wise. 2008. Effects of artificial night lighting on amphibians and reptiles in urban environments.

Prugh, L.R. and C.D. Golden. 2014. Does moonlight increase predation risk? Meta-analysis reveals divergent responses of nocturnal mammals to lunar cycles. Journal of Animal Ecology 83: 504-514.

Richmond, J.O., A.R. Backlin, P.J. Tatarian, B.G. Solvesky, R.N. Fisher. 2014. Population declines lead to replicate patterns of internal range structure at the tips of the distribution of the California red-legged frog (*Rana draytonii*). Biological Conservation 172: 128-137.

Rohacek, A., B. Buchanan, and S. Wise. 2010. The effects of artificial night lighting on the nocturnal activity of the terrestrial red-backed salamander, Plethodoncinereus.

Rosen, P.C., and C.H. Lowe. 1994. Highway mortality of snakes in the Sonoran desert of southern Arizona. Biological Conservation 68:143–148.

Shaffer, H.B., G.M. Fellers, S.R. Voss, C. Oliver, and G.B. Pauley. 2010. Species boundaries, phylogeography, and conservation genetics of the red-legged frog (*Rana aurora/draytonii*) complex. Molecular Ecology 13:2667-2677.

Stebbins, R.C. 2003. A field guide to western reptiles and amphibians. Houghton Mifflin. Boston, Massachusetts.

Storer, T.I. 1925. A synopsis of the Amphibia of California. University of California Publications in Zoology 27: 1-342.

_____. 1933. Frogs and their commercial use. California Department of Fish and Game 19(3): 203-213.

Stuart, J.M., M.L. Watson, T.L. Brown, and C. Eustice. 2001. Plastic netting: an entanglement hazard to snakes and other wildlife. Herpetological Review 32(3):162–164.

Tatarian, T.J. and G. Tatarian. 2008. California red-legged frog telemetry study; Hughes Pond, Plumas National Forest. Annual Report, Option Year 3 to: U.S. Fish and Wildlife Service, 2800 Cottage Way, Sacramento, California and U.S. Forest Service, Plumas National Forest, 875 Mitchell Avenue, Oroville, California.

_____. 2010. Chytrid Infection of *Rana draytonii* in the Sierra Nevada, California, USA. Herpetological Review 41(3): 325-327.

Tatarian, P.J. 2008. Movement patterns of California red-legged frogs (*Rana draytonii*) in an inland California environment. Herpetological Conservation and Biology 3(2): 155-169.

A. M. Tozetti and Toledo, L. F. 2005. Short-Term Movement and Retreat Sites of Leptodactylus labyrinthicus (Anura: Leptodactylidae) during the Breeding Season: A Spool-and-Line Tracking Study. Journal of Herpetology 39(4): 640-644.

Trombulak, S.C., and C.A. Frissell. 2000. The ecological effects of roads on terrestrial and aquatic communities: a review. Conservation Biology 14:18–30.

Twedt, B. 1993. A comparative ecology of *Rana aurora* Baird and Girard and *Rana catesbeiana* Shaw at Freshwater Lagoon, Humboldt County, California. Master of Science thesis. Humboldt State University, Arcata, California. 53 pages plus appendix.

U.S. Fish and Wildlife Service (Service). 1996. Endangered and threatened wildlife and plants; determination of threatened status for the California red-legged frog. Federal Register 61: 25813-25833.

_____. 1998. Recovery Plan for Upland Species of the San Joaquin Valley, California. Portland, Oregon. 340 pages.

_____. 2002a. Draft Recovery Plan for Chaparral and Scrub Community Species East of San Francisco Bay, California. Region 1, Portland, OR. xvi + 306 pp.

_____. 2002b. Recovery plan for the California red-legged frog (*Rana aurora draytonii*). Portland, Oregon. 173 pages.

_____. 2005. Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog. Sacramento, California. 26 pages. Available at http://www.fws.gov/sacramento/es/Survey-Protocols-Guidelines/Documents/crf_survey_guidance_aug2005.pdf

_____. 2006. Endangered and threatened wildlife and plants; designation of critical habitat for the California red-legged frog (*Rana aurora draytonii*), and special rule exemption associated with final listing for existing routine ranching activities; final rule. Federal Register 71(71):19244-19346.

_____. 2010a. Endangered and threatened wildlife and plants; revised designation of critical habitat for California red-legged frog; final rule. Federal Register 75: 12815-12959.

_____. 2010b. San Joaquin Kit Fox (*Vulpes macrotis mutica*) 5-Year Review: Summary and Evaluation. Sacramento Fish and Wildlife Office.

_____. 2015. Recovery Plan for Four Subspecies of Island Fox (*Urocyon littoralis*). U.S. Fish and Wildlife Service, Sacramento, California. xiv + 180 pages.

_____. 2017. Recovery Plan for the Central California Distinct Population Segment of the California Tiger Salamander (*Ambystoma californiense*). U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, California. v + 69pp.

Van der Zande, A.N., W.J. ter Keurs, and W.J. Van der Weijden. 1980. The impact of roads on the densities of four bird species in an open field habitat - evidence of a long-distance effect. Biological Conservation 18:299–321.

Van Gelder, J.J. 1973. A quantitative approach to the mortality resulting from traffic in a population of *Bufo bufo* L. Oecologia 13:93–95.

Vos, C.C., and J.P. Chardon. 1998. Effects of habitat fragmentation and road density on the distribution pattern of the moor frog, *Rana arvalis*. Journal of Applied Ecology 35:44–56.

Wise, S. 2007. Studying the ecological impacts of light pollution on wildlife: Amphibians as models. In StarLight: A Common Heritage; Proceedings of the StarLight 2007 Conference; International Initiative in Defence of the Quality of the Night Sky and the Right to Observe the Stars, edited by C. Marín and J. Jafari, pp. 209–218. La Palma, Canary Islands, Spain: StarLight Initiative; Instituto de Astrofísica de Canarias.

Wright, A.H. and A.A. Wright. 1949. Handbook of frogs and toads in the United States and Canada. Comstock Publishing, Ithaca, New York.

Yovanovich, C.A.M., S.M. Koskela, N. Nevala, S.L. Kondrashev, A. Kelber, and K. Donner. 2017. The dual rod system of amphibians supports colour discrimination at the absolute visual threshold. 372 Phil. Trans. R. Soc. B 372:1717.

Zeng, Sheng-Lan, T.T. Zhang, Y. Gao, B. Li, C.M. Fang, S.L. Flory, and B. Zhao. 2012. Road effect on vegetation composition in a saline environment. Journal of Plant Ecology. 5(2):206-218.

Personal Communication

Allaback, M. 2019. E-mail communication from Mark Allaback, Biosearch Environmental Consulting, to John Cleckler, Service, Sacramento FWO, dated September 5, 2019.

Alvarez, J. 2019. E-mail communication from Jeff Alvarez, The Wildlife Project, to John Cleckler, Service, Sacramento FWO, dated September 9, 2019

Gordon, R. and J. Bennett. E-mail communication from Rebecca Gordon and Jesse Bennett, Service, Carlsbad FWO, to Valerie Hentges, Service, Sacramento FWO, dated October 12, 2017.

Mabe, J. 2017. Phone conversation from Jeff Mabe, U.S. Forest Service, Eldorado National Forest, to Ian Vogel, Service, Sacramento FWO, dated June 6, 2017.

Ohrens, O., C. Bonacic, and A. Treves. 2019 Non-lethal defense of livestock against predators: flashing lights deter puma attacks in Chile. Frontiers in Ecology and the Environment 17(1):32-38.

Searcy, C. 2019. E-mail communication from Chris Searcy, Assistant Professor of Conservation Ecology, Department of Biology, University of Miami, to John Cleckler, Service, Sacramento FWO, dated September 6, 2019.

Shaffer, B. 2019. E-mail communication from Brad Shaffer, Director of UCLA La Kretz Center for California Conservation Science, to John Cleckler, Service, Sacramento FWO, dated September 6, 2019.

Trenham, P. 2019. E-mail communication from Pete Trenham, Pennsylvania State University, to John Cleckler, Service, Sacramento FWO, dated September 9, 2019

Yang, D. and J. Martin. 2017. E-mail communication from Dou-Shuan Yang and Jacob Martin, Service, Ventura FWO, to Valerie Hentges, Service, Sacramento FWO, dated July 5, 2017.

This page is left blank intentionally.

Appendix G. List of Technical Studies

Biological Assessment: Interstate 580 Safety Lighting and Power Source Installation Project. November 9, 2018

Comments from the Air/Noise/Energy Branch Memorandum. March 27, 2018

Comments from the Hazardous Waste Branch Memorandum. March 27, 2018

Construction Greenhouse Gas Analysis. November 2, 2018

Geologic and Paleontological Environmental Study/Memorandum. October 12, 2018

Historical Property Survey Report, Archaeology Survey Report, and Extended Phase I. Close-Out Summary of Cultural Resource for the Interstate 580 Install Power Source and Safety Lighting Project. October 16, 2018

Location Hydraulics Study. October 3, 2018

Natural Environmental Study: Interstate 580 Safety Lighting and Power Source Installation Project. November 5, 2018

Visual Impact Assessment: Interstate 580 in Alameda County, from Grant Line Road to North Flynn Road. August 30, 2018

Water Quality and Storm Water Runoff Report. May 2018